SHODH SAGAR®
International Journal for Research Publication and Seminar
ISSN: 2278-6848 | Vol. 15 | Issue 3 | Jul - Sep 2024 | Peer Reviewed & Refereed

To Study of Construction wastages on Construction Project

Mr. Sudhir Patil[1]*
PG Student, Department of Civil Engineering, School of Engineer & Technology, D Y Patil University, Pune.
Email- sudhir.Patil2008@gmail.com

Er. Upendra Saharkar[2]
[3]Assistant Professor, Department of Civil Engineering, School of Engineer & Technology, D Y Patil University, Pune.
Email- Upen.saharkar@gmail.com

DOI: https://doi.org/10.36676/jrps.v15.i3.1429

Check for updates

Published: 15/07/2024

* Corresponding author

Abstract
The construction industry is an important cog in the wheel of national economies around the globe. Low productivity, unsafe working conditions, inadequate quality, and poor safety are some of the well-known chronic difficulties in the construction industry. In today's world, the construction sector is confronted with a number of critical issues. These include rising competition from outside, a lack of qualified workers, and the imperative to enhance the quality of building. In order to meet these problems, the sector must immediately increase efficiency, improve quality, and adopt new technology. Over the last several decades, a great deal of research and study has focused on the difficulties encountered by the construction industry. This research has sought to determine the root causes of these problems and, in some cases, has even proposed solutions. The study is to confirm and reevaluate the current state of productivity and performance in the local construction industry's activities and processes. The purpose of this is to gain a better understanding of the existing state of "lean" in the local construction sector by establishing new measurement parameters that are specific to waste and cycle time as they relate to the principles and concepts of Lean Construction.

Key Word- Construction Wastages, Lean Construction, CWMT, Construction Project

1. Introduction

There is a dearth of data and quantitative assessments on process-related issues and wastes that have occurred on Indian building sites. Consequently, the local construction industry is looking to the introduction of new lean construction ideology's concepts and framework as a way to solve their current problems. By using these ideas, they can further quantify and structure the extent to which their problems and wastes are impacting the industry.
Identification of construction waste is crucial part of project. If the source of waste is found out at the initial stage of activity, waste can be minimized at the initial phase of activity. The construction waste is categorized in two parts one is avoidable and another is non-avoidable. If the cost of waste is more than the prevention cost is called as avoidable waste and reduction of waste causes higher investment than economy produce called unavoidable waste. The reason and percentage of waste are varying from project to project.

1.1 Some common reason of waste found similar in different projects are enlisted below:

• Improper movement of staff and labor, • Wrong specification, • Defective products, • Change in design, • Inferior quality of work	• Lack of labor management • Lack of training sessions • Lack of communication within the team • Lack of proper methodology of work process	• Improper storage of construction • waste • Improper time management. • Improper material handling • Delay in payment

1.2 Construction Waste Management Technique

Reduce: This strategy is described as reducing the amount of waste that is generated on a regular basis. The generation of garbage is decreased through the usage of this technique, which is the reason why this trash generation strategy is utilized in the most effective manner for the purpose of minimizing waste.

Reuse: One definition of this method is "reuse," which refers to the process of reusing material. In the process of building, there are a number of elements that influence the amount of trash that is produced. These factors include the materials, the

SHODH SAGAR®
International Journal for Research Publication and Seminar
ISSN: 2278-6848 | Vol. 15 | Issue 3 | Jul - Sep 2024 | Peer Reviewed & Refereed

labor force, the methods, the machinery, and so on. However, the disadvantage of this method is that it only allows for the reusing of the material.

Recycle: This method is defined as the utilization of raw material in the same construction activity or as part of another construction activity. In the process of building, there are a number of elements that influence the amount of trash that is produced. However, the disadvantage of this method is that it can only recycle certain types of material, and the cost of recycling other types of material also increases.

Recovery: Recovery is a method that is defined as the process of generating energy through the processing of waste material. In the process of building, there are a number of elements that influence the amount of trash that is produced.

