

Name of report:

***Guidelines on Environmental Management of C&D Waste Management in India
(CPCB's Draft February 2017)***

INDEX OF CONTENTS

1. C&D Waste Management Rules, 2016 - Notification
2. Definition of C&D waste & Applicability of the Rules
3. Bulk C&D waste generators
4. Guidelines on Environmental Management of C&D Waste Management in India
5. Objectives and scope of the Guidelines
6. Uncertainty in quantum of generation of C & D waste
7. Thumb rules for estimation of C&D waste generation for India
8. Composition of C & D waste is project specific
9. Environmental degradation in cities due to indiscriminate disposal of C&D wastes
10. Effective C&D Waste Management is an approach to conservation of natural resources and creating employment opportunities
11. Thrust areas in C&D waste management – National Building Code (NBC)
12. 'Sustainable Model' on C&D waste management
13. The Rules promotes C&D waste utilization
14. Type of C&D wastes products suggested under Rules
15. Initiatives to promote recycling of C&D waste in India
16. Roadmap for C&D waste management - Targets & timelines
17. Hierarchy in waste management
18. Options in C&D waste processing / recycling facilities
19. *Guidelines w.r.t. Building Sector - Building Materials and Technology Promotion Council (BMTPC)*
20. *Guidelines w.r.t. Building Sector - Central Public Works Department (CPWD)*
21. Necessary guidance for setting up C&D waste management operations
22. Separation distances (or buffer area)
23. Common environmental impacts from C&D operations
24. Environmental pollutants highlighted under C&D Waste Management Rules
25. Overview of environmental impacts from C&D operations
26. Public complaints – mainly on NOISE generation
27. NOISE mitigation strategies in C&D operations
28. DUST –environmental pollutant in C&D waste operations
29. DUST mitigation strategies in C&D operations
30. Other pollution abatement measures and safety issues
31. C&D waste processing facility – 'ORANGE' category activity
32. Some GOOD PRACTICES in C&D waste management
33. Initiatives by some civic bodies (ULBs) in C&D waste management

C&D Waste Management Rules, 2016 - Notification

The Construction and Demolition (C&D) Waste Management Rules, 2016 was notified vide G.S.R. 317(E) 29th March, 2016 by the Ministry of Environment, Forest and Climate Change (MoEF&CC).

Definition of C&D waste & Applicability of the Rules

As per Rule 3 (c) "*construction and demolition waste*" means waste comprising of building materials, debris and rubble resulting from construction, re-modeling, repair and demolition of any civil structure.

The rules shall apply to every waste resulting from construction, re-modeling, repair and demolition of any civil structure of individual or organization or authority who generates construction and demolition waste such as building materials, debris, rubble.

Note in many countries also include surplus and damaged products and materials arising in the course of construction work or used temporarily during the course of on-site activities.

Bulk C&D waste generators

- a. Under Rule 3 under Definitions – sub-rule (1)(j) **“waste generator”** means any person or association of persons or institution, residential and commercial establishments including Indian Railways, Airport, Port and Harbour and Defence establishments who undertakes construction of or demolition of any civil structure which generate construction and demolition waste.
- b. Under Rule 4 sub-rule (3) :
Waste generators who generate more than 20 tons or more in one day or 300 tons per project in a month are **bulk C&D waste generators**. As per the Rules, the segregation by bulk C&D waste generators shall be done into four streams such as:
 - i. concrete
 - ii. soil
 - iii. steel, wood and plastics, bricks and mortar

Guidelines on Environmental Management of C&D Waste Management in India

The draft “*Guidelines on Environmental Management of C&D Waste Management in India (2017)*” has been prepared by CPCB in compliance of under *Duties of the Central Pollution Control Board under Rule 10 sub-rule 1(a)* of Construction and

Demolition (C&D) Waste Management Rules, 2016 states 'prepare operational GUIDELINES related to environmental management of construction and demolition waste management'. Part II is in compliance of the above-mentioned rule.

CPCB has constituted an expert Committee to advise it on matters pertaining to Implementation of C&D Waste Management Rules, 2016 that includes the above Guidelines.

