ASSESSMENT OF NATIONAL PROJECT HEALTH AND SAFETY PLAN TEMPLATE LEVEL OF COMPLIANCE BY BUILDING CONSTRUCTION INDUSTRIES IN ABUJA METROPOLIS

BY

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MTech/SSTE/2018/8467

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MAY, 2023

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A THESIS SUBMITTED TO THE POSTGRADUATE SCHOOL, FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA, NIGERIA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTERS OF TECHNOLOGY IN INDUSTRIAL AND TECHNOLOGY EDUCATION (BUILDING TECHNOLOGY)

MAY, 2023

DECLARATION

I hereby declare that this thesis titled: "Assessment of National Project Health and Safety Plan Template Level of Compliance by Building Construction Industries in Abuja Metropolis" is a collection of my original research work and it has not been presented for any other qualification anywhere. Information from other source (published or unpublished) has been duly acknowledged.

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CERTIFICATION

This thesis titled: **"Assessment of National Project Health and Safety Plan Template Level of Compliance by Building Construction Industries in Abuja Metropolis**" by Mohammed, Usman Katcha (MTech/SSTE/2018/8467) meets the regulation governing the award of MTech in Industrial and Technology Education of the Federal University of Technology, Minna, and its approved for the contribution to the scientific knowledge and literary presentation

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ABSTRACT

The study was designed to assess the national project health and safety plan template level of compliance by building construction industries in Abuja Metropolis. Four research questions and four null hypotheses guided the study. Survey research design was used for the study. The study was conducted on registered construction industries in Abuja Metropolis. The population of the study comprised of 227 respondents from the 55 registered construction industries in Abuja Metropolis. The instrument used for data collection was a structured questionnaire with 50 items designed to obtain information from the respondents. The instrument was subjected to face and content validation by three experts. The reliability coefficient of the instrument was determined using Cronbach Alpha method, which was found to be 0.81, indicating that the instrument has a high reliability index. Mean and standard deviation were used to answer the research questions while Z-test statistics was used to test the hypotheses at 0.05 level of significance. Based on the data analyzed, the findings revealed among others that compliance with the established safety policy on the site before construction begins with mean value 2.12 and safety rules and regulation on the site planning and layout with mean value 2.36 were not complied by the construction industries and erection of scaffold under the supervision of competent personnel with mean value 3.56 is highly complied by the construction industries and findings further revealed that shoring of excavation back to 45^0 with mean value 2.20 and provision for daily inspection of excavation to determine the possibility of a cave in with mean value 2.33 were not complied by the construction industries in Abuja Metropolis. The findings on the hypotheses revealed that there was a significant difference in the mean responses of the professional and site workers on the compliance level of construction industries on site planning, layout and security precautions as contained in national project health and safety plan, there was also a significant difference in the mean responses of the professional and site workers on the compliance level of construction industries on excavation precautions as contained in national project health and safety plan Based on the findings of the study, it was concluded that construction industries in Abuja Metropolis do not complied with some of the construction precautionary measures outlined in the national project health and safety plan template by Council of Registered Builders of Nigeria (CORBON). It was recommended that government should provide appropriate inspection services in the construction site in order to enforce and ensure full compliance of the national project health and safety plan template by construction industries in Nigeria and the construction industries should ensure that all precautionary measures outlined in the national project health and safety plan template are strictly adhered to in order to saveguard the safety of the workers in the industries

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Study

Building Construction industry is a very important place, as considerable numbers of workers are involved in construction activities. Building industry is unique among all other sectors because it provides the necessary infrastructures that stimulate national development (Olanrewaju & Abdul-Aziz, 2015). Building construction industry in Nigeria, remain one of the key economic sectors in terms of its Gross Domestic Product (GDP) and employment. A large proportion of the Nigerian workforces are employed in the building construction sites and a great majority of them are exposed to varying levels of risks to their health and lives. Some of these risks associated with building project health and safety as identified by Muiruri and Mulinge (2014), include non-provision of health and safety environment, non-implementation of health and safety risk response strategies; working on high rise building; manual handling of loads; working in the sun and high temperature, exposure to fire, structural defect of building , working in an unsafe environment, bushy site environment, exposure to chemical substance and accidental struck by object, careless usage of tools, stepping on sharp object, working on slippery platform, unavailability of safety equipment, machines and tools, working in underneath loads moving crane, exposure to noise working with faulty equipment and exposure to electrical dangers at building construction sites.

Building construction is the techniques involved in assembly and erection of structures which is primarily to provide shelter (Alfred & Pao-Chi, 2019). It is an ancient human activity which began with the functional need for control of environment to moderate the effects of climate. The occurrence of accidents is of grave concern to both

practitioners and researchers all over the world (Kaur *et al.,* 2019). Among all major industries, building construction workers face the highest number of risks of occupational injuries, illnesses even death around the world. Higher mortality rates on construction sites remain a global major concern. The reality on ground in Nigeria is that accidents and injuries continually occur on construction sites, some even leading to loss of lives. Most employers fail to provide a safe and conducive working environment while in some cases the workers use the facilities inappropriately; these practices have implications to the workers themselves, the construction company and even the society at large (Ikechukwu *et al.,* 2012).

The Council of Registered Builders of Nigeria (CORBON, 2014) developed a check-list to minimize the occurrences of accident in the building construction project site known as national project health and safety plan template for compliance by the Construction industry. But the incidence of accident in construction site still persist which could be as a result of non-compliance with the national project health and safety plan (CORBON, 2014).

Compliance is described as adherence with laid down rules. Compliance with the national project health and safety plan template is applying measures/ requirements designed to minimize accident in the building construction site with the primary concerned to improved outcomes rather than prosecution (Williams *et al.,* 2018). According to Agwu and Olele (2014), compliance with Building Project Health and Safety legislations can increase productivity in building industries by reducing accidents. The input of the building construction industry in the development of a nation cannot be overemphasized, being among the largest industries that significantly subscribe to nation's development (Babalola *et al.,* 2015). The building industry is found to have contributed 4.18% to the Nigerian economy (Tanko *et al.,* 2017), as it

produces commercial, educational, government, industrial, medical, military, religious and residential buildings. Nevertheless, activities ranging from site clearance, excavation, concreting, scaffolding, block laying and roofing are some of the major activities carried out in the building construction site. Such activities requires the use of plethora of tools, equipment, and machinery which pose a great danger to the operatives on the building construction site. Besides, the nature of the construction site coupled with the high platform at which workers operate, and the weather conditions that these workers are exposed to serve as threats to their safety. However, such accidents are identified to include falls from heights/falling hazards (Orji *et al.,* 2016), explosion (Hovdem *et al.,* 2008), electrical accidents (Nkem *et al.,* 2015), roof construction falls and contact with electric current (Umeokafor *et al*., 2014), and fall of heavy objects during lifting. Shamsuddin *et al.* (2015) opined that workers knowledge and understanding of health and safety at work setting remained vital in promoting safety among them in the building construction site. CORBON divided the project health and safety plan template into different sections to include roof work, excavation, scaffolding, site layout planning and others.

Site layout planning involves identifying, sizing, and on-site-positioning of temporary facilities which may include security fences, access roads, storage sheds, field offices, fabrication shops, sanitary facilities, electric power service, stockpiles of excavation, and batch plants. Developing and maintaining an effective site layout is a significant and critical task that should be properly performed and updated during the project planning and construction phases as it can lead to: reducing the costs of materials handling; minimizing the travel times of labor, material and equipment on site; improving construction productivity; and promoting construction safety and quality (Tommelein *et al.,* 2015). Construction site layout planning has been recognized as a

critical step in construction planning. The basic function of the process is to find the most suitable arrangement for the positioning of temporary facilities. Site layout planning precautions according to Jamison (2018) is that, temporary facilities have to be placed right from the beginning of project, adequate measures in the form of reinforcement of all trenches, relevant safety checks at regular intervals which should be in compliance with official health and safety guidelines should be put in place before any employee begins any excavation works.

Excavation works is eminent in building construction industries. It the ultimate base of the entire construction. Excavation is required for building foundation, utility lines, tunneling and underpasses. Excavation and trenching are among the most hazardous construction operations (Gurley, 2012). The Occupational Safety and Health Administration's (OSHA) Excavation standards, defines an excavation as any man-made cut, cavity, trench, or depression in the Earth's surface formed by earth removal. Trenching and excavation work presents serious hazards to all workers involved. Employers must ensure that workers enter trenches only after adequate protections are in place to address cave-in hazards. Other potential hazards associated with trenching work include, falling loads, hazardous atmospheres, and hazards from mobile equipment (OSHA, 2015). Excavation accidents are always on the high side, and a lot of employees are injured annually. Several factors can affect excavation works, such as, rainfall, weather, adjoining structures, ground conditions and vibration or other external loading factors (Risk Control Guide, 2017). Furthermore, heavy moving equipment, improper assembly of scaffolds, wind, heights and worker fatigue causes scaffolding accident.

Scaffolding is a temporary structure and temporary working platform used to support people and material in the construction or repair of buildings and other large structures.

There are different types of scaffold structure such as independent tower, bracket tower, and scaffold tower supported by building, suspended scaffold and trestle scaffold (CORBON, 2014). The main use of construction scaffolding is to support construction work at elevated and inaccessible locations. In addition, the scaffolding is also used in other areas, such as the renovation of technological lines, in shipyards, as support structures for advertising, to separate specific areas from an enclosure, as temporary structures and decorative elements. Scaffolding accidents have many causes, falling objects, electrocution, falls during assembly or disassembly, falls while working, overturns falls while climbing, and construction deficiencies. According to the Occupational Safety and Health Administration (OSHA), construction deficiencies were responsible for 30% of all scaffolding accidents (Paul, 2013). According to Occupational Health and Safety Executive (OSHA, 2015) stated that, roof workers form greater percentage of operatives who are prone to injuries on site. Fall from height is the most severe hazard associated with roof work.

The roof work serves as a shelter for life and properties and hence a building is not complete without a roof. It also provides the principal line of defense against all elements while its design significantly affects its overall appearance. According to Hawkins (2012), the roof is the most vital component of a building to maintain but the most disregarded. Against this backdrop, roof cannot under any circumstance be ignored in any construction work or research work due to its significant importance. Mattison (2011) supported this notion by stating that about fifteen (15) percent of all newly constructed roofs fail during the first six years of usage. These statistics is a proof that most industries are using inferior materials, careless installation and overlooked maintenance. Many researchers have written about safety in the construction industry as far as the roofing industry is concern. Hence, it was appropriate to look at the driving

force that will make site operatives adhere to building project health and safety template to achieve high safety standards in both excavation, scaffolding and roofing work in Nigeria building project sites. Therefore, there is need to comply with the building project health and safety plan by site workers and professionals in the building work.

The professionals in building industry are those that have a career in a building construction related discipline. They include, the Architects, Quantity Surveyors, Engineer, (Civil, Mechanical, Structural, Electrical) the Building contractors, Artisans, and the Suppliers. Site workers are highly skilled workers, such as carpenters, electricians, plumbers, steelworkers, among others. Professional is engaged in a predominately mental activity while site workers are mainly engaged in physical labour. Both professionals in building industry and site workers need to comply with established building project health and safety policy as contain in the Builders documents. The objective of establishing the health and safety policy as contain in the Builders document is as follows: to provide health and safety in relation to workplaces and hazards, activities and things at workplaces, provide for the safe operation of major hazard facilities and mines in order to reduce the likelihood of a serious incident occurring, provide for the registration of certain people engaged in construction work at workplaces, provide for the licensing of certain people engaged in high risk work at workplaces, provide procedures for the resolution of health and safety issues at workplaces' as extracted from (CORBON Builders' document). Against this backdrop, there is a need to assess the National Project Health and Safety Plan template level of compliance by building construction industries in Abuja Metropolis.

1.2 Statement of the Research Problem

Building construction industry is a risk prone industry especially during the execution of major basic substructure and superstructure operations. It is because of this reason the

Council of Registered Builders of Nigeria (CORBON) developed a precautionary measures in each operations which when properly adhere to will minimize accident. However, accident in the building construction site still persist. According to Olanrewaju and Abdul-aziz (2015), the rise of accident in building construction sites and related issue is at the increased with little or no documentation in Nigeria. Some of these accidents occur due to illiteracy, lack of commitment to work and noncompliance with building project health and safety plan template among others. However, noncompliance with building project health and safety plan template and lack of stringent implementation of functional safety measure in building construction site lead to an increase in the number of accidents and fatalities (Agwu & Olele, 2014).

In the recent past in Nigeria, death tolls, permanent disability and severe environmental threat had been on the increase through collapse of buildings and major operational accidents especially in Lagos, Port Harcourt and Abuja, (Awodele & Ayoola, 2012). Hence, the need to find a way of minimizing the rate of construction related accidents in Abuja metropolis, through compliance with building project health and safety plan template. It is against this backdrop that this research set to assess the national project health and safety plan template compliance level by building construction industries in Abuja Metropolis.

1.3 Aim and Objectives of the Study

The aim of the study was to assess the national project health and safety plan template compliance level by building construction industries in Abuja Metropolis. Specifically, the objectives of the study were to determine:

1. The level of compliance with the national project health and safety plan template in Abuja Metropolis by construction industries on site planning, layout and security precaution.

2. The level of compliance with the national project health and safety plan template in Abuja Metropolis by construction industries on excavation precaution.
3. The level of compliance with the national project health and safety plan template in Abuja Metropolis by construction industries on scaffolding precaution.
4. to determine the level of compliance with the national project health and safety plan template in Abuja Metropolis by construction industries on roof work precaution.

1.4 Significance of the Study

The finding of this study will be of great benefit to: Council of Registered Builders of Nigeria (CORBON), Nigeria Institute of Builders (NIOB), Federal Ministry of Works and Housing (FMWH), tradesmen, contractors, professional builders, occupational health and safety officers, government agencies and the academia in the built environment programmes.

The findings of the study will be of benefit to CORBON as it revealed the compliance level of the implementation of the national project health and safety plan template in Abuja metropolis. The findings revealed those areas where the compliance level by the construction industries were high and therefore educate the CORBON the need to develop a strategies or advise the government on how to improve it for wellbeing of the workforce.

The finding of the study will be of great benefit to Nigeria Institute of Building (NIOB) by serving as a reference material for further research and development on compliance with occupational health and safety plan in the building construction industries.

The findings of this study will serve as a guide to Federal Ministry of Works and Housing (FMWH). Building construction workers on compliance to occupational health

and safety plan. This study will increase the body of knowledge and literature on the Occupational Health and Safety by building contractors. Furthermore, it will enable policy makers at Federal Ministry of Work and Housing, and management in the construction sector address issues in relating to Occupational Health and Safety in Nigeria.

The findings of this study will be of immerse benefit to tradesmen that are highly expose to hazards in carrying out their respective duties as vast majority of tradesmen are ignorant of the extent of compliance to occupational health and safety plan in building construction site which eventually leads to accident that result to injuries, damages to properties, equipment and loss of lives. This research will however, highlight the relevant authorities in ensuring occupational safety and health compliance in Nigerian building construction industry. Hence, minimize the rate of accidents as a result of lack of compliance to occupational safety and health in the industry.

The finding of this study will be of benefit to building construction contractors by creating awareness and re-orientate them on the effect of noncompliance to occupational health and safety plan in the construction site, hence device a means on how proper plan and preparation of their contract documents will influence compliance on safety and health issues in the construction site. Thereby minimizing accident, gain speed, higher productivity and maximize profit.

The findings will be of benefit to professional builders by keeping them informed of the potential danger harboured in some of the unserviceable electrical parts they handle and dispose improperly such as high intensity discharged lamp, vehicle light switches containing mercury among others.

The findings of this study will be of great benefit to occupational health and safety officers by making them aware of the new strategies adopted by the developed countries on compliance to occupational health and safety plan to meet up with the global challenges of safety in the construction industries. Compliance to occupational safety and health in the construction site will be of great benefit to professional builders by giving them more confidence in carrying out their duties.

The study will be of immerse benefit to government agencies as findings will lead to improvement in formulation, implementation, enforcement, review of national policies, statutory rules and regulations on compliance to occupational health and safety plan in building construction industries. The recommendations proposed will enable government and construction experts to look into sustainable methods to enforce compliance with builder's project health and safety plan and other safety control systems in enhancing workers compliance with safety practices and also in ensuring that construction works are carried out in a safe manner from the planning stage up to handing over stage.

The finding of the study will also be of advantage to academia and practitioners in the built environment in exploring the potential for more studies to be conducted towards formulating the comprehensive frame work for ensuring prompt compliance to occupational health and safety plan in the construction industries. This study will be of significance to academia and practitioners in the field of building construction by occupational health and safety compliance in the Nigerian context. Therefore, this study when concluded will be an addition to past researchers effort in addressing safety practices during the execution of construction projects in Abuja and by implication Nigeria at large. As well, provides lasting solutions to the challenges confronting compliance with safety practices in management of building production process. It will

also provide further suggestion and solutions to stakeholders on measures to upgrade safety practices on construction projects. The study is intended to serve as a bench mark for proper assessment of occupational health and safety plan and provide current and relevant information and data that will benefit the construction industries in FCT and Nigeria at large.

1.5 Scope of the Study

The study was delimited to the assessment of the compliance level of building project health and safety plan by the construction industries in Abuja Metropolis Specifically, this study covered site planning layout and security, excavation, scaffolding and roof work to other aspects of building construction such as stair cases, floor finishes and many more others. The study furthered consider tradesmen, project managers, safety officers and the management staff of the building construction industries.

1.6 Research Questions

The following research questions

1. What is the level of compliance with the national project health and safety plan template in Abuja Metropolis by construction industries on site planning, layout and security precaution?
2. What is the level of compliance with the national project health and safety plan template in Abuja Metropolis by construction industries on excavation precaution?
3. What is the level of compliance with the national project health and safety plan template in Abuja Metropolis by construction industries on scaffolding precaution?

4. What is the level of compliance with the national project health and safety plan template in Abuja Metropolis by construction industries on roof work precaution?

1.7 Research Hypotheses

The following hypotheses were formulated and tested at 0.05 level of significance:

HO_1: There is no significant difference between the mean responses of professional and site workers on the level of compliance by construction industries on site planning, layout and security precautions as contained in the national project health and safety plan template in Abuja Metropolis.

HO_2: There is significant difference between the mean responses of professionals and site workers on the level of compliance by construction industries on excavation precautions as contained in the national project health and safety plan template in Abuja Metropolis.

HO_3: There is significant difference between the mean responses of professional and site workers on the level of compliance by construction industries on scaffolding precautions as contained in the national project health and safety plan template in Abuja Metropolis.

HO_4: There is no significant difference between the mean responses of professional and site workers on the level of compliance by construction industries on roof work precautions as contained in the national project health and safety plan template in Abuja metropolis.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Theoretical Framework

2.1.1 Distractions theory

The proponent of the theory is Hinze (2002) and states that safety is situational. Because mental distractions vary, the responses to them may have to differ to maintain safe performance. Additionally, hazards or physical conditions with inherent qualities that can cause harm to a person, may or may not be recognized by the worker and influence safety of the task. The theory applies to a situation in which recognized safety hazard or mental distractions exist and there is a well-defined work task to perform. In the absence of hazards, there is little to prevent workers from completing their tasks. However, in the presence of hazards, work is greatly complicated. The theory has two components, first dealing with hazards posed by unsafe physical conditions and the other dealing with a worker preoccupation with issues not directly related to the task being performed. The theory basically states that when a worker has lower probability of injury and higher level of task achievement in building construction industries. When a worker has a higher focus on a mental distraction, the worker has a higher probability of injury and a lower level of task achievement.

To avoid injury and achieve high levels of productivity, workers must avoid mental distractions. Lavie (2005) states that managers must consider human capabilities from health and safety viewpoint when assigning tasks to their employees. He argues that accidents have identifiable socio-technical cause resulting in human performance. Employers should take account of their capabilities and the level of training, knowledge and experience on health and safety in the workplaces. Lavie (2005) confirms that organizations should design human error oriented accidents prevention programs

without slowing productivity or compromise performance since accidents and incidents in workplaces are unplanned and unwanted occurrences involving movement of persons, objects or materials which may result in injury, damage or loss to property or people.

2.1.2 Goal-Freedom Alertness Theory

The Goal-Freedom Alertness Theory was developed by Kerr (1950) and it states that safe work performance is the result of psychologically rewarding work environment. Under this theory, accidents are viewed as low-quality work behaviour occurring in an unrewarding psychological climate. This contributes to a lower level of alertness. According to the theory, a rewarding psychological climate is one where workers are encouraged to participate, set sustainable goals and choose methods or safety programmes to attain those safety and health goals. They must be allowed to participate in raising and solving problems.