Landfill: The term "landfill" refers to the process of disposing of garbage that has been created by constriction. This is one of the techniques that is used the least.

2. Methodology and Data collection

These included a literature review, field observation, and questionnaire. The cross-checking of the data collected is also facilitated by the combination of qualitative and quantitative methods. Qualitative research is concerned with the object of study from the perspective of the individuals being examined, whereas quantitative research is associated with the researcher's perspective.

A. Sample selection: Symmetrical structures are chosen for the purpose of selecting samples. The prototype structures are exclusively residential. The symmetrical sample facilitates accurate comparisons. The samples are all sourced from the same city.

B. Research instruments: Literature, questionnaires, and observations The primary instruments employed to generate the data for this investigation are quantitative data.

C. Literature: This research instrument offers a comprehensive overview of the previous research conducted in the subject matter. Additionally, literature serves as the most effective guide for researchers. Provide guidelines for the study area in this research literature.

D. Questionnaires: This research instrument enables the researcher to directly communicate with the respondent and gain access to the current data of the construction industry. The questionnaire was developed in accordance with the project hierarchy for this investigation.

E. Quantitative data: This research instrument assists in the preservation of the project's calculative data. The quantitative data collected in this study is instrumental in determining the precise quantity of additional labour, or construction waste.

2.1 Observations: This research instrument reveals the observer's perspective and assists in the identification of research solutions. It has been noted, with the use of a research instrument, that a single project is characterized by a number of activities, some of which are listed below

Excavation		1. Excavation work includes taking away dirt, mud, soft rock, and hard rock up to the finalised lead and lift distance on the site. 2. Excavator, JCB, Dumper, Bob cat, shovel, total station and metre tape are some of the tools and equipment that are needed for mining work.
Backfilling		1. Backfilling is the process of putting dirt back into holes or foundations that are not in the building area of an area that was dug up. 2. Backfilling is done to protect the base, for landscaping purposes, or to fill in holes made by digging.
1. Anti-termite treatment		The anti-termite treatment is a process in which the soil is treated before building starts and after construction, the structures are treated. 2. The anti-termite spray acts like a chemical wall to keep subterranean termites out. 3. The pre-constructional soil treatment has to be done up to the level of the plinth at the foundation pits, plinth beam, plinth filling,

SHODH SAGAR®
International Journal for Research Publication and Seminar
ISSN: 2278-6848 | Vol. 15 | Issue 3 | Jul - Sep 2024 | Peer Reviewed & Refereed

		plinth.
R.C.C. 2.		The RCC work is made up of steel bars that are pushed into the ground and concrete. 2. Concrete is good at being compressed, but not so good at being stretched. Steel, on the other hand, has a high tensile strength. When you mix concrete and steel, you get a structure that is very resistant to load. 3. Reinforce steel comes in the form of mild steel bars that range in size from 6 mm to 32 mm.
Water proofi ng		1. Waterproofing is the process of putting up a barrier on the surface to stop water from getting in and causing damage to the building. 2. This job includes treating the floor, basement, bathroom and terraces with chemicals. 3. Waterproofing is needed because of capillary action that brings water up from the ground, cracks in the outside wall, a weak structure.
Brick Work		1. Brick work is made up of red or fly-ash bricks. Two types of brick work are usually done: brick work on the outside and brick work on the inside. 8" or 9" bricks are used for the outside wall, and 6" bricks are used for the inside. 2. Masonry made of bricks is made by brick layers who use bricks and mud. 3. A brick wall is made by laying a row of bricks, called a course, on top of each other.
Plaster Work		1. Plastering is the process of putting down one or two coats of sand and cement. 2. Plastering is used to give a wall or building a nice finish. 3. There are two types of plaster: sand face plaster and scratch plaster. Sand face plaster is used to smooth out the surface of a wall before painting or gypsum work, and scratch plaster is used to prepare a wall for covering with tiles or stone.
Gypsum Work		1. Gypsum is used for work inside, both on the walls and the roof. 2. Hydrous calcium sulphate ($CaSO_4.2H_2O$) is the scientific name for gypsum. 3. Gypsum stone is sometimes called marble, and it can be carved into any shape. 4. Gypsum board is used to make walls, lined walls, and decorations for the roof.
Tiling Work		1. Tiling work includes laying of tiles of ceramics, mosaic and natural stone. 2. Tile work is laying on walls, floors, kitchen otta and staircases in residential building, also in industrial, commercial buildings.

