IDENTIFICATION OF RISK FACTORS IN CONSTRUCTION WASTE MANAGEMENT

(Recycle Process of Construction Waste in Construction Industry)

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Abstract : **Construction industry has been developing rapidly around the world. The development has led to serious problem in generation of construction wastes in many developing countries and exploitation of the natural resources to large extend. The construction wastes clustered into physical and non-physical waste and it has greater impact to environment, economy and society of each country.**

Keywords-component; Design, Handling, Worker, Management, Site condition, Procurement and External factor.

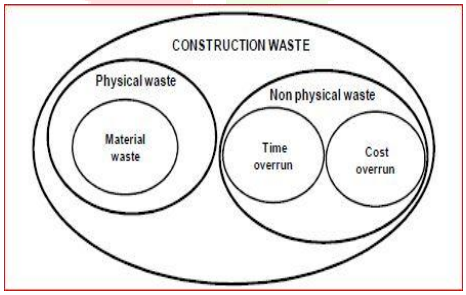
I. INTRODUCTION

About Construction Waste

Construction and demolition waste management has become one of the major environmental problems in many municipalities. It has been a pressing issue in India since the late nineties due to the running out of disposal sites to manage the huge amount of waste generated. The building industry is consuming a considerable amount of resources, from the most common material sand to the valuable natural assets like timber. If the life cycle of the material on site, from its transportation and delivery to the end fate, is closely examined, it is generally known that there is a relatively large portion of the materials being wasted because of poor material control on building sites. There are two main kinds of building construction waste, structure waste and finishing waste. Concrete fragment, reinforcement bars, abandoned timber plate and pieces are generated as structure waste during the course of construction.

Construction waste and its types

Construction waste can be defined as any materials by product of human and industrial activity that has no residual value. Waste is a product or material that is unwanted. Construction waste clustered into two groups namely the physical and non-physical waste. Classification of physical and non-physical construction waste are given.



Definition Of Physical Ad Non Physical Waste:

Physical construction waste is defined as waste which arises from construction, renovation and demolition activities including land excavation or formation, civil and building construction, site clearance, demolition activities, roadwork, and building renovation.

The Non-physical waste normally occurs during the construction process. By contrast with material waste, non-physical wastes are time and cost overrun for a construction projects. Similarly, researchers from Indonesia defined waste as not only associated with waste of materials but also other activities such as repair, waiting time and delays.

EXPANSION

RII	Relative Important Index
C&D Materials	Construction and Demolition Materials
GDP	Gross Domestic Product
SWMP	Site Waste Management Plan

Fixtures

Cabinets, light fixtures, bathtubs, sinks, mortar mix, hardware, nails, screws and plumbing fittings and supplies are all accepted by Habitat for Humanity.

Insulation

Install left-over insulation in interior wall cavities or on top of installed attic insulation if it cannot be used on another job.

Lumber / Wood

- Set aside lumber and plywood/OSB cut-offs to be used later as fire blocking, spacers in header construction, etc.
- Save small wood scraps to use as kindling for clients or crew members (no plywood or treated wood).

larger pieces of leftover lumber (6 feet or more) may be able to be donated to Habitat for Humanity.

Masonry

- Check to see if your masonry supplier will accept the return of materials in good condition.
- Good quality used concrete (also known as urbanite) can be used as brick or block for landscaping walls or foundations for small buildings.

Metal

- During *remodeling*, separate metal radiators, grates, piping, aluminum siding, and old appliances for salvage or recycling.

RECYCLING MATERIALS

Materials that cannot be reused, very likely can be recycled. And keep in mind that recyclable materials are not only generated through the construction process, but also by employees. Following are examples of materials that are readily recycled in most areas:

Asphalt shingles, batteries (including rechargeable tools), Bottles and cans (glass, plastic, metal), Brush and trees (yard and landscaping waste), Buckets (5-gallon), Cardboard and paper (must be kept dry)

Ceiling tiles, Clean wood cut-offs, flooring, trim, pallets, Lumber and plywood (without nails) and Metals.

