

Efficient Techniques of Construction Material Management in Construction Projects

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Abstract - Construction industry is an industry, which is involved in the planning, execution and evaluation (monitoring) of all types of civil works. Physical infrastructures such as buildings, communication & energy related construction works, water supply & sewerage civil works etc. are some of the major projects in the construction industry. Construction industry plays an important role in social, economical & political development of a country. The industry has been experiencing such problems as managing and minimizing wastage of construction materials due to lack of effective management and planning. One of the very important sections that should specify in the construction project management is managing and minimizing wastage 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. This explains also that the management of materials becomes the most pertinent source of construction waste. The main tools for the collection of data included questionnaires, and site visit were used to identify the annual requirement of the construction materials. Simple EOQ analysis involving tables of the annual requirement of the construction materials were used in analyze the results from the questionnaire. Secondary sources of data were obtained from relevant literature that covered thesis related to the construction materials management and research paper.

Key Words: Materials management, Wastes management, Construction Sites

1. INTRODUCTION

Management of Construction materials is very important as materials are the major cost component in any construction project and site. The total cost of used material may be 50% or more of the total cost. The aim of the materials management is to make sure that the materials are available at their point of use when requirement hence, efficient of material's procurement represents a key role in the successful completion of the work of construction project and site. Materials Management is the need to be more efficient in the construction industries. Management of materials must be effectively managed or taken care of the materials to avoid incurring losses and administrative costs, which affect the construction projects cost. However, material waste is a

major problem in the Indian construction industry that has important implications in both the efficiency of the industry and the environmental impact of construction projects due to lack of effective materials management and planning. In this study management of the material is done by the EOQ analysis. The EOQ analysis is the most importance methodology to avoiding the construction materials west on site. There are many difference between the project that planed with EOQ analysis and without EOQ analysis. The cost of the project may be decreases by EOQ analysis. In my study, the questionnaire survey is done from four construction projects in Gwalior division. The opinion of the experts in terms of construction materials (cement, steel, bricks, sand, aggregate and tiles) is collected and according to this data find out the minimum cost of the construction materials. To make sure a flow with time of materials is an important to involve of material management. Planning of material and inventory control technique are the two most important measures as per as Material management is concerned. This study is focusing on the difference between planned and actual cost of the materials.

Planning and control of materials, lack of materials when needed, materials of poor identification, re-handling and not enough storage cause losses in labor growing crops and overall delays that can indirectly increase total cost of project. Effective management of materials can less these costs and contributes significantly to the success of the project.

2. NEED FOR MATERIAL MANAGEMENT SYSTEM

The purpose of material management is to assure that the right materials are in the right place, in the right quantity when needed.

In a construction project, time and accurate information is vitally important in order to accomplish scheduled completion. The main reason is that there is no direct link between the head office and the regional site office and there is no "quick" link between site office and site engineers who are out in the field for most of the time. This study proposes the design of and information system to address the following issues:

- (i) Time and cost can be saved.
- (ii) Improved productivity in conjunction with cost savings.

- (iii) Enhancement of construction business.
- (iv) Improved communication between the sites and the head office.
- (v) Highly systemized way of construction practice.
- (vi) Improved material shortage problem.

3. METHODOLOGY

3.1 SOURCE OF DATA

In this research, this research, data collection are used which can be divided into two parts.

- a) Primary source
- b) Secondary Sources.

a) Primary Sources: Primary sources are gives pre idea about research. It also gives theoretical & practical concept.

b) Secondary Sources: Secondary data are collected through questionnaire survey in Gwalior division.

Literature Review:

To know the present time practices of Construction material management, literature review has been carried through internet, and engineering journals. By referring to previous literature information from the material management

Ashwini R. Patil, Smita V. Pataskar: The efficient procurement of material represents a key role in the successful completion of the work. Poor planning and control of material, lack of material when needed, poor identification of material, re-handling and inadequate storage cause losses in labor productivity and overall delays that can indirectly increase total project cost. Effective management of materials can reduce these costs. T.phani Madhavi, Steve Varghese Mathew, Roy Sasidharan. The objective of the present study is to understand about all the problems occurring in the company because of improper application of material management. In construction project operation, often there is a project cost variance in terms of the material, equipment, manpower, subcontractor, overhead cost, and General condition. Material is the main component in construction projects. Calistus Ayegba, The study further Suggest measures for effective material management in construction site. Data for the study was obtained through a structured questionnaire administered to respondents in ten different construction sites and head offices of the construction companies in charge of the sites in Minna metropolis Niger State. Findings reveal that, 31% of respondents organization procure materials for sites by head office provisions without site requisition, 64% of respondents organization procure materials for sites by

head office provisions with site requisition and 5% of respondents organization procure materials. Aditya A. Pande, S .Sabihuddin. A properly implemented materials management program can achieve the timely flow of materials and equipment to the jobsite, and thus facilitate improved work face planning, increased labor productivity, better schedules, and lower project costs. Mrs.Ashwini i.R.Patil, Mrs.Smita V.Pataskar, The efficient procurement of material represents a key role in the successful completion of the work. Poor planning and, control of material, lack of material when needed, poor identification of material, re-handling and inadequate storage cause losses in labour productivity and overall delays that can indirectly increase total project cost.

