

Analysis Of Factors Influencing for Material Wastage & Quality Management in Construction Project

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Abstract—The construction industry is one of the industries through which physical development of nation is achieved, and it is truly the locomotive of the national economy. The more resources, engineering, labor, materials, equipment, capital, and market exchange are provided through this industry to the national economy. The increasing complexity of infrastructure projects and the environment within which they are constructed place greater demand on construction managers to deliver projects on time, within the planned budget and with high quality. The successful execution of construction projects and keeping them within estimated cost and prescribed schedules depend on a methodology that requires sound engineering judgment. To the dislike of owners, contractors and consultants, however, many projects experience extensive delays and thereby exceed initial time and cost estimates. Therefore, improving construction efficiency by means of timeliness would certainly contribute to cost savings for the country as a whole. Efforts directed to time effectiveness were associated with managing time and materials, which in this study were approached via investigating time and material wastages of construction projects.

Index Terms—Construction, Infrastructure, Material Wastage, Budget, Methodology

1. INTRODUCTION

The construction industry is one of the industries through which physical development of nation is achieved, and it is truly the locomotive of the national economy. The more resources, engineering, labour, materials, equipment, capital, and market exchange are provided through this industry to the national economy. The increasing complexity of infrastructure projects and the environment within which they are constructed place greater demand on construction managers to deliver projects on time, within the

planned budget and with high quality (Enshassiet al, 2010).

The successful execution of construction projects and keeping them within estimated cost and prescribed schedules depend on a methodology that requires sound engineering judgment. To the dislike of owners, contractors and consultants, however, many projects experience extensive delays and thereby exceed initial time and cost estimates. This problem is more evident in the traditional or adversarial type of contracts in which the contract is awarded to the lowest bidder-the awarding strategy of the majority of public projects in developing countries including Western Maharashtra Region.

A. Time and Material Wastages in Western Maharashtra region:

One of the main objectives and policies of any public or private sectors dealing with the execution of projects is to upgrade projects performance, through reduction of costs, completion of projects within their assigned budget and time constraints, and improve quality. Construction industry in Western Maharashtra region is suffering from many problems which affect time, cost and quality, these factors related to political situation and techniques used in

Western Maharashtra region, these problems are summarized as following:

- Large number of workers in comparison to the number of projects (the large number of unemployed labours in Western Maharashtra region)
- Shortage of materials in markets;
- Continued increase in material prices;

- Dependency on donor countries to get the fund of implemented projects in Western Maharashtra region;

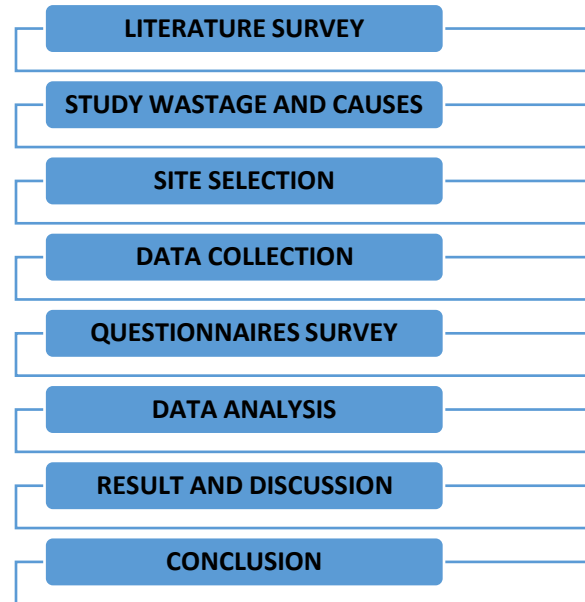
These factors above and others contributed to large proportion in making many problems in construction industry, which usually related to time and material wastages. Delay of project and material wastages in Western Maharashtra Region is one of most important problems at construction management field. In addition, research and studies in this field in India are few compared to worthy expected results. Despite the importance and the significance of the construction sector in India, it is noted that the parties of project (owner, consultant, and contractor) don't give the time and material wastages the importance at the evaluation at the end of project.

