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A STUDY ON THE QUALITATIVE ANALYSIS OF MATERIALS MANAGEMENT IN KERALA CONSTRUCTION INDUSTRY

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Abstract - *This project thesis titled "A study on the qualitative analysis of materials management in Kerala construction industry" is an attempt made on studying and assessing the material management principles and practices in construction industry in Kerala. The objective of the study is to understand about the problems occurring in the organization because of improper application of materials management and to find the factors affecting material management in construction projects. In the construction industry, material management is critical for the successful and timely completion of a project. When the planning, material identification, and material management systems are inadequate, the project's cost rises. Labor productivity will suffer as a result of material shortages and insufficient storage. A good material management system on a construction site can help to avoid project delays and cost variations. This results in better planning, higher labor productivity, accurate schedules, and lower project costs.*

Key Words: *Materials Management, Construction, Civil Engineering, Storage, Planning.*

1. INTRODUCTION

Materials Management is the process of planning, executing, and controlling field activities in construction, The goal of material management is to ensure that construction materials are available when needed. Material management is concerned with the principles and practises that effectively reduce the cost of materials used in a project. Material management is the line of responsibility that begins with supplier selection and ends when the material is delivered to its destination.

Materials Management is concerned with the planning, acquisition, storage, and provision of appropriate materials of the appropriate quality and quantity at the appropriate location and time in order to coordinate and schedule the construction activity. Materials management is a single manpower organisation concept that encompasses all activities and line responsibility that begin with the selection and personnel primarily concerned with the flow of materials into and within an organisation.

Materials Management is a critical component of project management. Materials are a major expense in a construction project, so lowering procurement costs increases the chances of lowering overall project costs. Poor material management can lead to increased construction costs. Efficient material management can result in significant project cost savings. Budget overruns, delays, and claims plague far too many construction projects. A well-executed materials management programme can ensure the timely delivery of materials and equipment to the job site, allowing for better work face planning, increased labour productivity, better schedules, and lower project costs

1.1 Definition

Material management is defined as "The function responsible for the 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."

The International Federation of Purchasing and Materials Management accept the definition of materials management as "Materials Management is a total concept having its definite organization to plan and control all types of materials, its supply, and its flow from raw stage to finished stage so as to deliver the product to customer as per his requirements in time".

1.2 Different stages of material management are:

a) Planning and Scheduling

b) Monitoring and Controlling

c) Organization and Personnel

d) Procurement

e) Delivery

f) Storage and Storage Facilities

g) Usage

h) Surplus and Waste Control

a) Planning and Scheduling

The first and most important process in any project is planning. Material planning, a critical function of material management, is inextricably linked with project planning and control setup. The entire material programme must be planned in order to meet the project deadline. Indeed, planning and scheduling are important in terms of increasing productivity, profit, and ensuring that construction projects are completed on time.

b) Monitoring and Controlling

All construction activities in material management are monitored and controlled to ensure that the right materials with the exact quality are available at the right time and place suitable for the lowest cost construction process. It is a step in which facilities, personnel, resources, and capital are monitored and controlled to have a significant impact on construction project operations.

c) Organization and Personnel

The material management process is structured in such a way that it allows for integrated planning and coordination of material flow in order to maximise resource utilisation and minimise costs. The organisation must be designed to ensure that work is completed on time, with material personnel located at an appropriate level of project management and influencing decision-making.

d) Procurement

Floating enquiry indents conduct primary investigations to develop sources for material procurement. It is processed by the material procurement responsible personnel in order to invite quotations with material samples where applicable.

e) Delivery

Delivery ensures the efficient use of workforce and production or process in construction projects by organising the movement of vehicles, people, and materials. One of the major factors influencing cost and time during the construction stage is material routing.

f) Storage and Storage facilities

The provision of required space, protection, and control of building materials and components held on site during the construction process is referred to as material storage. A good and systematic storage of materials allows for better material management in construction.

g) Usage

Material usage is the facilitation that allows for their movement and placement. The construction industry employs a wide range of building materials for various aspects of home construction. Architects work with structural engineers to determine the load-bearing capabilities of the materials they recommend.

h) Surplus and Waste control

Waste reduction can be accomplished through a zero-waste attitude, proper design decisions, site management, and proper standardisation of construction materials. Waste management on construction projects can also help to reduce waste. Every construction personnel involved in minimising the overall waste generation at the project must plan the project activities at each stage. The waste rate estimation method can be used to improve material handling, reduce waste, and increase productivity

1.3 Advantages of Material Management:

To manage interface problems between functions, a material management function is established. The benefits that can be expected from the use of material management are those that arise when a systems approach is used to handle an organization's day-to-day activities as interconnected parts of the overall process.

