



A STUDY ON CONSTRUCTION WASTE MINIMIZATION AND REUSE MANAGEMENT

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Abstract-Construction waste are obtained during the building process or often demolition. The construction industry has been reported to be generating intolerable levels of material waste. In construction field 65% to 75% of cost using the overall project cost. Materialwastage occurs at all stage of building process starting from the design stage until the handover of the projects and there are many factors contribute to the generation of material wastage no matter direct or indirect wastage. This paper study about identifying the qualitative factors involving in material wastage on construction from the various literatures and the interview with the selected respondents. Questionnaire has been prepared with the keep in mind about residential and commercial projects and the bridge then questionnaire will be distributing to various Project Managers, Planning Engineers and contractors in Salem, Nagapattinam,Thanjavurand Bangaluru. From this journal, most of the wasted materials factor will be fineded and suggestions also listed in that best solution will be implemented in differenttype. From this review we reduce material waste, and then reduce the project cost and also find waste minimization, and reuse management techniques.

Keywords - Construction Wastes, Waste minimization, Reduce waste, Cost control.

❖ INTRODUCTION

The Construction industry is largest economic expenditure in India. This analysis work is predicated on material waste management in building construction through the treatise work, try is created to search out

reasons of wastage in industry and the way it will be reduced. In construction, 4-M (Material, Manpower, Money and Machine) play crucial role. The major problems in delaying construction projects is poor materials management. Ensuring a timely flow of materials is an important concern of material management. The construction waste occurred in first reason for Designs and their clientrequirements, then secondary reason for construction team and contractors, finally the reason for site supervisors and site operatives.

The material waste in construction industry can be divided into on-site and off-site operational activities.On site activities which mean the activities related to the construction works. It requires sufficient adjacent to the actual construction area on which to carry out the work. While off site activities are the activities out of the construction site including manufacturing and transportation of materials and components.

The large investment requires considerable planning and control so as to minimize wastage which invariably affects the performance of the organization. Managing waste means that eliminating waste wherever possible, minimizing waste wherever feasible and reusing materials which could otherwise become waste. A large and various types of waste with different characteristics are created at all the stages of construction right from site preparation, demolition of existing structures to final product. However, the generation of construction waste is predictable based on the building design and procurement of the building materials. The nature of waste composition might be different at various construction stages. This waste generation throughout the

construction stages needs to be identified and quantified to minimize the wastage.

These construction methods are technically to all type of building construction and it can increase productivity and quality of work through the use of better construction machinery, equipment, materials and extensive pre-project planning. The objective of cast in-situ system formwork method is to eliminate and reduce the traditional site-based trades like traditional timber formwork, brickwork, plastering and reduce labour content, in order to speedy construction, low maintenance, durable structure and low cost. Nevertheless, conventional construction seems the main choice of the contractors in the construction industry.

❖ OBJECTIVES OF THE STUDY

The study consists of the protection of environment through effective waste management techniques, literature review, questionnaire survey and on-site visits to investigate the construction wastage that aims to determine the types and causes of material wastage. To minimize the indirect cost of the project and also reduce the wastage of materials, time, money, manpower.

❖ SCOPE OF STUDY

This study deals with reason for the material wastage, minimization and re-use like a 3R principals of construction wastes. The study is conducted by questionnaire survey method. By result analysis, various methods are found out to control wastages in construction industry.

❖ TYPES OF WASTE

Concrete, reinforcement bars, timber plates and pieces are generated as structure wastes during the time of construction. In Malaysia, generation of construction waste covers almost every construction stage. The sources of construction waste generation have to investigate in four major components of construction waste such as wood, concrete, metal, brick and others such as waste generated from finishing works such as packaging of materials, ceramic tiles and insulation. The construction wastes include the materials like

- Timber
- Metals

- Concrete
- Brick
- Glass
- Electrical Wires
- Plumbing Fixtures
- Insulation
- Paint
- Adhesives and sealants
- Gypsum Board
- PVC Pipes
- Asphalt

❖ REASONS FOR CONSTRUCTION WASTE

In generally, waste will occur on site for a number of reasons, it resulting from all stages of building process starting from the design stage until the handover of the project. There are many factors contribute to the generation of material wastage in a project. They are

1. Design and Contract Documents,
2. Site Management,
3. Procurements,
4. Storage and Handling of materials,
5. Workers and Supervision,
6. Site Conditions and External factors.

