SAFETY NEEDS OF SITE WORKERS IN THE BUILDING CONSTRUCTION INDUSTRY IN ENUGU STATE

by

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PG/M.Ed/12/62323

DEPARTMENT OF INDUSTRIAL TECHNICAL EDUCATION
UNIVERSITY OF NIGERIA, NSUKKA

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TITLE PAGE

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A PROJECT PRESENTED TO THE DEPARTMENT OF INDUSTRIAL TECHNICAL EDUCATION, UNIVERSITY OF NIGERIA, NSUKKA, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTERS DEGREE IN INDUSTRIAL TECHNICAL EDUCATION, UNIVERSITY OF NIGERIA, NSUKKA

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APPROVAL PAGE

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The work embodied in this project is original and has not been submitted in part or full for any other degree of this or any other university.

_____________________	_____________________
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DEDICATION

This work is dedicated to Rev. Fr. Benjamin Ezulike who initiated this work and supported it to the end.

ACKNOWLEDGEMENTS

It is with deep sense of appreciation, the researcher wishes to acknowledge God Almighty for His providence throughout this academic programmes and who made it possible for this work to be a reality at this time.

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TABLE OF CONTENTS

LIST OF TABLES

Table **Page**

Abstract

The main purpose of the study was to determine the safety needs of site workers in the building construction industry in Enugu State. Four research questions and four null hypotheses were formulated to guide the study. The population of the study was 182 respondents comprising of 11 technical instructors of Government Technical Colleges, 36 management staff and 135 craftsmen from registered building construction industries under study. The instrument used for collection of data was a structured questionnaire with four sections. The instrument was pilot tested on 20 respondents comprising of six management staff, four technical instructors and 10 craftsmen. After being subjected to validation by three experts the reliability coefficients of the instrument was calculated to be 0.71using Cronbach alpha reliability coefficient. The analysis of data was carried out using mean to answer the research questions. The hypotheses were tested using ANOVA at 0.05 level of significance. The findings of this study revealed that most importantly, use of personal protective equipment, maintaining good standard of housekeeping, providing adequate ventilation, proper handling of materials and conducting first aid training for workers are safety needs required by site workers that cut across all the building activity areas this study investigated. Based on the findings, it was recommended that site workers, building contractors and technical teachers should be re-trained on safety needs and policy makers and curriculum experts integrate the safety needs into the curriculum.

CHAPTER ONE

INTRODUCTION

Background of the Study

Building construction is known to be very important but hazardous activity therefore making safety precaution an imperative for the efficient realization of its noble objectives. Activities abound in the building construction industry which includes the building of new structures such as residential houses, schools, churches, offices among others; additions and modifications to existing buildings, as well as maintenance, repair and improvements of these structures. These activities make building industry accident prone ranging from minor to major accidents and causing loss of life or impairment to the human body. Also, there can be financial losses and delays in the completion of a project. Ramchandran (1999), pointed out reasons for these accidents which include carelessness on the part of workers, improper planning and wrong sequence of operations, poor quality of materials, bad workmanship and inadequate training with respect to handling of machinery and equipment. In line with this Oke (1999), identified the main types of accidents which cause death or serious injury on building sites as falls from heights, unshored trenches, floor and wall collapse, scaffolding failure, inhalation of gases and other chemicals, and contact with overhead powerlines. These types of accidents are very common among the site workers in the building industry in Enugu State.

The building construction industry in Enugu State has witnessed series of site accidents and building failures resulting in injuries and death of workers. Prominent among them was the collapse of a three storey building in Nsukka area of the state where seven workers were trapped. Isiguzo (2014) reported that those affected were bricklayers and carpenters. Similar to this were the death of not less than five workers in a church site in Obuma area of Enugu State (Jimoh, 2015). In order to curb this ugly trend, the Enugu State chapter of the Nigerian Institute of Buildings (NIOB) is making concerted efforts to ensure the health and safety of workers at various construction sites in the state. Omeife (2013) declared that the state of the housing sector has become very critical as a result of various emergencies which have claimed several lives. According to Omeife, it is the responsibility of professional builders to provide solutions to the problems after due comparative analysis of how things have been done in other climes. He emphasized the need for stakeholders to look into health and safety issues before, during and after construction and called the attention of all professionals within the building environment to engender proactive measures that will facilitate safety among construction workers. The hazardous nature of the building industry indeed calls for safety of site workers.

Safety can be said to be a state in which one is safe and not in danger or at risk. Safety as related to this study may be explained as avoidance of accident which may lead to injury to persons, wastage of materials and damages to tools, equipment or machines in the worksite, through adherence or compliance to precautionary measures. This is in agreement with the opinion of Dazel and Townsend (1980) who observed that safety is a combination of knowledge, skills and awareness in the management and control of hazards in work environments a of which they added were required in the use and care of tools, equipment, machines and following operational procedures. The issue of safety however, needs to be of foremost concern in every aspect of building construction at all times to minimize accident. In order to achieve this, it becomes pertinent to assess the safety needs of site workers to enable them achieve good health and maintain safe practices in the workplace.

Safety needs are those essential requirements that should be adopted in order to remain safe. Hartzell (2015), stated that safety needs include those needs that provide a person with a sense of security and well being. He also identified personal security, financial security, good health and protection from accidents, harm and their adverse effects as safety needs of workers. Ingram (2015), agreed to this fact by indicating that safety needs of workers include physical health, job security and protection from harm and for private property. Protection from accident becomes paramount as safety needs, this study seeks to assess, boarders on site workers.

Site workers in the building industry are skilled or apprentice craft workers who specialize in trades such as carpentary, masonry, house painting and decorating, plastering, brick/block laying etc. Site workers need physical stamina because their work frequently requires prolonged standing, bending, stooping and working in confined spaces. They also may be required to lift and carry heavy objects. Exposure to weather is common because much of the work is done outside or in partially enclosed structures. Site workers often work with potentially dangerous tools and equipment amidst a cluster of building materials. Some work on temporary scaffolding or at great heights and in bad weather. Consequently, they are more prone to injuries than are workers in other jobs (Bureau of Labor Statistics 2011).

Furthermore, clear assessment of safety needs of site workers reveals that workers require to be protected against hazards such as falls, cement burns, inhalation of toxic gases and fumes. Osha (2005) emphasized that fall hazard is the most frequent on construction site and reiterated further that these fall hazards mostly occur as a result of trench and scaffold collapse, floor and wall failures among others. This study however seeks to assess the safety needs of site workers in the major activity areas such as trench excavation scaffold construction, brick/block laying and concreting and painting and decorating where these accidents mostly occur. This assessment is imperative to give the required feedback to the stakeholders in the building industry on the state of the art of building sites. The feedback resulting from the study will enhance remedial actions to bridge the gap between the statusquo and the ideal.

Statement of the Problem

Over the years Nigerian workers in the building sector of the economy have been endangered and exposed to accidents ranging from the minor to the fatal are some have lost their lives right in the line of duty; while some have lost vital organs, which rendered them permanently incapacitated. In the analysis of annual accidents in the construction industry involving persons, Omeife (2013), discovered that the major cause were: fall 27 per cent, handling materials 26 per cent, striking against an object 11 per cent, being struck by falling objects eight per cent, machinery eight per cent, hand tools eight per cent, transport six per cent, others six per cent. Other hazards associated with building activities include: cave-ins, slips and trips, suffocation in deep trenches, inhalation of toxic fumes and chemicals, unsafe access/egress among others.

Safety in the building construction industry is relegated to the background and as such cases of workers injuries and building failures abound; there are delays in project completion and even abandonment as construction costs escalate. There is no gain saying that only the living can work and earn wages. However, the building industry requires an assessment directed towards boosting safety and health at work. The problem that this study intends to tackle, therefore, is to assess the safety needs of site workers in the building construction industry to achieve maximum productivity in an accident free environment.

Purpose of the Study

The main purpose of the study was to assess the safety needs of site workers in the building construction industry in Enugu State. Specifically, the study sought to assess:

1. Safety requirements in trenching and excavation.
2. Safety practices appropriate for scaffolding at site.
3. Safe strategies for brick/block laying and concreting.
4. Safety requirements for painting and decorating.

Significance of the Study

The significance of this study centers on the relevance of safety for site workers in the building construction industry. The findings of the study would be of immense benefit to site workers, building owners, policy makers, building contractors, curriculum development experts, technical teachers, students, building construction industry and the general public.

The study will provide site workers with safety requirements on site hazards and how to eliminate them. They will be conversant with risks associated with their duties and working environment as well as prevention measures appropriate for them. The study will also educate site workers on proper use of personal protective equipment and safe manual handling of tools and machinery in order to remain safe at work.

Building owners will be acquainted with safety needs of workers on site and this will guide them towards hiring contractors with good safety records and ensure their involvement in teaching their workers safety. This will yield higher productivity at a reasonable cost.

Policy makers will utilize the findings of the study in formulating building safety acts which will stipulate duties of workers and employees on site. These acts will be put into laws and appropriation which will serve as code of conduct for builders in the construction industry.

Building contractors will utilize the findings of the study in ensuring that effective site safety and health practices are being maintained. It will help them conduct health monitoring of workers and carry out detailed risk assessment of all work areas and processes record their findings and proffer measures where significant risks exists.

Curriculum development experts will integrate the findings of the study in the curriculum. Safety issues in each activity area studied will be broken down as a topic for instruction in the classroom. This will be relevant in training students in technical colleges and tertiary institutions.

The findings of the study will be of great benefit to technical teachers, they will utilize the safety contents incorporated in the curriculum in teaching their students. They in turn will attend re-training courses on safety needed for improvement and efficiency in the building construction industry.

Students will benefit when they are taught the identified safety needs which may integrated into the curriculum. This will enable them imbibe safety culture that is needed at work site. They will be able to transfer this safety culture to job site after graduation. Having been equipped with safety needed at work, they will be able to identify hazards and report accident accordingly.

The building construction industry will become more conducive for workers despite the hazardous nature of activities therein. It will record less fatality rates and higher productivity of workers, who will utilize their work hours to the maximum. The building industry will run safety meetings and trainings for its workers. This will attract workers from outside the industry and by so doing increase the workforce.

The general public will be saved the trauma of loosing their benefactors and loved ones to site accidents. They will benefit from the services of the building construction industry at a considerable cost without facing the frustration of abandoned projects. In other words, when site workers adhere to safety measures, they will serve the general public better.

Research Questions

The following research questions were posed to guide the study:

1. What are the safety requirements in trenching and excavation?
2. What safety practices are appropriate for scaffolding at site?
3. What strategies should be adopted to ensure safety of workers during brick/block laying and concreting?
4. What are the safety requirements needed for painting/decorating?

Hypotheses

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

$H0_1$: There is no significant difference in the Mean responses of technical instructors, management staff and craftsmen on safety requirements needed in trenching and excavation.

$H0_2$: There is no significant difference in the Mean responses of technical instructors, management staff and craftsmen on the safety practices appropriate for scaffolding on site.

$H0_3$: There is no significant difference in the Mean responses of technical instructors, management staff and craftsmen on the strategies suitable for safe brick/block laying and concreting.

$H0_4$: There is no significant difference in the Mean responses of technical instructors, management staff and craftsmen on safety requirements needed for painting and decorating.

Delimitations of the Study

This study was delimited to safety in brick/block laying and concreting, trenching and excavation, scaffolding and painting/decorating as perceived by Building Construction teachers and Site Workers in the Building Construction Industry in Enugu State.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

The review of related literature was organized under the following sub-headings:

Conceptual Framework

- Safety Needs
- Building Construction Industry
- Safety Requirements in Trenching and Excavation
- Safety Practices Appropriate for Scaffolding
- Safe Strategies for Brick/Block Laying and Concreting
- Safety requirements in Painting and Decorating

Theoretical Framework

- **Abraham Maslow's Theory of Hierarchy of Needs**
- **The Domino Theory**
- **Multiple Causation Theory**
- **The Energy Transfer Theory**

Review of Related Empirical Studies

Summary of Review of Related Literature

Conceptual Framework

A concept is an idea that expresses a situation or an action in order to give meaning to it. Olaitan (1999) explained that a concept is an idea or any acceptable interpretation of existing phenomena. It represents an idea or an opinion with respect to bring out or make clear the meaning of that phenomenon. The author stated further that, a concept is a thinking tool, highlighting an abstract intellectual representation of any object. Encarta (2009) recorded that a concept is an idea that somebody has thought up or imagined. It is a broad abstract idea or guiding general principle that may determine how an individual or culture behaves or how nature, reality or events are perceived. Encarta continued that a concept is the most basic understanding of something. Olaitan, Ukonze and Ifeanyieze (2009) noted that a research topic is made up of concepts that are related in order to give a functional meaning to a problem. Each concept, according to the author, has its meaning and relationship with another concept in a research topic to make it meaningful or researchable.

A conceptual framework therefore, refers to a system of interconnected concepts that gives a functional basis or skeleton of a research topic. It contains ideas, opinions, principles, agreements or assumptions that are logically and systematically linked up to provide the outline on which a research topic is developed. Eric (2009) described a conceptual framework as the intellectual drivers of the research; the microcosm or condensed picture of the research problem and the mental imagery of the orientation of the research. The author mentioned functions of conceptual framework that, it: gives the research an identity and enables the process of inquiry to move from vague and confusing ideas about what is to be studied to recognizing and measuring it in the real world; lends greater credibility to the re search process and facilitates the verifiability and validity of research findings; provides working and/or workable definition of what is being studied and specify dimensions of the research problems; instructs the formulation of a sound and effective research design; serves as a tool for identifying what a researcher would plan on various possible observations; serves the borderline for the research; stimulates the research process intellectually as it calls attention to other challenges of the research; gives shape, form and practical or practicable focus to the research; provides critical bases for assessing the impact of the research; and gives good idea of how to interpret the research results.

