

Analytical Study between Construction Material Wastage and Time Overrun

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ABSTRACT

It is well known that most construction projects in Pune Strip exposed to time overruns and material wastage or both. This phenomenon may affect the progress of construction industry in Pune Strip as well as may expose many institutions of construction to be destroyed. Literatures of previous studies were studied and most related researches were reviewed which included the study of these factors in many states. The aim of this research paper is to assess factors influencing time overruns and material wastages on construction projects in residential project particularly. This study was carried out based on literature review and a questionnaire survey that was obtained from contracting companies, consultants and owners in Pune Strip.

KEYWORDS: Material Wastage, Time Overrun, Residential Project

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1. INTRODUCTION

In most parts of the world, construction industry consumes huge amount of natural resources and often generates large quantities of construction waste. Indian construction industry is one of the largest in terms of economic expenditure, volume of raw materials/natural resources consumed, volume of materials and products manufactured, employment generated, environmental impacts, etc. Owing to the growth in the construction activity, it is appropriate to link construction and demolition waste generation with the national and global economic growth related issues. Presently there is lack of awareness of resource efficient construction practices and techniques. Significant portion of Indian construction waste is still disposed of in landfills. [1 & 2]

The economic and environmental benefits to be gained from waste minimization and recycling are enormous, since it will benefit both the environment and the construction industry in terms of cost savings. Thus this paper aims to focus the problem of construction waste and time overrun by the questionnaire survey approach in particular to residential projects in Pune belt. [3]

The most common causes of such waste arising include:

- Overconsumption of resources.
- The composite and deep design of buildings.
- Material damage on-site due to mishandling and/or careless delivery.

- Material damage due to weather and inappropriate storage.
- Rework/change in design/improvement in the quality of work.
- Excess material left from site preparation and after finishing the job

It is believed that effective recycling and reuse of construction waste for building activities on-site can reduce the burden on landfill by up to 40%, this report studies those management techniques of waste prevention, and they are commonly summarized as the so-called 4Rs: reduction, reuse, recycling, and recovery.

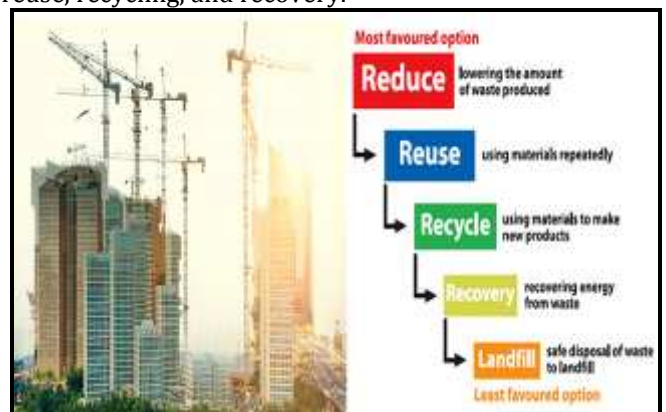


Figure No. 1: Construction Waste Management – 4 R's

1.1. Problem Statement

Management of construction and demolition waste is a serious concern in the country given the high phenomenal growth in the construction industry; the market size is expected to increase at a Compound Annual Growth Rate (CAGR) of 11.2 percent. It has serious consequences due to the increasing quantum of demolition’s rubble, continuing shortage of dumping sites, and increase in transportation and disposal cost and various associated environmental issues.

An estimated 25% of solid waste generated is attributed to the construction industry and therefore, management of such high quantum of waste (which is mostly bulky and heavy) puts enormous pressure on solid waste management system.

1.2. Research Objective

“The ultimate aim of this work is, to systematically study the impact of construction waste on time in associate with the various waste generated in Residential building”.

- To study the impact of construction material waste in related to time.

2. LITERATURE REVIEW

Economic Aspects of Construction Waste Materials in terms of cost savings – A case of Indian construction Industry

In this paper author, aims to focus on the economic feasibility of waste minimization of construction waste materials in terms of cost savings in India.

Observation of the author reveals that proper site waste management proclaims that total benefits exceed totals cost by incorporating appropriate methods. And widespread adoption can significantly save huge amount of money which otherwise goes into landfills in form of waste materials.

Author recommendation states that Government’s interventions like Landfill tax, higher tax for using virgin materials, tax credits for recycling, etc. can act as an initial momentum towards seeking various other cost-saving measures through waste minimization at source and appropriately managing it on site. Institutions and local organization can create awareness among clients and contractors which will initiate the demand for material waste minimization from clients and voluntarily from contractors.

Quantitative Analysis of the Sources of Construction Waste

Conferring to author view of this research paper, construction waste has a negative economic impact by contributing additional cost to construction due to the need to replace wasted materials.

In this paper author has presented a study that was carried out on the contribution rates of nine identified sources of construction waste.

Establishing the contribution rates of different waste sources will enhance knowledge-based decision-making in developing appropriate strategy for mitigating construction waste.