These advantages include:

- Improved coordination of activities.
- Reduced sub-optimization
- Increased flexibility
- Balanced stocks and fewer obsolete stocks
- Lower purchase prices and better delivery conditions
- Lower storage and transportation costs

2. OBJECTIVES

The objective of the paper is to study the different material management procedures practiced currently in local construction projects and also identify the factors affecting material management in construction projects in the state of Kerala. The primary goal of material management is to reduce the cost of materials to the greatest extent possible so that the final products are more competitive and the organization's profit increases. This study will generate a list of root causes for ineffective material management that can be used as a benchmark to control the existing and future projects. Furthermore the most concerning issues like cost overrun and delay in terms of project delivery and its relation with the current material management practice will reveal the weakness in the current material management practices to the stakeholders. Apart from this research being useful to the field professionals, this study will be valuable for the academicians too.

The project focuses on the following objectives:

- To identify the problems faced in material management.
- To identify the critical factors in various stages of material management
- Recommendations to reduce the problems faced in material management.

3. LITERATURE REVIEW

[1] Narimah Binti Kasim (2008): This research focuses on the creation of a tool to help construction projects improve their materials management concepts and practices. Integrating materials management and resource modelling allows for investigation. This development will be based upon management recognition of the significance of materials management, combined with extensive pressure upon the costs and efficiency in the functions which make up the materials management systems .The incorrect control of materials during project execution is a critical element negatively affecting project performance. The case studies under discussion involve procedures used in construction projects that have major issues with materials management.

[2] Anusha Rajendran K (2011): This study examines the implementation of Material Coding and Material Requirement Planning on a residential project. It also emphasises enhancing the project site's material storage efficiency. The study does not include non-consumable products, and the work was completed in a short amount of time. The work's output does not include a thorough examination of each and every project item; rather, only a few significant elements are examined.

[3] Abhilin G B, and Vishak M S" (2017): Poor material management is one of the leading causes of building project delays. The material management plan aims to ensure that the right quality and quantity of materials are identified, purchased, transported, and handled on site in a timely and cost-effective manner. Time, money, and quality are three interrelated concerns in every building job. Control and management are required. It is necessary to change the material management process in order to make a profit. Using information and communication technologies technology, accurate material usage, stocking material, and material location may all be found. It saves time and money by reducing labour-intensive error

[4] Harsh Soni (2016) this study explored the current practice of Material Management in construction industry and analyzed using ABC, SDE, & EOQ inventory control technique. The purpose is to find out the ways of managing the inventory properly, so that there would be a little impact on the profits. They conclude that ABC analysis provides identifying those items that make the largest impact on a company's overall inventory cost performance. SDE analysis in very useful in knowing present day scarcity of materials, in lead time and deciding upon purchase strategies. EOQ maintains the sufficient material safety stock in period short supply and reduced material wastage. Economic Order Quantity total investment is reduced and no of order is more in a year. So, Rate of Interest is increasing in actual site ordered material.

A literature review is typically conducted to better understand the topic, identify the problem, and provide appropriate solutions suggested by various researchers in the project. Various researches in material management and inventory management are studied to learn about the problems encountered in the industry around the world. It aids in discovering and comprehending the various possible solutions that can be obtained from literature research.

4. METHODOLOGY

The research approach adopted in this project is qualitative methodology. In this study the questionnaire was prepared followed by literature review related to material management. Information collected through the literature review was used to generate questionnaire surveys. The structured questionnaire is most likely the most widely used data collection technique for survey research. Questionnaires have been widely used in descriptive and analytical surveys to gather facts, opinions, and points of view.

Methodology of the study is as follows.

1. Literature Survey
2. Literature review
3. Identify material management processes and root causes in ineffective material management in other countries to formulate the questions
4. Preparation of the questionnaire
5. Distribute the questionnaire
6. Data collection
7. Data analysis
8. Result and discussion.

4.1 Designing and collecting data through a questionnaire survey:

Questionnaires have been widely used in descriptive and analytical surveys to gather facts, opinions, and points of view. It improves confidentiality, strengthens internal and external validity, simplifies analysis, and saves resources. As a source of primary data, a questionnaire survey was conducted. The data gathered from the literature review was used to create questionnaire surveys. This is a set of questions that have been developed to provide useful

answers to researchers. The survey was divided into sections based on the research goals and objectives. Each section was given a title that reflected its purpose and purpose, and questions were used to cover the main areas of research