Therefore, the conceptual framework of this study will be based on the following concepts:

Safety Needs

Safety in the building construction industry could be regarded as the planned measures of precautions that should be taken to control situations and acts in an endeavour to prevent injuries to site workers and other people around the working area as well as damage to the tools, equipment and materials. Okorie (2000) defined safety as the effort by management and/or labour, to prevent and eliminate the causes of accidents. According to him safety at work means thinking and acting responsibly at all times and in every activity, and requires the co-operation of all. Site workers are prone to accidents, it is pertinent to establish safety standards which should be used in the construction industry to familiarize workers with hazards in the construction industry for them to learn how to live and work safely in their environments. The safety standards issued by the Occupational Safety And Health Administration OSHA (2002) are designed to provide safe and healthful workplaces as well as protect all employees. These measures only work when construction professionals receive training on safety and put them into practice on the job to reduce accidents. Accidents are part and parcel of the building industry and workers should be doing all they can to make sure that they do not occur. Accidents should be reduced to the barest minimum or at least the risk of them occurring got rid of. Okorie (2001), listed four categories of general safety requirements which could aid the reduction of accidents in the construction industry as:

- Personnel safety requirements
- Machines, tools and equipment safety requirements
- Environmental safety rules
- Statutory Provisions

The Occupational Safety and Health Administration OSHA (1971) outlined health and safety regulations that should be included in a safety assessment. These are:

- Establish and maintain an education based training programme.
- Provide new employees with a safety orientation before they begin work.
- Provide job or task specific safety training for all employees.
- Offer safety refresher training (at least annually).
- Provide a system for employers and employee to discuss safety-related issues
- Implement a method for periodic workplace inspection and hazard assessments.

- Document Safety-related activities.
- Develop a safety committee
- Assign specific safety responsibilities and performance accountability to employees.
- Maintain procedures for investigating, reporting and taking corrective action on all work-related illnesses, incidents, accidents and injuries.

A Safety needs of workers however, is assessed by evaluating and integrating set of regulations and activities aimed at improving safety. Safety here is related to site workers in the building industry.

Building Construction Industry

The building construction industry plays a vital role in the transformation of the physical terrain of any nation in its march towards greater civilization and economic independence. It is also concerned with the assimilation and utilization of new developments in technology, management sciences and related sciences to enhance building performance the world over. Adesanya (2013) stated that the major objective of the building industry is striving continuously to enhance the performance of buildings to make them safe, healthier, more comfortable to the user; more durable; easier, faster and less expensive to construct, and to a greater extent easier to manage and maintain. The Building industry is one of such establishments that involves application of high level of human resource development, integrity on the part of practitioners, and vast experiences in many fields of study. Operations in the building industry are very vast and they need to satisfy structural requirements, safety convenience and health.

Due to the vast nature of the building construction industry and its operations workers face a variety of hazards, particularly safety problems such as falls, slips, trips, cuts, and being hit by falling objects. There are also dangers from working high up, often without adequate safety equipment, musculoskeletal problems from lifting heavy objects as well as the hazards associated with exposure to noisy machinery. Haslam, Hide, Gibb, Gyi, Pavitt, Atkinson and Duff (2005), identified common causes of accidents in the construction industry as falling hazard, unsafe working conditions, being struck by tools, equipment and falling objects, trenching and excavation hazards, step ladder misuse, electrocutions and power tools accidents, scaffolding accidents, and construction vehicle accidents.

It is, therefore, an obligation to owners, contractors and designers to provide a safe working environment as negligence on safety may cause severe accidents, injuries as well as economic loss (Laufer, 1987). A large number of construction accidents occur on yearly basis and thousands of workers are killed or injured on construction sites. As a result, project owners lose large amounts of money and many families suffer from permanent pain. Accidents in the building construction industry are classified as bricklayer accidents, carpenter accidents, painter accidents, iron worker accidents, excavation accidents, scaffolding failure, residential building site accidents, maintenance worker accidents, plumber accidents etc (URLI, 2004). These construction accidents may or may not cause injuries and life loss and the economic loss may be small or huge. Accidents in the building construction industry can be rooted in equipment failure, design ignorance, working carelessness, and natural disaster. Other reasons may include owners failure to consider potential site safety issues and neglect to safety management in the planning phase; architects and designers negligence to all possible safety-related design codes at the design phase, and contractors failure to be cautious about site safety risks and as a result not being able to report problems in time which may lead to workers doing their job carelessly. In addition unsafe conditions abound in the construction site which can cause accident when unidentified. Abdelhamid and Everett (2000), described an unsafe condition as a condition in which the physical layout of the workplace or work locations, the status of tools, equipment and/or material are in violation of contemporary safety standards. According to them unsafe conditions in a construction site include exposed rebar, uncovered holes or trenches, and inadequate personal protective equipment.

The building construction industry comprises of a wide range of activities involving construction, alteration and /or repair. Examples include residential construction, bridge erection, roadway paving, trenching and excavations, demolitions and large scale painting jobs. The industry is divided into three major segments. The construction of building segment which include contractors, usually called general contractors, who build residential, industrial, commercial and other buildings. Heavy and civil engineering construction contractors who build sewers, roads, highways, bridges, tunnels, and other projects related to the nationӧs infrastructure. Specialty trade contractors perform specialized activities related to all types of construction such as carpentry, painting, plumbing and electrical work.

Building construction usually is done or coordinated by general contractors, (otherwise known as general foreman) who specialize in one type of construction such as residential or commercial building. They take full responsibility for the complete job, except for specific portions of the work that may be omitted from the general contract. Although general contractors may do a portion of the work with their own crews, they often subcontract most of the work to heavy construction or specialty trade contractors. Specialty trade contractors usually do the work of only one trade, such as painting, carpentry, or electrical work, or of two or more closely related trades, such as plumbing and pipe fitting.

Beyond fitting their work to that of the other trades, specialty trade contractors have no responsibility for the structure as a whole. They obtain orders for their work. From general contractors, architects, or property owners. Repair work is almost always done on direct order from owners, occupants, architects, or rental agents. These numerous activities/operations in the building construction industry explains the reason why there are many workers engaged on site. Faizal (2010), in line with this opined that construction industry needs a lot of workers with many levels such as skilled labour or unskilled labour. These site workers work with potentially dangerous tools amidst clutter of building materials and under adverse weather conditions, hence the need for safety. Assessing the safety needs of site workers is worthwhile. Safety when adhered to by site workers accrue immense benefits ranging from reduction in the overall construction costs, decrease in the time for the completion of projects to the improvement in the quality of jobs and above all zero accident environment is maintained (Levitt and Nancy, 1993). It is, therefore, of utmost importance to determine safety procedures that should guide site workers during every building activity.

Safety Requirement in Trenching and Excavation

Trenching hazards may set workers in danger of being trapped by soil and rocks, asphyxiation, inhalation of poisoning fumes and drowning in underground water. Inadequate excavation wall support, protective system failure, soil inspection failure and unsafe passage into and out of the trench may generate such kind of construction accidents. An excavation is a hole left in the ground as a result of removing materials. A trench is an excavation in which the depth exceeds the width. Trenching and excavation work is inherently dangerous. Hazards include cave-ins, struck by injuries, electrical contact and slips, trips, and falls. Stanevich and Middleton (1988), made it clear that the primary hazard of trenching and excavation is employee injury from collapse and said that soil analysis is important in order to determine appropriate sloping, benching and shoring. Additional hazards include working with heavy machinery, manual handling of materials; working in proximity to traffic, electrical hazards from overhead and underground power lines; and underground utilities, such as natural gas. A hazardous atmosphere can be present or develop in a trench or an excavation especially when digging close to a landfill, toxic site or a sewer. It can also develop if chemicals are used inside or close to the trench or excavation. Oxygen deficiency, presence of toxic or highly flammable gases (such as carbon monoxide, hydrogen sulphide, methane and solvent vapours) are the main contributors to hazardous atmosphere. Testing for such hazardous atmospheres should be done and if such problem exist it should be addressed by providing fresh air ventilation or using personal protective equipment (PPE).

Trenching and Excavation Hazards

Trench collapses cause dozens of fatalities and hundreds of injuries each year. Occupational safety and health administration (OSHA) requires that workers in trenches and excavation be protected, and that safety and health programmes address the variety of hazards they face. Cave-ins are perhaps the most feared trenching hazard. But other potentially fatal hazards exist. Electrocution or explosions can occur when workers contact underground utilities.

The following hazards cause the most trenching and excavation injuries:

- No protective system
- Failure to inspect trench and protective systems.
- Unsafe spoil-pile placement
- Unsafe access/egress.

All excavations are hazardous because they are inherently unstable. If they are restricted spaces, they present the additional risks of oxygen depletion, toxic fumes, and water accumulation. If workers are not using protective systems as equipment while working in trenches or excavation on site, they are exposed to danger of suffocating inhaling toxic materials, fire, drowning or being crushed by a cave-in (Mickle, 1991). To avert hazards related to protective systems pre job planning is vital to accident free trenching. According to Behm (2006), designing for safety is the consideration of construction site safety in the preparation of plans and specifications for construction projects and that all potential hazards in the site should be identified and minimized prior to the installation of protective systems. Safety cannot be improvised as work progresses, competent persons should;

- Evaluate soil conditions and select appropriate protective systems.
- Construct protective systems in accordance with the standard requirements.
- Pre plan, contact utilities (gas electric) to locate underground lines, plan for traffic control if necessary determine proximity to structures that could affect choice of protective system
- Test for low oxygen, hazardous fumes and toxic gases, especially when gasoline engine driven equipment is running, or the dirt has been contaminated by leaking lines or storage tanks.
- Ensure adequate ventilation or respiratory protection if necessary.
- Provide safe access into and out of the excavation
- Provide appropriate protections if water accumulation is a problem.

- Inspect the site daily at the start of each shift following a rainstorm or after any other hazard increasing event.
- Keep excavations open the minimum amount of time needed to complete operations (OSHA, 2002).

Hazards associated with the failure to inspect trench and protective systems can be eliminated through:

Inspection of excavations:

- before construction begins
- daily before each shift
- as needed throughout the shift
- following rainstorms or other hazard-increasing events (such as vehicle or other equipment approaching the edge of an excavation.

OSHA (2002), further directed that inspections must be conducted by a competent person who:

- has training in soil analysis
- has training in the use of protective systems.
- is knowledgeable about the occupational safety and health administration requirements.
- has authority to immediately eliminate hazards.

Another trenching and excavation hazard is that of unsafe spoil-pile placement. Excavated material (spoils) on site can be hazardous if they are set too close to the edge of a trench excavation. The weight of the spoils can cause a cave-in, or spoils and equipment can roll back on top of workers, causing serious injuries or death.

To avoid unsafe spoil hazard;

- Set spoils and equipment at least two feet back from the excavation.
- Use retaining devices such as a trench box that will extend above the top of the trench to prevent equipment and spoils from falling back into the excavation.
- Where the site does not permit a two-feet set back, spoils may need to be temporarily hauled to another location (OSHA, 2002).

In the case of unsafe access/egress, ladders, stairways, or ramps are required to deal with fall injuries during normal entry and exit of a trench or excavation at the job site. To avoid unsafe access hazards, OSHA recommends the following:

- Provide stairways, ladders, ramps, or other safe means of egress in all trenches that are four feet deep or more.
- Position means of egress within twenty-five lateral feet of workers.
- Structural ramps that are used solely for access or egress from excavations must be designed by a competent person.
- When two or more components form a ramp or runway, they must be connected to prevent displacement and be of uniform thickness.
- Structural ramps used in place of steps must have a non-slip surface.

The major determinant of safety in trenches is the trench stability, although it can be affected by a number of factors such as:

- Improper use or installation of support system or trench box.
- Soil type and moisture content
- Weather
- Vibration
- Depth of the trench
- Length of time the trench is left open
- Surcharge (excessive weight near the trench)
- Adjacent buildings and structures.
- Previous excavations or soil disturbances.

An unstable trench or excavation can collapse, killing or injuring workers by suffocation or crushing when a worker is buried by falling soil. However, Mickel (1991) outlined three basic methods of protecting workers against trench cave-ins;

- Sloping
- Shoring
- Fabricated support systems (eg trench boxes and shields).

Sloping is the cutting back of the trench wall at an angle inclined away from the excavation. Maximum allowable slopes for excavations less than twenty feet (6.09m) based on soil type and angle to the horizontal are as follows:

Fig 1: Allowable Slopes

Soil Type	***Height/depth ratio***	***Slope angle***
Stable rock (granite or sand stone)	Vertical	90^0
Type A (clay)	3¼ :1	53^0
Type B (graved, silt)	1:1	45^0
Type C (sand)	11/2:1	34^0
Type A (short term) for a maximum excavation depth of 12ft	1/2:1	63^0

Source: (OSHA, 1999).

There are five options for providing a protective system as developed by Dow (2004):

Option I: Sloping and benching which calls for soil classification as shown above.

Option 2: Timber shoring

This is a system of wooden walers, cross braces and uprights, that support the walls of a trench or excavation and the type of timber used to build the structure.

Option 3: Aluminum hydraulic shoring

These systems have replaced a lot of timber shoring, two types of hydraulic shoring exists- vertical shores and horizontal walers. Both employ aluminum rails and hydraulic cylinders that apply pressure to the walls of a trench, creating an ñarching effectò that prevents the walls from collapsing.

Option 4: Trench shields

These are aluminum or steel structures designed to protect workers by withstanding the forces imposed by a cave-in.

Option 5: Site specific engineered systems

There may be job site conditions that exist or other factors that prevent the use of manufactured systems such as aluminum hydraulic shoring or trench shields. In such case a registered professional engineer must design a system specifically for the job. Such engineer has to be registered in the state where the system will be used and will have to ñstampò the design.

General Safety in Excavation and Trenching

- Trenches over four-feet deep must have exits within twenty-five feet of every worker by way of ladder or ramp.
- Underground utilities should be marked by the ñBlue stake organizationò before the beginning of the excavation.
- Any excavation under a base or a foundation or a wall requires a support system designed by a registered professional engineer.
- Hard hats are required in every trenching and excavation work zone and traffic vests are required when working in street areas.
- Look out for overhead power lines before commencing excavation or make sure that there is enough clearance to work under the power line.
- Heavy vehicles which create vibrations should not be allowed close to excavation.
- The competent person ñmust examine the excavations site every morning and after rain or changing conditions such as water in the excavation for

signs of earth movement and movement of shoring. Adherence to safety with regards to trench and excavation yields productivity and profitability to workers (Dow, 2004). Stanevich and Middleton (1988), stated that most fatal cave-ins occur on small jobs of short duration such as excavations for drains and wells, and that is as a result of people thinking that these jobs are not hazardous enough to require safeguards against collapse. Unless the walls are solid rock, workers are advised never to enter a trench deeper than 1.2 metres if it is not properly sloped, shored, or protected by a trench box.

Furthermore, employees entering bell-bottom piers, holes or other similar deep and confirmed footing excavations shall wear a harness with a life line securely attached to it. The lifeline shall be separate from any line used to handle materials and shall be individually attended to at all times while the employee wearing the lifeline is in the excavation. Employees shall wear as determined by the project managers approved gloves or other suitable hand protection. Each employee at the edge of an excavation six feet or more deep shall be protected from falling. Fall protection shall be provided through guardrail systems, fences, barricades, covers or a tie back system. Emergency rescue equipment, such as breathing apparatus a safety harness and line, and a basket stretch shall be readily available where hazardous atmospheric conditions exist or may develop during work in an excavation. This equipment shall be attended when in use. However, following the general safety in excavation and trenching and utilizing protective systems, employees can work safely in trenches and excavation.

