UNIVERSITY OF EDUCATION, WINNEBA

INVESTIGATION INTO SITE LAYOUT PRACTICES IN GHANA: A CASE STUDY IN HO MUNICIPALITY

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BY:

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A DISSERTATION IN THE DEPARTMENT OF CONSTRUCTION AND WOOD TECHNOLOGY EDUCATION, UNDER THE FACULTY OFTECHNOLOGY EDUCATION, SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES, UNIVERSITY OF EDUCATION, WINNEBA IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF THE MASTER OF TECHNOLOGY EDUCATION (CONSTRUCTION TECHNOLOGY) DEGREE

JUNE, 2014

DECLARATION

CANDIDATE'S DECLARATION

I Emmanuel Dagabu, declare that this thesis, with the exception of quotations and acknowledged, is entirely my own original work, and it has not been submitted, either in part or whole, for another degree elsewhere.

Signature……. Date…….

SUPERVISOR'S DECLARATION

I hereby declare that the preparation of this thesis was supervised in accordance with the guideline on supervisors of thesis laid down by the University of Education, Winneba.

Supervisor: Dr. William Gyadu-Asiedu

Signature…… Date……

ACKNOWLEDGEMENT

I would like to thank the almighty God who has granted me the hope and made me it possible for me to come out with this project work which will be very useful and important to constructor who undertakes construction projects.

My sincere gratitude goes to my Supervisor, Dr. William Asiedu, a former lecturer of University of Education Winneba, Kumasi and now at Koforidua poly whose guidance diligence, tolerance and comment in matters related to the research work assisted to make this thesis successful one.

I am also grateful to Mr. Sangmor Edwin, Godfred Tsotorvor and Hope Awudor for their loving support. Also to all members of the building Team visited and interacted with for accommodating me during my field survey.

To conclude, I acknowledge all authors from whose book and publications I made reference to

DEDICATION

This thesis is dedicated to my lovely wife, Peace Mawufemor Tengey for her undutiful support and advice.

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ABSTRACT

Planning the site layout of construction project is a crucial task that has a significant impact on construction lost, productivity and safety. It involves the positioning and relocation of temporary facilities that are needed to support various construction activities on site such as office, storage areas workshops, and parking areas. Due to the complexity of the site layout planning problem, construction managers often perform this task using previous experiences, first come first save approach.

To address the difficulties associated with this process, additional research is conducted in some areas like security needs and constrains during the construction of infrastructure projects, to enhance the utilization of interior building space for materials storage areas and plants allocation on construction site. The main objective of this study is to investigate into the site layout practices of construction firms in the Ho Municipality so as to identify the deficiencies and problems with it. The study will also identify the problems that poor site layout usually cause to projects in the municipality. A survey method was undertaken by the researcher to actually observe what took place on the construction site in terms of site layout practices. The study involves survey, assessment of views and collecting of data through the use of techniques such as questionnaires, personal observation and interviews of layout practices in the housing sector. The method use to analyze the data was descriptive statistics through the use of Microsoft Office Excel. The results show that, most sites are not properly layout before the commencement of a project. It is therefore recommended that standardize and modern site layout should be put in place on construction site before any project is begins.

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

Space on construction sites is recognized as a resource that is as important as other resources of money, time, material, labour, and equipment; (Tommelien et al., 1997c; Hegazy and Elbetagi, 1999). Despite its importance, space was not typically modelled in construction management tools a decade ago; Zouein and Tommelien (1993), and the situation has not changed since. Studies have shown that for every dollar spent on pre-planning of large projects, four dollars could be saved in their total cost; Hegazy and Elbetagi (1999), proper site planning can improve the efficiency of construction operations and reduce material handling costs, which consumes up to 40% of site expenses; Zovein (1996). Thus, detailed studies of site arrangements before commencement of construction can have an impact on the efficiency of site operations and the cash flow associated with resource management. However, site visits and interviews with superintendents and site managers, as literature reveal that site layout planning is often ignored in the planning phase of construction project; Elbetagi and Hetazy (2003), Tommelien and Zouein (1993a). A good portion of production losses occur due to space –related issue such as unnecessary travel on site for tools and material, searching for misplaced tools or materials in work interruption due to space congestion; Cheng (1992). A well-planned site can contribute in decreasing production losses by minimizing travel time, decreasing time and effort spent on material handling, and in improving safety. As well, planning for site layout aids in detection of potential space conflicts, which in turn can increase certainly to schedules and reduce the risk of project cost and time overrun; Dawood et al. (2003). Further, the algorithm proposed for the construction of site layout

optimization can be adapted for other application such as space scheduling and manufacturing cell-layout; Harmanani et al. (2000).

1.2 STATEMENT OF THE PROBLEM

The need of putting up building within reasonable amount of time and on projection has led to the need for effective site layout planning. Lack of effective site layout planning has led to accident, delays, double handling, material wastage, etc. It is well known that one of the reasons for slow progress of work and the high cost of building project work in Ghana in general and Ho in particular, is site layout planning. The current practice of site layout was studied through site visit and interviews with practitioners, specifically of construction projects in the Volta region. Despite the acknowledgment of practitioners of the impact of site layout on efficiency of site activities, it is often ignored in the planning phase of construction projects. This means that drawings are not prepared for site layout purpose. At best site managers or superintendents draw sketches on site plans generated for other purposes (e.g. Landscape plans). As construction progresses, information is added to the first drawing so the drawing consist of several layers of information. As these layers of information are added along the progress of construction, they become more complicated and difficult to understand in practice. Space allocation on construction site in typically carried out on a first-come-first serve basis and mainly through human judgement which could result in chaotic sites and may give rise to productivity losses and safety related incidents. The problems, which are encountered in some selected areas in Ho Municipal, are: poor site layout planning, bad storage areas for materials, lack of provision of space for plant and equipment.

1.3 PURPOSE OF STUDY

The aim of the study is to investigate into the site layout practices of construction firms in the HO Municipality so as to identify the deficiencies and problems with it.

1.4 SPECIFIC OBJECTIVE OF THE STUDY

In order to achieve the above aim, the following strategic objectives shall be followed.

1. To identify the site layout practices of firms in the Ho municipality.
2. To find out the problems associated with the site layout practices in the municipality.
3. To identify possible dangers that poor site layout brings about.

1.5 RESEARCH QUESTION

An analysis of the above-stated objective indicated that the following research questions were appropriate to form the focus of this study:

1. How do firms undertake site layout practices in the Ho municipality?

2. What are the problems associated with the site layout practices of construction firms in the Ho municipality?

1.6 SIGNIFICANCE OF THE STUDY

This research is to establish, the factors which leads to poor construction site layout practice in the Ho Municipality. It is expected that when fully completed this will be very useful to policy makers, planners and decision makers in the building industry. It will also be of much importance to all agencies, companies and individuals in the housing business in particular and serves as preference to current developers and

those who are about to enter into any construction industry venture. The following difficulties are anticipated to be resolved when this project is put into good used.

- The loss of income due to improper site layout practice in construction site.
- The waste of time during construction project due to items blocking access and interfering with the construction activities at various stage of building.
- The loss of income due to accident on the construction site.
- The loss of income due to improper way by which materials are handled on the site.

1.7 SCOPE OF STUDY

The study is limited to local constructors in Ho and its outskirts. This will include the construction of domestic and public buildings, such as school blocks, flat etc.

CHAPTER TWO

LITERETURE REVIEW AND THEORY

2.1 SITE LAYOUT AND ORGANIZATION

As far as building project is concerned any initial planning process can take place to ensure that site is effectively laid out for the various activities to flow smoothly without affecting administration work and construction.

The period after tender acceptance is actual starting date called the pre-construction period is the time to carry out this exercise. The arrangement of site huts, storage shed Plant Park and the placing of loose materials, mixing bay and so on, will be more than likely be the risk consideration on site and the last move on project completion for easy take of work. This orderly layout; Greeno (1986) shows operatives that are employed by an organization with planning care and consideration in mind. To the general public, the impression created is one of efficiency, which is a good advertisement. Through the public and the period of a project, a good tidy site will often reflect the efficiency of the site supervisor; reduce work and purposeless movement of plant and material [double handling] hence reduce the cost of project.

2.1.1 MOVEMENT ON SITE

According to Jessop et al.(1986), before any specific consideration and decision can be made regarding site layout, much attention should be given to access to site. This access concerns the vehicles and workers on the project site; this must be considered for both on and off site access. Routes to and fro the site must be checked as to the suitability for transporting all the materials required for the proposed project. Access

on site for deliveries and general circulation must be carefully considered, vehicles delivering materials to the site should be able to do so without difficulty or delay.

2.1.2 SITE OPERATIONS

Good logical operations are essential to profitability; Randy and Branley (2011). At the building construction site, numerous operations are carried out on site which contributes in the construction of building. Contractors who have tendered for the contract must alternatively consider certain factors by planning, organising and controlling activities is the decision making process to influence the condition of environment for a better productivity.

Engineers do not do the work alone they works with their supervisors and operatives to formulate plans to aim at a goal. Whilst workers perceive themselves as members of the project in that area, behaviour emanate from standard set by group to which the workers belong not from standard being imposed by the contractor. Attention should be taken to avoid item-interrupting work during construction activities at the various stages of a project. The procedure is to list all the items and storage that will be needed on site and location their position on site.

2.2 SECURITY MEASURES AND PROTECTION ON SITE

According to Crudely and Greeno (1999), most site security of materials pose the biggest problem to site supervisors. Theft, pilfering, vandalism and other losses add to the value of materials to be written off as a loss or waste. In constantly being vigilant to the serious problem of waste, a suitable system of materials control should be

adopted using specially designed forms to show present stock, deliveries, amounts used and percentage waste.

2.2.1 SITE SECURITY

In order to meet insurance requirement or incentives, construction companies must put a security plan in place for every construction site; McGraw-Hill (2013). It is a very significant aspect of site layout, which is often not taken seriously by contractors. If after the concern for optimizing the use of material and components, no care is given in retaining them and for that matter all the time, money and effort would have to be wasted, then no site should therefore not to be protected.

In order to do these, construction companies when executing projects put in plans security system. It is aimed at reducing pilfering of material on site and those activities seem to be going on at various sizes during construction. This can be attributed to insufficient of security system. But is not of prime important that this behaviour are dealt with drastically or stopped. It is not only hampering the progress of work but affect the project margin that the contractors will have.

In considering site security system, three (3) factors in the construction site need to be considered. These are;

1. Loss of material and goods on the site
2. Vandalism
3. Injury to passers-by or children on site

2.2.2. LOSS OF MATERIAL AND GOODS ON THE SITE

Before any security system is put in place, it is vital to understands how material or goods get lost on site or are wasted there are great loses caused by workers who work

there on the site, but estimates as high as 5% -10% of the total damage or material cost having been made material taken from the site are by outsiders and those working gaining chances. An item which cannot be taken into store room like metal bars, iron rood etc. should be put under shade with coil chains are padlock them.

One that be sent into the storeroom should be on platforms or racks which will prevent it from distortion and also there should be no window on the store. The storeroom doors must be locked with well burglar-proof metal whiles light is always provided around the area. The contractor should employed competent men to see to the materials, which are brought to the site. With this, if there is incurred loss, he will be responsible. Large or bulky items are more difficult to secure and to protect but deterrents such as fencing or hoarding is used.

2.2.3 VANDALISM

Whenever construction work is going on, there will always be related problem of theft and vandalism; Farinloye et,al. (2009). This is another possible type of lost; it is the destruction of goods, plant and materials that occurs too often on the building site by outsiders rather than operatives. So the way of preventing outsiders from the site is essential factor and that has been the problem associated in the construction site. Also contractors should look at areas of operation where there is greater risk of stealing. This is usually or identified from Past project undertaken. The workers to be employed and length of time projects are all considered in setting out proper and effective security system.