Objectives and scope of the Guidelines

The key objectives of the Guidelines are intended to:

- a. promote an integrated approach , whereby environmental management of construction and demolition waste is given due consideration throughout the duration of the project ;
- b. approach has been towards reduction of environmental impacts
- c. provide both general and specific guidance in relation to the preparation of satisfactory construction and demolition waste management plans for projects which exceed a specified threshold size

These Guidelines - '*Guidelines on Environmental Management of C&D Waste Management in India*' have been prepared with the primary objective to encourage an integrated approach to construction and demolition (C&D) waste management (includes C&D waste processing facilities) and provide both general and specific guidance in relation to the preparation of satisfactory environmental construction and demolition waste management practices in cities with varying population.

The scope of the guidelines is to serve as a guiding tool :

- a) In preparation of project specific C&D Waste Management Plans for those generating more than **20 tons or more in one day or 300 tons per project in a month of installed capacity (bulk generators)** in cities with more than million plus population.

The applicability of such Plans shall cover public and private sector developmental projects to assist all stakeholders to provide a platform for determining the adequacy of a project specific C&D Waste Management Plan w.r.t. reduction of environmental impacts.

- b) To provide general guidance in relation to the preparation of satisfactory environmental construction and demolition waste management practices in cities with less than one million population

The guidelines recommends pollution mitigation measures in operation of C&D dump sites/waste processing facilities. The reference to 'operators; in these Guidelines imply operators of bulk C&D waste management/waste recycling facilities (henceforth referred to as 'operator(s)).

Uncertainty in quantum of generation of C & D waste

There is an uncertainty of the quantum of generation of C&D wastes in India either per month or annually. There are several factors contributing the to the uncertainty they are level of urbanization, rate of growth of cities and the development plans w.r.t. landuse. The quantum of C&D waste generation figures vary however on an average C&D waste accounts for about 30 percent of all solid waste produced in a city.

The quantum of generation of C&D waste estimates available are given below:

- a. 10 MT -15 MT (MT – million tonnes) per year by MoUD (2000);
- b. 12 MT - 15 MT by TIFAC (2001);
- c. 10 MT -12 MT by MoEF (2010) and
- d. 12 MT by CPCB
- e. 165-175 MT per annum during 2005-2013 (BMTC)

Forecast: Presently, C & D waste generation in India accounts upto **23.75 million tons** annually and these figures are likely to double fold **upto 2016**. (Source International Society of Waste Management, India)

Thumb rules for estimation of C&D waste generation for India

Technology Information, Forecasting and Assessment Council's (TIFAC) thumb rules for estimation of C&D waste recognises that the generation is project specific, TIFAC's C&D waste estimation are as follows :

- i. Range 40-60 kg per sq.m of new construction,
- ii. Range 40-50 kg per sq.m of building repair
- iii. Range 300-500 kg per sq.m for demolition of buildings.

From the above it may be noted that the highest waste generation comes from demolition of buildings. C&D waste generation figures for any region fluctuate as it depends largely on the type & nature of construction/demolition activities.

Composition of C & D waste is project specific

1. The composition of C & D waste can vary depending on age of building being demolished / renovated or the type of buildings being constructed. As mentioned earlier, C&D waste generation figures for any region fluctuate as it depends largely on the type and nature of construction / demolition activities.
2. Demolition waste characteristics : In India, when old buildings are demolished, the major demolition waste is soil, sand and gravel (26%), bricks & masonry (32%), Concretes (28%), metal (6%), wood (3%) others (5%). Bricks, tiles, woods and iron metal are sold for reuse / recycling.(BMTPC)
3. The typical composition of Indian C & D waste: The major constituents are concrete, soil, bricks, wood, asphalt and metal. Brick & masonry, soil, sand & gravel account for over 60% of total waste. (Source- Municipal Corporation of Delhi , Burari facility)
4. Excavations, concrete, masonry and wood together constitute over 90% of all C&D waste

Environmental degradation in cities due to indiscriminate disposal of C&D wastes

As per C&D Waste Rules (Rule 4 sub-rule (4)) there should be no littering or deposition of construction and demolition waste so as to prevent obstruction to the traffic or the public or drains

Instances of environmental degradation caused in cities due to indiscriminate disposal of C&D waste are listed below:

- i. Due to lack of options for dumping in designated sites, low lying areas or abandoned quarries, vacant plots or sometimes even the outskirts of the city often become targets for dumping debris from the construction and demolition (C&D) of a city.
- ii. Often C&D is dumped on roadsides quietly by C&D waste generators.
- iii. Private contractors remove waste to privately owned, low-lying land for a price, or more commonly, dump it in an un-authorized manner along roads or other public land.
- iv. C&D debris is being indiscriminately dumped in drains (nallahs) which clogs drains and encourages growth of mosquitos and other disease causing environment.

