ST. MARY'S UNIVERSITY
SCHOOL OF GRADUATE STUDIES

AN ASSESMENT OF MATERIALS MANAGEMENT PRACTICES ON CONSTRUCTION SITES:

THE CASE OF DEFENCE CONSTRUCTION ENTERPRISE

BY

TIBEBU KEBEDE

ID NO. SGS/0165/2007A

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JUNE, 2016

ADDIS ABABA, ETHIOPIA

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APPROVED BY BOARD OF EXAMINERS

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Advisor	**Signature**
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DECLARATION

I, the undersigned, declare that this thesis entitled **"an assessment of material management practices on construction projects sites: The case of Defense Construction Enterprise."** is my original work, prepared under the guidance of the research advisor. All sources of materials used for the thesis have been duly acknowledged. I further confirm that the thesis has not been submitted either in part or in full to any other higher learning institution for the purpose of earning any degree.

TIBEBU KEBEDE _____

Name Signature

St. Mary's University **May, 2016**

Addis Ababa

ENDORSEMENT

This is to certify that this project work, **"an assessment of material management practices on construction projects sites: The case of Defense Construction Enterprise."** undertaken by Tibebu Kebede for the partial fulfillment of Master of Business Administration [MBA] at St. Mary University, is an original work and not submitted earlier for any degree either at this University or any other University.

Research
Advisor

_____ _____

Tekle Giorgis Assefa (Asst. Prof) *Date*

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Tibebu Kebede

Acronyms/Abbreviations

DCE-Defense Construction Enterprise

MOND –Ministry of National Defense

M&E-Monitoring & Evaluation

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ABSTRACT

Construction materials usually constitute a major portion of the total cost in building construction project**.** An essential factor adversely affecting the performance of construction projects is the improper handling of materials during site activities. The aim of this thesis is to assess the material management practices on the construction projects site of in Defense Construction Enterprise by the use of structured questionnaires administered to construction-professional personnel of the enterprise.

Literature about material management was reviewed. Questionnaire were developed, pilot study of the questionnaire was achieved using 15 questionnaires. A total of 126 questionnaire were distributed 121 were received (96%).

The data generated were analyzed using descriptive statistics. 96% response rate was achieved and used for analysis. The study revealed that there are many problems in material management of DCE construction projects. The most important were the public procurement procedure, delay on enterprise's construction projects ,difficulty in delivery of materials ,and materials damage .

The study showed that the factors affecting against materials management contributes to delay in completion time of project such as competence of stock and waste control system on site, competence of material transportation ,competence of estimators , issuing of materials for use and competence of procurement for materials . Based on the findings, it was concluded that Materials management practices require a transformation to improve the overall in handling of materials for more efficiency and effectiveness on the enterprise's construction site. It was also recommended that Material management should be practiced on all sites of the enterprise building construction projects, whether large, medium or small. Competent and experienced personnel with basic managerial skills in material management should be engaged on site as store officer to enhance material management practice.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Construction industry is an industry, which is involved in the planning, execution and evaluation (monitoring) of all types of civil works. Construction industry plays an important role in social, economic & political development of a country. Construction is not only one of the major sectors of an economy but it is also the largest and accounts from 12% to 25% of the GNP of both developed & developing countries. It consumes the higher percentage of the annual budget of a country; specifically in our country Ethiopia, it covers 58% of the annual budget (Semere, 2006).

Similar to the case with other developing countries, the Ethiopian construction industry shares many of the problems and challenges the industry is facing in other developing countries, perhaps with greater severity. However, materials management is a major problem in the Ethiopian construction industry that has important implications for the efficiency of industry due to lack of effective management and planning (Asmara,2015)

One of the very important sections that should specify in the construction project management is managing of construction materials at construction projects. The successful execution of construction projects within given cost, time and quality, good handling of construction materials on construction site requires systematic planning and controlling of the construction works.Construction material constitutes a major cost component in any construction project. The total cost of installed material may be 50% or more of the total cost (Pataskar, 2013).

A small saving in materials cost, say even 5%, through efficient management of materials, can result in a large contribution specially, when competitive bidding is for small profit margins, varying from 3.5% to 10% of the project cost (Chitkara, 1998).

A research carried out in Ethiopia had shown that construction materials constitute 57% of the total budget allocated for construction works (Addise,2005).Therefore, efficient procurement and handling of material represent a key role in the successful completion of the work. It is important for the project manager to consider that there may be significant difference in the date that the material was requested or date when the purchase order was made, and the time at which the material will be delivered. These delays can occur if the contractor needs a large quantity of material that the supplier is not able to produce at that time or by any other factors beyond his control. Chan (2002) noted that the project manager should always consider that procurement of materials is a potential cause for delay. The management of construction processes to reduce, reuse, recycle and effectively dispose of wastes has a serious bearing on the final cost, quality, time and impact of the project on the environment.

The goal of material management is to ensure that the materials are available at their point of use when needed hence, efficient procurement of material represents a key role in the successful completion of the work. It is important for the contractor to consider that there may be significant difference in the date that the material was requested or date when the purchase order was made, and the time, at which the material will be delivered, thus materials management is a key of project management (Asmara ,2015).

Materials management can be defined as a process that coordinates planning, assessing the requirement, sourcing, purchasing, transporting, storing and controlling of materials, minimizing the wastage and optimizing the profitability by reducing cost of material (Baldva,1997)

Materials management is defined as the process to provide right material at the right place at the right time in the right quantity to minimize the cost of the project . Materials management is concerned with the planning, identification, procuring, storage, receiving and distribution of material (Pataskar,2013).

While Eduardo (2002) viewed materials management as the system for planning and controlling all of the efforts necessary to ensure that the correct quality and quantity of materials are properly specified in a timely manner, are obtained at a reasonable cost and most importantly are available at the point of use when required.

Especially, management of construction materials is generally recognized to be the integrated coordination of materials takeoff, purchasing, expediting, receiving, ware housing, proper utilization and disposal. When these functions are not properly managed, materials shortages, surpluses, and cash flow problems are likely to occur. (Bell ,1987).

Petra (2013) observed that successful materials management requires the participation of all persons involved in a construction process. Materials may deteriorate during storage or get stolen unless special care is taken. Delays and extra expenses may be incurred if materials required for particular activities are unavailable. Ensuring a timely flow of materials is an important concern of materials management.

Lan (2008), opined that the rate at which materials have been squandered on site due to poor management is getting too rampant in our society and if not curbed, it can jeopardize the future of our construction industry. This is particularly true in view of the fact that mismanagement of construction resources (i.e. materials, plants and labor) affects the continuity and profit margin of such project and if not checked can lead to technical insolvency or bankruptcy. Therefore, attention must be paid to how materials are been procured, stored and managed in order to achieve perfect work, effective handling of materials, right usage of materials and control of construction resources.

Materials management functions include planning and taking off materials, vendor evaluation and selection, purchasing, expenditure, shipping, material receiving, warehousing and inventory, and material distribution (Narimah 2011). Almost 60% of the total working capital of any industrial organization consists of materials costs. Materials management can only produce what it should with the right quantities of the right material at the right time.

Thus, any improper handling and managing of materials will cause a huge effect on the total project cost, time and quality. There is a need to explore on the area of materials management, the issues relating to materials management problems. The aim of this study is therefore to investigate deeply the material management practices on construction sites of Defense Construction Enterprise.

1.2 DCE's Organizational Profile

DCE is established by the council of ministers under the supervision of Ministry of National Defense by merging two construction companies, Defense construction and Engineering enterprise and Kality construction and construction material production enterprise in 2003 E.C. The enterprise is engaged in construction of roads, dams, irrigation, infrastructure, buildings and other construction works in the country mainly to satisfy the national defense construction needs.

As shown in the organization structure the enterprise has two cores and two support process. Currently it has six road, one dam and twelve building construction projects which are operating at Addis Ababa, Debrezeit, Mekele, Berehale, Awash and Bahirdar. Table 1.2 and 1.3 shows the current list of defense construction enterprise road & building projects . In the project code the first number indicates the year in E.C. ,the second indicate the number of project started in that year and the alphabet represents the type of project (R=Road, DR=Dam & Road, IR=Irrigation, and B=Building).

Table 1.2 Road, Irrigation and Dam projects

Item No.	Project Name	Project code	Contract Amount before vat
1	Berhale-Dalol Design and Build project	10-02R	1,042,835,862.65
2	Mekele -Abi-Adi Road project	11-04R	419,999,109.10
3	Addis Ababa Golf club Project	11-02R	174,946,874.97
4	Mekele city administration Road	12-06R	64,394,077.40
5	Girindaho Dam project	14-02DR	188,482,982.36
6	Awash Road Maintenance	15-05R	655,000,000
7	Dicheto-Beleho Cement Concrete Design and Build Project	15-03 R	2,660,000,000
Total contract Amount			5,205,658,906

Source: Road, Irrigation and Dam Engineering core process, 2016

Table1.3 Building Projects

Item	Project Name	Project	Contract Amount
1	Mekele 3 star hotel	11-03B	140,501,782.68
2	Bahirdar Apartments	11-06B	310,200,464.83
3	Addis Ababa INSA project	1108B	928,569,468.38
4	Janmeda staff college	11-09B	93,179,862.24
5	MOND head quarter	11-10B	1,102,727,382.36
6	Calibration center	12-02B	150,359,402.77
7	lion Zoo	12-03B	82,959,713.10
8	Swimming pool	12-04B	51,109,425.91
9	children and youth center	12-05B	304,503,474.76
10	Mekele Referral Hospital	13-03B	451,723,229.43
11	Bahirdar Referral hospital	13-02B	439,478,115.62
12	Debreziet Engineering College	13-01B	228,736,350.02
Total contract Amount			4,284,048,672

Source: Building & Real Estate Engineering Core Process, 2016

1.3 Statement of the problem

The construction project of defense construction enterprise reflects various problems ranging from delays on project completion time on most of the enterprise's projects execution/delivery, substandard work, disputes, to cost and time overrun and decrease on expected project profitability as a result of material shortage and wastages on sites, displacement of materials on sites, as well as poor accounting and security system of the concerned sites. Lack of materials not only causes delays, but a consequent decrease in productivity and resulting to cost overruns.

Lack of effective material management is one of the major causes of this problem. Failure of the project manager to make available materials need could lead to delay. Non-compliance strictly with project bill of quantities, schedule of materials, specifications and construction program in material stock control practice is another contributing factor which tends gradually to decrease profitability of a project also often leads to extension of time respectively.

Besides that, the rate at which materials are being wasted due to improper management is becoming unbearable to the defense construction enterprise projects due to its effect on profit margin and proper usage of material to achieve quality job.Therefore, the overall intention of this study is to assess the material management practices on the construction projects site of Defense Construction Enterprise.

1.4 Research Questions

The following are the research questions as related to this study.

1. What are the practices of materials management in defense construction enterprise?
2. What is the current practice of the DCE's projects materials management?
3. What are the factors militating against materials management on the DCE's Construction project sites?
4. What are the measures to be put in place to ensure effective materials management? On DCE's projects construction sites?

1.5 Objective of the Study

1.5.1 General objectives of the Study

The general objective of the research is to assess material management practices on construction project sites in DCE with a view to proffering solutions to the identified problems.

1.5.2 Specific Objectives of the Study

The specific objectives of this research are;

1. To study the practices of construction material management in Defense Construction Enterprise
2. To investigate the factors militating against effective materials management on Construction project sites in Defense Construction Enterprise
3. To assess professionals view on the measures to be put in place to ensure effective Materials management in DCE Construction Project sites.

1.6 Definitions

Construction: the art and science to form material or immaterial objects, systems or organizations

Project: a temporary endeavor undertaken to create a unique product, service, or result which have its own starting and ending time.

Planning: answers the questions what is going to be done? How? Where? By whom? and When (in general terms, the project‘s start and end)?

Monitoring: to be aware of the state of a system and may refer to observe a situation for any changes which may occur over time.

Evaluation: is a systematic determination of a subject's merit, worth and significance, using criteria governed by a set of standards.

Engineers: is a professional practitioner of engineering, concerned with applying scientific knowledge, mathematics, and ingenuity to develop solutions for technical , societal and commercial problems.

Professionals: Engineers who were graduated in engineering discipline which are civil, Electrical Sanitary, Mechanical or any related with construction works.

1.7 Significance of the study

A major part of professional engineer's responsibility in building production management entails the selection, purchase, testing, storing and use of construction materials. As noted earlier, materials are a major expense in construction, thus the ability of contractor to manage his team and the flow of supplies are absolutely necessary for the successful project delivery and profit maximization.

This research is significant in that it may help to determine the problems behind proper materials management in DCE's construction project sites, so as to minimize against project delay and cost overrun. This research may help create a standard method of materials management based on size of construction site and to control cost of contract and materials wastage. It is not only desirable but necessary to undertake careful study of material management.

Furthermore, since proper materials management in the enterprise will benefit the firm in terms of increased profit margin, quick execution and reduce cost of the project. In addition, this study intends to provide some framework for the development of company policies and rules in the management of construction materials. This brings the need for an assessment of materials management in DCE's construction project sites.

This research could also be used as a reference material for others who might be interested to conduct similar studies in the enterprise or other enterprises in the construction industry.

1.8 Delimitation/Scope of the Study

The study was conducted to assess the professionals' perception on material management practices on the construction projects site of in DCE. The enterprise has two core and two support process at head office, six road construction, one dam and twelve building projects which are operating at Addis Ababa, Debrezeit, Mekele, Berehale,Dicheto ,Bahrdar and Awash. Due to its number of projects and geographical dispersion, the data collection for the research will be limited to head office, Addis Ababa, Debrezeit , Mekele and Bahirdar construction projects.

The study was conducted only in DCE using self-administered semi structured questionnaire. Hence, it was limitations since the study is to be conducted in defense construction enterprise, the results may not be used to generalize and apply to all construction contractors in the country as these contractors are different in organizational structure, type and scope of projects they undertake, technological capability etc. Furthermore, since the study had done by self-administered questionnaire, it was liable to social desirability bias.

1.9 Limitations of the Study

The researcher understands that constraints are expected while doing researches and would like to address them as such. The major constraints faced by the researcher whilst conducting this study were the non-availability of adequately published and documented data about construction material management practice by the organizations which would have been useful if found. The other main constraint was that even the data found it was not adequate

1.10 Organization of the Paper

This research paper is organized in to five chapters. The first chapter deals with the introduction part which encompasses the background of the study, the statement of the

research problem, objectives of the study, significance of the study, scope of the study and limitations of the study.

The second chapter deals with the review of related literature. Chapter three focused on the research methodology, data collection and procedures, sample and sampling techniques, whereas the fourth chapter presented the result analysis and discussion of the data. Finally, conclusions and recommendations were presented under fifth chapter.

CHAPTER TWO

LITERATURE REVIEW

2.1 Background

The Webster's dictionary defines materials as "the elements, constituents, or substances of which something is composed or can be made." Ballot (1971) defines materials as the physical materials that are purchased and used to produce the final product and does not suggest that materials are the final product. In other words, materials are the parts used to produce the final product.

Bailey and Farmer (1982) define materials as the goods purchased from sources out of the organization that are used to produce finished products. Stukhart (1995) defines materials as the items that are used to produce a product and which include raw materials, parts, supplies and equipment items.

Chandler (1978) states that construction materials can be classified into different categories depending on their fabrication and in the way that they can be handled on site. He classifies the materials into five categories.

They are:

- Bulk materials:- these are materials that are delivered in mass and are deposited in a container.
- Bagged materials:- these are materials delivered in bags for ease of handling and controlled use.
- Palleted materials:- these are bagged materials that are placed in pallets for delivery.
- Packaged materials:- these are materials that are packaged together to prevent damage during transportation and deterioration when they are stored
- Loose materials:- these are materials that are partially fabricated and that should be handled individually. Table 2.1 presents some examples of commonly used materials in construction and their classification.