Goal-Freedom Alertness Theory essentially states that management should allow workers to have well defined goals and freedom to pursue those goals. The result is a higher level of alertness and a focus on the tasks at hand. The theory suggests that managers and supervisors should try and make work more rewarding for workers. They may use a variety of managerial techniques including positive reinforcements, goal setting participative management and clear work assignments. Heinrich *et al.,* (1980) supports the theory by stating that workers will be safe in a positive work environment. They argue that safe performance is compromised by a climate that diverts the attention of workers. They confirm that hazards divert the workers' attention during work hours and thus the diversion increases susceptibility to injury. Heinrich *et al.,* (1980) suggests that managers and supervisors can actively work to alleviate hazards in the work

environment. Reaction of workers to unsafe conditions depends on the fact that whether the worker identifies with the unsafe condition

2.1.3 Compliance-based or cooperative theories

These theories are of the philosophical position that compliance is best achieved through the conciliatory style of enforcement (Fairman & Yapp, 2005; Oded, 2010), persuasion, and the cooperation of the regulated but not through threat of sanctions (Oded, 2010). Compliance strategies can encourage a better relationship between the regulator and the regulated, and they foster a flexible approach in regulation (Fairman & Yapp, 2005). Mitchell (2007) presents this theory while writing about International Environmental Agreements. Mitchell relates this to understanding 'behaviour as a response to an interplay of norms and identity (involving elements of both socialization and internalization) in a process characterized by the 'logic of appropriateness''. To illustrate the decision to comply is made based on what is the most practical usefulness of something to an individual after considering the available information.

2.2 Conceptual Framework of the Study

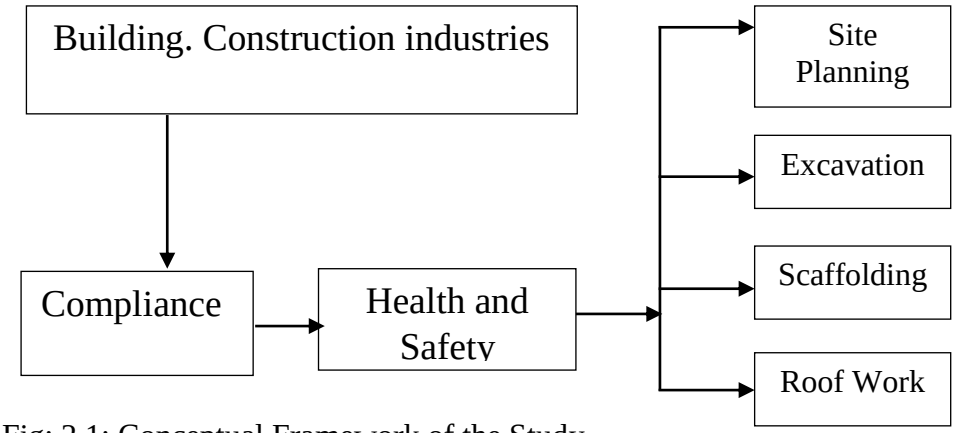

Fig: 2.1: Conceptual Framework of the Study
Source: Oded (2011)

2.2.1 Building construction industry in Nigeria

Building Construction activities is believed to have been in existence as humanity, while building project in Nigeria started as early as 1930's. Construction activities were executed via public works department (PWD) and Royal Army Engineers who later became (Nigerian Army Engineers). The only means of project execution then was through direct labour. However, British and Italian construction companies were first to be engaged as contractors in the Nigerian construction industry in the 1940's (Olowo-Okere, 1985). Building construction industry is also considered as labour intensive because, labour cost amounts to 40-65% of the overall cost of a project according (Rao *et al.*, 2015).

The construction companies in Nigeria operate majorly in two categories, multinational construction companies and indigenous construction companies as expressed in Ogbu (2011). According to Ogbu (2011), the Nigerian Oil and Gas Industry Content Development Act 2010, defines Nigerian indigenous company as one who registered under Companies and Allied Matters Act and having not less than 51% of Nigerian shareholding. Ogbu (2011) and Ibrahim *et al.* (2014) explained that an indigenous construction company can be view as the Nigerian owned firms, whose establishment and man power resources are sourced in Nigeria, and their strength determine their level of operation in terms of project handling. Majority of government financed project and public-private-partnership project enjoy the engagement of foreign firms in execution of their project, due to adequacy of technically demand, skillful managerial competence, good planning, robust financial management, diversity in construction methods compared to indigenous firms who depend on individuals client for the award of building contracts as viewed in (Enshassi *et al.*, 2007; & Idoro, 2007) studies.

Building construction industry remains one of the key economic sectors in terms of its

contribution to Gross Domestic Product (GDP) and employment. Building construction industry in any country is associated with vital contributions to national economic development through strategic planning, design, and construction in transforming various production processes into constructed facilities (Isa *et al*., 2013). The Building industry is unique among all other sectors because it provides the necessary infrastructures that stimulate national development (Babalola *et al.*, 2015). In Nigeria, approximately 25% of the Nigeria's workforce were attributed to construction industry (Ibrahim & Musa-Haddary 2010). Construction industry is also viewed as labour intensive because labour cost amounts to 40-65% of the overall cost of a project (Rao *et al.*, 2015). Therefore, the labour intensive nature of the industry will demands more human involvement at the production stage. However, the industry compared with other sectors of the economy, due to caliber of casualty suffered in execution of building projects across the globe, has made the construction industry the most dangerous or highly hazardous industry (International Labour Organisation, 2016).

The building construction sector is a very hazardous one, as other construction sectors experiencing very frequent accident cases. This sector is very vital to all other industries as it provides the environment for their operation (Jimoh, 2012). Shelter is one of man's basic necessity in life. The quest for the provision of adequate housing has led to an increase in the activities of the building construction industry in Nigeria. Little or no attention is paid to the safety of the workers who see to the realization of these buildings, they are mostly illiterate and are ignorant of their rights and privileges. As such, building construction workers are constantly being made to work under unsafe conditions which pose danger to their lives. Deaths and permanent disabilities have occurred as a result of these poor standards Awwad *et al.* 2016). This shows that the government needs to enforce the available regulations to check these accidents.

The term building construction worker refers to a person engaged in the physical construction of a building. These individuals could be either skilled or unskilled, depending on the nature of work they are expected to perform on the building site (sokanu.com). Building construction workers perform a wide range of tasks, although virtually all these tasks require some form of training and experience, some can be performed with little or no skills. The typical building site worker executes some basic tasks like: Load or unload building materials to be used on site, Clean and prepare construction sites by removing all the debris and potential hazards around the site. Operate machines used in construction works like, concrete mixers and cranes. A variety of trades are usually generally grouped as building construction works. They include, the following: Masons (Brick layers), Carpenters, Electricians, Painters, Plumbers, Roofers, Steel benders, Labourers Tillers.

2.2.2 Level of Compliance with Building Project Health and Safety Practices

Level of compliance with building project health and safety practices in Nigeria and Abuja metropolis in particular, is of great concern to professional builders and site workers. Hawkins (2012), describes compliance as applying measures designed to comply with legal requirements with the regulator being primarily more concerned with improved outcomes than prosecution results. According to Idubor and Osiamoje (2013), lack of strict enforcement of OSHA regulations enables non- compliance to OSHA regulations; while Umeokafor *et al.* (2014) state that non-compliance to OSHA regulations is a major contributor to the poor state of OSHA in Nigeria. Hence compliance with Occupational Health and Safety legislations can increase productivity in industries by reducing accidents, because accidents result in decreasing productivity and damage to equipment or property (Hawkins, 2012).

Despite the existence of regulatory system and standard in many building construction industries in most countries the accident occurrences persists. The accidents and fatalities rate in building construction industries is attributed to the noncompliance by contractors with safety and health regulation on building construction sites (Baxendale & Jones, 2010). Looking at the side effect of construction related injuries on workers and the project success in Abuja metropolis, building project health and safety plan must be given high priority by the construction participants to ensure human safety against the frequent occurrence of accidents on building construction site. Ahmad *et al.* (2016) defined safety as unique event that is paramount to continuous attainment of productivity. Ahmad further opined that safety focus on curbing accidents at work setting and its negative effect on the workers in all manners. Assessment of various researchers such as: Okoye and Okolie (2012); Idubor and Oisamoje (2013); Dodo (2014); and Umeokafor *et al.* (2014); on compliance and management of safety in building construction project reveals that adoption and compliance with health and safety provision served as catalyst in optimizing construction production process. On the other hand, without compliance to health and safety practices, more accident will result in pains, accidents and legal actions thereby escalating production cost. Based on this, Famakin and Fawehinmi (2012) stated that safety practices are parameter to measure successful project delivery which is most paramount to the client because they greatly influenced in achieving efficiency and effectiveness amongst professionals and even workers in the construction industry.

The noncompliance with building project health and safety practices will delay the production process of construction activities. Several attempts have been made by the construction industry towards improving its safety performance. However, the paradigm shifts from monitoring safety performance to preventive measures of

improving safety performance. Ikechukwu *et al.* (2012) stated that some of the developing nations like Nigeria lacks adaptive laws and regulations on health and safety practices. The study added that, effective management of safety practices are aided by various factors such as: socio-humanitarian perspective, and financial-economic perspective. George *et al.* (2013) added that Construction Company should provide awareness particularly on each project that covers an outline of the project, a top to bottom survey of the safety necessities and desires, clearing arrangements and systems, disciplinary activities, substance manhandle testing policy and proactive management methods needed for the project.

Kamau (2014) claims that health and safety regulations are just symbolic gestures and useless. Thus the prevalence of health and safety abuses on construction site among construction stakeholders calls for an intensive investigation into the level of health and safety knowledge and compliance of construction workers. This is because enforcement and compliance with building project health and safety regulations are not the standard steps for improving health and safety, as improving organizational culture can also improve health and safety in the construction industries, (Umeokafor *et al.*, 2014). This therefore, implies that regulation without strict compliance and management commitments amounts to waste of time and resources. In support of this, Kalejaiye (2013) asserts that prior to the enactment of the safety laws in England in 1833, it was believed that accidents were predestined and inevitable, but this was no longer acceptable after the enactment of the above laws. Furthermore, Idubor and Osiamoje (2013) identify religious beliefs to determine compliance with OSH regulations. They opine that some employers resort to fetish rituals to stop accidents instead of taking adequate safety precautions. Idubor and Osiamoje (2013) further posit that some believe accidents are acts of God. That is, accidents occur because God allows them.

This is further emphasized by Smallwood and Ehrlich (2008) who note that the Islamic 'Tawhidic' principles of justice and equality, dignity of labour and removal of hardship do not support intervention decisions based on cost benefits. As a result of the above arguments, contractors may do little or nothing to prevent these accidents; and may not take safety guidelines seriously. Therefore, this suggest that beliefs, be it religious or superstitious often filters into work environments resulting to lack of compliance with health and safety regulations in the construction industry in Africa. So also, Idubor and Oisamoje (2013) identify unemployment as one of the factors that embolden non-compliance with OSH regulations. The level of unemployment in Nigeria is so high and increasing. According to Trading Economics (2015), unemployment in Nigeria rose from 21.10 % in 2010 to 23.90 % in 2011. This amounts to high volume of men and women given to the employer to pay low wages or impunity to take advantage of workers to work under dehumanizing conditions provided they have jobs. Therefore, if construction works being carried out violate OSHA regulations at the same time under dangerous conditions, the workers are unable to complain, for they risk losing their jobs.

2.2.3 Factors Responsible for non-compliance with Safety Practices in Construction Industries

The importance of operational safety regulations has been taken with a levity hand due to individual acceptance that construction accidents is an unavoidable act due to the characteristic of activities involved on project sites. Thus, making non-compliance with operational health and safety a common believe (Smallwood & Ehrlich, 2008). Several authors have worked on health and safety management on construction site, but adequate consideration have not been given to the effect of safety wears on workers output. Olutuase *et al.,* (2014) studied safety management in the context of Nigerian industry with an intention to compare level of compliance with the international standards. The study outcome established existence of safety regulations in the

management of construction projects. However, the system seems to be poorly characterized by ineffectiveness and poor documentation.

The study called for urgent attention on construction managers to strictly adhere with the provisions safety regulation requirements for site management. Umeokafor *et al*, (2014) adopted strategic overview of past researchers effort on the subject of health and safety. The study unearthed reasons regarding noncompliance with health and safety requirement in Nigerian construction sites, as owner's impact and weak implementation. The study concluded that, safety personnel should consider importance of implementing safety provision to attract construction manager and contractors in building a robust safety management on construction site, while client should use health and safety records as a required document for prequalifying contractors.

2.2.4 Site Layout planning work at Building Construction Site

Site Planning for Construction activities must be prepared and free from dangers and hazardous materials that could affect the health and safety of the worker doing the construction. Site layout planning involves identifying, sizing, and on-site-positioning of temporary facilities which may include security fences, access roads, storage sheds, field offices, fabrication shops, sanitary facilities, electric power service, stockpiles of excavation, and batch plants. Developing and maintaining an effective site layout is a significant and critical task that should be properly performed and updated during the project planning and construction phases as it can lead to: reducing the costs of materials handling; minimizing the travel times of labor, material and equipment on site; improving construction productivity; and promoting construction safety and quality (Tommelein *et al.,* 2015).

Construction site layout planning has been recognized as a critical step in construction planning. The basic function of the process is to find the most suitable arrangement for the positioning of temporary facilities. Site layout planning precautions according to Jamison (2018) is that, temporary facilities have to be placed right from the beginning of project completion, adequate measures in the form of reinforcement of all trenches, relevant safety checks at regular intervals which should be in compliance with official health and safety guidelines should be put in place before any employee begins any excavation works.

2.2.5 Excavation work at Building Construction Site

Excavation work presents serious hazards to all workers involved. Cave-ins pose the greatest risk and are more likely than other excavation-related incidents to result in worker fatalities. An unprotected trench can be an early grave for employees in the building construction industry. Employers must ensure that workers enter trenches only after adequate protections are in place to address cave-in hazards. Many on the job incidence resolve from inadequate planning, (Mayer & Nakamura, 2021). Other potential hazards associated with trenching work include falling loads, hazardous atmospheres, and hazards from mobile equipment (OSHA, 2015). Excavation accident is always on the high side, and a lot of employees are injured annually. Almost all of excavation works are considered to have potential high risk activities such as, foundations, sewers and drainage and the depth for any of the activities, varies from one task to another. Several factors can affect excavation works, such as, rainfall, weather, adjoining structures, ground conditions and vibration or other external loading factors (RCG, 2017). Cave-ins are the most potentially catastrophic risks that affect excavation projects and the people who work on them. Excavation cave-in occurs more often than any other type of excavation hazard, resulting in employees' fatalities (Kiganda, 2017).

In order to minimize or prevent the occurrence of such accidents, adequate protection should be provided against any collapse (RCG, 2017). Excavation work includes open excavations, potholing, pit excavations, trenches and retaining walls, shafts and drives. Working in and around excavations and trenches can result in serious injury and death if hazards are not properly identified and controlled at all times. Gurley (2012) posited that most of the excavation accident occur at depths not less than 10 ft. Due to lack of protective systems and finally, leading to trench-related fatalities. There are many potential hazards when working in excavations and trenches. Probably, the most common hazard at any work site is the threat of cave-in. A cave-in occurs when walls of an excavation collapse and can result in death. Wall failures often occur suddenly, with little or no time for the worker to react. The weight of the soil crushes and twists the body, causing death or serious injury in a matter of minutes. Excavations need not be deep or large to create a life threatening hazard (Mayer & Nakamura, 2021).

The author further stressed that, Cave-ins occur when undisturbed soil is kept in place by natural horizontal and vertical forces of the nearby soil. Natural forces are no longer able to hold back the soil left behind during excavation. The laws of gravity take over during the excavation, since there is support and the soil from the excavation walls move downward and inward into the excavation. The result is a cave-in and is likely to occur in unprotected excavations. The excavation is dug in unstable soil, or in soil that has been dug in before; There is excessive vibration from construction equipment or vehicle traffic around the excavation; Too much weight near the sides of an excavation, most frequently from equipment or the excavated material (spoil pile) too near to the edge; Water has collected in the excavation; Changes in weather conditions among others.

The Occupational Safety and Health Administration issued its first Excavation and Trenching Standard in 1971 to protect workers from excavation hazards. Since then, OSHA has amended the standard several times to increase worker protection and to reduce the frequency and severity of excavation accidents and injuries. Despite these efforts, excavation related accidents resulting in injuries and fatalities continue to occur. The N.C. Department of Labor has developed this guide in effort to address requirements of the standard, as well as provide information for equipment operators, workers and all others associated with trenching and excavating to help recognize hazardous conditions that could result in injury or a fatality. This guide discusses soil composition in moderate details to provide a general overview of the various properties associated with different types of soil. A general understanding of the properties of soil, is the first step in predicting the behavior of soils in varying condition. Some of the most common types of soil conditions that lead to trench and excavation failure are also discussed.

Proper trenching operations are necessary to protect the workers from soil collapse. In building construction, significance of the excavation works is eminent due to the ultimate base of entire construction. In general, construction projects such as building foundation, utility lines, tunneling, and underpasses require excavation in different makeup, e.g., open excavation, potholing, trenches, and shaft drives. According to safety and health agency in the United States, Occupational Safety and Health Administration, hereinafter referred to as OSHA, excavation typically refers to any man made cut, trench, cavity, or depression made by removal of earth. Despite constant determination from safety professionals, researchers, and imposed safety regulations, injuries and fatalities in construction have not significantly dropped (Hussain, *et al*., 2017)

2.2.6 Scaffolding work at Building Construction Site

Scaffolding is a temporary structure erected to support access or working platforms. Scaffolds are commonly used in construction work to have a safe and stable work platform when work cannot be done at ground level or on a finished floor. Scaffoldings are used to support light to moderate loads of labors, small construction material and equipment for safe working space. They are usually attached to buildings with ties and only one bay wide.

Types of Scaffoldings

According to OSHA (2015), there are many different types of scaffolding and the precise names and terminology tend to vary from place to place, but in general the main categories are set based on how the structure interacts with the building it's up against, how it's constructed, and the type of weight it can support. All have some inherent dangers, manufacturers and users usually have to adhere to a number of best practices in order to stay safe. Based on how scaffoldings are constructed they can be classified as follows:

1. **Supported Scaffolding**

Supported scaffoldings are built from the base upwards, and will normally be used wherever possible. It is the most commonly used form of scaffolding in construction work and on most other forms of work where elevation is required. Extra support may be required if the scaffolding will be long or required to take a lot of weight. Supported scaffolding can be left in position for longer periods of time, making it especially useful in those situations where permanent access may be needed to elevated positions. Different forms of supported scaffolding are available, and each will serve a very specific purpose and used in specific circumstances. The most common types of supported scaffolds are the following:

***Tube and coupler scaffolds*:** are built from tubing connected by coupling devices. Due to their strength, they are frequently used where heavy loads need to be carried, or where multiple platforms must reach several stories high. Their versatility, which enables them to be assembled in multiple directions in a variety of settings, also makes them hard to build correctly. The three basic elements of scaffolding are standards, ledgers and transoms. The tubes used to construct the scaffolds are also known as the standards or uprights. They run throughout the entire structure and ensure that it stands upright. They also transfer the entire weight of the structure to the ground on a square base plate so as to spread the load. Ledgers are the tubes that are horizontal and connecting to the vertical tubes to hold the structure firmly. Transoms are placed on the ledgers at right angles to give the structure more strength. All these different components ensure that the structure is strong and firm to hold weight and ensure safety. Standard couplers or clamps are used to connect these elements together to form a complete scaffold (OSHA, 2015).

***Frame or fabricated scaffolding*:** Fabricated frame scaffolds are the most common type of scaffold because they are versatile, economical, and easy to use. However, such scaffolds suit mostly residential or other kinds of symmetrical construction where a single configuration would be repeatedly used. Framed scaffolds are also used in industrial projects depending on the type of situation as they are far easier to construct and take down than a normal tube and clamp scaffold which in turn saves considerable resources (Chandan, 2013).

***Systems scaffold*:** According to OSHA (2015) Systems scaffolds or all around scaffolds can be applied to a wide variety of rectangular, dome or circular configurations. It's not as adjustable as a tube and clamp; however, they are comparatively quicker to set up and take down.

2. **Suspended Scaffolding**

Suspended scaffolding is typically suspended from a roof or other tall construct. It is most commonly used when it is not possible to construct a base, or where access to upper levels may be required, and the building of scaffolding from floor to the required level would be impractical. The suspended scaffolding is high-efficiency modern overhead operation equipment capable of replacing a traditional scaffold and being reused. Generally, the suspended scaffolding can be divided into two kinds: manual and electric. It is widely applied to the outer wall construction, curtain wall installation and outer wall cleaning and maintenance in high rise and it can be also applied to large tanks, bridges, dams and other engineering operations (OSHA, 2006).

3. **Mobile Scaffolding**

There are a number of factors to consider when deciding whether to use static or mobile scaffolding. Ease of access is one such consideration, along with the amount of movement on the scaffolding itself. Where possible, scaffold contractor should rely on the use of a single scaffolding structure, or a number of structures, because mobile units, while perfectly safe when well-constructed and used properly, do pose more of a hazard than mobile constructs. Most scaffolding is considered semi-permanent. Once used, it can be taken apart and moved to another location before it is constructed again (OSHA, 2015).

4. **Aerial Lifts**

Aerial lifts should be used where workers need to be able to access a number of levels in order to be able to complete a construction. For example, if building work is being completed on the outside of a multi-story property and both workers and materials will be needed to work outside two or more floors, at different times, then an aerial lift will make it easier and safer to lift even large amounts of material, and multiple workers to

the levels required.