2.3 SITE SAFETY

A contractor with a poor safety programme can adversely affect quality, productivity, schedules and overall cost; Lawrence Bennett (1999). In most construction site, research has shown that pieces of broken block, pieces of timber treads with nails in there are all the time left on the site which create environment unsafe for the proper operation of the work. The facts remain that accident continues to occur on the construction site and it site safety is neglected by contractors, the consequence of an accident in detrimental to the progress of work and also affect the project margin of the contractor. Accidents will not only cause injury to the operatives involve but also cause delay in the construction time with the related cost.

2.3.1 LIGHTNING AT THE BUILDING SITES

Chudley R. (1999), Inadequate light account for more than 50% of the loss of production on construction site and also increase the risk of accident and lowers the security of the site. The initial cost of installing a system of artificial lighting for both internal and external activities can usually be offset by higher output, better quality work, a more secure site and apportioning the cost over a number of construct on a use and re-use basis. The reason for installing a system of artificial lighting on a construction site can be listed as follows:

- Inclement weather, particularly in winter when a reduction or natural daylight is such that the carrying out of work becomes impracticable. Without adequate light all activities on construction site carry on increased risk of accident and injury.
- Avoid short-time working due to inability to see clearly enough for accurate and safe working.
- Improve the general security of the site.

Some of the benefits that may be obtained by installing and using a system of artificial lighting on a construction sites are:

- Site activities can be arranged to suit the needs of the contract, the availability of material and the personnel involved.
- Overtime and extra shifts can be worked to overcome delays that might occur from any cause.

Reduction in the amount of spoilt material and the consequent rectification cause by working under the inadequate light. Improved labour relationships by ensuring regular working hours. Planning the lighting requirements depends on site layout, size of site, shape of site, geographical location, availability of an electrical supply and the planned activities during the dry period. Temporary artificial site lighting should be easy to install and modify as needs change and the easy to remove whilst works are skill in progress. The main objective s of site lighting is to enable man and machinery to move around the site in safety and to give greater security to the site. Areas of local danger such a excavations and obstructions should however be marked separately with red warning lights or amber flashing lamps

2.3.2 BEAM FLOODLIGHT

Tungsten filament or mercury vapour lamps could be used on the construction sites to supplement other forms of lighting. Beam floodlight are used to illuminate areas from a great distance. The light is intense producing light glare and should therefore be installed to point downwards the working area.

2.3.3 WALKWAY LIGHT

Tungsten filament and fluorescent lamps are used to illuminate access route such as stairs, corridors and scaffolds. Bulkhead fitting that can be safely installed with

adequate protection to the wiring can be run off a main voltage of 240v single-phase but if they are in a position when they can be handed a reduce voltage of 110v single-phase should be used. For lighting to scaffold of 4 or 5 boards with 60w lamps placed at not more than 6.0m centres and preferably at least 2.4m to 3.0m above the working platform, either to the wall site or centrally over the scaffold.

2.3.4 LOCAL LIGHTING

Clusters of pressed glass reflector flood lamps, tungsten filament lamps, festoons and adjustable fluorescent can be used to increase the surface illuminate at local points. Particularly where finishing trades are involved they also reduce the shadow casting from working plane.

However, another system that can be used for local lighting is flame lamps which normally used propane gas as the fuel, which produce a great deal of local heat and water vapour, the lather may have the effect of showing down the drying out of this building. An alternative fuel to propane gas is butane gas but this fuel will not usually vaporise at temperature 1 degree Celsius. Whatever method of illumination is used on a construction site, it is always advisable to remember the axioms " a workman can only be sage and work well when he can see where he is going and what he is doing"

2.4 SITE ACCOMODATION

According to Chudley R. (1999), apart from this minimum requirement, the main areas of concern will be sizing, equipping and setting the various units of accomodation. The contractor has to decide immediately after the plan has been prepared and carefully studied. The site accommodation comprises site office, dry

rooms for operations, canteen, store, toilet facilities, workshop etc. Depending on the size of project and the space available within the site boundary and proximity of service to such accommodation facilities may not be required due to the lost involved. But especially on the large contract such as industry and estate houses, it is possible to provide such facilities for the work required.

2.5 AREA OF STORAGE MATERIALS

The major reasons on site are materials, personnel and plant, ultimate responsibility for their control lies with the site manager but he will delegate the responsibility to resource manager to cover each sector. Materials are likely to be supervised by the store man personnel and the assistant site manager; Greeno, R.(1986)

Walter, A. (1984) defined material storage as, the provision of adequate space, protection and control for building materials and components held on the site during the construction process. At the commencement of a contract site layout plan should be drawn how to outline the construction working areas and to show all the site facilities (hut) etc. And materials storage areas which are codified for the various key bulk or valuable materials. A storage compound layout would also save to highlight to everyone concerned where the various delivered materials are to be plane for safe keeping.

To ensure that stored materials are secured but readily available when required, store should therefore be located such that they do not interfere with any work in progress but are really accessible for both the deposit and removal of goods storage of material depends on the following factors:

(i) Point of use of material; the main consideration is that, material should be stored at the appropriate place where it is near to the point of use as it is physically possible. Where the point of use is at a height, the storage will be adjacent to the lifting appliances. Wherever possible, it is advisable to remove the material from the transport to the point of use.

(ii) Ease of access and off-loading: if the material as to be kept and stored until it is moved to the point of use, the storage area must be located at where material can be brought safety and easily .Majority of suppliers state in the supply condition that the contractors must provide adequate facilities for the safe access of the vehicle thus a well consolidated road.

(iii) Planned rate and sequence of working: The location of storage areas could make easily by studying the overall mature of the programme of the contract and the scheduling for the delivery progress of material.

Actually, the programme of schedule can be structured for the time, amount and dates for the delivery of major components materials. The area of storage can be given five dimension times for allowance for facing of delivery.

(iv) Storage requirement: this will limit the demarcation of the storage area because it will or may need to be under the shade in full protection or in a room under lock prevent pilfering, theft and vandalism.

(v) The size of load: mostly, it has direct influence on the storage location. A load consists of small items, which can be distributed over a number of areas whereas large items require relatively large area. If the load cannot fit into the life facilities, the contractor should call for discussion with the supplier in the view of changing delivery made with the one suitable for handling and storage on the site.

The availability of space for storage of materials is classified into three parts. These are:

(a) Limited space: When after the location of space, the surplus left is minimised all the facilities required by the work could be located without too much disturb within the confines of the site.

(b) Unlimited space: The area available will not impose any restriction on the storage facilities that is necessary. There could be a danger of facilities and a storage areas being unduly spread out creating unnecessary long journey between point of storage and place of work.

(c) Restricted space: This does not permit a full employment of the necessary facilities and some of these packages have to be forfeited. For example, car parking areas and reduction of material storage areas. With a material bringing to site need to be negotiated with supplied to delivering to site when needed for specific work.

2.6 SITE CONTROL OF MATERIAL AND WORKMANSHIP

To have an effective material handling and storage, managers must take an active role in it development .Supervisors must be convince of the importance of controlling materials and storage, and must be held accountable for employees training.

Not only the inspection that needs to be carried out with care but it should also replace damaged good which escalates with the delay in their discovery and it can be shown that the cost is found to be defective after the completion. It can be as much as three times the original cost. This can represent the difference between the profit and loss.

However, it is therefore most important that all materials are thoroughly checked and inspected when they first arrive on site. Although workmanship can be in manner and

must receive constant supervisions to ensure one stage is corrected before proceeding to the next.

2.7 LOCATION OF PLANT

Most often at building construction site, plants that are needed to facilitate work are placed in the advantageous position to enable construction work finish up within specified period that have been objected for. This goes a long way demarcating the site properly to meet a required standard. The formulating policy for the selection of plant which will be needed for executing the project will be determined by the contractor and the nature of job at hand and the area being allocated for plant will allow the type, size and shape of the specialised items of the plant on site. If the hiring machine cannot occupied the space available for so long, the contractor will adjust its network programme and employ more labour force to use the machine for the objective work that have been drawn on the using of the machine instead of one month, it can be used for two weeks and the machine is send back. In the other way round, it will help the other activities to move faster. Nowadays, these machines such as loader, forklift, trucks, excavators etc. are now available which provides degree of flexibility in the site layout consideration.

CHAPTER THREE

METHODOLOGY

3.1 INTRODUCTION

The development issues and problems arising from site layout practice with regards to the construction industry as presented in this project work were realised from a research study. This chapter deals with data collection procedures and methods. It includes the research techniques employed with the source of data details of sample sizes and composition, a description of the methods analysis employed and explanation observed thus describes the approach to the study and presented an overview of the procedure adopted in arising at the relevant information.

3.2 RESEARCH DESIGN

Qualitative research design is selected for the research. This was undertaken by the researcher to actually observe what took place on the construction site in terms of site layout practice.

The study involves survey; assessment of views, collecting data, questionnaire, checklist to cross-check items included in the site layout plan and personal interview on site layout practices in the construction sector. The strength of the survey technique is the reduction in cost, great scope and quick way of obtaining some information. This type of approach is the most comprehensive and systematic one that could produce a reliable and undoubtful result of the research.

3.3 POPULATION

The population for the study included members of the building team namely: Storekeepers, Contractors, Site supervisor's, Trade foremen and Casual workers. It also included construction firms in Ho Municipality.

3.4 SAMPLING TECHNIQUES AND SAMPLE SIZE

The researcher used quota and convenient sampling techniques to determine the sample size for the study. This is to make sure that certain sub-groups of unit represented in the sample are approximately in the same proportion as they are represented in the population. The total sample size for the study comprises of ten [10] construction companies that were selected randomly from the whole population of which some information would be obtained from Sixty (60) targeted members of the building team, who were also selected at random. Some selected members of the building teams are given quota allocation as represented in the table1.

Table 1: Quota allocation of the Building Teams

BUILDING TEAM	TARGETED NUMBER	PERCENTAGE
Storekeepers	13	21.7
Contractor	10	16.7
Site supervisors	17	28.3
Trade Foremen	12	20
Unskilled Labourers	8	13.3
TOTAL	60	100

3.5 DATA COLLECTION TECHNIQUES

The data collection techniques for the study involved; questionnaires, interviews and observation of what goes on at the site, concerning site layout practice. This will

enable the researcher, observe and cross-check things in the course of operation and acquire information.

3.5.1 QUESTIONNAIRES

Questionnaires were developed and administered to the ten (10) construction firms selected. In all, thirty-five (35) structured questionnaires were circulated to twelve (12) Storekeepers, Seventeen (17) to site supervisors working at the site. The issues in the questionnaires focused on the constrains regarding site layout practice such as;

- Personal Information
- Site Layout Planning
- Accommodation on Site
- Site Security
- Service on the Site
- Areas of Storage Materials
- Site Welfare
- Company's Background
- Company's Performance Dimension

3.5.2 INTERVIEWS

Structured interviews were developed and conducted for ten (10) contractors, twelve (12) trade foremen and nine (9) unskilled labourers. This strategy was adopted to create the atmosphere for the participation of all categories of people in the construction field. The interview focused on very serious issues on site layout practice. The researcher was guided by an interview schedule. Among the issues raised are; types of security system adopted by firms, how site are planned before the commencement of work etc.

3.5.3 OBSERVATION

In order to support the data gathered for the research work, a number of visits were made to some site at Ho Municipal, where works were going on, to observe the site layout and also cross-check to see if the layout at the various sites are in full force. The security system, how workforce work during working hours and other constructional practice used were considered.