Table 2 .1: Classification of Materials (Adopted from Chandler , 19 78)

Material	B	Bag	Pelle	Packa	Loos
Sand	X				
Gravel	X				
Top soil	X				
Paving slabs					X
Structural					X
Cement	X	X	X		
Concrete	X				
Pipes				X	X
Tiles				X	
Doors			X		
Electrical				X	

Stukhart (1995) states that the main categories of materials encountered in a construction project are engineered materials, bulk materials, and fabricated materials.

- Bulk materials: - these are materials manufactured to standards and are purchased in quantity. They are bought in standard length or lot quantities. Examples of such materials include pipes, wiring, and cables. They are more difficult to plan because of uncertainty in quantities needed.
- Engineered materials: - these materials are specifically fabricated for a particular project or are manufactured to an industry specification in a shop away from the site. These materials are used for a particular purpose. This includes materials that require detailed engineering data.
- Fabricated materials: - these are materials that are assembled together to form a finished part or a more complicated part. Examples of such materials include steel beams with holes and beam seats.
- Stukhart (1995) defines material management as the activities involved to plan, control, purchase, expedite, transport, store, and issue in order to achieve an efficient flow of materials and that the required materials are bought in the required quantities, at the required time, with the required quality and at an acceptable price.

- Plemmons and Bell (1995) define material management as the plan and control of all activities to ensure the correct quality and quantity of materials and equipment to be installed as specified in timely manner, obtained at reasonable cost and are available when needed.
- Dobler and Burt (1996) state that material management is designed to improve the activities related to the flow of materials. They add that material management should coordinate purchasing, inventory control, receiving, warehousing, materials handling, planning, and transportation

2.2 Management Function

For any kind of organization to run smoothly, it needs to implement core management concepts. This necessitates that the four management functions - planning, organizing, leading and controlling be precisely understood. According to (Kondalkar, 2007), the following are the four types of management function

1. Planning

Planning is the process used by managers to identify and select appropriate goals and courses of action for an organization. There are steps to good planning:

i. What goals should be pursued?
ii. How should the goals be attained?
iii. When resources should be allocated?

The planning function determines how effective and efficient the organization is and determines the strategy of the organization.

2. **Organizing**

In organizing, managers create the structure of working relationships between organizational members that best allows them to work together and achieve goals.

Managers will group people into departments according to the tasks performed. Managers will also lay out lines of authority and responsibility for members. An organizational structure is the outcome of organizing. This structure coordinates and motivates employees so that they work together to achieve goals.

3. Leading

In leading, managers determine direction, state a clear vision for employees to follow, and help employees understand the role they play in attaining goals.

Leadership involves a manager using power, influence, vision, persuasion, and communication skills. The outcome of the leading function is a high level of motivation and commitment from employees to the organization.

4. Controlling

In controlling, managers evaluate how well the organization is achieving its goals and takes corrective action to improve performance. Managers will monitor individuals, departments, and the organization to determine if desired performance has been reached. Managers will also take action to increase performance as required. The outcome of the controlling function is the accurate measurement of performance and regulation of efficiency and effectiveness.

2.3 Material Management on Construction Project

The construction industry is the most significant industry in the economy and the successful measure with completion within time, budget, accordance with specification and satisfaction of stakeholders (Nguyen, Ogunlana, (2004). Construction projects are complex, with many organizations involved such as clients or owners, architects, engineers, contractors, suppliers and vendors (seller). This includes the heterogeneous and often complex process of producing unique, large and immovable products with a supply of the resources (money, equipment, material, and labour).

Construction is the process of physically erecting the project and using construction equipment, materials, supplies, supervision, and management necessary to accomplish the work (Clough,Sears,(2000).As projects grow in scale, complexity, materials management becomes more difficult, frequently requiring the use of appropriate tools, and techniques to ensure, amongst other things, that materials are delivered on time, stock levels are well managed, the construction schedule is not compromised, and that wastage is minimized.

Materials management is especially problematic for large and complex projects, where sophisticated tools and techniques are necessary. The management of materials in complex construction projects needs adequate consideration due to the various elements involved and the importance of the project. The improper handling and management of materials on construction sites has the potential to severely buildup project performance.

The result of improper handling and managing materials on site during construction process will influence the total project cost, time and the quality (Narimah, 2013). The costs of materials management may range from 30-80% of the total Construction costs depending on the type of construction (Muehlhausen, 1991). However, Kini (1999), noted that 50-60% of the total cost of construction projects is for construction materials and equipment. According to Stukhart (1995), materials are a major component on any project with value 50-60%. Therefore, there is a need for efficient materials management in construction projects. This is because poor materials management will affect the overall construction time, quality and budget. Therefore, an effective materials management system is required in order to avoid problems, such as delays in a construction project.

Delays in materials supply have been found to be a major cause of time overrun (Dey, 2000). Many factors accelerate the delay of project duration, however poor materials management can have a major effect on site activities. Ogunlana, Promkuntong, Jeark (1996) suggested that the main reasons for project delays on housing projects in Thailand were incomplete drawings, material management problems, organization deficiencies, shortage of construction materials, and inefficiencies in site workers. Dey (2000) also observed that delays in materials supply was a major cause of time overrun. Thus, it would seem that materials delays are a major cause of delays in construction projects. The common issues relating to materials management are storage problems; incorrect materials delivery; subsequent design changes; materials surplus; materials damage/loss; incorrect materials take-off; and vendor evaluation. There is also a need for an integrated material handling process from the design stage to the usage of materials. Hence, a good materials management environment enables proper materials handling on construction projects activities (Narimah , 2013).

2.3.1 Objectives of Materials Management

According to Cavinato (1984) the objectives of a material management system should include lowest final cost, optimum quality, assurance of supply, and lowest administrative costs. The materials manager should obtain the materials needed at the lowest cost possible.

According to Khyomesh and Chetna (2011), the objectives of materials management are Efficient materials planning;. Buying or Purchasing; Procuring and receiving; Storing and inventory control; Supply and distribution of materials; Quality assurance; Good supplier and customer relationship; and Improved departmental efficiency.

To fulfill all these objectives, it is necessary to establish harmony and good co-ordination between all the employees of material management department and this department should have good co-ordination with the other departments of the organization to serve all production centers

2.3.2 Components of Material Management are:

i. Material estimation, budgeting, planning and programming.
ii. Scheduling, purchasing and procurement.
iii. Receiving and inspection
iv. Inventory control, storage and warehousing
v. Material handling and transport
vi. Waste management

2.4 Materials Management Processes

Materials management processes involve the planning, procurement, handling, stock and waste control, and logistics surrounding materials on construction projects. A good materials management environment enables proper materials handling on construction sites. In order to better understand materials management the following processes are discussed: planning, procurement, logistics, handling, stock and waste control, storage of materials.

2.4.1 Planning

The process of planning construction methods has been defined as "understanding what has to be built, then establishing the right method, in the most economical way to meet the client's requirements" (Illingworth, 1993). This is a detailed scheme for achieving an objective for certain work tasks. In the case of materials, there is a need for an appropriate planning, which must be done concurrently with engineering, construction, and other project plans (Stukhart, 1995). He also mentioned, thus, material planning will provide guides for all the Subsequent activities and can have a great impact on the project plan.

The materials planning process covers setting up and maintaining the records of each part used in each plant to determine target inventory levels, and delivery frequency Payne, Cliclsoin, and Rcavill (2006).As a result, an excellent management of the materials record will help the flow of materials at the site in order to avoid several problems such as materials out of stock and materials that have not been delivered.

Stukhart (1995) mentioned that material planning would provide guides to all the Subsequent activities and that this could have a great impact on the project plan. The materials planning process covers the set up and maintenance of records and determines the target inventory levels, and delivery frequency Payne et al. (2006).Planning of access and routing of materials within a construction site has an important implication for the development of an effective materials management strategy (Faniran and Caban, (1998); Ogunlana, Promkuntong, Jeark(1996) particularly in terms of increasing productivity and profit, and facilitating the timely completion of construction projects (Wong and Norman, 1997). The objective of efficient materials planning is, to increase productivity and profit of the company, and facilitate the completion of construction projects (Wong and Norman, 1997). Thus, better planning of raw materials on site can help to eliminate project delays and reduces activity times, resulting in better service

2.4.1.1 Material Schedule

Chandler (2008) said schedule is a list in a diagrammatic presentation indicating requirement of resources. And aid used in the ordering of material is schedule. Materials gratuity will be required to be taken off from the drawing and must show:-quantity required to be fixed; waste allowed in the estimate; gratuity to be ordered; date of delivery; cost includes in the estimate.

Paul (2007) said while construction scheduling is concerned with the regulation of the flow of construction units through their preconceived plans of operations, material. Scheduling involve the establishment of time tables for the ordering of all materials requirement for maintaining the flow of materials must be schedule to coincide with the flow of all construction of activities involved in the actual construction of each project .

The schedule is usually produced by Quantity surveyor or by a material schedule e.t.c. By systematic analysis to bills of quantity and contract drawing with specification, schedule is the pre-requisite for the programming of the materials delivery and material usage planning on the site. Material should never be ordered directly from the contract bills, which are only intended as a guide to the contractor pricing the contract. The estimate will produce schedule of material for the buyer. The estimator will produce figure for material to be delivered in bulk and those material that should be imported.

The date of delivery guaranteed by the suppliers against each item can be compared with the builders plan requirements. In those circumstances changes in the specification with often enable the builder to order under material that will available within the required period for delivery and thereby avoid unnecessary delay in the future.

2.4.1.2 Ordering Planning

Materials may be ordered for by the architect or the contractor. The supplier dominated by the architect is called dominated supply. Whoever is making the order should give fullest information as regard delivery debt, the hour during which the material will be accepted on site and other general terms and conditions such as liability for damage use, method of

packing, size and weight of the load that can be handle on site. Materials that are on long term delivery should be placed on other as soon as the contract is sign so that material will arrive at the reward time. In the short form programmed the quantity of material required in the place and period of its use to be indicated.

2.4.1.3 Storage Planning

Before the material ordered arrives adequate preparation should be pounded for storage and its handing storage of nation and successful coordination are vital so as to prevent dissipation to site procedures and wastage to material caused by disregard and disorganize operatives.

Also good storage enhances proper management of materials aid it minimizes concerned. The rate at which materials are being used and the working order should provide a guide as to the quantity of materials to be ordered.

2.4.1.4 Transportation Planning

An efficient transportation of construction materials from storage to point of use reduces project cost. Therefore proper transportation planning system should be planned, the route and the best suited for the conveyance of each material should be used ford. And all fragile material must be tired to the transporting plan to prevent breakage. In the finer analysis, purchasing and trafficking have no logical alternative but walk together. Their interest are so interrelated that the performance of one department significantly influence use the degree of success attain by the order if purchasing ignore the principle of good traffic management in its daily work. It will in the long run inevitably pay excessive price for the transportation segment of the material it brings (Lamer, 2007).

2.4.2 Procurement

The term procurement encompasses a wide range of activities that includes purchasing of equipment, materials, labour and services required for construction and implementation of a project (Barrie and Paulson, 2002). The objective of procurement in materials management is to provide quality materials at the right time and place, and at an agreed budget.

Payne et al. (2006) stated that procurement is about organizing the purchasing of materials and issuing delivery schedules to suppliers and following-up, to make sure that suppliers deliver on time.

A failure in the purchasing process or in overseeing and organizing the buying functions as listed by Canter (2003) could result in:

- Over-ordering of materials (wastage problems);
- Over-payments for materials (inadequate administration procedures);
- Loss of benefits (lack of skilled negotiating procedures);
- Lack of knowledge (when and where the best service/source might be available at any particular time).

In order to avoid failure, it is important to know how the typical purchasing procedure takes place, and this is illustrated in Figure 2.1.

Procurement of materials begins with defining the requirements of the project, followed by the selection of suppliers or subcontractors, and ends with the delivery of materials at the destination (Kent, 1991).

Purchasing materials from the best source, at the right price and with timely delivery are challenges of many construction companies. Therefore, a control strategy is needed during materials procurement to achieve the targeted objectives. All requests for quotations and purchases must be initiated through a properly authorized requisitioning procedure normally controlled by the Project Manager. The Project Manager must ensure that the purchasing of materials follows the standard requirement, time and quality.

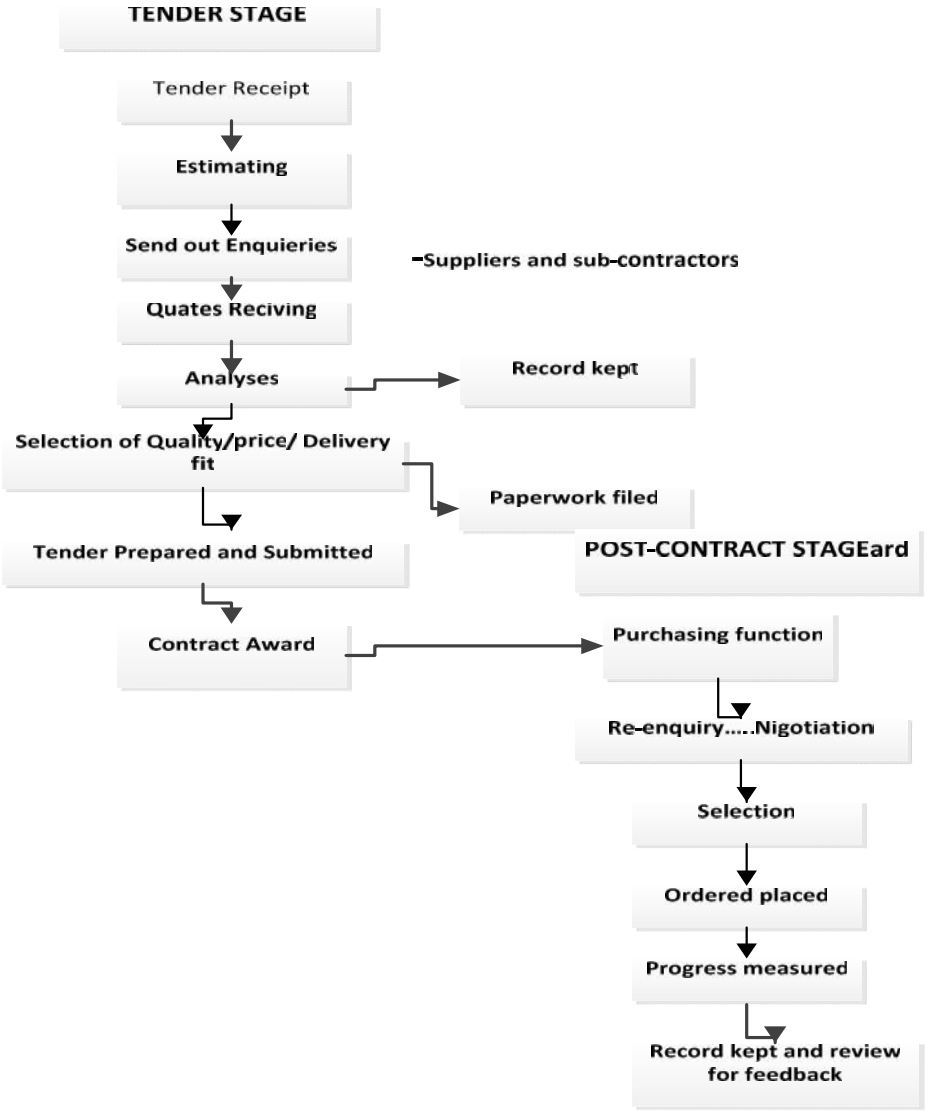


Figure 2.1: Typical Purchasing Procedure for construction firm (source: center, 1995)

2.4.2.1 Purchasing Methods

a) Purchase Accounting.

Purchase accounting is a method used to make sure that; only goods authorized are purchase; only goods and material purchased and received are paid for; and payment made in accordance with agreed and or on contractual terms.

b) Purchasing research

Purchasing research is a technique that systematical searches for the analytics and quantity of need material at the best price as well as analyzing eventually uses of such material and expensive method of use. Study of the following may be included purchase research.

