ANALYZING INVENTORY MATERIAL MANAGEMENT CONTROL TECHNIQUE ON RESIDENTIAL CONSTRUCTION PROJECT

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ABSTRACT

Materials management is a critical component of the construction industry. As such, organizations need to understand the effects of proper materials management techniques on the effectiveness of project execution. A properly implemented materials management program can achieve the timely flow of materials and equipment to the job site, and thus facilitate improved workforce planning, increased labor productivity, better schedules, and lower project costs. Materials represent a major expense in construction, so minimizing procurement cost, improves opportunities for reducing the overall project cost. This research paper is written to explore the current practices of Material Management so this study is conducted in two analysis technique. In Qualitative Analysis this study mainly focuses on Inventory Control Techniques which includes Always Better Control (ABC), Scare, Difficult and Easy to obtain (SDE) Analysis and also Quantitative approach like Economic Order Quantity (EOQ). This research paper deals with identification of selective inventory control technique and To maintain sufficient stock of raw material during the period of short supply, to protect inventory against deterioration and control investment in inventories and to keep it at an optimum level an inventory control techniques such as ABC, SDE and EOQ analysis.

Key Words: *Materials Management, Jobsite, Labor Productivity, Procurement, Inventory*

1. INTRODUCTION

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 management requires the right blend of technical and commercial expertise, operating within the framework of an appropriate and good organizational structure if it is providing the most efficient and effective service demanded of it. Increasingly, selective techniques are being applied to all the functions within the materials management to achieve an efficient method to reduce the inventory cost. Materials Management is a key business function that is responsible for coordination of planning, sourcing, purchasing, moving, storing, and controlling materials in an optimum manner so as to provide a pre-decided service to the customer at a minimum cost. Thus materials management is an important element in project management. The materials on a project can represent anything from 50% to 60% of the cost of the work, so minimizing procurement costs improve opportunities for reducing the overall project costs.

2. LITERATURE REVIEW

According to **Onwubolu et al. (2006)** ABC (Always Better Control) analysis tends to measure the significance of each item of inventory in terms of value. When the ABC (Always Better Control) analysis is applied to an inventory situation, it shows the importance of items and level of control placed on the items. (9)

Gupta et al. (2007), Madan et al. (2014) applied that ABC (Always Better Control) and VED (Vital, Essential, and Desirable) selective inventory control techniques are applied for cutting tool inventory modeling and medical stores in an industry. An ABC-VED matrix was constructed for economic analysis of drug expenditure and cutting tools of priced of different items. It was suggested that to sell off the scraps and extra unused items in order to reduce the inventory holding costs and empty the space which have been un-necessarily being occupied. By this study of selective inventory control techniques they concluded that their inventory more effectively and hence later it helped them to reduce the inventory which added increased productivity, business growth and reduce the losses. (3,8)

Kasim et al. (2012) analyzed an improving on site material tracking for inventory management in construction projects. It is important to manage all materials and inventory throughout construction activities and process. Failure in managing site inventory will result in cost overrun, delays in project completion and reduce overall project performance. (6)

Ali et al. (2012) conducted that the previous study in Decision tree analysis will determine the best alternative whether forecasting and EOQ are necessary to be used and it will minimize the cost of raw materials inventory. The results of the analysis are inventory management of iron, cement, sand and split inventory should use Forecasting method and EOQ (Economic Order Quantity) model. So, companies can manage their inventory management efficiently and effectively. (1)

Aggarwal et al. (2013) analyzed that the overall inventory management system of the company is satisfactory the company is using satisfactory techniques with the help of inventory management tools, ABC (Always Better Control) analysis and EOQ (Economic order quantity). The purpose is to find out the ways of managing the inventory properly, so that there would be a little impact on the profits and sales of the company. (2)

3. OUTLINE OF REASEARCH WORK

A. SCOPE OF STUDY

The Scope of research work is restricted to Residential building project in construction firms at Ahemdabad in central Gujarat region.

