Research Paper

Volume : 3 | Issue : 4 | Special Apr Issue 2014 • ISSN No 2277 - 8179

Technology & Innovation

KEYWORDS : Reuse of materials, Management Resources, Recycling.

New Approach for Using C&D Waste

C. MATHI RAJA	M.Tech I Year (CEM)., Department of Civil Engineering, PMU, Thanjavur
V.A. SHANMUGAVELU	Asst Professor (SG), Department of Civil Engineering, PMU, Thanjavur
P. LENIN	sst Professor, Department of Civil Engineering., PMU, Thanjavur

ABSTRACT

Concern over construction and demolition (C&D) waste is becoming a prevalent part of any construction project. Historically, landfilling waste materials was the standard solution for most contractors, but as tipping fees have risen dramatically over the past five to seven years, many contractors are looking for alternative methods such as recycling or waste minimization, to reduce waste. C & D waste proposes to address the problem of assessing waste disposal techniques efficiently and economically. A brief history of C&D waste is provided to understand how and why costs associated with waste materials have risen over the last several years. Current waste management resources are disccussed to demonstrate the availability of alternative disposal methods. An overall waste management plan is developed to provide a contractor with a step by step flow chart for analyzing material wastes, quantitatively assessing all cost associated with waste disposal, and implementing and updating the chosen waste management technqiues.

INTRODUCTION

The purpose of this report is to characterize the quantity and composition of building- related construction and demolition (C&D) debris generated in the United States, and to summarize the waste management practices for this waste stream. C&D debris is produced when new structures are built and when existing structures are renovated or demolished. Structures include all residential and non-residential buildings as well as public works projects, such as streets and highways, bridges, piers, and dams. Many state definitions of C&D debris also include trees, stumps, earth, and rock from the clearing of construction sites. The focus is on building-related wastes, including construction, demolition, and renovation of residential and non-residential buildings.

WASTE GENERATION IN CONSTRUCTION INDUSTRY

All over the world, the growth of construction industry is enormous in the past decade. The pace of generation of C&D waste is also significant. In general, there are two sources for generation of waste materials, namely, bulk generators and retail or small generators. The classification of sources is given in Fig 1. The infrastructure development sector and real estate sector are the bulk generators of waste. The contributors of C&D waste in a project are given in Fig 2. The project activities are to be planned at every stage by every personnel, who e involved, to minimize the overall waste generation.

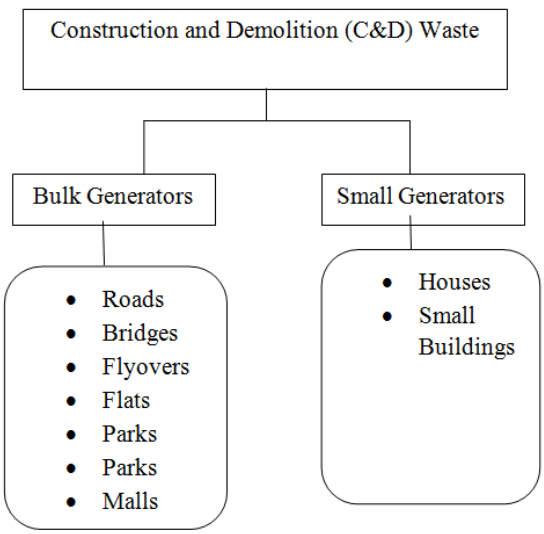


Fig .1 Sources of C&D waste generators

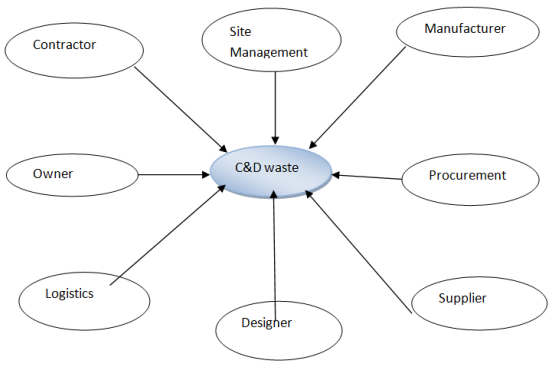


Fig 2 Contributors of C&D waste in project

Construction industry is largest economic expenditure in India. According to eleventh five year plan, it is the second largest economic activity after agriculture. Construction industry consumes high volume of raw materials and products. It generates high employment opportunity. Based on an analysis of the forward and backward linkages of construction, the effect in the construction on economy is estimated to be significant [2].