- Material used in construction:- new material, alternative materials, high Quality materials;
- Price: - including satisfactory supply at best price, Market and economic trends;
- Capital equipment decisions:- whether to buyer hire;
- Work study;
- Assessment of material cost in relation to use purchasing employees who Have studied these areas can provide cost reduction purchase services:-recommend an economic intercompany system of supply; set up a purchasing system for Efficient supply of materials; be able to fare cast supply price changes; be able to Forecast market changes; be aware of new materials and work-study.
- Type of Purchase ,according to (Bajeh, 2010), the types of purchase are; batch Purchase; schedule purchase; and sale supplier agreement

2.4.2.2 Material Purchase

Purchasing has a direct impact on profitability and individual job profits. Purchasing needed raw material, supplies and equipment is a vital area for cost reduction. Since it involve the spending of large sums. According to Frank (1980) circumstances of misuse and water of resources in the form of material can be extensive and include: buying the wrong article; buying too much; buying too little; buying uneconomically; losing material in transit, in storage, in use; materials stolen or proffered; spoilage and damage to material before use; scrap and spoiling during use; buying or making out of balance.

According to Lamer (2007), purchasing is one of the basics functions common to all type of business enterprise. These functions are basic because no business can operate without them all business are administered or managed by coordinating and integrating those six functions:-

- Creation, the idea of design function
- Finance, the capital acquisition records function
- Personnel, the human resources and labour relation function
- Purchasing, the buying of required equipment, material, and services
- Conversion, the changing of material to economic goods
- Distribution, the selling or marketing of goods produced

The good of the purchasing department then should be to avoid cheap purchase but to look for optimum purchases. Sometime good material can be purchased at lower unit cost through large – order size purchases.

2.4.2.3 Purchasing Departments

In large organization the purchasing group may include purchasing analyst, traffic expert expedite as well as management. In some cases purchasing is expanded to include all logistics involve in the moving handling storing of material.

Lamer (2007), the purchasing department on the order hand has the responsibility and authority to schedule outside production the purchasing department is an organization unit of firm whose duties include some part or all of the purchasing function.

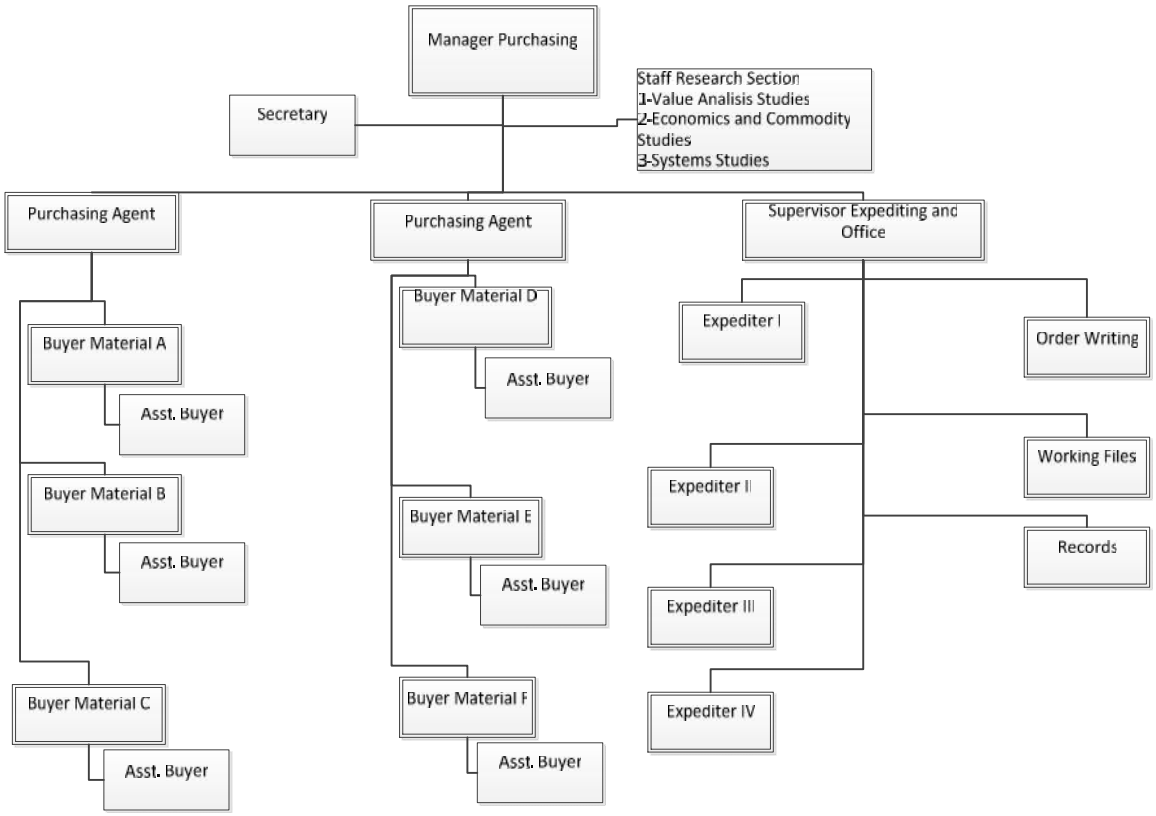


Figure 2.2: Organizational chart for Purchasing Department for typical construction firm (source: Lee and Debtor(1985)

2.4.2.4 Purchasing Procedures and Documentation

According to DCE's procurement & property administration directive (2010), the process is started with purchase requisition, the authorization of the firm through an approved official to buy the needed materials. Quality, quantity, and date needed are specified on a requisition form, which must be signed by an authorized person.

The requisition form should also be numbered for accounting control in the case of materials that are needed periodically, a repeating requisition form may be established, where goods are ordered regularly according to a predetermined schedule. A section to include purchase order number, address should be included in the form's design for best control.

2.4.2.5 Ordering

Selecting of suppliers in purchasing depends on :-quality of materials; price goods and materials; availability of materials in bulk and small quantities; service offered by supplier; payments terms offered by supplier; and reliability of supplier. Supplier offering case discounts for prompt payment may be cheaper overall than companies without discounts, even if the basic goods costs more.

Quotation request from is often used to determined supplier's prices for goods and used to compared the supplier offering the best advantages to the buyer chose. The next step is preparation of purchase order. Careful from design is needed. Since the purchase order serves as a legal contract, therefore, the Factor to be included are: name and number of farm, name address of supplier, name and address of buyer, date of order, description of goods, quantity of materials, production, delivery destination, delivery date, terms of payment, cost of transportation, discount and signature of purchasing officer. Form design and flow should be planned for simplicity for handling, avoiding unnecessary and costly duplication. Purchase orders or contracts often list conditions and terms to protect buyer

2.4.2.6 Purchasing Records

One key area in reducing purchasing cost is that of record keeping. The trades those should be maintained for rapid construction are: supplier's name and address, including what goods are supplied by each; prices of goods last purchased in each area; purchase made, listing items, prices and suppliers; and date of purchase

The following records give status purchase to process ensuring time and cost control:

- File of contracts outstanding by deadline date
- Receiving book, detailing deliveries
- Invoice book, detailing invoices proceed
- Codes for use on requisition, quotation requests and purchase order to indicate department and material for accounting use.
- Order register for purchase to progress but not yet received.
- Department breakdown of purchasing costs.

2.4.3 Logistics

Effective logistic management systems will also facilitate the integration and degree of Coordination among contactors, sub-contractors, and suppliers and will ultimately increase Construction workers' productivity (Caron, Marchet, and Perego 1998).Logistics is a concept that emphasizes movement and it encompasses planning, implementing, and controlling the flow and storage of all goods from raw materials to the finished product to meet customer requirements (Stukhart, 1995). Raw materials for construction are usually varied, bulky and heavy and required proper handling in the supplying process. Consequently, the construction industry requires active movement of materials from the suppliers to the production area in both the factory and the worksite (Pheng and Chuan, 2001).

The primary focus of the logistics concept in construction projects is to improve coordination and communication between project participations during the design and construction phases, particularly in the materials flow control process Agapiou, Clausen, Flanagan, Norman and Notman (1998). They also mentioned that Problems arise in the materials flow control process which includes delays of materials supply, due to some materials purchased just before they are required and waste of materials during storage, handling and transporting when procured in large quantities without complying with the production needs on site. The previous research suggested that, the routing of materials is one of the main causes which affect cost and time during construction projects (Varghese and O'Connor, 1995).

Hence, the factors that should be taken into consideration during the logistics process for effective materials management include: optimum forecasting of materials movement; and Planning of access and routing of material within a construction site.

2.4.4 Handling

Tompkins and White (1984) define Effective material handling as using the right method in providing the right amount of the right material, at the right place, time, sequence, position, condition, and cost.

This involves handling, storing, and controlling of the construction materials. Therefore, materials handling provides movement to ensure that materials are located and that a systematic approach is required in designing the system.
Handling of materials is the flow component that provides for their movement and placement. The importance of appropriate handling of materials is highlighted by the fact that they are expensive and engage critical decisions.

Due to the frequency of handling materials there are quality considerations when designing a materials handling system. The selection of the material handling equipment is an important function as it can enhance the production process, provide effective utilization of manpower, increase production and improve system flexibility (Chan, 2002).

The importance of appropriate handling of materials is highlighted by the fact that there are expensive and engages critical decisions. The materials handling equipment selection is an important function in the design of a material handling system in order to enhance the production process, provide effective utilization of manpower, increase production, and improve system flexibility (Chan, 2002).

In addition, materials scheduling is also an essential part of handling material on site, which has several benefits Che Wan Putra, Ahmad, Abd Majid, and Kasim (1999) such as: showing the quantities involved in each particular operation; providing a key to the distribution of materials on site; and demonstrating useful way of checking quantities required by sub-contractor, etc.
Materials must be delivered to site undamaged and without any wastage. Most common problems associated with materials supply is inadequate unloading and handling facilities, which attribute a high proportion of wastage (Canter, 1993). Therefore, handling with safety during movement of materials at site, which reduce the percentage of materials wastage and finally foster significant improvement can often the total system productivity.

2.4.5 Stock and Waste Control

The European Construction Institute's Total Productivity Management report (ECI, 1994) states that materials delivery to site is a critical, productivity-related aspect which

demands the introduction of a carefully developed system of monitoring and control as early as possible. Delivery of the bulk of the construction materials requires proper management of the stock control. Stock control is a technique to ensure all items such as raw materials, processed materials, components for assembly, consumables stores, general stores, maintenance materials and spares work in progress and finished products are available when required. (Prabu and Baker, 2006).

Construction activity can generate an enormous amount of waste (Teo Loosemore, (2001), and materials waste has been recopied as a major problem in the construction industry Formoso, De Cesare and Isatto (2002).There are also mentioned that construction materials waste, in the USA contributes approximately 29%. In the UK it contributes more than 50% and in Australia it contributes 20-30%. This is evidence to control constructions materials in a good way during the construction process. The cause of waste in construction projects indicates that waste can arise at any stage of the construction process from inception, right through the design, construction and operation of the built facility (Faniran and Caban, 1998). Therefore, waste can be reduced through the careful consideration of the need for minimization and better reuse of materials in both the design and construction phases (Dainty and Brooke, 2004).

Material storage on site requires close attention in order to avoid waste, loss and any damage of materials which would affect the operations on the construction project.
Problems often arise during materials supply because of improper storage and protection facilities (Canter, 1993). Previous studies have identified that building materials often require a large storage capacity which is rarely available on site (Agapiou et al.1998). However, Stukhart (1995) suggested that there are a few considerations to be taken into account in the planning of the storage space such as timing of the initial buy, and historical information and experience.

Materials management on site should seek to reduce loss of profit due to theft, damage and wastage, as well as running out of stock. Therefore, the requirements of storing space should be taken into consideration from the initial stage of the construction process.

2.4.5.1 Elements of a Waste Management Plan

Project planning is very important because it allows the opportunity to define a problem, assess possible solutions, proceed to implement the final option and make provision for evaluation at the end. It is unthinkable to commence a construction project without going through this process.

For the same reason, waste management on construction sites should be planned before construction activities begin. A waste management plan does not have to be complicated; in fact it need not even be a long document. It simply needs to be concise, comprehensive and practical for easy interpretation and implementation on site.

2.4.5.2 Materials Wastage and Security Control on Site

Materials waste control methods reduce firm and industry wastages from practice already operation thus reducing project costs. Control is applied to the following areas.

- Materials quality:- Inspection of materials prior to construction can eliminate faculty materials that would waste processing labor and other materials if unchecked.
- Materials standard should be specified to aid to the inspection process.
- Materials handling efficiency including equipment and methods that will not charge materials in storage or interplant practices
- Employee training to maximize efficient construction.
- Study packing to protect incoming materials and outgoing materials

When determining the amount of waste and methods to control it the statistics that should be established are:- weight and / or volume of wastes; sources of wastes; value of waste; and later use of waste, if any.

Therefore, with the trend of materials cost using at a faster than other resources the control of waste is vitally important, both on and off site. Buttler (1983) in the Element of Administration for building student's stressed that waste can reduce by the following:-

- Ensure that materials are delivered as required so that site storage time is cut a minimum this requires careful phasing of deliveries between site and supplier
- Ensure that materials delivered are those specified for that particular job.
- Ensure that workman are not only producing excessive amount of “off event”
- Make sure that the storage is located near the site
- Make sure that stored materials are not deteriorated.
- Collect waste and use to prevent more cutting.

2.4.5.3 Security Control of Materials

Security is the protection of business property including information, both in the plant or site and intra-sit. Costs are reduced through the use of security by a reduction of materials, suppliers that are proffered or stolen.

Additionally insurance costs may be reducing when adequate security pensions are made. One study made by professor leons redzinoicy, well-known criminology at Cambridge University, indicates that as many as of preterm of women and 29 percent of men carry out one or more indictable crimes during their lifetimes, and percentages are rising. Cost of security system it is much lower when the system is designed and built on site. Theft resistance doors and windows fencing, compounds, store shed, day guard and night, dogs on the site. Alarm e.t.c are all much cheaper to install.

2.4.5.4 Material Control

Chandler (2008) explained that the degree of control on the inflow of materials and accompanying paper work will depend upon the size of the contract and the staff assigns to oversee this work.

After all the planning ordering and buying process have been working to effect a tight control over the materials situations, the site can negate the whole system if it does not carry out its functions (to supervise the utilization of materials on the site).

He stressed further that control on site must be exercised respect of waste deterioration, misuse e.t.c. careful check should be made to ensure correction of orders and that materials delivery can be properly stretch and unnecessarily handling avoided

Control measures on site should include:

- Adequate supervision: should ensure that materials are not dropped, spoiled or discarded unnecessarily during operation.
- Accounting: Records should be kept of all transactions – receipts, suppliers, waste, and transfers to other sites
- Delivery: schedule of timing and contractual responsibility in delivery orders should be agreed with supplier. Order should be checked on arrive on site by competent storekeeper.
- Security and storage: practical site security with fencing where necessary and a watched gateman, site store with lock. In addition, site manager's office should be situated in such a position that he could have an overview of the entire site where practicable.
- Internal Transportation: This should be done in a way to avoid double handling. And so on.

2.4.5.5 Stock Control Technique

Compton(2009) states that "stock control" is the means by which materials of the correct quality and quantity is made available as and when required with due regard to economy in storage and ordering cost, purchase prices and provision of in terms of money. Higgins (2006) explained that careful stock control assures the user that materials and supplies are not being wasted or stolen and can reduce costs of such goods and their storage.

He said further that another fact of the technique controls purchase goods inventories from the times they are supplied until incorporated by the contractors. Basic steps that both areas of stock control include is:- goods receiving and receiving the receipt; storage of goods in goods conductor; and control recording incoming and outgoing construction materials as well as the supply on hand.

Also control of incoming and issuing of construction materials as well as inventories of stock on hand and reserve stock records of issuing materials and the of inventory turnover.