The safe scaffolding should be of adequate strength to support the weight and stress which the processes and workers will place upon it, and should be designed to prevent the fall of workers and materials. Many construction accidents are caused by deficiencies in the project design phase (Toole, 2005). Heavy moving equipment, overhead tools and materials, lack of proper assembly or inspection, wind, heights, and worker fatigue causes scaffolding accident (Paul, 2013). Mogarkar and Varghese (2012) reported that workers fall from scaffolds when components fail, handrails give way, planks break, and scaffold supports collapse, while most scaffold accidents can be traced to untrained or inappropriately trained workers. The main factors causing the scaffolds accidents are inappropriate work practices; inappropriate construction of scaffolding including planking; safety equipment not used and unexpected force shifted scaffolding (Mogarkar & Varghese, 2012). Halperin and Mccann (2004) reported that scaffold injury incidents occur in two ways, falls from scaffolds, or scaffold collapses.

The failure chain of the component can be explained by three different phases or events: initial crack formation, brittle propagation, final failure (Lacalle *et al.,* 2008). The accidents happened as a reason when ladder used in all construction sites does not match to standards. Inadequate provision of PPE or their absence in addition to inappropriate training of workers, are frequent causes of fall accidents (Huang & Hinze, 2003). It was revealed that personal factors particularly worker behavior are main factors leading to fall accident causation in high rise building projects occurring in the scaffolding area (Latief *et al.,* 2011). Romero *et al.* (2013) demonstrated that the standardization of scaffolding equipment had a direct and positive impact on work safety conditions at construction sites.

2.2.7 Roofwork at Building Construction Site

Generally, roofs are known to serve as the first line of defense against all weather conditions and protect life and properties as such very important component of the building. The building project is not complete without a decent roof. Basically, roofs can be classified into three major categories: flat, sloppy and arc or curve roofs. Various researches has been conducted on health and safety in the construction industry Kaplinski (2002) and Rowlinson (2004) stressed the need for government, health and safety professionals and stakeholders participation to create a better environment at work. The welfare of operatives when prioritized will go a long way to boost the reputation of their respective companies and minimize wastage as well as improving roof performance. This measure if up held will in long-term profit all parties involved. As part to delivering project worth the cost to the client, factors such as: proper installation of roof frame work and sheets, higher safety standards as far as avoidance of accidents is concerned and adequate roof performance over a lengthy period are the responsibility of all stakeholders involved. Stakeholders involved in this context are:

a. The manufacturers of roof products and related equipment
b. The project manager which may involve the owner of the company supervising the quality of roof work
c. The installers on-site fixing the wood or metal members and sheet
d. The client who will be using the finished product

The roof work serves as a shelter for all life and properties and hence a building is not complete without a roof. It also provides the principal line of defense against all elements while its design significantly affects its overall appearance. According to Hawkins (2012), the roof is the most vital component of a building to maintain but the most disregarded. Against this backdrop, roof cannot under any circumstance be

ignored in any construction work or research work due to its significant importance. Mattison (2011) supported this notion by stating that about fifteen (15) percent of all newly constructed roofs fail during the first six years of usage. These statistics is a proof that most industries are using inferior materials, careless installation and overlooked maintenance. Over the year many researchers have written about safety in the construction industry as far as the roofing industry is concern. Hence, it was appropriate to look at the driving force or what will make site operatives adhere to building project health and safety to achieve high safety standards in both excavation, scaffolding and roofing work in Nigeria building project sites.

Adhering to health and safety on site is tailored towards encouraging and maintaining of the highest level of the physical, mental and social welfare of workers in all occupations, avoiding high labour turnover owing to health complications caused by working environments, protecting workers from risks ensuing from factors adverse to health and creating favourable working conditions for worker.

Safety concerns in the construction industry of which the roofing industry is no exception are always essential as it can make or break a construction firm. Universally, construction industry is still regarded as one of the most dangerous industries (Hinze, 2002). The physical nature of roof work makes it prone to health and safety hazards. Hence, investing in health and safety offers strong dividend on individual projects. There are relatively low cost to implementing health and safety practices, and the benefits that comes with it help drives most companies to greater investment returns in their safety programs especially smaller ones (Hill, 2013).

According to OSHA (2006), Jordanian reports published by their Ministry of labor from 1995 to 2005 showed that the spate of accidents within most industries continue to rise

at an alarming rate claiming life's and properties as a result of poor safety performance. This report stated that though construction employees' accounts for about 7.1% of the labor force, Occupational Safety and Health Institute in Jordan reports that accidents in the construction industry contributed to about 10.5% of all cases. This explains that a safe working environment helps secure skilled employees on the job and projects on schedule by reducing accidents, the occurrence of injuries and schedule delays, while also reducing the risks of dispute and regulatory action (Cesarini *et al.,* 2013).

2.2.8 Accidents and ill Related Problems in the Construction Industries

The construction industry is known for its reputation of being one of the worst industries in terms of onsite health and safety. Nevertheless, the inadequate health and safety performance on building sites has triggered various studies with the intention of identifying the causes of construction accidents, so that appropriate reduction measures could be implemented (Haslam *et al.,* 2005). Murie (2007) stated that, many researchers' categorized health and safety hazards in either physical injury or ill-health hazards. The physical injury hazard includes death whereas the ill-health hazard can cause illness or death after a period of time has lapsed. Likewise the safety circumstances and the health situation in the building industry is also alarming. Health related issues such as stress, depression, anxiety, and arm vibration syndrome and respiratory diseases, musculoskeletal disorders, dermatitis, cement burns, hearing loss are not unusual in the building industry. (Health & Safety Executive, 2019).

2.2.9 Types of accidents and ill-health related issues in the building industry

Although accident data collection tends to concentrate on fatal accidents, it is paramount to recognise that way more employees in the construction industry die from the chronic effects of ill-health-related issues caused by or made worse at the

workplace. (Donaghy, 2009). The most common hazards on construction sites regardless of the physical injury or ill-health issues are identified as the following:

- Working at Height
- Electricity
- Noise
- Vibration
- Asbestos
- Dust
- Equipment, tools and machinery
- Manual handling
- Slips and trips
- Mental effects, traumatic events, aggression and bullying

These usual hazards found on the building sites are further explained one by one. Working at Height. When a job at altitude is planned, some necessary measures should be taken in order to do the job properly. This includes the technical aids that should be used regarding health and safety. The risk of falling from heights, is higher to window cleaners, painters, masons, decorators and those who work without proper training, protective equipment or planning (Murie, 2007). A report made by Health and Safety Executive (2019) found that approximately 45% of the fatalities are mainly caused by falls from heights in the UK. Electricity Sometimes it is necessary to work bellow power lines. Any work involving electrical power lines and electrically powered equipment can result in serious or fatal injuries. Therefore, some of the most common operations that can lead to contact with overhead power lines are: Operating cranes or other lifting equipment, raising the body or inclined container of tipper lorries, operating

excavators and other earth-moving equipment, handling long items such as scaffolding, metal roof sheets, ladders, using mobile elevated working platforms. In case of excavations elevated posts with high visibility can prevent accidents. It is important to eliminate the risks of electrocution on the site by using machinery with lower voltage or battery powered equipment. By conducting visual inspections to the electric machinery the site manager has to make sure: that the wires are properly insulated, the plugs are in good condition and the machine works properly. (International Labour Organisation, 2015). In the UK, for instance, 2% of all the work related fatalities are caused by electric shocks. (Hughes & Ferrett, 2011)

2.2.10 Causes of accidents on building construction sites

Accidents don't just happen, they are caused. For every accident that occurs there exists a remote reason why it happened. Various researches have been done pertaining this topic with various conclusions reached. A variety of causes exist for accidents which occur on building construction sites, as such it becomes the responsibility of the personnel in charge of the site to recognize the cause when it occurs and proffer effective ways to tackle them (Siriwardena, 2006). Natural phenomenon's referred to in Nigerian construction industry as "Acts of God" also play some role in causing construction accidents, the researchers listed rains, earthquakes, flooding and landslides as some of the "Acts of God" which exist and are capable of disrupting construction activities and causing accidents. Man has no control over the occurrence of these natural phenomenon, in the event of their occurrence construction activities are automatically suspended. During the rainy season, workers engaged at height could lose balance as a result of the slippery scaffolds from the rains, hence Adeniyi, (2001) suggested that it is much easier to work on construction sites during the dry season than the rainy season.

Workers accidents on construction sites can be attributed to two aspects, unsafe acts and

unsafe conditions (Toolboxtopics.com). Unsafe acts are controlled by the construction worker, using faulty equipment to work, disregarding posted warning signs on site unsafe conditions (mostly found across all construction sites) include insufficient lightning on site, poor ventilation. Aniekwe (2007) in his research concluded that the factors leading to accidents on building construction sites include:

1. Use of faulty tools.
2. Noncompliance to standard safety rules and regulations.
3. Improperly maintained and inadequate scaffolding.
4. Lack of experience.
5. Improper handling and storage of flammables.
6. Poor handling of tools and equipment.
7. Worker fatigue and boredom.
8. Improper Supervision.
9. Management attitude.
10. Workers operating environment.
11. Natural causes.
12. Inadequate management of work environment.
13. Faults in design details and specifications.
14. Faulty construction techniques.
15. Workers physical condition.
16. Lack of Job satisfaction.
17. Monotony (exposure to a particular job constantly).

Zaynab *et al.* (2012) in a research conducted in Yola, the capital city of Adamawa state in Nigeria concluded that the main causes of accidents on construction sites include the following, listed in order of superiority:

a) Lack of safety training.

b) Poor understanding of the risks associated with the work.

c) Influence of unsafe behaviour by workmates.

d) Over confidence.

e) Shortage of equipment.

Nigerian construction firms especially the multinationals which seem to have inherited safety policies and systems from their parent companies still record repeated cases of accidents and injuries some of which include falls from height, trapped by something collapsing or overturning, struck by a moving vehicle, contact with electricity or electrical discharge, struck by flying/falling object during machine lifting of materials, contact with operating machinery or material being machined, exposure to hot or harmful substance or fire outbreak that engulfed their entire office premises (Consult net Ltd, 2011). Kolawole (2014) stated that, workers indiscipline, inadequate communication and site characteristics were expressed as causes of accidents at building construction sites. Okoye *et al.* (2016), listed out the following: working bare footed, use of bamboo scaffolds, hand mixing of concrete without protective safety wears as some of the unsafe practices among workers on construction sites in Nigeria. In arguing the cause of accidents on construction sites in Nigeria, the author, noted that the failed occupational health and safety system in Nigeria could be traced back to weak statutory regulations and provisions. Umeokafor *et al*. (2014) study unearthed key issues affecting health and safety compliance in Nigeria as owner`s character and lack of clarity in the health and safety provisions, inadequate enforcement and lack of adequate regulations.

It should be pointed out that all these researches are broadly based on the construction industry in general be it road construction, bridge construction etc. It is based generally on all civil construction works, this research will focus primarily on the building construction

industry in order to fashion out issues associated precisely with this sector.

According to Ezenwa and Jolles (2011) on any building construction site, appropriate Health and Safety methods should be considered and used that will reduce or eliminate risk to death or injury.

Despite substantial investments made to mitigate OHS hazards in construction, accidents continue to occur with their attendant undesirable effects on workforce, equipment, and the environment (Cagno *et al.,* 2014). Available evidence suggests accidents in the construction industry are among the highest compared with other industries across countries (ILO, 2017). Globally, accidents in the construction industry are disproportionately higher than other industrial sectors. Reported average annual fatalities rates of 1.77 whereas Dong *et al.* (2014) estimate fatalities in the US construction industry as 23 per 100,000 workers. The underlying causes of accidents continue to prove elusive. Employees on construction sites usually feel the physical effect of accidents the most. These accidents result in bodily injury or even death. Loss of income, psychological effects is also experienced by such workers. Research conducted by Dong *et al*., (2014), about the number of casualties in the building construction sector of Lagos, Abuja and Port Harcourt between the year 2000-2010 revealed that Lagos state led in the casualty figures with 178 casualties within the period, Abuja came in second with 65 casualties while Port Harcourt recorded 30 casualties. A breakdown of Anthony's result is given in figure 2.1 below:

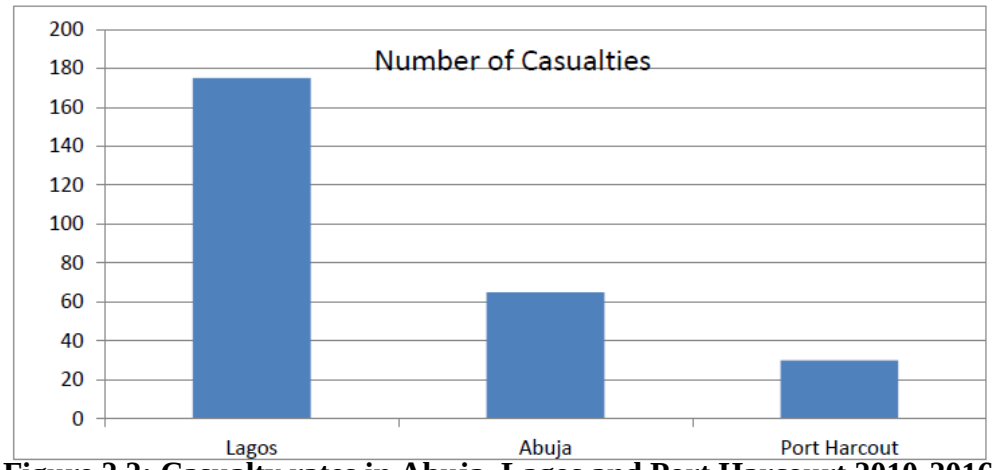

Figure 2.2: Casualty rates in Abuja, Lagos and Port Harcourt 2010-2016
Source: Dong *et al.*, (2014)

Most Frequent Accidents on Site

Table 2.1 below shows the ranking of the most frequent accidents that occur on site.

The three most frequent accidents that topped the rank in occurrence are: scaffolding accidents, falls from ladder and stepping or kicking abandoned objects. The two least frequent accidents are: accidents caused by fire or explosion and compressed gas accidents.

Table 2.1: Frequency of accident occur in Abuja Metropolis construction site

No.	Accident on Site	Frequency	Rank
1	Scaffolding accident	5	1
2	Lifting equipment failure	2	4
3	Welding accident	2	4
4	Trench collapse	2	4
5	Stepping of kicking abundant objects	3	4
6	Crane accident	2	43
7	Forklift truck accident	2	4
8	Electric shock injury	2	4
9	Accident caused by fire or exploration	1	15
10	Traffic accident	2	4
11	Compressed gas accident	1	16
12	Fall from ladders	4	2
13	Unsafe safety harnesses	2	4
14	Accident from faulty machinery	2	4
15	Power tool accident	2	4
16	Holes in flooring	2	4

Source: Dodo *et al.* (2014)

Regulation remains an essential means of setting standards for safe and healthy work

environment for workers. However, such regulation differs markedly in terms of comprehensiveness, coverage, and the extent of duties of stakeholders as well as their effectiveness across jurisdictions. Notably, OSHA regulations are evolving from a much simpler form in the past to more complex ones to meet growing complexities of modern and industrialized workplaces (Alli, 2008). However, the quest for zero accidents and ill health continue to be elusive task as it can be observed from the accident statistics already stated. One means of achieving increased OSHA performance to business performance is through effective OSHA regulations. After all obsolete and ineffective laws has been argued to result in undue bureaucracy, red tape procedures, difficulties in compliance and increased compliance cost (Bong *et al.* 2015). Therefore, this supports the need for research that evaluates OSHA regulation as it forms the foundation for more effective regulation. Such a need is particularly strong in developing countries where OHS regulations are yet to be critically examined alongside growing industrialization.

2.2.11 Prevention of accident on Building Construction Sites

Accident prevention on building construction sites involves predicting the occurrence of future accidents and the perceived characteristics of these accidents given the immediate nature of the site and surrounding environment (Kennedy, 2014). Construction accidents on building construction sites can be effectively checked if the following measures are effectively enforced on sites:

- **Site Safety Precautions:** The task of providing adequate safe site environment lies with the main contractor (Kennedy, 2014). In 1958, building regulations were amended, the amendment applied to all works in the construction industry. Safety training courses should be introduced on the construction sites. These will

help reduce the amount of accidents on sites as the workers will be educated on the dos and don'ts as well as the best ways to go about their works.

- **Site Discipline:** Respect and obedience on site can help reduce to a great extent the amount of accidents on sites. There should be no hurry while working with mechanical plants. Break periods should also be strictly obeyed to ensure that the operators refresh themselves before continuing work. Absence of such breaks results in operators working under fatigued conditions (Kennedy. 2014).
- **Training and Educating Site Workers:** Modern job training has taken a new dimension as the employees learn how to perform a job in the safest way possible. They learn how to identify possible hazards and how to avoid them. He further suggested that the employees must be taught what to do and what not to do on site, if safety training is to be effective. He was of the opinion that workers involved in building construction should be trained in the following areas: Safety awareness and consciousness, correct operational procedure and activity timing, Skill acquisition, correct operational methods. Exposing unskilled workers to hazardous conditions on site is generally unwise and can be catastrophic, even the well trained workers need the control of a supervisor for an acceptable safety standard (Griffith & Howarth, 2001).

First Aid Provision: First aid is that which is rendered subject to a secondary medical treatment or any subsequent redressing. Ideally, adequate provisions should be made on sites for the treatment of injury or illnesses (Blake *et al*., 2004). The author further advised that in order to achieve a satisfactory functioning first aid service on sites, it is necessary to have the following in place:

a) Have a competent / qualified first aid attendant.

b) Have proper organizational record.

c) Adequate housing facilities and equipment.

d) Personal protective equipment (PPE)

Safety management and accident prevention remained an issue of debate in construction industry. Personal protective equipment (PPE) is a preventive safety wears against the occurrence of injuries at work. According to the International Labour Organization (ILO) codes of practice, it is important for employers to make available personal protective equipment (Safety Wears) appropriate for the nature of work to be carried out. Safety wears should fit perfectly and be suitable to work with. In order to properly use safety wears the nature and degree of the anticipated risk must be studied, known and then selection of appropriate safety wears should be in conformity with the specified standards. Users must be trained on right usage and adequate maintenance must be provided for safety wears after use. The choice of selecting appropriate safety wears is based on the anticipated hazards. However, some of the safety wears for the construction work include: hardhat, safety glasses or face shield, respirator, body protective wears, gloves and safety foot wears.

a. Head Protective wear

Safety helmets or hard hat is the name of safety wear use to protect human head from injury of falling or flying objects, or due to striking against objects or structures". Most of the safety Regulations clearly includes the use of safety helmet before visitor or workers can gain entrance to construction site, especially where the possibility of falling object is high to avoid head injury. Safety helmets or hard hats has reinforced ribs on top for impact strength, a rain gutter round the side and rear to guide water away, and can be fitted with a chin-strap. Helmet also has an adjustable in-built safety visor, which can be easily pushed up out of the way if required. The whole helmet is light and quite comfortable (OSHA, 2015). Manufacturers have adapted hardhats so

that ear protection and face shields may be easily attached. Hardhats are adjustable so a liner can be worn during cold weather. A chin strap is advantageous when work involves bending and ducking. It also helps secure the hardhat to the head when full-face masks are worn. Face shields that attach to hardhats provide added protection. A combination that leaves no gap between the shield and the brim of the cap is best because it prevents overhead splashes from running down inside the face shield.

Figure 2.3: Hard hat

Eye Protective wear

A face or clear goggles, shield and other suitable gadgets must be use used when there is possibility of physical hazards or the eyes is being exposed to face injury from airborne dust or flying particles, in particular during welding, flame cutting, rock drilling, concrete mixing dangerous substances, harmful heat, light and other hazardous work. There should be standard safety wear for respiratory protection is a half-face mask with no face shield (OSHA, 2015). Both safety glasses/goggles and a faces shield are recommended so far they are transparent. However, it is not advisable to wear contact lenses in situations where workers are to use hazardous chemical. Face shields

and goggles must be worn in combinations in a situation where work operations such as grinding that involves flying particles or corrosive materials are to be carried out.

Figure 2.4: Eyes protection wear

b. Ear Protective wears

Ear protective wear is good for workers working under the exposure to high levels of noise, which could lead to irritability. Noise reduces workers' ability to concentrate and hearing damage can lead to accidents. Earplugs or muffs help when noise coming from a particular task become unbearable and problematic, such as working around heavy machinery and impact tools (OSHA, 2015). Hearing protection gadgets must be used, especially for persons working in areas such as high-volume pumps, power drilling machine, skid units, pile drivers, jack hammers, impact tools, grinders, saws.

Figure 2.5: Ear protection wear

c. Foot Protective wear

Building construction process generates lot of waste on sites, workers are prone to accidents due to penetration of sharp objects like nails which have not been knocked down and crushing by falling materials, this could be drastically reduced with the use of foot protective boot. The type of safety shoes or boots to be used depend absolutely

on nature of the work (e.g. the presence of ground water on construction sites), but all safety footwear must have an impenetrable sole and uppers with a steel toe-cap. There are two available styles of safety boot, they are called: pullover and shoe boot. Pullovers may be inexpensive enough to be considered disposable; otherwise they must be completely decontaminated (OSHA, 2015). With chemical resistant boots, the pant leg should be outside and over the boots to prevent liquids from entering. All boots are expected to have steel toe while steel shanks must be included for the workers expected to climb ladders or travel over sharp protruding objects.