CHAPTER FOUR

RESULTS AND DISCUSSION OF THE STUDY

4.1 INTRODUCTION

This section of the research study deals with the presentation and analysis of results from the Field Survey. During the course of the study, a number of construction companies were visited at the study area. Almost all the sites visited had their own construction procedures. The results are based on the data obtained from questionnaires, interviews and personal observations.

4.2 PRESENTATION OF RESULTS OF QUESTIONNAIRE

This section presents results on a total number of thirty (30) questionnaires which were designed and distributed to members of the building team namely; thirteen (13) Storekeepers and Seventeen (17) Site supervisors. A total number of thirty (30) questionnaires were distributed and all were retrieved after a follow - up by the researcher. The breakdown of questionnaires issued and received in percentages are in tables 1 and 2. The results of responses from the questionnaires are presented in the table below with the analysis of the study obtained from the above mentioned members of the building team respectively; whiles copies of questionnaires are in the appendix.

SECTION A: Background of Respondents

Table 4.1.1: Responses to questionnaires

Classification	Issued	Received	Returned (%)
Storekeepers	13	13	100
Site Supervisors	17	17	100
Total	30	30	100

Table 4.1.2: Overall Percentages of Responses to Questionnaires

Classification	Received Questionnaires	Overall Percentages (%) of Questionnaires
Storekeepers	13	43.3
Site Supervisors	17	56.7
Total	30	100

SECTION B: Response from Storekeepers

4.2.1 Employment Status

Figure 4.1.1 shows the results of employment status of the respondents

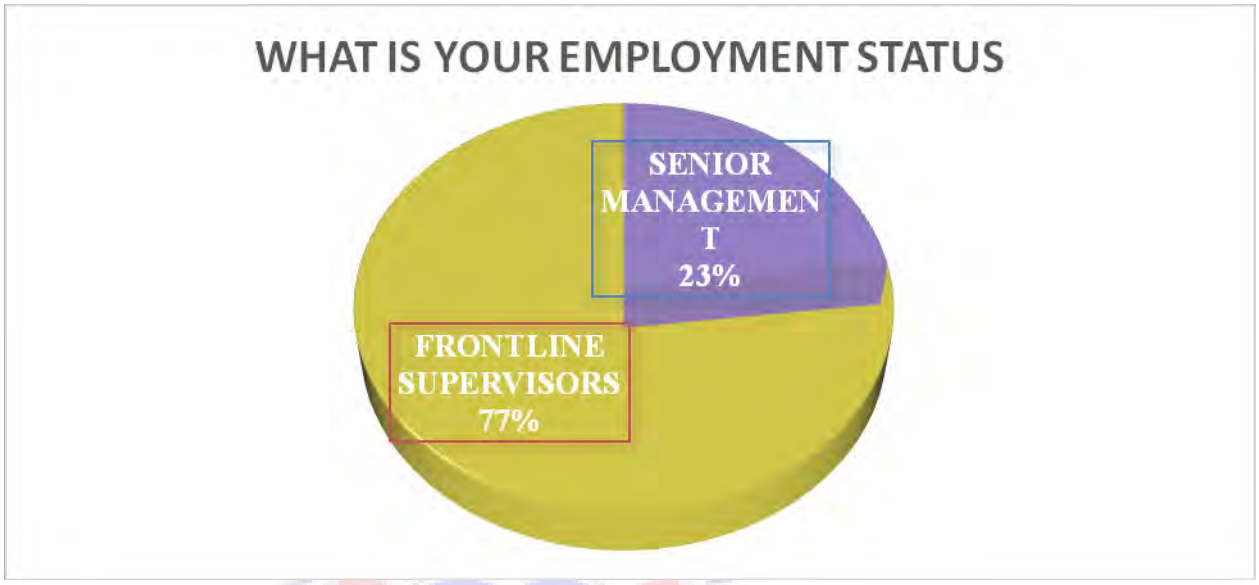

Fig. 4.2.1 Employment status

Responses from respondents (from Fig. 4.1) on employment status indicate that more than half of the respondents were Frontline Supervisors representing Seventy - seven percent (77%), the other twenty - three percent (23%) indicates, they are senior management Staff. Adding to this information, most of them are noted to be non - professionals but practicing as Storekeepers

4.2.1 Experience with the Company

Figure 4.2.1 shows the results of the experience of respondents with the company.

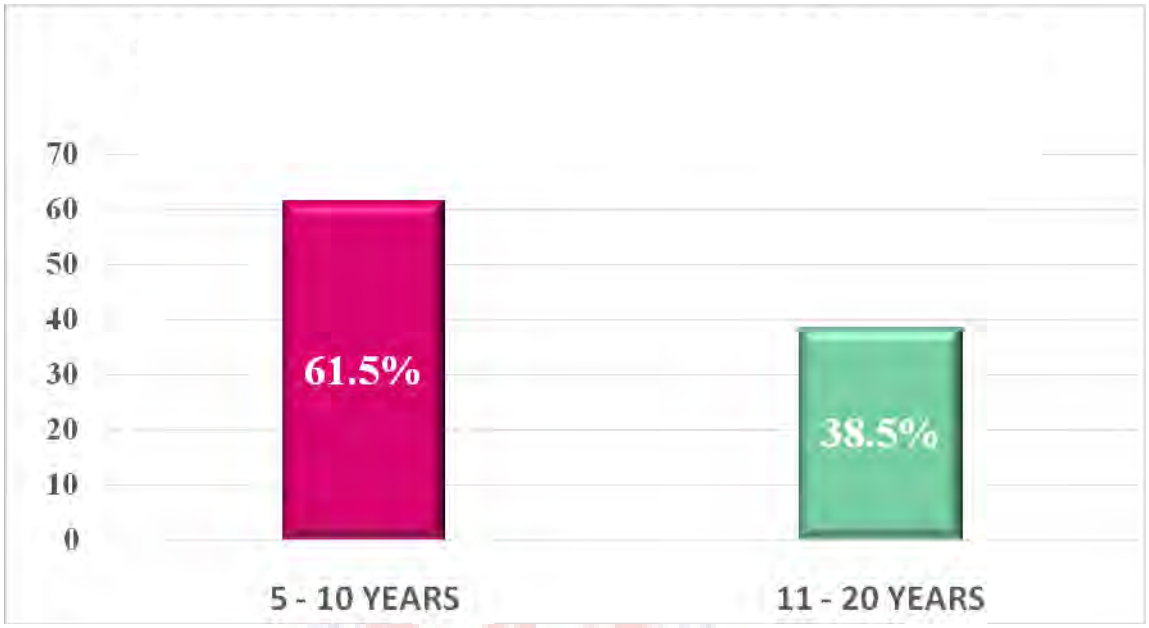

Fig. 4.2.2 Experience with company

Result about employment duration in Fig. 4.2.1 indicate that eight (8) of the Storekeepers representing 61.5% worked between 5 and 10 years whiles 5 of them representing almost (38.5%) worked between 11 to 20 years. To conclude, neither of the respondents worked either 0 - 4 years or 21 years and above. This shows that, greater part of them worked for quite some few years at that position which indicates there is a suspicion that, they did not have much experience.

4.2.2. Quality of Systems of Storage

Figure 4.2.2: Contain the responses on the quality of systems of storage of construction materials.

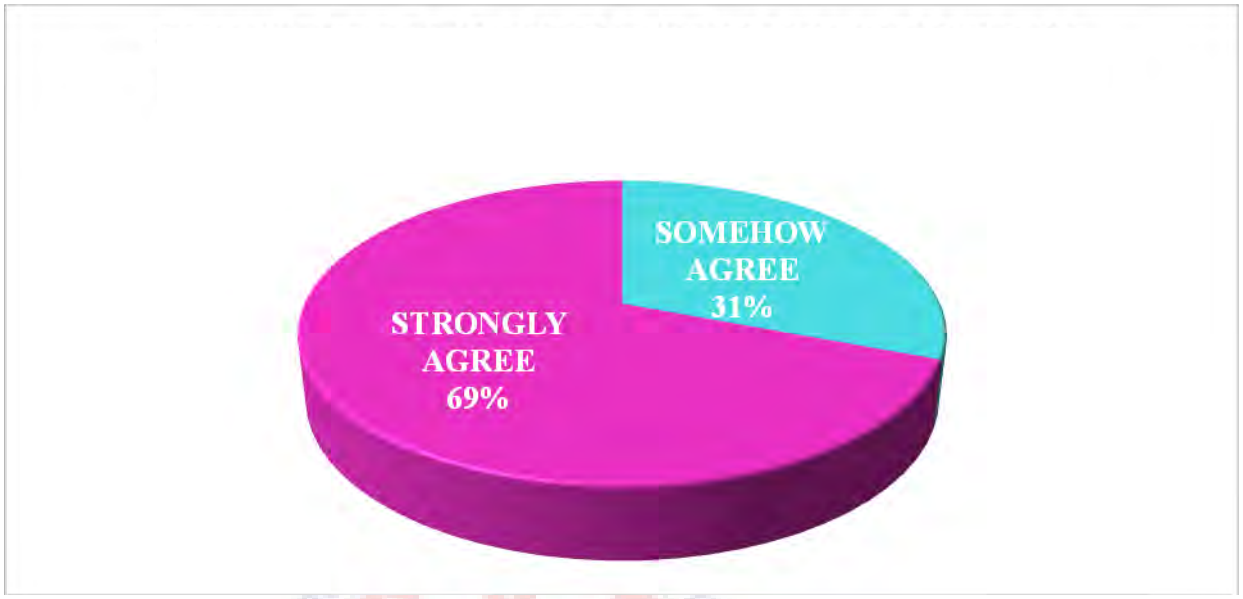

Fig.4.2.2. Good quality system of storage of construction material on site

Investigation on the extent at which good quality system of storage of construction material on site help reduce time and cost of construct sum in Fig. 4.3 revealed that nine (9) of the respondents represent (69%) indicates that, they strongly agree to that effect while the rest made up of Four (4) representing (31%) were not all that convinced. Nobody disagree to that effect.

4.2.3. Planning of Storage Area

Figure 4.4 contain the responses on the planned storage area on site.

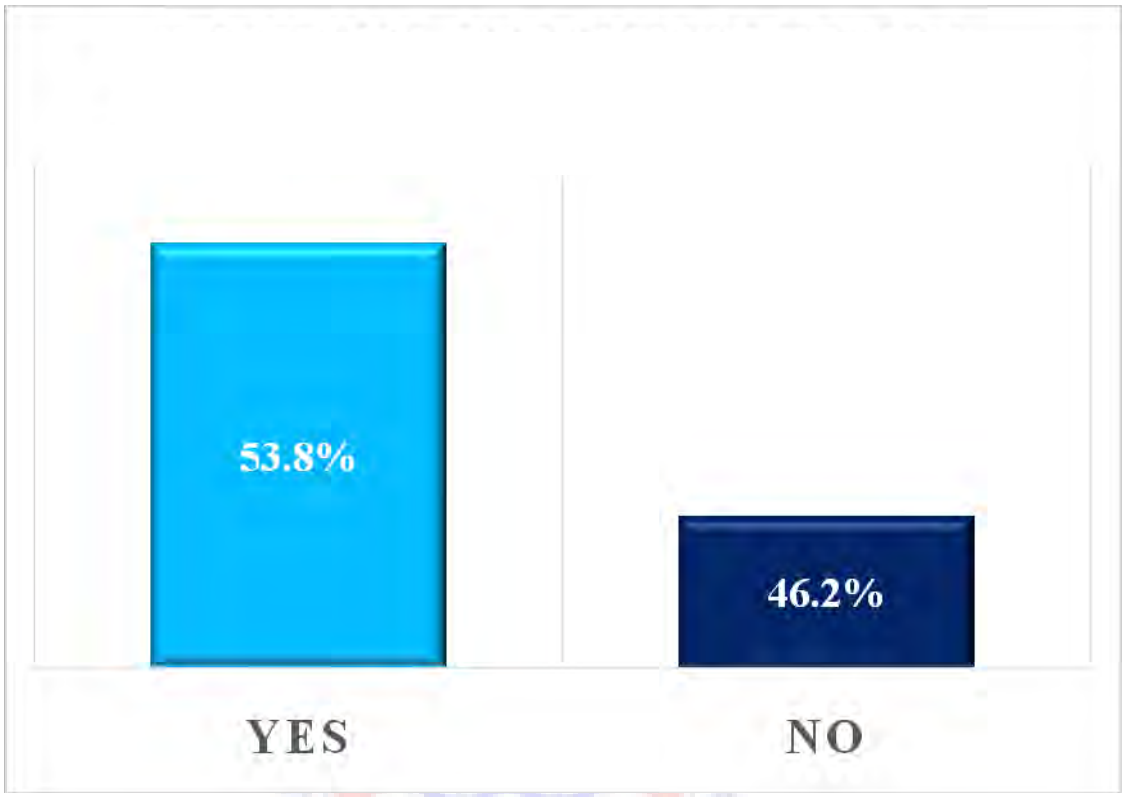

Fig 4.2.4 Planned storage area on site

Investigation on Site storage area planned on the various construction site in Fig 4.4 shows that, Seven (7) out of thirteen (13) respondents representing (53.8%) indicates that, the various firm practice Site storage planning arrangement; whiles the rest made up of six (6) representing (46.2%) confirmed that there is no such arrangement on the site, rather, materials are brought from the main..... store to the site of construction on demand.

