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Cost effective procurement pattern for steel reinforcement in volatile market conditions.

Ar. Himanshu Chavan[1], Prof. Atul Dighe[2], Prof. Anjali Jadhav[3]
[1]*Prof. Ar. Himanshu Chavan, HOD Architecture Dept.KLE Society, Chikkodi, Karnataka*
[2]*Prof. S.P.S.M.B.H S College of Architecture, Kolhapur, Maharashtra*
[3] *Professor, Dept. of Architecture and Construction Project Management, S.P.S.M.B.H S College of Architecture, Kolhapur, Maharashtra, INDIA.*

Abstract - *Management and Procurement of materials have over the years been a great problem to most firms in the construction industry. As the size of the contract increases, however the scale of activities concerning material management and procurement also increases. The aim of this research is to investigate into materials management and procurement problems faced by construction firms. To achieve this aim, the following objectives are set out: To identify the problems in materials management and procurement practices by construction firms, to identify the causes of these material management and procuring problems, to identify proper ways of managing and procuring materials by construction firms on site and to suggest ways of solving materials management and procurement problems by construction firms. The quantity analysis approach was adopted for the analysis of the data. The analysis revealed that high project cost and delay are also some of the effects of improper materials management and procurement. Recommendations are made for the study.*

Key Words: *Cost effective, Procurement, Steel reinforcement, Volatile, Materials management, Purchasing strategy, Bar bending schedule, Impact of volatility.*

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I. INTRODUCTION

Steel is a useful building material. Without steel no one building can be completed. So it is also an unavoidable component of building construction. Steel pricing is volatile. This is because the prices of steel are very high. Sometimes it can be happen in a market that the availability of steel is more so in that case the price of steel becomes less. But sometimes availability is less so in that case prices will be higher.

The money value is ascertained by multiplying the quantity of materials of each item by its unit price. The items "A" category – 5% to 10% of the items represent 70% to 75% of the money value. "B" Category – 15% to 20% of the items represent 15% to 20% of the money. "C" Category – the remaining number of the items 5% to 10% of the money value.

The relative position of these items show that items of category A should be under the maximum control, items of category B may not be given that much attention and item C may be under a loose control.

II. Background of the Study

Materials management and procurement is defined as a management system that is required in Planning and Controlling the quality and quantity of the material, punctual equipment placement, good price and the right quantity as required.

It is important to note that materials management on construction site is not just reducing waste; it equally has to do with when and where materials are located on site, site security and competency of operatives. Careful checks should be made to ensuring correct of orders and that materials delivered can be properly stored and unnecessary handling avoided. **(P. Ezhilmathi, DR. T. Shanmugpriya 2016)**

One way to achieve proper material control on construction site is to appoint a material control manager with all the responsibilities that implies. Proper storage of materials helps minimize waste and losses arising from improper storage. Procuring of materials is simply the process of buying. Procuring is responsible for establishing the flow of materials into the firms, following up with the supplier and expediting delivery. Movement of material is a process of transferring construction materials from one position to another within the site. The aim is to get the materials to the required level in the most efficient way.

Edward .A. Silver (May 1989) stated in his research paper "Materials Management in Large – Scale Construction projects: Some concerns and research Issues" that,

Materials management in large scale construction projects is very challenging task & responsibility. Bar charts are done in every construction project for scheduling all construction activities. From bar chart we may know

that which activity will be started at what time, how much time it will run and when it will be completed. So for that particular activity how much material is required that quantification must have to be done and orders should be placed. So the materials will be procured and stored on site before construction activity will be started. Steel is a corrosive material so it should be ordered at least one week before and it should have to be on site before one or two days of steel binding work. So that it can be used immediately.

Edward .A. Silver also taken an interviews in oil and gas industry in Canada. It is likely that the concerns, suggestions and research topics identified are of interest in most other setting of major one – off projects. Because oil and gas industry also requires more quantity of steel not only for construction but later on after starting project it requires for storage purpose also. Same thing is apply for steel and mechanical industries. In these type of industries maximum steel and metal is used for construction work. On ground rolling tracks are made by of steel whereas above roof trusses are also made by steel. Steel beams, columns and also gantry girders, steel lifts are used in mechanical industries. So for these kinds of projects steel is required as a preferable material. So its procurement and management must have to be done by studying and observing many factors and operations in project. (Edward .A. Silver, 1989)

III. Statement of the Problem

Management of materials has over the years been a great problem to most firms in the construction industry. In construction project operation, there is always a tendency of mismanagement of materials by construction firms. As the size of the contract increases, however so do the scale of activities concerning materials management.