4.2 Questionnaire:

Table 1 - Questionnaire Survey

CATEGORY	FACTORS
MATERIAL PLANNING	1. Incorrect materials take off from drawing and design documents
	2. Vendor evaluation criteria is not organized.
	3. Supply chain challenge
	4. Lack of communication
	5. Nonstandard specifications of materials
	6. Difference between plans and specifications
	7. Changes in material types and specifications during construction leads to delay
	8. Late in selection of finishing materials due to diversity in market and also from many contractors and subcontractors.
	9. Unexpected increase in demand of materials
MATERIAL PROCUREMENT	10. Receiving materials before they are required
	11. Not receiving materials at the time of requirement
	12. Selection of type of contract for specific materials procurement
	13. Shortage of materials in the market (availability)
	14. Over-ordering of materials (wastage problems).
	15. Over-payments for materials (inadequate administration procedures)
	16. Loss of benefits (lack of skilled negotiating procedures).
	17. Lack of knowledge on procurement of materials
	18. Late delivery
	19. Incorrect delivery
	20. Incomplete delivery
MATERIAL STORAGE	21. Piling up of inventory items and controlling of the same is most difficult task at site.
	22. Management of surplus materials consumes a lot of space and incurs cost
	23. Storage constraints
	24. Problems with de-centralized processing of materials to and from the site to storage
	25. Inadequate training practices given to the store in charge
	26. Difficulty in delivery of long lead time materials
SITE FACTORS	27. Regulation consideration: the permission from local authority to deal with materials delivery into the construction site
	28. Project size challenge: The scale/size of the project and physical access problems with traffic overflow and surrounding local roads near the construction site
	29. Improper handling of materials: This is related to poor handling of materials by site labor.
	30. No proper stock yard available for storing of materials (steel and shuttering material's) leading to material wastage.
	31. Site access problems: The single site access point led to traffic congestion when many vehicles come to the construction site at the same time.
	32. Small loading area: This leads to constraints in the loading and unloading of materials
	34. Change in design according to site conditions leading for change in level difference during excavation
	35. Inaccessibility to the site area during harsh weather conditions.
	36. Work diversion of personnel's. - Concentration of the management towards other blocks in the same projects leading to work diversion.
	37. Rework due to inevitable reasons occurred
	38. Material unavailability at site

4.2 Data Collection

The weight and authenticity of the research are heavily reliant on the validity and dependability of the data collected. Data are frequently thought of as 'the facts,' or things that are known to be true. But data are social products. The records produced are not reality in and of themselves; rather, they are the result of researchers' attempts to observe or measure traces or evidence of phenomena occurring within complex systems. Data for this study were gathered using primary data collection methods.

For this study the primary data was collected using questionnaires by the help of 'Google form' as well as direct communication with thee Stakeholders. The questionnaires was transmitted to the targeted respondents and they were expected to fill this form and to submit the same.

4.3 Rating scale

Each statement in these questions should be rated on a scale from strongly agree to strongly disagree, starting with the rating system was given as follow;

Strongly agree – 5, Agree – 4, Satisfactory – 3, Disagree – 2 strongly disagree – 1.

5. RESULT AND ANALYSIS

Table -2: Result Analysis Chart

Question No	No. Of companies with 4 & 5 (agree)	No. Of companies who have given 2 &1(disagree)	No. Of companies who have given 3((satisfactory)
1	24	3	3
2	23	0	7
3	27	0	3
4	23	3	4
5	18	1	11
6	25	1	4
7	24	0	6
8	28	0	2
9	25	1	4
10	18	3	9
11	25	2	3
12	26	0	4
13	25	1	4
14	17	2	11
15	17	7	6
16	17	3	10
17	23	1	6
18	26	2	2
19	24	1	5
20	21	2	7
21	21	0	9
22	25	3	2
23	23	2	5
24	23	1	6
25	23	1	6
26	22	1	7
27	24	0	6
28	24	1	5
29	24	1	5
30	23	1	6
31	25	0	5
32	20	2	8
33	24	1	5
34	23	1	6
35	25	0	5
36	23	2	5
37	17	1	12
38	26	0	4

