Construction waste minimization

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Abstract: *Construction industry is second largest industry in India and has been developing more rapidly. But the development of Construction industry also lead to serious problem of construction waste generation. Heavy wastage is occurring in any type of construction work. It is unavoidable but with help of prevention techniques by finding causes of waste it can be avoided. Construction waste increases burden on land fill which are becoming scare. If the waste is not properly managed it causes water and soil pollution. So it's become essential for any construction company to reduce the construction waste to minimize environmental damages and enhance the construction process. This paper identifies the top five activities of waste generating from different five sites and finding the causes of waste generation and suggests the recommendations in order to reduce waste.*

KeyWords: Construction waste, Rcc, Brickwork, Plastering.

1. INTRODUCTION

The construction industry is the second largest industry in India. The construction industry as a whole presents many employment opportunities in the fields of building, civil engineering, offshore structures. It makes significant contribution to the national economy and provides employment to large number of people. The construction industry must be able to respond to the changes that the world is constantly facing.

Construction waste leads a negative impact to the environment, costs, time, and productivity of the country. Construction waste also affects economic health of construction companies. Construction waste increases the burden on landfill sites which are becoming increasingly scarce. If waste is not managed properly cause soil and water pollution. It's essential for construction companies to reduce waste in order to minimize environmental damages and conserve natural resources.

Waste minimization is nothing but reducing the amount of waste and its impact on environment. To reduce these negative impacts, it needs a complete understanding of the construction waste generation. There are many sources of generation of waste in construction as Design of structure, Handling of material and equipment, Worker's influences, Management of the sites, Procurement of Materials and external factors. Waste management plan, Building information modelling, 3R (Reduce, Reuse, Recycle) techniques can be used for effective management of construction waste.

1.1 Construction waste

Construction industry consumes huge amount of natural resources. In general, a very high level of waste is assumed to exist in construction. Construction waste is unwanted materials produced directly or indirectly by construction activity. The construction activity involves assembling materials and component. Construction waste means any matter or thing which is generated as a result of construction work. It is mixture of surplus materials arising from site clearance, excavation, construction, renovation and demolition. This include building materials such as concrete, plaster, wood, metal, broken tiles, bricks, masonry insulation, nails, electrical wiring, as well as waste originating from site preparation such as degrading materials, tree stumps. These wastes are heavy, having high density, very often occupy considerable storage space.
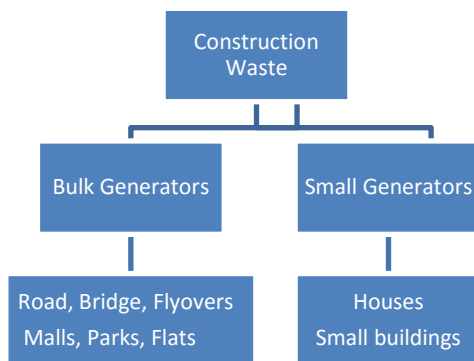
1.2 Sources of waste generation:

In past decade construction industry in India has shown its growth drastically upward due to the development and redevelopment projects in the India. Generally there are two sources of waste generation of waste materials.

I .Bulk generators

Infrastructure and real estate sector are the bulk generators of waste. Construction and repairs of roads, bridges, flyovers etc. are classified under the infrastructure development sector.

II. Retail generators or small generators.

Small generators consist of housing, industrial, and commercial building construction, demolition of unauthorized structures etc. small commercial enterprise and individual house.

1.2.1 Sources of waste generation

1.3 Construction waste classification

Construction waste can be originated due to different causes. The following classifications consider all these forms of occurrence of construction waste.
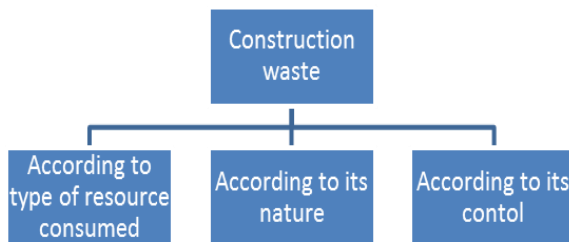
1.3.1 Waste according to the type of resource consumed

- Physical waste of materials: additional amount of material required due to material waste;
- Physical waste of equipment: equipment hours increased
- Financial waste in result of the physical waste

1.3.2 Waste according to its nature

- Indirect waste, related to the financial waste and the use in excess of material, and \Direct waste, related to the physical waste of material, more specifically, the debris.

1.3.2 Waste according to its control

Considering the possibility of controlling or reducing the index of waste detected, the waste is classified in two categories

A) The unavoidable waste is the one for which investment is necessary for its reduction to obtain economy. Generally, this waste category represents an acceptable

level of waste that its factors escape to the control of the builder, depending on the development of each company.
B) The avoidable waste is consequence of a process of low quality, in which resources.