2. PROBLEM STATEMENT

Project finishing on time and absence of material wastages are considered the most important factors of successful projects, which help to decrease problems for all parties and give new chances to construct another related project. It also helps to increase the Profits and development of construction industry. Material wastages is also considered a big problem, which hinders project's progress, since it decreases the contractor profit leading to huge losses leaving the project in a big trouble. Despite meticulous planning and execution, quality issues can and do arise, leading to delays, cost overruns, and even safety hazards. Here are eight common quality issues encountered in construction and engineering, along with their causes, effects, and potential solutions.

3. RESEARCH DESIGN

The purpose of the pilot study was to test and prove that the questionnaire questions are clear to be answered in a way that help to achieve the target of the study. The questionnaire was modified based on the results of the pilot study. The fifth phase of the research was questionnaire distribution. The questionnaire was used to collect the required data in order to achieve the research objective. The sixth phase of the research focused data analysis and discussion. Statistical Package for the Social Sciences was used to perform the required analysis.



A. Study Area- Mumbai Coastal Road Projects (South) Package

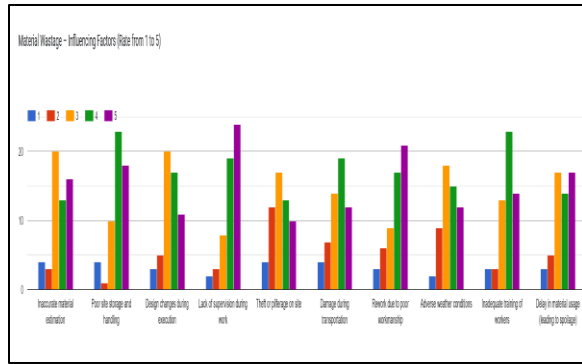


Fig 1 Mumbai Coastal Road Project (South) Package
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4. ANALYSIS OF QUESTIONNAIRE

The questionnaire has been prepared by the author for the working staff of the Mumbai Coastal Road Project to evaluate the factors influencing material wastage and quality management. The spreadsheet was sent to the respective employees of the coastal project, and total - 56 responses were collected. The responses were analyzed as follows

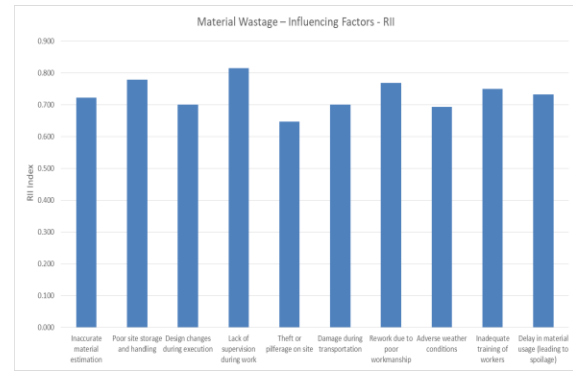
A. Material Wastage – Influencing Factors (Rate from 1 to 5)



Graph 1 Material Waste Influencing Factors

Table 1 RII of Material Waste Influencing Factors

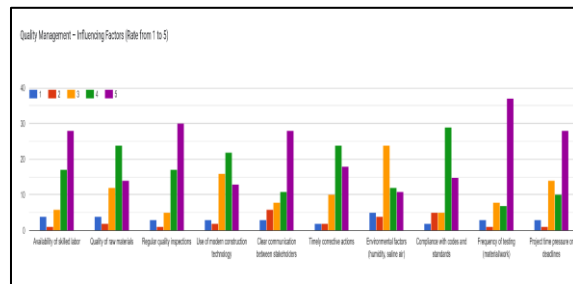
Material Waste – Influencing Factors							(RII)
Sr No	Answer	1	2	3	4	5	RII
1	Inaccurate material estimation	4	3	20	13	16	0.721
2	Poor site storage and handling	4	1	10	23	18	0.779
3	Design changes during execution	3	5	20	17	11	0.700
4	Lack of supervision during work	2	3	8	19	24	0.814
5	Theft or pilferage on site	4	12	17	13	10	0.646
6	Damage during transportation	4	7	14	19	12	0.700
7	Rework due to poor workmanship	3	6	9	17	21	0.768
8	Adverse weather conditions	2	9	18	15	12	0.693
9	Inadequate training of workers	3	3	13	23	14	0.750
10	Delay in material usage (leading to spoilage)	3	5	17	14	17	0.732