4.2.4. Proximity of storage to construction site

Figure 4.2.4. Contain the responses on the proximity of storage to construction site.

Fig. 4.2.4 Proximity of storage to construction site

Describing proximity of the storage area on site, relating to the various construction companies, majority (10) representing Seventy-seven percent (77%) responded that storage area is near to the construction site whiles two (2) respondent representing Fifteen percent (15%) said Site storage area is somehow nearer to construction site. Only one (1) respondent representing eight percent (8%) indicated that, their site is very near to the storage area on site. this show that, more than half of the construction firms have their storage facility some hoe close to the site.

The respondents were asked to rate the storage standard of some types of building materials listed on a four-point Likert scale. For purposes of interpretation the following shall apply for the mean score: 1-1.5 =not good; 1.6-2.5 = fairly good; 2.6-3.5 =good; 3.6-4 = very good.

Mean score above 2 implies that the storage standard under consideration is good. The ratings were ranked according to the mean scores (**MS)** calculated using the Statistical Package for the Social Sciences (SPSS). In the analysis, a rating with a higher mean was ranked higher than another with a lower mean. In other cases where they have the same mean and the same standard deviation, they were ranked in alphabetical order. The Table below illustrates the ranking of the factors.

Table 4.1.2 Arrangement of material in stock

Rank	TYPES OF BUILDING MATERIAL	N	Mean	Standard Deviation
1	Electrical and plumbing accessories	13	2.92	0.641
2	Finishes and Fitting	13	2.92	0.641
3	Roofing Units (eg. Aluminium)	13	2.92	0.641
4	Building Units (eg. Blocks and Brick)	13	2.77	0.439
5	Binding agents (eg. Cement and lime)	13	2.54	0.776
6	Reinforcement rods	13	2.46	0.519
7	Timber and wood material eg. Plywood	13	2.46	0.519
8	Fine and course aggregates	13	2.23	0.439

From the table items 1- 4 falls within the category of “good” according to respondents, while items 5-8 were adjudged to be “fairly good”. This means that respondents believe that none for the material stock arrangement on their site could be considered as “very good”.

4.2.5 Nature of site

Figure 4.2.5: Contain the responses on the nature of site.

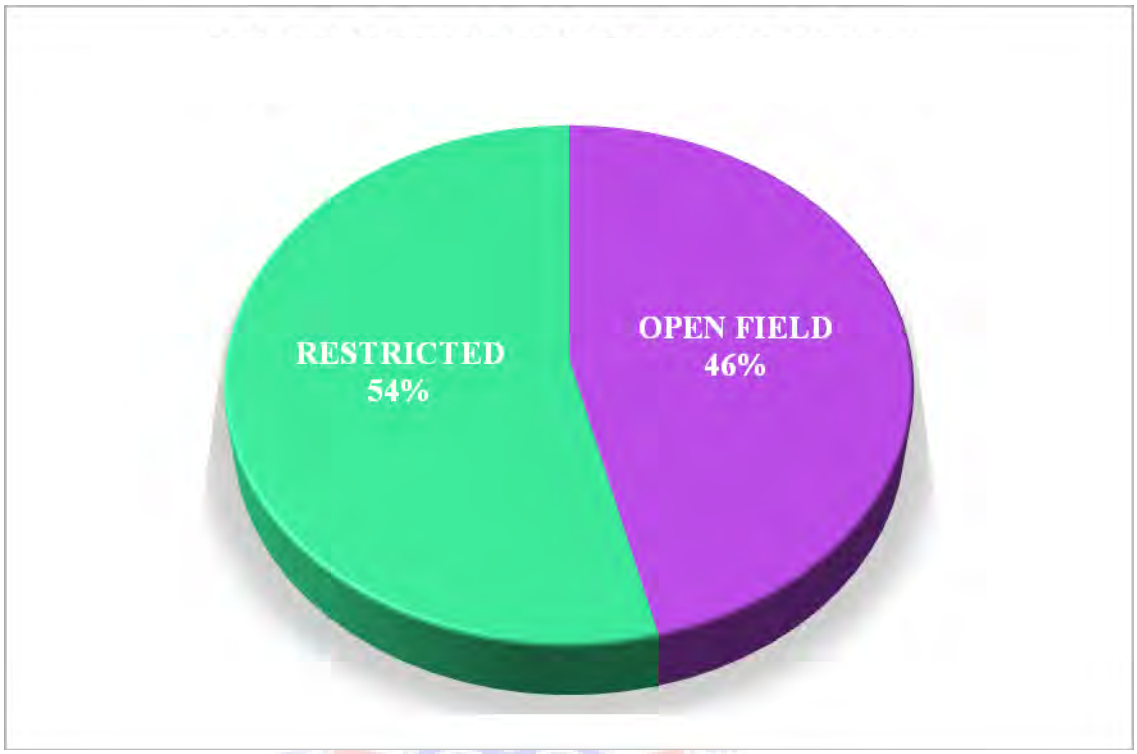

Fig. 4.2.5. Nature of site

Results about the nature of the various firms site indicated that, seven (7) out of the thirteen (13) respondents (Storekeepers) representing Fifty-four percent (54%) indicate their site is restricted whiles the rest, six (6) representing Forty-six percent (46%) indicted that, their site is an open field. This shows that, quite a good number of firms

4.2.6 Type of security system on site

Figure 4.2.6 contain the responses on the type of security system on site

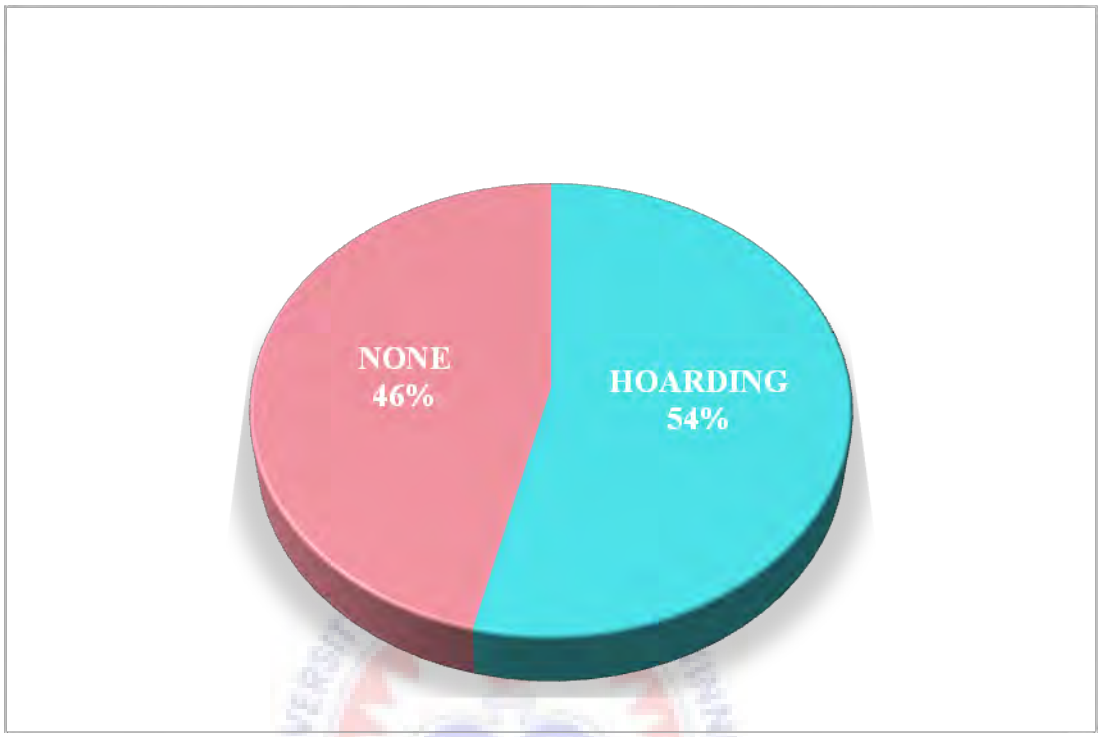

Fig. 4.2.6 Type of security system on site

Considering the type of security system constructed by the firm, Seven (7) out of the respondents indicating Fifty-Four percent (54%) chose hoarding while the rest, six (6) representing (46%) reveal they do not hoard their site.

4.2.7 Stressed on material on sites and protection in terms of security

Figure 4.2.7 contain the responses from respondents (Storekeepers) on how materials are stressed on sites and protection in terms of security

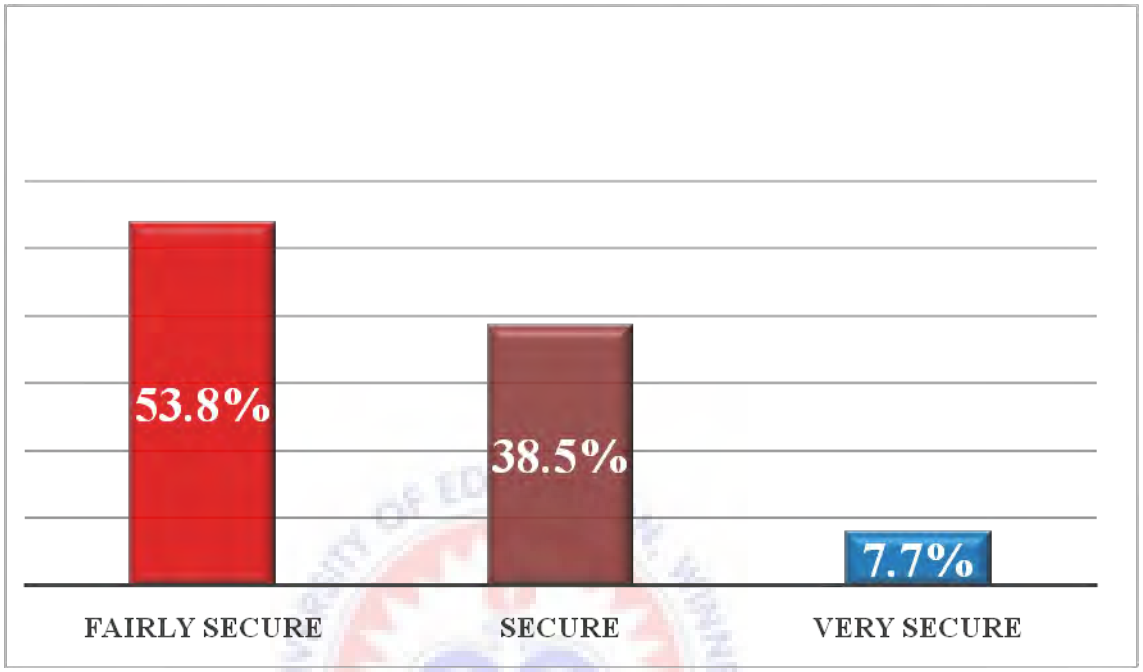

Figure 4.2.7 stressed on materials on sites and protected in terms of security

Responses from respondents (Storekeepers) on how materials are stressed on sites and protected in terms of security, Seven (7) out of thirteen (13) indicating (53.8%) reveal their material are fairly protected on site, while five (5) of them representing (38.5%) indicate they always secure their materials on site in terms of protection. Only one (1) out of the thirteen (13) representing (7.7%) indicates their material is very secure on site in terms of protection.

