

# Material Management of Residential Building

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## ABSTRACT

This project titled 'Material Management of Residential Building' is an efforts made on studying and analyzing various material management techniques. This study is done to understand the importance of material management in the construction industry and to observe what are various problems faced on construction sites. It includes studying various aspects and methodologies for proper material management. In construction project operation, often there is a project cost variation in terms of the material, apparatus (equipment), human resources, contractor, overhead cost, and general case. Material is the most important component in construction projects. Therefore, if the material management is not managed properly it will create cost difference. For proper management of construction materials various analysis techniques are used to find out by proper ways of handling the material to give minimum cost. ABC analysis, EOQ analysis, VED analysis, SDE analysis and HML analysis are different techniques of material management that I am going to use. A properly executed materials management program can achieved by timely flow of materials and equipment to the sites, and thus facilitate improved work face planning, it increases labor productivity, better schedules and lower project costs. Materials management is an major function to improve productivity in construction projects.

**Keywords-** material management, inventory control techniques, ABC analysis, EOQ analysis, VED analysis, SDE analysis and HML analysis.

## I. INTRODUCTION

Materials management is also a management process where coordination between department, supervision of sites and execution of the tasks are co-related with the flow of materials which is in and out of an organization. Material management deals with main principle of effectively optimize cost of materials used in the project and also to save time. Material management is th responsibility which starts from the selection

of suppliers and ends with the material delivered on time. Materials management is process of planning, acquiring, storing and providing the proper materials of right quality and quantity at right place in correct time so as to coordinate different activity and schedule the construction activity. Materials management is the one of the manpower organisation concept embracing and developing, planning, and monitoring of all those activities and its responsibility begins from the selection and primarily concerned with the flow of materials into and within an organisation. Material Management study suggests that the real savings in cost can happen in improved reduced surplus, labour productivity, and improved cash flow. Giving high level attention to material is not been easy, but it is observed that material is the main backbone of the project as it cost about more than half and it is also observed that most of the delay of project is due to improper management of material

### 1.1 Objectives

1. To identify various problems faced on construction site related to material management.
2. To apply inventory control techniques.
3. To give suggestions and recommendation for material management.
4. To estimate the quantity of different materials required from data collected and prepare schedule in MSP software.

### 1.2 Problem Statement

- As we know that construction industry is second largest industry in our country, it should be properly handled. Materials are the main backbone for construction as it cost is 60-70% of total construction cost, so it should be properly managed.
- If material management is not done properly it will increases the cost of construction and also time of construction will increase.
- So this study will be based on identification of problems affecting on construction site and on

analyzing proper techniques for material management.

**1.3 Methodology**

1.Study of literature review



2.Study the process of material management



3.Site selection and data collection related to selected site



4.Estimation of required quantity and prepare schedule in msp project



5. To apply inventory control techniques



6.Problem related to material management on construction site



7 Result and conclusion

**Fig.1 Methodology Of Project**



**Fig.2 Architectural View**

**1.4 Data Collected**

Site selected : Rudradham (G+4 building)

Following data were collected –1.Structural Drawings

2. Architectural

Drawings

3.Specifications of

materials and rates of material

Inventory management deals with controlling and monitoring of the different materials .There are different inventory control techniques some are given in details:

1. ABC Analysis: It is done on the basis of annual usage of materials:

‘A’ class items – Less than 15% of the material items accounts for 65-70% of the total annual usage value of the items.

**II. INVENTORY CONTROL METHODS**

‘B’ class items – About 25% of the material items accounts for 25-30% of the total annual usage value of the items.

‘C’ class items - 50% of the material items accounts for 5% of the total annual usage value of the items.

From abc analysis we find out that which material requires more control, medium and less control.

#### 2. HML Analysis:

It is like ABC Analysis but instead of annual usage of material unit prices are considered where H means high, M means medium and L means low. According to unit price, it is differentiated into H, M and L.

#### 3. SDE Analysis:

Here, S means scare, D means difficult and E means easy in terms of material available. It is differentiated into different classes according to its availability in market.

#### 4. VED Analysis:

V – Vital means material should be available on time otherwise cause use loss and production stops for long time.

E-Essential means material can be not available for some time only and production stops temporary.

D- Desirable means material not available it okay and no loss.

This analysis is done so that proper materials are available on time.

#### 5. EOQ Analysis:

EOQ means economic order quantity which refers to ideal quantity order to purchase so that it minimize inventory costs. It is necessarily used in inventory management, for which we get to know ordering size and number of orders.