- v. There are cases reported cases C&D wastes are used to illegally fill up water bodies and wetlands around urban centres for real estate development.
- vi. As C&D waste forms a part of solid waste it gets disposed in landfills, as this is the cheapest option of disposal of C&D waste.
- vii. C&D waste from individual households finds its way into nearby municipal bins and waste storage depots making the municipal waste heavy, and degrading its quality for treatments such as composting or energy recovery.

Effective C&D Waste Management is an approach to conservation of natural resources and creating employment opportunities

Some key benefits of efficient recycling and reusing of C&D waste are listed below :

- i. Reduces the pressure for utilisation of new construction materials / need for further mining operations. Mining activity if not properly monitored degrades the environment
- ii. Reduction of demand for energy and water in manufacture of building materials from mined / natural resources (thereby reducing GHGs and environmental impacts arising from mining , manufacturing and transportation)
- iii. Reduces quantum of transportation and disposal of C&D wastes to be handled
- iv. Proper segregation of C & D waste avoids mixing with bio-degradable waste destined for MSW treatment facilities/landfills
- v. Promotes options for use of products from C&D waste
- vi. Roads sides and vacant plots could be freed from debris dumps thereby giving cities a better facelift
- vii. Creates employment generation:
 - a. C&D waste management activities (segregation , reuse & recycling) being labour intensive activities, generate employment opportunities
 - b. The manufacturing & sale of recycled products creates a market this further opens further job opportunities.

Thrust areas in C&D waste management – National Building Code (NBC)

Some key thrust areas (NBC 2005) regarding C&D waste reuse/recycling :

1. Establish utilization of C&D wastes in concrete and concrete based products by preparing standards
2. Quality control and certification
3. Need for popularizing products from C&D waste
4. R&D activities on continuous basis in tandem with manufacturing industry and users
5. Achieving environment protection through C&D waste utilization
6. Optimizing utilization pattern of traditional materials by interfacing the same with supplementary materials.

‘Sustainable Model’ on C&D waste management

The key components of a ‘Sustainable Model’ on Construction and Demolition (C&D) Waste Management Rules 2016 can include the following:

- i. Proper estimation of C&D waste generation
- ii. Initiatives from the local administration / civic bodies
- iii. Identified sites and approval of land for development of integrated C&D processing facilities
- iv. Specifications / standards for recycled C&D waste products
- v. Landfill levy
- vi. Awareness campaign
- vii. List out and mandate use of recycled products from C&D wastes
- viii. Research on economically viable C&D recycling options
- ix. Map all water bodies in a city / region

The Rules promotes C&D waste utilization

The Construction and Demolition (C&D) Waste Management Rules, 2016 promotes C&D waste utilization.

Under Rule (6) under Duties of Local Authority , the following sub-rules states :

- i. sub-rule (9) ‘shall device appropriate measures in consultation with expert institutions for management of construction and demolition waste generated including processing facility and for using the recycled products in the best possible manner’;
- ii. sub-rule (10) ‘shall create a sustained system of information, education and communication (IEC) for construction and demolition waste through

collaboration with expert institutions and civil societies and also disseminate through their own website’;

- iii. sub-rule (11) ‘shall make provision for giving incentives for use of material made out of construction and demolition waste in the construction activity including in non-structural concrete, paving blocks, lower layers of road pavements, colony and rural roads’.

Under Rule (7) mentions the ‘Criteria for storage, processing or recycling facilities for construction and demolition (C&D) waste and application of construction and demolition waste and its products.’

Under **Schedule I** (Rule (7) (1)): Construction and demolition waste shall be utilized in sanitary landfill for municipal solid waste of the city or region as mentioned under Schedule I’.