The boom in the economical growth in the country is attributed to the developments in the construction industry. Investment in construction accounts for nearly 11 per cent of India's Gross Domestic Product (GDP). Based on the studies done by Technology, Information, Forecasting and Assessment Council –TIFAC (2000) the total construction works in the country for the five years during 2006-2011 has estimated to be for $847 billion.

From the cost analysis of various modes of expenses in Indian construction industry, it has been seen that the component of material cost comprises nearly 40 to 60 % of the project cost. The material waste generation in construction industry is huge in monetary terms. This is particularly essential for a development that responds to the challenges of environmental sustainability, low carbon emission and minimal resource depletion [3].

The total quantum of C&D waste generated in India is estimated to 11.4 to 14.69 million tons per annum (TIFAC, 2000). The concrete, brick and masonry together constitutes more than 50 percent of the total C&D waste. This shows the importance of developing C&D waste management plan for these components.

PRESENT PRACTICES OF WASTE DISPOSAL

The common treatment methods of C&D waste are given in Fig 3. Among the various approaches, the manual separation is highly

labour oriented and the mechanical separation requires costly installations. The present waste handling practices adopted by the construction industry in India at different levels [4] are:-

- Items recovered during construction /demolition is sold in the market at a discount rates
- The feasibility of recycling. Items that cannot be re-used are used for filling the land.
- Landfill tax is not imposed by municipality.
- Waste is disposed without segregation.
- No penal action is taken against violators.

The industry is not aware about the possibilities of cost savings from proper handling of C&D waste. In fact, higher construction productivity, save in time and cost can be achieved by proper implantation of C&D waste management system [5].

NEW METHOD FOR C&D WASTE MANAGEMENT

In India 50% of C&D waste is used for land filling Purpose at present, Which may be reused in construction after segregation process. By Crushing the construction and demolition waste to powder and being used as alternative material in construction. It may become familiar only when there is no place to fill, dispose the c and d waste.

THE '3R' CONCEPT

Until last two decades, landfill was considered as the cheapest and convenient method of C&D waste disposal. But land filling is considered to be undesirable due to environmental and ecosystem hazards. Now most of the landfills are at the verge of arriving at its full capacity. Hence, more valuable lands may have to be employed in the future, which increase cost for C&D waste disposal [6].

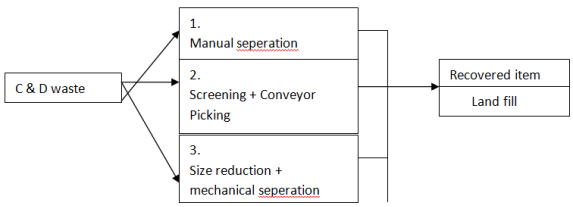


Fig.3 C&D waste treatment methods

Reduce

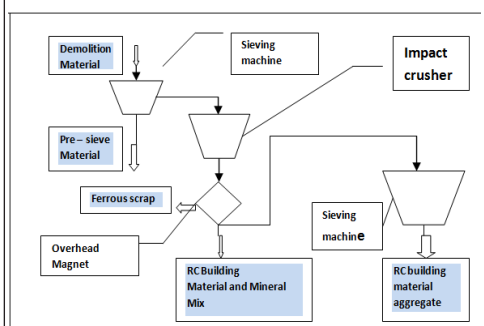
Potential wastes can be identified early in the design process itself and measures should be taken during to minimize the waste. The reduction can be achieved by design with standard sizes for all building materials, design spaces to be flexible and adaptable to changing uses and design for deconstruction.