Safety practices Appropriate for Scaffolding

Haslam et al (2005) declared that an estimated construction workers, or sixty-five per cent of the construction industry, work on scaffolds frequently. It is worthwhile to protect workers from scaffold related accidents in order to prevent injuries and death. The most potential risk of scaffolding is due to moving scaffold component; scaffold failure related to damage to its components; loss of the load; being struck by suspended materials; and improper set-up by construction workers who assemble and dismantle scaffolding and work on platforms at construction sites face the risk of serious injuries due to falls. Hunter (2011), stated that workers should adhere to specific requirements for the maximum load, when to use scaffolding, bracing and the use of guardrails. Morra (2011), enumerated ten scaffold safety essentials as follows:

- Ensure that everyone is properly trained: Safety regulations require that workers be trained in the design and operation of scaffolding. Training covers important safe work practices such as how to use access ladder, not the scaffold frame, unless it is specially designed to be climbed and both hands are free to grab the rungs. It should also cover comprehensive fall protection training specific to the type of scaffolding, erecting and dismantling procedures for anyone involved in these activities, and a host of other lifesaving details.
- Know and respect the load capacity: Failure to consider all the loads to which the scaffold may be subjected is one of the top things that go wrong at

the design stage. The scaffold must be strong enough and capable of holding the desired weight otherwise it could collapse. Do not try to fit more workers on the platform than it can handle, do not overload it with equipment and materials; and do not rest anything on the guardrails.

- Ensure the scaffold is properly secured: The scaffold must be adequately braced or tied to the building. If it is wrapped in a tarp for protection from the elements, it could blow over if it is not secured. Bracing must be properly secured in place, otherwise scaffold movement may dislodge an end, reducing the stability of the scaffold. There are several brace retention or locking systems found on scaffolds. These devices must operate freely for ease of assembly and dismantling, and also lock securely to prevent a brace from dislodging. Nails and other miscellaneous odds and ends should not be used in place of proper retention parts supplied by the manufacturer.
- Use guardrails: The design of the scaffold must incorporate guardrails on at least the three sides facing away from the building if the scaffold is more than ten feet above ground. There should be a top rail, mid rail and a bottom rail (toe board). If you must remove any guardrail while hoisting materials, replace them promptly. Wear fall protection at all times.
- Inspect and maintain: Scaffolding must be routinely inspected by the supervisor and by a competent person ideally a professional engineer or a person designated in writing by a professional engineer. In the case of suspended platform, all components including welds, stirrups, connecting

pins, connecting plates, trusses, beams and working surface should be tested. Check that the lumber is of good quality, with broken or damaged pieces replaced right away.

- Good house keeping: It is important to store tools and materials in an orderly fashion. The platform should be free of obstructions. Place debris and waste materials in a container or remove it from the platform immediately.
- Use appropriate Personal Protective Equipment (PPE): This includes head protection, non-slip protective footwear and fall protection as required, in the form of a safety harness tied off to a solid structure, such as the building.
- Keep your balance: A scaffold and its platform must be perfectly level to minimize the risk of workers losing balance and falling off. Any sudden movement or reaching too far from the platform, can cause a loss of balance.
- Take time to prepare for work: The base of a scaffold should be sound, level and adjusted before use such that legs are plumb and all braces in place that locking devices and ties are secured. Cross members should be level, planks, decks and guardrails are installed and secured.
- Keep scaffolds legal: Employers who fly under the radar and operate without a license pose a significant obstacle to scaffold safety.

Scaffolding accidents cause large numbers of deaths and injuries every year. Most accidents are caused by scaffold equipment failure, inadequate scaffolding safety training, lack of personal fall protective systems or improper scaffolding equipment operation. In addition, materials and tools falling off scaffolding may also cause injures. Chi, Chang, and Ting (2005) stated that accident prevention in scaffolding should be embedded throughout the planning, designing, construction and maintenance phases in order to reduce scaffolding hazards and injuries. Occupational safety and health administration suggests that a trained competent person should be used to supervise all scaffold erections. And should have authorization to take prompt action to eliminate predictable hazards logically, in the surroundings or working conditions which are unsanitary and hazardous to employees. He should be within line of site of erection, dismantling or alteration activity. He carries out the following duties under these circumstances: In general:

- To select and direct employees who erect, dismantle, move or alter scaffolds.
- To determine if it is safe for employees to work on or from a scaffold during storms or high winds and to ensure that a personal fall arrest system or wind screens protect these employees (Note: windscreens should not be used unless the scaffold is secured against the anticipated wind forces imposed).

  For training

- To train employees involved in erecting, dismantling, moving, operating, repairing, maintaining, or inspecting scaffolds to recognize associated work hazards.

For Inspections:

- To inspect scaffolds and scaffold components for visible defects before each work shift and after any occurrence which could affect the structural integrity and to authorize prompt corrective actions.
- To inspect ropes on suspended scaffolds prior to each work shift and after every occurrence which could affect the structural integrity and to authorize prompt corrective actions.
- To inspect manila or plastic (or other synthetic) rope being used for top rails or mid rails.

For Erectors and Dismantlers

- To determine the feasibility and safety of providing fall protection and access.
- To train erectors and dismantlers to recognize associated work hazards.

For Suspension Scaffolds:

- To evaluate direct connections to support the load.
- To evaluate the need to secure two point and multi-point scaffolds to prevent swaying. (OSHA, 2002).

The importance of a competent person in scaffolding construction cannot be over emphasized, he determines when it is safe to work on scaffolds and permits employees correctly to reduce accident cases while working with scaffolds. Seventy-two per cent of workers injured in scaffold accidents attributed the accident either to the planking or support giving way, or to the employee slipping or being struck by a falling object. OôConnor (2001), listed cases of scaffolding hazards as electric shock (contact with overhead line through scaffold), employee being killed in scaffold collapse, fall from scaffold, falling scaffold, when box falls and employee sustaining injury after being struck by collapsing scaffold. OôConnor further stated that workers should avoid common mistakes by learning how to prevent the basic scaffold hazards because when it comes to safety errors can be fatal. Falling from high places such as scaffolding (over six feet) account for more than fifty per cent of the accidents that happen at the workplace. The usual cause of this incident is slipping, and tripping. There are thousands of reasons for fall hazards and to eliminate such risks, employers must have a fall protection programme as part of any overall workplace safety and health programme. Workers should be trained to identify and evaluate fall hazards and be fully aware of how to control exposure to such risks as well as know how to use fall protection equipment properly, (Hunter, 2011).

OSHA (2002) outlined the General Safety in Scaffolding as follows:

- Initially inspect the scaffold prior to mounting it. Do not use a scaffold if any pulley, block hook or fitting is visibly worn, cracked, rusted or otherwise damaged.
- Do not climb on scaffold that wobble or lean to one side.
- Do not work on scaffold outside during stormy or windy whether.
- Do not use a scaffold unless guardrails and all flooring are in place.

- Level the scaffold after each move. Do not extend adjusting leg screws more than twelve inches.
- Keep the scaffold free of scraps, loose tools, tangled lines and other obstruction.
- Do not jump from, to or between scaffolding.
- Do not work on platforms or scaffolds unless they are fully planked.
- Do not use unstable objects such as barrels, boxes, loose brick or concrete blocks to support scaffolds or planks.
- Do not walk or work beneath a scaffold unless a wire mesh has been installed between the mid-rail and the toe board or planking.
- Use your safety belts and lanyards when working on scaffold at a height of ten feet or more above ground level.
- Chock the wheels of the rolling scaffold, using the wheel blocks, and also lock the wheels by using your foot to depress the wheel lock, before using the scaffold.
- A ñcompetent personò must inspect the scaffolding and at designated intervals, re-inspect it.
- Scaffolds must be at least ten feet from electric power lines at all times.
- Scaffolds are not moved horizontally while workers are on them unless they are designed to be mobile and workers have been trained in the proper procedures.

- Scaffolds should not be loaded with more weight than they were designed to support.
- Scaffolds must be sound, rigid and sufficient to carry its own weight plus four times the maximum intended load without setting or displacement. It must be erected on solid footing.
- Scaffold accessories such as braces, brackets, trusses, screw legs, or ladders that are damaged or weakened from any cause must be immediately repaired or replaced, (OSHA, 2002). Scaffolds designed in accordance with safety standard enumerated above reduce accidents, injuries and death of workers to the barest minimum.

Safe Strategies for Brick/Block Laying and Concreting

The main risks involved in brick/block laying and concreting are from manual handling. This is more pronounced when heavy duty concrete blocks are used. On most sites, brick and block layers are supported by hod carriers, apprentices and scaffolders, all these persons provide the brick/block layers with materials and access and they should all receive safety related training as a further method of reducing risks. Grimshaw (2013), outline strategies for reducing risks in bricklaying as:

- Use of mechanical means where possible
- Use and continuous use of personal protective equipment (PPE)
- Good house keeping practices

- Continual inspection of plant and tools.

According to Grimshaw the major objective of brick/block work is to complete brick laying work to the required line, level and elevations as regards architectural/design drawings. The extent to which this objective is achieved depends to a larger extent on the workplace safety culture. Most building industries should carry out risk assessments in all areas of the building activities, steps should be taken to reduce the risks and safe work method written to provide clear instructions on how to carry out the task in a safe manner. Grimshaw (2013), however discussed safe work method in brick/block laying as follows:

- All drawings will be studied and understand before works commence.
- Lines and levels to be set out by competent person (Datumsmarked where possible).
- Materials will be stacked as close as possible to the working area.
- Brick and block work, wall ties, damp proof membranes, cavity details will be in accordance with architectural and/or engineers drawings.
- Bricks, blocks and mortar will be supplied to the bricklayers by experienced workers (hod carriers), the materials will be positioned in a manner to reduce the manual handling requirements.
- Mortar will be used in accordance with the design specification.
- Mortar will be mixed on site and measured to ensure consistency.

- Trestles and boards will be used where required for as short a term as possible, these will be checked before, during and after use.
- Line and level will be continually checked during works.
- All surplus/broken materials will be removed from the working area to ensure continual house keeping as part of our safe systems of work.

The ability to carry out the safe work methods discussed above in the workplace requires planning and effective implementation. Hence, the safety needs of workers should be of utmost consideration throughout the planning, designing, construction and maintenance phases (Behm, 2006). In addition, attention should be given to each step (work methods), the tools and equipment that should be used, the people who will be carrying out the work, supervision, welfare and first aid arrangements to reduce risks.

Another suitable strategy for safe brick/block laying is the use of bricklaying and blocklaying tools and equipment. This includes the identification, selection and use of hand and power tools, plant and equipment used in masonry work. Jobs on site are not carried out impromptu rather preparations are made ahead. Preparations involve work instructions, including plans, specifications, quality requirements; also operational details are obtained, confirmed and applied; safety requirements are followed in accordance with safety plans and policies barricade requirements are identified and implemented environmental protection requirements are identified for the project in accordance with environmental plans and regulatory obligations and applied. The next stage is identification of hand and power tools. Types and functions of hand and power tools to be used in the bricklaying and blocklaying work are identified together with their method of operation which should be in accordance with specifications, standards and manufacturersô instruction (Health and Safety Authority, 2011). In addition, occupational health and safety requirements for specific hand and power tools are identified and applied as well as personal protective equipment required for the operation of the tools and this should be in accordance with regulatory and workplace requirements.

Sequel to the identification of tools, follows careful selection of tools for work. Tools and personal protective equipment are selected consistent with job requirements, and serviceability. Power tools guards, guides and controls are checked and maintained in accordance with manufacturersô recommendations. Also pre operational checks including lubricants, hydraulic fluid and water are completed where required. Proper usage of tools commences after selection, tools are used safely and effectively according to regulatory requirement and safely located when not in use (Ezeji, 2004), start up and shut down procedures are observed. Identification, selection and use of plant and equipment are carried out following the same procedure with that of power tools. Lastly work area is cleared, materials disposed of, reused or recycled in accordance with legislation/regulations/codes of practice and job specification. Odocha (1994) asserted that these wastes from the work area altogether does not apply to worthless substances as some can be reused or recycled for a better use.

Machinery, tools and equipment are cleaned, checked, maintained and stored in accordance with standard work practices. Appropriate housekeeping on site has become paramount to reduce injuries resulting from slips and trips, other site operatives-safety boots with toe caps, safety goggles and gloves should not be neglected.

Furthermore, concrete which is regularly used in most building sites should be seriously given attention to as regards safety in mixing, transporting and placing. Working with concrete is an everyday occurrence for tens of thousands of Nigerian concrete workers, and from time to time people experience serious injuries when handling concrete. Workers should understand and practice a number of basic safety strategies concerning protection, prevention and common sense precautions. Dee (2013), suggested the following strategies for safe concreting.

- Head protection: Working on a construction site presents a variety of items to avoid that can cause serious head injury. Both construction equipment and tools are frequent potential hazards to concrete workers. Hard hats are therefore worn on site to protect the head.
- Back protection: Working with the normal materials that are required to make and pour concrete such as Portland cement, aggregates-sand and graved and water can be very strenuous to the average personôs back. Most of these materials are heavy even in small quantities. Care should be taken on how to move these heavy materials and to lift properly. The back should be kept straight and the legs bent to avoid serious back strain. Keep the

materials waist high and centered between the legs to lessen the chance for injury, before placing the concrete, the materials should be moved as close to its final placement area with the help of equipment whenever possible. Cement mixers, chute, a pump or just a wheelbarrow should be used to get concrete placed.

- Skin protection: Severe burns can result when there is contact between fresh concrete and skin surfaces, eyes and clothing. OSHA (2002), revealed that when wet concrete comes in contact with the skin for a short period and is thoroughly washed off, it causes little irritation, while continuous contact between skin and wet concrete allows alkaline compounds to penetrate and burn the skin. When wet concrete or mortar is trapped against the skin-for instance, by falling inside a workerθs boots or gloves or by soaking through protective clothing- the result may be first, second, or third degree burns or skin ulcers. These injuries can take several months to heal and may involve hospitalization and skin grafts (Dee, 2013). Flush eyes and skin immediately once in contact with fresh concrete. Get treated by a physician if minor burns persist.
- Eye protection: splattering concrete and blowing dust can easily enter the eyes during concrete placement. Full cover goggles or safety glasses with side shields should be worn. Exposure to airborne dust may cause immediate or delayed irritation of the eyes. Depending on the level of exposure, effects may range from redness to chemical burns and blindness.