Table 4.1.3 contains respondents view on pilfering of materials on site.

NO OF TIMES	FREQUENCY	PERCENT
1 - 2 TIMES	0	0.0
3 – 5 TIMES	0	0.0
6 – 9 TIMES	5	38.5
10 AND ABOVE	8	61.5
Total	13	100.0

Table 4.1.3 contains respondents view on pilfering of materials on site.

Respondents view on pilfering of materials on site, all of them agreed there is always pilfering on their site. This clearly shows that all the firms do not attach any seriousness in protecting their materials on site.

On how many times does pilfering occur at their site, eight (8) out of thirteen (13) repre heir firms whiles the rest, five (5) representing (38.5%) indicates that pilfering occur between six (6) to nine (9) times in their firm. None of them either picked between one (1) to two (2) times and three (3) to five (5) times meaning there are serious pilfering taken place on site.

4.3 Measures put in place to prevent pilfering on site.

Figure 4.2.8 contains responses on measures put in place to prevent pilfering on site.

Fig 4.2.8 Measures put in place to prevent pilfering

On measures put in place to prevent pilfering at the site, seven (7) respondents out of the thirteen (13) representing 54% indicates operations are checked at the entrance before they leave the site. The rest, six (6) out of the thirteen representing 46% rvals. None of

4.3.1 Employment Status

Figure 4.2.9 contains the employment status of workers

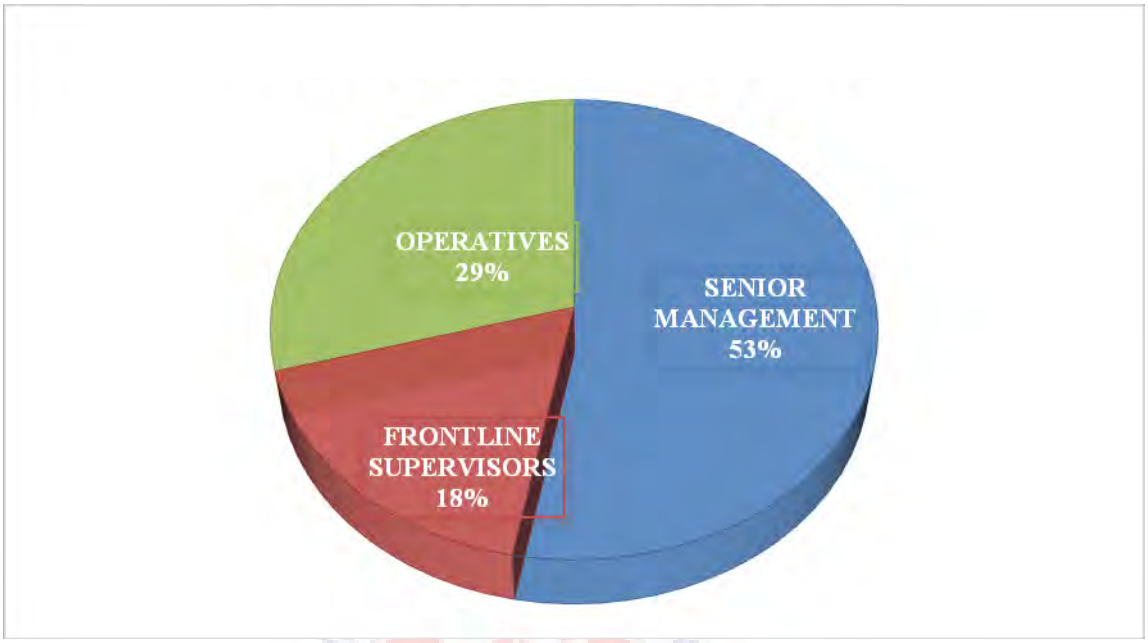

Fig 4.2.9 Employment status

Respondents from Fig.4.3 above on employment status indicated that, nine (9) of the seventeen (17) respondents representing (53%) are Senior Management, five (5) out of the seventeen (17) respondents representing (29%) are Operatives whiles the rest, three (3) representing (18%) are Frontline Supervisors in their respective companies.

4.3.2 Employment durations of workers

Figure 4.2.10 contains responses on employment durations of workers

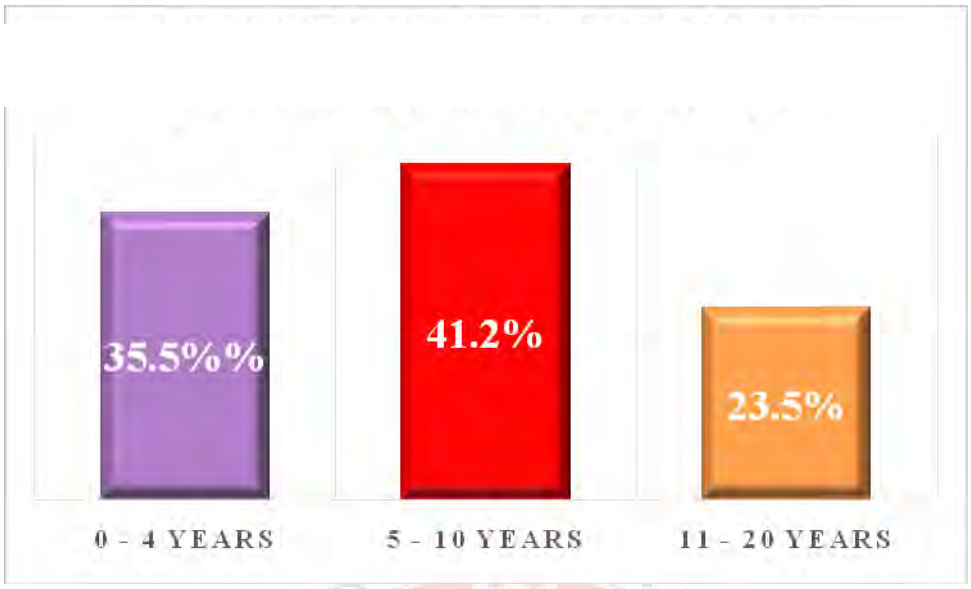

Fig. 4.2.10. Employment durations of workers

Talking about employment durations, seven (7) respondents representing (41.2%) of Site Supervisors worked from 5 – 10 years and six (6) of them representing (35.5%) worked for 4 and below years. To conclude, four (4) representing (23.5%) worked between 11 – 20 years which means that most of the Site Supervisors might have gained enough mastering and experience on efficient Site Management and supervision.

4.3.3 Companies background information

Efforts made for brief information on companies background; their operating licenses as laid down in the White Paper on Guidelines for the classification of Contractors for Building and Civil Work by the Ministry of Water Resources, Works and housing. These classifications are based on capacity of personnel, Equipment, Finance and Experience is presented as follows;

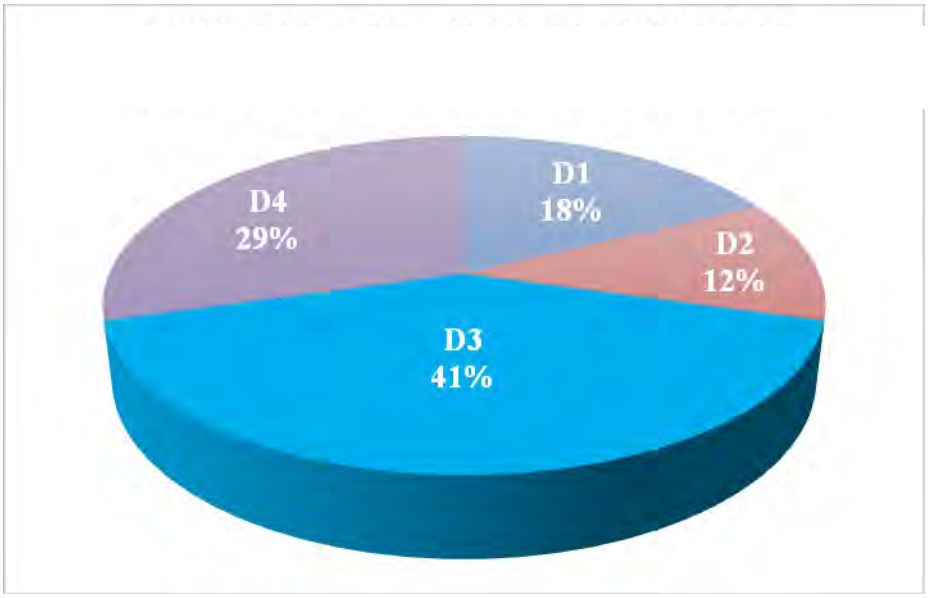

Fig. 4.2.11 Companies background information

A section of the respondents made up of seven (7) representing (41%) responded that, their companies operate with license D3 whiles five (5) of the representing (29%) indicated that their companies operate with license D4. A small number of them, three (3) respondents representing (18%) also indicated that their companies, for which they work possessed license D1 whiles the rest, two (2) representing (12%) claimed their companies operate with license D2. In terms of respondents' responses on the company's duration, Site Supervisors responded and have been interpreted below;

4.3.4 Company experience

Table 4.1.4 contains responses on company's experience

NO OF YEARS	FREQUENCY	PERCENT
1 – 2 YEARS	0	0.0
3 - 4 YEARS	3	17.6
5 - 6 YEARS	4	23.5
7 YEARS AND ABOVE	10	58.8
Total	17	100.0

Ten of them representing (58.8%) revealed that, their companies were in existence for the past seven (7) years and more, four (4) of them representing (23.5%) of companies worked for 5 - 6 years whiles the rest, three (3) representing (17.6%) also indicated that their companies were in existence for the past 3 - 4 years.

4.3.5 Company's Status

Table 4.1.5 contains responses on company's status

		ERCENT
LOCAL	17	100
FOREIGN	0	0

To verify the company's status, all the seventeen (17) Site Supervisors discussed above representing (100%) responded that, their various companies operate as local firms. This indicates clearly that all their construction activities are limited to Ghana only.

4.3.6 Current working strength of company

Figure 4.2.12 contains responses on Current working strength of company.

Fig. 4.2.12 Current working strength of company

Responding to staff strength by site supervision, majority of the respondents, i.e. Eleven (11) representing (64.7%) indicated that they have staff strength between 100 -

290. The rest, six (6) of the respondents representing (35.3%) indicated that, their companies work with less than 100.

4.3.7 Number of projects executed by the company

Table 4.1.6 contains responses on the number of projects the company undertook within the last five years.