- a) The Rule (7) sub-rule (3) gives Application of materials made from construction and demolition waste in operation of sanitary landfill shall be as per the criteria given in **Schedule II**.
- b) The Rule (9) sub-rule (4) mentions that the ‘Procurement of materials made from construction and demolition waste shall be made mandatory to a certain percentage (say 10-20%) in municipal and Government contracts subject to strict quality control.’
- c) Rule (11) under Duties of Bureau of Indian Standards (**BIS**) and Indian Roads Congress (**IRC**) ‘The Bureau of Indian Standards and Indian Roads Congress shall be responsible for preparation of code of practices and standards for use of recycled materials and products of construction and demolition waste in respect of construction activities and the role of Indian Road Congress shall be specific to the standards and practices pertaining to construction of roads.’

Type of C&D wastes products suggested under Rules

The C&D wastes products suggested under the Construction and Demolition (C&D) Waste Management Rules, 2016 are as follows :

- i. Under Rule (6) under Duties of Local Authority : sub-rule (11) ‘shall make provision for giving incentives for use of material made out of construction and demolition waste in the construction activity including in non-structural concrete, paving blocks, lower layers of road pavements, colony and rural roads’.

- ii. Under **Schedule I** (Rule (7) (1)): Construction and demolition waste shall be utilized in sanitary landfill for municipal solid waste of the city or region as mentioned under Schedule I'. The Rule (7) sub-rule (3) gives Application of materials made from construction and demolition waste in operation of sanitary landfill shall be as per the criteria given in **Schedule II**.
- iii. The Rule (9) sub-rule (4) mentions that the 'Procurement of materials made from construction and demolition waste shall be made mandatory to a certain percentage (say 10-20%) in municipal and Government contracts subject to strict quality control.'

Initiatives to promote recycling of C&D waste in India

"The demand for aggregates in 2007 has seen an increase by five percent, to over 21 billion tones, the largest being in developing countries like example India". (Study by Asian Institute of Technology (AIT), Thailand for some Asian countries included India , report released in May 2008). Construction accounts for nearly 65 per cent of the total investment in infrastructure and the trend is increasing, it hence all the more important how to effectively manage C&D waste w.r.t. reuse & recycle. Some key initiatives on C&D C&D waste management in India is given below :

1. Ministry of Urban Development (**MoUD**) : Ministry of Urban Development vide circular dated June 28, 2012, directed States to set-up such facilities in all cities with a population of over 10 lakh. (one million plus cities) to establish environment friendly C&D recycling facilities (eference base being the first C&D waste processing facility commissioned in Delhi in Burari model). The MoUD report 'Technical Aspects of Processing and Treatment of Municipal Solid Waste', Swach Bharat Mission (MoUD 2016) also recognises the need for C&D waste management Page 227)
2. Ministry of Environment, Forest and Climate Change (**MoEF&CC**): India has provisions for the protection and improvement of the environment in its constitution. Environmental considerations have been integrated into all levels and the National Environment Policy of 2006, incorporation of the concept of 3Rs, is reflected in all the notified waste management rules (MSW, plastic, BMW, HW , e-wastes). A Report of the Committee to 'Evolve Road Map on Management of Wastes in India (2010)' highlights C&D problems, it recognised the utility of the

waste and also acknowledged lack of data on the waste generation. The C&D Waste Management Rules, 2016 were notified by MoEF&CC vide notification no. G.S.R. 317(E) dated 29th March, 2016.

3. Bureau of Indian Standards (**BIS**):

Under the Construction and Demolition (C&D) Waste Management Rules, 2016 Rule (11) under Duties of Bureau of Indian Standards (**BIS**) and Indian Roads Congress (**IRC**) 'The Bureau of Indian Standards and Indian Roads Congress shall be responsible for preparation of code of practices and standards for use of recycled materials and products of construction and demolition waste in respect of construction activities .' Earlier there were no specifications or codes for C&D waste processing / products / recycling however BIS IS: 383 was the principal driver , the standard for coarse and fine aggregates for use in concrete was revised in January, 2016, permitting use of recycled aggregates up to 25% in plain concrete, 20% in reinforced concrete of M-25 or lower grade and up to 100% in lean concretes of grade less than M-15.