2.2 Among this construction activity Eight activities are selected:

1. Waterproofing
2. Brickwork
3. Plaster
4. Gypsum work
5. Tiling work
6. Carpentry work
7. CP & Sanitary work
8. Glass Work

2.3 Details of Quantitative data Collection:

The tabular format consists of -

1. Estimated Quantity (Ec): The quantity of activity calculated from drawings
2. Estimated cost (Ec): The calculated cost of activity
3. Estimated rate on built-up area: For fixing of budget of project, rate on built area finalised before execution of work.
4. Actual Quantity (Ac): The quantity of activity calculated from actual work
5. Actual cost (Ec): The total actual cost of activity after execution
6. Actual rate on built-up area: Rate calculated after final executed cost of work

2.4 Details of Questionnaire for data Collection:

Considering project hierarchy questionnaire prepare for -

1. Architect – Responsible for project design
2. Project manager – Responsible for project
3. Estimation Engineer -Responsible of project quantity and amount
4. Material manager – Responsible for Material management
5. Site Engineer – Responsible of execution of project

2.5 Details of Project

Due to request of respondent, we are not declared the name of Company and respondent

Details of site					
S.N.	**Nomenclature**	**Name of Project**	**Type of project**	**Name of Builder**	**Location**
1	Project -A	A	Residential Project	A	Pune
2	Project -B	B	Residential Project	B	Pune
3	Project -C	C	Residential Project	C	Pune

3. Data Analysis

The method of quantitative analysis with the help of MS-Excel and observation are mentioned below

3.1 Sample calculation

- Step -I Find out difference in quantity
- Dq = Actual quantity – Estimated quantity = Aq – Eq
- Step -II Find out difference in cost
- Dc =Actual Cost -Estimated Cost =Ac – Ec
- Step -III find out difference into rate on built up area Dr = Actual rate – Estimated rate =Ar – Er
- Step -IV Find out % of Waste
- Dc/ Ec = Difference in Cost / Estimated Cost Example: Activity 1 Waterproofing
- Step -I Find out difference in quantity Dq = Actual quantity – Estimated quantity

= Aq – Eq

=7,439.60 - 6,248.76 = 1,190.84

Step -II Find out difference in cost Dc =Actual Cost -Estimated Cost

=Ac – Ec = 54,30,908 -415355

SHODH SAGAR®
International Journal for Research Publication and Seminar
ISSN: 2278-6848 | Vol. 15 | Issue 3 | Jul - Sep 2024 | Peer Reviewed & Refereed

Step -III find out difference into rate on built up area

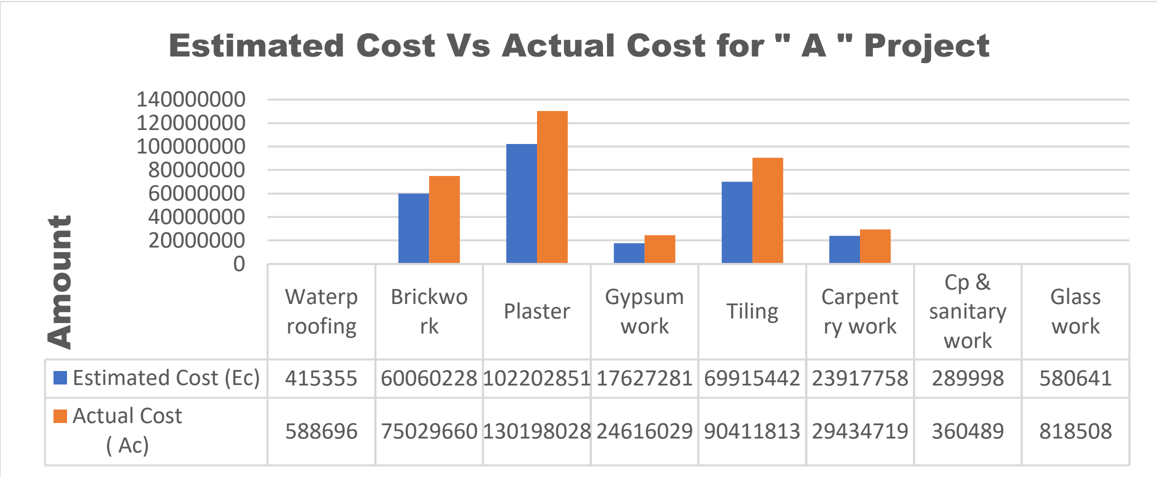
= Actual rate – Estimated rate Dr = Ar – Er =79.13 - 66.47 =12.67

