

## Construction and demolition waste management

Ronak Verma, Nishikant Arya, Sooraj Kumar

Environmental Engineering, Delhi Technological University

### ABSTRACT

Demolition waste is waste from the destruction of houses, large building structures, roads, bridges and dams. The construction industry in India generates about 10-12 million tons of waste every year. Although reusable items (such as bricks, wood, metal) are recycled in India, old concrete and masonry (>50%) are recycled. Half of all waste is not recycled. Demolition waste (C&D) authorities sometimes make rules, but often do not follow these rules. The report is expected to become a pilot project. The purpose of this study is to collect relevant literature to provide information on the demolition waste disposal strategies of different countries and the role of regulatory agencies in demolition waste disposal. Disassemble waste, its harmful effects and provide safe methods of recycling/reuse/disposal. Based on this research, a C&D waste management plan was developed. In order for the demolition to be carried out effectively, the plan needs to be proposed and implemented by the local government, which will greatly reduce the pollution caused by construction and demolition waste.

### 1. INTRODUCTION

Construction and floating wastes are generated during the construction, renovation, renovation and dismantling of houses, large building structures, roads, bridges and dams. Construction and demolition waste includes: concrete, soil, steel, wood and plastic, and other materials: bricks and mortar.

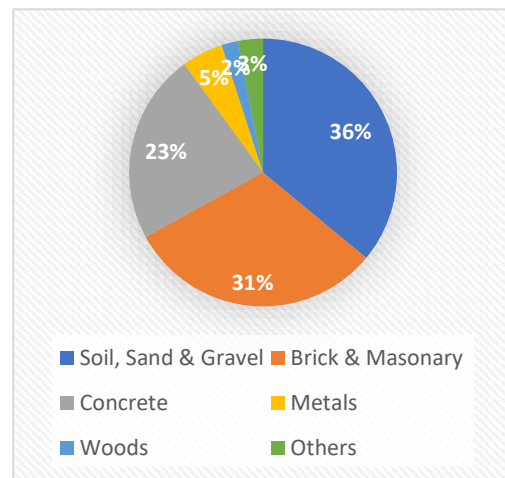
#### Table:1 Typical composition of C&D waste

##### 1.1 Quantum of Waste:

Wastes will be generated at different stages of the construction process. During the construction process, waste materials/removal caused by structural changes or poor craftsmanship, etc. After the construction is over, too much cement or concrete will be left, resulting in a waste of 500 or 500 tons. 300 kg/m<sup>2</sup>...The waste generated during construction is estimated to be 40 to 60 kg/m<sup>2</sup>, and the waste generated during renovation/reconstruction is estimated to be 40 to 50 kg/m<sup>2</sup>. There are two forms of concrete treatment: reinforced concrete (the structural element of a building) and foundation (non-reinforced concrete). Excavation produces topsoil, clay, sand and gravel, which can be reused as backfill in the same area after excavation is completed. Over time, it will collapse into ruins. Stones are generated during excavation or when demolishing old buildings.

##### 1.2 CONSTRUCTION AND DEMOLITION WASTE AND POSSIBLE USES:

- Industrial sand (M sand): Industrial sand is also produced by grinding construction and demolition waste. However, these materials are relatively small and can replace natural sand



in unsupported structures. Only materials with a mesh size of 0.075 to 4.750 mm are classified as sand M, and particles smaller than 0.075 mm are classified as dust particles suitable for daily MSW coverage only. • Melting-waste is melted during the melting process, so it is recycled into new products. All waste and demolition waste can be reused or recycled through melting.

- Landfill: In India, construction and demolition waste is most commonly used as landfill material. Pour into wells, ditches, etc. And compact to fill or use it to increase the height or create the top layer for the building.
- Reuse: Use recyclable materials, such as wood, intact bricks and ceramics, which can be used for after-sales temporary structures. Or, if handled correctly, it can be used for permanent structures.
- Other uses: The construction and demolition waste used for other secondary purposes is also used as a base material for fertilizer treatment, roof filler, decorative rubble, etc. Depending on its composition and type, construction and demolition waste can be recycled and reused for various purposes. The customs classification of waste is as follows.

