



# International Journal of Innovative Research in Science Engineering and Technology (IJIRSET)

*(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)*



**Impact Factor: 8.699**

**Volume 14, Issue 4, April 2025**

# **Identifying Key Factors Affecting Rework in the Construction Industry**

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**ABSTRACT:** Rework, are activities in the field, which have been completed, but were required to be repeated or undertaken again as a result of some impeding correction that was necessary to be carried out during the project. This is regardless of source, or effecting a change, not due to change of scope by the owner. Fundamentally, rework becomes necessary either when an element of building works fails to meet customer requirements, or when the completed work does not conform to the contract documents. In either scenario, the product is altered so as to ensure conformity. At ascertain moment during construction, for example due to an error, rework is necessary. But the rework might not be discovered until some form of quality control check is done, after which it can be concluded as to what kind of rework needs to be done. Rework can also have internal or external origins. Changes in clients' expectations are an example of an external factor that might lead to rework. Rework can cause many costs to be higher than calculated at the start of the project. Rework can result from various sources such as errors, omissions and changes. While it is widely recognized that additional costs due to rework can have an adverse effect on project performance, limited empirical research has been done to investigate the influencing factors.

**KEYWORD:** Rework, Construction Projects, Rework Analysis, Importance Index.

## **I. INTRODUCTION**

Over the centuries, construction work across the globe has been a means for countries increasing their national economies. The construction industry has faced with the significant problems of high cost of project delivery, bad financial performance and inability to deliver value to customers on time to time. As a result, the industry has been criticized extensively for poor performance and inefficient output. A major factor contributing to this failure is rework. Rework is defined as the unnecessary effort of redoing an activity that was inaccurately done the first time or the process by which an item is made to conform to the original requirement by completion or correction. Rework and wastages have become recognized as non-value adding endemic symptoms that seriously affect the performance and productivity aspects of construction projects and the problem of rework has been largely ignored by the construction industry. The adverse consequences of rework include reduced profit, loss of market share, worker injuries, damaged reputation, increased turnover of management and workforce, lower productivity, higher costs, and finally, costly litigation between participants over responsibility for overruns and delays. In the long term, rework can also affect a construction company's reputation and its ability to attract new business. However, little is known about the background and consequently, rework remains an innate problem. The lack of attention to the root causes of rework seems to be a global phenomenon. With this in mind, the aim of this research is to determine the underlying causes of rework during construction as well as the impact of rework on overall project performance so that effective prevention strategies can be developed. Most construction projects have.



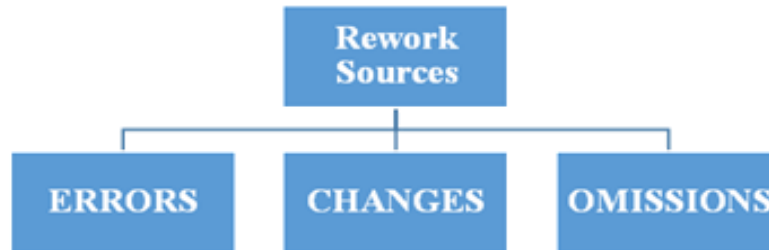


Figure 1 Rework

## II. PROBLEM STATEMENT

Rework is a recurring issue in the construction industry, leading to significant cost overruns, project delays, and resource wastage. Despite advancements in construction technology and project management practices, many projects continue to experience high levels of rework due to a variety of underlying causes. These causes are often multifaceted, ranging from poor workmanship and inadequate planning to communication breakdowns and design errors.

Table 1 Details of Mumbai Coastal Road Project

Project Title	Mumbai Coastal Road Project (South) Package – I.
Project Site Location	Mumbai
Customer	Mcgm
General Consultant	Aecom Asia Company Limited
Project Management Consultant	Louise Berger International
Contractor	Larsen & Toubro Construction.
Scope Of Work As Per Contract	Design and Construction of Road, Bridges, Interchanges including Reclamation and Associated Works. (Priyadarshini Park to Baroda Palace- CH 5+900 to CH 9+720). Package I, Priyadarshini Park to Baroda Palace consists of grade road and bridges including Navigation Bridge and reclamation. This package extends from CH 5+900 to CH 9+720 on main line and two major interchanges, namely Amarson Garden and Haji Ali interchanges, abutting existing shoreline roads and to allow free flow of traffic.
Contract No. And Date	MCRP/South/P-I Date: 22-08-2017
Contract Duration	1461 days (Inclusive of monsoon)