Concrete mix and pour operations pose significant possible hazards to employees. It is therefore, of great necessity to conduct concrete pour operations under the direct supervision of a competent supervisor, carry out on site pre-safety briefing, and also inspect forms, bracing and troughs. Safe concrete mix and pour operations should be a combined responsibilities of the management, supervisors and employees, hence Ramchandran (1999) maintained that safety in the job site involves everybody and not just the contractor alone. He further enumerated management, supervisor and employee responsibilities as follows:

Management Responsibilities

- Ensure all equipment is routinely serviced and maintained in a safe condition.
- Conduct periodic on-site inspection of operations.
- Provide operation and safety training for affected employees.
- Ensure access to operation areas are controlled.

Supervisory Responsibilities

- Provide continuous operation safety observation and control
- Provide immediate corrective training for all unsafe acts.
- Conduct pre-pour inspections.

Employee Responsibility

- Follow all safety and operational procedures
- Immediately notify supervisors of all unsafe condition.

Furthermore, concrete works are mostly constructed on formworks, operational safety with regards to formwork should not be relegated to the background. Hence, formwork shall be designed, fabricated, erected, supported, braced and maintained so that it will be capable of supporting without failure all vertical and lateral loads that may reasonably be anticipated to be applied to the formwork (Ezeji, 1984). Drawings or plans, including all revisions, for the jack layout, formwork (including shoring equipment), working decks, and scaffolds, shall be available at the jobsite. According to OSHA general requirements (2002), the safety requirements for shoring and re-shoring include:

- All shoring equipment (including equipment used in re-shoring operations) shall be inspected prior to erection to determine that the equipment meets the requirements specified in the formwork drawings.
- Shoring equipment found to be damaged such that its strength is reduced shall not be used for shoring.
- Erected shoring equipment shall be inspected immediately prior to, during and immediately after concrete placement.
- Shoring equipment that is found to be damaged or weakened after erection, such that its strength is reduced to less than what is required shall be immediately reinforced
- The sills for shoring shall be sound, rigid, and capable of carrying the maximum intended load.

- All based plates, shore heads, extension devices, and adjustment screws shall be in firm contact and secured when necessary, with the foundation and the form.
- Eccentric loads on shore heads and similar members shall be prohibited unless these members have been designed for such loading.
- Re-shoring shall be erected, as the original form and shores are removed, whenever the concrete is required to support loads in excess of its capacity.

In addition, safe concreting encompasses the proper use of tools and machinery in concrete works. Rotating machinery is always a potential source of injury on a jobsite. Concrete/masonry saws, cut off saws and power trowels pose a threat to appendages when used improperly. Moreso, any sustained or sudden noise above eighty-five decibels emanating from machinery can be damaging to the ear. Other tools such as sharp edged trowels, hammers, chisels, utility knives should be used correctly. When potential hazards are considered and combined with preventive measures, the occurrence of work-related injuries and death can be significantly reduced.

Safety Requirements for Painting and Decorating

Painting and decorating involves the application of paint, wall coverings and other materials to the inside and outside of buildings. Other works include application of wall hangings and decorative paint coatings in the home, and in commercial and industrial locations, the designing and producing of sign work and displays among others.

Apprenticeship Factory (2014) outlined the tasks of painting and decorating as follows:

- Working out the quantity of materials needed for the job by taking surface measurements or by looking at job specifications or drawing
- Erecting scaffolding, cradles and ladders and placing drop sheets to protect areas from dripping paint
- Removing old paint or paper using sanding, scraping, blowtorches, liquid paint removers and steam strippers as appropriate.
- Preparing surfaces by fixing woodwork, filling or sealing holes, cracks and joints and washing them down to remove dust and grease.
- Selecting and preparing paints to match colours by the addition of tints.
- Brushing, rolling or spraying the paints, stains, varnishes and other finishes.
- When wallpapering, set out the area according to the pattern match and starting point in the room, the paper is cut to the appropriate length, paste is applied to the back of each strip and hang the paper on the wall, smoothing out any wrinkles or bubbles.
- Spraying paint surfaces using a spray gun or specialized equipment.
- Applying decorative paint finishes such as stencils, colour glaze, graining, marbling and lettering.
- Washing equipment and cleaning work areas.

According to the Apprenticeship Factory (2014) ideal personal requirements of painting and decorating include:

- practical work and good hand-eye coordination
- normal colour vision and a good sense of balance
- ability to read and interpret plans.
- ability to work at heights and physical fitness
- ability to work independently and as part of a team. Painting and decorating trade has hazards peculiar to it which can result in accidents if not properly handled. The main painting and decorating hazards are:
- injury from slips, trips and falls.
- injury falling from step ladders
- falls from height
- injury from manual handling
- fire from hot stripping
- injury to tenants and members of the public.

OSHA (2002) documented that employees should be instructed on the potential dangers of manual handling and should receive manual handling training ahead of time. Workers should not lift items or equipment beyond their capabilities. Heavy or awkward items will be broken down into smaller units or dual lifted where this is not possible. However, it is the duty of the site foreman to identify and control potentially dangerous manual handling situations as they occur on site on a day to day basis.

People leap into decorating without giving a second thought to the risks involved. Epstein (2010) asserted that chemicals from paint can cause serious health problems both for those who apply them and those who have to live in the house afterwards and that there are hidden dangers in apparently simple procedures such as removing old wallpaper, painting new building and re-painting. Paints used in the home contain potentially harmful chemicals such as solvents, and volatile organic compounds (VOCs). Deacon in Epstein (2010) declared that when the paint dries, these chemicals evaporate into the air where the hapless decorator can inhale their toxic fumes. Prowse in Epstein (2010) added that inhaling paint fumes can exacerbate asthma and sinusitis, and due to the fact that the solvents are absorbed into the blood stream, they can lead to headaches and dizziness. Prowse further stated that painting for too long in a room with no ventilation can even cause a blackout. Both fresh paint and just poured cement can affect the lungs. Short term exposure can result in irritation to the eyes and nose, choking, and difficulty in breathing. Long term, repeated exposure can even lead to an eventually fatal lung disease called silicosis or it can help stimulate lung cancer, (Deacon in Epstein, 2010).

Properly dried paint is not an issue at all, the problem rather is with the evaporating fumes, which come of the walls as the paint is drying. These fumes contain volatile organic compounds (VOCs) which can and do cause immediate harm in some people resulting in symptoms such as

- Eye irritation
- Respiratory irritation
- Asthma
- Sinusitis
- Dizziness
- Headaches
- Memory Problems
- Blackouts

Consequently, these volatile compounds are absorbed directly into the lungs then they travel to the blood stream, they can cause dizziness, headaches, or even loss of consciousness if the exposure is prolonged (Star, 2013).

It is therefore pertinent to take precautions to avoid exposure to the paint fumes as they evaporate from newly painted surfaces. Some of these precautions according to Star (2013) include:

- Ventilate the area being painted so that the paint dries quickly and there is no build-up of paint fumes. Open all windows and turn on fans.
- Wear a mask
- Wear gloves
- Take breaks from painting at regular intervals.

- Check the VOC content on paint tin labels and purchase paint with lower VOC content.

It can sometimes take days for paint fumes to dissipate from a newly painted area. Susceptible individuals should avoid the environs of the newly painted area until the paint has fully dried out. This is because the VOCs that are emitted as gases from newly painted surfaces are readily inhaled. World Health Organization (WHO) has also raised concerns about the long-term health effects of óoff gassingô; the release of vapours over the life of the paint. The most vital aspect of training required in painting and decorating is in the use of safety equipment.

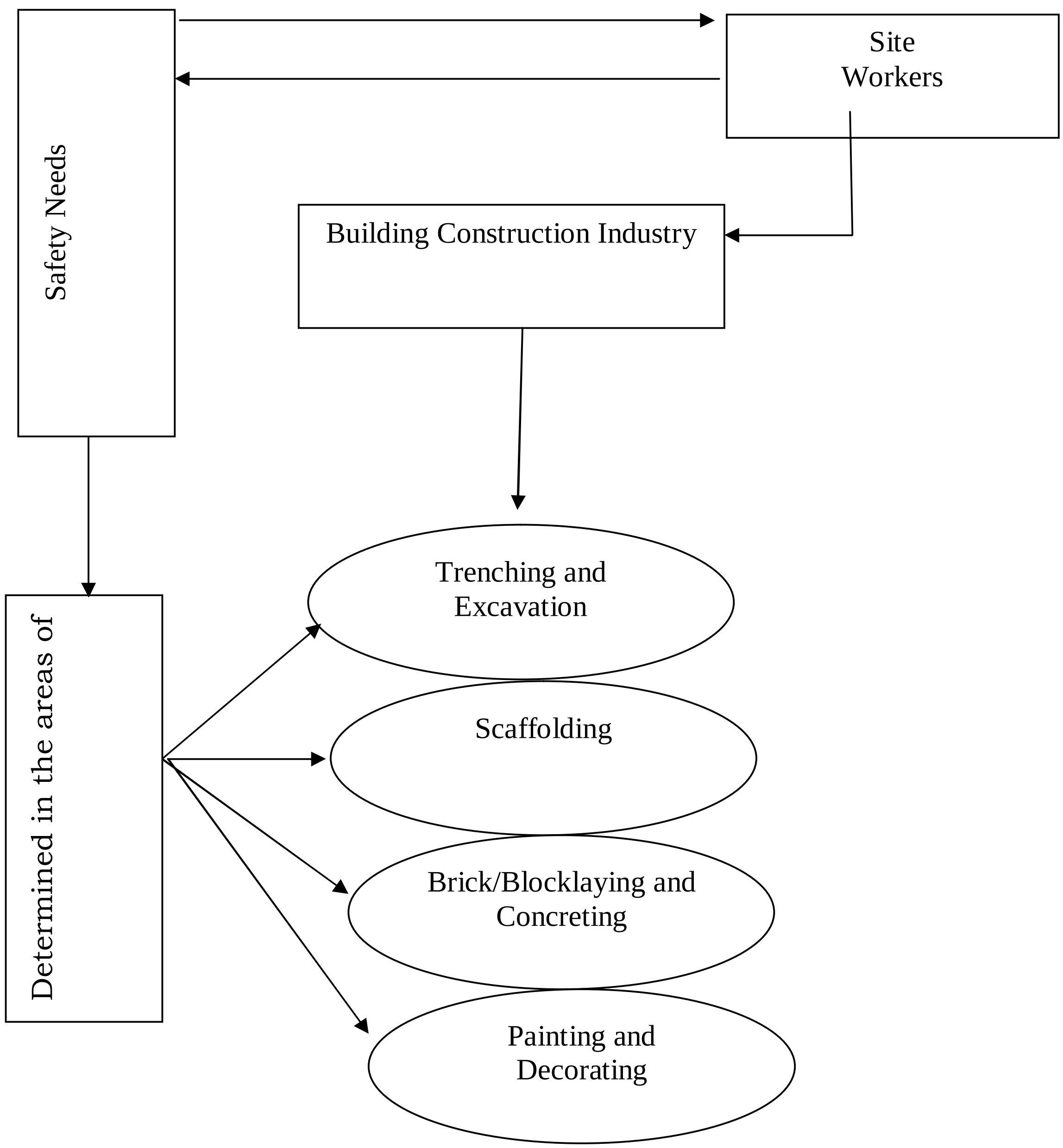
Types of Safety Equipment for Painting

- Disposable overalls: Protect the clothing from splashes and spills associated with the paint and protect the skin so that no rashes, burns and irritations occur, skin rashes, burns and other types of irritations have been experienced when paint makes its ways onto the skin. Wright cited in Epstein (2010) disclosed that getting paint on the skin can also lead to an allergic, rash-like reaction.
- Neoprene gloves: Assist in protecting the hands from a large assortment of irritants, like paint, acids, solvents and even oils. It is very difficult to break the surface of this type of glove so one does not have to worry about cuts, and snags while painting. Neoprene gloves can withstand any type of weather condition including high heat and humidity levels.

- Protective glasses or goggles: These come with sides so that dust from the paint or other particles does not invade the eyes from the side. The greatest risks are paint chips from scraping or sanding dust and debris plus paint drips when working overhead and mist from spraying. All of these can cause damage to the eyes. Hence safety training covers wearing of safety glasses or goggles to avoid painful injuries.
- Dust masks and respirators: Protect against little particles like dust and pollen. The respirators that are designed for safety protect against harmful fumes, gases, acids, and chemicals. Respirators have a pre-filter that prevent fine dust particles from entering the chemical filter cartridge.
- Spray hood/spray sock: It is an excellent piece of safety equipment that resembles a cap and fits firmly over the head. It protects the head and hair from spills as well as the area of the face and the neck.
- Ladder safety equipment: Additional paint safety equipment deals with ladder safety. Falling from ladders is an all too common occurrence. This can result in serious injuries or even death. Most ladder accidents occur as a result of careless or improper ladder usage.

Training of workers on the adequate use of safety equipment designed for painting and decorating will go a long way in minimizing hazards associated with painting and decorating.

SCHEMA OF A CONCEPTUAL FRAMEWORK



Source: Researcher (2015)

Theoretical Framework

Abraham Maslow Hierarchy of Needs Theory

Abraham Maslowʼs hierarchy of needs theory and the accident causation theories propounded by Heinrich support the study: Maslowʼs hierarchy of needs theory. The hierarchy of needs theory propounded by Abraham Maslow in 1954 states that needs are psychological or physiological insufficiencies that provoke some type of behavioural response. The needs a person has can range from weak to strong and can vary based on environmental factors, time and place. Maslow reasoned that human needs are many and varied. At any instance any individual has many needs competing for his attention. Such competing needs can be ordered in an ordinal hierarchy from the most energetic to the least energetic at any given instance. The need that commands and directs the behavior of an individual at any given instance is the most energetic or pre-potent. Second in the hierarchy of needs designed by Maslow is safety needs which is grouped into material and psychological needs. These include needs for security, stability and order.

Maslowʼs theory of safety needs relates to the safety needs of site workers this study seeks to assess. The absence of safety puts a threat to workers environment-security, stability and order. However, when workers have maximum security at work, protection from accidents as well as good health is guaranteed (Maslow, 1954).