NO OF PROJECTS	FREQUENCY	PERCENT	**POSITION**
0 - 2	1	5.9	**4**
3 - 5	4	23.5	**2**
6 - 9	8	47.1	**1**
10 AND ABOVE	4	23.5	**2**
Total	17	100.0	

In studying the company's performance dimensions, results shows that eight (8) of the respondents representing (47.1%) indicated that between 6 - 9 projects were executed by their companies. Four (4) of them representing (23.5%) indicated that, their companies executed 3 - 5 projects. Four (4) of them, also representing (23.5%) reveal their company executed 10 and above projects. Only one of the respondents representing (5.9%) indicated between 2 and below projects has been executed.

4.3.8 Time extension of project.

Figure 4.2.13 contains responses on time extension of project.

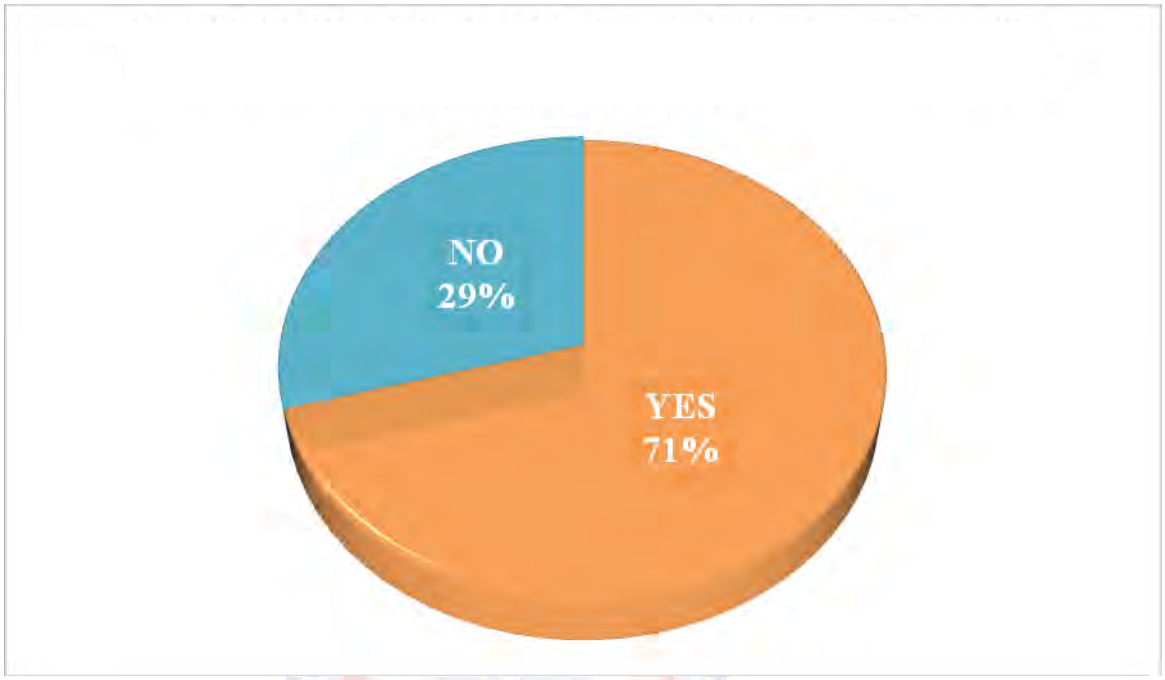

Fig. 4.3.3 Time extension of project

To determine whether the respective companies experience any project extension time, majority of twelve (12) respondents representing (71%) revealed that, most of the projects executed suffered extension times whiles minority of five (5) respondents representing (29%) responded that it was under control.

4.3.9 The percentage extension of time

Table 4.1.7 contains responses on percentage extension of time

% OF EXTENSION	NO. OF TIMES EXTENSION HAS BEEN GRANTED							
	1 – 2 TIMES		3 – 5 TIMES		6 – 8 TIMES		9 TIMES AND ABOVE	
	FREQ	%	FREQ	%	FREQ	%	FREQ	%
0 – 10%	4	33.3	6	50.0	2	16.7	0	0.0
11– 20%	4	33.3	8	66.7	0	0.0	0	0.0
21 – 30%	3	25.0	7	58.3	2	16.7	0	0.0
31 – 40%	4	33.3	7	58.3	1	8.3	0	0.0
41 – 50%	5	41.7	4	33.3	3	25.0	0	0.0

Also efforts made to know the percentage extension of time given, between 0 – 10 %, six respondents representing 50% indicate that, their project were extended between 3-5 times. Four also representing 33.3% indicates their project were extended between 1 – 2 times while the rest, two, representing 16.7% reveals that, their project were extended between 6 – 8 times. Also, between 11 – 20%, eight respondents representing 66.7% reveals their project were extended 3 – 5 times. The rest, four, representing 33.3% reveals their projects were extended between 1 – 2 times. Between 21 – 30 % of the respondents, seven out of the twelve respondents representing 58.3 % indicates, their project were extended 3 – 5 times while three representing 25.0% indicate their project were extended 1- 2 times. The rest, two, representing 16.7% indicated their project were extended 6 – 8 times. Between 31 – 40 %, seven out of the total number of twelve representing 58.3 % indicated that their project were extended 3 – 5 times while four, representing 33.3% indicates their project were extended 1 – 2 times. Only one, representing 8.3% indicates their project were extended 6 – 8 times. Between 41 – 50 %, five respondents, representing 41.7%

reveals that their projects were extended 1 – 2 times. Four representing 33.3% reveals that, their project were extended 3 – 5 times, the rest, three, representing 25.0% reveals their project were extended 6 – 8 times.

4.4 Projects executed in Ghana exceeding its original contract sum

Figure 4.2.14 contains projects executed in Ghana exceeding its original contract sum.

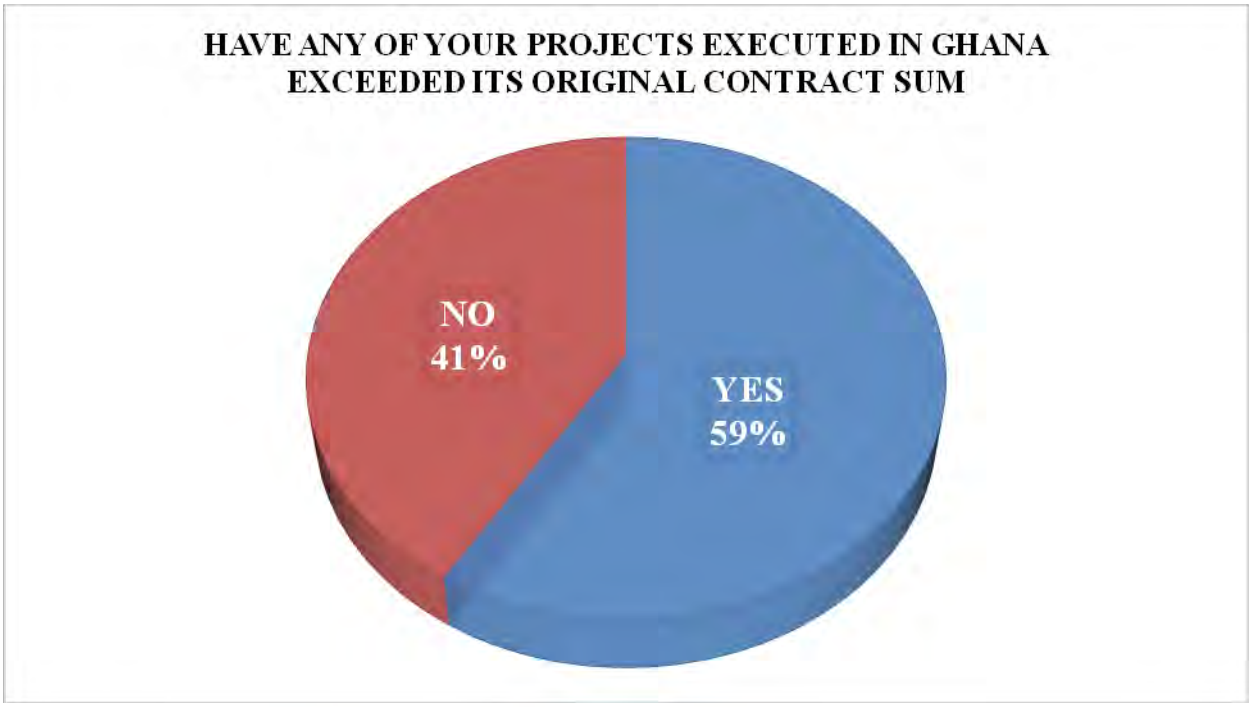

Fig. 4.2.14 Project exceeding original contract sum

To ascertain if the project executed in Ghana exceeded its original contract sum, majority of ten (10) respondents representing 59% indicates yes and the rest seven out of the seventeen (17) representing 41% indicates no.

4.4.1 Percentage of cost overrun

Table 4.1.8 contains responses on percentage of cost overrun and frequency

	PERCENTAGE OF COST OVER RUN AND FREQUENCY?							
% OF COST OVERUN	1 – 2 TIMES		3 – 5 TIMES		6 – 8 TIMES		9 TIMES AND ABOVE	
	FREQ	%	FREQ	%	FREQ	%	FREQ	%
0 – 10%	5	50.0	3	30.0	2	20.0	0	0.0
11– 20%	0	0.0	4	40.0	6	60.0	0	0.0
21 – 30%	4	40.0	3	30.0	3	30.0	0	0.0
31 – 40%	0	0.0	0	0.0	0	0.0	0	0.0
41 – 50%	0	0.0	0	0.0	0	0.0	0	0.0

Also effort made to know the percentage of cost over runs shows that, between 0 - 10 %, five respondents out of ten representing 50.0% indicates the firm do experience cost overrun 1 - 2 times. Three, representing 30.0 % indicates that their firm do experience cost overrun 3 - 5 times while the rest, two, representing 20.0 % indicates six to eight times. Between 11 - 20 %, six respondents representing 60.0 % indicates that, their firm do experience cost overrun 6 - 8 times while the rest, four, representing 40% reveals their firm experience cost overrun 3 - 5 times. Between 21 - 30%, four out of ten respondents representing 40% reveals their firm experience cost overrun 1 - 2 times. Three also representing 30% of the respondents indicates their firm experience cost overrun 3 - 5 times while the rest, three, also representing 30% indicates cost overrun 6 - 8 times. Between 31 - 40 % and 41 - 50 % respectively, indicates there is no cost overrun in their firms.

4.4.2 Project execution before schedule

Figure 4.2.15 contains responses on project execution before schedule

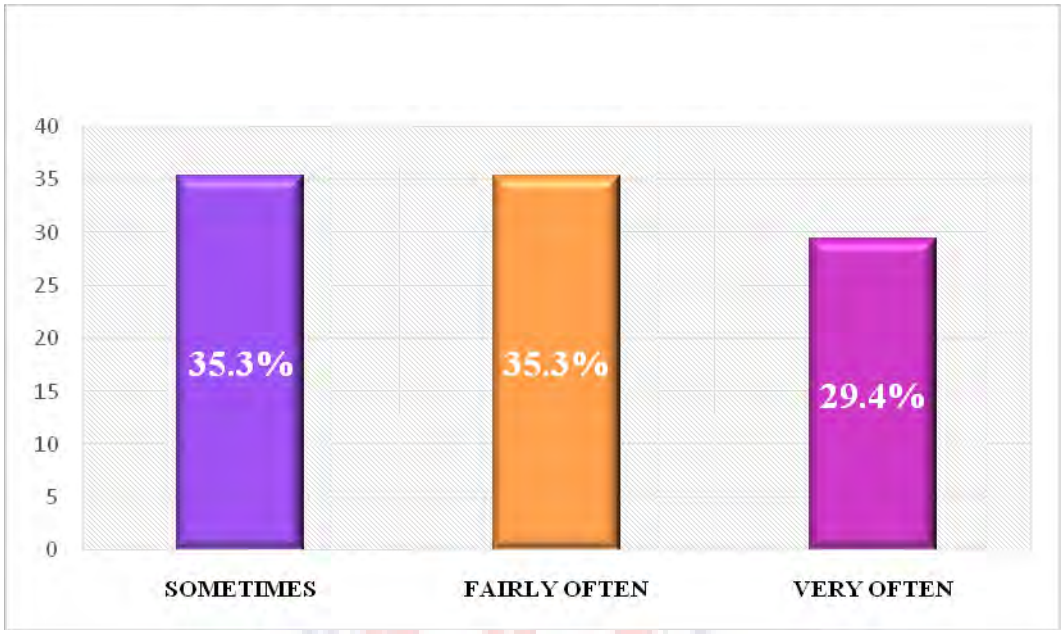

Fig. 4.2.15 Project execution before schedule

On whether the various construction companies met their project deadlines, 35.3% of the respondents indicate, they sometimes finish their project before schedule. 35.3% of the respondents also indicate they fairly often finish the project before schedule. The rest, 29.4% of the respondents indicate very often before schedule.