National Building Code (NBC) of India 2005 : Part 11 of NBC 2005 on '*Approach to Sustainability*', states that :

- a. Recycled Coarse Aggregate may be used in concrete for bulk fills, bank protection, base/fill of drainage structures, pavements, sidewalks, kerbs and gutters etc.
- b. Up to 30 percent of natural crushed coarse aggregate can be replaced by the recycled concrete aggregate
- c. This percentage can be increased up to 50 percent for pavements and other areas which are under pure compression

4. Building Material & Technology Promoting Council (**BMTPC**): BMTPC in 2016 released "*Guidelines for utilization of C&D waste in construction of dwelling units and related infrastructure in housing schemes of the Government*". The guidelines on Construction and Demolition (C&D) waste addressed the building industry

5. Central Public Works Division (**CPWD**) : : The guidelines "*Guidelines for Sustainable Habitat* (March 2014)" are based on reports of National Mission on 'Sustainable Habitat' by the Ministry of Urban Development (MoUD) and draft code on "*Approach to Sustainability*" as part of National Building Code (NBC 2005). The PART IV of the Guidelines for 'Sustainable Habitat' discusses 'Guidelines on reuse

and recycling of Construction and Demolition (C&D) waste. The guidelines on Construction and Demolition (C&D) waste addressed the building industry activity.

Roadmap for C&D waste management - Targets & timelines

In MOEF Performance Audit was conducted during July 2007 to December 2007 through document analysis, collection of responses to questionnaires, physical collection and testing of samples. Records and documents relating to the issue in the Performance Audit were examined and a key observation was:

‘MoEF, in consultation with the states, should prepare an action plan for the reduction, reuse and recycling of waste with clearly defined numerical targets as well as timelines for the achievement of targets.’

Roadmap w.r.t. Construction and Demolition (C&D) waste’ has addressed the above issues as discussed below :

1. The NUMERICAL TARGETS :

- a. The numerical targets for commissioning processing facilities utilisation of C&D waste is Cities are based on population
 - i. Cities with population of 01 million and above
 - ii. Cities with population of 0.5-01 million
 - iii. Cities with population of less than 0.5 million
- b. The numerical targets for based on quantum of C&D waste generation
Waste generators who generate more than 20 tons or more in one day or 300 tons per project in a month are bulk C&D waste generators.
- c. The numerical targets for Utilisation of C&D waste products :
The Rule (9) sub-rule (4) mentions that the ‘Procurement of materials made from construction and demolition waste shall be made mandatory to a certain percentage (say 10-20%) in municipal and Government contracts subject to strict quality control.’
- d. The numerical targets for setting recycling targets for C&D wastes facilities :
Landfill has been the traditional disposal destination for C&D waste or low lying areas or roadsides. However w.r.t. the waste management hierarchy , priority is given to resource value of the discarded materials vis-à-vis constraint on landfill areas. Thus, recycling gets the highest attention in waste management programs. To begin with setting a target of 80%

recycling of C&D waste with a timeline specified by civic authority depending on the type of construction / demolition activity may be explored.

Under the C&D waste Rules 2016 ‘Exemption from the compliance of norms (Schedule I (14))’, The following are exempted from the norms of pollution from **dust and noise** as mentioned above:

- i. For construction work, where at least 80 percent construction and demolition waste is recycled or
- ii. reused in-situ and sufficient buffer area is available to protect the surrounding habitation from any adverse impact.

2. The TIMELINES for achievement of targets :

The roadmap for implementation of Construction and Demolition (C&D) Waste Rules 2016 : Under Schedule III Timeframe for Planning and Implementation off the C&D Waste Rules [See Rule 13] (see below)

**Schedule III [See Rule 13]
Timeframe for Planning and Implementation**

Compliance Criteria	Cities with population of >=one million	Cities with population of 0.5-01 million	Cities with population of < 0.5 million
1. Formulation of policy by State Government	12 months	12 months	12 months
2. Identification of sites for collection & processing facility	18 months	18 months	18 months
3. Commissioning and implementation of the facility	18 months	24 months	36 months
4. Monitoring by SPCBs	3 times a year / in 4 months	2 times a year / once in 6 months	2 times a year / Once in 6 months

Hierarchy in waste management

According to United Nations Environment Programme (UNEP), waste management includes both the components of prevention and disposal of waste. The waste management hierarchy can be traced back to the 1970s, when the environment movement started to criticize the practice of disposal-based waste management. It regarded ‘waste’ argued that as it was made up of different materials it should be treated differently :

- Reduce its production
- Explore its reuse and recycle potential
- Final disposal

According to this hierarchy, the priority of any country should be to extract the maximum practical benefits from products and prevent and minimize the waste that is generated. Thus, strategies for waste disposal should focus on waste prevention and minimization through the '3 Rs' - Reduce, Reuse and Recycle.

to this hierarchy, waste disposal strategies are 'end of the pipe' solutions and should be the least favoured option. Emphasis on waste prevention and waste minimization would ensure that less waste is being produced which needs to be disposed. Waste prevention means measures aiming at the reduction of the quantity and harmfulness for the environment of diverse waste streams. Prevention is the most desirable waste management option as it eliminates the need for handling, transporting, recycling or disposal of waste. It provides the highest level of environmental protection by optimizing the use of resources and by removing a potential source of pollution.