The Domino Theory

The domino theory was propounded by Heinrich in 1931. The theory states that eighty per cent of all accidents are caused by unsafe acts of people, ten percent by unsafe actions and two per cent by acts of Godô. He proposed a five factor accident sequence in which each factor would actuate the next step in the manner of toppling dominoes lined up in a row. The sequence of accident factors is as follows:

1. ancestry and social environment.
2. worker fault
3. unsafe act together with mechanical and physical hazard.
4. accident
5. damage or injury

In the same way that the removal of a single domino in the row would interrupt the sequence of toppling, Heinrich suggested that removals of one of the factors would prevent the accident and resultant injury, with the key domino to be removed from the sequence being number three. Although Heinrich provided no data for his theory, it nonetheless represent a useful point to start discussion and a foundation for future research (Heinrich, 1931).

Multiple Causation Theory

Heinrichôs multiple causation theory is an outgrowth of the domino theory, but it postulates that for a single accident there may be many contributory factors, causes and sub-causes, and that certain combination of these give rise to accidents.

According to this theory, the contributory factors can be grouped into the following two categories: Behavioural: This category includes factors pertaining to the worker, such as improper attitude, lack of knowledge, lack of skills and inadequate physical and mental condition. Environment: This category concludes improper guarding of other hazardous work element and degradation of equipment through use and unsafe procedures. The major contribution of this theory is to bring out the fact that rarely if ever, is an accident the result of a single cause or act (Heinrich, 1931).

The Energy Transfer Theory

The energy transfer theory propounded by Heinrich 1959 states that a worker incurs injury or equipment suffers damage through a change of energy and that for every change of energy there is a source, a path and a receiver. This theory is useful for determining injury causation and evaluating energy hazards and control methodology. Strategies can be developed which are either preventive, limiting or ameliorating with respect to the energy transfer. Control of energy transfer at the source can be achieved by the following means:

- elimination of the source
- changes made to the design or specification of elements of the work station
- preventive maintenance (Heinrich, 1931).

The theory went further to state that the path of energy transfer can be modified by:

- enclosure of the path
- installation of barriers

- installation of absorbers
- positioning of isolators.

The receiver of energy transfer can be assisted by adopting the following measures:

- limitation of exposure
- use of personal protective equipment

The three accident causation theories chosen for this study as propounded by Heinrich are laying emphasis on the major causes of accident on the job site and possible ways of eliminating them to attain safety at work.

The three accident causation theories chosen for this study as propounded by Heinrich are laying emphasis on the possible causes of accident on the job site and the need for safety. Heinrich implied that negligence to safety precautions is to a greater extent the cause of accidents and injuries to workers. He further suggested positive measures towards reducing accidents and promoting safety. The theories however, are relevant to the study in that both are interested in the elimination of accident at work and ensuring safety of workers which is also the main crux of this study.

Review of Related Empirical Studies

Famakin, Makanjuola, Adeniyi and Oladinrin (2012) conducted a research on the impact of construction health and safety regulations on project parameters in Nigeria: Consultants and contractors view. The study revealed that the effectiveness of the construction industry can only be enhanced by repositioning the construction health and safety regulations to safeguard the health of the workers and the entire community. The paper sought to assess the views of consultants and contractors about the impact of construction health and safety regulations in Nigeria. Data was collected using questionnaire survey distributed among construction professionals and statistical tools employed include tables, percentages and mean score ranking. The study revealed that construction health and safety is still perceived to be more important than the traditional project parameters in the form of cost, time and quality. Designers perceived that an enhanced environment is the resultant impact of construction health and safety regulation while quantity surveyors see improved quality as having the resultant impact, also contractors perceived improved maintenance as having the resultant impact on health and safety regulation. The study recommends that better attention is given to health and safety as a project parameter and that related practice notes and guidelines should be evolved for all project stakeholders.

Okparaeke (2004) carried out a study on safety practice skills needed by trainee and employees of block laying and concreting occupation in the building industry in Imo State of Nigeria. The study adopted survey research design. The population for the study was 152 which comprised of 13 technical instructors of block laying and concreting, 25 management supervisory staff and 114 employees technical staff. A structured questionnaire was used to collect data from respondents. The data collected were analyzed using the mean and standard deviation to answer the research question while Analysis of Variance (ANOVA) was used to test the hypotheses at 0.05 level of significance. The findings revealed that the trainees required all the safety practice skills for development in block laying and concreting occupation; the employee did not require improvement in safety practice skills in block moulding; the same employees require safety practice skills in equipment and machines for block moulding. Preliminary site operations and concreting, block wall construction and finishing with the use of equipment, machines and safety facilities. The study recommended that the identified safety practice skills in block laying and concreting areas be used to develop trainees in Technical Colleges and improve employees in the construction site.

Nwachukwu, Bakare and Jika (2011), conducted a research to identify effective laboratory safety practice skills required by electrical and electronics students of technical colleges in Ekiti State. A survey research design was employed for the study. The population for the study was 80 electrical/electronics teachers and electrical and electronic workers in the field. A structured questionnaire item was used for collecting data from the respondents. Three research questions were developed and answered by the study and three null hypotheses were formulated and tested at 0.05 level of significance. Mean was used to analyze the data for answering research questions while t-test statistics was used to test the hypotheses of no significant difference at 0.05 level of significance and 78 degree of freedom. It was found out that all the safety practice skills identified are required by electrical and electronics students in technical colleges for effective functioning in the laboratory. It was recommended that all the safety practice skills identified, should be integrated into the curriculum of electrical and electronics at technical college.

Relationship exists between the empirical studies reviewed and the present study in that they all investigated health and safety at workplace, made use of survey research design and structured questionnaire as instrument for data collection. On the other hand, while Famakin et al investigated health and safety of contractors, Okparaeke and Nwachukwu centered on safety practice skills needed by workers in brick/block laying and concreting and electrical electronics students respectively, the present study however focused on the safety needs of site workers in the building construction industry and this distinguished it from the empirical studies reviewed.

Summary of Review of Related Literature

In this chapter, efforts were made to review as much as possible literature related to this study. This was initiated by discussing the conceptual framework which aimed at emphasizing safety as required in the major activity areas in the building industry which include safety requirements in trenching and excavation, safety practices appropriate for scaffolding, suitable strategies for safe brick/block laying and concreting and safety requirements for painting and decorating. Theoretical framework was reviewed, theories found to be most relevant were the Abraham Maslowќs hierarchy of needs theory, and domino theory, multiple causation theory and the energy transfer theory as propounded by Heinrich.

The review also covered some empirical research findings on the impact of construction health and safety regulations on project parameters in Nigeria: contractors and consultants view, the need for functional workplace safety promotion programme in secondary schools: perception of the teacher, safety practice skills needed by trainee and employee of block laying and concreting occupation in the building industry and effective laboratory safety practice skills required by electrical and electronics students of technical colleges.

Relationship exists between the empirical studies and the present study, they are both conducted to determine safety requirements but in different areas. Gap however exists which this study sought to fill and which is to assess the safety needs of site workers in the building industry which is quite different from the focus of the empirical studies reviewed.

CHAPTER THREE

METHODOLOGY

This chapter was concerned with the description of procedure used in this study, namely: design of the study, area of the study, population of the study, sample and sampling techniques, instrument for data collection, validation of the instrument, reliability of the instrument, method of data collection, and method of data analysis.

Design of the Study

The study adopted survey research design. This was because it ascertained the opinions of the respondents on the safety needs of site workers in the building construction industry in Enugu State. According to Olaitan and Nwoke (1988), any study in which questionnaire is to be employed as the main instrument for data collection and which seeks to obtain the opinions of the respondents is said to be a survey research design. The design was therefore suitable since it aimed at getting the safety needs of site workers in the building construction industry.

Area of the Study

The study was conducted using the Registered Building Construction Companies and Government Technical Colleges Situated at Enugu, Nsukka and Akpugoeze in Enugu State. The choice of these companies was informed by the fact that they engage in all the building activities this study sought to assess the safety needs of site workers on. Furthermore, these areas have witnessed incessant building failures, project abandonment and site accidents resulting in workers injuries and deaths. Also these areas have high concentration of professional builders that are renowned for their expertise in the field of building construction, while the technical colleges have resource materials needed to carry out the research.

Population for the Study

The population for this study is a total of 182 subjects, made up of 11 Technical Instructors of Building Construction in the three Government Technical Colleges in Enugu State, 36 Management Staff and 135 craftsmen (Technical Staff) involved in building construction services in registered construction companies in Enugu State (See Appendix A).

Sample and Sampling Technique

As a result of the small population the entire population made up of 11 Technical Instructors, 36 management staff and 135 craftsmen, with a total of 182 subjects was used in this study.

Instrument for Data Collection

Structured questionnaire titled ñSafety Needs of Site Workers Questionnaire ï SNOSWQò elicited information from the subjects. The questionnaire had two sections I and II. Section I consisted of general information on the respondents; while section II was divided into four sections A,B,C and D with 105 items in line with the four research questions that was answered by the study. Cluster A had 20 items which elicited information on the safety requirements of workers in trenching and excavation, cluster B contained 30 items on the safety practices appropriate for scaffolding at site, cluster C consisted of 25 items on safety strategies in brick/block laying and concreting while cluster D contained 30 items on safety requirements for painting and decorating. A five-point Likert Scale was provided for the respondents to indicate the strength of their opinions as follows: Strongly Agree (SA), Agree (A), Undecided (UD), Disagree (D), Strongly Disagree (SD) for clusters A, C and D; Most Appropriate (MA), Very Appropriate (VA), Moderately Appropriate (MA), Not Appropriate (NA) and Most Inappropriate (MI) for cluster B. The various response options were coded as 5, 4, 3, 2 and 1 for SA, A, UD, D and SD and MA, VA, MA, NA, and MI respectively.

Validation of the Instrument

The developed instrument was face-validated by three experts in the department of Vocational Teacher Education at the University of Nigeria, Nsukka. Face validation is the degree to which experts agree that the developed instrument is within the level of the respondents (Olaitan, Ali, Eyoh and Sowande, 2000). Face validation therefore aims at determining the extent to which the developed instrument items are relevant to the objectives of the study and the research questions. The experts were requested to critically scrutinize the instrument for relevance of adequate representativeness of contents and clarity of statements. Their corrections and inputs formed the basis for the modification of the draft and the production of the final instrument.

Reliability of the Instrument

The reliability of the instrument was established using Cronbach Alpha reliability test to ascertain the internal consistency of the instrument. The analysis was computer-based with the aid of SPSS 16.0 version. A pilot study of 20 respondents comprising of six management staff, four technical instructors and 10 craftsmen from building construction industries that are not registered was used which was outside the study area.

Cluster one (items 1-20) gave an index of 0.65, cluster two (items 1-30) gave an index of 0.80, cluster three (items 1-25) gave an index of 0.70, cluster four (items 1-30) gave an index of 0.72, while the overall clusters yielded a reliability index of 0.71. This result indicates that instrument is reliable for collecting the data.

Method of Data Collection

The direct delivery and retrieval technique were employed by the researcher in collecting data. One hundred and eighty-two copies of the questionnaire for the study were administered to the respondents at their various locations with the help of two research assistants and the researcher. The research assistants were briefed by the researcher on procedures in administering the instrument so as to ensure safe handling and return of the instruments.

Method of Data Analysis

Mean ($\bar{x}$) statistic was employed in analyzing the data to answer the research questions. A mean score of 4.50 or over was rated as Strongly Agree (SA) or Most

Appropriate (MA), 3.50 -4.49 were rated as Agree (A) or Very Appropriate (VA), 2.50 -3.49 as Undecided (UD) or Moderately Appropriate (MA), 1.50 ï 2.49 as Disagree (D) or Not Appropriate (NA), and 1.49 or less as Strongly Disagree (SD) or Most Inappropriate (MI) on a five-point Likert Scale.

Also, analysis of variance (ANOVA) was used to test the null hypotheses at 0.05 level of significance. Any hypothesis whose calculated f-value was greater than the table f- value was rejected, otherwise it was accepted at relevant degrees of freedom.

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

In this chapter, data for this study were analysed and presented based on the research questions and hypotheses that guided the study.

Research Question 1

What are the safety requirements in trenching and excavation?

Data relevant to this research question are presented in Table 1.

Table 1
Mean Response on Safety Requirements in Trenching and Excavation by Technical Instructors, Management Staff and Craftsmen

N = 182

S/N	Items	Mean	Remark
1	Inspecting the trenches daily	4.08	A
2	Maintaining safe access into and out of excavation	4.42	A
3	Providing adequate ventilation	4.41	A
4	Shoring the edges	4.31	A
5	Providing warning system for mobile equipment	3.94	A
6	Conducting soil analysis	3.89	A
7	Conducting first aid training for workers	4.42	A
8	The use of safety helmets and hard hats	4.36	A
9	Providing guardrails on walkways	4.09	A
10	Timbering trench walls	4.26	A
11	Providing emergency response equipment	4.51	SA
12	The use of respiratory protection equipment	4.18	A
13	Providing barricades around excavations	3.77	A
14	Creating barriers at all remote excavations	3.84	A
15	Sloping the trench walls	4.35	A
16	Inspecting utilities	4.10	A
17	Providing shield systems	4.16	A
18	Conducting atmospheric test	3.63	A
19	Protecting underground installations	3.99	A
20	The use of safety boots	4.46	A

Results in Table 1 revealed that the respondents strongly agreed to item 11 but agreed to items 1-10 and 12-20. This means that these items reflect the safety requirements in trenching and excavation.

Research Question 2

What safety practices are appropriate for scaffolding at site?

Data relevant to this research question are presented in Table 2.

Table 2
Mean Response on Safety Practices Appropriate for Scaffolding at site by Technical Instructors, Management Staff and Craftsmen

N = 182

S/N	Item Statement	Mean	Remark
21	Surface guardrails	4.25	VA
22	Safe means of access and egress	4.15	VA
23	Wide platform capable of preventing instability	4.28	VA
24	Secured cross braces	4.44	VA
25	Toeboards along open sides	4.14	VA
26	Screens between toeboards and guardrails	4.20	VA
27	Sound and rigid footing	4.31	VA
28	Ladders to get on and off	4.12	VA
29	Coating wooden platform with preservatives	4.02	VA
30	Sound frames and accessories	4.47	VA
31	Routine inspection of scaffold components	4.21	VA
32	Full planking and decking of platform surface	4.42	VA
33	Good house keeping	4.31	VA
34	Secured poles and legs	4.23	VA
35	Use of personal protective equipment	4.57	MA
36	Maintaining accessories in good repair	4.32	VA
37	Use of overhead protection for workers	4.27	VA
38	Intermediate beams to avoid dislodgement	4.24	VA
39	Maintenance practices by a competent person	4.27	VA
40	Eliminating slippery conditions	4.26	VA
41	Barricades against moving vehicles	3.83	VA
42	Securing suspended scaffold to prevent swaying	4.08	VA
43	Correcting unsafe conditions	4.20	VA
44	Use of personal fall arrest system	4.29	VA
45	Platform butting for two scaffolds	3.88	VA
46	The use of personal protection kits	4.45	VA
47	Training employees on scaffolding hazards	4.59	MA
48	Proper specifications of scaffold components	4.54	MA
49	Maintaining load carrying capacities by workers	4.57	MA
50	Proper handling of materials on scaffold	4.51	MA

From Table 2 it can be seen that items 35,47,48,49 and 50 attracted higher responses of most appropriate (MA) while others were very appropriate (VA). This means that these items reflect the safety practices appropriate for scaffolding.