Graph 2 RII of Material Waste Influencing Factors

Material waste is a critical issue that impacts project cost, efficiency, and sustainability. This study concludes that three major factors significantly contribute to material waste. Rework due to poor workmanship RII 0.768 and Lack of Supervision during Work RII 0.814 allows errors and careless behavior to go unchecked, increasing the likelihood of material loss and wastage throughout various project stages.

B. Quality Management – Influencing Factors (Rate from 1 to 5)

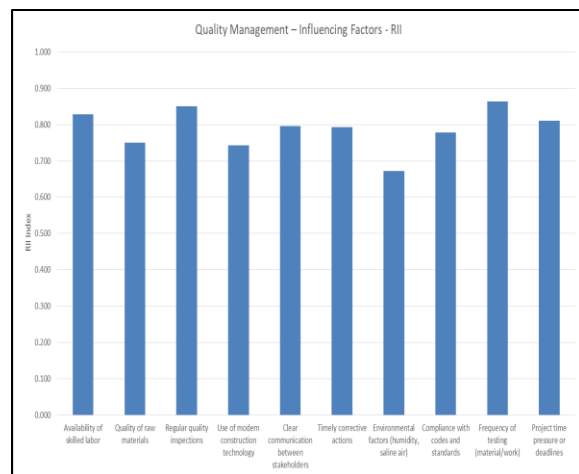


Graph 3 Quality Management Influencing Factors

Table 2 RII of Quality Management Influencing Factors

Quality Management – Influencing Factors							(RII)
Sr No	Answer	1	2	3	4	5	RII
1	Availability of skilled labor	4	1	6	17	28	0.829
2	Quality of raw materials	4	2	12	24	14	0.750
3	Regular quality inspections	3	1	5	17	30	0.850
4	Use of modern	3	2	16	22	13	0.743

	construction technology						
5	Clear communication between stakeholders	3	6	8	1	2	0.796
6	Timely corrective actions	2	2	1	0	2	0.793
7	Environmental factors (humidity, saline air)	5	4	2	4	1	0.671
8	Compliance with codes and standards	2	5	5	2	1	0.779
9	Frequency of testing (material/work)	3	1	8	7	3	0.864
10	Project time pressure or deadlines	3	1	1	4	2	0.811



Graph 4 RII of Quality Management Influencing Factors

The study on quality management influencing factors in construction reveals that maintaining high standards of quality is strongly dependent on the Frequency of testing (material/work) RII-0.864, Regular quality inspections RII- 0.85, Availability of skilled labor RII- 0.829