Figure 2.6: Safety foot wear

Hand Protective wear

Protective glove is highly recommended for a good tactile sense, elasticity and dexterity and as well provide necessary chemical resistance. The gloves must have ability to resist puncturing, must not be slippery, easy to use and removed. They are made of materials such as cotton, latex, nylon or leather. The nature of work anticipated determine the appropriate kind of gloves that must be used (OSHA, 2015). The only place gloves may not be used are situations where the gloves might get tangled up in moving parts of machinery such as drill spindles and revolving cutting tools. The H and S are as susceptible to contamination as the feet.

Figure 2.7: safety hand glove

d. Body Protective wear

Protective clothing against bodily damage from hazardous substances, gases, or vapors are available in a variety of styles and materials. The materials can be made of Tyvek which are disposable or Nomex which are durable. Both are available as overalls suitable for field use. As the hazards to the body increase, so also the level of protection needed. A splash suit made of PVC is suitable for a liquid such as an acid or base or when there will be minimal contact with organic materials. Some are inexpensive enough to be disposable. If the material is more toxic, then more protection must be utilized. Splash suits similar in design to the PVC splash suits are good barriers against toxic hazards (OSHA, 2015). These are made of neoprene and butyl rubber. Toxic vapor/gases require the most complete protection, the best being fully encapsulating suits. The suit must not allow any penetration or permeation. Zippers must be properly sealed and seams properly connected and sealed to protect against vapors. Fully encapsulating suits also require the basic safety items such as safety boots and hardhat, along with a source of breathing air.

Figure 2.8: Body protective wear

1) **Orange safety vest**: Is worn where visibility is necessary.
2) **Cloth coveralls:** they are used to protect street clothes from getting soiled and are not for protection against exposure to hazardous material. They are made with an open weave that allows particles, liquids and vapors to pass through easily.

1. **Chemical splash suits:** There selection is based on the hazard anticipated.
2. **Tyvek suits**: Offers protection against particulate contaminants and other nuisances. It provided limited protection against liquids.

e. Safety belt

Working at heights mighty be challenging with possibility of falling. However, safety regulations require employers to adopt basic safety precautions including the provision of suitable scaffolding, safe access and egress and the erection of suitable guardrails at hazardous locations (OSHA, 2015). All of this must be use with safety belt.

Figure 2.9 Body protective wear

h. Breathing Protective wear

An air-purifying respiratoris a protective gadgets used to control airborne contaminants that cannot be reduced to safe levels by engineering control. It allows work to be done in a confined spaces. An emergency escape pack should be used in conjunction with an air-purifying respirator.

Figure 2.10: Breathing Protective wear

2.2.12 Building Project Health and Safety regulation enforcement agency

Building project health and safety is a discipline dealing with prevention of work related injuries and diseases, and the protection and promotion of healthy workers. It aims at the improvement of working conditions and environment. Looking at the occupational health and safety policy on employees' performance, Rim and Lim (2012) stated that when workers understand the health and safety rules and procedures of their job and the tools used for working, it helps them to work effectively and efficiently resulting in better performance of employees. According to Dodo (2014), occupational health and safety is an integral part of construction operation due to the uniqueness of the industry, different trades and skills are needed to be carried in a safe environment, however individual's contributes determine the successful outcome of the projects. The authors further stressed that compliance with health and safety regulations remains one of the integral parameters to which successful projects delivery can be obtained.

Regulation refers to laws or rules that have their origin in the legislative arm of government which seek to effectively manage health and safety issues that negatively impact on persons whether employed or not. World over, health and safety regulations governing the construction industry and other work related industries exist. In Nigeria also, a number of legislations on occupational health and safety exist. These include;

Labour Act of 1974 modified to Labour Acts 1990, and updated to Labour Act, Cap L1, Laws of the Federation of Nigeria (LFN), 2004; the Factories Act of 1987 which became effective in 1990 and later updated to Factories Act, Cap. F1, LFN, 2004 Federal Republic of Nigeria (2004) the Workman's Compensation Act of 1987 which became effective in 1990, modified to Workman's Compensation Act, Cap W6, LFN, 2004 and repeal to Employee's Compensation Act, No. 13, 2010 of the laws of the Federation of Nigeria the Insurance Act, 2003 FRN, (2003) and the Labour, Safety, Health and Welfare Bill of 2012 including the National Building Code Enforcement Bill which has suffered huge political setback over the years, and is yet to be passed into law by the National Assembly.

The Factories Act Cap 126, Laws of the Federation of Nigeria, 1990 is the legislation set aside for the enforcement of safety regulations in Nigeria. 'This provides for the enforcement of the Act by occupational safety officers in the inspectorate department of the Federal Ministry of Labour and Productivity, Ministry of Health, Ministry of Works and Transport'. Olutuase *et al.* (2014) studied 'safety management in the Nigerian construction industry' but the scope of the work did not cover the effects of safety wears on workers productivity. In the same vein, Umeokafor *et al*., (2014) conducted study on "review of Nigeria's Construction industry compliance with occupational health and safety regulations." The study scope did not cover the cost implication of managing compliance with the health and safety provision on sites. Dodo (2014) worked on extent of implementing safety plan in Nigerian construction sites. However, the study articulated that, some construction firms neither have safety insurance plan for their workers nor facilitate payment of compensation for their injured staff.

As matter of fact, Awwad *et al.* (2016) opinion that, lack of enforcement of construction labour safety law is due to absent of monitoring, and inadequate safety knowledge and commitment from construction participant. Muiruri and Mulinge (2014) study stated that, there is a limited effect of all institutions and government on the implementation of 'occupational health and safety' in developing nations remains one of the integral parameter to which successful projects delivery can be obtained, but despite the numerous benefits attached to the compliance with health and safety regulation, it become worrisome why it is difficult for the constructions companies to comply with health. Nzuve and Lawrence (2012) ascribed that compliance with health and safety rule in FCT, Abuja building construction sites is as a result of low level of supervision and examination at work settings environment. Political influence and corruption are part of the major challenges confronting the implementation of any laws in Nigerian, while most laws appear to fulfill all righteousness Onyeozili (2005).

In the same vein, the opinion of Muhammad *et al.* (2015) revealed that legislation on safety practices are endorsed by parliament including International Labour Organization (ILO) however the implementation of the law is the responsibility of the government bodies. The researcher added that, construction sector of developing countries performed poorly regarding safety practices as a result of weak enforcement mechanism. Fowode (2016) suggested that, Abuja metropolis should make effort towards having a standing list of certified HSE professional to manage the accreditation process in order to prequalify contractor on health and safety compliance and their level of competence over the years of building construction practices. He further stressed that, it became imperative to initially consult the building regulators at the planning stage of a building project since every project is first constructed on the drawing board and safety must start from the planning stage, so as to integrate

foreseeable methods to be adopted for the building production process. Compliance with health and safety regulations.

The Federal Ministry of Labour and Employment is saddled with the responsibility of enforcing the Factories Act and Employee's Compensation Act, while the Labour, Safety, Health and Welfare Bill of 2012 empowers the National Council for Occupational Safety and Health of Nigeria to administer the proceeding regulations on its behalf. In the developed countries such as UK, USA, Australia, Singapore and Germany, these regulations are well developed and functional. However, despite being among the countries that signed the occupational health and safety law in the Geneva Convention of 1981, the pathetic health and safety situation in Nigeria construction industry still pervades. In spite of numerous statutory provisions and expectations in Nigeria, gap still exist in health and safety management (Diugwu *et al*., 2012). This gap is largely due to a dysfunctional health and safety law, causing an apparent lack of regulation of health and safety in almost every sector of the economy. Adeogun and Okafor (2013) contend that these acts are not being enforced in Nigeria as evidenced from the reports of unhealthy exposure to risks of workers and employees in various organizations. According to Okeola (2009), the Ministry charged with enforcement of these laws has not been effective in identifying violators probably due to inadequate funding, lack of basic resources and training therefore, consequently neglect safety oversight of other enterprises, particularly construction sites and non-factory works. Umeokafor *et al.* (2014) agree that the impact of the enforcement authority is ineffective, as the key stakeholders pay less attention to OSH regulations; thus, rendering the OSHA scheme dysfunctional and unenforceable, at the same time impeding OSH development. To this end, Diugwu *et al*. (2012) attributed the failed OSH management system to the non-functional OSH regulations and provisions. Idoro

(2008), linked the problem to adopting almost all existing regulations of reference on health and safety in Nigeria from foreign countries, especially from the British legal system with little or no changes made (Kolo, 2015).

According to Ezenwa and Jolles (2011), on any construction site, appropriate Health and Safety methods should be considered and used that will reduce or eliminate risk to death or injury. In Nigeria, the first effort in regulating and controlling Health and Safety at work was the Factories Act of 1958, but unfortunately there is lack of provisions for the enforcement of Health and Safety standards in construction industry. This Act was repealed in 1987 and replaced with the Factories Decree No. 16 and Workman's Compensation Decree No. 17. Both were signed into law on June12, 1987, but became effective in 1990. The Federal Ministry of Labour and Productivity is responsible for the enforcement of the safety and welfare regulations in Nigeria. Nzuve and Lawrence (2012) found that low level of inspection and examination of workplaces might determine the level of compliance with OSH regulations as evident in workplaces in Nairobi. The same can be said of Nigeria, where lack of enforcement characterizes regulatory institutions (Idubor & Osiamoje, 2013). Most laws appear to fulfill all righteousness or are used for political or victimization reasons, and the institutions alleged and proved to be corrupt and arbitrarily exercise its powers (Onyeozili, 2005). These ill characteristics of the regulatory institution in Nigeria also weaken its legal system. The contention being that the efficiency and effectiveness of the OSH enforcement bodies may determine the level of compliance with OSH regulations in workplaces. These explain why researchers posit, that lack of strict legislation enforcement, competent professionals that is OSH officers at Federal Ministry of Labour and Productivity 2010 in trained safety officers all enable non-compliance with OSHA regulations in Nigeria (Idubor & Oisamoje, 2013). However, although the

quality of enforcement may be marginal, enforcement at organizational level perhaps via safety officers should be made mandatory to Nigerian construction contractors as it will improve OSH enforcement. Equally important, Idubor and Oisamoje (2013) argue that the weak legal structure and absence of law enforcement in Nigeria allow foreign companies to take advantage of the ineffective statutory regulation. The same can be said of the construction industry. That may also suggest that these foreign firms may not have plans to comply fully with the OSH regulations in Nigeria or have an OSH management system similar to those obtained in their countries of origin, as they intend to reduce expenses and added cost to construction outputs.

2.2.13 Building Project Health and Safety Regulation in Nigeria

The Nigerian construction industry lacks of statistical records on health and safety performance of its construction industry (Idoro, 2008). This absence of reliable information about the incidences of occupational accidents and diseases is generally a major obstacle to curbing the appalling toll of work-related deaths and injuries. (Okojie, 2010). Information is needed, particularly by those charged with the task of remedying the appalling situation, in order to understand what preventive action is necessary. This information must be sufficiently comprehensive and above all accurate (ILO, 2017). For any preventive measure at any level to be evidence-based and meaningful, the data required depend heavily on the reporting of occupational diseases, dead and injuries which assists in measuring performance (Bowling & Ebrahim, 2005). Investigating the problem of high accident and injury rates in the construction industry and similar others such as lost time injury frequency rate are traditional measures of health and safety performance and do actually report performance (Idoro, 2007). The author also stressed that, regular and accurate reports can assist in the provision of measures that can reduce them. This situation is blamed on lack of concern from the government, lack of accurate

records, inadequate and old statutory regulations governing the health and safety in the country.

Furthermore, the new Factories Act Cap 126 of the Laws of the Federation of Nigeria, 2004 is the legislation for the enforcement of H and S standards in Nigerian workplaces. It stipulates minimum standards of H and S for Nigerian factories and further provides for the enforcement of the Act by occupational H and S officers in the Inspectorate Department of the Federal Ministry of Labour and Productivity (Okojie, 2010). Sections 51, 52 and 53 of Part VI of the Factories Act make provision for reporting of occupational diseases and accidents. This section 53 of the law is entitled Notification of Industrial Disease and it states that ’he occupier of any factory who believes, suspects or has reasonable ground for believing or suspecting, that a case of occupational disease has occurred in the factory, shall forthwith send written notice of such a case, in the prescribed form and accompanied by the prescribed particulars, to the nearest inspector; and the provisions of this Act with respect to the notification of accidents shall apply to any such case in like manner as to any such accident as is mentioned in those provisions (Okojie, 2010).

According to 99 of the Federal Ministry of Labour and Productivity (Okojie, 2010). Sections 51, 52 and 53 of Part VI of the Factories Act make provision for reporting of occupational diseases and accidents. This section 53 of the law is entitled Notification of Industrial Disease and it states that ’the occupier of any factory who believes, suspects or has reasonable ground for believing or suspecting, that a case of occupational disease has occurred in the factory, shall forthwith send written notice of such a case, in the prescribed form and accompanied by the prescribed particulars, to the nearest inspector; and the provisions of this Act with respect to the notification of accidents shall apply to any such case in like manner as to any such accident as is

mentioned in those provisions (Okojie, 2010). Similarly, to (Adeniyi, 2001) Also accord that Occupational safety and health deals with the well-being, safety and comfort in the workplace.

2.2.14 Builder's Document of Building Project Health and Safety Plan

Builder's document explicitly discussed the obligations of builders by the provision of Nigerian National Building Code who places responsibility to prepare project health and safety plan among others document for effective production process of building project. Bamisile (2004) ascribed that project health and safety plan is essential for all the construction project starting from the measures that needs to be put in place right from the planning, design, construction, completion and maintenance of the building. Thus, all the risks associated with each items of work can be examined and planned ahead right from the project inception. Kennedy (2014) stated that accident prevention plan on construction sites predicts the occurrence of future accidents and possible characteristics of those accidents regarding the nature of the site and its adjoining environment.

Similarly, in evaluating the effectiveness of safety programme in the Thailand construction industry Aksorn and Hadikusumo (2008) established that safety programmes did not require extensive elements, but critical elements such as: safety record keeping, safety inductions, control of sub-contractors, safety committees and safety training. There are twenty (20) listed parameter in the project health and safety plan, these include: Project safety policy, objective plan, risk and hazard assessment, duties of employers', duties of site personnel, health and safety briefing, health and safety committee, site accommodation and welfare facilities, accident preventives measures, protective clothing and equipment, permit to work, Access and egress to work, underground observations and buried services, First aid, control of hazardous substances, emergency response plan and safety records (Bamisile, 2004). However,

some of the minimum requirement of the builders' document project health and safety plan on construction projects are discussed in details below:

a. Project Safety Policy

'Safety policy are statements developed as a general strategy and commitment together with the arrangements put in place to make all who are at risk aware of the health hazards associated with their work and the role individual persons have to play in maintaining a safe and healthy safety at work (OSHA, 2006). The policy must therefore be prepared in an understandable manner for the employees, which must be signed by the employers. It is worthy of note that, it is cost effective to prevent an accidents than to cure it occurrences once it has happened.

Construction professionals should seek to provide at all times, the safest and healthiest working conditions that are reasonably practicable by adopting health and safety regulations of the international standard with emphasis on the company/construction firms with the desires to accept responsibility safety practices on construction project, while the employees will reflects their acceptance of the understanding to protect life and property of themselves, colleagues and properties of their employer.

b. Objectives of project health and safety plan

The objective of establishing the health and safety policy as contain in the Builders document is as follows: 'providing health and safety in relation to workplaces and hazards, activities and things at workplaces, 'providing for the safe operation of major hazard facilities and mines in order to reduce the likelihood of a serious incident occurring, 'providing for the registration of certain people engaged in construction work at workplaces 'providing for the licensing of certain people engaged in high risk work at workplaces, 'providing procedures for the resolution of health and safety issues at

workplaces' as extracted from (CORBON, 2014).

c. Safety First Aid

The availability of first Aid materials becomes imperative both on the site and in the workshop with a trained personnel assigned for the treatment of the following: injuries that require no medical attention accept from the one provided on site, and as well provided temporary solution until help is been sought nearby hospital (CORBON, 2014). First aid is rendered subject to a secondary medical treatment or any subsequent redressing.

d. Safety Training

The accident trend in the construction industry can only be influence positively by providing adequate safety education training and management to control the workers, plants and equipment and the working environment. In contradiction, the study conducted by Roelofs *et al.* (2011) on construction workers perception regarding factors impacting worksite safety. The study contends that workers attitude towards training is alarming because their goal is to get their work done and be rewarded.

e. Emergency Response Plan

To this effect, CORBON (2014) specified the following measures are to be taken into consideration on site and at the workshop as a catalyst to optimizing project health and safety plan.

a) Each worker should be adequately trained and informed of the activities lie is expected to perform and be made aware of the entire inherent hazard.
b) He or she should be made to use the protective clothing and equipment provided.
c) He or she should be made aware of cost of an accident.
d) The contractors should be mandate to register with nearby clinic for emergency

services and ensure the doctor telephone no is obtained as well know the shortest route from the site to the clinic.

First aid is what is rendered subject to an auxiliary therapeutic treatment or any ensuing changing. In a perfect world, sufficient arrangements ought to be made on destinations for the treatment of harm or ailments (Blake *et al.,* 2004), he exhorted that keeping in mind the end goal to accomplish an attractive working emergency treatment benefit on locales, it is important to have the accompanying set up.

f. Template for Investigating Accidents

A well-developed policy must be in place for investigating causes of accident on site; this will leads to inaugurating of health and safety committee to be headed by safety manager/total quality manager and representative of each section of work. While it will be the duty of the TQM/SM to monitor the safety of all site personnel, the committee will assist him in the implementation and compliance with the health and safety regulation on the building production process (CORBON, 2014).

g. Site Accommodations and Welfare Facilities

The objective of every construction project is to make quality a desirable, therefore quality requires well trained, well-motivated workers which will foster the compliance with the laid down health and safety plan for the workers. Mcgregor "X and Y" theory suggested that work can be a source of satisfaction or punishment according to the conditions associated with it. Quality production can only be achieved where workers 100% input were given towards the assigned tasks. A divided mind can cause injury to his/her person and that of the co-workers. Therefore, the following facilities must be provided to aid safety compliance on project site; shelter for the workers on site, drinking water, canteen, washing facilities, sanitary conveniences, and welfare facilities

both financial and non-financial incentives.

h. Safety Wears/Personal Protective Equipment

Section (18.1.1) of International Labour Organisation (ILO) (2016) specified the need for general provision of adequate protection against the risk of accident or injury to workers health, including exposure to adverse conditions. Suitable safety wears must have regard to the nature of work while workers ensured adequate maintenance are provided after used.

i. Permit to work

Construction activities are in stages, a formal permit to carry out work especially when working in a confined space, installation and the use of scaffolding, use of electrical operated hand tools, crane, electrical control room etc. warrant the need to obtained permit before work can progress on such activities due to the inherent risk of such activities. This may require construction manager of such project to prepare the necessary document which building control agency will request for when they come to site before work can start or continue on site.

j. Erection and Inspection of Scaffolds

Scaffolds and working platform are installed to ensure proper working at a convenient height. Scaffolds are erected, modified, or dismantled under the supervision of trained personnel who his/her duty is to ensure the installation is done according to the specifications. The materials used must be sufficient enough to carry all the load designed for. Upon the completion, scaffold supervisor will ensure Scaffold Erection Form is filled and signed by the person that installed the scaffold and supervisor or safety manager respectively to ensure the adequacy of the scaffold.

k. Safety Signs and colour control of hazardous substances

Safety signs are non-verbally communicated on construction sites with the use of reflective signs and appropriate colour code, spoken communication and the marking of dangerous substances. The signs are marked with different colours for different purposes, such as (i) prohibition signs (red colour, authorized personnel only, smoking prohibited) (ii) warning signs (yellow signs, danger of electric shock, flammable liquid) (iii) mandatory signs (blue colour, safety helmets must be worn, protective clothing must be worn) (iv) Safe Conditions Signs (Green colour, Emergency escapes, Treatment area and Safe area) (Chudley & Greeno, 2001).