Research Question 3

What strategies should be adopted to ensure safety of workers during brick/block laying and concreting?

Data relevant to this research question a

re presented in Table 3.

Table 3
Mean Response on Safe Strategies to be adopted for Brick/Blocklaying and Concreting by Technical Instructors, Management Staff and Craftsmen
N = 182

S/N	Item Statement	Mean	Remark
51	Handling materials adequately	4.55	SA
52	Servicing tools, plants and equipment	4.13	A
53	Adequate bracing of formwork	4.32	A
54	Setting up first aid against machine injuries	4.25	A
55	Training workers on ergonomic practices	4.28	A
56	Proper stacking of materials	4.18	A
57	Arranging work/rest cycles to reduce fatigue	4.08	A
58	Maintain proper postures at work	4.37	A
59	Training workers on head protection	4.12	A
60	Eliminating slipping and tripping hazards	4.31	A
61	Rinsing eyes splashed with wet concrete	4.47	A
62	Routine inspection of machine parts	4.24	A
63	Following confined space procedures	4.03	A
64	Maintaining safe working clearance	4.25	A
65	Use of personal protective equipment	4.33	A
66	Disposing materials appropriately	4.25	A
67	Organizing fall protection training	4.05	A
68	Maintaining good house keeping	4.28	A
69	Safe location of tools	4.24	A
70	Addressing hazards and emergencies	4.19	A
71	Complying with workplace instructions	4.31	A
72	Maintaining appropriate guards before using power tools	4.24	A
73	Wetting down work area against dust	4.02	A
74	Avoiding lifting loads over workers	4.29	A
75	Switching off concreting plant/equipment when not in use	4.39	A

Results in Table 3 showed that the Technical Instructors, Management Staff and Craftsmen strongly agreed to item 51 and agreed to items 52-75. This means that all these items are suitable safety practices to be adopted in brick/block laying and concreting operations.

Research Question 4

What are the safety requirements needed for painting and decorating?

Data relevant to this research question were presented in Table 4.

Table 4
Mean Response on Safety Requirements Needed for Painting/Decorating by Technical Instructors, Management Staff and Craftsmen

N = 182

S/N	Item Statement	Mean	Remark
76	Preparing work instructions	4.39	A
77	The use of safety ladders	4.41	A
78	Barricading around work area	4.04	A
79	Maintaining good standard of house keeping	4.28	A
80	Applying suitable ventilation	4.29	A
81	Selecting tools in line with job requirement	4.16	A
82	Servicing tools/equipment regularly	4.23	A
83	Disposing paint waste to the designated area	4.12	A
84	Taking frequent breaks while at work	4.09	A
85	Avoiding awkward body positions	4.23	A
86	Keeping safe distance from energized electrical equipment	4.21	A
87	Rectifying faults prior to job commencement	4.12	A
88	Providing fire extinguishers	4.38	A
89	Sealing unused paints and solvents	4.29	A
90	Providing short term secure storage for debris	4.35	A
91	Reading paint safety data sheet before use	4.36	A
92	Keeping paints from open flames	4.29	A
93	Conducting manual handling training for workers	4.41	A
94	The use of personal protection kits	4.27	A
95	Conducting first aid training for workers	4.41	A
96	Cleaning paint tools after use	4.26	A
97	Making access to height inaccessible after work	4.21	A
98	Covering floor area to prevent splashes	4.35	A
99	Training workers on fall protection	4.29	A
100	Wearing personal protective clothing	4.57	SA
101	Proper storage of paint items	4.38	A
102	The use of respirators against harmful chemicals	4.35	A
103	Tidying work area against trip hazards	4.31	A
104	Washing and drying overalls after use	4.46	A
105	Protecting against spontaneous combustion.	4.36	A

The data presented in Table 4 show that the respondents strongly agreed to item 100 and agreed to items 76-99 and 101 ï 105. This means that these items reflect the safety requirements in painting and decorating.

Testing of Hypotheses

Null Hypothesis One

There is no significant difference in the mean responses of technical instructors, management staff and craftsmen on safety requirements needed in trenching and excavation.

The data for answering hypothesis one were presented in table 5.

Table 5
One-way Analysis of Variance (ANOVA) on Mean Responses of Technical Instructors, Management Staff and Craftsmen on Safety Requirements Needed in Trenching and Excavation

Trenching	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.430	2	.215	3.049	.052
Within Groups	12.634	179	.071		
Total	13.064	181			

Table 5 indicate that the calculated value of F(3.049) has a probability value(0.052) which is greater than the 0.05 level of significance. Therefore the null hypothesis which states that there is no significant difference in the mean responses of technical instructors, management staff and craftsmen on safety requirements needed in trenching and excavation was upheld. This shows that technical instructors, management staff and craftsmen are in agreement on safety requirements needed for trenching and excavation.

Null Hypothesis Two

There is no significant difference in the Mean responses of technical instructors, management staff and craftsmen on the safety practices appropriate for scaffolding on site.

The data for answering hypothesis two were presented in table 6.

Table 6
One-Way Analysis of Variance (ANOVA) on Mean Responses of Technical Instructors, Management Staff and Craftsmen on the Safety Practices appropriate for Scaffolding on Site

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.188	2	.094	1.458	.236
Within Groups	11.535	179	.064		
Total	11.723	181			

Table 6 indicated that the calculated value of F(1.458) has a probability value(0.236) of which is greater than the 0.05 level of significance. Therefore the null hypothesis which states that there is no significant difference in the mean responses of technical instructors, management staff and craftsmen on safety practices appropriate for scaffolding on site was upheld. This shows that technical instructors, management staff and craftsmen are in agreement on safety requirements needed for scaffolding.

Null Hypothesis Three

There is no significant difference in the Mean responses of technical instructors, management staff and craftsmen on the strategies suitable for safe brick/block laying and concreting.

The data for answering hypothesis three were presented in table 7.

Table 7
One-Way Analysis of Variance (ANOVA) on Mean Responses of Technical Instructors, Management Staff and Craftsmen on the Strategies suitable for Safe Brick/Block Laying and Concreting

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	.020	2	.010	.146	.864
Within Groups	12.246	179	.068		
Total	12.266	181			

Table 7 indicated that the calculated value of F(0.146) has a probability value(0.864) of which is greater than the 0.05 level of significance. Therefore the null hypothesis which states that there is no significant difference in the mean responses of technical instructors, management staff and craftsmen on strategies suitable for safe brick/block laying and concreting was upheld. This shows that technical instructors, management staff and craftsmen are in agreement on safety strategies suitable for brick/block laying and concreting.

Null Hypothesis Four

There is no significant difference in the Mean responses of technical instructors, management staff and craftsmen on safety requirements needed for painting and decorating.

The data for answering hypothesis four were presented in table 8.

Table 8
One-Way Analysis of Variance (ANOVA) on Mean Responses of Technical Instructors, Management Staff and Craftsmen on requirements needed for Painting and Decorating

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	.011	2	.006	.083	.920
Within Groups	12.045	179	.067		
Total	12.056	181			

Table 8 indicated that the calculated value of F(0.083) has a probability value (0.920) of which is greater than the 0.05 level of significance. Therefore the null hypothesis which states that there is no significant difference in the mean responses of technical instructors, management staff and craftsmen on safety requirements needed for painting and decorating was upheld. This shows that technical instructors, management staff and craftsmen are in agreement on safety requirements needed for painting and decorating.

Findings

The following findings emerged from the study:

A. Research Question One

Safety Requirements in Trenching and excavation

1. Inspecting the trenches daily;
2. Maintaining safe access into and out of excavation;
3. Providing adequate ventilation;
4. Shoring the edges;

5. Providing warning system for mobile equipment;

6. Conducting soil analysis;

7. Conducting first aid training for workers;

8. The use of safety helmets and hard hats;

9. Providing guardrails on walkways;

10. Timbering trench walls;

11. Providing emergency response equipment;

12. The use of respiratory protection equipment;

13. Providing barricades around excavations;

14. Creating barriers at all remote excavations;

15. Sloping the trench walls;

16. Inspecting utilities;

17. Providing shield systems;

18. Conducting atmospheric test;

19. Protecting underground installations; and

20. The use of safety boots.

B. Research Question Two:

Safety Practices for Scaffolding

21. Surface guardrails;

22. Safe means of access and egress;

23. Wide platform capable of preventing instability;

24. Secured cross braces;

25. Toeboards along open sides;
26. Screens between toeboards and guardrails;
27. Sound and rigid footing;
28. Coating wooden platform with preservatives;
29. Ladders to get on and off;
30. Sound frames and accessories;
31. Routine inspection of scaffold components;
32. Full planking and decking of platform surface;
33. Good house keeping;
34. Secured poles and legs;
35. Use of personal protective equipment;
36. Maintaining accessories in good repair;
37. Use of overhead protection for workers;
38. Intermediate beams to avoid dislodgement;
39. Maintenance practices by a competent person;
40. Eliminating slippery conditions;
41. Barricades against moving vehicles;
42. Securing suspended scaffold to prevent swaying;
43. Correcting unsafe conditions;
44. Use of personal fall arrest system;
45. Platform butting for two scaffolds;
46. The use of personal protection kits;

47. Training employees on scaffolding hazards;

48. Proper specifications of scaffold components;

49. Maintaining load carrying capacities by workers; and

50. Proper handling of materials on scaffold.

C. Research Question Three

Safe Strategies for Brick/Block Laying and Concreting

51. Handling materials adequately;

52. Servicing tools, plants and equipment;

53. Adequate bracing of formwork;

54. Setting up first aid against machine injuries;

55. Training workers on ergonomic practices;

56. Proper stacking of materials;

57. Arranging work/rest cycles to reduce fatigue;

58. Maintain proper postures at work;

59. Training workers on head protection;

60. Eliminating slipping and tripping hazards;

61. Rinsing eyes splashed with wet concrete;

62. Routine inspection of machine parts;

63. Following confined space procedures;

64. Maintaining safe working clearance;

65. Use of personal protective equipment;

66. Disposing materials appropriately;

67. Organizing fall protection training;

68. Maintaining good house keeping;

69. Safe location of tools;

70. Addressing hazards and emergencies;

71. Complying with workplace instructions;

72. Maintaining appropriate guards before using power tools;

73. Wetting down work area against dust;

74. Avoiding lifting loads over workers; and

75. Switching off concreting plant/equipment when not in use.

D. Research Question Four

Safety Requirements for Painting and Decorating

76. Preparing work instructions;

77. The use of safety ladders;

78. Barricading around work area;

79. Maintaining good standard of house keeping;

80. Applying suitable ventilation;

81. Selecting tools in line with job requirement;

82. Servicing tools/equipment regularly;

83. Disposing paint waste to the designated area;

84. Taking frequent breaks while at work;

85. Avoiding awkward body position;

86. Keeping safe distance from energized electrical equipment;

87. Rectifying faults prior to job commencement;

88. Providing fire extinguishers;

89. Sealing unused paints and solvents;

90. Providing short term secure storage for debris;

91. Reading paint safety data sheet before use;

92. Keeping paints from open flames;

93. Conducting manual handling training for workers;

94. The use of personal protection kits;

95. Conducting first aid training for workers;

96. Cleaning paint tools after use;

97. Making access to height inaccessible after work;

98. Covering floor area to prevent splashes;

99. Training workers on fall protection;

100. Wearing personal protective clothing;

101. Proper storage of paint items;

102. The use of respirators against harmful chemicals;

103. Tidying work area against trip hazards;

104. Washing and drying overalls after use; and

105. Protecting against spontaneous combustion.

E. Findings from Hypotheses

1. There is no significant difference in the mean responses of technical instructors, management staff and craftsmen on safety requirements in trenching and excavation site with mean responses of 4.01 for instructors, 4.12 for management staff and 4.19 for craftsmen.
2. There is no significant difference in the mean responses of technical instructors, management staff and craftsmen on safety practices appropriate for scaffolding on site with mean responses of 4.23 for instructors, 4.22 for management staff and 4.29 for craftsmen.
3. There is no significant difference in the mean responses of technical instructors, management staff and craftsmen on safety strategies for brick/block laying and concreting with mean responses of 4.29 for instructors, 4.24 for management staff and 4.25 for craftsmen.
4. There is no significant difference in the mean responses of technical instructors, management staff and craftsmen on safety requirements needed for painting and decorating with mean responses of 4.31 for instructors, 4.28 for management staff and 4.30 for craftsmen.

Discussions

With reference to research question 1, the technical instructors, management staff and craftsmen agreed that items listed as safety requirements in trenching and excavation are relevant. These safety requirements according to them include: sloping, shoring and timbering of trench walls, inspecting the trenches daily, use of safety boots, maintaining safe access into and out of excavation, use of safety helmets and hard hats, inspecting and protecting underground utilities, providing shield systems, conducting first aid training for workers, providing adequate ventilation, barricading around excavations, providing guardrails on walkways, conducting soil analysis among others. They consented too to a greater degree that emergency response equipment be provided to ensure safety of workers digging trenches.

This finding agree with Stanevich and Middleton (1988) and OSHA (2002) who emphasized the importance of soil analysis in order to determine appropriate sloping, benching and shoring of trenches to ensure safety of workers. Also OSHA (2002) documented that safety in trenching and excavation should be guaranteed by providing safe access into and out of excavation, inspecting the trench daily and ensuring adequate ventilation and respiratory protection if necessary. The result is in consonant with Mickel (1991) and Dow (2004) that three basic methods of protecting workers against trench hazards include sloping, shoring and providing shield systems.

Hypothesis 1 was accepted as postulated, the acceptance is not out of place because the technical instructors, management staff and craftsmen are considered most suitable to report the state of the art in the building industry and are reasonable enough to articulate what site workers need in order to maintain safety on site.

The second research question focused on the safety practices appropriate for scaffolding at site. Table 2 showed that the respondents rated items 21-46 very appropriate (VA) whereas items 47-50 were rated most appropriate (MA) safety practices for scaffolding. The respondents weight of response on training employees on scaffolding hazards, proper specification of scaffold components, maintaining load carrying capacities by workers and proper handling of materials on scaffold as most appropriate brought to bare where most site accidents associated with scaffolding emanate from.