1. Granular substrate (GSB): Regardless of the type of building, waste and demolition waste can be used as the GSB layer for road construction. Objects of different sizes overlap directly under the road surface. It can be used as a load and reinforcement component for road structures. It can also drain road structures and protect them from frost.
2. Recycled Concrete Aggregate (RCA)-Waste concrete can be recycled and reused to make aggregates of various standard sizes to replace natural aggregates in the construction process. Can be used in any structural or non-structural application.
3. Recycled Aggregate (RA)-Standard size milled aggregate made from a mixture of C&D waste is called Recycled Aggregate (RA). PA can be used to partially replace natural aggregates in non-load-bearing structures. According to Indian standards, it can replace 20% of traditional cement concrete and 30% of road construction, but laboratory test results are expected to be confirmed. RA can also be used for the construction of precast concrete parts of RCC, such as paving stones, curbs, concrete tanks and sculptures.

**Table 2- C&D waste and its potential use**

MATERIAL	PROCESS	END USE
Plain Concrete	Crushed	Aggregate
Fresh Concrete	Washed to remove cement & recover aggregate	Aggregate
Reinforced Concrete	Crushed & Steel bars removed, Steel recycled	Aggregate
Clay bricks & roof tiles	Cleaned, Crushed, Pulverized	Masonry, Aggregate, Building Materials
Brick	Cleaned & Crushed	Aggregate & Filling material

Source:

[https://re.urban-industrial.in/live/hrdpmp/hrdpmaster/igep/content/e64918/e64922/e67075/e67087/GIZ\\_CD\\_eTrainingManual.pdf](https://re.urban-industrial.in/live/hrdpmp/hrdpmaster/igep/content/e64918/e64922/e67075/e67087/GIZ_CD_eTrainingManual.pdf)

## 2. OBJECTIVE OF STUDY

The Scope of the work is limited to collection of literature on demolition waste management which includes properties of demolition waste, its hazardous effects. The scope of this work is also: -

- To find out what is the need to process C&D waste.
- To study demolition waste management strategies in our country.
- To study the role of regulatory authorities in demolition waste management.

### 2.1 Necessity of management of C&D waste

For stakeholders, the importance of managing construction and demolition waste has not been lost, especially in large cities that have already felt the impact. However, various challenges and their implementation hinder the effective disposal of construction and demolition waste. This is far from ideal. The system and the environment can be roughly divided into the following aspects in many aspects:

- Sidewalks, driveways, alleys and all other places have a large amount of demolition and construction waste-common in Indian cities, which makes the environment unsightly.
- Generally speaking, conventional street cleaners or household garbage collectors cannot dismantle C&D wreckage because they usually lack equipment, insufficient vehicles to collect garbage, and insufficient personnel.
- Generally, pollution tends to add other municipal solid waste to the mixture of other wastes.

CITIES	WASTE GENERATED (in million tonnes/annum)	CAPACITY OF RECYCLING (in million tonnes/annum)	FINE FOR ILLEGAL DUMPING
GURUGRAM	800	300	RS 5000
DELHI	7000	4150	RS 5000
AHMEDABAD	700	1000	NA
MUMBAI	2500	1200	RS 1000
BENGALURU	3500	750	RS 50000
CHENNAI	2500	1200	RS 2000
HYDERABAD	5000	300	RS 5000
PUNE	300	125	RS 25000
KOLKATA	1600	NA	RS 50000

Cause unhealthy conditions

- Construction and demolition waste is also carefully stuffed into open channels, waterways and even drains, causing flooding. In India, flooding is reported to have caused epidemics to spread.

**Table 3- C&D waste generation from some selected cities**

Source: <https://www.downtoearth.org.in/news/waste/india-drowns-in-construction-demolition-debris-65110>

### 3. METHODOLOGY

Method of Approach for Achieving the Objectives are: -

1. Collect literature from internet and journals

2. Visit local C&D Processing site and enquire about the strategies adopted.

The following aspects are going to be studied: -

Classification of various major and minor components of demolition waste, Properties of various major and minor components of demolition waste, Recycling and reuse of various components of demolition waste, Planning and management aspects, Institutional and regulatory aspects.

### **3.2 Management of C&D waste in India: -**

Currently, waste management in the construction industry in India includes the following elements: -

- Reuse of recovered materials in good condition during demolition.
- All metal items are sent for smelting by scrap dealers.
- Dispose of other items in low locations.

Various surveys on the reasons for the reduced use of recycling processes in India have shown the following: -

- 70% of the respondents cited a lack of awareness of recycling techniques as one of the main reasons for not adopting recycling. Recycling of waste from the construction industry.
- 30% of Respondents indicated that they are not even aware of the recycling options.
- 67% of respondents from the user industry cited the unavailability of recycled products as a reason for not using them.
- The use of recycled products indicates that there are currently no specifications available in the Indian standard codes for the use of recycled material in construction.