Reuse

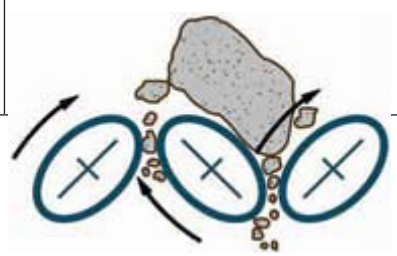
This involves identification of waste that can be salvaged for reuse on the current project or another project. A comparison of the value of the materials "as it is" for salvage and to their value as materials for recycling may be considered prior to reuse in many cases.

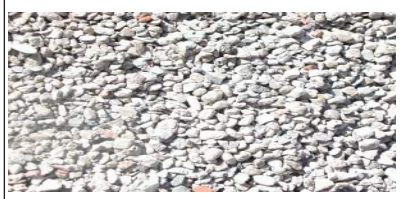
Recycle

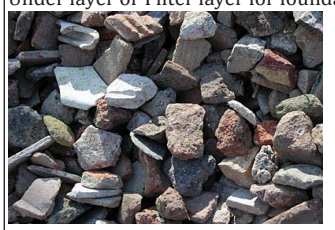
After adopting all the options to prevent waste, salvage and reuse materials, the next step is to recycle as much of the remaining debris as possible. Recycling saves money by minimizing disposal costs. The Recycled and Reuse of Construction Materials such as:

Material	Concrete Normal concrete, steel reinforced concrete, concrete brick, waste concrete. Concrete is produced from cement (binder), aggregate, water and additives, when required. It is cast on site in shuttering, or as blocks or concrete elements.
Origin	Concrete is the primary material for larger buildings in foundations, retaining walls, roofs and floor construction & used in pavement on roads.
Reuse	Some concrete can be reused with little processing: a) Pre Fabricated elements b) Concrete Block (once cleaned of mortar and finishes)
Ways of Collection	Collection of prefabricated sections and blocks requires careful dismantling of a building.
Technologies	Concrete saws, grinders & lifts.
Market	The market for recycled concrete is primarily in road construction as underlay's and drainage material. Recycled concrete could be used as aggregate in new concrete and progress has been made towards the normalization of this process.
Recycling	The value of in-situ concrete in terms of recycling is low It can be crushed and ground to aggregate. The majority of it has to be sorted and used as fill. Road base and construction fill Crushed concrete can be used as base fill in the construction of roads. The crushed material is used in place of lime rock. The benefits of such reuse are by the local availability of lime rock deposits, as hauling costs are substantial. It is also used as primary road surface material on unpaved roads in rural areas. Aggregate in concrete Crushed concrete has been proposed for use as aggregate in the manufacture of new concrete. Drainage material Crushed concrete that has been well screened of fine particles provides similar drainage characteristics as new rock or gravel. It can be used for drainage applications in construction.
Ways of collection	Recovered from concrete demolition sites unprocessed. Reduced volume of concrete allows for fewer loads and lower transport costs.
Ways of sorting	Example of central sortingn process
	
	Jack hammering and crushing in-situ, separation from steel components manually by crusher and magnetic separation.
Recycling Process	1. Reduced by crusher and sorted by kernel size 2. Removal of metals by magnet 3. Used concrete as fill material, gravel substitute, stabilizing material 4. Reinforcing steel as scrap for steel production

Volume : 3 | Issue : 4 | Special Apr Issue 2014 • ISSN No 2277 - 8179

Technologies	For Example: Concrete crusher "RUBBLEMASTER"  "RM60 - The FLEXIBLE ENTRANCE MODEL the crane-lift mobile RM60 produces 80 tons/h of granular material from building debris, bitumen or Concrete. Supplementary pre- and post sorting modules is integrated for a complete recycling system."  Roller screens The Minerals roller screens are used to separate on-size particles from the oversize and undersize fractions.  Wobbler feeders/scalpers The unique action of a wobbler feeder provides feeding and scalping of materials in a single machine. Even wet, sticky materials can often be handled due to the specially designed self-cleaning, non-clogging elliptical bars.  