This finding agrees with Hunter (2011) who stated that workers should adhere to specific requirements for the maximum load, bracing and the use of guardrails. Haslam et al (2005) asserted that workers should maintain the load carrying capacity of the scaffold as well as secure scaffold components to prevent swaying in order to avert serious injuries due to falls. The result also corroborates the safety requirements in scaffolding as enumerated by Morra (2011) which include maintaining load carrying capacities by workers, training employees on scaffolding hazards, use of surface guardrails, good house keeping, securing scaffolding components and use of personal protective equipment.

Hypothesis 2 was upheld as postulated. The acceptance is in order since the safety practices appropriate for scaffolding are obvious to site workers.

With reference to research question 3, the respondents agree to all the items on safe strategies to be adopted in brick/block laying and concreting. According to them workers who engage in brick/block laying and concreting operations should adhere to such safety practices as maintaining safe working clearance, rinsing eye splashed with wet concrete, avoiding lifting loads over fellow workers, complying with workplace instructions, maintaining proper postures at work, good house keeping, using personal protective equipment, bracing formwork adequately among others.

The finding agree with Grimshaw (2013) that bricklaying risks should be reduced by maintaining good house keeping practices, use and continuous use of personal protective equipment, as well as continual inspection of plant and tools. Behm (2006) added that servicing tools, plants and equipment as well as making arrangement for first aid should go a long way in reducing brick/block laying risks. The finding lent credence to OSHA (2002) safety requirements that safe concreting encompass the proper use of materials, tools and machinery. Dee (2013) confirmed that concrete mix and pour operations pose significant hazards to workers and that proper handling of these materials can avert such occurrences.

The supportive hypothesis revealed no significant difference in the mean responses of technical instructors, management staff and craftsmen on safety strategies for brick/block laying and concreting. The finding however support the findings by Okparaeke (2004) who discovered that trainees required all the safety practice skills for development in block laying and concreting occupations.

With reference to research question 4, the respondents share the same view on the safety requirements for painting and decorating. According to them preparing work instruction, use of safety ladders, barricading work area, good standard of house keeping, suitable ventilation, disposing paint waste accordingly, avoiding awkward positions are worthwhile, likewise the provision of fire extinguishers, sealing unused paints, reading paint safety data sheet, keeping paints from open flame, conducting manual handling training for workers, conducting first aid training for workers, taking frequent breaks while at work, cleaning paint tools after use, proper storage of paint items, use of respirators, washing and drying overalls after use among others. They however rate wearing personal protective clothing highest as the most needed safety requirement in painting and decorating.

This finding agree with Star (2013) who enumerated safety requirements in painting and decorating to include ventilation of the area being painted, taking breaks from painting at regular intervals and wearing of personal protective clothings such as mask, gloves and overalls. In the same vein, OSHA (2002) documented that employees should be instructed on potential dangers of manual handling and should receive manual handling training ahead of time. The finding is in accordance with Apprenticeship Factory (2014) that outlined requirements in painting and decorating to include cleaning work areas and tools after use, covering floor area to prevent splashes and the use of safety ladders and scaffold. The apprenticeship factory further pointed out major painting and decorating hazards as falls from height as well as workers injury resulting from slips, trips and falls. This explains the respondents agreement that workers should be trained on fall protection and at the same time tidy their work area to overcome trip hazards.

Finally, supportive hypothesis revealed no significant difference in the mean responses of technical instructors, management staff and craftsmen on safety requirements for painting and decorating. Their agreement points towards the relevance of the items in eliminating hazards associated with painting and decorating on site.

The consistency in research findings on safety practices as seen in the discussion shows the importance of safety in any working environment. Hence safety should be of utmost priority in order to achieve maximum productivity in the building industry.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Re-statement of Problem

Over the years Nigerian workers in the building sector of the economy have been endangered and prone to accidents ranging from the minor to the fatal as some have lost their lives right in the line of duty; while some have lost vital organs, which rendered them permanently incapacitated. In the analysis of annual accidents in the construction industry involving persons, Nash (1970), discovered that the major cause were: fall 27 per cent; handling materials 26 per cent; striking against an object 11 per cent; being struck by falling objects eight per cent; machinery eight per cent; hand tools eight per cent; transport six per cent; others six per cent. Other hazards associated with building activities include: cave-ins, slips and trips, suffocation in deep trenches, inhalation of toxic fumes and chemicals, unsafe access/egress among others.

Safety at the building construction industry is relegated to the background and as such cases of workers injuries and building failures abound; there are delays in project completion and even abandonment as construction costs escalate. There is no gain saying that only the living can work and earn wages. However, the building industry requires an assessment directed towards boosting safety and health at work. The problem of this study, therefore, is to assess the safety needs of site workers in the building construction industry to achieve maximum productivity in an accident free environment.

Summary of Procedures Used

The main purpose of the study was to determine the safety needs of site workers in the building construction industry in Enugu State. Four research questions and four null hypotheses were formulated to guide the study. The population of the study was 182 respondents comprising of 11 technical instructors of Government Technical Colleges, 36 management staff and 135 craftsmen from registered building construction industries under study. The instrument used for collection of data was a structured questionnaire with four sections. The instrument was pilot tested on 20 respondents comprising of six management staff, four technical instructors and 10 craftsmen. After being subjected to validation by three experts the reliability coefficients of the instrument was calculated to be 0.71using Cronbach alpha reliability coefficient. The analysis of data was carried out using mean to answer the research questions. The hypotheses were tested using ANOVA at 0.05 level of significance.

Major Findings

Based on the data analyzed, it was revealed that all the safety needs determined in this study reflect the needs of site workers. However, some safety needs are more outstanding than others as shown in the following findings:

1. Twenty safety requirements were adopted in trenching and excavation; safety items that attracted higher responses include: providing emergency response equipment, the use of safety boots, maintaining safe access into and

out of excavation, conducting first aid training for workers, providing adequate ventilation, sloping and timbering trench walls.

2. Thirty safety practices were needed in scaffolding among which the following attracted higher responses than others; training employees on scaffolding hazards, maintaining load carrying capacities by workers, use of personal protective equipment, proper specifications of scaffold components and proper handling of materials on scaffold.
3. Twenty five safe strategies were adopted for brick/block laying and concreting out of which the following items were most outstanding, handling materials adequately, rinsing eyes splashed with wet concrete, complying with workplace instructions, eliminating slipping and tripping hazards, switching off concreting plant when not in use and use of personal protective equipment.
4. Thirty safety requirements were adopted for painting and decorating among which the following safety needs were outstanding: wearing personal protective clothing, washing and drying overalls after use, the use of safety ladders, conducting manual handling training for workers, providing fire extinguishers and conducting first aid training for workers.
5. There is no significant difference in the mean responses of technical instructors, management staff and craftsmen on the safety requirements needed in trenching and excavation.

6. There is no significant difference in the Mean responses of technical instructors, management staff and craftsmen on the safety practices appropriate for scaffolding on site.
7. There is no significant difference in the Mean responses of technical instructors, management staff and craftsmen on the strategies suitable for safe brick/block laying and concreting.
8. There is no significant difference in the Mean responses of technical instructors, management staff and craftsmen on safety requirements needed for painting and decorating.

Implications of the Study

The findings of this study implicated the following groups: Site workers, building owners, policy makers, building contractors, curriculum development experts, technical teachers, students, building construction industry and the general public.

The findings of this study will provide site workers with clear insight into the safety requirements and site hazards as well as how to eliminate them. They will be conversant with risks associated with their duties and working environment as well as prevention measures appropriate for them. The study will also educate site workers on proper use of personal protective equipment and safe manual handling of tools and machinery in order to remain safe at work. Building owners will strive to get acquainted with safety needs of workers on site which will guide them towards hiring contractors with good safety records and ensure their involvement in teaching their workers safety. This will yield higher productivity at a considerable cost.

Policy makers will utilize the findings of the study in formulating building safety acts in the areas of trenching and excavation, scaffolding, brick/block laying and concreting and painting and decorating. Such safety acts will stipulate duties of workers and employees in each of these activities. These acts will be put into laws and appropriation which will serve as code of conduct for builders in the construction industry.

Building contractors will utilize the findings of the study to ensure that effective site safety and health practices are being maintained. It should conduct health monitoring of workers and carry out detailed risk assessment of all work areas and processes record their findings and proffer measures where significant risks exists. This implies detecting and dismissing workers that indulge in sharp practices as well as recruiting and training new ones.

Curriculum development experts will integrate the findings of the study in the curriculum especially on the major activity areas this study determined. Safety issues in each activity area studied will be broken down as a topic for instruction in the classroom. Such curriculum developed will specify both teachers and students activities geared towards improving safety in the building workshop. Technical teachers should be familiar with the safety needs and be able to utilize the safety contents incorporated in the curriculum in teaching their students. They in turn will attend re-training courses on safety needed for improvement and efficiency in the building construction industry. Students will be taught the identified safety needs integrated into the curriculum. This will enable them imbibe safety culture that is needed at work site and be able to transfer this safety culture to job site after graduation. Having being equipped with safety needed at work, they will be able to identify hazards and report accident accordingly.

The building construction industry will become more conducive for workers despite the hazardous nature of activities therein. This implies that less fatality rates and higher productivity of workers will be recorded. Workers should utilize their work hours to the maximum. The building industry will run safety meetings and trainings to its workers will be recorded; this will attract workers from outside the industry and by so doing increate the workforce. The general public should be saved the trauma of losing their benefactors and loved ones to site accidents if the findings of this study are adhered to. They will benefit from the services of the building construction industry at a considerable cost without facing the frustration of abandoned projects.

Conclusion

Based on the findings of the study, the following conclusions were drawn: Achieving maximum productivity in every job site is heavily dependent on the safety of workers. Building activities can be hampered in a hazard prone environment. Addressing the safety needs of site workers in the building industry is panacea to attaining safety, therefore, the determined safety needs should be established as a code of conduct in building industries as well as incorporated into the curriculum of building construction in technical colleges. This will equip both students and site workers with safety culture needed for maximum security on site.

Recommendations

The following recommendations were made based on the findings of this study:

1. Site workers should place their safety first by adhering to the findings of this study on excavation, scaffolding, brick/block laying and concreting, painting and decorating and make concerted efforts towards maintaining safety on site.
2. Policy makers should integrate the findings of this study when formulating building safety acts.
3. Curriculum development experts should integrate the findings of the study in the curriculum.
4. Site workers, building contractors and technical teachers should be re-trained on safety needs in the building construction industry.
5. Safety meetings, seminars and conferences should be organized by the Ministry of Health for site workers.
6. Strict safety measures observances should be made mandatory in all building sites.

Suggestions for Further Studies

Based on the outcomes of this study, it is suggested that further research be conducted on:

1. Site management competency improvement needs of workers in the building industry.
2. Development of safety programme for site workers in the building construction industry.
3. Reducing workplace dangers through risk assessment.
4. Exploring injury and disability among public safety employees.
5. Effectiveness of safety mandates in preventing injuries and illnesses in the building industry.

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APPENDIX A

Distribution of Building Construction Technical Instructors in Government Technical Colleges in Enugu State

Government Technical Colleges	Number of Technical Instructors
GTC Enugu	5
GTC Nsukka	3
GTC Akpugoeze	3
Total	11

Source: Approved Technical Colleges in Nigeria (2013)

Table 1 shows the distribution of technical instructors comprising of five from Government Technical College Enugu, three from Government Technical College Nsukka and three from Government Technical College Akpugoeze, all in Enugu State.

Distribution of Management Staff and Craftsmen in Major Building Construction Companies in Enugu State

Construction Company	Management Staff	Technical Staff (Craftsmen)
Achimore Nig. Ltd.	3	11
Micheletti and Sons Nig. Ltd	2	12
Italcon Engineering Associates Ltd	3	9
Maston George Ltd.	3	10
Innochim Const Services	2	8
Dopike Nig. Ltd.	3	8
Lazsam Const Comp Nig Ltd.	3	13
Ifewnort Const Ltd.	2	10
Dave Building Const	2	9
Chubis Engineering Services	3	9
Epcon Concept	2	7
De-patony Invest Ltd.	2	8
Appleview Ltd.	2	7
Blue Stride Engineering Ltd.	2	6
Akiota Works Ltd.	2	8
Total	36	135

Source: List of Registered Construction Companies; Vconnect. Lagos.

Table 2 shows the list of building construction industries in Enugu State that are registered with Vconnect with the distribution of their management staff and craftsmen giving a total of 36 and 135 respectively.

APPENDIX B

Department of Vocational Teacher Education
University of Nigeria, Nsukka

May 11, 2015

Dear Respondents,

I am a postgraduate student of the above department currently carrying out a research on determining safety needs of site workers in the building construction industries in Enugu State. You are please requested to respond to the items in the enclosed questionnaire. Your responses will be used only for this research study and will be treated confidentially.

Thank you for your co-operation.

Yours Faithfully,

Ezulike, A.P.
Researcher

APPENDIX C

SAFETY NEEDS OF BUILDERS

This study is aimed at determining safety needs of workers in the Building construction sites. A questionnaire is designed to this effect to elicit information from the target population on four major activity areas in the Building Industry, which are: trenching and excavation, brick/block laying and concreting, scaffolding and painting and decorating. The questionnaire consists of two sections A and B meant to elicit general information on the respondents and on the 105 items of the questionnaire respectively as given below:

SECTION I: General Information

Instruction: Please check (✓) in the spaces as applicable to you.

1. Working Establishment: ______ Building Construction Company
   ______ Technical College
2. Position held: ______ Management/Supervisory Staff
   ______ Technical Instructor
   ______ Craftsman
3. Area of Specialization: ______ Brick/Block Laying
   ______ Concreting
   ______ Carpentry/Scaffold Construction
   ______ Painting and Decorating

SECTION II

Indicate your response by checking (✓) in the columns provided the response most agrees with your opinion on the safety needs required by site workers. The response options are: Strongly Agree (SA), Agree (A), Undecided

(UD), Disagree (D) and Strongly Disagree (SD) for clusters A, C and D, and Most Appropriate (MA), Very Appropriate (VA), Moderately Appropriate (MA), Not Appropriate (NA) and Most Inappropriate (MI) for cluster B. You are required to check (✓):

1. Strongly Agree (SA) or Most Appropriate (MA) if you are completely of the same view with the item in question.
2. Agree (A) or Very Appropriate (VA) if you accept the questionnaire item to a large extent but not completely.
3. Undecided (UD) or Moderately Appropriate if you are not sure of the item but have some positive view about it.
4. Disagree (D) or Not Appropriate (NA) if you do not accept the questionnaire item as relevant to the safety of workers.
5. Strongly Disagree (SD) or Most Inappropriate (MI) if your opinion is completely not in support of the questionnaire item.