4.4.3 Queries received on delay of projects

Figure 4.2.16 contains responses on queries received on delay of projects

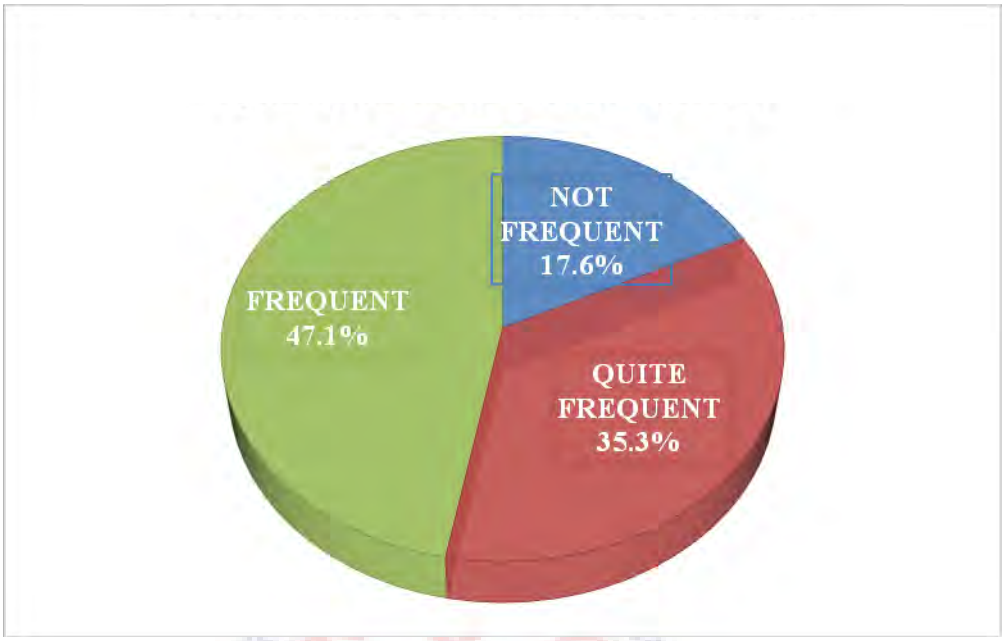

Fig. 4.3.6 Queries received on delay of project

To ascertain whether the construction companies under discussion have received any queries for delays in work, eight out of the seventeen respondents representing 47.1 % reveals that, they are frequently queried for delay of work, six representing 35.3% revealed they are quite frequently queried whiles the rest, three, representing 17.6% indicate they are not frequently queried.

4.4.4 Effects of site layout

Table 4.1.9 contains responses on effects of site layout on some construction activities

ACTIVITIES	NO. OF TIMES EXTENSION HAS BEEN GRANTED					
	NO EFFECT		NEGATIVE EFFECT		POSITIVE EFFECT	
	FREQ	%	FREQ	%	FREQ	%
ACCESS TO SITE	8	47.1	5	29.4	4	23.5
MOVEMENT ON SITE	8	47.1	4	23.5	5	29.4
SITE ACCOMODATION	7	41.2	8	47.1	2	11.8
CANTEEN	10	58.8	6	35.3	1	5.9
STORRAGE AREA FOR MATERIALS	7	41.2	3	17.6	7	41.2
SITE SECURITY	7	41.2	5	29.4	5	29.4
SITE SAFETY	8	47.1	5	29.4	4	23.5
SERVICE ON SITE	8	47.1	3	17.6	6	35.3
LOCATION OF STATIONARY PLANT	7	41.2	8	47.1	2	11.8

When respondents were asked whether planning and control of site layout is necessary on any construction site, all the seventeen respondents responded yes representing 100%. Most of them suggested that, all construction firm should be well planned to meet the standard. Others also were of the view that site layout system should be included in the building plan. On the factors to consider in site layout planning, almost all the respondents came out with the same proposal. To ascertain the effectiveness of some layout on construction site, eight respondents representing 47.1 % indicate no effect on access to site, five representing 29.4% indicate negative

effect on access to site whiles the rest, four, representing23.5% indicate positive effect on access to site.

On movement on site, eight respondents out of the seventeen representing 47.1% indicates no effect on movement on site, four representing 23.5% indicate negative effect on movements on site and five representing 29.4% indicate positive effect on movement on site. Considering site accommodation, eight respondents representing 47.1% indicate negative effect on site accommodation, seven representing 41.2% indicate no effect on site accommodation while the rest, two, representing 11.8% indicate positive effects. Considering canteen, majority of the ten respondents representing 58.8% indicate no effect on site canteen, six representing 35.3% indicate negative effect on canteen while only one representing 5.9% indicate positive effect.

On storage area for materials, seven respondents representing 41.2% indicate no effect on storage area. Seven also representing 41.2% indicate positive effect and the rest three repreenting17.6% indicate negative effect. On site security, seven respondents, representing 41.2% indicates no effect on site security, five representing 29.4 % indicate negative effect whiles the rest five, representing 29.4% indicate positive effect. On site safety, majority of eight respondents out of seventeen representing 47.1% indicate no effect for site safety. Five representing 29.4 % indicates negative effect and the rest four representing 23.5% indicate positive effect for site safety.

In responding to service on site, again eight respondents representing 47.1% indicate no effect for service on site, six representing 35.3% indicate positive effect whiles the rest, three representing 17.6% indicate negative for service on site. Considering the location of stationery plant, seven respondents representing 41.2% reveals no effect for the location of plant, eight respondents representing 47.1% reveals negative effect for the location of plant whiles the rest, two, indicate positive effect for location of plant.

4.4.5 Vandalism on site

Figure 4.2.17 contains responses on vandalism on site

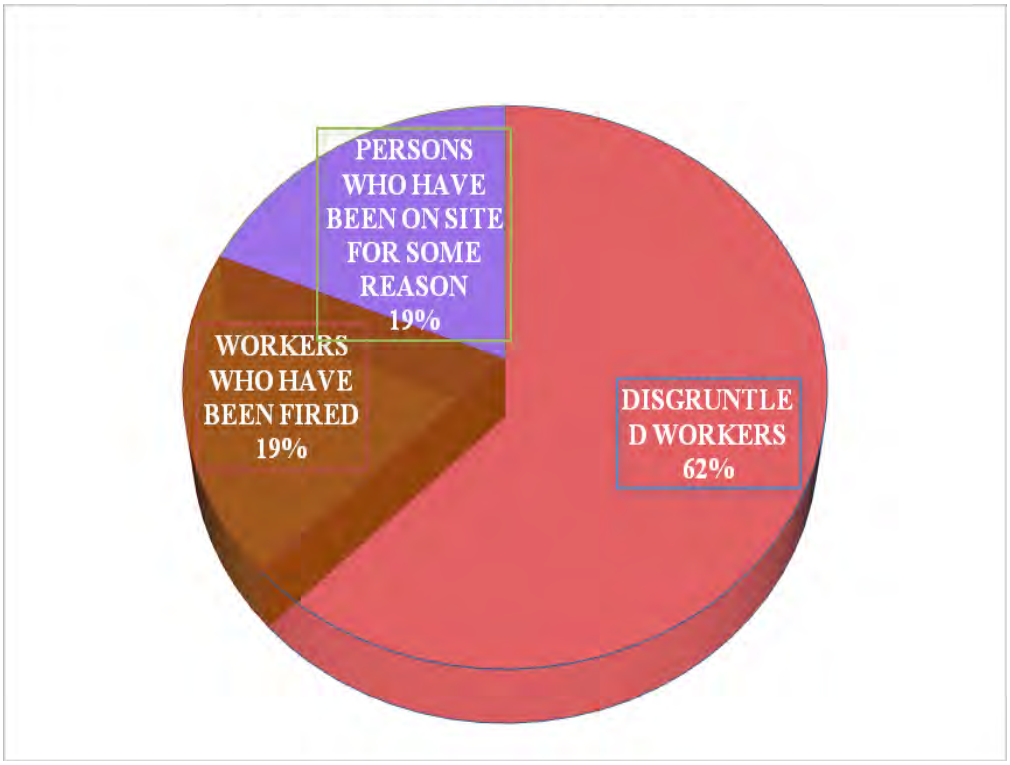

Fig 4.2.71 Vandalism on site

Responding to vandalism on construction site, respondents were asked the effect of vandalism on the site for the past three years and most respondents indicate they experience vandalism at site at least once and total estimated lost runs in millions of cedis. On the number of vandalism cases reported to the police, only few of the

respondents reveal they inform the police. Majority of them said they deal with the case within the firm.

To ascertain if the people involved in the vandalism were caught, all the respondents indicate none of them were caught. Considering the people who are the vandals, 64% of the respondents reveals that, the vandals are the disgruntled workers, 19% of the respondents reveals they are persons who have been on site for some reason and the rest, 19% reveals workers who have been fired.

4.4.6 Results and discussion from Interviews

The researcher during the study also carried out face to face interactions (Interviews) with thirty (30) members of the building team namely; Contractors, Trade foremen and unskilled labourers. Below is some of the information gathered for discussion.

- Most of the interviewees interacted with during the visit indicated that, they have storage facility on their site where materials purchased for executing a project are kept.
- Trade Foremen on site also revealed that, most of the materials used on site are classified whiles in stock but are not stored in their standard facility.
- Some of the workers also indicated that, material shortage occur on site which sometimes delay the project delivery time.
- Most of the workers indicated that, they have a very good security, but it surprises them, how and when people steal from the company.
- They also indicated that, pilfering occur at every site including theirs, and also testified that, it is their people who does the stealing and also other people from outside.

- Majority of the workers revealed that, they have some kind of accommodation but not the best standard since some of the facilities are not even in use. Most of them also indicate that, plants are kept outside the working area while the equipments are kept in the store.
- Most workers also indicate that, accidents do occur at the sites which are normally caused by carelessness, ingenuity and clumsy site layout. They also revealed that, it is the responsibility of the site manager to manage accident at the site.
- They also reveal that, pilfering by the workforce also affect the rate of executing projects. This is because, materials bought for the project were estimated prior to the commencement of the job delivery and will add a supplementary budget.

4.4.7 Results and discussions from Observations

In view of adding more information to the data needed for the research work, the researcher visited a number of construction site to ascertain by cross-checking first hand information about some items supposed to be in a layout.

During the visit, a number of revelations were made and below are some related ones;

- It has been revealed that, most of the sites have access road but not to the best standard.
- In reality, eighty percent (80%) of firms use the site layout plan to locate only buildings instead of including storage areas and this has been a general practice of most contractors.

- It has been observed that, most of the sites have no canteen, so the workers have to walk a distance before getting food during break.
- It was also observed that, lighting at the site and other services in most of the site were poorly installed at the various site.