B. OBJECTIVES OF THE STUDY

Objectives which have covered in this project study are as follows:

1. To study the present practices of material management for construction field.
2. To select the Qualitative analysis technique such as Always Better Control (ABC), Sacrce, Difficult, East items (SDE) Analysis and Quantitative Approach like Economic Order Quantity.
3. To apply and analysis ABC, SDE, and EOQ technique on site and analyze the material performance.
4. To maintain sufficient stock of raw material and Control investment in inventories and give pragmatic suggestion for Future work.

4. RESEARCH METHODOLOGY AND DETAILS OF CASE STUDY

RESEARCH METHODOLOGY

1. ABC Analysis. The ABC inventory control technique is based on the principle that a small portion of the items may typically represent the bulk of total material usage of the total inventory in the construction process, while a relatively large number of items may from a small part of the money value of stores. The total material usage is ascertained by multiplying the quantity of material of each item by its unit price. The items

"A" Category – 5% to 10% of the items represents 70% to 75% of the total material usage.

"B" Category – 15% to 20% of the items represent 15% to 20% of the total material usage.

"C" Category – The remaining number of the items represents 5% to 10% of the total material usage.

The relative position of these items shows that items in 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.

2. EOQ analysis: The EOQ refers to the order size that will result in the lowest total of ordering and carrying costs for an item of inventory. If a firm place unnecessary orders it will incur unneeded order costs. If a firm places too few orders, it must maintain large stocks of goods and will have excessive carrying cost.

DETAILS OF CASE STUDY

Company profile: The case study which is selected for this project is a Residential Building under the guidance of Savvy Infrastructures Private Limited. Savvy Infrastructures Private Limited (formerly known as Savvy Swaraaj Construction) is formed in January 2004. Savvy Swaraaj developed by Green Area Properties in Ahmadabad is one of the finest integrated township projects in the city. It is located at a strategic location in close proximity to S.G Highway and S.P Ring Road. Being a self-sufficient township it facilitates for every basic and social need of the inhabitants with 2 & 3 BHK residential apartments, office spaces, hotels, and multiplexers.

5. DATA ANALYSIS FROM QUALITATIVE ANALYSIS

In the Qualitative Analysis study mainly focuses on inventory control techniques which includes ABC Analysis and SDE Analysis for minimizing inventory control.

A-B-C Analysis

In this study ABC analysis is performed on Bulk material. Ceramic Glazed tiles Doors, Windows, Plumbing/ Sanitary Fittings, Kitchen Cabinets, Wiring/ Electric Legend. It is a selective inventory control technique where the materials are divided into three categories to identify which items need more effort in controlling. The highest-valued items are classified as 'A' items and under highest control. 'C' items represent relatively least value and are under simple control. 'B' items fall in between these two categories requires reasonable management attention. As per fig. 1,2,3,4,5,6 shown that data analysis by bulk material, ceramic Glazed tiles, doors, windows, pluming/ sanitary fittings, Kichtecn Cabinets, Wiring/ Electric Legend.