Step -IV Find out % of Waste

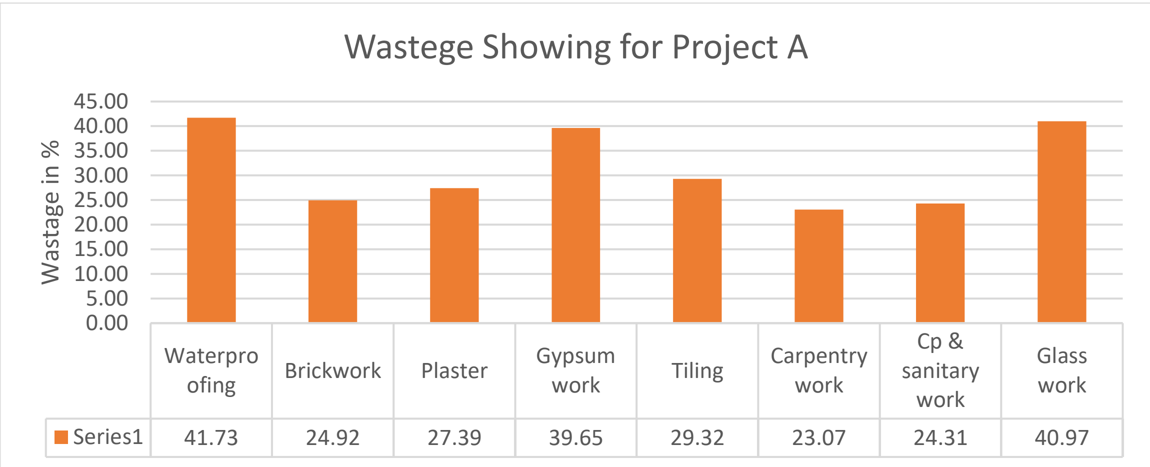
= Difference in Cost / Estimated Cost

= Dc/ Ec = (8,69,312.00 /415355) *100 = 41.73% %

3.2 Graphical Presentation for Eastimated Cost and Actual Cost for sample project



3.3 Graphical Presentation for Wastages Showing Chart



3.4 Activity wise wastage

A. Waterproofing work

Contruction activity - waterproofing			Observations
Project A	Project b	Project c	• In case of waterproofing work, it is observed that there is variation of wastage at each project. Project-A, is having higher % of wastage and project-B and Project-C are having lower comparison of wastage than each other. • In case of project-A it is observed that the wastage occurs due to change in estimate and specifications. • In case of project-B the treatment provided is having proper guidelines to perform the work • In case of project-C proper guidelines were provided to labour and then executed. And continuous remark on activity was done
41.73	5.99%	6.14 %	

B. BRICK WORK

Project type - residential building	Observations
Contruction activity - brickwork	

SHODH SAGAR®
International Journal for Research Publication and Seminar
ISSN: 2278-6848 | Vol. 15 | Issue 3 | Jul - Sep 2024 | Peer Reviewed & Refereed

Project a	Project b	Project c	
24.92%	7.59%	8.92%	• In case of brick work it is observed that there is variation of wastage at each project. Project: a, is having higher % of wastage and project: b and project: care having lower comparison of wastage than each other. • In case of project a it is observed that the wastage occurs due to defective machinery the brick cutting was improper and the wastage generates. • In case of project b it is observed that it working method was appropriate and material storage was good. Also, separate bins are provided to item wise storage of waste • In case of project c it is observed that the wastage occurs due to the curing of bricks was not done proper before execution of work.