Formula for EOQ is,

$$Q = \sqrt{\frac{2os}{ul}}$$

**Table 1: ABC Analysis**

Material Name	Rate	Quantity	Total Amt.	Total % Usage	Cumulative % Total
Cement	300/bag	11068	3320400	24.46	24.46
Steel	50/kg	65280	3264000	24.05	48.51
Bricks	8/brick	270472	2163776	15.94	64.45
Sand	7200/brass	212	1526400	11.24	75.69
Aggregate	3000/brass	292	876000	6.45	82.14
Door	3200/piece	184	588800	4.33	86.47
Vitrified Tiles	640/box	750	480000	3.5	89.97
Paint	500/liter	554	277000	2.04	92.01
Sliding Window	2500/piece	88	220000	1.62	93.63
Washroom Pot	3000/piece	64	192000	1.41	95.04
Granite	100/sq ft	1455	145500	1.07	96.11
Anti Skid Tiles	250/box	540	135000	0.94	97.05
Safety Grills	1300/piece	88	114400	0.84	97.89
Ventilator	1000/piece	64	64000	0.47	98.36
Primer	100/liter	554	55400	0.41	98.77
Sink Kitchen	1200/piece	40	48000	0.35	99.12
Wash Basin	1200/piece	40	48000	0.35	99.47
Kadappa	40/sq ft	1110	44400	0.32	99.8
Putty	600/bag	18	10800	0.07	100
		Total Amt.	13573876		

**Table 2: ABC Analysis, HML Analysis and SDE Analysis**

Material Name	Rate	Cumulative % Total	ABC Analysis	HML Analysis	SDE Analysis
Cement	300/bag	24.46	A	L	D
Steel	50/kg	48.51	A	M	D
Bricks	8/brick	64.45	A	L	D
Sand	7200/brass	75.69	B	H	E
Aggregate	3000/brass	82.14	B	H	E
Door	3200/piece	86.47	B	H	E
Vitrified Tiles	640/box	89.97	B	M	E
Paint	500/liter	92.01	C	M	D
Sliding Window	2500/piece	93.63	C	H	D
Washroom Pot	3000/piece	95.04	C	H	E
Granite	100/sq ft	96.11	C	M	E
Anti Skid Tiles	250/box	97.05	C	M	E
Safety Grills	1300/piece	97.89	C	H	D
Ventilator	1000/piece	98.36	C	M	E
Primer	100/liter	98.77	C	M	E
Sink Kitchen	1200/piece	99.12	C	M	E
Wash Basin	1200/piece	99.47	C	H	E
Kadappa	40/sq ft	99.8	C	L	E
Putty	600/bag	100	C	M	E

**Table 3: VED Analysis**

ACTIVITY	V	E	D
<b>Foundation</b>	Cement, Sand	Steel	Aggregate
<b>Construction Of Plinth Beam</b>	Steel	Cement, Sand, Aggregate	Aggregate
<b>Column</b>	Steel	Cement, Sand	Aggregate
<b>Slab And Beam</b>	Steel	Cement, Sand	Aggregate
<b>Brick Work</b>	Bricks, Cement, Sand		
<b>Plumbing</b>	Ms Grills, Windows, Doors	Kitchen sink, Washbasin, Ventilator, Washroom pot	
<b>Plastering</b>	Cement, Sand		
<b>Painting</b>	Putty	Paint, Primer	
<b>Flooring</b>	Anti Skid Tiles, Cement, Sand	Vitrified Tiles, Granite, Kadappa	

**Table 4:** SAMPLE EOQ Analysis of A Class items (Brick)

Date	Steel required	Ordering Cost	Inventory Carrying cost	Eq	No. Of order
14-12-2019 to 14-01-2020	5745	200	15 %	554	10
15-01-2020 to 15-02-2020	6526	200	15 %	590	11
16-02-2020 to 16-03-2020	5189	200	15 %	526	10
17-03-2020 to 17-04-2020	4918	200	15 %	512	10
18-04-2020 to 18-05-2020	8129	200	15 %	660	12
19-05-2020 to 19-06-2020	3433	200	15 %	428	8
20-06-2020 to 20-07-2020	3780	200	15 %	385	7
21-07-2020 to 21-08-2020	4140	200	15 %	470	9
22-08-2020 to 22-09-2020	4918	200	15 %	512	10
23-09-2020 to 23-10-2020	8912	200	15 %	689	13
24-10-2020 to 24-11-2020	3690	200	15 %	444	8
25-11-2020 to 25-12-2020	3220	200	15 %	412	8
26-12-2020 to 26-01-2021	3680	200	15 %	443	8

$$Q = \sqrt{\frac{2os}{ul}} = \sqrt{\frac{2 \times 5745 \times 200}{50 \times .15}} = 554$$

$$N = 5745 / 554 = 10$$

$$Q = \sqrt{\frac{2os}{ul}} = \sqrt{\frac{2 \times 6526 \times 200}{50 \times .15}} = 590$$

$$N = 6526 / 590 = 11$$

$$Q = \sqrt{\frac{2os}{ul}} = \sqrt{\frac{2 \times 8149 \times 200}{50 \times .15}} = 660$$

$$N = 8149 / 660 = 12$$

### III. FACTORS AFFECTING MATERIAL MANAGEMENT AND POSSIBLE SOLUTIONS

#### 3.1 Factors Affecting Material Management:

Various factors affecting material management on site are as follows:

- Late delivery of materials.
- Material damaged
- Unavailable required material quantity.
- Communication problem.
- Poor quality of materials.
- Materials getting steal.
- Lack of material management process.

#### 3.2 Possible Solution For Factors Affecting Material Management:

1. While ordering the materials various factors should be considered like lead time, transportation place, vendor reputations, type of materials and schedule so that there is delivery of materials on time. Delivery of materials should be done 2-3 days required so care must be done by ordering materials and most important schedule should be considered.
2. While delivery materials should be checked. Place of storage of materials should be chosen such that materials are not damaged for example cement should not become hard rock,

steel should not rotten, etc. Special care should be taken in rainy season. While using materials the technique FIFO should be used so that materials are not damaged. FIFO (first in first out) technique is the simple technique in which material are first delivered should be first used.

3. Firstly proper schedule should be prepared and also materials should be estimated from drawings. While ordering the material schedule and estimation should be considered properly. While ordering EOQ analysis should be also done so that ordering size is obtained and it's also economic. By using this analysis number of order can also be obtained.
4. One of the main factors affecting the material management process is communication problems. There should be proper communication and co-ordination between all the departments. Materials should be clear and it should also be in written format. After ordering there should be communication between supplier and purchaser. And also between site engineer and supervisors.
5. Materials quality should be checked when it is delivered only so that there are not delay problems. For quality check purpose it should be order 2-3 days before materials required. Materials quality should be not checked when

it is required. Some materials samples are also available before ordering should be considered. As we know production of qualitative work is always beneficial for site work.

- Proper record should be maintained of materials in and out a register should be kept. A watchman should be kept on site.

#### IV. RESULT AND CONCLUSION

- It was concluded that there was not proper management of material on selected site.
- It was concluded that total cost of materials was 62.99 % of total construction cost.
- From ABC Analysis we get usage value and used to control on the significant few materials and the insignificance materials. Storage of material of A item materials should be done properly and its inventory cost should be as less as possible. Usage of A and B materials are 15.79 % and 21.05%. And for C is 63.15%.
  - A class materials are steel, cement and bricks.
  - B class materials are sand, aggregates ,doors and vitrified tiles.
  - C class materials are kitchen sink, washroom basin, washroom pot, anti-skid tiles, primer, granite, kadappa, putty, ventilator, paint, sliding window and ms grills.
- For HML Analysis unit prices of materials are considered and it is done to control purchases.
  - H class materials are sand, aggregates and doors.
  - M class materials are Kitchen sink, washroom basin, washroom pot, tiles, primer, granite, putty, ventilator, paint, sliding window and ms grills.

- L class materials are steel, cement and bricks and kadappa.

- SDE Analysis gives availability of materials in market and requirement of procurement investment/ease. This analysis used to decrease problems of procurement.

- S class materials are steel and cement.
- D class materials are and ms grills, tiles and paint.

- E class materials are bricks, kadappa, Kitchen sink, washroom basin, washroom pot, primer, granite, putty, ventilator, sliding window sand, aggregates and doors.

- From VED Analysis we get to know which of the materials play a vital role especially while starting of the particular activities.

- For activity foundation cement, sand and steel plays vital roles.

- For activities of construction of plinth beam, column, slab and beam steel plays a vital role and if they are not available during the start of the activities it will create delay in project.

- In Brickwork activity bricks, cement and sand plays vital roles.

- During plumbing activity MS grills, windows and doors play vital roles.

- In plastering cement and sand play vital roles.

- In painting putty plays vital role.

- In flooring tiles, cement and sand plays vital roles.

- By EOQ analysis we get to know quantity of order which is economic for project. We also get to know no. of orders. By using we can solve stock problems (over/less stocking). By this analysis various materials problems can be solved like wastage, late delivery, unavailable of proper quantities’.

**Table 5:** Total Cost of A Class items Materials with and without EOQ

Material	with EOQ	without EOQ
Cement	3337740	3338775
Steel	3306130	3313400
Bricks	2184431	2186526

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