

# INVESTIGATION AND ASSESSMENT OF CONSTRUCTION & DEMOLITION WASTE

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**Abstract :** The ever increasing quantity of construction and Demolition waste (C & D waste) in India is presently very challenging for public administrators, which needs to ensure that collection and recycling are properly managed and the need to reuse them in construction industry. In this study assessment of C & D waste is done. In this study we have visited C & D waste recycling plant in New Delhi for close analysis of the process and techniques used in the recycling and management of C& D waste. Further we have studied the hindrances and problems which are restricting the application and recycling of C & D waste in construction industries. Different recycling materials were collected and tested in the material testing lab to calculate different properties. These results permitted a practical means of measuring the quality of recycled aggregates which can be used to produce concrete of known behavior. Investigation also resulted in to the need of increment in the number of recycling plants, better technology for more accurate segregation and increment in reuse in construction industry.

**IndexTerms** - construction and Demolition waste (C&D waste), recycled aggregate (RA), recycled concrete aggregate (RCA)

## I. INTRODUCTION

Increment in the development rate especially in the construction has lead to severe damage to the environment and depletion of natural resources for its raw material. The millions of tonnes of aggregates used to fulfill the demand of concrete required for construction and without any proper disposal or recycling of it for its reuse has lead to think about sustainable development to safeguard our future generations. By 2025 India will produce maximum construction waste in Asia according to 'Nature' journal. The drastic increase in volume of construction and demolition waste has burdened local waste management systems and in some contributed to environmental damage to both extents either globally or locally. This has resulted in some countries like Spain to develop new plans and strategies of C & DW (PNIR 2007-2015) and to encourage local and municipal bodies to apply and enforce more and further regulations.

Wide range of materials which can be categorized as follows (Symonds & Associates 1999):

1. Waste generated from total or partial demolition of civil structure.
2. Soil, rocks and vegetation arising from clearing, earth moving, civil works or excavation for foundations.
3. Waste generated during construction activities while constructing buildings and other civil structures.
4. Road construction and materials arising from maintenance of roads.



Fig1.1: recycling plant visit



fig1.2: c & d waste after demolition

Considering sustainable construction defined by Bruntland Commission (1987): 'development which meets the needs of present without compromising the ability of future generations to meet their own needs'. In India seeing the increase in construction activities there is need to adopt sustainable development which reflects the following process that is-

## II. STATUS OF C & D WASTE IN DELHI

Delhi is one of the most populated cities of the world and having such old and few profound, prestigious infrastructures like residential buildings, monuments etc. there is a need to renovate or rebuilt them as per the modern requirements. With such high rate of construction and redevelopment or renovation it is causing very huge amount of development of C & D waste.

Delhi is producing approximately 7000 tonnes per day of C & D waste as per the officials of C & D recycling plant in New Delhi. But, only approximately 3000 tonnes per day of waste can be recycled. Pradeep khandelwal, Chief Engineer EDMC in 2015 in one of the workshop on construction & demolition waste recycling (CWDR) informed that Delhi is generating 5000 tons per day of C & D waste. Further per Sqm waste generation is as follows:

- New construction activities: 35kg/sqm
- Reconstruction activities : 350kg/sqm
- Average C & D waste received at the landfills : 2000 TPD

### III. COMPOSITION AND CHARACTERIZATION OF C & D WASTE

It is mainly produced by the demolition, renovation, refurbishment or extension of buildings and other infrastructures for their further use.

Composition of C & D waste is classified in eight groups by the European catalogue of waste (Directive 75/442/CEE and 94/904/CE) as:

- Mixture of concrete, bricks, tiles and ceramics.
- Mixture of wood, glass and plastic.  
metals(alloys).
- Bituminous mixture and other tar products.
- Soil, stones.
- Insulation materials and construction materials containing asbestos.
- Gypsum based materials.
- Mixed construction and demolition waste materials

#### Characteristics of C & D waste

Table 2.1: Composition of C & D Waste

S. No.	Composition of C & D waste	MCD Survey, 2004 (%)	IL & FS Survey, 2005(%)
1.	Soil/Sand, Gravel	43.0	31.5
2.	Concrete	<b>35.0</b>	-
3.	Bitumen	-	-
4.	Masonry / Brick	15.0	59.0
5.	Metals	-	0.4
6.	Wood	-	1.5
7.	Others	7.0	7.6
8.	Total	100.0	100.0

### IV. PROCESSING OF C & D WASTE

- The waste received at the plant is first weighed by electronic bridge.
- After this the waste is dumped to the tipping floor and manually inspected for hazardous waste if any.
- Segregation of further waste material is done manually, useful material like unbroken bricks etc are reused.
- Big concrete pieces are crushed into smaller pieces of size 200mm-400mm mechanically.