C. PLASTER

Project type - residential building			OBSERVATIONS
Contruction activity - plaster			
Project a	Project b	Project c	• In case of plaster work it is observed that there is variation of wastage at each project. Project: A, is having higher % of wastage and project: B and Project: C are having lower comparison of wastage than each other. • In case of project A it is observed that the wastage occurs due to improper working process • In case of project B it is observed that the plaster activity done as per instructions only • In case of project C it is observed that the good quality of work is done.
27.39%	8.98%	7.03%	

3.5 Table for Conclusions from data analysis Cost Comparison

Cost comparison				
S. N.	**Description**	**Estimated cost**	**Actual cost**	**Difference in cost**
1	**PROJECT: A**	**275009553**	**351457940**	**76448387**
2	**PROJECT: B**	**210222007**	**228652414**	**18430407**
3	**PROJECT: C**	**115537003**	**120307617**	**4770614**

3.6 Table For Item wise comparison of Activity

ITEMWISE COMPARISON IN %							
No	**Description**	**Project : A**	**Project : B**	**Project : C**	**Total**	**No. of sites**	**Avrg. Wastage %**
1	Waterproofing	41.73%	5.99%	6.14%	**53.86%**	3	**17.95%**
2	Brickwork	24.92%	7.59%	8.92%	**41.43%**	3	**13.81%**
3	Plaster	27.39%	8.98%	7.03%	**43.40%**	3	**14.47%**
4	Gypsum work	39.65%	7.15%	11.00%	**57.80%**	3	**19.27%**
5	Tiling	29.32%	9.38%	11.79%	**50.49%**	3	**16.83%**
6	Carpentry work	23.07%	11.07%	11.64%	**45.78%**	3	**15.26%**
7	Cp & sanitary Work	24.31%	8.59%	12.63%	**45.53%**	3	**15.18%**
	Glass work	'%	ó	ó	**)%**		**)%**

Based on the quantitative analysis and observations, it is determined that there is a discrepancy between the estimated and real quantities of manpower in the project. The reasons for the formation of waste are identified as changes in drawings, inaccurate estimation methods, and poor working practices. Waste production in the case of materials is caused by factors such as selecting the wrong specifications, mishandling materials, faulty loading or unloading, and incorrect storage.

4. Findings and Suggestion measure

4.1 Results obtained from the analysis of existing literature

Aligned with the research objectives, the literature review of this study has demonstrated that the construction industry continues to be a significant economic sector, with a crucial role in promoting economic development in both the formal and informal sectors. It is widely recognized that there is a significant amount of waste in the building industry. The reduction of construction waste has emerged as a crucial concern for enhancing the efficiency, quality, and sustainability of the building sector.

4.2 Conclusion drawn from the study of the data

The data collected from the surveys and field observations conducted in Pune, India, exposes various concerning problems within the building sector. If the results of this study are to be applied to the entire local construction sector, then it is necessary to be aware of the implications. The following findings are mentioned below:

- ✓ There is a lack of an established process to identify garbage.
- ✓ There is no system in place to quantify waste.
- ✓ There are no officially accepted rates for waste.
- ✓ There is an absence of waste reduction plans and strategies.
- ✓ There are no rules for recycling and reuse.

4.3 Suggestions

1. Prior to commencing work, meticulous site cleaning is conducted.
2. The centerline drawing and layout design must be in GFC format exclusively.
3. The central line of the building should be delineated on the ground by extending a thread between wooden or mild steel pegs.
4. Each projection should be positioned around 25 to 50 mm above ground level and 2m away from the border of the excavation.
5. The boundary should have been demarcated with lime powder.
6. Strengthen the excavation bed by moistening and compacting it. Any areas that are soft or faulty should be excavated and then filled with concrete.
7. Perpendicular lines are marked on the center of the other walls, intersecting with the longer walls.
8. Each corner should be aligned with a benchmark.