CHAPTER FIVE

5.0 SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATION

5.1 INTRODUCTION

This chapter presents the summary of the findings, conclusion and recommendation of the study. The following summaries of finding are based on the results of the study;

The study has revealed that, a good number of both storekeepers and site supervisors; lack the technical knowledge about material storage and handling, causing increase in cost of material in the construction industry.

Result also shows that even though security system is provided at almost all the sites is not to the best standard. This shows clearly when all the respondents indicate clearly that, they do experience theft at their various sites and also materials are fairly secure at the sites.

Result also shows that, a good number of firms do not take time to plan their site before the commencement of any project and some of them do not have their storage facility nearer to their site.

It has also come to light that, almost all the firm's projects have attracted an extension of time and also exceeded its original contract sum due to improper planning prior to the commencement of the project.

Interview result also proved that, incompetent site supervision and control of proper site layout suffered by numerous construction sites contributes greatly to waste and

purposeless movement of plant and materials (double handling) hence, maximize cost of projects.

Observations from majority of sites visited revealed that, handling of materials and tools on the various sites are not the best since workers have to move a distance before bringing tools and materials onto the sites for work. This practice delays the total work and some time increase the cost of production in general.

In reality, eighty percent (80%) of firm use the site layout plans to locate only buildings instead of including storage areas. It is also observe that, lighting at the site and other services in most of the site were poorly install.

Cost margin for a project increases vigorously, since operatives on site with permanent employment status are paid wages during ideal time due to delay in delivery of materials on site.

5.2 CONCLUSION

In addressing the pending constrain of improper site layout practices on construction site, most construction firms at the study area could not manage their working areas well which in some cases causes congestion and also increase cost projects. It was also established that the continued existence of poor coordination between site supervisors and other artisans on site contributes greatly to the delay of most work on site.

Thefts and vandalism should also be checked very well to enable the construction firms not to run at loss. Accidents should be minimized at sites through the proper handling of tools and equipment and also by wearing protective clothing during working hours.

Finally, the outmoded method of store keeping among storekeepers at the various sites is high and need some urgent solution to educate them to be abreast with the modern and standard techniques of storage, material handling and usage which will go a long way to minimize theft among workers.

5.3 RECOMMENDATION

The recommendations made to address the findings of the study;

- Contractors, site supervisors and storekeepers in the construction industries should be given adequate knowledge on the technical proficiency of material storage and handling for efficient material management on sites.
- Adequate and standard security system should be provided at the construction site so as to minimize theft and it related cases.
- Appropriate site layout plans mostly showing location of building and also space allocation for material storage should be applied on construction site to avoid double handling.
- Proper transport arrangement should be put in place for prompt delivery of materials on construction site to enhance the efficient and effective use of the material in order to reduce wages paid the permanent employees when no work is done.

- Stiffer punishment should be given to firms which would not finish their project on time and the client should also ensure that monies meant for projects should be to the firms on time.
- Proper work supervision should be undertaken by the architects so as to track down firms which do not comply with the regulation meant for a particular project.

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APPENDICES

APPENDIX 1

QUESTIONNAIRE FOR BUILDING TEAM

BUILDING CONSTRUCTION SITE LAYOUT PRACTICES IN GHANA

CASE STUDY IN HO MUNICIPALITY

This research work focuses specifically on site layout practices in Ghana. This questionnaire is prepared to gather information on the above topic for study in partial fulfilment of the award of Master of Technology Education Degree in Construction Technology at the University of Education, Winneba – Kumasi campus. Ho municipality has been selected for the study and you are kindly requested to provide responses to the questions to enable the researcher contribute knowledge in the field of study. Please all information given will be treated with outmost confidentiality whiles your anonymity is guaranteed for the purpose of this study.

Emmanuel Dagadu.

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THANK YOU FOR YOUR KIND CO-OPERATION

QUESTIONNARE FOR STOREKEEPERS

PLEASE READ THE QUESTIONS BELOW AND TICK (√) THE APPROPRIATE BOX

SECTION (A): PERSONAL INFORMATION

1. Which part of the building team do you belong?

   Storekeepers [ ] Contractors [ ] Site supervisor [ ] Trade Foreman [ ] Unskilled labourers [ ]

2. What is your employment status with your company?

   Senior Management [ ] Front Line Supervisor [ ] Operative [ ]

3. For how long have you been in practice with this company?

   0-4 years [ ] 5- 10 years [ ] 11- 20 years [ ]

   21 years and above [ ]

SECTION (B): SITE STORAGE PLNNING AND LAYOUT.

4. To what extent do you agree that a good quality system of storage of construction material on site can help reduces time and cost of total contract sum.

   Disagree [ ] Somehow agree [ ] Strongly agree. [ ]

5. Is a storage area planned on your site before commencement of work?

   Yes [ ] No [ ]

6. If yes, is your storage near to area of your construction activities.

   Not near [ ] Fairly Near [ ] Near [ ] Very near [ ].

SECTION (C): ARRANGEMENT OF MATERIAL IN STOCK ON SITE

7. How will you rate the storage standard of the materials listed below in the table

TYPE OF BUILDING MATERIAL	1	2	3	4
Binding agents [e.g. cement and lime]				
Fine and coarse aggregates				
Timber and wood material e.g. plywood				
Building unit [e.g. block and bricks]				
Roofing unit [e.g. aluminum]				
Rein faring rods				
Finishes and fitting				
Electrical and plumbing accessories				

SECTION (D): SITE SECURITY FOR MATERIALS AND EQUIPMENT ON SITE.

8. What is the nature of your site?

   Open field [ ] Restricted [ ] Very restricted [ ].

9. What type of security system are constructed on your site?

   Five [ ] Hoarding [ ] None [ ].

   Any other specify……

10. How are your material stresses on site, protected in terms of security?

    Not secure [ ] Fairly secure [ ] Secure [ ] Very secure [ ].

11. Does filtering takes place on your site?

    Yes [ ] No [ ].

12. How many times does pilfering occur in your company?

    1- 2 times [ ] 3-5 times [ ] 6-9 times

    [ ] 10 and above [ ]

13. What measures are put in place to prevent pilfering at the site?

Operations are checked at the entrance before they leave the site [ ]

Accurate stock control in maintained and checks at regular interval [ ]

Small items are stored in a clove room [ ].

QUESTIONNAIRE FOR SITE SUPERVISORS

PLEASE READ THE QUESTIONS BELOW AND TICK [√] THE APPROPRIATE BOX

SECTION (A): PERSONAL INFORMATION.

1. Which part of the building team do you belong?

   Storekeeper [ ] Contractors [ ] Site supervisors [ ] Trade foremen [ ]

   Unskilled labourers [ ]

2. What is your employment status with your company?

   Senior Management [ ] Frontline supervisors [ ]

   Operatives [ ]

3. For how long have you been in practice with this company?

   0-4years [ ] 5-10years [ ] 11-20years [ ] 21 and above [ ]

SECTION (B): COMPANY BACKGROUND.

4. Under what class of contribution license does your company fall?

License class	D1	D2	D3	D4
Tick Response				

5. For how long has your company be operating?

   1-2years [ ] 3-4years [ ] 5-6years [ ] 7years and more [ ]

6. Is your company a local or foreign firm?

   Local [ ] Foreign [ ].

7. What is the current working strength of your company in terms of personnel?

   Less than 100 [ ] 100-290 [ ] 300 and above [ ].

SECTION (C): COMPANY PERFORMANCE

8. How many projects have your company undertaken within the last five years?

0-2 [ ] 3-5 [ ] 6-9 [ ] 10 and above [ ]

9. Have any of your company's projects attracted an extension of time?

Yes [ ] No [ ]

10. If your answer to question 9 is yes, please select percentage extension of time given and the corresponding frequency.

Percentage of Cost- run	No' of times in which project have exceeded their original contract sums			
	1 – 2 times	3 – 5times	6 – 8 times	9 times and above
0 - 10%				
11- 20%				
21- 30 %				
31- 40%				
41- 50%				

11. Have any of your projects executed in Ghana exceeded it's original contract sum.

Yes [ ] No [ ]

12. If your answer to question 11 is yes please select the percentage of cost over – run the corresponding frequency.

Percentage of Cost- run	No' of times in which project have exceeded their original contract sums			
	1 – 2 times above	3 – 5times	6 – 8 times	9 times and
0 - 10%				
11- 20%				
21- 30 %				
31- 40%				
41- 50%				

13. How often do you finish your project or construction before schedule?

Never [ ] Almost never [ ] Sometimes [ ] Fairly often [ ]

Very often [ ]

14. How frequent has your company been queued on delay of project

Not frequent [ ] Quite frequent [ ] Frequent [ ]

Very frequent [ ]

SECTION (D): SITE LAYOUT AND ORGANIZATION

15. Is planning and control of site layout necessary on any construction site?

Yes [ ] No [ ]

16. If yes, what do you suggest?

……
……
……

17. What are the factors you consider in site layout planning?

……
……
……
……
……

18. How does the following affects the effectiveness of construction work on site?

NOTE: (1 – NO EFFECT, 2 – NEGATIVE EFFECT,
3 – POSITIVE EFFECT)

	NO EFFECT	NEGATIVE EFFECT	POSITIVE EFFECT
Access to site			
Movement on site			
Site accommodation			
Canteen			
Storage area of materials			
Site security			
Site safety			
Service on site			
Location of stationary plant			

SECTION (E): VANDALISM ON CONSTRUCTION SITE.

19. How does vandalism affect your work on site for the past three years?

a. Number of vandalism in the past three years ……..

b. Total estimated lost due to vandalism GH¢…….

c. Number of vandalism incident that were repeated to the police …….

20. How many of the following vandalism incident did the firm expenses for the past three (3) years?

    a. Broken glasses……..

    b. Destruction of in-place material…..

    c. Damage to vehicles …

    d. Damage to construction equipment….

21. For how many instance of vandalism in the past three years were there on your Firm's project caught?

22. If none, who were the vandals?

    Disgruntled workers [ ] strange [ ]

    Workers who has been fired [ ]

    Persons who has been on the site for some reason [ ]

APPENDIX 2

CHECK LIST

NOTE: (1- **Not available**, **2 – available but in fairly good condition**,

3- available but in very good condition, 4- available but in excellent condition)

TYPE OF ITEMS	1	2	3	4
1. Access to site				
2. Movement on site				
3. Site accommodation				
4. Site canteen				
5. Storage area of materials				
6. Location of plant and equipment				
7. Sight lighting				
8. Site fencing				
9. Services on site				
10. Site welfare facilities				

INTERVEIW QUESTIONS

Date……

Please, my name is Emmanuel Dagadu. I am investigating into site layout practices in Ghana. I would like you to provide answers to few questions on the theme.

Thanks

A. BACKGROUND

1. When were you employed by this firm?

   .....

2. What type of job do you perform on site?

   .....

3. Is your company a local or foreign firm?

   .....

B. STORAGE FACILITY

4. Do you have a storage facility on your site?
5. What type of storage facility do you have?
6. How often do you use them?
7. How secured are the facilities

C. SECURITY

8. Do your company provide security for the facilities at the site?
9. What type of security do your company provide at the site?
10. How vulnerable are the facilities without security?

D. PILFERING

11. Does Pilfering take place on your site?

12. If yes, who are the people involved?

13. How often do Pilfering occur at your site?

E. ACCOMODATION

14. Do you have accommodation facilities on the site?

15. If yes, what type of accommodation do you have?

16. How effective are your accommodation facilities on the site?

17. How do you keep plant and equipment on the site?

.....

F. ACCIDENT

18. Do accidents occur at your site?

19. What are the causes of accidents on the site?

20. In your opinion who should be responsible for accident on the site?

.....