The author adopted Quantitative research method, using survey questionnaire in this study to assess the frequency and severity of contribution of the sources of waste.

The contributions of construction material waste to project cost overruns in Abuja, Nigeria

The purpose of this article is to report the results of an objectively investigated study on the contributions of material waste to project-cost overrun. The investigation included ongoing building construction projects within Abuja, Nigeria, from which a sample of 31 public and private projects was purposefully selected.

The author used Pearson moment correlation and the descriptive method to analyze the collected data and the results revealed a statistically significant relationship between material waste and cost overrun. This implies that any increase in the volume of material waste would lead to a corresponding increase in the amount of cost overrun. The results showed that the significant percentage contribution of material waste to project-cost overrun ranges from 1.96% to 8.01%, with an average contribution of 4.0% to project-cost overruns.

Scenario of Construction material waste and its effects on cost Wastage in Nasik

In this paper, the author has an opinion that the technological advancement and rapid development of new areas, the cities are facing a lot issues relating with construction and demolition waste. Also increasing amount of waste contributes to increase in overall cost of the project. The study is carried out in Nasik city in residential projects in which under the same scenario for 5 small scale residential construction projects in Nasik where studied and observed that the chances of waste generation are more due to lack of proper management. Also regulatory framework is suggested to overcome the problem.

The implications of rising cost on construction project arising due to construction material wastage range between 5% to 10 % for considered project.

3. DATA COLLECTION AND ANALYSIS

3.1. Methodology

This is the section of the paper will explain how the research will be carried out, from where the data will be collected, the sort of data gathering techniques used, and so forth.

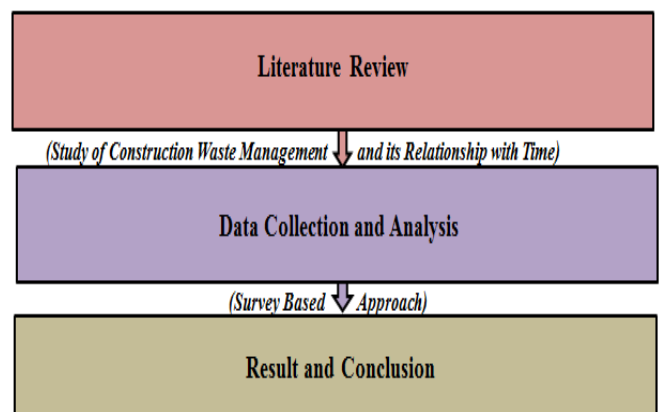


Figure No. 2: Overall Methodology Process

3.2. Data Collection

A questionnaire was established to evaluate the insights of contractors, consultants, and owners due to the importance

index by Likert Scale for the causes and effects of delay in Pune band construction industry. Factors influencing time and material wastages in construction projects in Pune band were first examined and identified through a relevant literature review and by conducting a pilot study that sought advice from competent construction practitioners.

A. Survey Outline

1. A framework of Survey:

This part mainly designed to provide general information about the survey and its respondents. The data has been excreted in terms of the name of organization, major type of work involved, position and experience contact person, location of organization, average of projects executed per year and the number of constant employees at the organization.

2. The objective of Survey:

The main purpose of this survey is to study the impact of material wastage in Residential projects.

3. Parameters of Impact assessment:

Construction material wastage influence in terms of Cost and Time.

B. Method and Factors

Various kinds of rating scales have been developed to measure attitudes directly (i.e. the person knows their attitude is being studied). The most widely used is the Likert Scale.

In our system of analysis, five-point scales are used as Least Impact, Slight Impact, Average Impact, Considerable Impact, and Great Impact. The rating will be given accordingly from least to the higher impact value as shown in following table Likert Scales have the advantage that they not expect a simple yes / no answer from the respondent, but rather allow for degrees of opinion, and even no opinion at all.

Table No. 1: Impact Value for Various Parameters

Sr. No.	Impact Parameter	Impact Value
1.	Least Impact	01
2.	Slight Impact	02
3.	Average Impact	03
4.	Considerable Impact	04
5.	Great Impact	05

The study incorporates 10 factors perceived from each i.e. Contractor, Consultant, and Owner which affect the overtime of Residential Project in India. The details of the factors are given in below table

Table No. 2: Factors Persuading Overtime in Residential Project

Sr. No.	Factors Influencing Overtime	Legend
A)	Contractor	
1	Money problem during construction	A1
2	Ineffective planning and scheduling of project	A2
3	Effects of subsurface and ground conditions	A3
4	Poor site management	A4
5	Lack of materials in markets	A5
6	Shortage of construction materials at the site	A6
7	Delay of material delivery to site	A7
8	Delay of materials approved by a consultant	A8
9	Shortage of site workers	A9
10	Waiting time for approval of tests and poor inspection	A10
B)	Consultant	
1	Unethical behavior used by contractors to achieve the highest possible level of profit	B1
2	Discrepancies between contract documents	B2
3	Poor site management	B3
4	Ineffective planning and scheduling of project	B4
5	Insufficient number of staffs	B5