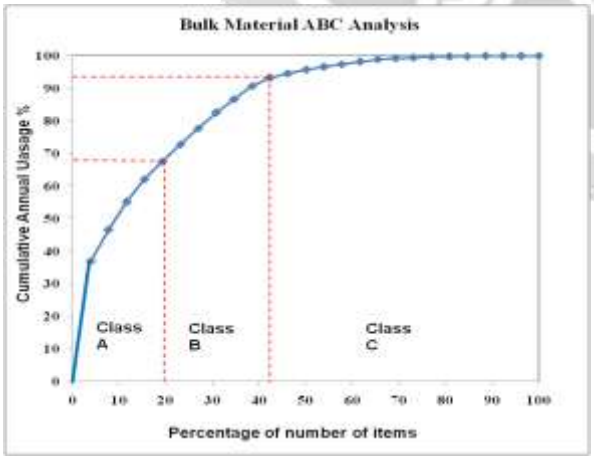

Fig. 1 Bulk Material

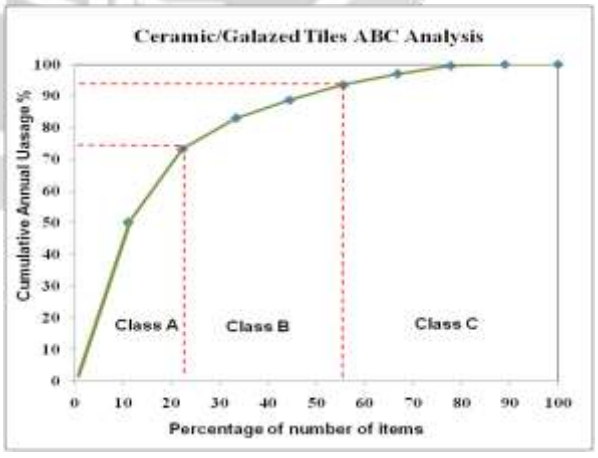

Fig. 2 Ceramic/Galazed Tiles

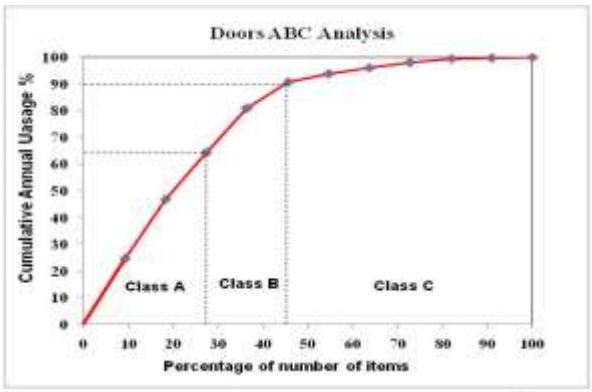

Fig. 3 Doors for ABC

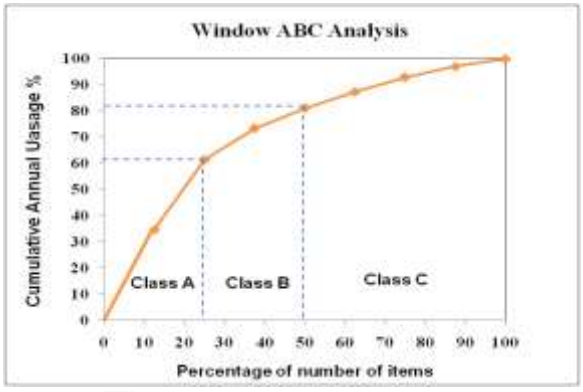

Fig. 4 Window for ABC

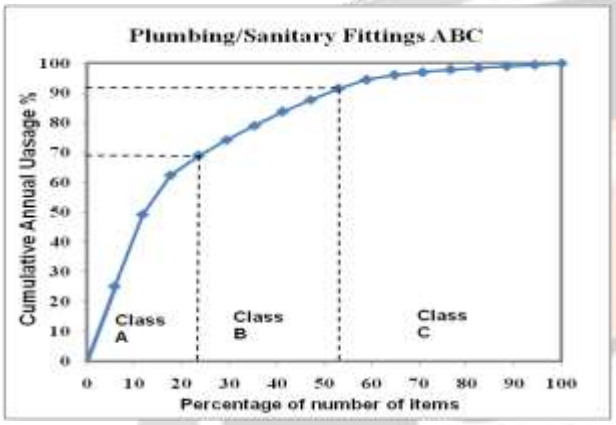

Fig.5 Plumbing/ Sanitary Fittings

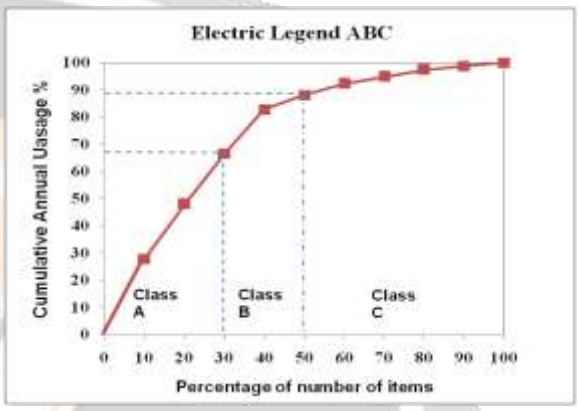

Fig. 6 Electric Legend

SDE Analysis

In this study SDE analysis is performed on Bulk material. Ceramic Glazed tiles. SDE stands for scarce, difficult and easily available items in the local market. Scarce items are generally in short supply; usually these are raw material, spare parts and imported items. Difficult items are not available in local markets, and have to be produced from for off cities or items for which there are a limited number of supplies or items for which quantity suppliers are difficult to get. The number shown in Table 1, which Summary of Scare, Difficult and Easy to obtain (SDE) Analysis of all material in the residential project.