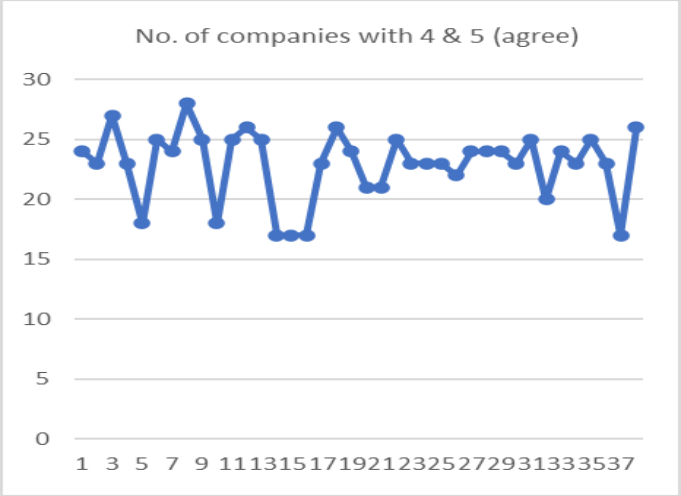

Chart -1: - Number of companies responded, 4&5

Chart -2 - Number of companies responded 3

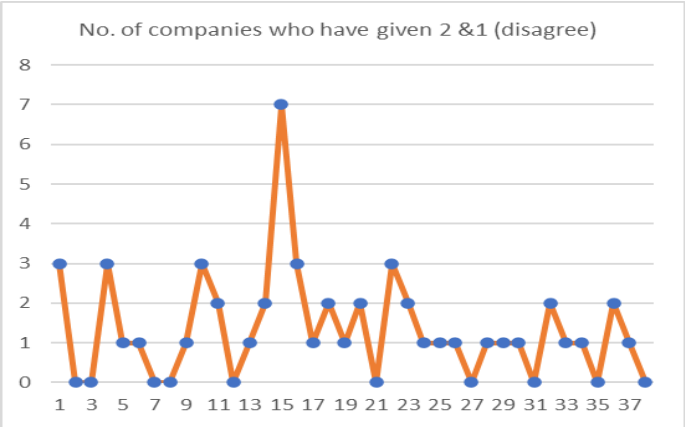

Chart -3 - Number of companies responded 1&2

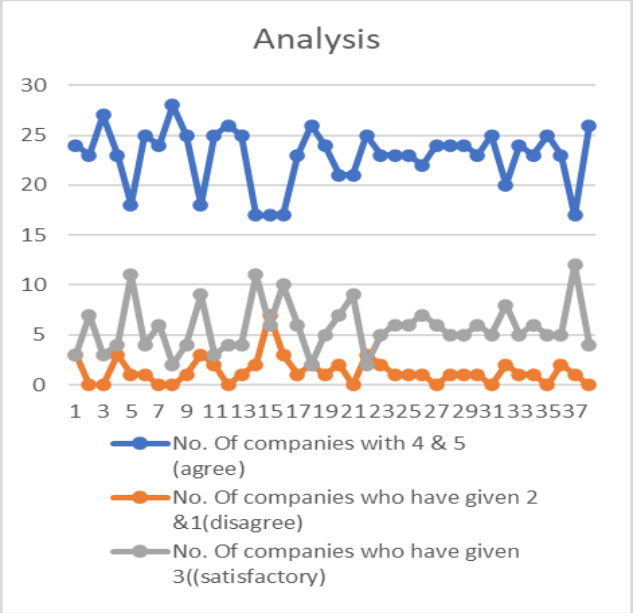

Chart -4 - Overall Result Analysis

6. CONCLUSIONS

The purpose of this study was to identify the factors affecting materials management in construction projects in the State of Kerala and their effects and solution. The factors were compiled into a questionnaire, and responses were obtained from stakeholders involved in residential projects in Kerala. Based on the research in the Kerala construction industry, I have discovered top 15 most common factors affecting material management. Based on the response from the stakeholders, after analysing based on the feedbacks of the questionnaire survey, we can conclude that different factors affecting at each stage of material management and are treated in different form.

The following conclusions are:

1. Poorly defined roles and responsibilities were identified as a major issue during the material planning stage of material management.

2. Supply chain challenge also be considered at material planning stage of material management

3. Poor coordination and communication between contractor and material supplier was identified as the major issue during the vendor analysis stage of material management.

4. Local issues causing material delays and unavailability are regarded as the major problem during the material purchasing stage of material management.

5. The main issue in the storage and inventory stages of material management is a lack of modern equipment and methods for handling.

6. Damage to material on site and a lack of onsite material control were identified as major issues during the supply and distribution stages of material management.

7. Project size challenge, Site access problems and Small loading area are regarded as the problem at site factors stages of material management.

7. RECOMMENDATION

Recommendations are made based on the conclusions and issues discovered during my study. These suggestions are intended to improve materials management and reduce project complexity.

• Making changes in the plans or the materials used should be avoided by the owners as much as possible

• Proper and clear contracts must be written to make the missions and responsibilities of contractors, consultant, and management team

• Do not utilize substandard materials in construction

• Avoid of buying more or less amount of materials than that are needed for construction

• Experienced Construction Manager should be hired for tasks like selecting appropriate construction methods or materials, managing costs and time, observing the construction process, and organising contracts.

• Hiring trained and skilled labour speeds up the process and eliminates the possibility of defective work and repeated works.

• To avoid communication issues, it is recommended that all indents, requests, notes, and records be kept in writing.

• Material handling equipment such as conveyor belts, trolleys, cranes, and so on should be used to reduce waste caused by improper material handling.

• Every construction firm should use the EOQ technique before placing any order to reduce project cost overruns

• To avoid manual errors in material management, software such as MSP, PRIMAVERA, ERP, SAP, and others should be used.

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