2.4.5.6 Reason for Holding Stock

The cost goods for inventory burden cost is high usually 25-35 percent of the values of goods – (Higgins, 2006). This figure includes the cost of the physical storage facilities. Handling, distribution taxes insurance and deterioration. Deterioration account for well over half of the cost, and therefore they are especially suitable targets for cost reduction procedures. Storage should be kept to the minimum required, and reasons for holding stock include the following reasons.

- Delivery cannot be exactly matched with day by day usage.
- Quantity discounts or projected inflation caused price increase on materials purchased large enough to offset storage costs.
- Fear of widely fluctuating market for goods.
- Fear of short run inflation on some materials constantly used.
- Some items appreciate in value during the time of storage e.g block.

2.4.5.7 Control

Stock control requires the following steps.

- Establishing a base inventory of goods now held, as well as a method for adding to or subtracting from the inventory, will eliminate costly annual stock taking.
- Decisions must be made as to the amount of supplier's goods to be held, taking business conditions and quantity needed into account along storage cost factors.
- Co-ordination of purchase and delivery schedules by departmental head and the purchasing department.

The following are the stock control;

- ABC Analysis: this is a useful technique for stock control materials. Here, goods are broken down into one of three classifications of value of goods consumed. A small percentage of items stocked will account for a large percentage of total value, and storage cost control can be more precisely applied to these items with the saving of large areas of cost with little effort.

- Material Utilization Control: the efficient use of construction materials to reduce waste thus lowering costs. According to Higgins (2006), primary methods of materials utilization include efficient materials selection, efficient handling and use, standardized materials practices, and administrative controls.
- Efficient Material Selection: includes choosing the lowest cost material of an adequate quality for construction purpose after considering the availability of needed grades, sizes, quality, e.t.c.
- Efficient Handling and Use: can be facilitated through proper management of computers firm with correctly designed and maintained fools and equipment. Oil leaks rusty e.t.c. and also ruin raw materials. If the equipment is not adequately taken case of it can increase the cost of raw materials. Materials handling could be manual or mechanical, materials are handled manually when human labour/power is employee to carry/move or handled manually to and in site. Examples of such materials that could be handled manually to and on site are bagged some package and loose materials. Materials are handled mechanically when mechanic, equipment or plants are the device used to move the materials are dumper, forklift, trucks, Carnes, host power shovel city.

2.4.6 Storage of Materials

According to Mezue (1992) material storage can be defined as merely keeping material(s) in sage place until it is required or requested for use in a manufacturing process. Manufacturing process also includes construction process. To obtain good material storage, a system whereby material are systematically organized by administratively keeping them safely and providing for the best means of flowing in and out of them is adopted. Storage of materials is the direct responsibility of site management and has a strong influence of material.

Chandler (1978) advanced that attitude taken to newly delivered materials and components will be carried through their subsequent handling and usage. A careless regard for the value and utility of the materials on part of the management could lead to a progressive deterioration in the operatives' regard for the materials. The system adopted for the storage of materials will therefore depends wholly on the co-operation of the site team.

He stressed further that areas on site allocated for the storage of materials should be determined after considering the questions:-will construction take place in that area?; is the storage for a long or short term relatives to the contract time?; can delivery transit vehicles safely and easily reach the areas?; can on site movement storage area to point of use be safely and economically carried out?; are the materials as near to their point of use as practically possible?; is the materials have considered value are they in a security areas?; will the storage area create problems in routine site transport and personnel?

The answers to each of these questions will vary from materials to materials. Good storage facilities must be maintained by construction industries for effective construction work cost and cost control. Materials must be stocked in places where they can be easily obtained for use. Below is a typical organization chart for store department.

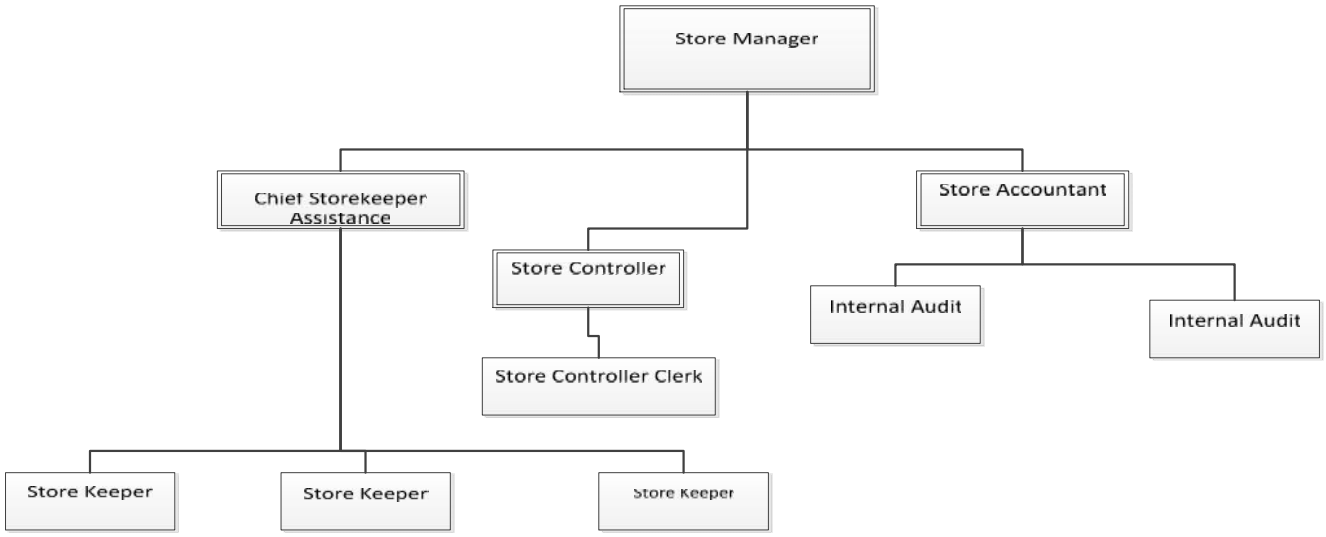


Figure 2.3: Organizational Chart for Store Department in Construction Firm

Source: Peter and David (1992)

2.4.6.1 Popularity Storage

Popularity storage is a stock controls technique that places the most frequently used and or the most easily moved materials, suppliers or goods nearest the point issue. The order that priorities and storage positions are assigned to good are:-most often issued most easily moved items; out of date items; excess stock items; and out of reason items.

2.4.6.2 Physical Storage Facilities

- Factors those should be considered in arranging storage areas:- choice of one large storage place or a network of smaller storage areas is the first consideration.
- If only one operation is served or if multiple operations are located near one another, a central storage place is the most economical. If branch operations are located near one another, a central storage place is the most economical. If branch operations are spreads over a wide geographical area, however branch areas may be proffered to allow storage near the point of use.
- Transportation loading and unloading materials should design to most efficiently handle the type of transportation used, as should access facilities such as roads or rail access features.
- Safety areas should be designed for storage of fragile or dangerous materials.
- Open areas such as outdoor yards may be used for low cost storage for durable materials or goods not harmed by weather.

2.4.6.3 Goods Receiving

In goods receiving, incoming materials and suppliers are checked against purchase order for quantity and conditions and shipment is recorded, purchasing departments and inspection division are notified. A multiple copy form called a good received register may be used for this purpose. The forms are numbered and show the date received, suppliers name and address e.t.c. this form, combined with the suppliers invoice and an inspection form, are used by the accounting department to make it payment.

2.5 Materials Management Problems

There are many issues which contribute to poor materials management in construction projects. Zakeri et al (1996) suggested that waste, transport difficulties, improper handling on site, misuse of the specification, lack of a proper work plan, inappropriate materials delivery and excessive paperwork all adversely affect materials management. Shortage of materials contributes to the cause of delay in managing materials in the construction site Ogunlana, Promkuntong, Jeark-jirm (1996; Abdul-Rahman, and Alidrisyi, (1994); Aibinu and Odeyinka, 2006). Late delivery of ordered materials is also problematic in materials management. Furthermore, Dey (2001) noted that the common issues relating to materials management are as follows:

- Receiving materials before they are required, causing more inventory cost and chances of deterioration in quality;
- Not receiving materials at the time of requirement, causing loss of productivity;
- Incorrect materials take-off from drawings and design documents;
- Subsequent design changes;
- Damage/loss of items;
- Selection of type of contract for specific materials procurement;
- Vendor evaluation criteria;
- Piling up of inventory and controlling of the same;
- and Management of surplus materials

The traditional construction method supply paper-based work during the construction process. This can produce excessive paperwork and contributes poor materials management in construction projects. Zakeri.,Olomolaiye, Holt and Harris(1996) there is also give problematic, effort - prone and inefficient in the recording and exchanging information of materials component within a supply chain.

2.5.1 Factors Affecting Materials Management on Construction Sites

According (Narimah, 2011), the factors affecting materials management are:- sourcing of materials and requisition; demand estimation; transportation; receiving and verification of materials on site; storage of materials on site; issuing of materials for use; procurement or indent for materials; quality inspection and control; maintenance; time; materials handling; stock and waste control; financial ability; possession of qualified staff; possession of qualified subcontractors; possession of qualified of required equipment; competence of estimators; availability of equipment; duration of the project; type of project; type of materials; and level of awareness

2.5.2 Approaches to Addressing Problems

Firstly, if there are any problems with the materials delivery (relating to late delivery, materials damages or shortages) the suppliers were advised immediately. There was a second strategy, which involved referral of any problems to the Project's Quality Officer, who solves problems relating to the quality of materials. Lastly, in order to deal with the logistics within the work place', all work by labour is carefully controlled and monitored. In order to avoid double handling and committing the same mistake by to labour force, the site manager gives clear instructions and delegates certain work processes to the construction workers.

According (Narimah ,2008), the measures for effective materials management practices on construction project are:- timely placing of orders for materials; ensure quality assurance/control processes are in place; logistics for tracking & transportation of materials to site; receiving and inspecting materials on site; storage & issuing of materials to construction location; complete quality records of materials; established material management system to be used; documentation; record receipt of goods upon delivery; monitoring of materials distributed; assigning of material codes; construction activities and schedule of materials; proper materials handling; make the store safe from theft and vandalism; materials return to be submitted weekly; determine the daily allocation of materials on site; education/training/enlightenment of staff in charge of materials management; special security agents; and usage of qualified construction professionals

2.6 Benefits Gained In Good Materials Management

According to Bernold and Treseler (1991), the following are the benefits of materials management.

- Elimination of bulk passing: by defining centrality the authority and responsibility for all the materials function are under key individual, a central part of control for the total flow system is provides. When using departments have problems regarding their materials requirements, they can look at are central part within the organization for answers and action.

- Better inter-department/section co-operation: this is accomplished both between the materials management function and manager departments within the total organization, and also with the various sub functions that make up the materials department. Using departments find that they relieve better, more efficient service from the materials section. This creates an atmosphere conducive to solving materials user supplier problems with a sense of mutual trust and cooperation. In addition to cooperation between user section and the materials department, cooperation will be festered between the various functions making up the material, under a central responsible manager; these departments will develop a sense of mutual support and confidence in accomplishing the total material jobs.

- Lower prices for materials and equipment used. Wise buying requires accurate information, promptly supplied, regarding materials used. Wise buying requires accurate information, promptly supplied, regarding materials needs. This enable purchasing to take advantage of things such as quality buying, use of various types of blanket orders and other type if contract buying arrangement and buying in anticipation of market changes when all materials functions including materials planning control and inventory control are joined together organizationally, communication regarding materials requirements are generally expedite.

- Faster inventory turnover: Dug to great speed, accuracy and completeness of communication regarding materials requirement and usage rates, it is often possible to reduce the total investment inventory, with resultant savings in inventory cases. Indeed some firms famed that centralization of materials function resulted in a 20-40% reduction in site of materials stock.

- Continuity of supply of materials during construction: descriptions in operations are extremely costly to a construction firm and the client. Yet descriptions do occur, often because of breakdown in communications between various materials function and lack of cooperation between functioning. Material management factors the used for co-operation communication, coordination which help to prevent such disruptions.

- Reduce material lead time: with long communicates a substantial amount of time may elapse between the date potential material user recognize his need and the time that material of relieved by the construction firm. If this information must be transmitted to materials planning and control, then to inventing control and finally to purchasing and if these three functions are vet in close organizational proximity, several days male elapse before the purchase order even goes to vendor. Additionally, there is a chance that because of the organizational distance between functions, urgency in materials needs may be misunderstood.

An effective material management system can bring many benefits for a company. Previous studies by the Construction Industry Institute (CII) concluded that labor productivity could be improved by six percent and can produce 4-6% additional savings (Bernold and Treseler, 1991).
Among these benefits are: reducing the overall costs of materials; better handling of materials; reduction in duplicated orders; materials will be on site when needed and in the quantities required; improvements in labor productivity; improvements in project schedule; quality control; better field material control; better relations with suppliers; reduce of materials surplus; reduce storage of materials on site; labor savings; stock reduction; purchase savings; and better cash flow management

2.7 Local practice

Literature reviewed in relation regarding local practice is limited. However it is not focused directly on the professionals' perspective, there was a survey which was done at Bahirdar University on the title that construction materials management on project sites of Bahirdar town (Wubishet ,2013)

The survey results show that contactors, in general, are interested in using many tools of managing construction materials. However, most contractors did not actually apply some tools and techniques of construction materials management such as:

- Creating database for materials categories, local suppliers, international suppliers, and materials cost.
- Updating database for local suppliers, international suppliers, materials cost when change, and using internet for knowing the new materials and its prices.
- Providing a list of materials in project, providing material cards at site store, and recording the received materials on site.

Even the few contractors who used the above-mentioned tools and techniques, they applied these tools either without recording at all or with recording in an unsystematic way without using manual or computerized forms. Most contracting companies manage construction materials using non computerized forms. Shortage of suitable construction materials management software is considered the main obstacle to computerize materials management processes. Another important factor is lack of qualified persons in using computerized construction materials management packages. There is a consensus amongst contractors on the importance of using a computerized construction materials management system. The main advantages that can be obtained from using materials management software are:

- Reducing the cost of materials needed in the project.
- Better handling of materials.
- Materials on the construction site in time and with required quantities.
- More effective waste control.
- Improving follow up and monitoring construction materials.

From the physical observations of the site visit, it is observed that most of the contractors in Bahir Dar do not have a good perception of construction materials management principle.
Some contractors in the town have a little concept in the application materials management principle. This is expressed by their provision of some systems of material management at their project sites.

2.8 Conceptual frame work of the research

2.8.1 Construction Materials Management on Project Sites

Materials management is a process for planning, executing and controlling field and office activities in construction. The goal of materials management is to insure that construction materials are available at their point of use when needed. The materials management system attempts to insure that the right quality and quantity of materials are appropriately selected, purchased, delivered and handled on site in a timely manner and at a reasonable cost. Materials management is the system for planning and controlling all of the efforts necessary to ensure that the correct quality and quantity of materials are properly specified in a timely manner, are obtained at a reasonable cost and most importantly are available at the point of use when required. Thus Materials management is an important element in project management.

Materials represent a major expense in construction, so minimizing procurement costs improves opportunities for reducing the overall project costs. Poor materials management can result in increased costs during construction. Efficient management of materials can result in substantial savings in project costs. If materials are purchased too early, capital may be held up and interest charges incurred on the excess inventory of materials. Materials may deteriorate during storage or get stolen unless special care is taken. Delays and extras expenses may be incurred if materials required for particular activities are unavailable. Ensuring a timely flow of materials is an important concern of material management. For effectively managing and controlling materials, the performance of materials management should be measured.

A performance measure calculates the effective working of a function. These performance measures may differ from system to system. The measures divide the materials management system in parts and make the working of the system more efficient. When joined, the measures make the complete materials management system.