Reducing waste includes any process or activity that avoids, reduces or eliminates waste at its source or results in reuse or recycling.

Regarding MSW , waste disposal typically involves the collection, transportation and finally, disposal of waste. Disposing waste in a landfill is the most traditional method of waste disposal and a properly designed and well-managed landfill can be a hygienic and relatively inexpensive method of disposing waste materials in a way that minimizes their impact on the local environment. However the same cannot be applied to C&D waste , prevention at source (encourage on – site management) is the preferable approach in waste management, since this removes the need for its subsequent handling, transportation and treatment.

Options in C&D waste processing / recycling facilities

As major components of Construction and Demolition (C&D) Wastes have the potential to be reused or recycled most of the city ULBs are gearing to set up integrated facilities of Construction and Demolition (C&D) waste collection and recycling facilities. Profitable use of recycled C&D waste minimises the cost of managing such waste and requirement for valuable landfill space, besides giving

employment opportunities to unemployed youth. It will also save on mining of natural resources and reduce transportation costs.

Three general ways to reuse C&D waste material in a building :

- a) reuse the structure (corresponding to renovation and design for adaptability)
- b) reuse the elements (corresponding to re-development) and
- c) recycle the material (corresponding to re-processing or re-cycling)

The three possible options that can be explored in C&D waste recycling (AIT study - 2008)

- a) Mobile C&D waste recycling
- b) Semi-Mobile C&D waste recycling
- c) Stationary plant C&D waste recycling

A brief of the three options are given below :

- a. In the **Mobile** C&D waste recycling plant , the material is crushed and screened and ferrous impurities are separated through magnetic separation. The plant is transported to the demolition site itself and is suited to process only non-contaminated concrete or masonry waste.
- b. In the **semi-mobile** C&D waste recycling plant, removal of contaminants is carried out manually and the end product is also screened. Magnetic separation for removal of ferrous material is carried out. End product quality is better than that of a Mobile unit. These plants are not capable to process a of mixed demolition waste containing matter like metal, wood, plastic, etc.
- c. **Stationary C&D waste recycling plant plants** are equipped for carrying out crushing, screening as well as purification to separate the contaminants. (ex. the 1st C&D waste processing facility commissioned in Delhi in Burari and operated by IL&FS)

Options a & b options are often found to be practical for on-site operations as LAND availability and transportation in cities are MAJOR constraints besides public resistance to set up C&D facilities (Stationary plant C&D waste recycling).

Guidelines w.r.t. Building Sector - Building Materials and Technology Promotion Council (BMTPC)

The demand of building materials for 2021-22 has been reckoned by Building Materials and Technology Promotion Council (BMTPC) as cement 380 million tonne, steel 50 million tonne, bricks 600 billion numbers, aggregate 400 million cubic meters and timber 40 million cubic meters. Data show that there is a considerable amount of shortage of conventional and traditional building materials in India. BMTPC in year 2016 (**ANNEXURE**) released “**Guidelines for utilization of C&D waste in construction of dwelling units and related infrastructure in housing schemes of the Government**”. The construction and demolition (C&D) waste discussed in this report pertains to building industry. Salient features are given below :