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Waste minimization includes:

- Using only those materials that you need;
- Decreasing the amount of material that has to be disposed of as trash; and
- Diverting materials from disposal to reuse or recycling.

QUESTIONNARIE STRUCTURE

The questionnaire was tested with survey for clarity. The questionnaire survey is divided into two parts. The first part consist of general information like type of company, experience value of their project etc and the second part consist of the construction waste management factors for evaluation.

Waste management factors for this study are classified into seven categories namely,

1. Design
2. Handling
3. Worker Workers' mistakes
4. Management
5. Procurement
6. Site condition
7. External Factor

RELATIVE IMPORTANT INDEX (RII):

The questionnaires are collected and analysed using statistical software package SPSS v 21. The ranking of factors was calculated based on Relative Importance Index

$$RII(\%) = \sum a * \frac{n}{N} * \frac{100}{5}$$

Where:
RII = Relative Important Index
a = constant expression weight
n = frequency of response
N = total number of response

Estimated Composition of Construction Wastes in India

Waste Type	Percent(%) by volume
Dimension lumber	25
Gypsum wall	15
Masonry and tile	12
Cardboard	10
Manufacture wood	10
Asphalt	6
Other wastes	5
Fiber glass	5
Other packaging	4

METHODS OF MINIMIZATION AND RECYCLING

Asphalt

Most asphalt waste comes from repaving projects. Asphalt paving is composed of a mixture of about 5 percent heavy oil and 95 percent. Most old pavement that is reused is processed for road base, but up to 40 percent can be included in new pavement.

All types of asphalt pavements can be recycled: low, medium and high traffic volume highways, county roads, city streets, airport taxiways, runways and aprons, and parking lots.

Brick

A brick is a block or clay tempered with water, sand, etc., molded into a regular form, usually rectangular, and sun-dried, or burnt in a kiln, or in a heap or stack called a clamp.

Cardboard

Cardboard or known as corrugated paper in the industry, is a heavy wood-based type of paper, notable for its stiffness and durability. Corrugated cardboard is made of paper and consists of a fluted piece of paper between two flat liner boards. It is the most common building product packaging material.

Methods

At the mill, the corrugated is pulped and blended with additional pulp from wood chips. Broken, thus shorter and weaker, old fibers are blended with the new pulp to make the medium. Recycled paper fibers and new pulp are blended to make linerboard. Then the medium and the linerboard are shipped to a boxboard plant, where the manufacturing process is finished. The medium is corrugated by specially-geared machines, the linerboards are glued on, and the resulting flat pieces, called mats, are trimmed to size and creased along a pattern of folds. The mats are shipped flat to customers who set them up into boxes. Then the boxes are used to package products for shipping.

Concrete

Most concrete is recovered from roads, bridges and foundations. It's processed from road based aggregate in asphalt pavement, and as a substitute for gravel aggregate in new concrete. Concrete chunks are crushed, ferrous materials such as bolts or reinforcing bar are removed, and the resultant aggregate is screened to sizes suitable for road building or new concrete.

Concrete recycling is much more viable as a result of landfill costs for construction, demolition, and land-clearing debris is increasing, the expensive cost of trucking old concrete to the landfill and environmental concerns.

Methods

Products (aside from base course) are high quality aggregate, processed in steps with time and effort involved in crushing, pre-sizing, sorting, screening and contaminant elimination. The denominator is to start with clean, quality rubble in order to meet design criteria easily and ultimately yield a quality product that will go into end use.

Crushing and screening systems start with primary jaws, cones and/or large impactors taking rubble from 30 inches to 4 feet. A secondary cone or impactor may or may not need to be run, and then primary and secondary screens may or may not be used, depending upon the project, the equipment used and the final product desired. A scalping screen will remove dirt and foreign particles. A fine harp deck screen will remove fine material from coarse aggregate.

Further cleaning is necessary to ensure the recycled concrete product is free of dirt, clay, wood, plastic and organic materials. This is done by water floatation, hand picking, air separators, and electromagnetic separators.