6	No adherence with materials standards that is stored in the site	B6
7	Inadequate contractor’s work experience	B7
8	Suspension of work by owner or contractor	B8
9	Money problem during construction	B9
10	Delay of material delivery to site	B10
C)	Owner	
1	Ineffective planning and scheduling of project	C1
2	Poor site management	C2
3	Insufficient number of staffs	C3
4	Shortage of equipment at a site	C4
5	Lack of materials in markets	C5
6	Shortage of construction materials at the site	C6
7	Money problem during construction	C7
8	Delay of material delivery to site	C8
9	No adherence with materials standards that is stored in the site	C9
10	Suspension of work by owner or contractor	C10

C. Factor Analysis

The data summary of the filled sheet is given below. In this datasheet, total fifty respondents have given their ratings on every 10 factors by using Likert’s scale of 5 points. The data has been collected in form of physical sheets and all the respondents are the competent persons to avoid error in result analysis.

Factor s	A 1	A 2	A 3	A 4	A 5	A 6	A 7	A 8	A 9	A 10	B 1	B 2	B 3	B 4	B 5	B 6	B 7	B 8	B 9	B 10	C 1	C 2	C 3	C 4	C 5	C 6	C 7	C 8	C 9	C 10
	Contractor										Consultant										Owner									
1	2	4	5	3	5	5	5	5	5	5	5	5	2	5	3	4	5	4	5	5	5	3	5	4	5	5	5	5	4	5
2	3	5	5	1	5	5	5	5	5	5	4	5	1	5	2	5	5	5	5	5	4	1	4	5	5	5	5	5	5	4
3	1	5	4	1	4	4	5	5	4	5	4	5	2	5	1	5	4	5	5	4	4	5	5	4	5	4	4	4	5	5
4	1	5	5	2	5	5	5	5	5	3	4	4	2	3	2	4	5	4	4	5	5	4	5	4	5	5	5	5	5	5
5	2	4	5	3	5	5	4	5	3	5	2	4	2	5	2	5	5	5	5	5	3	3	5	5	5	5	5	5	3	4
6	3	4	5	4	5	4	5	5	5	5	5	4	3	5	2	3	4	5	5	4	4	4	3	4	5	4	5	5	5	5
7	4	5	5	4	5	5	3	5	5	5	5	2	3	5	3	5	5	4	5	5	5	4	4	5	4	5	5	4	5	5
8	4	3	4	3	5	5	5	5	5	4	4	5	1	4	3	5	3	3	4	5	5	3	4	5	5	4	5	4	5	5
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12	1	4	5	3	4	5	5	5	3	5	5	5	3	5	3	5	5	5	4	5	5	3	3	5	5	5	5	5	5	5
13	2	5	5	2	5	5	5	4	4	5	5	4	2	5	4	3	4	4	4	5	5	2	4	4	4	5	5	5	4	5
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Average Impact Value	3	5	5	4	5	5	5	5	4	4	4	4	2	4	3	5	5	4	5	5	4	4	4	4	5	5	5	5	4	5	

4. CONCLUSION

The top ten factors that cause time overruns as perceived by contractors are: "lack of materials in markets " in the 1st position, "shortage of construction materials at site" in the 2nd position, "delay of material delivery to site" in the 3rd position, "money problem during construction" in the 4th position, "ineffective planning and scheduling of project" in the 5th position, "effects of subsurface and ground conditions" in the 6th position, "poor site management" in the 7th position, "delay of materials approval by consultant" in the 8th position, "shortage of site workers" in the 9th position and "waiting time for approval of tests and poor inspection" in the 10th position.

The top ten factors that cause time overruns as perceived by consultants are: "money problem during construction" in the 1st position, "ineffective planning and scheduling of project" in the 2nd position, "poor site management" in the 3rd position, "delay of material delivery to site" in the 4th position, "insufficient number of staffs" in the 5th position, "no adherence with materials standards that is storage in the site" in the 6th position, "inadequate contractor's work experience" in the 7th position, "suspension of work by owner or contractor" in the 8th position, "unethical behavior used by contractors to achieve the highest possible level of profit" in the 9th position and "discrepancies between contract documents" in the 10th position.

The top ten factors that cause time overruns as perceived by owners are: "lack of materials in markets" in the 1st position, "shortage of construction materials at site" in the 2nd position, "money problem during construction" in the 3rd position, "delay of material delivery to site" in the 4th position, "ineffective planning and scheduling of project" in the 5th position, "poor site management" in the 6th position, "insufficient number of staffs" in the 7th position, "shortage of equipment at site" in the 8th position, "no adherence with materials standards that is storage in the site" in the 9th position and "suspension of work by owner or contractor" in the 10th position.

The overall finding represents that material is an important element which plays a vital role in delaying the project. In further section of this chapter with the help of case study we will try to study analytically the relationship of material wastage with respect to cost and time.

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