National Building Code of Nigeria

The Nigerian Building Code came into existence in August 2006, its purpose was to regulate the conduct and operations of professionals and stakeholders in the construction industry. According to the National Building Code drafting committee, the need for developing a building code for the country was because of some peculiar deficiencies noticed in Nigerian building industry, some of which include:

Lack of town planning in Nigerian cities, frequent cases of collapse of buildings, dearth of standards for regulating building designs, incessant involvement of quacks in the industry, use of substandard materials and the poor maintenance culture in the industry. All these factors were highlighted by the National Council on Housing and Urban Development as the main reason for developing a National Building Code for the country. The provisions made by the code in section 7.49.1 says that the general public and construction workers should be protected whenever a building is to be erected, demolished or repaired. It has the following provisions to ensure safety implementation during works on site:

1. **Fences:** Every site located 1.5m from the streets plot line should be enclosed with a 2.4m high fence to prevent and restrict entry of unwanted persons.
2. **Lightning:** All parts of a building undergoing construction or demolition should be adequately lighted when workers are working on site.
3. **House Keeping:** All rubbish and trash shall not be allowed to accumulate on site, they shall be removed as fast as possible.
4. **Protective Equipment:** All protective equipment shall be kept in closed containers.
5. **Ladders:** Temporary ladders for working on site should extend at least 1.0 meters above the ground level.
6. **Concrete Forms:** Highly combustible materials should not be stored on a building site under construction, unless all combustible concrete forms are removed.
7. **Signs:** All signs on site should be at least 100mm in height with a conspicuous colour.
8. **Hoist:** All hoist materials should be protected effectively, especially when erected outside buildings higher than 26 meters or Seven (7) floors. The hoist structure should be built on fire-retardant materials exempting the loading platform.
9. **Scaffolds:** Scaffolds and their components should be able of carrying without failure at least four (4) times the maximum intended load. Their platforms should be able of supporting minimum live loads in kilograms per meter square of the platform.

2.3 Review of Related Empirical Studies

Osei (2019) carried out study on Strength, Weaknesses, Opportunities and Threats (SWOT) analysis of the health and safety management practices of construction firms in the Kumasi Metropolis. The aim of the study was to examine the health and safety and site accident management practices of construction firms in the Kumasi Metropolis with

the view of identifying the strengths, weaknesses, opportunities and threats. Forty (40) construction firms were conveniently selected and structured questionnaires administered to them. The data collected for study was analyzed using Relative Importance Index (RII).

It was found out that the strengths in the health and safety management practices of the firms included provision of First Aid Box on project sites, providing signs and information to indicate danger zones on construction site, providing Personal Protective Equipment (PPE), Clothing for workers and provision of insurance for workers. The study also identified a number of weaknesses (lapses) in the health and safety management practices of the firms. This includes, lack of written Health and Safety management policy plan, absence of H&S department and poor record keeping on site accidents. These issues hinder the firms' effort to achieve safe working environment. Based on the strengths (good practices) of the firms the following were some of the opportunities (positive impacts): safe working environment, decreased costs and readiness planning. Some of the threats (negative consequences) included lack of monitoring by the company and high risk/ exposure of workers to health and safety threats. Based on the findings it was recommended that construction firms should develop health and safety policy plan and also set up safety departments.

The reviewed study is related to the present study because it analysis the health and safety management practices of construction firms in the Kumasi Metropolis; while the present study also assessed the compliance with building project health and safety plan by the building construction industries in Abuja Metropolis. However, common to both studies is the use of questionnaire but differed in terms of population and geographical location.

Olusoga and Fagbemi (2018) carried out a study on Health and Safety Management Practices in the Building Construction Industry in Akure, Nigeria. The aim of the study was to investigate the current state and adherence to health and safety practice in Akure, Nigeria. Survey research design was used for the study. 110 questionnaires were used to extract information from respondents within the Akure Metropolis. The safety precautions put in place by contractors for their site workers was also probed. Issues such as the post-accident treatment of site workers were also investigated.

Data collected were analysed using descriptive statistics. The study found that construction workers are left to protect themselves in the line of duty and are largely responsible for any occurrence of accidents. As a result, a lot needs to be done to ensure the health and safety of site workers. Recommendations were made on possible solutions yearning for strict actions to be taken against defaulters by the respective site inspectors. This study relates to the present study in the area of compliance to occupational health and safety plan in Building construction site. However they differ in terms of population, statistical tools used for the study and geographical location.

Ogundipe (2017) carried out a study on safety practices and workers performance on construction sites in Lagos State. The aim of this study was to determine the level of compliance with the use of safety wears and other safety control systems with a view to enhancing safety performance and workers' productivity on construction projects. The population for this study covers medium scale construction companies that operate in Lagos State. A total of one hundred and twenty eight (128) copies of questionnaire were administered to participants with years of experience on construction management in Lagos State, Nigeria. Data obtained based on snowball and random sampling technique were analysed using descriptive statistics, mean Scores, Relative Importance Index (RII). The significance of each of the associated variables as

impacted on construction workers safety practices on buildings project were determined using Independent Samples Test, Mann-Whitney U Test. Descriptive outcome of the statistical analyses showed a high prevalence need of safety practices.

The findings of the study established dissatisfaction with effective use of safety wears and its implementation among site operatives because workers find it difficult to adapt to as it was against their traditional practices(RII=0.776), unethical practice of workers due to human attitudinal peculiarities (RII=0.766),inadequate engagement of safety managers on sites (RII=0.764), inadequate engagement of safety managers and ineffective supervision on site (RII=0.762) as well as poor communication between site managers and site operatives (RII=0.750) as factors preventing effective use of safety wears among the categories of respondents sampled. The study concluded based on Mann-Whitney U Test result on safety improvement measures and control systems available for safety practices and workers performance on construction sites this include: the use of safety audio, video and visual displaying gadgets on site, daily check of scaffold and ladder etc., inclusion of safety matters from the planning stage, setting safety guidelines into conditions of contract, reward workers that exhibit excellent safety performance, conduct in-house safety training were found to be statistically significant with medium effect. The study recommend minimum of one safety managers on every construction sites.

The reviewed study is related to the present study because it assessed the realities of Construction Health and Safety Regulation in Nigeria; while the present study also assessed the compliance with building project health and safety plan by the building construction industries in Abuja Metropolis. However, they both differed in terms of population, subject area covered and geographical location.

Umeokafor (2017) carried out a study on realities of Construction Health and Safety Regulation in Nigeria. The study stressed that, Health and safety (H and S) has long been at the forefront of policymaking resulting in various regulatory approaches, making it a priority on the corporate strategy agenda. Thus, some companies have progressed to self-regulation, which although being effective in some cases does have some potentially serious limitations. Self-regulation in relation to H and S and the links with the environments that companies operate in remain under-researched. This research advances the understanding of the current realities of construction H and S regulation in Nigeria (an industry reported as unregulated, self-regulation overlooked), and develops a framework of recommendations based on empirical data and analysis. Construction contractors and key informants were interviewed. The thematic analysis procedure shows that the current realities of regulating construction H and S in Nigeria can be understood and explained as follows. There are secondary factors in the social, political, cultural, economic and institutional contexts, which influence the primary factors, approaches, and attitudes of the contractors towards H and S self-regulation. However, the regulatory system is multiplex and counterproductive on the regulation of H and S; this, in turn primarily determines H and S self-regulation. The primary factors, in turn, influence the attitudes of the contractors, which in turn, influence the approaches to H and S self-regulation.

The findings show that religion, cultural institution and money culture are among the social and cultural context factors. Political context factors include the political influence and lack of governmental action while institutional context factors include inadequate H and S policies and multiple actors in H and S regulation. The self-regulatory approaches can be explained as voluntary, industry-led, community-led, H and S crusader-led, and enforced/mandatory. The understandings of the contractors of

viewing H and S as a ‘primary responsibility’, and ‘caring for others’ enhance H and S self-regulation while ‘bias in H and S responsibility’, ‘the understanding that H and S self-regulation is about window dressing’ all constrain H and S self-regulation. While contextualized construction H and S laws and a consolidated H and S regulatory system to be overseen by a central regulatory agency are recommended for policymakers, two antigraft institutions should monitor the activities of the H and S regulatory agency.

The reviewed study is related to the present study because it assessed the realities of Construction Health and Safety Regulation in Nigeria; while the present study also assessed the compliance with building project health and safety plan by the building construction industries in Abuja Metropolis. However, they both differed in terms of population, subject area covered and geographical location.

Mojapelo *et al.* (2016) carried out a study on the employee perceptions of Occupational Health and Safety standard in the steel industry. The aim of this study was to explore the perceptions of employees in the steel industry towards occupational health and safety standards in the steel industry in South Africa. A survey was conducted in which a structured questionnaire was distributed to a purposive sample of 165 employees employed by a large steel processing company in Gauteng Province. The collected data were analysed using mean and standard deviation. A combination of descriptive statistics and analysis of mean scores was applied to meet the aim of the study.

The results reveal that employees in the steel industry perceived that occupational health and safety standards were satisfactory in all seven occupational health and safety dimensions considered in this study. These are (1) information and training, (2) health and safety awareness, (3) employee behaviour (4) role of the supervisor, (5) health and safety reporting mechanisms, (6) workplace inspection, and (7) workplace environment.

Among these dimensions, safety awareness emerged as the most important dimension to employees. The results may be utilized by managers in the steel industry to identify and direct their attention to the key occupational health and safety factors in their different contexts. The reviewed study is related to the present study in the area of compliance to occupational health and safety plan in Building construction site. However they differ in terms of population, area of the study subject area covered as well as the geographical location.

Mojidi and Fidelis (2019) conducted a study titled "Examination of the application of health and safety plan on construction sites in Lagos state, Nigeria. This study was therefore undertaken to examine the current practice of application of Health and Safety Plan during project implementation. In pursuing this objective, a descriptive case study research design was used where 32 construction project sites in Lagos State were selected through random sampling. A total of one hundred and twenty eight (128) copies of questionnaire were administered to participants with years of experience on construction management in Lagos State, Nigeria. Data obtained based on snowball and random sampling technique were analysed using Mean Scores and Relative Importance Index (RII). The significance of each of the associated variables as impacted on construction workers health and safety practices on buildings project were determined using Independent Samples Test and Mann-Whitney U Test. Descriptive outcome of the statistical analyses showed a high prevalence need of safety practices.

The findings of the study established dissatisfaction with effective use of health and safety plan and its implementation among site operatives because workers find it difficult to adapt to as it was against their traditional practices(RII=0.776), unethical practice of workers due to human attitudinal peculiarities (RII=0.766), inadequate engagement of safety managers on sites (RII=0.764), inadequate engagement of safety

managers and ineffective supervision on site(RII=0.762) as well as poor communication between site managers and site operatives (RII=0.756) as factors preventing effective use of health and safety plan among the categories of respondents sampled. The study concluded based on Mann-Whitney U Test result on health and safety improvement measures and control systems available for health and safety practices and workers performance on construction sites. The study recommends use of a more proactive and integrated management mechanism to enforce the existing Safety and Health regulations in construction sites, in order to prevent accidents, injuries and ill health on the site.

The reviewed study is related to the present study because it examined the application of health and safety plan on construction sites in Lagos state, Nigeria; while the present study also assessed the compliance with building project health and safety plan by the building construction industries in Abuja Metropolis. However, common to both studies is the use of questionnaire but differed in terms of population, subject area covered and geographical location and method of data analysis.

Okoye *et al.* (2016) conducted a study titled building construction workers' health and safety knowledge and compliance on sites in Anambra State, Nigeria. The study examined the health and safety knowledge and compliance of building construction workers on site in Anambra State, Nigeria. Questionnaires containing information relating to health and safety at site were administered randomly to the construction workers selected from fifteen (15) selected building sites across the state. Mean Score Index and Pearson's Product-moment Correlation Coefficient(r) were statistical tools used for analysis of results. The result revealed that there was moderate level of health and safety knowledge, and low level of health and safety compliance among building construction workers in the state. It also found that the effect of the health and safety knowledge and compliance on project performance was low. The result established a

very weak positive correlation (r=0.19) between health and safety knowledge and compliance. It further established a strong positive correlation between health and safety knowledge and project performance (r=0.71); and between health and safety compliance and project performance (r=0.76). However, when the significance of the correlation was tested, the t-values obtained were (0.335), (1.746) and (2.025) respectively. From the result, all the t-values were less than the t-critical (3.182) at 5% significance level. The result implied that though there were relationships between all the variables considered, the relationships were not significant. Practically, this meant that health and safety knowledge and compliance alone cannot substantially improve the project performance, but was limited to the values of their coefficient of determination (R2) 50.41% and 57.76% respectively. Thus, since knowledge and compliance alone cannot achieve optimum project performance improvement, some other factors such as management commitment, workers involvement and strict enforcement of safety regulation should be applied to complement. In this case, establishment of the Anambra State Safety Commission whose function would include inter alia; policy formulation, setting of safety standard for all sectors in the state is of paramount important

The finding of the study recommended that, knowledge and compliance with health and safety practices alone cannot achieve optimum project performance, it would require safety culture which encompassed other factors are as follows: management commitment, workers involvement and strict enforcement of safety regulation should be adopted.

The reviewed study is related to the present study because it examined the building construction workers' health and safety knowledge and compliance on sites in Anambra State, Nigeria; while the present study also assessed the compliance with building project health and safety plan by the building construction industries in Abuja

Metropolis. However, common to both studies is the use of questionnaire but differed in terms of population, subject area covered and geographical location.

Kolo (2015) carried out a study on Safety Issues Involving Workers on Building Construction Sites in Nigeria. The population of the study comprises of construction sites workers in Lagos state, Nigeria. The term Building Worker refers to any personnel engaged in the physical construction of a building. Just like every other occupation they are faced with challenges in performing their duties. The safety of building construction workers on sites is key to achieving success in any project, when these workers are physically healthy work can go on smoothly as virtually all works on site are dependent on the workers for implementation. Numerous building projects are situated in Abuja, Nigeria with little or no attention being paid to safety issues. This research looked into the level of safety implementation of the Construction companies and the level of safety awareness of the workers in Abuja city. 80 questionnaires were issued, 69 (85%) copies were retrieved.

The findings revealed that building site workers in Nigeria lacked the requisite trainings needed to perform their trades. The Construction Company's practice of not providing the basic safety materials and facilities was also exposed. The older workers were aware of their rights as employees on site. Lack of safety training was the major cause of accidents among the workers with minor injuries being mostly experienced. The Unqualified laborers were most frequently engaged in accidents on the sites. Accidents mainly occurred among workers less than 20 years of age. The study therefore recommends that the Governmental agencies need to step up their enforcement activities in order to adequately protect these workers, the available safety regulations need updating and if possible solely Nigerian regulations should be designed.

The reviewed study is related to the present study because it assessed the Safety Issues Involving Workers on Building Construction Sites in Nigeria; while the present study also assessed the compliance with building project health and safety plan by the building construction industries in Abuja Metropolis. However, common to both studies is the use of questionnaire but differed in terms of population, subject area covered and geographical location.

Kaigama (2015) carried out a study titled Safety Compliance for High Rise Projects in Nigeria Construction industry. Health and safety issues had always been a major challenge and concern in the construction industry. Construction is found to be one of the most dangerous on health and safety practice, predominantly in developing countries. As construction accidents continue to dominate the overall construction industry. Despite the programs implemented by government and measures introduced by companies the number of high rise construction accidents still remains alarmingly. The aim of the study was to investigate the safety compliance for high rise construction project in Nigeria. Survey research design was used for the study. Construction industries in Nigeria were use as the population for the study. In achieving these aim three (3) objectives were outlined; to investigate the current level of compliance to safety practice and policies in Nigerian construction site. To investigate the factors that prevent the compliance to safety and health practices in high rise projects of Nigerian construction industry.

The findings among others, recommend appropriate ways to improve the compliance to safety in high rise of Nigerian construction. The interview and questionnaire method were used in this research. Structured Questionnaires was distributed to 108 potential respondents from the construction industry players 90 was returned and Qualitative interview have been conducted to meet the first objective of the project, to investigate

the current level of compliance to safety practice In addition, structured interviews were carried out with selected managers from construction industry. The result shows that Bribery and corruption, Lack of training, Absence of safety representatives, Lack of corporate responsibility and Accountability, Weak legal structure were the significant factors affecting safety compliance. The result also indicate that Site inspection, Safety seminars (enforcement officers), Building codes of practice, Enforcement of safety act, Workers/labourers training are the effective factors that could improve compliance to safety practice in high rise project of Nigerian construction industry. It is recommended that relevant authorities should checkmate the Safety practices in the Nigerian construction industry.

The work reviewed is related to the present study because it assessed the Safety Compliance for High Rise Projects in Nigeria Construction industry and the use of questionnaires is also usual to both field while it differ from present survey in term of geographical placement, area of the study, research question and population used.

2.4 Summary of Literature Reviewed

From the literature review it is evident that health and safety measures are necessary in building project sites to ensure worker's safety and well-being so as: To maintain and improve productivity and quality of work; To minimize absenteeism and labour turnover; To reduce indiscipline and accidents; To improve employee motivation and morale; To reduce spoilage and cost operations and; To reserve the physical and mental health of employees. But for this to be realized a good health and safety management system and program should be put in place by providing; a written statement of safety policy, organization and allocation of responsibilities for health and safety matters, train employees in health and safety matters, establish safety committee, ensure first aid facilities, provide appropriate procedures and documentations to minimize accidents and

to regularly consult with employee representatives. Construction firms should provide training and induction to all employees so that they are aware of potential hazards and given instructions on how to avoid them. This was initiated by considering the conceptual and theoretical framework. Theories found to be most relevant were that of Distractions theory, Goal-Freedom Alertness Theory and Compliance-based or cooperative theories which views health and safety compliance to be achieved through the conciliatory style of enforcement, persuasion, and the cooperation of the regulated but not through threat of sanctions.

The conceptual framework, which aimed at emphasizing the various concepts that are relevant to the study were discussed. They include the concept of compliance with building project health and safety at construction industries. The review also covered some aspects of building construction work such as: site layout planning, excavation, scaffolding and roofwork. Concept of Building Project Health and Safety Regulation and enforcement in Nigeria were also reviewed, and the empirical study reviewed showed that there are many attempt to study on compliance with building project health and safety in construction site by construction industries. But none of the studies have been conducted on the compliance level of health and safety by construction industries in Abuja Metropolis. Thus the study focused to assess the national project health and safety plan template compliance level by building construction industries in Abuja Metropolis

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CHAPTER THREE

3.0. RESEARCH METHODOLOGY

3.1 Research Design

A survey research was adopted for the study. This is because it involves the use of structured questionnaire developed from the review of related literature to determine the opinion and perception of respondents. Survey design according to Oded (2010) is a research design which involve gathering of information about a large number of people or objects by studying a representative sample of the entire group through the use of questionnaires. The design aids the researcher to collect the data from the target population on the national project health and safety plan template level of compliance by building construction industries in Abuja Metropolis.

3.2 Area of the Study

The study was conducted in Abuja Metropolis in the Federal Capital Territory (FCT) which is the capital city of Nigeria. It is located in the Northern part of the country and have a total land mass of 7,315 kilometer square. Its border by the state of Niger State to the West and North West, Kaduna State to the North East, Nasarawa State to the East and South, and Kogi State to the South West. It has a coordinate of 8.8941^0N, 7.1860^0E. Abuja falls within latitude 7º25' N and 9º 20º north of the equator and longitude 5º 45' and 7º 39'. The choice of Abuja for this study is because of the obvious reason of it being the nation's capital. Being a relatively new city, it is still expanding and thus adequate construction sites exist. Nigerian newspapers have reported a number of stories regarding accidents and casualties in Abuja building sites, this gives an embarrassing and unsafe picture of the building sector in Abuja. Most problems encountered on sites in Abuja can be fairly generalized to the whole country due to the synonymous nature of the construction industry in Nigeria. Therefore, this will not in

any way minimize the importance of the findings. A large number of multinational construction companies are also resident in Abuja.

3.3 Population of the Study

The targeted population for this study was 2,356 which comprised of 38 project managers172 safety officers and 2,146 tradesmen. See appendix F for population distribution table.

3.4 Sample and Sampling Techniques

Simple random sampling technique was used to select 338 which comprises of 38 project managers, 172 Safety Officers and 128 Tradesmen (Ten percent, (10%)).See appendix G for sampled population distribution table

3.5 Instrument for Data Collection

The instrument used for data collection was a structured questionnaire titled Questionnaire for Assessment of the National Project Health and Safety Plan Compliance Level by Construction Industries." The questionnaire is divided into two parts: part one contains the personal data of the respondent, while part two is made up of four sections (I–IV). Section I focuses on the compliance level of the construction industry with the national project health and safety plan on site planning, layout, and security precautions in Abuja metropolis, with 14 items. Section II is based on the compliance level of the construction industry with the national project health and safety plan on excavation precautions in Abuja metropolis, with 12 items. Section III addresses the compliance level by the construction industries with the national project health and safety plan on scaffolding precautions in Abuja metropolis with 12 items, while Section IV determines the compliance level by the construction industries with the national

project health and safety plan on roof work precautions in Abuja metropolis with 12 items.

All sections of the research questions were structured on four points' response options: Highly Complied With (HCW) (4 points), Complied With (CW) (3 points), Moderately Complied With (MCW) (2 points), and Not Complied With (NCW). So that respondents express their opinion by ticking the appropriate option that best describes their opinion.

3.6 Validation of the Instrument

To ensure the validity of the instruments, the questionnaire was subjected to face and content validation by three experts. Two from Industrial and Technology Education Department, Federal University of Technology Minna, One from Niger State Ministry of Work and Infrastructural Development (MOWID). Their suggestions and corrections for improvement of the language level technical terms and content of the instruments were used to refine the items before the final copies were produced.