➤ Design and Contract Documents

- Lack of attention paid to dimensional co-ordination of products.
- Changes made in the design while construction is in progress.
- Complexity of detailing in the drawings.
- Errors in contract documents.
- Incomplete contract documents at the time of commencement of project.

➤ Site Management

- Time management problems
- Liberal management to the labours
- Without plan about the doing process

➤ Procurements

- Ordering errors (E.g. Ordering significantly more or less)
- Lack of possibilities to order small quantities.
- Purchased products that do not comply with specification.

➤ Material Handling

- Damage during transportation.

- Inappropriate storage leading to damage or deterioration.
- Material supplied in loose form.
- Use of whatever material which are close to workplace.
- Unfriendly attitudes of project team and laborers.
- Theft.

➤ **Operational**

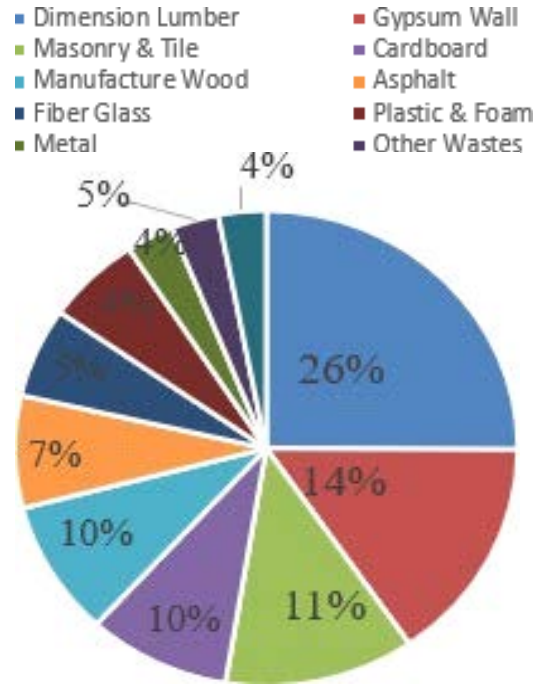
- Errors by trade persons or labours.
- Accident due to negligence.
- Damage to work done caused by subsequent trades.
- Uses of incorrect materials thus requires replacement.
- Required quantity unclear due to improper planning of information to the contractor on types and sizes of product to be used.
- Equipment malfunctioning.
- Inclement in weather.

➤ **Site Condition and External factors**

- Hill station projects
- Underground projects
- Blasting works, Rock type of work

❖ **CONSTRUCTION WASTE**

Construction waste is normally combined with demolition waste, described as “Construction and Demolition” (C&D). C&D waste is defined as waste from new construction, remodelling or demolition of a structure. Construction wastes were usually transported to the landfill in open top roll-off containers, dump trucks. The construction loads tend to be lighter, less weathered, more homogeneous (all wood, dry wall, etc., and contained more cardboard boxes (usually from fixtures). In most cases it is relatively easy to visually differentiate construction and demolition wastes.



➤ **ESTIMATED COMPOSITION OF CONSTRUCTION WASTES IN INDIA**

Waste Type	Percent (%) by Volume
Dimension Lumber	26
Gypsum Wall	14
Masonry & Tile	11
Cardboard	10
Manufacture Wood	10
Asphalt	7
Other Wastes	5
Fiberglass	5
Other Packaging	4
Plastic & Foam	4
Metal	4
Total	100

❖ **DEMOLITION WASTE**

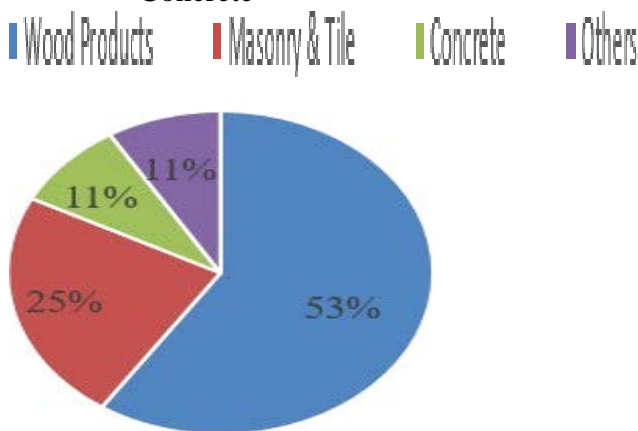
The construction and demolition waste generated is about 530 million tonnes annually. The Ministry of Environment, Forest and Climate Change notified the Construction & Demolition Waste Management Rules, 2016 on 29 March 2016. The rules are an initiative to effectively tackle the issues of pollution and waste management.