Components of material management are:

- Material estimation, budgeting, planning and programming.
- Scheduling, purchasing and procurement
- Receiving and inspection.
- Inventory control, storage and warehousing
- Material handling and transport
- Waste management

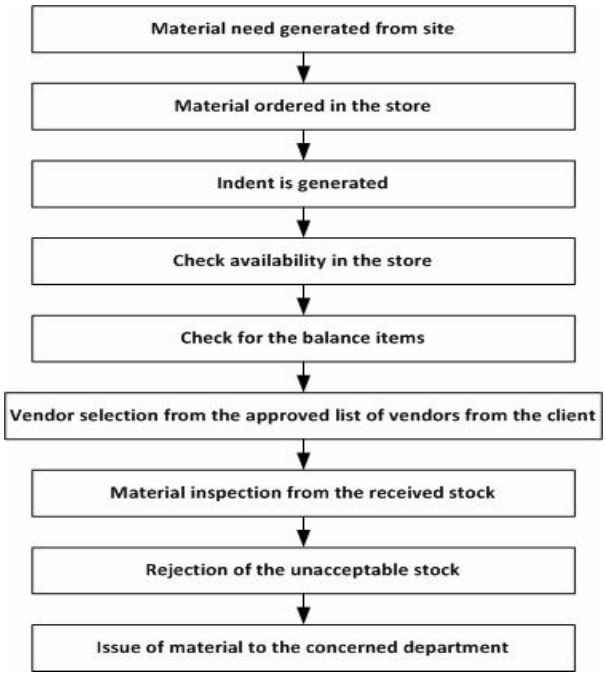


Fig.2.4 Process of Material Management

2.8.2 Project Management

Special training sessions should be arranged on site to update the workers regarding the latest techniques. Plant and machinery should be updated regularly in order to avoid any break down. Workers and contractors should be guided for correct methodology to execute a particular task. Regular check should be kept on planning so as to overcome any error.

Proper supervision should be done on site to improve the level of workmanship. Taylor (1913) pointed out that the economic losses caused by material waste are smaller than those related to the inefficiency of human work. Ford (1927) also suggested that human work should be the focus of waste convention since the value of materials depends, to a great extent, on the work that has been spent on them. Berliner says project control in many companies is based mostly on financial performance measures, which tend to be backward focused and do not make it easy to trace operational costs.

Objectives of materials management

- Efficient materials planning
- Buying or Purchasing
- Procuring and receiving
- Storing and inventory control
- Supply and distribution of materials
- Quality assurance
- Good supplier and customer relationship
- Improved departmental efficiency

To fulfill all these objectives, it is necessary to establish harmony and good co-ordination between all the employees of material management department and this department should have good co-ordination with the other departments of the organization to serve all production centers.

In order to fulfill the objectives of materials management as stated above to meet the basic objectives and goals, the functions of the materials management are also categorized as primary and secondary functions.

(I) Primary Functions

To meet the primary objectives, the primary functions of the materials management are given as follows:

- Materials Requirements Planning (MRP)
- Purchasing
- Inventory Planning and Control

- Ascertaining and Maintaining the Flow and Supply of Materials
- Quality Control of Materials
- Departmental Efficiency

(II) Secondary Functions

- Standardization and Simplification Make and Buy Decisions
- Coding and Classification of Materials
- Forecasting and Planning

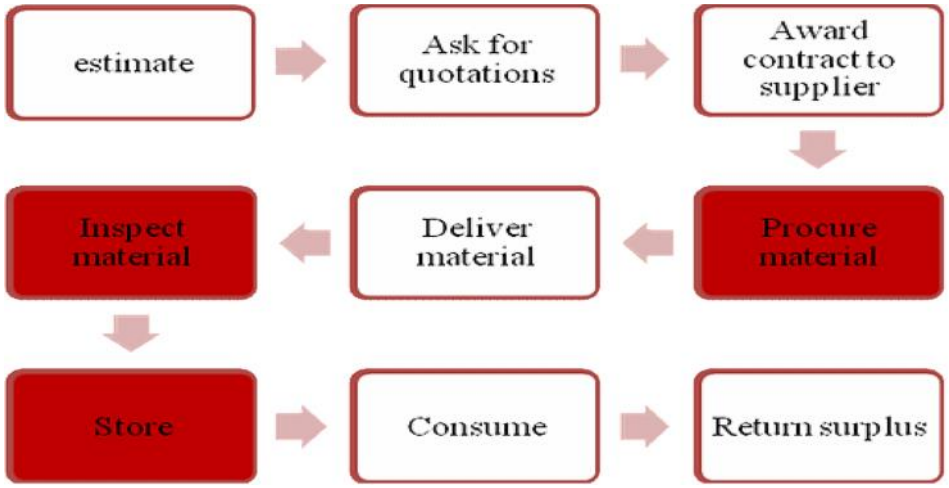


Figure 2.5:Material Management Flow At Construction Site– DCE

1. PM is in charge of all the releases based on schedule
2. Store keeper coordinates with PM directly if problems arise and PM contacts vendor
3. Materials stored on site directly till the time they are consumed, no proper storage facility.

According to Agarwal Anil (NICMAR, Pune) benchmarking processes and techniques can be applied to develop benchmarks for wastage control of building materials. After selection of project, the following steps are adopted. Work out estimates of quantities of materials required either from the first or final drawings. From site records/ accounts records, actual quantities of material consumed is obtained. Interviews are held with project managers and owners concerned to collect other related information.

Planning

The most commonly used basis for planning things out for the project is the BOQ prepared by the client. Companies may have two major levels in planning- micro and macro level. Time, cost, material and labour are the four major types of planning undertaken on sites. The planning should be revised as frequently as possible in order to monitor whether work is progressing as planned.

Purchasing

According to Ninad Shah and Manish Dave Purchasing procedure can be described as below: Step 1 – Material Indent

Step 2 – Enquiry to Vendors

Step 3 –Vendor Comparison

Step 4 –Vendor Selection and Negotiations

Step 5 – Purchase Order

Step 6 – Vendor Evaluation

Receiving

According to Sunders an, M. the receipt system can be divided into: Receipt from outside suppliers & Receipts from internal divisions.

System of receipt starts even before the material reaches the site. The three documents that should be dispatched are copy of purchase order, supplier's advice document and the consignment note. This enables the Stores manager to organize and plan for clearances of materials. For receipt from internal divisions, usually transfer notes and return to stores documents are used.

Inspection

Inspection can happen in two ways

1. Pre- dispatch inspection
2. Inspection on site

It is the responsibility of the inspector to inspect all materials delivered to the site prior to their being used in the work. It is desirable to perform inspection of materials or fabricated products prior to their delivery at site. E.g.: precast members. The inspector shall have rights to reject faulty material and have it removed from site. With respect to manufactured goods, the quality requirements should be specified in the purchase order. There are three methods of inspection: Visual, Tactile, and Statistical:

Stacking And Storage

Types of physical storage system on site vary according to the space availability and company practices. Industrial guidelines are also taken into consideration for the stacking and storage of particular materials. Materials are most often classified as per the comfort level of working of the workers. Basic categories followed are civil, electrical, plumbing, finishes, construction chemicals, miscellaneous. The materials are also often stacked as per the specification of the vendor or manufacturer.

1. The materials should not be affected by impurities or atmospheric agencies.
2. Materials like cement should must be stored in covered sheds and stacked on timber raised platforms.
3. Reinforcing bars should be stacked yards away from moisture to prevent rusting and also away from oil and lubricants. Bars of different classification, sizes and lengths should be stored separately to facilitate issues.

Issuing Material

According to Sundersan, M. issues can be divided into

1. Issues to consuming departments
2. Issues to outside suppliers for processing or conversion. Issuing on site does not happen in the case of all construction materials. In the case of sand or aggregate, the materials are consumed as and when required corresponding to the progress of the project. For other materials, issues are based on production programs. Based on this and the bill of materials, work orders are printed, listing for each material, quantity to be issued against each component requiring that material. This automatically controls consumption.

Inventory Control

Sunders an, M. defines inventory as “The sum of the value of raw materials, fuel and lubricants, spare parts, maintenance consumables at any given point of time.”

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter is a review of the various approaches to data collection and analysis adopted in conducting this research; it explains the type of research strategy adopted the mode of data collection and the methodology used in carrying out this research. It includes the research design, sample size and sampling technique, data source and collection method, procedure of data collection, method of data analysis and questionnaire reliability test was presented.

3.1 Research Design

The research employed descriptive method because the study intended to find out the material management practice on construction projects sites. Kothari (2004) defines descriptive research study as –Descriptive research studies are those studies which are concerned with describing the characteristics of a particular individual, or of a group. According to Saunders et al (2009), there are seven research strategies (experiment; survey; case study; action research; grounded theory; ethnography and archival research). In this research the researcher used survey research.

Survey research is a popular and common strategy in business and management research and is most frequently used to answer who, what, where, how much and how many questions. And used for exploratory and descriptive research. Surveys research allows the collection of a large amount of data from a sizeable population in a highly economical way. Often obtained by using a questionnaire administered to a sample, these data are standardized, allowing easy comparison. In addition, the survey strategy is perceived as authoritative by people in general and is both comparatively easy to explain and to understand.

The survey strategy allows you to collect quantitative data which you can analyze quantitatively using descriptive statistics. In addition, the data collected using a survey strategy can be used to suggest possible reasons for particular relationships between variables and to produce models of these relationships.

The two common data collection techniques and analysis procedures widely used in business and management research according to Saunders et al (2009) are quantitative and qualitative methods.

One way of distinguishing between the two is the focus on numeric (numbers) or non-numeric (words) data. Quantitative is predominantly used for any data collection technique (such as a questionnaire) or data analysis procedure (such as graphs or statistics) that generates or uses numerical data. In contrast, qualitative is used predominantly as a synonym for any data collection technique (such as an interview) or data analysis procedure (such as categorizing data) that generates or uses non-numerical data.

In order to make it suit to the collection of the required information from a larger sample and make the analysis easier, the study was used a quantitative method by incorporating a qualitative item in to the questionnaire. Thus, data was gathered from building department top and middle organizational managers, project managers and construction engineers, office engineers ,follow up engineers, site engineers and quantity surveyors those who are working in head office and building projects which are located in different part of the country, via self-administered closed ended questionnaire.

Saunders et al (2009) also divide research design in to longitudinal and cross-sectional, based on time horizon. Cross-sectional studies are the study of a particular phenomenon at a particular time. It includes research projects undertaken for academic courses. Cross-sectional studies often employ the survey strategy. Longitudinal research has capacity to study change and development over time the researcher is able to exercise a measure of control over variables being studied. In this study, the researcher had used a cross-sectional study because data were collected from a cross-section of professional engineers of the enterprise, once.

3.2. Data Sources and Instruments of Data Collection

The study had used both primary and secondary data sources. The secondary data were collected via detailed review of related literature i.e. books, articles, journals and many

other relevant written publications. The researcher used primary data that was collected via questionnaire.

The decision to select the two instruments was arrived at after carefully considering their advantages and disadvantages. As the research was intended to investigate the material management practice of the construction projects site in DCE, a set of questionnaire was distributed to professional engineers of the enterprise. The researcher was developed 98 Likert-scales and 10 additional open-ended questionnaires. The questionnaire was used from which it prepared to gather information on Assessment of Delays in Building construction projects in Ethiopia. (Semere, 2006) and from which to gather information on Construction materials management on project sites of Bahirdar town(Wubishet,2013). The questionnaire statements objective was evaluated on a 1-5 Likert scale , where 1 indicates strongly disagree with the statement, 2 disagree, 3 neutral, 4 agree and 5 refers to strongly agree with the statement.

3.3 Sample size, Sampling Technique and Participants

According to the information obtained from human resource development and general service team of defense construction enterprise, there are two core processes which are the road and building departments with 202 professional engineers. The population size considered in this study is 202 in numbers, but purposely the researcher focus only on the building core process because the road core process works are more machinery intensive rather than material. So the sample size considered in this study is 126 , which are all building department's top and middle organizational managers, project managers, construction engineers, and office engineers, follow up engineers, site engineers and quantity surveyors of each project in which purposive non probability sampling is adapted to gather data. As the information obtained from human resource development and general service team of defense construction enterprise, there are 3 building department top and middle organizational managers, 12 building and real-estate project managers and around 111 construction engineers, office engineers, follow up engineers, site engineers and quantity surveyors. The sampling design for this population is purposive non probability sampling. In purposive non probability sampling units such as individuals, group, of individuals etc. are taken based on specific purposes associated with answering a research study's questions (Creswell, 2009).

The number of building department top and middle organizational managers, project managers , construction engineers, office engineers, follow up engineers, site engineers and quantity surveyors of building projects from human resource development and general service team of the enterprise are 126 ,and all of them were included in the sample. The researcher was surveyed and distributed 126 questionnaires for the entire population.

3.4 Data Gathering Techniques

Both primary and secondary sources of data are used in this research. The use of these two sources helps to get pertinent data related to the study from these important sources. The primary data was obtained through field survey. In order to collect data and to meet the set objectives of the research, a structured questionnaire based on the aim of this study was designed. On primary data collection relevant documents of the enterprise, policy guideline different books, the enterprise manuals, reports, contractual agreements and other related publications were used to enrich the data gathered from the primary sources.

3.5 Methods of Data Analysis

The methods of analysis used in this research were selected due to the type of data available for the analysis and the objectives of the research. The questions in the questionnaire were qualitative; hence the descriptive method of analysis is best suited for the analysis. Such method was applied for the presentation, interpretation and discussion parts on various dimensions of the appropriate to analyze, interpret, tabulate and present the result of the study. The data gathered through questionnaires was coded, entered into computer and analyzed and presented in the form of charts, diagrams, and tables by using SPSS Statics version 20 software. Finally, conclusions were made based on the results/findings of the study and recommendations were forwarded on the basis of the data analyzed.

3.6 Result of Pilot Test

Pilot study of the questionnaire is achieved by a survey sample, which consisted of 15 questionnaires. These questionnaires were distributed to team leaders, projects managers, office engineers, construction engineers, site engineers and follow up engineers & quantity surveyors at head office and projects around Addis Ababa , first to give their comment on the questions and then to fill the questionnaire. The following items are summary of comments obtained from pilot study:

- There are few technical defects, such as punctuations, missing letters, etc.
- There are redundant questions, or has questions of the same concept.
- It is well prepared and organized.
- Include cell phone and email address on your cover pages.
- Some choices should be added in section A of questionnaire in order to achieve more accurate and suitable choice of respondents.

After making some amendments according to their comments 16 questionnaires were distributed to test the reliability of the questionnaire and 15 questionnaires were returned. Those are taken as participant for pilot test not be included in that round of data collection.

The reliability of an instrument according to Saunders et al., (2009) is the degree of consistency which measures attribute, in particular, whether or not it will produce consistent findings at different times and under different conditions, such as with different samples. Internal consistency involves correlating the responses to each question in the questionnaire with those to other questions in the questionnaire. It therefore measures the consistency of responses across either all the questions or a sub-group of the questions from the questionnaire. There are a variety of methods for calculating internal consistency, of which one of the most frequently used is Cronbach‘s alpha. Cronbach's alpha is a measure of internal consistency, that is, how closely related a set of items are as a group. It is considered to be a measure of scale reliability. Cronbach's alpha can be written as a function of the number of test items and the average inter- correlation among the items. The formula for the standardized Cronbach's alpha is as shown below:

$$\alpha = \frac{N \cdot \bar{c}}{\bar{v} + (N-1) \cdot \bar{c}}$$

Where N is equal to the number of items,

C-bar is the average inter-item covariance among the items and

V-bar equals the average variance.

A commonly accepted rule of thumb according to Saleh (2009**)** for describing internal consistency using Cronbach's alpha is as follows.

$0.9 \leq \alpha \leq 1.0$	Excellent
$0.8 \leq \alpha < 0.9$	Good
$0.7 \leq \alpha < 0.8$	Acceptable
$0.6 \leq \alpha < 0.7$	Questionable
$0.5 \leq \alpha < 0.6$	Poor
$0.0 \leq \alpha < 0.5$	Unacceptable

Table 3.1: Reliability sample testing scale

Case Processing Summary			
		N	%
Cases	Valid	9	60.0
	Excluded [a]	6	40.0
	Total	15	100.0
a. Listwise deletion based on all variables in the procedure.			