3.7 Reliability of the Instrument

A trial test was conducted in salini and beam town construction companies in Niger State. The reliability coefficient of the instrument was determine using split-half reliability methods on a randomly sample size of fifteen (15) instrument in each of the construction site. The choice of Niger State for the trial testing exercise was informed by the fact that the Niger State did not form part of the study area but fall within the same geopolitical zone with Abuja Metropolis.

Thereafter, the reliability of the instrument questionnaire was computed using statistical package for the social sciences (SPSS) version 23. Cronbach Alpha formula was used to analyze the data generated for the reliability, which was found to be 0.81, indicating that

the instrument had a high reliability index. The items in the questionnaire were internally consistent in measuring what it was intended to measure for the study.

3.8 Administration of the Instrument

The questionnaire was administered to the respondents by the researcher with the help of two research assistants. The research assistants were briefed by the researcher on how to administer the instrument to the respondents. The researcher sought permission from the management, upon the approval of the permission, the researcher distributed the questionnaire to the respondents. The questionnaires were collected immediately from the respondents that answered it at a spot. While others were given two weeks to enable them have time to respond. The respondents were requested not to indicate their names and information regarding the nature and purpose of the study and instruction on how to complete the questionnaires were provided. The researcher collected the answered questionnaire and the returned questionnaire were determined and arranged for data analysis base on each research question.

3.9 Method of Data Analysis

The data collected was organized in line with the research questions and hypotheses formulated for the study. Statistical Package for Social Sciences (SPSS Version 23) was used for computation of data. Mean and standard deviation were used to answer the research questions, while Z-test statistics was used to test the null hypothesis at 0.05 level of significance. Below is the five rating scale that was used

0.50-1.49- Undecided (U)
1.50-2.49- Not Complied With (NCW)
2.50-3.49- Moderately Complied With (MCW)
3.50-4.49- Complied With (CW)
4.50-5.49- Highly Complied With (HCW).

The decision for each question was based on the resultant means scored interpreted in relation to the concept of the real lower and upper limit of number 1-5 as shown above. The decision on the null hypothesis formulated for the study was based on comparing the significant value with p-value of 0.05 level of significant. That is, where the significant value is less than ($P < 0.05$) it was rejected while equal or greater than ($P \geq 0.05$) level of significant, the hypothesis was accepted. See appendix H for decision rule table.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1. Research Question One

What is the level of compliance with the national project health and safety plan template in Abuja Metropolis by construction industries on site planning, layout and security precaution?

The results analyzed for research question one are presented in Table 4.1

Table 4.1: Mean Responses of the Professional and Workers on Level of Compliance by Construction Industries on Site Planning, Layout and Security Precautions as contained in the National Project Health and Safety Plan in Abuja Metropolis.

N_1= 196, N_2 = 186, N_T =382

S/N	ITEMS	$\bar{X}$	SD	Remark
1.	Compliance with the established safety policy on the site before the construction begins.	2.12	0.65	Not Complied With
2.	Safety rules and regulation on the site planning and layout.	2.36	0.61	Not Complied With
3.	Erection of fence at least 2 meter high at the boundary of the site.	2.42	0.69	Not Complied With
4.	Health and safety during excavation.	2.43	0.56	Not Complied With
5.	Covering of all opening at the end of working day.	2.04	0.69	Not Complied With
6.	Removal of Ladders from their rungs boarding areas at the end of working day.	2.77	0.71	Complied With
7.	Controlled movement of the vehicles on site	2.42	0.55	Not Complied With
8.	Freeing of site access road from all hazardous material.	2.53	0.61	Complied With
9.	Marking and covering of holes and opening all the time.	2.42	0.60	Not Complied With
10.	Unlettered of dangerous objects such a scrap or projecting nails in timber.	3.00	0.47	Complied With
11.	Provision of artificial lighting while working in the dark.	2.77	0.61	Complied With
12.	Keeping the site tidy and materials stored safely.	2.43	0.54	Not Complied With
13.	Proper arrangement of collecting and disposing waste and scrap materials.	2.47	052	Not Complied With
14.	Edge projection at all opens sides of gang ways or staircases.	2.37	0.63	Not Complied With
	Grand Mean	**2.46**		

Key: $\overline{X}$ = Mean responses of Respondents SD= Standard Deviation N_1= Number of Professional N_2 = Number of Workers N_T = Total Number of Respondents

Table 4.1 revealed the responses of the respondents on the compliance level by construction industries on site planning, layout and security precautions as contained in national project health and safety plan in Abuja Metropolis. The results showed that construction industries do not complied with 10 items on site planning, layout and security precautions with mean values ranges from 2.04 – 2.47 and do complied with 4 items on site planning, layout and security precautions with mean value ranges from 2.53 – 3.00. The standard deviation ranges from 0.47 - 0.71 which inferred that the respondents were closer to each other in their responses to the items. Hence, the grand mean of all the respondents is 2.46 implies that most of the site planning, layout and security precautions as contained in national project health and safety plan were not complied by construction industries in Abuja Metropolis.

4.2 Research Question Two

What is the level of compliance with the national project health and safety plan template in Abuja Metropolis by construction industries on excavation precaution?

The results analyzed for research question two are presented in Table 4.2

Table 4.2: Mean Responses of the Professional and Workers on the Level of Compliance by Construction Industries on Excavation Precautions as Contained in National Project Health and Safety Plan in Abuja Metropolis

N_1=196, N2= 186, N_T=382

S/N	ITEMS	$\bar{X}$	SD	Remark
1.	Supplying of adequate materials such as timber and trench sheet to site before the excavation begins.	2.30	0.61	Not Complied With
2.	Provision for daily inspection of excavation to determine the possibility of a cave in.	2.33	0.54	Not Complied With
3.	Shoring of excavation back to 45^0	2.20	0.52	Not Complied With
4.	Alternative means of putting in shoring which protect the shorer.	2.30	0.52	Not Complied With
5.	Sufficient long ladder for safely accessing in and out of excavation.	2.28	0.51	Not Complied With
6.	Barriers to stop person falling in to the excavation.	2.31	0.58	Not Complied With
7.	Proper arrangement to prevent vehicle driving in to the excavation.	2.99	0.51	Complied With
8.	Using manual Method of excavation for shallow trenches.	3.00	0.57	Complied With
9.	Using the right tools/equipment for the right job during the excavation	2.44	0.49	Not Complied With
10.	Organizing regular seminar on health and safety for workers on site.	2.30	0.55	Not Complied With
11.	Daily inspection of excavator and crane.	3.01	0.52	Complied With
12.	5m distance from existing structure to excavation.	2.22	0.56	Not Complied With
	Grand Mean	**2.47**		

Key: $\bar{X}$ = Mean responses of Respondents SD= Standard Deviation N_1= Number of Professional N_2 = Number of Workers N_T = Total Number of Respondents

The result of the analysis in Table 4.2 revealed the responses of the respondents on level of compliance by construction industries on excavation precautions as contained in the national project health and safety plan in Abuja Metropolis. The results showed that construction industries complied with 3 items with mean values ranges from 2.99 - 3.01

on excavation precautions while do not complied with 9 items with mean values ranges from 2.20 – 2.44 on excavation precautions as contained in the national project health and safety plan template. The standard deviations of 0.49 - 0.61 in the Table 4.2 indicated that the respondents were not too far from one another in their responses. Hence, the grand mean of all the respondents is 2.47 implies that most of the excavation precautions as contained in the national project health and safety plan were not complied with by construction industries in Abuja Metropolis

4.3 Research Question Three

What is the level of compliance with the national project health and safety plan template in Abuja Metropolis by construction industries on scaffolding precaution?

The results analyzed for research question three are presented in Table 4.3

Table 4.3: Mean Responses of the Professional and Workers on Level of Compliance by Construction Industries on Scaffolding Precautions as contained in National Project Health and Safety Plan in Abuja Metropolis.

N_1=196, N_2 = 186, N_T=378

S/N	ITEMS	$\bar{X}$	SD	Remark
1.	Erection of scaffold under the supervision of competent personnel.	3.56	0.85	Highly Complied With
2.	Proper access to all part of the scaffold platform.	3.62	0.54	Highly Complied With
3.	The upright of the scaffolds are mounted on proper base plates in order to prevent slipping or sinking.	3.61	0.49	Highly Complied With
4.	Used of seasoned or proper grade planks for working platform.	3.17	0.66	Complied With
5.	Proper securing of platform to prevent collapse.	3.02	0.67	Complied With
6.	Erection of guard-rails and toe to a safer height at the opening site.	3.56	0.69	Highly Complied With
7.	Evenly distribution of material on scaffold to avoid over loaded.	3.36	0.51	Complied With
8.	Proper locked and secure of wheels mobile tower.	3.62	0.54	Highly Complied With
9.	Access ladders for tower scaffolds are fitted internally and not externally.	3.17	0.66	Complied With
10.	Workers on suspended scaffolds are using lifeline anchored overhead to the building and not to the scaffold.	3.02	0.67	Complied With
11.	Scaffold is inspected by competent person at least once in a week.	3.50	0.68	Highly Complied With
12.	Inspections of scaffold are recorded and signed by the person in charge.	2.38	0.69	Not Complied With
	Grand Mean	**3.29**		

Key: $\bar{X}$ = Mean responses of Respondents SD= Standard Deviation N_1= Number of Professional N_2 = Number of Workers N_T = Total Number of Respondents

The analysis of the result in Table 4.3 showed that construction industries highly complied with six (6) items ranges from 3.50 - 3.62 and complied with five (5) items ranges from 3.02 - 3.17 while items with do not complied with has one (1) item with the mean value 2.38 on scaffolding precautions as contained in the national project health and safety plan in Abuja Metropolis. The standard deviations value in Table 4.3 ranges from 0.49 - 0.90. This signifies that the respondents were closer to each other in their

responses. Hence, the grand mean of all the respondents is 3.29 which implies that most of the scaffolding precautions as contained in the national project health and safety plan were complied with by the construction industries in Abuja Metropolis

4.4. Research Questions Four

What is the level of compliance with the national project health and safety plan template in Abuja Metropolis by construction industries on roof work precaution?

The results analyzed for research question four are presented in Table 4.4

Table 4.4: Mean Responses of Professional and Workers on the level Compliance of Construction Industries on Roofwork Precautions as Contained in the National Project Health and Safety Plan in Abuja Metropolis.

N_1=196, N_2= 186, N_T=378

S/N	ITEMS	$\bar{X}$	SD	Remark
1.	Proper crawling ladders are used to work on roof slopes of more than 10 degree.	3.01	0.62	Complied With
2.	Use of sufficient guard-rails and toe boards for roof work.	3.57	0.63	Highly Complied With
3.	There is crawling board for work above fragile material such as glass or asbestos.	3.37	0.59	Complied With
4.	Warning notices are at all approaches to fragile roof.	3.61	0.49	Highly Complied With
5.	Roof workers are provided with personal protective wears such as helmet.	3.02	0.67	Complied With
6.	Guard-rails are used when it's necessary to work close to fragile material or roof light.	2.96	0.75	Complied With
7.	Proper working tools and equipment's provided for workers.	3.06	0.73	Complied With
8.	Precautions are taken to stop debris falling on to others working under the roof.	3.01	0.62	Complied With
9.	Use of mechanical to supply heavy equipment/materials.	3.57	0.63	Highly Complied With
10.	Regular use of nose mask to prevent breathing in of asbestos's fibre	3.36	0.51	Complied With
11.	Well-equipped first aid box are provided where more than 25 workers are expected to work	3.61	0.49	Highly Complied With
12.	Proper address of workers demand on health and safety promotion.	2.97	0.73	Complied With

Key: $\bar{X}$ = Mean responses of Respondents SD= Standard Deviation N_1=Number of Professional N_2 = Number of Workers N_T = Total Number of Respondents

The analysis of the result in Table 4.4 showed that construction industries highly complied with four (4) items which ranges from 3.57 - 3.61 and complied with eight (8) items which ranges from 2.97 - 3.37 on roof work precautions as contained in the national project health and safety plan in Abuja Metropolis. The standard deviation value of the 12 items in Table 4.4 ranges from 0.49 - 0.75. This signifies that the respondents were closer to one another in their responses to the items.

4.5 Hypothesis One

There is no significant difference between mean responses of the professional and site workers on the level of compliance by construction industries onsite planning, layout and security precautions as contained in the national project health and safety plan in Abuja Metropolis.

The data for testing research hypothesis one is presented in Table 4.5

Table 4.5: Z-test Analysis of Significant Difference in the Mean Responses between Professional and Workers on Level of Compliance by Construction Industries on Site Planning, Layout and Security Precautions as Contained in National Project Health and Safety Plan Template

N_1=196, N_2= 182

Construction Industries	N	$\bar{X}$	S.D	df	Z	P-value
Professionals	63	2.82	0.29			
				335	1.00	0.000
Workers	274	2.79	0.23			

The data presented in Table 4.5 showed that the Z-test analysis on the responses of professional and site workers in the building construction industries in Abuja Metropolis as regards to the level of compliance by construction industries on site planning, layout and security precautions as contained in the national project health and safety plan. The table revealed the Z value of 1.00 was obtained with probability value of 0.000. Since the probability value of 0.000 was less than 0.05 set as a level of significance, the null hypothesis which stated that there is no significance difference in

the mean responses of the professional and site workers on the level of compliance by construction industries on site planning, layout and security precautions as contained in the national project health and safety plan was rejected. Hence, there is significance difference in the mean responses of the professional and site workers on the level of compliance by construction industries on site planning, layout and security precautions as contained in national project health and safety plan.

4.6. Hypothesis Two

There is no significant difference between the mean responses of the professional and site workers on the level of compliance by construction industries on excavation precautions as contained in the national project health and safety plan in Abuja Metropolis.

The data for testing research hypothesis two is presented in Table 4.6

Table 4.6: Z-Test Analysis of Significant Difference in the Mean Responses between Professional and Workers on the Level of Compliance by Construction Industries On Excavation Precautions as Contained in National Project Health and Safety Plan Template.

N=196, N= 182

Construction Industries	N	$\bar{X}$	S.D	df	Z	P-value
Professionals	63	3.12	0.18			
				335	2.61	0.025
Workers	274	3.32	0.17			

Table 4.6 showed that the Z-test analysis on the responses of professional and site workers in the building construction industries in Abuja Metropolis as regards to the level of compliance by construction industries on excavation precautions as contained in the national project health and safety plan. The table revealed the Z-value of 2.61 was obtained with associated exact probability value of 0.000. Since the associated probability value of 0.025 was less than 0.05 set as a level of significance, the null hypothesis which stated that there is no significant difference between the mean

responses of the professional and site workers on the level of compliance by construction industries on excavation precautions as contained in the national project health and safety plan was rejected. Hence, there is significance difference between the mean responses of the professional and site workers on the level of compliance by construction industries on excavation precautions as contained in national project health and safety plan.

4.7 Hypothesis Three

There is no significant difference between the mean responses of the professional and site workers on the level of compliance by construction industries on scaffolding precautions as contained in the national project health and safety plan in Abuja Metropolis.

The data for testing research hypothesis three is presented in table 4.7

Table 4.7: Z-test Analysis of Significant Difference between the Mean Responses of Professional and Workers on the Level of Compliance by Construction Industries on Scaffolding Precautions as Contained in National Project Health and Safety Plan

N=196, N= 182

Construction Industries	N	$\overline{X}$	S.D	df	Z	P-value
Professionals	63	3.38	0.17			
				335	5.59	0.344
Workers	274	3.32	0.21			

Table 4.7 shows the z-test analysis on the responses of professional and site workers in the building construction industries in Abuja Metropolis as regards to the compliance level of construction industries on site planning, layout and security precautions as contained in national project health and safety plan. The table revealed the Z-value of 5.59 was obtained with associated exact probability value of 0.344. Since the associated probability value of 0.344 was greater than 0.05 set as a level of significance, the null hypothesis which stated that there is no significance difference in the mean responses of the professional and site workers on the compliance level of construction industries on

building scaffolding precautions as contained in national project health and safety plan was accepted. Hence, there is no significant difference in the mean responses of the professional and site workers on the compliance level of construction industries on building scaffolding precautions as contained in national project health and safety plan.

4.8 Hypothesis Four

There is no significant difference between the mean responses of the professional and site workers on the level of compliance by construction industries on roof work precautions as contained in the national project health and safety plan in Abuja Metropolis.

The data for testing research hypothesis four is presented in table 4.8

Table 4.8: Z-Test Analysis of Significant Difference Between the Mean Responses between Professional and Workers on the Level of Compliance by Construction Industries on Roof work Precautions as Contained in National Project Health and Safety Plan

N=196, N= 182

Construction Industries	N	$\overline{X}$	S.D	df	Z	P-value
Professionals	63	3.41	0.19			
				335	8.10	0.764
Workers	274	3.26	0.19			

Table 4.8 showed that the Z-test analysis on the responses of professional and site workers in the building construction industries in Abuja Metropolis as regards to the level of compliance by construction industries on site planning, layout and security precautions as contained in the national project health and safety plan. The table revealed the Z-value of 8.10 was obtained with associated exact probability value of 0.764. Since the associated probability value of 0.764 was greater than 0.05 set as a level of significance, the null hypothesis which stated that there is no significant difference in the mean responses of the professional and site workers on the level of compliance by construction industries on roof work precautions as contained in the

national project health and safety plan was accepted. Hence, there is no significance difference in the mean responses of the professional and site workers on the level of compliance by construction industries on roof work precautions as contained in national project health and safety plan.

4.9 Finding of the Study

The following findings emerged from the study based on the data collected and analyzed and hypotheses tested.

1. Construction industries complied with 12 items on site planning, layout and security precautions as contained in the national project health and safety plan template but do not complied with 3 items in Abuja Metropolis
2. Construction industries complied with all the items on excavation as contained in the national project health and safety plan template in Abuja Metropolis
3. Construction industries highly complied with six items and complied with five (5) items while do not complied with one (1) item on scaffolding precautions as contained in the national project health and safety plan template in Abuja Metropolis
4. Construction industries highly complied with four (4) items and complied with eight (8) items on roof work precautions as contained in the national project health and safety plan template in Abuja Metropolis
5. There was significance difference between the mean responses of the professional and site workers on the compliance level of construction industries on site planning, layout and security precautions as contained in the national project health and safety plan.

6. There was significance difference between the mean responses of the professional and site workers on the compliance level of construction industries on excavation precautions as contained in national project health and safety plan.
7. There was no significant difference between the mean responses of the professional and site workers on the compliance level of construction industries on building scaffolding precautions as contained in the national project health and safety plan.
8. There was no significance difference between the mean responses of the professional and site workers on the compliance level of construction industries on roof work precautions as contained in the national project health and safety plan.

4.10 Discussion of Findings

Findings on the level of compliance by construction industries on site planning, layout and security precautions as contained in the national project health and safety plan template in Abuja metropolis revealed that established safety policy on site before construction begins are not complied with by the construction industries in Abuja metropolis. This finding is in line with the findings of Baxendale and Jones (2010) who postulated that despite the existence of the regulations and policy in most building construction industries in many countries, accident occurrence persist and that accident and fatality rate in building construction industries is attributed to the non-compliance with safety and health policies.

Finding of the study also revealed that unlittered of dangerous objects such as scraps or projecting nails in timber and provision for artificial lightening while working in dark are not complied with by the building construction industries in Abuja metropolis. This is probably due to lack of knowledge of the implication of littered material on

construction site. This finding concurred with the findings of Umeokafor *et al.* (2014) who stated that non-compliance with the construction regulation is a major contributor to the poor state of safety and health challenges in Nigeria.

The finding of the study also revealed that safety and health regulation on site planning and layout are not complied with. These findings is in agreement with the findings of Kolo *et al.* (2018) who said that developing and maintaining an effective site layout is a significant and critical task that should be properly performed and updated during the project planning and construction phases as it can lead to the reduction of cost of materials handling, minimize the travel time of labour, materials and equipment's on site, improving construction productivities and promoting the construction safety quality. Jamison (2018) also suggested that temporary facilities have to be rightly placed from the beginning of the project execution. Adequate measure in the form of reinforcement of all trenches and relevant checks at regular intervals should be in compliance with official health and safety guidelines to put in place before the construction begin on the site.

Finding on the level of compliance with building project health and safety plan on excavation in Abuja metropolis revealed that provision for daily inspection of excavation to determine the possibility of cave-in was not complied with. This finding is in conformity with the observation of OSHA (2015) who stated that cave-ins pose the greatest risk and are more likely than excavation related incidents to result in workers fatalities. OSHA (2015) further explained that unprotected trench can be an early grave for employees in the building construction industries, and that employers must ensure that workers enter trenches only after adequate protections are put in place to address cave-in hazards and other potential hazards associated with trenching work such as, falling load, hazardous atmosphere and equipment hazard.

Finding also revealed that supplying of adequate materials such as timber and trench sheets to site before the excavation begins were not complied with. This finding is corroborated by Mayer and Nakamura (2021) who reported that many on-the-job incident results from inadequate initial planning, waiting until after the work start to correct mistake in shoring or sloping slowdown the operation, add to the cost of project and make a cave-ins or other excavation fatalities.