#### These are further taken to wet-processing method where, Sequential Steps of Process of Recycling

1. . Density separation is done by wet process from the mix to remove plastic waste and also manual picking at the conveyors is done remove thick waste materials.
2. C & D waste is screened through screens of above 200mm size to segregate the large pieces of concrete blocks, bricks etc from the mix. These are further broken into smaller pieces by rock breaker.
3. The waste is passed through 60mm sieve to separate to remove soil and muck.
4. Size ranging from 60mm to 200mm is passed into impact crusher for size reduction.
5. Further the mix after crushing is passed through different size of sieves of 20 and 10mm to separate.

For the wet process the set machinery consisting of Grizzly, Vibo screens, Evo wash, Thickeners etc are used with centrifugal methodology separating soil and sand from mixed C & D waste. These recycled wastes are collected and stored on the ground in the form of heaps of different categories as separated. These are further supplied and used in all sorts of possible applications like in filling, manufacturing different products by mixing in concrete to produce non structural components like footpath tiles, concrete blocks, drain covers and kerb stones.

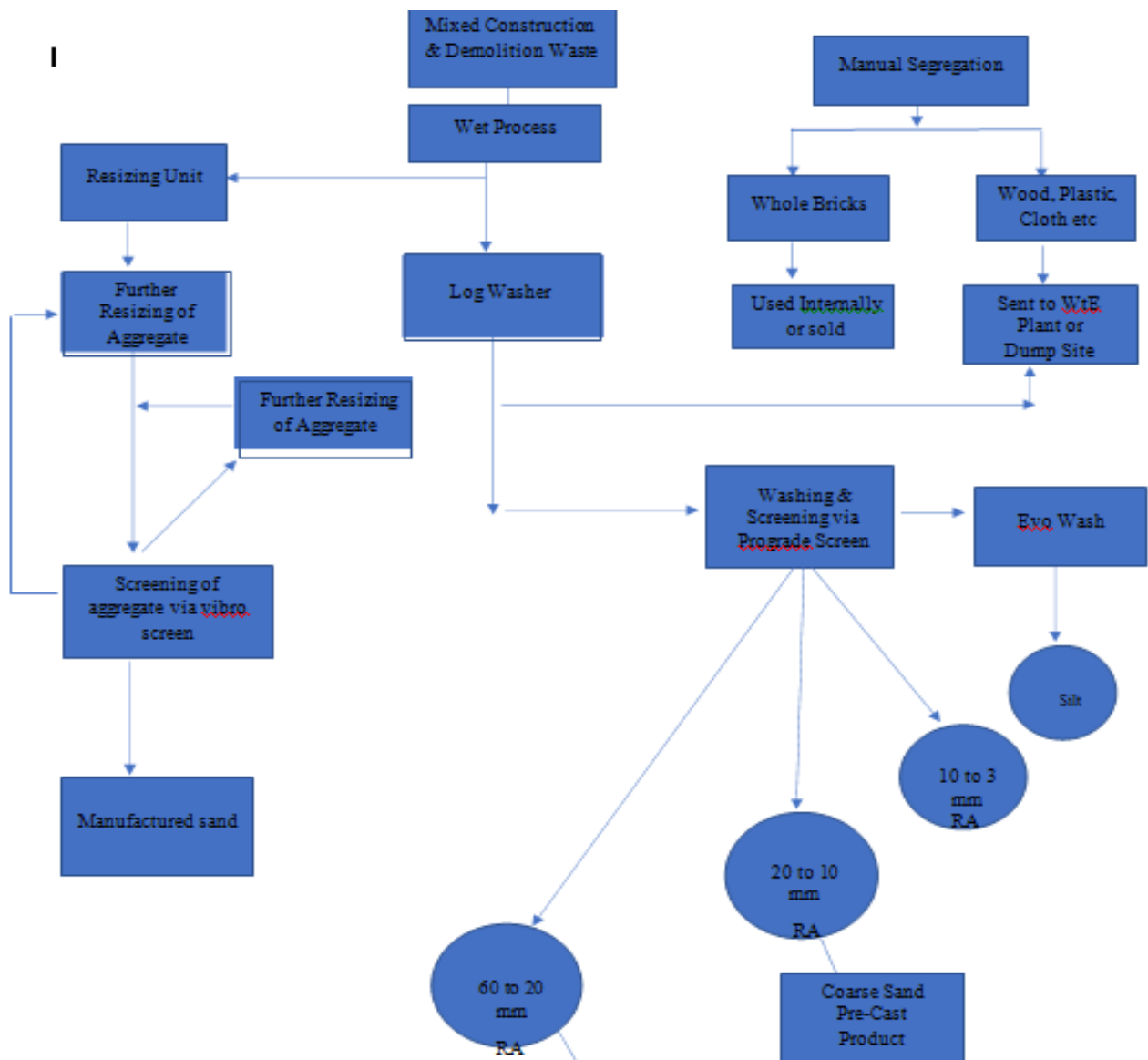


Fig4.1: flow-chart of process of recycling of c & d waste



fig 4.2: concrete block



fig4.3: paver block

**V. PROPERTIES OF RECYCLED AGGREGATES PROCURED FROM RECYCLING PLANT**

Different types of aggregates procured from recycling plant after recycling of C & D waste were tested in the laboratory to analyse their properties and behavior. The test performed were based on IS defined procedures. The tests performed are tabulated below with their results:

Table5.1: Test Result of Recycled Coarse Aggregate (20mm)

S. No.	Test performed	Result	Limits as per IS
1.	Impact Value Test	41%	30 – 40%
2.	Crushing Value Test	35%	30 – 40%
3.	Water Absorption Test	4.4%	0.1 – 2.0%
4.	Specific Gravity	2.29	2.5-3.0

Table5.1: Test Result of Recycled Fine Aggregates

S. No.	Test performed	Result
1.	Sieve Analysis of F.A.	F.M. = 0.58%

## VI. CONCLUSIONS & RECOMMENDATIONS

6.1 The following conclusions were drawn from the study are as follows-

- i. The amount of construction waste generated for different types of construction work has to be quantified in India.
- ii. Aggregates tested were having high water absorption, less crushing strength etc. hence, there properties must be improved before using them for concrete.