Market/Products	 RC-Frost protection material Base/Filter layer under surface or between foundation slabs  RC Concrete - SPLITT Self hardening Paving  RC Concrete - SPLITT Reinforcing of road and walkways, loose top coat  RC Concrete – SCHOTTER Drainage layer and basement wall protection
Material	Brick
Origin	Standard Bricks Clay, sand and light mineral materials are wet mixed, formed, and kiln fired.
Reuse	Bricks can also be re-used as bricks directly bricks. Mostly 45% of bricks are used for weathering course.
Ways of collection	Manual dismantling, cleaning and stacking
Ways of sorting	Manual in-situ
Reuse	Cleaning and separation from mortar
Technologies	Saws, grinders, mortar grinders

Market	Mainly care and restoration of monument class buildings
Recycling	
Ways of collection	Brick rubble is lifted by sieve shovels with excavators, thus partial sorting is possible during collection.
Ways of sorting	Rubble bucket lifting, sieving, magnetic separation
Recycling Process	Crushing and sorting according to kernel size, separation from metal components
Technologies	Breakers and Crushers identical to those used for concrete
Market/Products	Road base and construction fill Crushed brick can be used as base fill in the construction of roads. The crushed material is used in place of lime rock. The benefits of such reuse are often dictated by the local availability of lime rock deposits. Crushed brick may also be used as primary road surface material on unpaved roads in rural areas. .  RC-Rubble Under layer or Filter layer for foundations  RC-Rubble Top layer for path and public space surfaces  RC-Rubble Mechanical Soil stabilizer

Material	Wood, Timber
Origin	Timber has been the main structural and covering material in the county all over the world. In roof construction, its light weight and structural properties have made it more attractive. It can be used to cover roofs as shakes, shingles or planks. The sheeting is produced as fiberboard, cork, chipboard or veneer.
Reuse	Considerable quantities of reusable timber can be recovered during the demolition of old buildings.
Ways of collection	Collection of wood for direct reuse is largely done manually, with the aid of powered hand tools
Ways of sorting	Reusable wood is sorted by type, size and quality
Reuse	a) Direct use when free of pollutants b) Removal of nails and foreign objects, planning, surface treatment.
Technologies	Saws, hand tools, planers, sanders
Market	Wood working Larger pieces of the highest quality recovered wood, such as barn boards and structural timbers are used intact. They are largely used by the woodworking industry as raw material for furniture flooring
RECYCLING	 
Ways of collection	Wood to be recycled can be collected alone from a site or mixed with other C&D wastes.
Recycling Process	· Wood is collected onsite with or without out foreign materials. · Sorting is done by hand and machine. · Wood is shredded · Separation like air blower and magnetic is performed on shredded material · Shredded wood is marketed

CONCLUSION

The exploitation of potential resources from construction and demolition (C&D) wastes is yet another opportunity and future profession in the construction industry in India. Waste minimization and waste management programs are in its infancy in India. It is possible to minimize the volume of C&D waste generated by identifying the potential waste early in the design. But even with proper resource-efficient design and by adopting proper construction and deconstruction procedure, some waste may essentially be generated in every project.

REFERENCE

[1] Jain M, (2012) "Economic aspects of construction waste materials in term of cost savings- A case of Indian construction industry", International Journal of Scientific Research Publications, 2(10), 1-7. | | [2] Vilas, N. and Gilberto, B. (2007), Construction and Demolition Waste Management: Current Practices in Asia, Proceedings of International Conference on Sustainable Solid waste Management, Chennai, India, 97-104. | | [3] TIFAC (2000). "Utilization of waste from Construction Industry" Department of Science & Technology New Delhi. |