- i. The BMTPC Guidelines recognizes the importance given in Schedule III on time - frame for planning and Implementation [See Rule 13] in the *C&D Waste Management Rules 2016 notified by MoEF&CC vide G.S.R. no. 317(E) dated 29th March, 2016*
- ii. Cities with population > one million : MoUD vide its circular dated 28th June, 2012 all states to set up C&D waste recycling facilities in all cities with population of over 1 million.
 - a) Bulk generators : The agencies that generate C&D waste in bulk quantity to deliver the C&D debris at the recycling plant
 - b) Fee on bulk generators : The terms and conditions with the concessionaire and the fee levied on bulk producer of C&D waste are made available at a price at least 20% lower than corresponding materials from natural resources.
 - c) Criteria for setting up C&D waste processing facilities : The Civic bodies wherein current waste generation > than 2000 tpd, to set up more than one plant for recycling of C&D waste.
- iii. Cities of population < one million : Sensitization and facilitation for re-use and recycling of C&D waste may also be taken up in cities of population less than 1 million to encourage such initiative. This is because mega cities and cities with million plus population account for only 23 per cent of urban population (Census 2011).
 - a) Non-bulk generators : Collection points be provided so that small quantity generator of C&D waste is not required to transport the debris to a distance more than 2.5 to 3.0 km

- b) C&D Collection centers : to be notified wherein small quantity generators of C&D waste can deliver the C&D debris. The system and arrangements for collection and supply of C&D waste to recycling plants may be worked out and defined in an unambiguous manner.
- iv. Mandate use of C&D waste products :
- a) Mandate use of C&D waste products : As and when C&D waste recycling plant is commissioned at a city, it may be made mandatory for all construction activities to use a specified percentage of building construction materials manufactured from recycled debris.
 - b) Incentivize utilization of recycled C&D waste products : (i) All Government constructions may be mandated to use at least 20 per cent of recycled C&D waste products. (ii) All renovation projects involving demolition, even in private sector, may be mandated to use at least 20 per cent of recycled C&D waste products. (iii) The tipping fee for delivery of C&D waste to the recycling plant, terms & conditions of civic body with the concessionaire may be designed to keep the price of C&D waste recycled products about 20 per cent lower than the corresponding conventional products.
- v. Guidelines also proposes MANAGEMENT PLAN and MARKETING PLAN. Annexure-I in the BMTPC Guidelines contains the: Construction and Demolition Waste Management Rules, 2016, Gazette of India, Part-II, Section-3, Sub-section (ii)], Ministry of Environment, Forest and Climate Change.

Guidelines w.r.t. Building Sector -- Central Public Works Department (CPWD)

CPWD's Guidelines for Sustainable Habitat (March 2014) : The guidelines are based on reports of National Mission on Sustainable Habitat by Ministry of Urban Development and draft code on "*Approach to Sustainability*" as part of National Building Code (NBC 2005).

The above Guidelines has FOUR parts :

1. Guidelines on Architectural Design and Layout.
2. CPWD Sustainability index and Guidelines for materials.
3. Guidelines for selection of equipment for Electrical and Mechanical Services for sustainable buildings.

4. PART IV : Guidelines on reuse and recycling of construction and demolition (C&D) waste (ANNEXURE)

(Ref. http://cpwd.gov.in/Publication/Guideleines_Sustainable_Habitat.pdf)

Necessary guidance for setting up C&D waste management operations

- i. Provisions include appropriate plant location, road infrastructure, availability of land space, provision of weigh-bridge, provision for storage area etc.
- ii. Equipment : Different types of sorting devices and screens are used for separating contaminants from end-product and grading the recycled product in various grain sizes. Vibrating screens, star screens or disc-separators are used for removal of impurities. Other existing equipment include jaw crushers and impact crushers are used in India to suit the requirements of recycling and processing of C&D waste building materials.
- iii. A fixed recycling plant requires higher volumes of demolition waste to justify high investment in complex, screening and separation systems, which are necessary to process mixed demolition waste. It has to be located in a place, where large volume of waste is easily transported and there is a market for recycled products.
- iv. The capital investments involved in equipment and facilities required for recycling the materials is significant, unless the market for recycled aggregate is developed, economic viability of such a units would be a challenge.
- v. The capital investments involved in equipment and facilities required for recycling the materials, R & D shall be done on modifications of
A number of civic bodies in various cities have initiated the process of establishing C&D waste processing facilities in cities. India's first plant (stationary) for recycling of C&D waste was commissioned during 2009 at 10 acre site at Burari, Jahangirpuri in North Delhi by Infrastructure Leasing & Financial Services (IL&FS) under an agreement with North Delhi Municipal Corporation.
- vi. **Guidelines on C&D Waste Management in India – BMTPC, CPWD, IRC**
In continuation to the initiatives to promote utilization of C&D waste products
The construction and demolition (C&D) waste addressing building sector :
 - a. The Building Materials and Technology Promotion Council (BMTPC) in 2016 released “**Guidelines for utilization of C&D waste in**

construction of dwelling units and related infrastructure in housing schemes of the Government”. The construction and demolition (C&D) waste discussed in this report pertains to building industry.