- iii. Maximum strength achieved for recycled aggregate concrete is only M 15 by the recycling plant, hence there is need to improve the strength and its applicability in construction.
- iv. Increasing demand and depletion of natural resources to fulfill the demands of raw material, awareness programs are required to maximize the use of recycled aggregate.
- v. Strict rules and laws should be formed to implement the use of recycled aggregate concrete.
- vi. Government should turn-up with new plans to set up more recycling plants and reduce the C & D waste.
- vii. Management in handling C & D waste is lacking behind in India.

6.2 The following Recommendations that are drawn are-

- i. Segregation of waste has to be done on the source of waste generation level.
- ii. More segregation of C & D waste is required to increase the quality of recycled aggregate and its applicability.
- iii. Duty free and tax free services should be provided by the government to motivate recycling plants producers and consumers.
- iv. Number of products of utilization with better grades of concrete can be increased to use waste by-products more efficiently.
- v. Aggregates recycled should be pre-treated before construction.

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## REFERENCES

- [1] Indian concrete Institutes, Guidelines on recycling, use and management of C&D waste , Report of the Technical committee ICI/TC/05, October 2013.
- [2] Brundtland Commission: World Commission on Environment and Development (WCED) 1987 Our Common Future, p.43. Oxford University Press, Oxford.
- [3] Symonds in association with ARGUS, COWI and PRC Bouwcentrum (1999) Construction and Demolition waste management practices, and their economic impacts.
- [4] Ministry of environment and forests (MOEF), Govt. of India, The construction and Demolition waste (Management and Handling ) Rules ,2014 (under finalisation).
- [5] Report of the committee to evolve road map on management of wastes ,MOEF, govt. of India, March 2010,47p
- [6] Workshop : Construction Demolition Waste Recycling (CWDR)-JNTUH-CPWD ,Kukatpally, Hyderabad Feb,2015.
- [7] Rao A., Jha K.N and Mishra S., 2005. Use of aggregates from recycled construction and demolition waste in concrete . Resources conservation & recycling 50(1), 71-81.
- [8] Demolition and Reuse of Concrete and Masonry, Proceedings of the third International RILEM Symposium, 1993.
- [9] Nagapan, S., Rahman, A.I. and Asmi, A., 2012. Factors Contributing to Physical and Non-Physical Waste Generation in Construction Industry. International Journal of Advances in Applied Sciences, 1(1), 1-10.
- [10] Report of the committee to evolve road map on management of wastes , MOEF, govt. of India, March 2010,47p.