Reliability Statistics	
Cronbach's Alpha	N of Items
.812	113

Source: Survey data,(2016)

The reliability scale result is 0.812 which indicates that there is a very high consistency. Therefore, it can be said that the questionnaire is reliable and ready for distribution for the population sample.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Result/Findings of the study

This chapter explains and discusses the results of findings based on the analysis done on the data collected. The result of the survey was discussed by using the different source results: questionnaire results and document review results .The discussion attempts to accomplish the objectives of the study and answer the research questions.

A total of 126 questionnaires which dealt with survey to assess the material management practices in the construction projects site of DCE .However 121 questionnaires were collected and usable responses (96.03% response rate), relevant documents have been also reviewed.

The questionnaire contains variables which include issues such as component of materials management, stage of material logistic planning, factors which affect effective material management, problems of material management, causes of material wastage, measures to ensure, and benefit to implement construction material management on site. All items in the questionnaire are arranged in a form of Likert items to capture the feelings of respondents in scale ranging from 1 to 5.All the data has been analyzed in SPSS so that the accuracy of the information is maintained. In addition to this a self-administered close ended questionnaire is included to support the researcher to discuss the results more clearly .

4.1.1 General Information about Respondents

The information generated to address the stated research objectives is solicited from respondents with diverse demographic characteristics. The first part of the questionnaire consists of the demographic information of the participants. This part of the questionnaire requested a limited amount of information related to personal and professional characteristics of respondents. Accordingly, the demographic variables about the respondents were

summarized and described in different figures and tables. These variables include: sex, educational qualification, work experience and job profession.

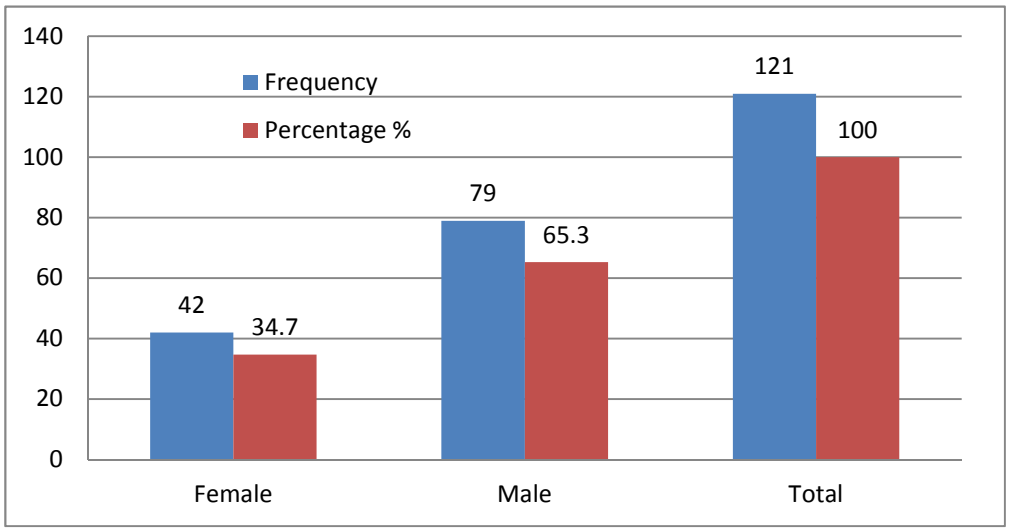
As stated previously, questionnaires were used to obtain primary data for this research work. The result of the returned questionnaire is presented in the table 4.1. From the table, it gives the breakdown of the administered questionnaires based on the number of responses obtained. Based on the level of homogeneity of the returned questionnaires, 96.03% response rate is considered adequate for analysis and conclusions of this type of research (Akintoye, 2000).

Table 4.1: Administered Questionnaires and Responses

Questionnaire	Frequency	Percentage %
No. of distributed	126	100
Accepted responses	121	96.03

Source: Field survey,(2016)

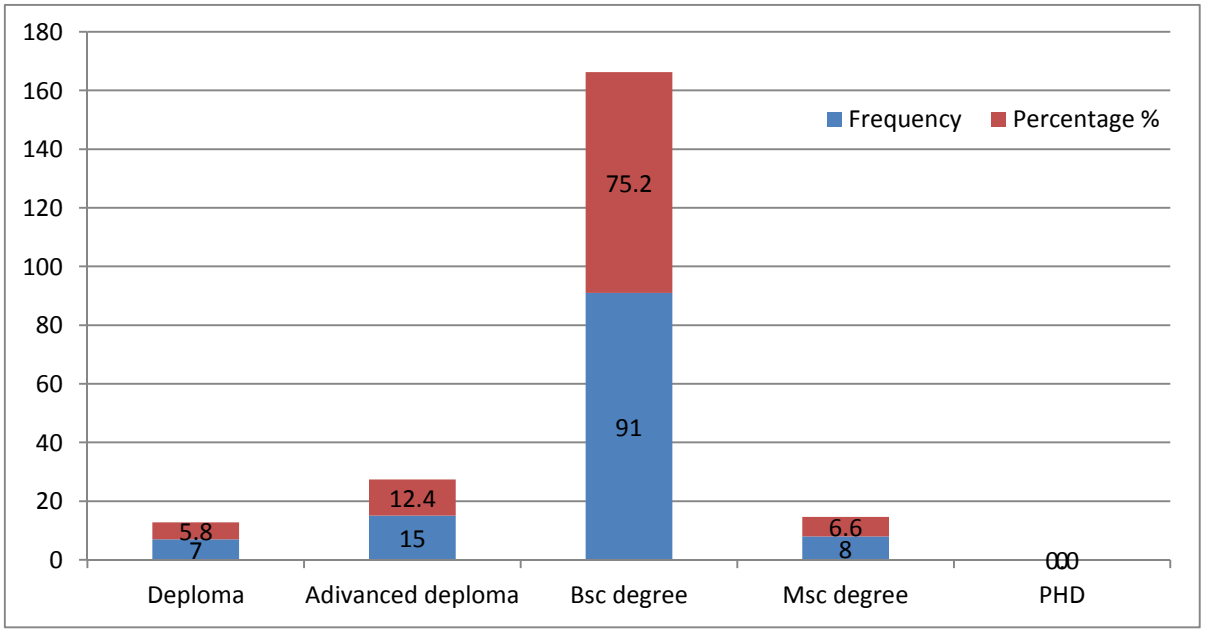
Figure 4.1: Respondent's Sex



Source: Field survey,(2016)

Figure 4.1 shows that most (65.3%) of respondents are male and 34.7% of the respondents are female.

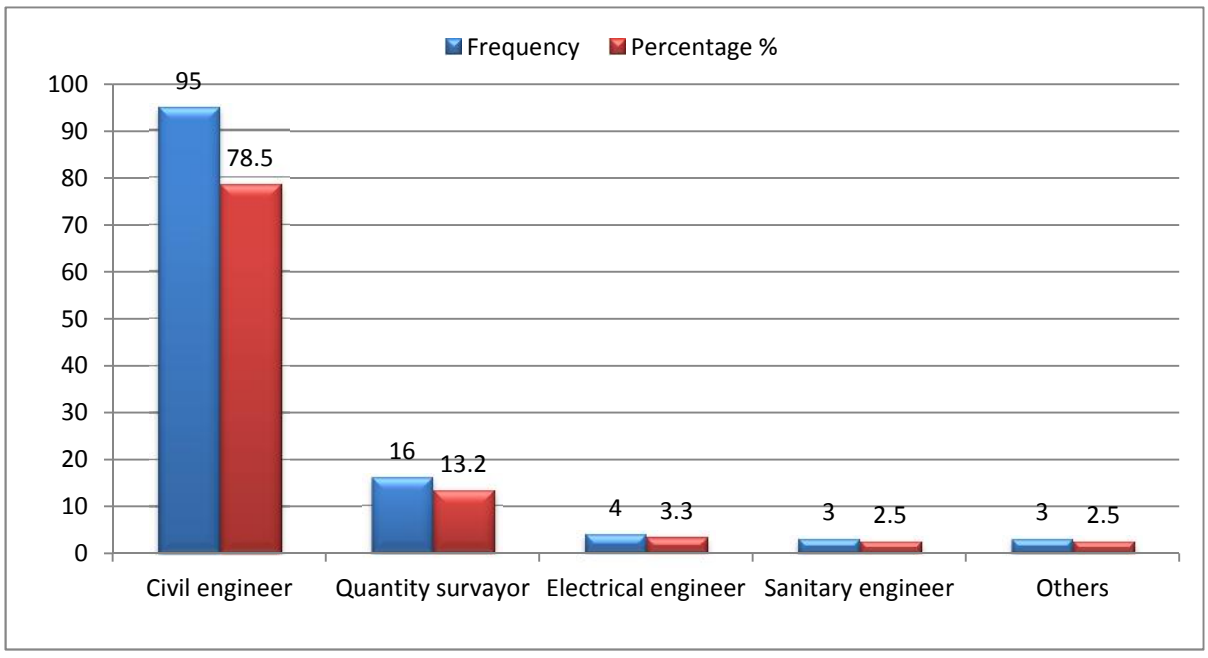
Figure 4.2: Respondent's Educational Qualification



Source: Field survey,(2016)

Figure 4.2 shows that 75.2% of the respondents are first Degree holders, 18.2% are Diploma holders and 6.6% are Master Degree holders. In summary, about 81.8% of the respondents have first degree and above.

Figure 4.3: Profession of Respondent's



Source: Field survey,(2016)

The distribution of respondent's profession is shown in figure 4.3, the highest concentration of the respondents are Civil engineers (78.5%), next are Quantity Surveyors (13.2%), then Electrical Engineers (3.3%), Sanitary Engineers (2.5%) while 2.5% are for remaining professions

Table 4.2:Year of Working Experience of Respondent's

Year of Experience	Frequency	Percentage %
0-5	72	59.5
6-10	30	24.8
11-15	8	6.6
16-20	11	9.1
Total	121	100.0

Source: Field survey,(2016)

Figure 4.4: Experience of Respondent's

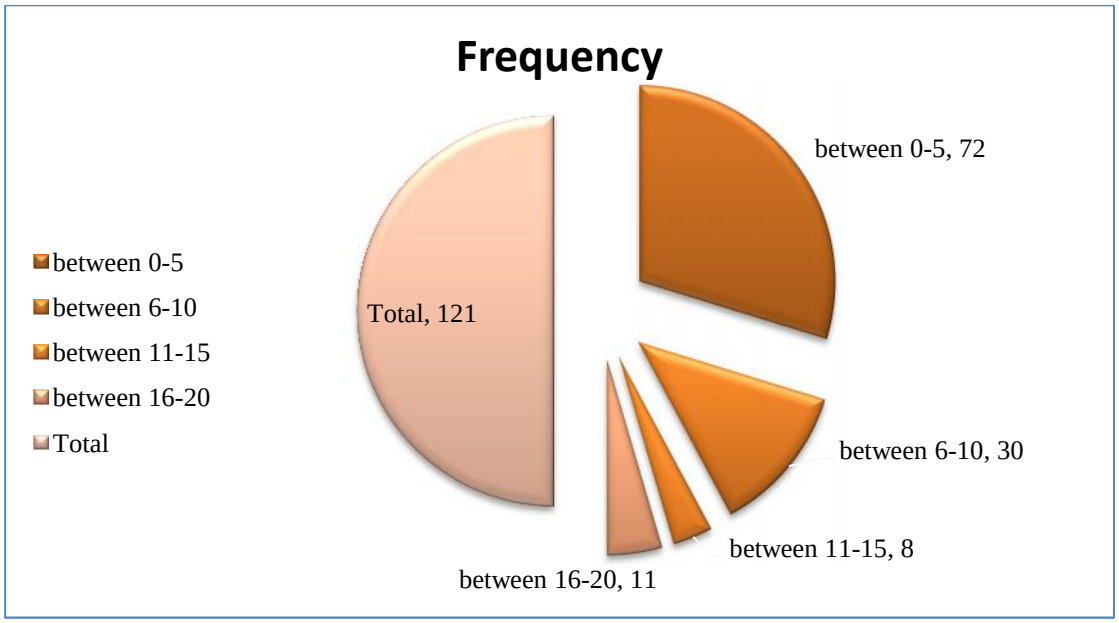


Table 4.2 and Figure 4.4 shows that 49 of them or 40.5% of the respondents have been working with construction firms for more than five years while about 59.5% have experience less than six years

4.1.2 Material Management Practices in Defense Construction Enterprise

Table 4.3: Person in charge of managing construction materials in Construction Projec

Responses	Frequency	Percent
Project manager	14	11.6
Construction engineer	43	35.5
Office engineer	17	14.0
Site engineer	19	15.7
Store manager	19	15.7
Others	9	7.4
Total	121	100.0

Source: Field survey,(2016)

Table 4.3 Shows that the person in-charge-of managing construction material is the Construction engineer (35.5%), follow by site engineer and also store manager each (19.0%), then office engineer (14.0%) while project manager(11.6%) and others (7.4%).

Table 4.4: Person Responsible for Ordering Materials

Responsible	Frequency	Percentage %
General manager	7	5.8
Site engineer	39	32.2
Procurement department	10	8.3
Project manager	36	29.8
Others	29	24.0
Total	121	100.0

Source: Field survey,(2016)

Table 4.4 shows that (29.8%) of the respondents site engineer is responsible for ordering materials, (29.8%) of the respondents project manager is responsible for this duty, (8.3%) for site engineer while (5.8%) of the General Manager for ordering of materials and (24%) for others.

Table 4.5: Method for Purchasing of Material

Responses	Frequency	Percentage %
In bulk	71	58.7
In pieces	32	26.4
Others	18	14.9
Total	121	100.0

Source: Field survey,(2016)

Table 4.5 shows that 58.7% of the respondents for bulk purchase while 26.4% for in pieces and (14.9%) for others

Table 4.6: Planning for project

Responses	Frequency	Percentage %
Before tender	42	34.7
After tender	48	39.7
During tender	31	25.6
Total	121	100.0

Source: Field survey,(2016)

Table 4.6 shows how materials planner starts planning for project. From the table, (34.7%) of the respondents agree for before award of contract, (39.7%) for before tender while (25.6%) observed during construction process.

Table 4.7: Undertake market survey before ordering for materials

Responses	Frequency	Percentage %
Yes	87	71.9
No	34	28.1
Total	121	100.0

Source: Field survey,(2016)

From above Table 4.7, it shows that 71.9% agree for undertaken market survey before ordering for materials while 28.1% of the respondents disagree.

Table 4.8: Frequency of Market Survey

Responses	Frequency	Percentage %
Weakly	26	29.9
Monthly	32	36.8
Every 3 months	20	23.0
Every 6 months	2	2.3
Over 6 years	7	8.0
Total	87	100

Source: Field survey,(2016)

Table 4.8 shows that 36.8% for monthly, 29.9% for weakly, and 23.0% for every 3 months ,8.0% for after every 6 months and above, while 2.3% for every 6 months.

Table 4.9: Assessment of Materials

Responses	Frequency	Percentage %
Testing	80	66.1
Selection	16	13.2
Measurement	9	7.4
Others	16	13.2
Total	121	100

Source: Field survey,(2016)

From Table 4.9 above, 66.1% of the respondents for testing of material,13.2% for selection of materials, and then 7.4% agree for observed measurement for materials while 13.2% agree for others

Table 4.10: Components of Materials Management

S/n	Components	N	Min.	Max.	Mean	Std. Dev.
1	The enterprise has proper Inventory control, storage and warehousing	121	2.00	5.00	4.694	.560
2	The enterprise has good scheduling and procurement process	121	3.00	5.00	4.595	.571
3	The enterprise has good material handling and transport system	121	2.00	5.00	4.215	.608
4	The enterprise has good Receiving and inspection mechanism	121	2.00	5.00	4.165	.624
5	The enterprise has proper Waste management system	121	1.00	5.00	4.322	1.035
6	The enterprise has good Material estimation, budgeting, planning and programming system	121	2.00	5.00	4.661	.585

Source: Field survey,(2016)

Table 4.10 shows components of the enterprise's materials management , inventory control has mean value(4.69),material estimation, budgeting, planning & Programming has mean value (4.66) follow by scheduling and procurement process (4.59),Waste management (4.32), then material handling and transport (4.21), while Receiving and inspection(4.16).