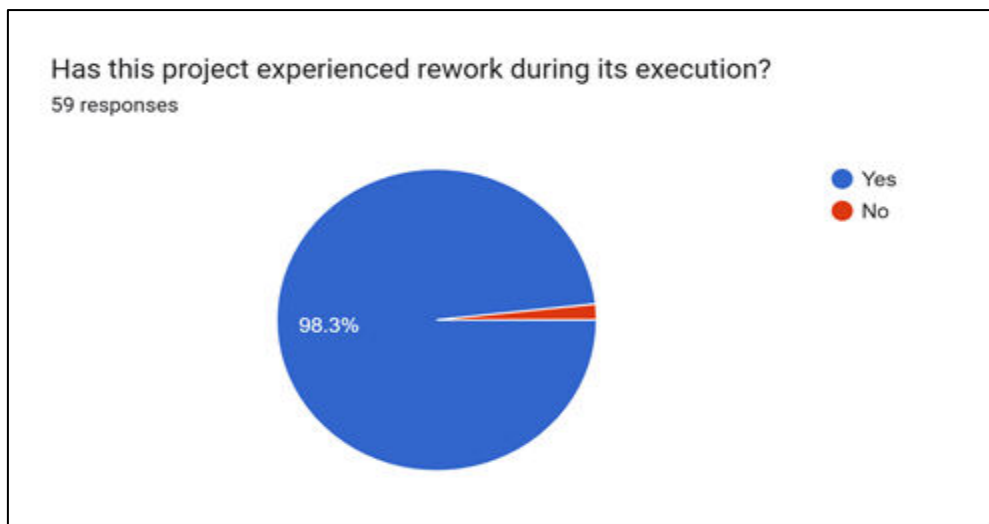
Figure 2 Actual Project Photo

### III. RESULT AND ANALYSIS

#### A. Analysis of the questionnaire:

A structured questionnaire survey was conducted using google form platform. Creating a questionnaire for a survey on the factors affecting study for rework causes in the construction industry requires clear, targeted questions. The purpose of the questionnaire should be to gather data on the root causes of rework, its impact, and the factors that contribute to its occurrence in construction projects. The questionnaire has been prepared by the author for the working staff of the Mumbai coastal road project to evaluate the factors affecting study for rework causes. The spreadsheet was sent to the respective employees of the coastal project, and total - 59 responses were collected.

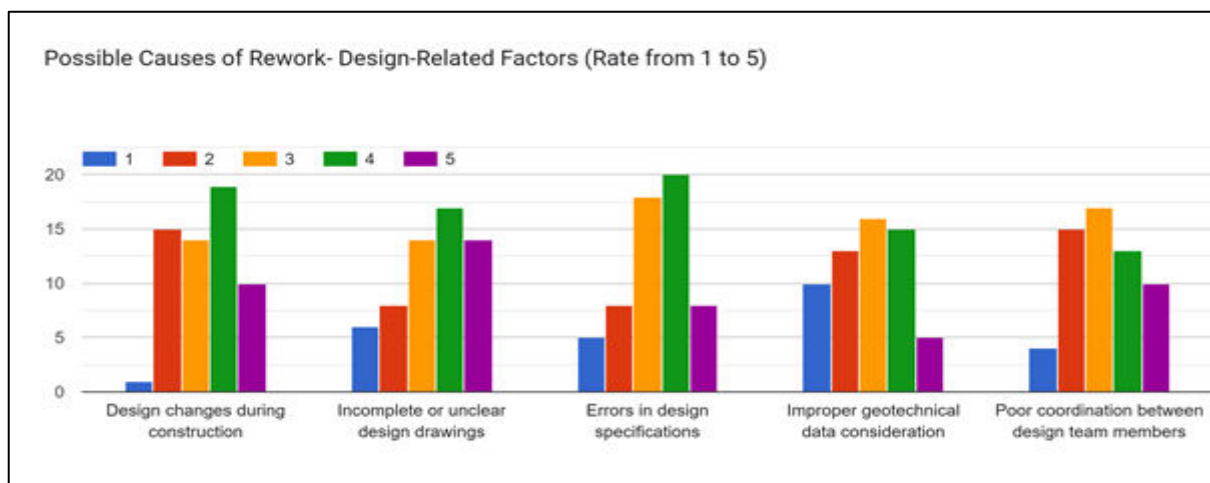
#### 1. Has this project experienced rework during its execution?



Graph 1 Project experienced rework during its execution

Above graph shows the experienced rework during its execution almost every response says yes.

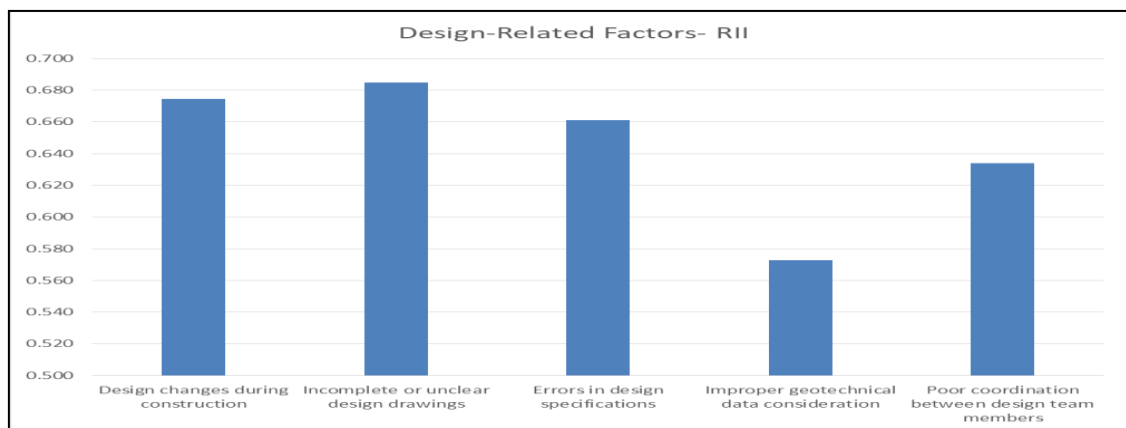
#### 1. Possible Causes of Rework- Design-Related Factors (Rate from 1 to 5)