The finding of the study also revealed that organizing regular seminar on health and safety for construction workers are not complied with by the construction industries in Abuja metropolis. This finding tailed with the opinion of George *et al.* (2013) who suggested that construction industries should provide awareness particularly on health and safety of their employees. This is due to the fact that construction workers are one of the most susceptible of the unorganized and unskilled labour as they are being exposed to varieties of excavation hazards and other related incidents. This finding is also supported by Griffith and Howarth (2001) who stated that modern job training has taken new dimension as the employee learn how to perform a job in the safest possible ways and that the training of construction workers enable them to know how to identify hazards and avoid them. He suggested that employees must be taught the do and don't if safety planning is to be effective.

Basic awareness of safety on construction sites, identification of hazards and risk involve in construction industries, implementation of effective safety management system, and reduction of the work place injuries through incidents prevention method and improve the safety culture within the organization. The finding further revealed that daily inspection of excavator and crane are not properly carried by the construction industries in Abuja metropolis.

Findings in the level of compliance with building project health and safety plan on scaffolding revealed that, erection of scaffold under the supervision of competent personnels was properly complied with. This finding is in consonance with the findings of OSHA (2015) which stated that scaffold should be erect, altered or dismantled only by competent personnel's. Scaffolding should be placed on firm and leveled ground and the base plate at their feet should rest on timber sole board. This helps to ensure that the load carried by each upright is distributed over fairly large area and so prevent the upright from sinking into the ground and affect the balance of the scaffold. The result of this findings is also in line with the views of Ezenwa and Jolles (2011) who suggested that upright of the scaffold should be kept equidistant and should be connected and strengthened by ledgers fixed on the inside of the upright.

Finding on the level of compliance with building project health and safety plan on roof work in Abuja metropolis revealed that proper crawling of ladders to work on roof slopes of more than 10 degree, and the use of sufficient guard rails and toe board for roof work are complied with. This finding is in line with views of Occupational Health and Safety Authority (OSHA, 2015) who started that on most sloping roofs, crawling board and suitable ladders are essentials in addition to the head protection. This finding is also in agreement with NPHSP that said crawling board and roof ladders should be properly designed and constructed, and not made up from odd material found at the site. That board should have cross battens at least 380mm apart and should be secured in position. The ridge anchorage or the ridge iron at the top of the board or ladder should not rely on the ridge capping which is liable to break away, but should bear on the opposite slope of the roof, or be secure by a rope, Eave gutters should not be used as a footing or to support a roof ladder as they are not strong enough to bear the expected weight.

The finding of the study also revealed that warning notice at all approaches to fragile roof are not properly complied with. This finding is in agreement with the views of Chudley and Greeno (2001) who postulated that Safety signs are non-verbally communicated on construction sites with the use of reflective signs and appropriate colour code, spoken communication and the marking of dangerous substances. The sign are marked with different colours for different purposes, such as (i) prohibition signs (red colour, authorized personnel only, smoking prohibited) (ii) warning signs (yellow signs, danger of electric shock, flammable liquid) (iii) mandatory signs (blue colour, safety helmets must be worn, protective clothing must be worn) (iv) safe conditions signs (green colour, emergency escapes, treatment area and safe area). He further explained the primary purpose of the safety sign on the construction sites as follows: Drawing attention to health and safety of tradesmen when others are absent, Documenting safety procedures and protocol, Reminding employees and visitors to put on safety equipment before entering an arena, under scoring the location of emergency equipment, such as fire extinguishers, eye wash station, underground cable, shutoff valve, prohibiting actions or mandating certain precautionary activities.

Finding of the study also revealed that precaution taken to stop debris falling on to other working under the roof, proper working tools and equipment are not properly complied with. This finding is in conformity with the views of Weeks (2011) who stated that roofing hand tools, power tools, and equipment can be hazardous and cause severe injuries if used incorrectly, the employers can therefore reduce the risk of injuries by providing tool guard, personal protective equipment [PPE], and training of workers on roofing tool safety. He further explained that power tool for example should have the proper shield guards, or safety attachment specified by the manufacturer, and the employer must ensured that workers using power tools wear the appropriate PPE. They

concluded that employers need to train workers on the proper usage of roofing tools and equipment, while in training, it is also important to discuss tool safety features, safety operating procedure and safety work practice such as proper body placement and how to use personal protective equipment.

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATION

5.1 Conclusion

Based on the findings of the study, it was concluded that there is compliance with the established safety policy on site before construction begins and safety rules and regulation on the site planning and excavation. There is high compliance with the established safety policy on the site when building scaffold and roof work under the supervision of competent personnel. Also there is significance difference between the mean responses of professional and site workers on the level of compliance by construction industries on site planning, layout and excavation security precautions as contained in the national project health and safety plan. There was also no significant difference in the mean responses of professional and site workers on the level of compliance by construction industries on building scaffolding precautions and roof work precautions as contained in the national project health and safety plan. Nevertheless, the findings is limited to the level of compliance by construction industries as contained in (CORBON) the national project health and safety plan in Abuja Metropolis.

5.2 Recommendations

Based on the findings of this study, the following recommendations were made

1. Professional and site workers of building construction industries should fully comply with site planning, layout and excavation security precautions as contained in the national project health and safety plan of CORBON.
2. Professional and site workers of building construction industries should fully comply with scaffolding and roof work precautions as contained in national project health and safety plan of CORBON.

3. Government should provide appropriate inspection services and enforce the application of the provision of national law and regulation on compliance to project health and safety in all building construction industries in Nigeria.
4. Every construction company should appoint properly qualified personnel whose special and main responsibility is the promotion of health and safety, and should have direct access to the executive director of the company.
5. Professional builders and site workers of building construction industries should be sensitized on the efficacy of CORBON document on the national project health and safety plan through conference, seminar and workshops.

5.3 Contribution to Knowledge

The study has empirically established the assessment of national project health and safety plan template level of compliance by building construction industries in Abuja Metropolis, Nigeria. The study highlights that tradesmen that are highly expose to hazards in carrying out their respective duties as vast majority of tradesmen are ignorant of the extent of compliance to occupational health and safety plan in building construction site which eventually leads to accident that result to injuries, damages to properties, equipment and loss of lives.

The study creates awareness and re-orientate them on the effect of noncompliance to occupational health and safety plan in the construction site, hence device a means on how proper plan and preparation of their contract documents will influence compliance on safety and health issues in the construction site.

5.4 Suggestions for Further Study

Based on the findings of this study, the following suggestions were made for further research:

1. Developing a frame work for improving safety and health compliance in building construction industries in Nigeria
2. A similar study to assess national project health and safety plan template level of compliance by building construction industries in other zones in Nigeria should be carried out.
3. Examination of the level of compliance of the application health and safety plan on building construction sites in north central States of Nigeria.
4. Compliance of occupational health and safety policies and regulations in public buildings in Nigeria.
5. Exploration of potentials for more studies to be conducted towards formulating the comprehensive frame work for ensuring prompt compliance to national project health and safety plan template by building construction industries in Abuja Metropolis.

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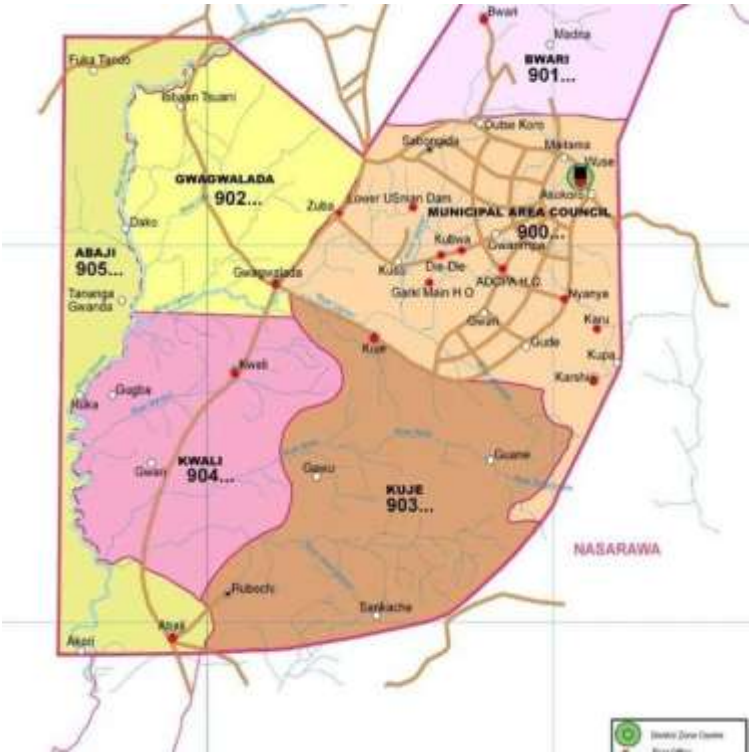
APPENDIX A

MAP OF NIGERIA SHOWING THE LOCATION OF ABUJA

Map of Abuja showing the six Area Council



Source: www.abuja.gov

APPENDIX B

VALIDATION LETTER

Department of Industrial and Technology Education,
Federal University of Technology Minna, Niger State.
11th November, 2021.

Sir,

REQUEST FOR RESEARCH INSTRUMENT VALIDATION

Your kind gesture is needed to ascertain the credibility and suitability of this instrument on the **ASSESMENT OF THE COMPLIANCE WITH BUILDING PROJECT HEALTH AND SAFETY PLAN BY THE BUILDING CONSTRUCTION INDUSTRIES IN ABUJA METROPOLIS.**

I therefore request that you validate the attached instruments (questionnaire).
You are obliged to remove or add items(s) necessary for the actualization of the set goal. The proficiency of the project is based on the accuracy of this instrument, and as such, your kind opinions on the above subject matter are highly valuable.

Thanks you.

Validated by:

Name: _____

Sign: _____

Date: _____

Yours faithfully,

Mohammed Usman Katcha.
MTech/SSTE/2018/8467
07031686788

APPENDIX C

RESEARCH INSTRUMENTS

SECTION I

Please read each statement carefully and respond by ticking(√) any appropriate option indicated as High Compliance (HC), Compliance (C), Moderate Compliance (MC), and non-Compliance (NC) that best described your opinion on the level of Compliance with the building project health and safety plan on site planning, layout and security in Abuja metropolis?

Researched Question 1

What is the level of Compliance with building project health and safety plan on site planning, layout and security in Abuja Metropolis?

S/N	ITEMS	HCW (4)	CW (3)	MCW (2)	NCW (1)
1.	Compliance with the established safety policy on the site before the construction begins.				
2.	Safety rules and regulation on the site planning and layout.				
3.	Erection of fence at least 2 meter high at the boundary of the site.				
4.	Health and safety during excavation.				
5.	Covering of all opening at the end of working day.				
6.	Removal of Ladders from their rungs boarding areas at the end of working day.				
7.	Controlled movement of the vehicles on site				
8.	Freeing of site access road from of hazardous material.				
9.	Marking and covering of holes and opening all the time.				
10.	Unlittered of dangerous objects such a scrap or projecting nails in timber.				
11.	Provision of artificial lighting while working in the dark.				
12.	Keeping the site tidy and materials stored safely.				
13.	Proper arrangement of collecting and disposing				

	waste and scrap materials.				
14.	Edge projection at all open sides of gang ways or staircases.				

SECTION II

Please read each statement carefully and response by (√) any appropriate option indicated as Highly Comply(HC), Comply(C) , Moderately Comply(MC), and Not Comply (NC) that best describe your opinion on the level of compliance with the building project health and safety plan on excavation.

Researched Question 2

What is the level of compliance with the building project health and safety plan on excavation in Abuja metropolis?

S/N	ITEMS	HCW (4)	CW (3)	MCW (2)	NCW (1)
15.	Supplying of adequate materials such as timber and trench sheet to site before the excavation begins.				
16.	Provision for daily inspection of excavation to determine the possibility of a cave in.				
17.	Shoring of excavation back to 45^0				
18.	Alternative means of putting in shoring which protect the shorer.				
19.	Sufficient long ladder for safely accessing in and out of excavation.				
20.	Barriers to stop person falling in to the excavation.				
21.	Proper arrangement to prevent vehicle driving in to the excavation.				
22.	Using manual Method of excavation for shallow trenches.				
23.	Using the right tools/equipment for the right job during the excavation				
24.	Organizing regular seminar on health and safety for workers on site.				
25.	Daily inspection of excavator and crane.				
26.	5m distance from existing structure to excavation.				

SECTION III

Please read each statement carefully and response by ticking (√) any appropriate option indicated as Highly Comply(HC) , Comply(C) , Moderately Comply(MC), and Not Comply(NC) that best describe your opinion on the level of compliance with the building project health and safety plan on scaffolding.

Research Question 3

What is the level of compliance with the building project health and safety plan on scaffolding in Abuja metropolis?

S/N	ITEMS	HCW (4)	CW (3)	MCW (2)	NCW (1)
27.	Erection of scaffold under the supervision of competent personnel.				
28.	Proper access to all part of the scaffold platform.				
29.	The upright of the scaffolds are mounted on proper base plates in order to prevent slipping or sinking.				
30.	Used of seasoned or proper grade planks for working platform.				
31.	Proper securing of platform to prevent collapse.				
32.	Erection of guard-rails and toe to a safer height at the opening site.				
33.	Evenly distribution of material on scaffold to avoid over loaded.				
34.	Proper locked and secure of wheels mobile tower.				
35.	Access ladders for tower scaffolds are fitted internally and not externally.				
36.	Workers on suspended scaffolds are using lifeline anchored overhead to the building and not to the scaffold.				
37.	Scaffold is inspected by competent person at least once in a week.				
38.	Inspections of scaffold are recorded and signed by the person in charge.				

SECTION IV

Please read each statement carefully and respond by ticking (√) ay appropriate option indicated as Highly Comply(HC), Comply(C), Moderately Comply(MC) and Not Comply (NC) that best described your opinion on the level of comply with the project health and safety plan on excavation in Abuja metropolis.

Research Question 4

What is the level of compliance with building project health and safety plan on roof work in Abuja metropolis?

S/N	ITEMS	HCW (4)	CW (3)	MCW (2)	NCW (1)
39.	Proper crawling ladders are used to work on roof slopes of more than 10 degree.				
40.	Use of sufficient guard-rails and toe boards for roof work.				
41.	There is crawling board for work above fragile material such as glass or asbestos.				
42.	Warning notices are at all approaches to fragile roof.				
43.	Roof workers are provided with personal protective wears such as helmet.				
44.	Guard-rails are used when it's necessary to work close to fragile material or roof light.				
45.	Proper working tools and equipment's provided for workers.				
46.	Precautions are taken to stop debris falling on to others working under the roof.				
47.	Use of mechanical to supply heavy equipment/materials.				
48.	Regular use of nose mask to prevent breathing in of asbestos's fibre				
49.	Well-equipped first aid box are provided where more than 25 workers are expected to work				
50.	Proper address of workers demand on health and safety promotion.				

APPENDIX D

VALIDATION CERTIFICATE

This is to certify that the instrument on the research work titled: **ASSESSMENT OF THE EXTENT OF COMPLIANCE OF OCCUPATIONAL HEALTH AND SAFETY PLAN IN THE BUILDING CONSTRUCTION INDUSTRY IN THE FCT ABUJA, NIGERIA.**

Was validated by me:

Name of First Validation Officer: Arc. Isheng Abubakar

Institution: Ministry of Works & Infrastructural Development (M.O.W.I.D)

Department: BUILDING DEPT.

Signature and Date: 14/04/2021

MINISTRY OF WORKS & TRANSPORT MINNA NIGER STATE SIGN...DATE.....

Name of Second Validation Officer: Dr. Ibrahim Dandi

Institution: FUT Mx.

Department: I.T.E

Signature and Date: 29/05/2021

Name of Third Validation Officer: Dr. Abdul Bello Kagara

Institution: Federal University of Technology, Minna

Department: Industrial & Technology Education

Signature and date: 31/05/2021

Name of Research Student: Mohammed Usman Katcha.

Matriculation Number: MTech/SSTE/2018/8467

Programme of Study: M.Tech Industrial and Technology Education (Building Technology)

APPENDIX E

POPULATION LETTER 1

Industrial and Technology Education Department,
Federal University of Technology,
PMB 65 Minna,
Niger State.
1st June, 2021.

The Managing Director,
Julius Berger Construction Company,
Utako, F.C.T Abuja.

Sir,

SOLICITATION LETTER

I wish to request for the total number of the following workers in your establishment.

1 Management staff. — 09
2 Project manager. — 06
3 Safety officers. — 25
4 Trade men. — 2010

JULIUS BERGER
Region Central & North
10 Shettima A. Munguno Crescent
Utako 900 108 | FCT Abuja
Tel: +234 803 906 7000

All the information provided will be treated confidentially and used only for the purpose of this research work.

Thanks you for your anticipation support.

Yours faithfully,

MOHAMMED USMAN KATCHA.
M.TECH/SSTE/2018/8467.

POPULATION LETTER 2

Industrial and Technology Education Department,
Federal University of Technology,
PMB 65 Minna,
Niger State.
1st June, 2021.

THE MANAGING
DIRECTOR
ARAB CONTRACTORS
FCT ABUJA

Sir,

SOLICITATION LETTER

I wish to request for the total number of the following workers in your establishment.

1 Management staff. -
2 Project manager. -
3 Safety officers. -
4 Trade men. --

All the information provided will be treated confidentially and used only for the purpose of this research work.

Thanks you for your anticipation support.

Yours faithfully,

MOHAMMED USMAN KATCHA.
M.TECH/SSTE/2018/8467.

POPULATION LETTER 3

Industrial and Technology Education Department,
Federal University of Technology,
PMB 65 Minna,
Niger State.
1st June, 2021.

The Managing Director,
Dantata and Sawoe Construction Company Nigeria Limited,
Garki, F.C.T Abuja.

Sir,

SOLICITATION LETTER

I wish to request for the total number of the following workers in your establishment.

1 Management staff.
2 Project manager.
3 Safety officers.
4 Trade men.

2 DANTATA & SAWOE
2 HUMAN
3 RESOURCES MANAGER
287

All the information provided will be treated confidentially and used only for the purpose of this research work.

Thanks you for your anticipation support.

Yours faithfully,

MOHAMMED USMAN KATCHA.
M.TECH/SSTE/2018/8467.

APPENDIX F

Table 3.1 show the distribution of population size in various construction companies.