Table 4.11: Stages of Materials Logistic Management

S/n	Stages	N	Min.	Max.	Mean	Std. Dev.
1	The enterprise has to implement procedures to manage suppliers	121	3.00	5.00	4.694	.545
2	The enterprise has to plan logistic of material at site mobilization and construction time	121	2.00	5.00	4.694	.530
3	The enterprise has to implement a training and communication plan	121	1.00	5.00	4.405	.832
4	The enterprise has to plan logistic of material at project completion and demobilization time	121	1.00	5.00	4.207	.562
5	The enterprise identify responsible persons and their job roles	121	3.00	5.00	4.479	.518
6	The enterprise has to plan for material receipt and storage	121	3.00	5.00	4.785	.451
7	The enterprise determine material types and quantities from the detailed design	121	2.00	5.00	4.810	.453

Source: Field survey,(2016)

Table 4.11 shows the stages of materials logistic planning, the respondents strongly agree for the stages of materials logistics planning. Since all have the mean value above 4.00.

Table 4.12: Factors Militating against Materials Management

S/n	Factors	N	Min.	Max.	Mean	Std. Dev.
1	Improper issuing of materials on the enterprise's construction projects site is affecting material management system	121	2.00	5.00	4.149	0.863
2	The enterprise's procurement process of materials is good	121	1.00	5.00	2.802	1.054
3	The enterprise's quality inspection and control system is good	121	1.00	5.00	2.802	1.022
4	Sourcing of materials and requisition is affecting the enterprise's material management system	121	2.00	5.00	3.983	0.836
5	The enterprise's material demand estimation system is good	121	1.00	5.00	2.719	1.018
6	Possession of qualified staff ,on the enterprise construction sites ,is good	121	1.00	5.00	2.835	1.052
7	The enterprise has selected and pre-determined supplier in the construction project sites.	121	1.00	5.00	2.702	1.054
8	The enterprise's materials handling mechanism is proper	121	1.00	5.00	2.388	1.128

9	The enterprise's material transportation system is well managed	121	1.00	5.00	2.669	0.986
10	Material receiving and verification of on the enterprise's construction project sites is handled properly	121	1.00	5.00	2.860	1.098
11	Availability of construction equipment on the enterprise construction project sites is good	121	1.00	5.00	2.669	0.995
12	On the enterprise's construction project ,duration of time for completion is enough	121	1.00	5.00	2.405	0.988
13	Type of construction project has impact on the enterprise's material management system	121	1.00	5.00	2.744	1.092
14	Types of construction materials has impact on the enterprise's material management system	121	1.00	5.00	2.760	1.133
15	The enterprise's stock and waste control system is good	121	1.00	5.00	2.306	1.055
16	The enterprise's financial managing ability is strong	121	1.00	5.00	2.669	1.274
17	The enterprise's construction project sites staff level of awareness is good	121	1.00	5.00	2.744	1.129
18	The enterprise has its own time management system on the construction projects site	121	1.00	5.00	2.562	1.238

Source: Field survey,(2016)

Table 4.12 represents the factors related to materials management on defense construction enterprise's construction project site. The results show that majority of the construction professionals believe that the factors which have bigger effect on material in the enterprise's construction site are improper issuing of materials with mean value (4.1), sourcing of materials and requisition with mean value(3.98),materials handle with mean value (2.38), stock and waste control system (2.30),project duration of time(2.40),time management system(2.56),financial managing ability(2.66),availability of construction equipment(2.66),material transportation system(2.66). On the other hand, the factors, which have lower effect to materials management on defense construction enterprise's construction project sites, are material receiving and verification (2.86), qualified staff (2.84). From the above it can be deduced that, improper issuing of materials, sourcing of materials and requisition, wrong stock and waste control system and not enough duration of time for project completion are the major factors that are affecting effective materials management in defense construction enterprise construction project sites.

Table 4.13: Materials Management Problem

S/n	Problems	N	Min.	Max.	Mean	Std. Dev.
1	There is congestion at loading area on the enterprise's construction project sites due to material management problem	121	1.00	5.00	4.264	1.006
2	There is damage of materials at the enterprise's construction project sites due to material management problem	121	1.00	5.00	4.347	0.892
3	There is operation limitation at the enterprise's construction project sites due to security considerations	121	1.00	5.00	4.190	1.043
4	There is surplus materials at the enterprise's construction project sites due to material management problem	121	2.00	5.00	4.289	0.970
5	There is material management problem due to lack of storage space on enterprise's construction project sites	121	1.00	5.00	3.876	1.037
6	There is problem of delay on the enterprise's construction projects due to poor material management system	121	1.00	5.00	4.397	0.944
7	There is material management problem due to Weather condition on enterprise's construction project sites	121	2.00	5.00	4.223	1.084
8	There is dust pollution due to poor material management system on enterprise's construction project sites	121	1.00	5.00	3.909	0.866
9	There is difficulty in delivery of materials on the enterprise's construction projects due to material management problem	121	2.00	5.00	4.364	0.904
10	The Public procurement procedure have impact on the enterprise material management system	121	2.00	5.00	4.471	0.837

Source: Field survey,(2016)

Table 4.13 above shows the materials management problem on construction, the public procurement procedure have impact on the enterprise material management system is high with mean value of 4.47, followed by delay on enterprise's construction projects with mean value of 4.39 ,difficulty in delivery of materials have the mean value of 4.36,while materials damage with mean value of 4.39. It can be inferred that the hope of solving the materials management problem lies not only on the hands of the construction professionals of the enterprises but also on the hands of procurement policy maker.

Table 4.14: Cause's of Materials Wastage On Sites

S/n	Wastage	N	Min.	Max.	Mean	Std. Dev.
1	There is material wastage due to over – ordering or under – ordering due to mistakes in quantity surveys on the enterprise's construction project sites	121	1.00	5.00	4.446	0.856
2	There is material wastage due to slow response from the consultant engineer to the enterprise's inquiries	121	2.00	5.00	4.322	0.878
3	There is material wastage due to handling of materials on the enterprise's construction project site	121	2.00	5.00	4.421	0.814
4	There is material wastage due to error in information about type and size of materials on design documents at the enterprise's construction project sites	121	2.00	5.00	4.289	0.898
5	There is material wastage due to lack of supervision and delay of Inspections on the enterprise's construction project sites	121	2.00	5.00	4.306	0.921
6	There is material wastage due to stocking and pilfering at the enterprise's construction project sites	121	2.00	5.00	4.314	0.913
7	There is material wastage due to poor quality of materials on the enterprise's construction project sites	121	2.00	5.00	4.388	0.860
8	There is material wastage due to distance from source of material to destination on enterprise's construction project site is so faraway	121	1.00	5.00	3.967	0.983
9	There is material wastage due to poor workmanship problem on the enterprise's construction project sites	121	2.00	5.00	4.471	0.765
10	There is material wastage due to imperfect planning of on the enterprise's construction project site	121	2.00	5.00	4.314	0.904
11	There is material wastage due to choice of wrong construction method on the enterprise's construction project sites	121	2.00	5.00	4.397	0.861
12	Rework due to workers mistakes is a cause of material wastage on the enterprise's construction project sites	121	1.00	5.00	4.438	0.846

13	There is material wastage due to lack of adequate storage space of material on the enterprise's construction project sites	121	2.00	5.00	4.140	1.059
14	There is material wastage due to lack of coordination among crews on the enterprise's construction project sites	121	2.00	5.00	4.289	0.926
15	There is material wastage due to poor coordination and communication between the consultant engineer, contactor and client on the enterprise's construction project sites	121	2.00	5.00	4.331	0.925
16	There is material wastage due to difficult to transport materials around on the enterprise's construction project sites	121	2.00	54.00	4.207	4.647
17	There is material wastage due to workplace becoming overcrowded on the enterprise's construction project sites	121	1.00	5.00	3.884	0.924
18	There is material wastage due to poor/ wrong specifications on the enterprise's construction project sites	121	2.00	5.00	4.207	0.903
19	There is material wastage due to poor qualification of the enterprise technical staff assigned to the construction sites	121	1.00	5.00	4.000	0.940

Source: Field survey,(2016)

Table 4-14 represents the causes of wastage related to material at defense construction enterprise construction project site.(4.47) respondents strongly agree that poor workman ship is the major cause of materials wastage, follow by over ordering or under ordering of material due to mistakes in quantity survey work(4.44),workers mistake(4.43),handling of material(4.42),choice of wrong construction method(4.39),poor quality of material(4.38) , poor coordination and communication between the consultant engineer, contactor and client(4.33) , imperfect planning, stocking and pilfering (4.31),slow response from the consultant engineer ,while (4.3) of the means value believe that lack of supervision and delay of inspection causes waste increase on construction site.

Table 4.15: Measures for effective Materials Management

S/n	Measures	N	Min.	Max.	Mean	Std. Dev.
1	The enterprise have to make monitoring of materials distribution	121	3.00	5.00	4.182	0.632
2	The enterprise have to implement proper materials handling system on construction project sites	121	1.00	5.00	4.000	0.785
3	The enterprise have to make the site store safe from theft and vandalism on the construction project sites	121	1.00	5.00	4.132	0.774
4	The enterprise have to implement proper assigning of material codes on construction project sites	121	2.00	5.00	4.000	0.816
5	The enterprise have to organize proper documentation on the construction project sites	121	2.00	5.00	4.215	0.744
6	The enterprise's construction projects have to record receipt of goods upon receiving and issuing	121	2.00	5.00	4.174	0.738
7	Storage & issuing of materials to construction site directly should be Implemented on the enterprise's construction project sites	121	2.00	6.00	3.983	0.764
8	In the enterprise , Education/ training/ enlightenment of staff in charge of materials management should be implemented	121	1.00	6.00	3.942	0.986
9	Assign special security agents on the enterprise's construction project sites	121	1.00	5.00	3.727	0.957
10	Usage of qualified construction professionals on the enterprise's construction project sites should be applied	121	2.00	5.00	3.917	0.791
11	The enterprise has to ensure quality assurance/control processes are in place	121	2.00	5.00	4.017	0.785
12	On the enterprise ,logistics for tracking & transportation of materials to site should be well managed	121	2.00	5.00	3.975	0.701
13	Receiving and inspecting materials on site have to be exercised on the enterprise's construction project sites	121	3.00	5.00	4.099	0.651
14	Materials return ,from the enterprise's construction project sites ,is to be submitted weekly	121	1.00	5.00	3.554	0.939

15	Complete quality records of materials should be available on the enterprise's construction project sites	121	2.00	5.00	4.008	0.747
16	Established material management system on the enterprise's construction Project sites should be used	121	2.00	5.00	3.992	0.736
17	Relate properly construction activities and schedule of materials on the enterprise's construction project sites	121	2.00	5.00	4.083	0.726
18	Determine the daily allocation of materials on the enterprise's construction project sites	121	2.00	5.00	3.942	0.809
19	Timely placing of orders for materials has to implemented on the enterprise's construction project sites	121	1.00	5.00	4.083	0.759

Source: Field survey,(2016)

Table 4.15 shows the measures for effective materials management. The respondents strongly agree that should be measures for effective materials management practices in defense construction enterprise construction project sites, since all have the mean value above 3.90.

Table 4.16: Benefits of Materials Management

S/n	Benefit	N	Min.	Max.	Mean	Std. Dev.
1	Due to implementation of construction management planning on the enterprise's construction project sites will be constructed on time or early than expected	121	1.00	5.00	3.942	0.840
2	The enterprise's construction project sites labor productivity will be increased	121	2.00	5.00	3.934	0.814
3	Materials are timely available on the enterprise's construction project sites with the right quality	121	1.00	5.00	4.066	0.803
4	Duplication of material orders will reduce on the enterprise's construction project sites	121	1.00	5.00	3.917	0.862
5	Enhancement of quality control will comply on the enterprise's construction project sites	121	2.00	5.00	3.860	0.699
6	The enterprise construction site layout will be effectively designed so as to aid in the management of materials on sites	121	2.00	5.00	3.826	0.760
7	The enterprise's relationship with suppliers will be better	121	2.00	5.00	4.017	0.658

8	The material cost of the enterprise's construction project sites will be reduced	121	1.00	5.00	3.769	0.955
9	Purchase saving will be exercised on the enterprise's construction project sites	121	2.00	5.00	3.818	0.775
10	Providing adequate storage of materials on the enterprise's construction project sites	121	2.00	5.00	4.017	0.695
11	The space for materials on the enterprise's construction project sites will be reduce	121	1.00	5.00	3.702	0.803
12	The enterprise's construction cash flow management will improved	121	2.00	5.00	4.207	0.670
13	The enterprise's construction project sites schedule will improve	121	2.00	5.00	4.132	0.670
14	Handling of materials on the enterprise's construction project sites will be better	121	2.00	5.00	4.157	0.695
15	Materials surplus on the enterprise's construction project sites will be reduced	121	2.00	5.00	3.992	0.780
16	Follow up and monitoring of construction materials on the enterprise's construction project sites will improved	121	3.00	5.00	4.165	0.663
17	Material control on the enterprise's construction project sites will be better	121	3.00	5.00	4.091	0.645
18	Material waste will reduce on the enterprise's construction project sites	121	2.00	5.00	4.099	0.790
19	There will be less inventory as the result of many tied by materials will be minimize on the enterprise's construction project sites	121	2.00	5.00	3.983	0.719

Source: Field survey,(2016)

From the above Table 4.16, it can observe that the respondents agree for benefits of materials management with mean value 3.7 and above.

4.2 Discussion of Findings

The data collected for the purpose of this study were evenly distributed to all types of construction project sites where materials managements are being administered. However, the analysis discloses most common ways through which improper management of materials contributes to delay in completion time of project.

Findings shows that in bulk procurement of materials for site, with monthly market survey before ordering is more common on the enterprise's construction project sites and its best

practice of materials procurements for construction sites for effective materials management. The study has also established the following: damage by mishandling and re-work due to poor workmanship, inadequate storage facilities on site, choice of wrong construction work methodology, poor quality of material, poor coordination & communication between the consultant engineer, client and contractor, delay in material supply, imperfect planning on construction works, inadequate supervision, alteration of material specification and designs, over ordering of construction materials are the causes of material wastage on building construction sites. Good site management will make a serious attempt to overcome these problems by providing better control of the site and more protection to work during the early stages of the contract.

From the data gathered so far, materials management on the site plays a very important role on construction firm and if not seriously planned and properly controlled, it might cost the firm more than what will be required to achieve a proper management of materials. Table 4.11 shows the stages of materials logistic planning, the respondents strongly agree for all stages of materials logistics planning.

Table 4.12 represents the factors related to materials management on defense construction enterprise's construction project site. The results show that majority of the construction professionals believe that the factors which have bigger effect on material in the enterprise's construction site are " Improper issuing of materials with mean value (4.1), Sourcing of materials and requisition with mean value(3.98),materials handle with mean value (2.38), stock and waste control system (2.30),project duration of time(2.40),time management system(2.56),financial managing ability(2.66),availability of construction equipment(2.66),material transportation system(2.66). On the other hand, the factors, which have lower effect to materials management on defense construction enterprise's construction project sites, are material receiving and verification (2.86), qualified staff (2.84). From the above it can be deduce that, improper issuing of materials, sourcing of materials and requisition , wrong stock and waste control system and not enough duration of time for project completion are the major factors that affecting effective materials management in defense construction enterprise construction project sites.