C. Preparation of Check list

DAILY CHECKLIST TO AVOID MATERIAL WASTAGE		
1 Project: Mumbai Coastal Road Project		
2 Date: 15-02-2025		
3 Site In-Charge: Vinayak Sidor (Site Engineer)		
4 Location - Mumbai		
Sr. no	Item	Remarks / Observations
A) General Material Handling & Storage		
1	Material delivered today verified against PO/specifications?	Yes
2	Materials unloaded with proper supervision to avoid damage?	Yes
3	Storage areas clean, dry, and protected from weather?	Yes
4	Damaged or expired materials immediately segregated?	Yes
B) Concrete Works (RMC & Site Mix)		
1	Concrete poured within permissible time after batching?	Yes
2	Slump test and cube casting done before placement?	Yes
3	Any leftover concrete used in non-structural applications?	Used for temporary
4	Pump and channel leakage minimized with proper sealing?	Yes
5	Cleaning water and washout collected & reused safely?	Collected
C) Reinforcement Steel		
1	Cutting done as per approved bar bending schedule?	Yes
2	Off-cuts stored and tagged for reuse?	Yes
3	Bars stored on raised platforms, protected from rust?	Stored
4	No unnecessary fabrication observed on site?	No
D) Documentation & Reporting		
1	Daily Material Wastage Log updated by storekeeper?	Updated
2	Quantity vs. Consumption matched and reconciled?	Review
3	Photos of any damaged/wasted material taken?	Yes
4	Corrective action initiated for any excessive wastage?	In progress
Feedback for Check list-		
This checklist helps to measure reinforce & reduce additional training.		
Signature: Vinayak Sidor 15-02-2025		

Fig 2 Checklist implementation for Quality Management

DAILY QUALITY MANAGEMENT CHECKLIST		
1 Project: Mumbai Coastal Road Project		
2 Date: 04-03-2025		
3 Site In-Charge: Tyghimay Baninge (Sr Site Engineer)		
4 Location - Mumbai		
Sr. no	Item	Remarks / Observations
A) General Quality Control		
1	Quality Control Plan (QCP) for today's work reviewed?	Yes Reviewed
2	Method statements and ITPs (Inspection & Test Plans) available on site?	Available
3	Work executed by trained/qualified personnel?	Verified
4	Materials used today checked against approved sources/specs?	Yes
5	Work carried out as per approved drawings/revisions?	Yes
B) Concrete Works		
1	Mix design approved and verified before pour?	Verified
2	Slump test and temperature check done at point of pour?	Yes
3	Cube samples taken and properly labelled?	Yes
4	Vibration done correctly (no honeycombing, segregation)?	Checked
5	Curing started immediately as per QMS plan?	Yes
C) Workforce Deployment & Qualification		
1	Labour deployed today verified against approved deployment plan?	Yes
2	Skilled trades (carpenters, bar benders, masons, operators) deployed as per task requirement?	As per plan
3	Workers assigned to critical works are trained/certified? (e.g. scaffolding, rigging, welding)	Certified
D) Training & Awareness		
1	Pre-work briefing conducted for all labour (Toolbox Talk)?	Conducted
2	Workers aware of the approved method statement and quality requirements for today's task?	Yes
3	Any new workers oriented before task assignment?	No
Feedback for Check list-		
This checklist helps for the ensuring daily quality of work & also helps for the Quality management		
Signature: Tyghimay Baninge Sr-Engineer 04-03-25		

Fig 3 Checklist implementation for Quality Management

5. CONCLUSION

To address these challenges, the checklist developed during the study was reviewed by site engineers, who found it effective, practical, and easy to implement. The checklist focuses on core areas such as material handling, supervision, planning, and compliance, offering a structured approach to minimizing waste and improving quality.

In conclusion, the updated findings validate that reducing material wastage and maintaining high quality in construction require a coordinated approach involving workforce training, supervision, planning, and frequent quality checks. The developed checklist continues to serve as a practical and implementable tool, contributing to more efficient, and cost-effective, and sustainable project delivery.

A. Material Wastage

Material wastage is a major challenge in construction, affecting productivity, costs, and sustainability. Key causes include poor planning, lack of training, and transportation losses. The study identifies inadequate worker training, lack of supervision, and handling errors as the top contributors. These issues lead to inefficient use of resources and increased project costs, highlighting the need for better planning, training, and on-site control.

B. Quality Management

Quality management relies heavily on skilled labor, effective supervision, and compliance with standards. To maintain high-quality outcomes, the study recommends regular training, appointing qualified supervisors, and implementing internal audits. These practices ensure consistent performance, fewer errors, and improved project delivery.

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