During the occurrence of high number of projects most construction firm's focus on getting works done while neglecting the management of materials. The negligence of proper materials management contributes to several negative consequences such as breakages of materials, dissatisfaction by client, and reduction in the productivity of workers, materials wastage, high project cost and delay in the progress of work at hand, which affects the maximization of limited resources. Most construction firms have given little priorities to the setting up of a department which oversee the management of their materials resulting in improper materials management if there is any at all. Mismanagement of materials can be classified as loss since it has adverse effects on construction projects. On the small sites, materials are managed by individuals with little or no knowledge about the management of materials. It is therefore prudent for construction firms to have a critical look on materials management, since it has a rippling effect on construction projects. **(Hemishkumar Patel, Jayeshkumar Pitroda, Prof. J.J. Bhavsar 2015)**

Ashwini .R. Patil and S.V. Pataskar carried out one method and found the frequent order quantity. Should be known to purchase the required materials on time. Moreover the order of frequency could also be achieved. The economic order of quantity was calculated using the formula.

$$Q = \sqrt{\frac{2 \times Co \times S}{Cu \times I}}$$

Where, Q = Economic order quantity.
Co = Ordering cost
Cu = Cost of item
S = Total Consumption
I = Inventory carrying cost.

By using the formula, total cost of inventory and economic order quantity were found. The cost obtained after adoption of EOQ analysis was less than without adopting EOQ. Thus the cost was minimized and this analysis was recommended. **(Ashwini .R. Patil, Smita .V. Pataskar 2013.)**

IV. Aim of the Study:

The aim of this study is to investigate into materials management and procurement problems faced by construction firms.

1) To identify the problems & causes in materials management practices by construction firms.
2) To identify proper ways of managing and procuring materials by construction firms on sites.
3) To suggest ways of solving materials management and procuring problems by construction firms.

V. Scope of study:

The project ranges in scope from investigating the problems faced by the construction firms with respect to material management system such as, storage, procurement, movement, control and handling of materials.

VI. Limitations of Study:

It is a normal process to suffer setbacks when executing premeditated activities in every human endeavor. The following are limitations encountered during the research work.

- Financial constraints.
- Limited time as the researcher had full time job as lecturer.
- Limited research materials.
- Unwillingness of the firm to give out information.

VII. Methodology:

For research work one project was required so selected a medium scale apartment project. Collected all details of steel purchasing. Then prepared one chart of purchased steel with bifurcation of each diameter steel. Studied variations in rates of each diameter of steel on every purchase. There is no more volatility in steel reinforcement purchase. We have considered that if there will be a volatility in steel market rate at a higher purchase. So where there is highest purchase that purchase rate increased by 1.5 times more. We have observed that if volatility will be occurs at highest purchase it can be affect in a total cost of steel purchase.

After finalization of a project for research collecting all the drawings from respective people, next step is quantification of steel. Quantified steel from foundation to stair cap of each diameter. After detailed observations we have done a graphical representation. Represented it as 'Graph of Purchase' and 'Graph of Rate'. Detailed case studies have been done by observing purchase quantity and rate of purchase. Observed time duration between purchases.

Discussions done in meeting. We knew that project was stopped in between up to one year because of financial crises. After all these activities moved to develop new strategy of procurement of steel in volatile market conditions. A strategy which will be useful for procuring a steel reinforcement for a medium scale apartment projects.

Case Study:

SR.NO.	SIZE	Qty.	AMOUNT
1.	6mm	347 kg.	11,756.35/- Rs.
2.	8mm	8741.2 kg.	3,20,623/- Rs.
3.	10mm	5117.3 kg.	1,76758.7/-Rs.
4.	12mm	4809.8 kg.	1,63,546.43/-Rs.
5.	16mm	4907.7 kg.	1,66,858.38/- Rs.
6.	20mm	2564.9 kg.	87,331.7/- Rs.
7.	25mm	1878 kg.	67,643/- Rs.
8.	B.W.	107.8 kg.	5,540/- Rs.
		TOTAL	**10,00057.56/- Rs.**

VIII. CONCLUSIONS:

Management and procurement of materials have over the years been a great problem to most firms in the construction industry. As the size of the contract increases, the scale of activities concerning material management and procurement increases.

The quantity analysis approach was adopted for the analysis of the data which involved procurement tables and charts. The analysis of the data revealed that high project cost and delay are also some of the effects of improper materials management and procurement. Materials management system required in planning and controlling the quality and quantity of the material, punctual equipment placement, good price and the right quantity as required. Materials management on construction sites is not just reducing waste; it equally has to do with when and where materials are located on site, site security.

One way to achieve proper material control on construction site is to appoint a material control manager with all the responsibilities, so that planned materials handling distribution can proceed from with discipline. Proper storage of materials helps minimize waste and losses arising from an improper storage. An aid is provided by the quantity surveyor to the procuring department by systematic analysis of quantities of materials is extracted from drawings and specifications to cut down wastage of materials, shortage and excess of materials supply to the site. The aim is to get the materials to the required level in the most efficient way. Ineffective management of materials brings about increase in the cost to both the contractor and the client.

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