### **3.3 Processing of C&D waste in India: -**

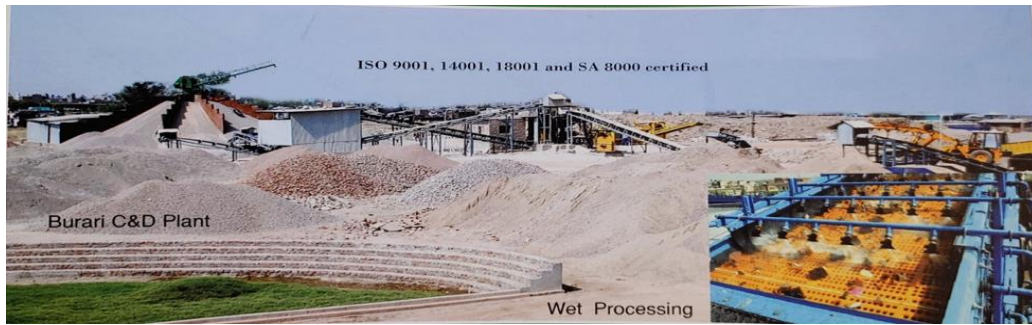
Construction and demolition waste make up a significant part of the total waste mass in almost all industrialized and developing countries. In many countries, a large part of construction and demolition waste is processed and used as raw material and then dumped in landfills. Due to the enforcement of stringent environmental laws and changes in MSW management regulations in the country, construction and demolition waste processing is sometimes gaining popularity in Indian cities as well.

### **3.4 Recycling of waste: -**

IL & FS Environment has set up India's first operational large-scale recycling facility for construction and demolition waste for North Delhi Municipal Corporation as part of a PPP framework. The Burari plant will help ease the pressure of 5,000 tons of construction and demolition waste that Delhi generates every day recycling into building-grade aggregates.

C&D waste can be: -Reuse (on site) of bricks, flagstones, wood, pipes, handrails, etc. as much as possible and depending on the condition. Sale / auction of material that cannot be used on site due to design limitations or design changes. Recycling industries can use plastics, broken glass, scrap metal, etc. for construction activities such as sorting under the lane layer on which traffic cannot be used. They represent heavy moving loads, and larger unusable parts can be shipped to fill in low areas.

## **4. SITE VISIT**



*Fig 3 - C&D Waste Processing Facility in Burari, New Delhi 1100 TPD Processing Capacity*

➤ **ISO 9001, 11001.18001 and SA 8000 certified**

**4.1 Burari C&D Facility Highlights**

- The country's first C&D waste recycling facility.
- Designed for processing mixed C&D waste from India. Processes over 2 million tons and saves 25 acres of land per 250 million rupee bank worth, protects waterways.
- Saves valuable natural resources such as aggregates in the construction industry.
- Wet processing technology reduces dust (SPM) and noise pollution.
- It can recycle/recover 95% of waste in an environmentally friendly.

The Burari plant is India's first construction and demolition waste recycling platform. IL&FS Environmental Infrastructure and Services Limited (IEISL) has been India's leading waste management company for 13 years. Among them, 7000 dpi is Delhi's own product portfolio and is under development. Burari's C&D recycling facility converts 5,000 tons of waste generated daily in the city of Delhi into construction grade aggregates, thereby reducing its pressure.

- Senior Executive Director Vaibhav Agarwal introduced to us the process of asset management, involving product processing and the characteristics of the Burari plant:-
  - The country's first C&D waste treatment facility.
  - Designed to treat mixed waste from C&D from India, it can recycle more than 2 million tons and save 25 acres of land worth 2.5 billion rupees.
  - Wet processing technology helps reduce dust and noise pollution.
  - Almost all waste is recycled in this facility.
  - The Delhi government requires that all city contracts must include 10% of recycled construction and demolition products.



**Fig 4 - Cement bricks**



**Aggregates from recycling**



The facility collects waste from different parts of the city and uses transportation methods to collect waste. The asset management process begins. The construction and demolition waste is processed through the technology used in the factory, which provides us with these equipment. These recycled aggregates are reused in the construction industry.