3.2 QUESTIONNAIRE DESIGN

A questionnaire survey was designed based on the objectives of the study, which is management of construction material on site. A questionnaire survey was developed to get the opinion and understanding from the experienced respondents regarding to the construction management problem. Questionnaires have the following questions.

1. Annual requirement of Cement on construction site.
2. Annual requirement of Steel on construction site.
3. Annual requirement of Bricks on construction site.
4. Annual requirement of Sand on construction site.
5. Annual requirement of Aggregate on construction site.
6. Annual requirement of Tiles on construction site

3.3 DATA ANALYSIS BY EOQ METHOD

This data analysis was determined to establishing the economic cost by Economic Order Quantity. It consists of six steps to analyzing the data.

1. Visiting for cost of construction material in local market.
2. Find out the Q (Economic Order Quantity).
3. Find out the number of orders per year (based on EOQ).
4. Find out the frequency of ordering (per year).
5. Find out the total cost.
6. Find out the compression between economic cost and general cost (without EOQ).

Analysis:

$$Q = \left(\frac{2 \times S \times Co}{Cu \times I} \right)^{\frac{1}{2}}$$

Where

S = Annual requirement.

Co = Cost of Ordering.

Cu = Item's cost.

I = carrying inventory cost.

4. RESULT FROM QUANTITATIVE ANALYSIS EOQ ANALYSIS

This study in EOQ analysis is performed on Cement, Reinforcement Steel, Bricks, sand and Aggregate. While performing economic order quantity analysis Ordering Cost and Inventory Carrying Cost is assumed for all materials with practical execution procedure of construction. Inventory carrying cost incurred for inventory maintenance, Cost of Storage is include, Insurance taxes, Deterioration & obsolescence this calculates in %. Inventory Carrying Cost = 22%.

Economic order Quantity is calculated by following formula.

Table 1: EOQ Analysis

Name of material	Annual Requirement	EO Q	No. of Orders	Frequency of ordering	Total cost of Inventory using EOQ in lakhs
Cement	245420Bag.	34	735	1	736.48044
Steel	868 T	20	43	9	279.1584
Bricks	500 CUM	12	42	9	9.04626
Sand	990 CUM	21	47	8	14.22398
Aggregate	2548CUM	34	75	5	22.8718
Tiles	5250 BOX	49	107	3	36.82523

Table 2: EOQ Analysis

Name of material	Annual Requirement	EO Q	No. of Orders	Frequency of ordering	Total cost of Inventory using EOQ in lakhs
Cement	10000 bags	67	150	3	30.0445
Steel	150T	8	19	19	48.5816
Bricks	400 CUM	10	40	9	7.2414
Sand	1415 CUM	25	56	6	20.31458
Aggregate	1700 CUM	28	60	6	15.26989
Tiles	5000 BOX	48	104	4	35.07342

Table 3: EOQ Analysis

Name of material	Annual Requirement	EO Q	No. of Orders	Frequency of ordering	Total cost of Inventory using EOQ in lakhs
Cement	204500 bags	304	672	1	613.70122
Steel	580T	16	36	10	186.7432
Bricks	110 CUM	5	22	16	2.00178
Sand	12900 CUM	77	168	2	184.71174
Aggregate	24250 CUM	105	230	2	217.2448
Tiles	4640 BOX	46	100	4	32.55072

Table 4: EOQ Analysis

Name of material	Annual Requirement	EO Q	No. of Orders	Frequency of ordering	Total cost of Inventory using EOQ in lakhs
Cement	110000 bags	224	491	1	330.14758
Steel	850 T	20	42	9	273.384
Bricks	300 CUM	9	33	11	6.0398
Sand	5500 CUM	50	110	3	78.80785
Aggregate	4500 CUM	45	100	4	40.3643
Tiles	75000 BOX	312	240	2	525.32437

5. CONCLUSION

The systematic literature review identified the materials management processes to need efficiency of project completion on time and under the budget. This is because very poor handling of construction materials affects the overall performance of construction projects in the terms of time, cost, quality, & productivity. This give light to the fact that pre-planning and material present are equally important in controlling the total cost of project. It reveals that the minimization of materials wastage during the construction phases is very important in order to prevent loss of profits. It is observed that considerable research have been conducted to investigate separately construction waste management strategies at a exact stage of a construction project.

Currently, the majority of research efforts has been given the material loss in construction activities rather than the non-value-adding work as an intangible waste of materials. Waste Generation Rate is an effective indicator for measuring waste of construction material and management performance. The EOQ analysis is better techniques to avoiding the extra cost of the materials by good management of the ordering construction materials.

In my study the questionnaire survey is main source to applying the EOQ analysis because cost of the materials can be minimizes with the help of EOQ technique. The questionnaire form prepared according to the EOQ technique and guidance of the guide and distributed at the four site of the construction in Gwalior division. The opinion of the respondent got in the questionnaire form in terms of annual requirement of construction materials such as cement, sand, aggregate, steel, tiles and brick. This valuable data got from the experts is most important to find out economic cost of the construction materials.

In this study, there are four case studies is done with the help of the EOQ analysis and in each case the cost of the materials take from the local market (Gwalior).

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