Glass

The glass industry recycled about 425,000 tonnes of glass in United Kingdom in year 1997. There are some uses for recycled glass in the construction industry. Recycled glass used in the manufacture of fiberglass now constitutes the highest second volume of postconsumer, glass(Pichtel,2005). Glassphalt, another alternative promising market

Masonry

The common materials of masonry construction are bricks, stone, concrete block, tile and so on. All these are laid or joint together using mortar. Masonry is a highly durable form of construction. There are some factors that can affect the quality of the overall masonry construction need to be considered such as the quality of the mortar and workmanship, and the pattern in which the units are assembled.

Brick of masonry wall typically will not require painting works and therefore can provide a structure with reduced life-cycle costs.

Methods

- Estimate masonry material needs carefully to avoid waste.
- During construction, collect, stack and cover brick and other masonry materials to prevent soiling or loss.
- Salvage usable bricks, blocks, slate shingles, tile and other masonry materials from remodeling and construction. Store for future jobs or divert to salvage operations.
- Check to see if your masonry supplier will accept the return of materials in good condition.
- Clean concrete chunks, old brick, broken blocks, and other masonry rubble can be buried on-site during foundation back-filling.
- Good quality used concrete (also known as urbanite) can also be used as brick or block for landscaping walls and foundations for small buildings.

Metals

Metals such as aluminum, copper and steel are widely being utilized in the construction industries. It is an element, compound, or alloy characterized by high electrical conductivity. Metal is usually use in building steel home, steel roofing, clear span building and others construction works. They are usually have high density, ductile, malleable, have a high melting point and can conduct electricity and heat well.

Metals have the highest recycling rates among the materials recovered from the construction and demolition sites. Good markets have been in existence for ferrous metals as well as copper and brass. The recycling rate for construction and demolition steel is about 85 percent (18.2 out of 21.4 million tons generated). Reinforcing steel used in foundations, slabs and pavement is usually recovered and sold to scrap dealers. Processors also reclaim nonferrous scrap such as aluminium window frames, screen doors, gutters and siding and copper pipe and plumbing fixtures.

Methods

- During remodeling, separate metal radiators, grates, piping, aluminum siding, and old appliances for salvage or recycling.
- Consider a front yard sale of usable items during the construction process.
- During construction, separate metals for recycling, including copper piping, wire and flashing; aluminum siding, flashing and guttering; iron and steel banding from bundles, nails and fasteners, galvanized flashing and roofing, and rebar; and lead chimney flashing. It is critical to keep lead out of landfills because it could leach into groundwater.
- The Ecology Action Diversion Center at the city landfill will accept all metals and appliances.

CONCLUSION

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. Once the root causes of waste generation are notified, it can either be avoided or minimized to benefit the world for better future. 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. Based on the results and findings of this study, the following recommendations are made to reduce the construction waste generation in any construction projects. The aim of this study is to investigate the waste recycling and reuse in the construction industry. It can be concluded that generally the construction personnel are Zero waste of the construction waste.

REFERENCES

Y. Khairulzan and A. B. Halim, " Eco-costing of Construction Waste," *Management of Environmental Quality: AnInternational Journal*, vol. 17, pp. 6-19, 2006.

M. Osmani, *et al*., "Architects' Perspectives on Construction Waste Reduction by Design," *Journal of WasteManagement*, vol. 28, pp. 1147–1158, 2008.

J. Y. Wang, *et al*., "An Investigation of Construction Wastes: An Empirical Study in Shenzhen," *Journal ofEngineering, Design and Technology*, vol. 6, pp. 227-236, 2008.

R. Ndihokubwayo and T. Haupt, "Variation Orders on Construction Projects: Value Adding or Waste," *International Journal of Construction Project Management*, vol. 1, pp. 1-17, 2009.

H. Yunpeng, "Minimization Management of Construction Waste," in *IEEE International Symposium of Water Resource and Environmental Protection (ISWREP)*, 2011, pp. 2769 - 2772.