**Table 4 - Allow the use of C&D products. IS: 383(2016)**

Sr. No.	Type of Aggregate	Maximum Utilization		
		Plain Concrete Percent	Reinforced Concrete Percent	Lean Concrete (less than M-15 Grade Percent)
(i)	Coarse aggregate			
(a)	Recycled concrete aggregate (RCA)	25	20 (Only up to M-25 Grade)	100
(b)	Recycled aggregate (RA)	Nil	Nil	Nil
(ii)	Fine aggregate			
(a)	Recycled concrete aggregate (RCA)	25	20 (only up to M-25 Grade)	100

Source: [https://www.bmtpc.org/DataFiles/CMS/file/PDF\\_Files/C&D\\_Ready\\_Reckoner\\_BMTPC\\_web.pdf](https://www.bmtpc.org/DataFiles/CMS/file/PDF_Files/C&D_Ready_Reckoner_BMTPC_web.pdf)

## 5. RESULT

Construction and demolition waste usually occurs where construction or demolition work is carried out. Construction and demolition waste is easy to find because it may contain harmful substances such as asbestos and lead. Construction and demolition waste includes

- concrete
- soil
- steel
- wood and plastic
- bricks, etc.

Construction waste usually comes from the following sources:

- Design sources
- Mining sources
- Residual sources
- Material processing sources
- Other sources of construction waste are the main threat to the environment.

## 6. CONCLUSION

Due to the rapid growth of the construction industry, India will generate more construction and demolition waste. If measures are not taken to dispose of construction and demolition waste, this may pose a threat to the environment and the country's sustainable development. The C&D amount of waste generated by identifying potential waste early in the design phase.

- Indian law only allows the use of building materials of natural origin. Construction companies have referred to regulations and guidelines issued to avoid the use of recycled construction and demolition waste.

- After developing environmental management guidelines for C&D waste in India in 2016, the government encouraged the use of C&D waste.
- Recyclable and non-recyclable C&D waste should be separated at the source of generation to facilitate the recycling process, and an institutional waste collection mechanism should be established, which should include an informal sector that can be trained to deal with waste separation, and this can be used, Reuse and recycling, for example, using shredded construction waste to make ceramic.
- Waste generators, such as builders and developers, must pay for the generation of construction and demolition waste.
- Some guidelines or standards related to the treatment and recycling of C&D waste should be formulated, and environmentally sound waste treatment technologies should be adopted. Like other countries (such as Germany, Denmark and Hong Kong), it should be passed nationwide.
- For indiscriminate waste disposal, fines or taxes should be imposed. Promote the use of recycled aggregates in new buildings.
- Tax exemption should be implemented. Further efforts are needed to educate on waste reduction and recycling, identify and use recycling opportunities, and overcome obstacles related to conservatism. Stakeholders and ordinary people should have easy access to these procedures.

## 7. SCOPE OF STUDY

A general approach for Construction and demolition waste management plan consists of following:

- Identifying needs of C&D waste management needs
- Identifying financial requirements
- Identifying and coordinating with personnel to achieve the targets
- Consideration of appropriate medium for mass awareness of C&D waste and recycled products
- Understanding C&D waste management practices

## 8. References:

- [https://www.bmtpc.org/DataFiles/CMS/file/PDF\\_Files/C&D\\_Brochure\\_BMTPC\\_CFARM.pdf](https://www.bmtpc.org/DataFiles/CMS/file/PDF_Files/C&D_Brochure_BMTPC_CFARM.pdf)
- [http://164.100.228.143:8080/sbm/content/writereaddata/C&D%20Waste\\_Ready\\_Reckoner\\_BMTPC\\_SBM.pdf](http://164.100.228.143:8080/sbm/content/writereaddata/C&D%20Waste_Ready_Reckoner_BMTPC_SBM.pdf)
- <https://cpcb.nic.in/rules-7/>
- <https://cpcb.nic.in/openpdf.php?id=UmVwb3J0RmlsZXMvNDYwXzE1MDIxNzAwNzJfbWVkaWFwaG90bzEwMDg0LnBkZg==>
- [https://niti.gov.in/sites/default/files/2019-03/CDW\\_Strategy\\_Draft%20Final\\_011118.pdf](https://niti.gov.in/sites/default/files/2019-03/CDW_Strategy_Draft%20Final_011118.pdf)
- <https://docplayer.net/54841763-Construction-waste-management-in-india.html>
- <https://juniperpublishers.com/cerj/pdf/CERJ.MS.ID.555658.pdf>
- <http://cpheeo.gov.in/upload/uploadfiles/files/chap4.pdf>
- [https://niti.gov.in/writereaddata/files/CDW\\_Strategy\\_Draft%20Final\\_011118.pdf](https://niti.gov.in/writereaddata/files/CDW_Strategy_Draft%20Final_011118.pdf)
- [https://www.bmtpc.org/DataFiles/CMS/file/PDF\\_Files/AR\\_1819\\_English.pdf](https://www.bmtpc.org/DataFiles/CMS/file/PDF_Files/AR_1819_English.pdf)