The demolition component of C&D is different from the construction component. Construction waste materials tend to be more homogeneous (all new wood or new drywall, etc.,) and for the most part is easier to separate and recycle. The demolition waste materials

tended to be mixed with a variety of materials and more difficult to separate and recover. Demolition loads fit into two broad categories; remodelling and debris.

The remodelling loads were often mixed with new construction materials. Residential remodelling loads had a higher percentage of wood while commercial remodelling projects contained more metal. Most remodelling loads arrived in open top roll-off containers or were self-hauled in pick-up or trailers. Debris loads were essentially structuring that were knocked down by heavy equipment and loaded onto dump trucks for transport to the landfill. Debris loads usually contains masonry materials (dirt, rock, concrete and bricks) that were mixed with wood, roofing, drywall and metal. The materials were mixed and usually shredded, broken and smashed. Therefore, debris loads are much more difficult to recover materials. The following materials were observed and estimated as part of the demolition waste.

- Wood Products
- Masonry
- Tile
- Concrete



➤ **ESTIMATED COMPOSITION OF DEMOLITION WASTES IN INDIA**

Waste Type	Percent (%) by Volume
Wood Products	53
Masonry & Tile	25
Concrete	11
Others	11
Total	100

❖ **CONSTRUCTION WASTEMANAGEMENT**

Responsible management of waste is an essential aspect of sustainable building. In this context, managing waste means eliminating waste where possible; minimizing waste where feasible; and reusing materials which might otherwise become waste. Solid waste management practices have identified the reduction, recycling, and reuse of wastes as essential for sustainable management of resources.

Construction waste has a major impact on the environment and is becoming a worldwide problem. In India, due to the commercial building and housing development and also the demands in implementing major infrastructure projects, there is a large amount of construction waste is being produced by the construction sector. Therefore, the construction waste management is an important area of concern in the construction industry of India. The construction waste management plan implemented represents the first steps in developing a holistic strategy for minimizing waste generation from the construction process.

Waste management also includes handling of waste, which including treatment, storage and disposal. Moreover, it is important to know the composition and quantity of the waste so that disposal can be handled in a planned manner. Waste minimizing is not only to reduce production costs but also to reduce liability at the same time.

In order to reduce the total disposal cost, reduce and recycling are the most effective ways to manage the construction and demolition wastes. Besides that, it is important that the contractors should use materials efficiently to avoid pay twice for the materials wasted on job sites. Furthermore, resource conservation also should be considered.

The waste management is widely based on the 3R principles. which are mentioned blow.

1. REDUCE
2. REUSE
3. RECYCLING

➤ **REDUCE**

The construction waste has the major issue of unplanning about the some works in site their waste of the materials should be increased so avoid the unplanning works in site.

It is reducing the entire waste we will discuss about the reduction of material that should be control the entire waste of material and it reduce the cost of the project.

Use standard sizes and quantities of materials, and plan ahead to reduce off cuts. Avoid over-ordering. Arrange deliveries to match work stages, to avoid materials being stored on site longer than necessary Reducing.

➤ **REUSE**

Reuse is to use an item again after it has been used. It includes conventional reuse where the item is used again for the same function, and creative reuse where it is used for a different function. Reuse helps in saving time, money, energy and resources. A variety of reusable and unused materials could be found in construction activity such as lumber of different sizes, piping, plywood, asphalt shingles and so on. The re-use of products or materials that would otherwise become waste can provide a range of social, economic and environmental benefits. Many building materials may be reusable during renovation projects where a new building is built following the demolition.

Concrete – can be broken down and recycled as base course for building driveways and footpaths

Untreated timber – is used as firewood or mulched. Large pieces can be re-milled and put back to use in construction

Asphalt paving – is crushed and recycled back into new asphalt for paved roads

Trees and brush – are recycled as compost or mulch Timber, large dimension lumber (i.e. lumber longer than 6 ft), plywood, flooring, and moulding – can be reused directly

Metals (i.e. steel, aluminium, copper) – can be melted down and reformed into new metal products. They can also be sold for scrap

➤ **RECYCLING**

Recycling is the process of converting waste materials into reusable objects to prevent waste of potentially useful materials, reduce the consumption of fresh raw materials, energy usage, air pollution (from incineration) and water pollution (from land filling) by decreasing the need for “conventional” waste disposal and lowering the emission of greenhouse gases.