It is important to conduct thorough surveys at both the top and ground levels.

10. The depth of excavation must be measured exclusively from the approved GFC (General Floor Level).
11. The dressing of loose soil is crucial due to its potential to disrupt work activities.
12. The cut-off levels should be clearly marked.
13. The trench construction, dewatering, and linking should have been executed with precision.
14. The verification of the boundary line markings should be thoroughly conducted using Ground Field Control (GFC).
15. Proper disposal of inappropriate material for filling is crucial.
16. It is essential to stack appropriate material for backfilling to prevent unnecessary repetition of handling.
17. Approval of strata classification by a competent authority.
18. Apply dressing to the bottom and sides of the pits according to the drawing, taking into account the centerline.

5. Conclusion

Waste reduction can only be achieved when all employees and contractors possess a comprehensive understanding of the magnitude of the waste management issue within the organization. Every construction worker must receive training on trash management. This training may encompass instruction aimed at reinforcing the significance of waste minimization methods. Implementing effective communication strategies across all levels of organizations, utilizing reliable work studies to determine waste allowances, and introducing incentives for improved waste management practices would facilitate the development and implementation of waste management applications in the construction industry, ultimately enhancing their performance.

6. References

1. Giorgio Locatelli "Improving Projects Performance with Lean Construction: State Of The Art, pplicability and Impacts"organization, technology and management in construction · an international journal · 6(2)2013
2. Richard HannisAnsah "Lean Construction Tools"Proceedings of the 2016 International Conference on Industrial Engineering and Operations Management Detroit, Michigan, USA, September 23-25, 2016
3. S. A. AbbasianHosseini "Flow Production of Construction Processes through Implementing Lean Construction Principles and Simulation" IACSIT International Journal of Engineering and Technology, Vol. 4, No. 4, August 2012
4. S. Dinesh "The Review on Lean Construction an Effective Approach In Construction Industry" International Journal of Engineering Research and Modern Education Impact Factor 6.525, Special Issue, April - 2017 6th National Conference on Innovative Practices in Construction and Waste Management
5. Vinaya D. More "Lean Construction Techniques in Indian Construction Industry: Some Analysis"

6. Aakanksha Ingle "Advances in Construction: Lean Construction for Productivity enhancement and waste minimization"International Journal of Engineering and Applied Sciences (IJEAS) ISSN: 2394-3661, Volume 2, Issue-11, November 2015
7. Amitha P "Implementation of Lean Six Sigma in Construction: A Review" International Journal of Science, Engineering and Technology Research (IJSETR)Volume 5, Issue 11, November 2016
8. Harsha N "Implementation of Lean Concepts in the Construction Engineering Project" International Journal of Engineering Research & Technology (IJERT)Vol. 2 Issue 5, May – 2013ISSN: 2278
9. Dr. (Mrs) Seema Sarkar (Mondal), Mr Angshuman Chowdhury (2013), "Effective Project Management Through Implementation of Lean Manufacturing Techniques in Project Planning", Asia Pacific Journal of Marketing & Management Review, Vol.2, Issue 6, June 2013, pp 137-142.
10. Inji Salihi (2013), "How to Change a Traditional Construction Company to Lean", Department of Civil and Environmental Engineering. Division of Construction Management Chalmers University of Technology, Goteborg, Sweden, 2013, pp 32-40.
11. Devaki M. P., R. Jayanthi (2014), "Barriers to Implementation of Lean Principles in the Indian Construction Industry", International Journal of Engineering Research & Technology Vol. 3 issue 5, May 2014, pp 1189-1192.
12. Ashwin Amarshi Maru (2015), "Lean Construction In Civil Engineering And Project Management: Case Study Analysis Of Ut Arlington College Park", American Journal Of Civil Engineering 2015, Vol. 3, Issue 3, April 13, 2015, pp 70-74.