Therefore, Defense construction enterprise should create awareness on effective materials management by education and training.

Table 4.15 indicates the measures for effective materials management. The respondents strongly agree that measures should be taken for effective materials management practices in defense construction enterprise's construction project sites.

Firstly, if there are any problems with the materials delivery (relating to late delivery, public procurement procedure, materials damages or shortages) proper documentation the suppliers should be organized to control their duty, timely placing of order should be introduced, monitoring of materials distribution ,related properly construction activities and schedule of materials.

There was a second strategy, which referral of any problems relating to quality of material, receiving and inspecting of materials on site has to exercise, ensure quality assurance/control processes are in place, complete quality records of materials should be available.

There was also third strategy, which referral of any problems relating to surplus of material, congestion on loading area and security on site, relate properly construction activities and schedule of materials, have to record receipt of goods upon receiving and issuing, implement proper assigning of material codes, make the site store safe from theft and vandalism

Lastly, in order to deal with the logistics within the work place, all work by labour is carefully controlled and monitored. In order to avoid double handling and committing the same mistake by to labour force, the site manager gives clear instructions and delegates certain work processes to the construction workers. It can be deduced therefore that, proper materials handling in defense construction enterprise construction sites can be a help for effective materials management and also education and training of staff in charge of materials management.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 Conclusions

The following conclusion could be drawn from the research work;

1. Materials management processes require a transformation to improve the overall in handling of materials for more efficiency and effectiveness on the DCE construction project sites. This is because poor handling of construction materials affects the overall performance of construction projects in terms of cost, time, quality and productivity. The minimization of materials wastage during the construction phases is important in order to avoid loss of profits.

2.Late purchase, late delivery, weak transport system, stringent public procurement procedures are the case of significant difference in the date that the material requested or date when the purchase order was made, and the time at which the material will be delivered to DCE construction sites, as a whole it is a potential cause of project delay.

3. Only by proper management of materials in construction sites, can benefits materials management in DCE construction project sites, as it aids the speedy completion period, it saves time of execution, it gives high quality works and reduces the materials wastage, and also it will improve the cash flow management.

4.As material management is the integrated and coordination of material estimation, purchasing, expediting, receiving, were housing, proper utilization & disposal, if this function are not properly managed material shortage, surplus and cash problems are likely to occur on the DCE construction project sites

5. Materials management process improves the success rate of project planning, execution and timely availability of material, thus lowering the project cost.

6. From the projects surveyed, it was found out that improper material management on site needs to be discovered and prevented in order to achieve the desired output. Such types are as;

poor site planning, poor workmanship, improper issuing of material, luck of quality inspection and control, lack of competent operations, wrong ordering of materials, poor relationship with supplier, corrosion and decay of materials when not properly protected from weather, un availability of space on site for storing fragile and valuable materials, choice of wrong methodology, poor quality of material, inexperience personnel, difficulty to transport materials around sites e.t.c. if all these could be put into consideration before resuming any site and all necessary or adequate provisions are been made to prevent the occurrence of these, proper materials management will benefit the enterprise in terms of increase profit margin, quick execution and reduce cost of the project.

5.2 Recommendations

Based on the results of this study, the following recommendations are made to foster effective materials management practice of construction projects in DCE:

1. The enterprise needs to develop better means and facilities in which building materials could be well-stored with proper bed at the base or as may be applicable to prevent undue damage which may lead to wastages.

2. The enterprise should make provisions for training and retraining of management and site personnel in order to improve their efficiency for effective material management and should ensure the use of skilled manpower for their works and provide efficient supervision with professionals to ensure effective material management on building construction sites

3. The project manager should co-ordinate dimensions between materials specified during design and those procured for use at sites so as to guide site personnel on how to prevent avoidable waste in the use of various types of materials during execution of construction projects.

4. There should be a proper planning of material management right from the inception of project execution and strict compliance with the project bill of quantities, schedule of materials, construction program, specification, proper stock accounting and security systems

is essential so as to ensure timely project execution and standard work delivery within reasonable cost, time and quality.

5. Material management should be practiced on all sites of the enterprise building construction projects, whether large, medium or small.

6. The use of incompetent hands on construction sites should be discouraged. Competent and experienced personnel with basic managerial skill in material stock control or material management should be engaged in order to enhance material stock control practice.

7. In order to be effective and efficient on construction works the extent of work, nature of work to be done, and materials to be used should be defined in time .

With these listed facts, successful materials management can be achieved in defense construction enterprise's construction project sites and without much effect of the size of the project affecting the management.

5.3 Contribution to Knowledge

The study was able to discover that, the major factors why there was an ineffective materials management was due to lack of stock and waste control system for materials, mishandling of materials, incompetence of estimators and issuing of materials for use.

The study also identified very good step which the enterprise observed that the site engineer are responsible for ordering construction materials for the site.

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APPENDICES

A-B

APPENDIX A

Questionnaire

St. Mary's University

School of Graduate Studies

MA in Business Administration (MBA)

Questionnaire for data collection

Dear respondents

I am undertaking a research survey *to assess the material management practices in the construction projects site of Defense Construction Enterprise.*.

The research is an individual research project as part of my study for MBA Degree at St. Mary's University.

The main purpose of this research questionnaire is to assess materials management practices in defense construction enterprise construction project sites with a view to proffering solutions to the problems of excessive waste leading to cost overrun.

As a key staff you are invited to participate in this survey. The information you provide in response to the items in the questionnaire will be used as part of the data needed for the study.
All the information you provide will kept in strict confidentiality and it will be used only for academic research Please answer each question carefully. There is no right or wrong answer. If you are unsure of an answer, please respond with your best estimate. I value your participation and thank you for the commitment of time, energy and effort. If you have any further question, I can be reached at the address below.

Sincerely

Tibebu Kebede

kingtibebu@yahoo.com

Cell phone No.0930 098260

General Instructions

-There is no need of writing your name

-In all cases where answers options are available please tick (√) in the appropriate box.

SECTION A: - Back ground information about the respondents please use (√) in the relevant box for your response

1. Gender

   Female ☐ Male ☐

2. Number of Employees in your team/site?

   0 – 9 employees ☐ 0 – 99 employees ☐ 100 – 299 employee ☐ above 300 ☐

3. Profession

   Civil engineer ☐ Quantity surveyor ☐ Electrical Engineer ☐ Sanitary Engineer ☐

   Other _____

4. Experience

   0 – 5 years ☐ 6 – 10 years ☐ 11 – 15 years ☐ 16 – 20 years ☐

5. Respondent's highest educational qualification

   Diploma ☐ Adv. Diploma ☐ BSC ☐ MSC ☐ PHD ☐

SECTION B: Materials Management Practices in Construction Sites

1. Who is the person in charge of managing construction materials in construction projects site?

   Project Manager ☐ Construction Engineer ☐ Office engineer ☐ Site Engineer ☐

   Store manager ☐ others_____

2. Who is the person responsible for ordering materials?

   General Manager ☐ Site engineer ☐ Procurement department ☐ Project manager ☐

   Others _____

3. Which method is applied on your project in the purchase of material?

   In Bulk ☐ In pieces ☐ Others _____

4. In making bulk purchases does it take into consideration the nature/type of material?

Yes ☐ No ☐

5. When does the materials planner start planning for projects?

Before tender ☐ After award of contract ☐ During construction process ☐

6 Does your Project undertake market survey before ordering for materials?

Yes ☐ No ☐

7 If Yes, how often?

Weekly ☐ Monthly ☐ Every 3 months ☐ Every 6 months ☐ Over 6 months ☐

8. How do you assess the quality/standard of materials?

Testing ☐ Selection ☐ Measurement ☐ Others _____

9. Who is responsible for monitoring & handling of materials on sites?

Site engineer ☐ Project manager ☐ Store manager ☐ Others _____

10. Do you consider stock and waste control for effective material management on sites?

Yes ☐ No ☐

11. To what extent you evaluate the following components of materials management?

S/N	Components	Responses				
		Strongly Disagree	Disagree	Partially Agree	Agree	Strongly Agree
1	The enterprise has proper Inventory control, storage and warehousing					
2	The enterprise has good scheduling and procurement process					
3	The enterprise has good material handling and transport system					
4	The enterprise has good Receiving and inspection mechanism					
5	The enterprise has proper Waste management system					
6	The enterprise has good Material estimation, budgeting, planning and programming system					

12. To what extent you evaluate the following stages of materials logistic planning?

S /N	Stages	Responses				
		Strongly Disagree	Disagree	Partially Agree	Agree	Strongly Agree
1	The enterprise has to implement procedures to manage suppliers					
2	The enterprise has to plan logistic of material at site mobilization and Construction time					
3	The enterprise has to implement a training and communication plan					
4	The enterprise has to plan logistic of material at project completion and demobilization time					
5	The enterprise identify responsible persons and their job roles					
6	The enterprise has to plan for material receipt and storage					
7	The enterprise determine material types and quantities from the detailed design					

13. To what extent you evaluate the following factors in order of their relevance as affecting effective materials management?

S/N	Factors	Responses				
		Strongly Disagree	Disagree	Partially Agree	Agree	Strongly Agree
1	Improper issuing of materials on the enterprise's construction projects site is affecting material management system					
2	The enterprise's procurement process of materials is good					
3	The enterprise's quality inspection and control system is good					
4	Sourcing of materials and requisition is affecting the enterprise's material management system					
5	The enterprise's material demand estimation system is good					
6	Possession of qualified staff ,on the enterprise construction sites ,is good					
7	The enterprise has selected and pre-determined supplier in the construction project sites.					
8	The enterprise's materials handling mechanism is proper					
9	The enterprise's material transportation system is well managed					
10	Material receiving and verification of on the enterprise's construction project sites is handled properly					
11	Availability of construction equipment on the enterprise's construction project sites is good					
12	On the enterprise's construction project ,duration of time for completion is enough					
13	Type of construction project has impact on the enterprise's material management system					
14	Types of construction materials has impact on the enterprise's material management system					
15	The enterprise's stock and waste control system is good					
16	The enterprise's financial managing ability is strong					
17	The enterprise's construction project sites staff level of awareness is good					
18	The enterprise has its own time management system on the construction projects site					

14. To what extent you evaluate the following problems associated with materials management?

S/N	Problems	Responses				
		Strongly Disagree	Disagree	Partially Agree	Agree	Strongly Agree
1	There is congestion at loading area on the enterprise's construction project sites due to material management problem					
2	There is damage of materials at the enterprise's construction project sites due to material management problem					
3	There is operation limitation at the enterprise's construction project sites due to security considerations					
4	There is surplus materials at the enterprise's construction project sites due to material management problem					
5	There is material management problem due to lack of storage space on enterprise's construction project sites					
6	There is problem of delay on the enterprise's construction projects due to poor material management system					
7	There is material management problem due to Weather condition on enterprise's construction project sites					
8	There is dust pollution due to poor material management system on enterprise's construction project sites					
9	There is difficulty in delivery of materials on the enterprise's construction projects due to material management problem					
10	The Public procurement procedure have impact on the enterprise material management system					

15. To what extent you evaluate the following factors in order of their relevance as causes of materials Wastage on site?

S/N	Causes	Responses				
		Strongly Disagree	Disagree	Partially Agree	Agree	Strongly Agree
1	There is material wastage due to over – ordering or under – ordering due to mistakes in quantity surveys on the enterprise's construction project sites					
2	There is material wastage due to slow response from the consultant engineer to the enterprise's inquiries					
3	There is material wastage due to handling of materials on the enterprise's construction project site					
4	There is material wastage due to error in information about type and size of materials on design documents at the enterprise's construction project sites					
5	There is material wastage due to lack of supervision and delay of Inspections on the enterprise's construction project sites					
6	There is material wastage due to stocking and pilfering at the enterprise's construction project sites					
7	There is material wastage due to poor quality of materials on the enterprise's construction project sites					
8	There is material wastage due to distance from source of material to destination on enterprise's construction project site is so faraway					
9	There is material wastage due to poor workmanship problem on the enterprise's construction project sites					
10	There is material wastage due to imperfect planning of on the enterprise's construction project site					
11	There is material wastage due to choice of wrong construction method on the enterprise's construction project sites					
12	Rework due to workers mistakes is a cause of material wastage on the enterprise's construction project sites					
13	There is material wastage due to lack of adequate storage space of material on the enterprise's construction project sites					
14	There is material wastage due to lack of coordination among crews on the enterprise's construction project sites					
15	There is material wastage due to poor coordination and communication between the consultant engineer, contactor and client on the enterprise's construction project sites					
16	There is material wastage due to difficult to transport materials around on the enterprise's construction project sites					
17	There is material wastage due to workplace becoming overcrowded on the enterprise's construction project sites					
18	There is material wastage due to poor/ wrong specifications on the enterprise's construction project sites					
19	There is material wastage due to poor qualification of the enterprise technical staff assigned to the construction sites					

16. To what extent you evaluate the following measures as important to be put in place to ensure Effective materials management in construction sites?

S/N	Measures	Responses				
		Strongly Disagree	Disagree	Partially Agree	Agree	Strongly Agree
1	The enterprise have to make monitoring of materials distribution					
2	The enterprise have to implement proper materials handling system on construction project sites					
3	The enterprise have to make the site store safe from theft and vandalism on the construction project sites					
4	The enterprise have to implement proper assigning of material codes on construction project sites					
5	The enterprise have to organize proper documentation on the construction project sites					
6	The enterprise's construction projects have to record receipt of goods upon receiving and issuing					
7	Storage & issuing of materials to construction site directly should be Implemented on the enterprise's construction project sites					
8	In the enterprise ,Education/training/enlightenment of staff in charge of materials management should be implemented					
9	Assign special security agents on the enterprise's construction project sites					
10	Usage of qualified construction professionals on the enterprise's construction project sites should be applied					
11	The enterprise have to ensure quality assurance/control processes are in place					
12	On the enterprise ,logistics for tracking & transportation of materials to site should be well managed					
13	Receiving and inspecting materials on site have to exercise on the enterprise's construction project sites					
14	Materials return ,from the enterprise's construction project sites ,is to be submitted weekly					
15	Complete quality records of materials should be available on the enterprise's construction project sites					
16	Established material management system on the enterprise's construction Project sites should be used					
17	Relate properly construction activities and schedule of materials on the enterprise's construction project sites					
18	Determine the daily allocation of materials on the enterprise's construction project sites					
19	Timely placing of orders for materials has to implemented on the enterprise's construction project sites					

17. To what extent you evaluate the following benefit when implement a construction material management Planning?

S/N	Benefit	Responses				
		Strongly Disagree	Disagree	Partially Agree	Agree	Strongly Agree
1	Due to implementation of construction management planning on the enterprise's construction project sites will be constructed on time or early than expected					
2	The enterprise's construction project sites labor productivity will be increased					
3	Materials are timely available on the enterprise's construction project sites with the right quality					
4	Duplication of material orders will reduce on the enterprise's construction project sites					
5	Enhancement of quality control will comply on the enterprise's construction project sites					
6	The enterprise construction site layout will be effectively designed so as to aid in the management of materials on sites					
7	The enterprise's relationship with suppliers will be better					
8	The material cost of the enterprise's construction project sites will be reduced					
9	Purchase saving will be exercised on the enterprise's construction project sites					
10	Providing adequate storage of materials on the enterprise's construction project sites					
11	The space for materials on the enterprise's construction project sites will be reduce					
12	The enterprise's construction cash flow management will improved					
13	The enterprise's construction project sites schedule will improve					
14	Handling of materials on the enterprise's construction project sites will be better					
15	Materials surplus on the enterprise's construction project sites will be reduced					
16	Follow up and monitoring of construction materials on the enterprise's construction project sites will improved					
17	Material control on the enterprise's construction project sites will be better					
18	Material waste will reduce on the enterprise's construction project sites					
19	There will be less inventory as the result of many tied by materials will be minimize on the enterprise's construction project sites					

Thank you Very Much!

APPENDIX B

Defense Construction Enterprise Organizational Structure