CLUSTER A

The following items are safe requirements in trenching and excavation on site. You are requested to indicate the extent to which you agree or disagree by checking (✓) in the relevant column.

Workers who are digging Trenches or Excavations should be protected by:

S/N	Item Statement	SA	A	UD	D	SD
1	Inspecting the trenches daily					
2	Maintaining safe access into and out of excavation					
3	Providing adequate ventilation					
4	Shoring the edges					
5	Providing warning system for mobile equipment					
6	Conducting soil analysis					
7	Conducting first aid training for workers					
8	The use of safety helmets and hard hats					
9	Providing guardrails on walkways					
10	Timbering trench walls					
11	Providing emergency response equipment					
12	The use of respiratory protection equipment					
13	Providing barricades around excavations					
14	Creating barriers at all remote excavations					
15	Sloping the trench walls					
16	Inspecting utilities					
17	Providing shield systems					
18	Conducting atmospheric test					
19	Protecting underground installations					
20	The use of safety boots					

CLUSTER B

The items listed below are the safety practices appropriate for scaffolding on site. You are required to indicate the level of which they are appropriate or inappropriate by checking (✓) in the columns given below.

Methods and designs appropriate for scaffolding should include:

S/N	Item Statement	MA	VA	MA	NA	MI
21	Surface guardrails					
22	Safe means of access and egress					
23	Wide platform capable of preventing instability					
24	Secured cross braces					
25	Toeboards along open sides					
26	Screens between toeboards and guardrails					
27	Sound and rigid footing					
28	Ladders to get on and off					
29	Coating wooden platform with preservatives					
30	Sound frames and accessories					
31	Routine inspection of scaffold components					
32	Full planking and decking of platform surface					
33	Good house keeping					
34	Secured poles and legs					
35	Use of personal protective equipment					
36	Maintaining accessories in good repair					
37	Use of overhead protection for workers					
38	Intermediate beams to avoid dislodgement					
39	Maintenance practices by a competent person					
40	Eliminating slippery conditions					
41	Barricades against moving vehicles					
42	Securing suspended scaffold to prevent swaying					
43	Correcting unsafe conditions					
44	Use of personal fall arrest system					
45	Platform butting for two scaffolds					

46	The use of personal protection kits					
47	Training employees on scaffolding hazards					
48	Proper specifications of scaffold components					
49	Maintaining load carrying capacities by workers					
50	Proper handling of materials on scaffold					

CLUSTER C

The following items are the strategies to be adopted to ensure safety of workers in brick/block laying and concreting. You are to indicate the extent of your agreement or disagreement by checking (✓) in the columns given below.

Safety in brick/block laying and concreting should be ensured by:

S/N	**Item Statement**	**SA**	**A**	**UD**	**D**	**SD**
51	Handling materials adequately					
52	Servicing tools, plants and equipment					
53	Adequate bracing of formwork					
54	Setting up first aid against machine injuries					
55	Training workers on ergonomic practices					
56	Proper stacking of materials					
57	Arranging work/rest cycles to reduce fatigue					
58	Maintain proper postures at work					
59	Training workers on head protection					
60	Eliminating slipping and tripping hazards					
61	Rinsing eyes splashed with wet concrete					
62	Routine inspection of machine parts					
63	Following confined space procedures					
64	Maintaining safe working clearance					

65	Use of personal protective equipment					
66	Disposing materials appropriately					
67	Organizing fall protection training					
68	Maintaining good house keeping					
69	Safe location of tools					
70	Addressing hazards and emergencies					
71	Complying with workplace instructions					
72	Maintaining appropriate guards before using power tools					
73	Wetting down work area against dust					
74	Avoiding lifting loads over workers					
75	Switching off concreting plant/equipment when not in use					

CLUSTER D

Items below are the safety requirements in painting and decorating in the building industry. You are expected to indicate the extent to which you agree or disagree by checking (✓) in the columns given below.

Painting and decorating safety on site should be guaranteed by:

S/N	Item Statement	SA	A	UD	D	SD
76	Preparing work instructions					
77	The use of safety ladders					
78	Barricading around work area					
79	Maintaining good standard of house keeping					
80	Applying suitable ventilation					
81	Selecting tools in line with job requirement					

82	Servicing tools/equipment regularly					
83	Disposing paint waste to the designated area					
84	Taking frequent breaks while at work					
85	Avoiding awkward body positions					
86	Keeping safe distance from energized electrical equipment					
87	Rectifying faults prior to job commencement					
88	Providing fire extinguishers					
89	Sealing unused paints and solvents					
90	Providing short term secure storage for debris					
91	Reading paint safety data sheet before use					
92	Keeping paints from open flames					
93	Conducting manual handling training for workers					
94	The use of personal protection kits					
95	Conducting first aid training for workers					
96	Cleaning paint tools after use					
97	Making access to height inaccessible after work					
98	Covering floor area to prevent splashes					
99	Training workers on fall protection					
100	Wearing personal protective clothing					
101	Proper storage of paint items					
102	The use of respirators against harmful chemicals					
103	Tidying work area against trip hazards					
104	Washing and drying overalls after use					
105	Protecting against spontaneous combustion.					

APPENDIX D

CRONBACH ALPHA RELIABILITY COEFFICIENT

Cluster A

Reliability Statistics

Cronbach's Alpha	N of Items
.653	20

Cluster B

Reliability Statistics

Cronbach's Alpha	N of Items
.804	30

Cluster C

Reliability Statistics

Cronbach's Alpha	N of Items
.706	25

Cluster D

Reliability Statistics

Cronbach's Alpha	N of Items
.728	30

Overall Cluster

Reliability Statistics

Cronbach's Alpha	N of Items
.905	105

APPENDIX E

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
VAR00001	182	2.00	5.00	4.0824	.56492
VAR00002	182	2.00	5.00	4.4231	.70681
VAR00003	182	3.00	5.00	4.4066	.56565
VAR00004	182	3.00	5.00	4.3132	.67778
VAR00005	182	2.00	5.00	3.9396	.95285
VAR00006	182	2.00	5.00	3.8901	.96285
VAR00007	182	3.00	5.00	4.4231	.58726
VAR00008	182	2.00	5.00	4.3626	.71320
VAR00009	182	2.00	5.00	4.0934	.80541
VAR00010	182	2.00	5.00	4.2637	.71038
VAR00011	182	3.00	5.00	4.5055	.55371
VAR00012	182	3.00	5.00	4.1758	.53792
VAR00013	182	2.00	5.00	3.7747	.80662
VAR00014	182	1.00	5.00	3.8407	1.01475
VAR00015	182	1.00	5.00	4.3516	.81252
VAR00016	182	2.00	5.00	4.0989	.80818
VAR00017	182	2.00	5.00	4.1648	.75456
VAR00018	182	1.00	5.00	3.6264	1.08377
VAR00019	182	2.00	5.00	3.9890	1.01366
VAR00020	182	1.00	5.00	4.4615	.92010
VAR00021	182	2.00	5.00	4.2473	.80699
VAR00022	182	2.00	5.00	4.1484	.73955
VAR00023	182	2.00	5.00	4.2802	.74592
VAR00024	182	3.00	5.00	4.4396	.65154
VAR00025	182	1.00	5.00	4.1429	.83529
VAR00026	182	2.00	5.00	4.2033	.89033
VAR00027	182	2.00	5.00	4.3132	.82485
VAR00028	182	1.00	5.00	4.1154	.99883
VAR00029	182	1.00	5.00	4.0165	.99432
VAR00030	182	2.00	5.00	4.4725	.67865
VAR00031	182	2.00	5.00	4.2088	.73607
VAR00032	182	3.00	5.00	4.4231	.61484
VAR00033	182	2.00	5.00	4.3132	.71738
VAR00034	182	2.00	5.00	4.2253	.74242
VAR00035	182	3.00	5.00	4.5659	.64246
VAR00036	182	3.00	5.00	4.3242	.74282
VAR00037	182	2.00	5.00	4.2747	.77340
VAR00038	182	2.00	5.00	4.2363	.79654
VAR00039	182	2.00	5.00	4.2747	.67416

VAR00040	182	1.00	5.00	4.2637	.99541
VAR00041	182	2.00	5.00	3.8297	1.05569
VAR00042	182	2.00	5.00	4.0769	.92516
VAR00043	182	2.00	5.00	4.2033	.82595
VAR00044	182	2.00	5.00	4.2857	.83150
VAR00045	182	1.00	5.00	3.8791	.91440
VAR00046	182	2.00	5.00	4.4451	.72428
VAR00047	182	3.00	5.00	4.5879	.58571
VAR00048	182	2.00	5.00	4.5440	.66958
VAR00049	182	2.00	5.00	4.5659	.57914
VAR00050	182	4.00	5.00	4.5110	.50126
VAR00051	182	3.00	5.00	4.5549	.54087
VAR00052	182	2.00	5.00	4.1264	.74364
VAR00053	182	3.00	5.00	4.3187	.62858
VAR00054	182	1.00	5.00	4.2473	.74282
VAR00055	182	1.00	5.00	4.2802	.87541
VAR00056	182	3.00	5.00	4.1758	.72969
VAR00057	182	2.00	5.00	4.0769	.75408
VAR00058	182	3.00	5.00	4.3736	.65051
VAR00059	182	1.00	5.00	4.1154	.83625
VAR00060	182	2.00	5.00	4.3077	.88189
VAR00061	182	3.00	5.00	4.4670	.62764
VAR00062	182	3.00	5.00	4.2363	.70059
VAR00063	182	2.00	5.00	4.0275	.74649
VAR00064	182	2.00	5.00	4.2473	.76481
VAR00065	182	3.00	5.00	4.3297	.67398
VAR00066	182	2.00	5.00	4.2473	.75023
VAR00067	182	2.00	5.00	4.0495	.83618
VAR00068	182	2.00	5.00	4.2802	.73096
VAR00069	182	2.00	5.00	4.2418	.83223
VAR00070	182	3.00	5.00	4.1978	.67668
VAR00071	182	2.00	5.00	4.3132	.61809
VAR00072	177	2.00	5.00	4.2429	.86127
VAR00073	182	2.00	5.00	4.0220	.88546
VAR00074	182	3.00	5.00	4.2912	.56395
VAR00075	182	3.00	5.00	4.3901	.54267
VAR00076	182	2.00	5.00	4.3901	.64501
VAR00077	182	3.00	5.00	4.4121	.65685
VAR00078	182	1.00	5.00	4.0440	.97382
VAR00079	182	3.00	5.00	4.2802	.58861
VAR00080	182	3.00	5.00	4.2912	.61098
VAR00081	182	2.00	5.00	4.1648	.70927
VAR00082	182	2.00	5.00	4.2308	.75182

VAR00083	182	2.00	5.00	4.1209	.70256
VAR00084	182	2.00	5.00	4.0989	.83507
VAR00085	182	2.00	5.00	4.2253	.74982
VAR00086	182	2.00	5.00	4.2143	.75305
VAR00087	182	2.00	5.00	4.1209	.83216
VAR00088	182	1.00	5.00	4.3791	.85669
VAR00089	182	3.00	5.00	4.2967	.63061
VAR00090	182	2.00	5.00	4.3462	.62716
VAR00091	182	2.00	5.00	4.3626	.75093
VAR00092	182	1.00	5.00	4.2967	.91028
VAR00093	182	2.00	5.00	4.4121	.80087
VAR00094	182	3.00	5.00	4.2692	.68853
VAR00095	182	3.00	5.00	4.4121	.69764
VAR00096	182	2.00	5.00	4.2637	.82549
VAR00097	182	3.00	5.00	4.2088	.69753
VAR00098	182	2.00	5.00	4.3516	.71098
VAR00099	182	2.00	5.00	4.2857	.71736
VAR00100	182	3.00	5.00	4.5714	.58796
VAR00101	182	3.00	5.00	4.3846	.59962
VAR00102	182	1.00	5.00	4.3516	.77064
VAR00103	182	2.00	5.00	4.3077	.70816
VAR00104	182	3.00	5.00	4.4560	.62696
VAR00105	182	1.00	5.00	4.3626	.80078
Valid N (listwise)	177				

Hypothesis 1

Descriptives

Trenchin

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
technical instructors	11	4.0136	.33022	.09957	3.7918	4.2355	3.40	4.60
management staff	36	4.1056	.25573	.04262	4.0190	4.1921	3.70	4.45
Craftsmen	135	4.1856	.26280	.02262	4.1408	4.2303	3.65	4.60
Total	182	4.1593	.26866	.01991	4.1200	4.1986	3.40	4.60

ANOVA

Trenchin

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.430	2	.215	3.049	.050
Within Groups	12.634	179	.071		
Total	13.064	181			

Hypothesis 2

Descriptives

Scaffolding

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
technical instructors	11	4.2333	.29590	.08922	4.0345	4.4321	3.80	4.70
management staff	36	4.2241	.29055	.04843	4.1258	4.3224	3.70	4.67
Craftsmen	135	4.2995	.23978	.02064	4.2587	4.3403	3.77	4.87
Total	182	4.2806	.25449	.01886	4.2434	4.3178	3.70	4.87

ANOVA

Scaffolding

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.188	2	.094	1.458	.236
Within Groups	11.535	179	.064		
Total	11.723	181			

Hypothesis 3

Descriptives

Bricklay

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
technical instructors	11	4.2873	.28499	.08593	4.0958	4.4787	3.88	4.76
management staff	36	4.2400	.25280	.04213	4.1545	4.3255	3.84	4.56
Craftsmen	135	4.2452	.26198	.02255	4.2007	4.2898	3.48	4.80
Total	182	4.2467	.26032	.01930	4.2087	4.2848	3.48	4.80

ANOVA

Bricklay

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.020	2	.010	.146	.864
Within Groups	12.246	179	.068		
Total	12.266	181			

Hypothesis 4

Descriptives

Painting

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
technical instructors	11	4.3061	.26990	.08138	4.1247	4.4874	3.90	4.70
management staff	36	4.2815	.23950	.03992	4.2004	4.3625	3.77	4.73
Craftmen	135	4.3005	.26357	.02268	4.2556	4.3454	3.53	4.83
Total	182	4.2971	.25809	.01913	4.2593	4.3348	3.53	4.83

ANOVA

Painting

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.011	2	.006	.083	.920
Within Groups	12.045	179	.067		
Total	12.056	181			