Table 1: Summary of Scare, Difficult and Easy to obtain (SDE) Analysis

Classification	Category	No.of Items	Action
Scarce Items	**S**	10	Imporated items
Difficult Items	**D**	4	Short Supply Various Reasons
Easy Items	**E**	67	Available in Locally, Market

6. RESULT FROM QUANTITATIVE ANALYSIS

In the Quantitative Analysis study mainly focuses on inventory control techniques which includes EOQ Analysis to maintain sufficient stock of raw material during the period of short supply.

EOQ Analysis

In this study EOQ analysis is performed on Bulk material. Ceramic Glazed tiles. While performing EOQ analysis Ordering Cost & Inventory Carrying Cost is collected from site data. Inventory carrying cost incurred for maintaining the inventory.In EOQ Study also to maintain sufficient stock & control investment in inventories. The Following table 2 shows which summary of EOQ Analysis is performed on Bulk material. Ceramic Glazed tile and also uses the EOQ formula using finding out the order cycle in per year.

Table No.2: Summary of EOQ Analysis

Name of Material	Annual Requirement	EOQ	No of Order Year	Order cycle in Days
Cement Opc 53 Grade	40000	540	74	5
Cement Ppc	40000	583	68	6
Cement Opc Bulker	2055	35	59	7
Tmt Bar 8mm Dia - Fe 500	190	6	30	12
Tmt Bar 10mm Dia - Fe 500	103	5	22	18
Tmt Bar 12mm Dia - Fe 500	80	4	20	19
Tmt Bar 16mm Dia - Fe 500	137	4	31	11
Tmt Bar 20mm Dia - Fe 500	164	5	30	12
Tmt Bar 25mm Dia - Fe 500	228	7	33	12
River Sand	30000	387	77	5
Metal I Stone (10-12 mm)	1100	52	21	18
Metal II Stone (20mm)	11000	179	61	6
Fly Ash Bricks (230mmx100mmx75mm)	956000	12623	75	5
Black Granite 20mm Thk	12000	699	17	21
Kotah -Semi Polish 24-26mm Thk	951000	9396	101	4
Ceramic Tiles Glazed 300 x 600mm	49500	1725	28	13
Ceramic Tiles 300mm x 300mm	5497	337	17	23
Vitrified Tiles 600 x 600mm	17000	460	37	10
Vitrified Tiles 400 x 400mm	225	39	5	64

7. CONCLUSION

From during the present research study using the Qualitative Analysis and Quantitative Analysis by inventory control technique ABC, SDE, & EOQ data analysis following some conclusion are drawn:

1. During present research work, it has been observed that ABC analysis is a kind of technique, which provides the means for identifying those items that make the largest impact on a company's overall inventory cost performance.
2. During the research it is also observed that the use of ABC analysis and EOQ which surely will help in reduction of cost on construction sites due to
   a) Wastage control,
   b) Right incoming quantity,
   c) Materials handling,
   d) Strict control,
   e) Frequent ordering,
   f) Accurate forecast
   g) Reduce lead time
3. The use of SDE analysis in very useful in the context of present day scarcity of materials. It is helpful in lead time analysis and in deciding upon purchase strategies. Usually S items have the longest lead time, D a somewhat short lead time and E items have shortest lead time.
4. From this Work we can observe that if there in help of Economic Order Quantity material can reduce wastage on site. Economic Order Quantity maintains the sufficient material safety stock in period short supply and reduced material wastage.
5. But with using the Economic Order Quantity total investment are reduced and nub order is more in a year. So, Rate of Interest is increasing in actual site ordered material and as per EOQ rate of interest is decreased. So, after all saving the cost to use the other investment of material, other beneficial activity and reduce the thief the material.

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