Recyclable materials include glass, paper and cardboard, metal, plastic, tires, electronics. Materials to be recycled are either brought to a collection centre then sorted, cleaned and reprocessed into new materials. Some materials can be reused. For example, doors and windows in good, resalable condition might substitute for new products, or be donated and or sold for use on another project, a form of beneficial reuse.

An over the years it is possible to believe that there will be greater amounts of construction and demolition waste be recycled in the future due to the environmental concerns, increasing cost for the disposal of construction and demolition waste by land filling, higher tipping fees and the success of entrepreneurs in processing boteseparated and mixed wastes of the material.

❖ **ZERO WASTE MANAGEMENT USING LANDFILL**

An effective waste management is the process of controlling the entire waste. The huge type of workhas the little amount of waste and it is will be the better result for the waste management.

Disposal is the “no alternative” option because it is the last functional element in the solid waste management system and the ultimate fate of all wastes that are of no further value, construction and demolition waste is commonly managed via land filling. There are some management concerns that must be considered such as environmental impact, public concerns and the adaptability for multiple uses in the waste management system. Disposal is the oldest form of waste treatment.

The benefits of being independently certified as zero waste landfill include:

- Certified to a recognized standard
- Costsavings
- Better management of wasteresources
- Legalcompliance
- Improved corporate socialresponsibility

❖ **QUESTIONNAIRESURVEY**

The questionnaire survey is divided into two parts. The first part consists of general information like type of company, project details etc. and the second part consist of construction waste management factors for

evaluation. Waste management factors for this study includes

- Handling
- Workers
- Management
- Site Condition
- Procurement

❖ CONCLUSION

In conclusion, waste is defined as unwanted materials cause disasters. C&D waste structure is generated essentially by wood, concrete, glass, and sand. Types of wastes are demolition manufacturing and economical. And to stop waste, reuse, recover, or recycle, unwanted materials. Advertising plans for efficient supplies, also takes a big part to eliminate waste. Hopefully, in the future as communities realize risks of C&D waste, we will see many applications to minimize waste, and we will have a healthy environment.

Construction waste management is required for a country to develop in a sustainable manner. It helps to address issues related to environment, social and economy. This study has identified significant factors contributing to waste in construction projects. By identifying the significant factors in construction process, construction players are able to notice the best ways to apply new practice for reducing material waste, time delay and cost overrun in any project. Types of material wastage and factors involved in material wastage were identified through literature study and expert's opinion.

The materials wasted in construction site bricks, cement, timber, concrete, metals, glasses. The questionnaire survey was conducted and the result was analysed by RII method. Based on the results and findings of this study, the recommendations are made to reduce the construction waste generation in any construction projects. By identifying the significant factors in construction process, construction players are able to notice the best ways to apply new practice for reducing material waste, time delay and cost overrun in any project.

The motive of the research is proving best idea to control the waste in construction site then its will be helps to find the better option of the control of waste material percentage and then reduce the cost of project.

➤ REFERENCES

- A study conducted to reduce construction waste generation in Turkey Tulay Esin, Nilay Cosgun Department of Architecture, Faculty of Architecture, Gebze Institute of Technology, Kocaeli 4140.
- Bossink, B.A.G., and Brouwers, H.J.H. 1996. Construction waste: Quantification and source evaluation. *Journal of Construction Engineering and Management*, ASCE, 122(1),55-60.
- Pinto, T.P., and Agopayan, V. 1994. Construction waste as raw materials for low-cost construction products. *Sustainable construction (Proc. 1st Conf. of CIB TG 16)*, C.J.Kibert, ed., Ctr. For Constr. And Envir., Gainesville, fla., pp:335-342.
- Priyanka.S 2019. A study to identify the reason for material wastage in construction industry (volume 7 issue 5 may 3221 5687,(P) 3221 568X).
- Skoyles, E.R. and Skoyles, J.R. 1987. *Waste prevention on site*. Mitchell Publishing Company Limited, London.
- Ekanayake L.L., Ofori.G, 2004. Building Waste Assessment Score: design-based tool. *Building and Environment* 39, 851-861. *Journal of Emerging Trends in Economics*.
- Muhwezi L., Chamuriho, L.M and Lema, N.M. 2012. An investigation into materials wastes on building construction projects in Kampala Uganda. *Scholarly Journal of Engineering Research*, 1(1),11-18.