S/N	Names of Construction Companies	No of project managers	No of safety officers	No of trade men
1.	A and K construction Abuja	01	03	33
2.	AbuixechEnginerring service Ltd	01	03	42
3.	ACC construction company	02	02	41
4.	Afebico construction company	02	04	41
5.	AG vivion company Nig Ltd	02	04	45
6.	Allami Home Ltd	02	03	36
7.	Arab construct Nig Limited	02	08	46
8.	Arfo construction company	02	04	34
9.	Artificial green Nigeria Ltd	01	04	25
10.	Badawe Engineering company Limited	01	04	43
11.	BlomstraNig Ltd	01	03	39
12.	BNL Enginerring& construction	01	03	43
13.	Bullet int'l Nig Ltd	03	02	33
14.	Bulletin construction company	02	03	25
15.	CGCC Nigeria Ltd	01	02	40
16.	Corona construction Ltd	-	02	42
17.	Cube consult Nig Ltd	01	03	31
18.	Dantata and sawoe construction company	02	03	46
19.	Designetic Int'l Building & construction Ltd	02	02	44
20.	Dutun company Ltd	01	03	27
21.	Eagle construction company	01	04	43
22.	Enerco Nigeria Limited	01	03	40
23.	Energo Nigeria limited	02	05	44
24.	Gilmor construction company	01	02	29
25.	Gitto construction company	02	03	41
26.	Gohanah Nigeria Ltd	02	05	45
27.	Green forest construction limited	01	05	43
28.	Habital and Building concept Ltd	01	03	35
29.	Hajaig construction Nig. Ltd	02	02	33
30.	Julius Berger construct company	06	05	49
31.	King fe m group of company	02	03	40
32.	KorstinmullerNig Ltd	01	03	41
33.	Land mark corporative reality (Abuja office)	-	03	43
34.	Lubell Nigeria Ltd	01	03	44
35.	Maserki Nigeria Ltd	02	02	40
36.	Missouri Engineering Ltd	02	01	51
37.	Naf construction company	01	02	25
38.	Nanman construction company	02	04	43
39.	News engineering	03	04	43
40.	NSG store Ltd	01	01	41
41.	P.W Nigeria Limited	02	04	43

S/N	Names of Construction Companies	No of project managers	No of safety officers	No of trade men
42.	Parsons science engineering Ltd	02	04	43
43.	Paulo Homes	01	02	20
44.	Phema construction company	03	03	39
45.	Puliz dredging and construction Ltd	02	01	42
46.	RCC Reynold construction	02	02	43
47.	River state Liaison (Abuja)	02	02	45
48.	S and M Nigeria Ltd	01	02	42
49.	Saidi Nigeria limited	01	01	24
50.	Salim construction company	02	02	43
51.	Setraco construction company	04	06	41
52.	Shelter and Road construction Ltd	01	01	40
53.	Trion worldwide constructor	01	07	30
54.	Vital construction Nig. Limited	01	02	40
55.	Zaina Engineering Ltd	01	05	42
	TOTAL	**38**	**172**	**2146**

Source: *Staff nominal roles of the companies (2021)*

APPENDIX G

Table 3.2: Sampled Population Distribution Table

S/N	Names of Construction Companies	No of project managers	No of safety officers	10% of the trade men
1.	A and K construction Abuja	01	03	03
2.	AbuixechEnginerring service Ltd	01	03	04
3.	ACC construction company	02	02	04
4.	Afebico construction company	02	04	04
5.	AG vivion company Nig Ltd	02	04	05
6.	Allami Home Ltd	02	03	04
7.	Arab construct Nig Limited	02	08	05
8.	Arfo construction company	02	04	03
9.	Artificial green Nigeria Ltd	01	04	03
10.	Badawe Engineering company Limited	01	04	04
11.	BlomstraNig Ltd	01	03	04
12.	BNL Enginerring& construction	01	03	04
13.	Bullet int'l Nig Ltd	03	02	03
14.	Bulletin construction company	02	03	03
15.	CGCC Nigeria Ltd	01	02	03
16.	Corona construction Ltd	-	02	04
17.	Cube consult Nig Ltd	01	03	04
18.	Dantata and sawoe construction company	02	03	03
19.	Designetic Int'l Building & construction Ltd	02	02	05
20.	Dutun company Ltd	01	03	04
21.	Eagle construction company	01	04	03
22.	Enerco Nigeria Limited	01	03	04
23.	Energo Nigeria limited	02	05	04
24.	Gilmor construction company	01	02	04
25.	Gitto construction company	02	03	03
26.	Gohanah Nigeria Ltd	02	05	04
27.	Green forest construction limited	01	05	05
28.	Habital and Building concept Ltd	01	03	04
29.	Hajaig construction Nig. Ltd	02	02	04
30.	Julius Berger construct company	06	05	03
31.	King fe m group of company	02	03	05
32.	KorstinmullerNig Ltd	01	03	04
33.	Land mark corporative reality (Abuja office)	-	03	04
34.	Lubell Nigeria Ltd	01	03	04
35.	Maserki Nigeria Ltd	02	02	04
36.	Missouri Engineering Ltd	02	01	04
37.	Naf construction company	01	02	05
38.	Nanman construction company	02	04	03
39.	News engineering	03	04	04
40.	NSG store Ltd	01	01	04
41.	P.W Nigeria Limited	02	04	04
42.	Parsons science engineering Ltd	02	04	04

S/N	Names of Construction Companies	No of project managers	No of safety officers	10% of the trade men
43.	Paulo Homes	01	02	02
44.	Phema construction company	03	03	04
45.	Puliz dredging and construction Ltd	02	01	04
46.	RCC Reynold construction	02	02	04
47.	River state Liaison (Abuja)	02	02	04
48.	S and M Nigeria Ltd	01	02	04
49.	Saidi Nigeria limited	01	01	02
50.	Salim construction company	02	02	04
51.	Setraco construction company	04	06	04
52.	Shelter and Road construction Ltd	01	01	04
53.	Trion worldwide constructor	01	07	04
54.	Vital construction Nig. Limited	01	02	04
55.	Zaina Engineering Ltd	01	05	04
	TOTAL	**38**	**172**	**128**

APPENDIX H

Table 3.3: Decision Rule

S/N	Response Mode	Rate	Real Limit	Decision
1	Highly Comply	4	3.50-4.00	Highly Comply
2	Comply	3	2.50-3.49	Comply
3	Moderately Comply	2	1.50-2.49	Moderately Comply
4	Not Comply	1	0.50-1.49	Not Comply

Decision rule is the set of criteria that need to be met before an action can be taken.

APPENDIX I

ANALYSIS OF THE RESULT

```
COMPUTE
MEAN1=MEAN(A1,A2,A3,A4,A5,A6,A7,A8,A9,A10,A11,A12,A13,A14).
EXECUTE.
DESCRIPTIVES VARIABLES=A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12 A13
A14
  /SAVE
  /STATISTICS=MEAN SUM STDDEV VARIANCE RANGE MIN MAX SEMEAN.
```

Descriptives

Notes

Output Created		08-AUG-2021 12:20:28
Comments		
Input	Active Dataset	DataSet0
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	338
Missing Value Handling	Definition of Missing	User defined missing values are treated as missing.
	Cases Used	All non-missing data are used.
Syntax		DESCRIPTIVES VARIABLES=A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12 A13 A14 /SAVE /STATISTICS=MEAN SUM STDDEV VARIANCE RANGE MIN MAX SEMEAN.
Resources	Processor Time	00:00:00.02
	Elapsed Time	00:00:00.03
Variables Created or Modified	ZA1	Zscore: Compliance with the established safety policy on the site before the construction begins.
	ZA2	Zscore: Safety rules and regulation on the site planning and layout.
	ZA3	Zscore: Erection of fence at least 2 meter high at the boundary of the site.
	ZA4	Zscore: Health and safety during excavation.
	ZA5	Zscore: Covering of all opening at the end of working day.

	ZA6	Zscore: Removal of Ladders from their rungs boarding areas at the end of working day.
	ZA7	Zscore: Controlled movement of the vehicles on site
	ZA8	Zscore: Freeing of site access road from of hazardous material.
	ZA9	Zscore: Marking and covering of holes and opening all the time.
	ZA10	Zscore: Unlittered of dangerous objects such a scrap or projecting nails in timber.
	ZA11	Zscore: Provision of artificial lighting while working in the dark.
	ZA12	Zscore: Keeping the site tidy and materials stored safely.
	ZA13	Zscore: Proper arrangement of collecting and disposing waste and scrap materials.
	ZA14	Zscore: Edge projection at all open sides of gang ways or staircases.

[DataSet0]

Descriptive Statistics

	N	Range	Minimum	Maximum	Sum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
Compliance with the established safety policy on the site before the construction begins.	337	2.00	2.00	4.00	919.00	2.7270	.03347	.61452	.378

Safety rules and regulation on the site planning and layout.	337	2.00	2.00	4.00	797.00	2.3650	.02693	.49433	.244
Erection of fence at least 2 meter high at the boundary of the site.	337	2.00	2.00	4.00	816.00	2.4214	.02853	.52374	.274
Health and safety during excavation.	337	2.00	2.00	4.00	1158.00	2.4362	.03129	.57445	.330
Covering of all opening at the end of working day.	337	2.00	2.00	4.00	1025.00	2.0415	.03776	.69312	.480
Removal of Ladders from their rungs boarding areas at the end of working day.	337	2.00	2.00	4.00	919.00	2.7270	.03347	.61452	.378
Controlled movement of the vehicles on site	337	2.00	2.00	4.00	797.00	2.3650	.02693	.49433	.244

Freeing of site access road from of hazardous material.	337	2.00	2.00	4.00	815.00	2.4184	.02819	.51757	.268
Marking and covering of holes and opening all the time.	337	2.00	2.00	4.00	1157.00	3.4332	.03127	.57411	.330
Unlittered of dangerous objects such a scrap or projecting nails in timber.	337	2.00	2.00	4.00	1088.00	3.2285	.02329	.42750	.183
Provision of artificial lighting while working in the dark.	337	2.00	2.00	4.00	918.00	2.7240	.03327	.61076	.373
Keeping the site tidy and materials stored safely.	337	2.00	2.00	4.00	796.00	2.3620	.02655	.48744	.238
Proper arrangement of collecting and disposing waste and scrap materials.	337	2.00	2.00	4.00	815.00	2.4184	.02819	.51757	.268

Edge projection at all open sides of gang ways or staircases .	337	2.00	2.00	4.00	1156.00	3.4303	.03154	.57892	.335
Valid N (listwise)	337								

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T-Test

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Group Statistics

	Namesofcategories	N	Mean	Std. Deviation	Std. Error Mean
MEAN1	Professionals	63	2.8243	.28767	.03624
	Workers	274	2.7855	.22707	.01372

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MEAN1	Equal variances assumed	12.689	.000	1.160	335	.247	.03881	.03346	-.02700	.10462
	Equal variances not assumed			1.001	80.661	.320	.03881	.03875	-.03830	.11592

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DATASET ACTIVATE DataSet1.

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DATASET ACTIVATE DataSet1.

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GET
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DATASET NAME DataSet1 WINDOW=FRONT.
COMPUTE MEAN3=MEAN(C1,C2,C3,C4,C5,C6,C7,C8,C9,C10,C11,C12).
EXECUTE.
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Descriptives

Notes

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	Cases Used	All non-missing data are used.
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	Elapsed Time	00:00:00.02

[DataSet1] C:\Users\User\Documents\research question.sav

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Erection of scaffold under the supervision of competent personnel.	337	2.00	4.00	3.6291	.58410
Proper access to all part of the scaffold platform.	337	3.00	4.00	3.6855	.46502

The upright of the scaffolds are mounted on proper base plates in order to prevent slipping or sinking.	337	3.00	4.00	3.6855	.46502
Used of seasoned or proper grade planks for working platform.	337	1.00	4.00	3.1869	.69270
Proper securing of platform to prevent collapse.	337	1.00	4.00	3.0119	.65455
Erection of guard-rails and toe to a safer height at the opening site.	337	2.00	4.00	3.6291	.58410
Evenly distribution of material on scaffold to avoid over loaded.	337	2.00	4.00	3.4036	.52643
Proper locked and secure of wheels mobile tower.	337	3.00	4.00	3.6855	.46502
Access ladders for tower scaffolds are fitted internally and not externally.	337	1.00	4.00	3.1869	.69270
Workers on suspended scaffolds are using lifeline anchored overhead to the building and not to the scaffold.	337	1.00	4.00	3.0119	.65455
Scaffold is inspected by competent person at least once in a week.	337	2.00	4.00	3.6291	.58410
Inspections of scaffold are recorded and signed by the person in charge.	337	1.00	4.00	2.2404	.84785
Valid N (listwise)	337				

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T-TEST GROUPS=namesofcategories(1 2)
  /MISSING=ANALYSIS
  /VARIABLES=MEAN3
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T-Test

Notes

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Missing Value Handling	Definition of Missing	User defined missing values are treated as missing.
	Cases Used	Statistics for each analysis are based on the cases with no missing or out-of-range data for any variable in the analysis.
Syntax		T-TEST GROUPS=namesofcategories(1 2) /MISSING=ANALYSIS /VARIABLES=MEAN3 /CRITERIA=CI(.95).
Resources	Processor Time	00:00:00.03
	Elapsed Time	00:00:00.05

Group Statistics

	NamesofCategories	N	Mean	Std. Deviation	Std. Error Mean
MEAN3	Professionals	63	3.3849	.16896	.02129
	Workers	274	3.3200	.21487	.01298

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MEAN3	Equal variances assumed	5.035	.025	2.245	335	.025	.06497	.02894	.00804	.12190
	Equal variances not assumed			2.606	113.132	.010	.06497	.02493	.01558	.11436

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COMPUTE MEAN4=MEAN(D1,D2,D3,D4,D5,D6,D7,D8,D9,D10,D11,D12).
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Descriptives

Notes

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Missing Value Handling	Definition of Missing	User defined missing values are treated as missing.
	Cases Used	All non-missing data are used.
Syntax		DESCRIPTIVES VARIABLES=D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11 D12 /STATISTICS=MEAN STDDEV MIN MAX.
Resources	Processor Time	00:00:00.03
	Elapsed Time	00:00:00.06

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Proper crawling ladders are used to work on roof slopes of more than 10 degree.	337	1.00	4.00	3.0119	.65455
Use of sufficient guard-rails and toe boards for roof work.	337	2.00	4.00	3.6291	.58410
There is crawling board for work above fragile material such as glass or asbestos.	337	2.00	4.00	3.4036	.52643
Warning notices are at all approaches to fragile roof.	337	3.00	4.00	3.6855	.46502
Roof workers are provided with personal protective wears such as helmet.	337	1.00	4.00	3.0119	.65455
Guard-rails are used when it's necessary to work close to fragile material or roof light.	337	1.00	4.00	3.0267	.74952
Proper working tools and equipment's provided for workers.	337	1.00	4.00	3.0059	.73999

Precautions are taken to stop debris falling on to others working under the roof.	337	1.00	4.00	3.0119	.65455
Use of mechanical to supply heavy equipment/materials.	337	2.00	4.00	3.6291	.58410
Regular use of nose mask to prevent breathing in of asbestos's fibre	337	2.00	4.00	3.4036	.52643
Well-equipped first aid box are provided where more than 25 workers are expected to work	337	3.00	4.00	3.6855	.46502
Proper address of workers demand on health and safety promotion.	337	1.00	4.00	2.9525	.71805
Valid N (listwise)	337				

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T-TEST GROUPS=namesofcategories(1 2)
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T-Test

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Missing Value Handling	Definition of Missing	User defined missing values are treated as missing.
	Cases Used	Statistics for each analysis are based on the cases with no missing or out-of-range data for any variable in the analysis.
Syntax		T-TEST GROUPS=namesofcategories(1 2) /MISSING=ANALYSIS /VARIABLES=MEAN4 /CRITERIA=CI(.95).
Resources	Processor Time	00:00:00.02
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Group Statistics

	Namesofcategories	N	Mean	Std. Deviation	Std. Error Mean
MEAN4	Professionals	63	3.4087	.18856	.02376
	Workers	274	3.2603	.19649	.01187

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MEAN4	Equal variances assumed	.897	.344	5.445	335	.000	.14839	.02725	.09478	.20200
	Equal variances not assumed			5.588	95.474	.000	.14839	.02656	.09567	.20111

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T-Test

Notes

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Missing Value Handling	Definition of Missing	User defined missing values are treated as missing.
	Cases Used	Statistics for each analysis are based on the cases with no missing or out-of-range data for any variable in the analysis.
Syntax		T-TEST GROUPS=namesofcategories(1 2) /MISSING=ANALYSIS /VARIABLES=MEAN2 /CRITERIA=CI(.95).
Resources	Processor Time	00:00:00.02
	Elapsed Time	00:00:00.02

Group Statistics

	namesofcategories	N	Mean	Std. Deviation	Std. Error Mean
MEAN2	Professionals	63	3.1177	.17623	.02220
	Workers	274	3.3166	.17413	.01052

Independent Samples Test

	Levene's Test for Equality of Variances		t-test for Equality of Means						
								95% Confidence Interval of the Difference	
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper

MEAN2	Equal variances assumed	.090	.764	-8.156	335	.000	-.19888	.02438	-.24685	-.15092
	Equal variances not assumed			-8.095	91.908	.000	-.19888	.02457	-.24768	-.15009

COUNCIL OF REGISTERED BUILDERS OF NIGERIA (CORBON)

Council of Registered Builders of Nigeria
CORBON

PROJECT HEALTH AND SAFETY PLAN TEMPLATE

BUILDERS
DOCUMENT 2

Annex 1

Safety, health and welfare on construction sites: Check-list

The following pages list the main points to consider when you are checking the safety of your site. If a statement cannot be confirmed, for example that all excavations are properly shored, then you should state whether you propose action and what priority you have given to the action. In the "Remarks" section can be entered such comments as the work to be carried out and who is to do it.

Safety organization and management

1. The enterprise has a written safety policy which states the safety and health standards to which the employer should adhere.

   Do you propose action?
   No ☐ Yes ☐ Priority ☐
   Remarks _____

2. Safety and health records are kept at the site.

   Do you propose action?
   No ☐ Yes ☐ Priority ☐
   Remarks _____

3. Training is conducted at all levels, including for managers, supervisors, workers, subcontractors and contract workers.

   Do you propose action?
   No ☐ Yes ☐ Priority ☐
   Remarks _____

4. Safety and health duties are specifically assigned on site.

   Do you propose action?
   No ☐ Yes ☐ Priority ☐
   Remarks _____

5. Tool-box briefings and safety checks are used regularly on site.

   Do you propose action?
   No ☐ Yes ☐ Priority ☐
   Remarks _____

6. There is an active safety committee at the site.

   Do you propose action?
   No ☐ Yes ☐ Priority ☐
   Remarks _____

Site planning, layout and security

7. All workers are aware that the site manager has established a safety policy and what the policy is.

   Do you propose action?
   No ☐ Yes ☐ Priority ☐
   Remarks _____

8. Safety aspects are included appropriately in site planning and layout.

   Do you propose action?
   No ☐ Yes ☐ Priority ☐
   Remarks _____

9. There is a fence at least 2 m high at the boundary of the site.

   Do you propose action?
   No ☐ Yes ☐ Priority ☐
   Remarks _____

10. Where this is not practicable, all excavations and openings are covered or fenced off at the end of the working day.

    Do you propose action?
    No ☐ Yes ☐ Priority ☐
    Remarks _____

11. Ladders are removed from position or their rungs boarded at the end of the working day.

    Do you propose action?
    No ☐ Yes ☐ Priority ☐
    Remarks _____

12. There is a traffic control system on site to control the movement of vehicles in order to avoid danger to pedestrians.

    Do you propose action?
    No ☐ Yes ☐ Priority ☐
    Remarks _____

Everyone can reach their place of work safely – that there are safe roadways, walkways, gangways, staircases, ladders and scaffolds.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

There is edge protection at all open sides of gangways, floors, staircases and landings where there is a drop of 2 m or more.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

Holes and openings are securely fenced off or provided with fixed, clearly marked covers.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

There are no projecting nails in timber.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

There is adequate artificial lighting at places where persons work after dark and such lighting does not throw deep shadows.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

The site is kept tidy and materials are stored safely.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

Proper arrangements have been made for collecting and disposing of waste and tidy up at frequent intervals.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

Excavations

20. An adequate supply of material such as timber, trench sheets and props with which to shore the sides of excavations has been delivered to the site before the excavation work is to begin.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

21. There are daily inspections of excavations to determine the possibility of a cave-in, and weekly recorded inspections of the shoring.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

22. The sides of excavations are sufficiently shored, or sloped back to 45 degrees.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

23. There is a method of work for putting in shoring which protects the shorer and does not rely on people working within an unsupported trench.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

24. A sufficiently long ladder for safely getting in and out of excavations is available and in use.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

25. There are barriers to stop persons falling into the excavations.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

26. There are no buildings whose stability might be affected by the excavations.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

27. There is no spoil or equipment close to the edge of the excavations likely to cause a collapse at the sides.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

28. Arrangements such as properly secured stop blocks have been made to prevent vehicles driving into the excavations.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

Scaffolding

29. Scaffolds are erected under the supervision of someone competent in scaffold erection.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

30. There is proper access to all parts of the scaffold platforms.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

31. All the uprights of the scaffold are mounted on proper base plates and timber sole plates if necessary, or prevented in some other way from slipping or sinking.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

No parts of the scaffold, including ties, have been removed after it was erected.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

The scaffold is secured to the building in enough places to prevent scaffold collapse.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

34. The uprights of the scaffold are vertical and securely braced to prevent swaying or displacement.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

35. The working platforms are close boarded with scaffold boards or planks of proper grade timber without obvious defects such as knots.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

36. There are effective barriers and warning notices to stop people using an incomplete scaffold, e.g. one that is not fully boarded.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

37. The boards are arranged so as to avoid the risk of tripping.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

38. Guard-rails and toe boards are erected to a safe height at the open sides and ends of scaffold platforms from which there is a drop of 2 m or more.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

39. Materials are evenly distributed over scaffolds designed to carry materials, and they are not overloaded

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

40. Unsecured tower scaffolds have a safe height-to-base area ratio of not more than 3 to 1.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

41. The wheels of mobile tower scaffolds are properly locked and secured.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

42. Access ladders for tower scaffolds are fitted internally and not externally.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

3. Workers on suspended scaffolds are using lifelines anchored overhead to the building and not to the scaffold.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

Scaffolds are inspected by a competent person at least once a week, and always after windy and bad weather.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

The results of scaffold inspections are recorded and signed by the person who carried out the inspections.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

ldders

Ladders are not being used for jobs which require a scaffold.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

Metal ladders are not being used near overhead power lines.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

48. The ladders that are in use are in good condition.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

49. Ladders are secured at or near the top whenever practicable even if only used for a short time.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

50. Where ladders cannot be secured at the top for technical reasons, they are secured near the bottom or footed.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

51. Ladders rise at least 1 m above their landing places or the highest rung used If this is not practicable, there are adequate handholds.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

52. Ladders are inspected regularly for signs of damage or corrosion.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

53. All ladders are marked for identification.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

Roof work

54. Except where roof battens provide adequate handholds and footholds, crawling boards or crawling ladders are used to work on roof slopes of more than 10 degrees.

Do you propose action?
No ☐ Yes ☐ Priority ☐
Remarks _____

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA, NIGERIA.

SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION

DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION

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Website: www.futminna.edu.ng

Your Ref: _____

Our Ref: _____

Date: 17/08/2021

JULIUS BERGER
COMPANY
UTAKO FCT
ABUJA

Sir/Ma,

TO WHOM IT MAY CONCERN

The bearer, MOHAMMED USMAN KATCHA with Registration Number M.Tech/SSTE/2018/8467 is A Master student of Industrial and Technology Education Department.

He is carrying out a research titled: "ASSESSMENT OF COMPLIANCE WITH BUILDING PROJECT HEALTH & SAFETY PLAN IN ABUJA METROPOLIS"

He needs your assistance to enable him carry out his field work.

We will appreciate your anticipated co-operation.

Thank you.

13/08/2021

Dr. E. Raymond
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