Graph 2 Design-Related Factors

Table 2 Design-Related Factors

Design-Related Factors							Relative Importance Index (RII)			
Sr No	Answer	1	2	3	4	5	ΣW	A	N	RII
1	Design changes during construction	1	15	14	19	10	199	5	59	0.675
2	Incomplete or unclear design drawings	6	8	14	17	14	202	5	59	0.685
3	Errors in design specifications	5	8	18	20	8	195	5	59	0.661
4	Improper geotechnical data consideration	10	13	16	15	5	169	5	59	0.573
5	Poor coordination between design team members	4	15	17	13	10	187	5	59	0.634



Graph 3 Design-Related Factors RII

The graph above illustrates the factors contributing to rework. Among the design-related factors, "Incomplete or unclear design drawings" has a Relative Importance Index (RII) of 0.685, while "Design changes during construction" has an RII of 0.675

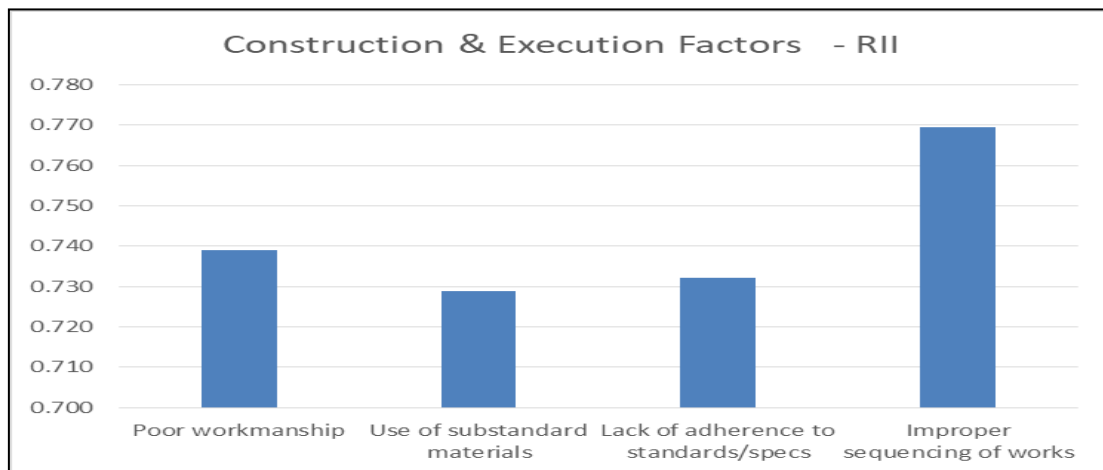
## 2. Possible Causes of Rework- Construction & Execution Factors (Rate from 1 to 5)



Graph 4 Construction & Execution Factors

Table 3 Construction & Execution Factors

Construction & Execution Factors							Relative Importance Index (RII)			
Sr No	Answer	1	2	3	4	5	$\Sigma W$	A	N	RII
1	Poor workmanship	0	7	15	26	11	218	5	59	0.739
2	Use of substandard materials	1	6	21	16	15	215	5	59	0.729
3	Lack of adherence to standards/specs	1	11	11	20	16	216	5	59	0.732
4	Improper sequencing of works	1	7	12	19	20	227	5	59	0.769



Graph 5 Construction & Execution Factors RII

The graph above illustrates the factors contributing to rework. Among the Construction & Execution related factors, Improper sequencing of works RII- 0.769, Poor workmanship RII- 0.739

#### IV. CONCLUSION

This study aimed to identify and evaluate the key factors contributing to rework in the Mumbai Coastal Road Project by gathering insights directly from the working staff through a structured questionnaire. A total of 59 responses were collected and analyzed using the Relative Importance Index (RII) method to rank the severity and frequency of rework causes across multiple categories.

The analysis revealed that Construction & Execution related factors emerged as the most significant contributors to rework, with a group RII of 0.742. Specifically, improper sequencing of works (RII = 0.769) and poor workmanship (RII = 0.739) stood out as critical issues that need immediate attention. These findings highlight the need for better planning, execution strategies, and skilled labor at the site level

##### 1) Construction & Execution Issues

- Use a detailed work breakdown structure (WBS) before starting activities.
- Implement construction scheduling tools like MS Project or Primavera.

##### 2) Project Management & Coordination Issues

- Create a central communication channel (Slack, or Trello board).
- Conduct weekly design-execution alignment meetings
- Maintain a change log for any design updates with timestamps.

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