2. DATA COLLECTION

The questionnaire was designed to identify and rank the most frequent waste categories present in the job site according there waste generation. General activities on construction sites were mentioned and site engineers were asked to rank them according to their capability of waste generation. The engineers ranked the waste categories from 1 to 15, with being the most frequent activity generating waste present in the job site and 15 the least one. This questionnaire is filled from 20 different construction sites. Following Questionnaire was formed.

| No	Activity	Rank
1	Excavation	
2	Foundation work	
3	Plinth filling	
4	Column casting	
5	RCC work (Beam and slab casting)	
6	Brick work	
7	Plastering	
8	Painting work	
9	Tiling work	
10	Electrical work	
11	Plumbing work	
12	Water proofing	
13	Drainage work	
14	Door fitting	
15	Window Fitting	

2. DATA ANALYSIS

The analysis is carried out in Microsoft excel. First data obtained for questionnaire one from all 20 construction sites is combined together in one table format. In second table number of response for a particular rank for a particular activity is carried out. After the analysis is completed for all activities the activity gets 1 rank for most waste generation from maximum responses, activity gets 2 ranks for waste generation from maximum responses and activity gets 3 ranks for waste generation from maximum responses is identify.

Max rank table:

No	Activity	Rank	No Reponses
1	Excavation	13	6
2	Foundation Work	5	8
3	Plinth Filling	6	5
4	Column Casting	4	4
5	RCC Work (Beam and slab casting)	1	10
6	Brick Work	3	6
7	Plastering	2	6
8	Painting Work	9	4
9	Tiling Work	6	5
10	Electrical Work	11	4
11	Plumbing Work	10	5
12	Water Proofing	12	5
13	Drainage Work	12	5
14	Door Fitting	14	5
15	Window Fitting	15	8

3. GRAPHICAL REPRESENTATION OF QUESTIONNAIRE
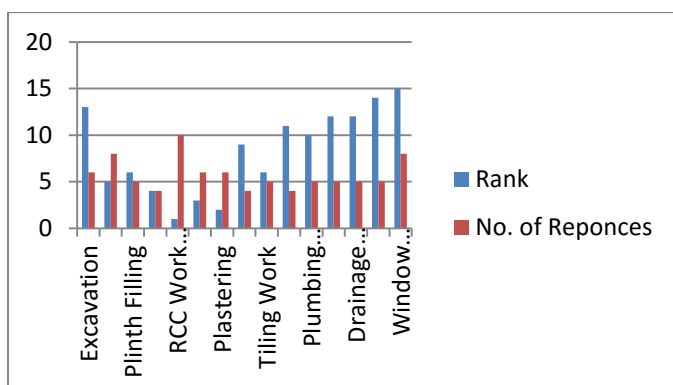
Result of first questionnaire:

Top three activities of waste generating on Construction sites:

1. RCC (slab and beam casting)
2. Plastering
3. Brickwork

4. SUGGESTIONS:

1. RCC

- Smaller Smaller pieces of concrete are used as gravel for new construction projects
- Crushed recycled concrete can also use as the dry aggregate for brand new concrete.
- Larger pieces of crushed concrete can be used as riprap revetments.
- Using recycled concrete can conserve natural resources by reducing the need for gravel mining, water, coal, oil and gas.
- Using recycled concrete as the base materials for roadways reduces the pollution involved in trucking materials.
- Recycled concrete drag down the cost for buying raw materials and transporting the waste to landfill sites.
- Reclaimed concrete can be used in walkways providing a walkable surface.
- Steel can reuse directly. If it is unsuitable for direct reuse it is melted to produce new steel.
- Steel can recycled over and over again without losing any of its properties.
- Reuse of small cut pieces of bars in miscellaneous parts like lintels, special projections.

2. Plastering:

- Mortar is composed of sand and cement and is normally consider as non-hazardous waste.
- It is use during plastering in large amount.
- The best way to minimise the amount of mortar entering the waste is through careful while mixing process.
- Mix the amount of mortar only as much quantity is needed for the work to be carried out.
- Wet mortar will set hard on drying and is therefore difficult to reuse.
- Mortar waste occurs on site as a result of materials spilt on to the ground during plastering and left over mix that has not been used is collected at the end of day and pour water in it and reuse it by crushing and adding cement for lower grade work for next day.

3. **Brickwork:**

- Most common source of bricks and block waste is items that are damaged during unloading storage and cutting and excess due to overloading.
- This wastage of bricks can be reduce up to certain level by making following changes to your site operations:
- Providing storage areas to reduce damage during storage.
- Training staff in the handling of materials.
- Planning during design stage to minimize the need for cutting bricks and blocks.
- Using lime based mortar than cement based mortar.

5. CONCLUSION:

One of the most frequently found problems in the construction projects is inadequate planning of the construction waste. Even after some extent of wastage rate allowable in each project, this limit extended beyond the allowable limit, which ultimately effect on project profit or Return on Investment.

It can be conclude from the study that systematic analysis of activity causing more waste and types of waste which occur frequently on construction sites is helpful for identification of major causes of construction waste. Once it is identified, it can be avoided or minimized resulting in major financial benefits for the firm. If construction are collected from construction site and recycle can save money and conserve resources and preserve environment.

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