- b. The Central Public Works Department (CPWD) , the PART IV: **Guidelines on reuse and recycling of construction and demolition (C&D) waste** is available in CPWD’s Guidelines for Sustainable Habitat (March 2014).
- vii. Need for ‘Guidelines on Environmental Management of C&D Waste Management in India’ – the present guidelines addresses this aspect

Separation distances (or buffer area)

The purpose of a buffer zone is to minimize the potential environmental impacts from the operation of a construction and demolition debris management & disposal activities. The Table below summarizes conditions regarding ‘buffer zone’ under the :

- a. The C & D Waste Management Rules, 2016
- b. Solid Waste (MSW matter) Management Rules, 2016

Table : Buffer area provisions under TWO waste management Rules

Under C & D Waste Management Rules, 2016	Under Solid Waste (MSW matter) Management Rules, 2016
<p>(a) Under Schedule I Criteria for Site Selection for Storage and Processing or Recycling Facilities for construction and demolition Waste [See Rule 7(1)]</p> <ul style="list-style-type: none"> • Sl(6) A buffer zone of no development shall be maintained around solid waste processing and disposal facility, exceeding five Tonnes per day 20 tons or more in one day or 300 tons per project in a month of installed capacity. This will be maintained within the total area of the solid-waste C&D waste processing and disposal facility. The buffer zone shall be prescribed on case to case basis by 	<p>(a) Rule 3 <u>Definitions</u> , Sub-rule 7 : “buffer zone” means zone of no development to be maintained around solid waste processing and disposal facility, exceeding 5 TPD of installed capacity. This will be maintained within total and area allotted for the solid waste processing and disposal facility.</p> <p>(b) Rule 11. <u>Duties of the Secretary-in-charge, Urban Development in the States and Union territories</u>.-</p> <ul style="list-style-type: none"> • Sub rule (j) facilitate establishment of <u>common</u> regional sanitary land fill for a group of cities and towns falling within a distance of <u>50 km (or more)</u> from the regional facility on a cost sharing basis and ensure professional management of such sanitary landfills; a. Sub rule (l) notify buffer zone for the solid waste processing and disposal facilities of <u>more than five tons per day</u> in consultation with the State Pollution Control

<p>the local authority in consultation with concerned State Pollution Control Board.</p> <ul style="list-style-type: none"> Sl (14) The following projects shall be <u>exempted</u> from the norms of pollution from dust and noise as mentioned above: (a) For construction work, where <u>at least 80 percent</u> construction and demolition waste is recycled or reused in-situ and (b) sufficient buffer area is available to protect the surrounding habitation from any adverse impact. (15) A vegetative boundary shall be made around Processing or Recycling plant or site to strengthen the buffer zone. 	<p>Board; and</p> <p>(c) Rule 14. Duties of Central Pollution Control Board.-The Central Pollution Control Board shall sub-rule (h) publish guidelines for maintaining buffer zone restricting any residential, commercial or any other construction activity from the outer boundary of the waste processing and disposal facilities for different sizes of facilities handling <u>more than five tons per day</u> of solid waste;</p> <p>(d) Under SCHEDULE I [see rule 15 (w),(zi), 16 (1) (b) (e), 16 (4)] Specifications for Sanitary Landfills (A) Criteria for site selection.-</p> <p>Sl (ix) A buffer zone of no development shall be maintained around solid waste processing and disposal facility, exceeding <u>five Tonnes per day</u> of installed capacity. This will be maintained within the total area of the solid waste processing and disposal facility. The buffer zone shall be prescribed on case to case basis by the local body in consultation with concerned State Pollution Control Board.</p>
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Comments on buffer area around C&D waste processing facility :

1. The Environmental Protection Authority (EPA) has guidance which recommends separation distances between industrial activities and sensitive land uses. These buffers aim to protect sensitive land uses from unacceptable impacts on health and amenity that may result from industrial activities, emissions and infrastructure. The document, titled **Guidance for the Assessment of Environmental Factors, Separation Distances between Industrial and Sensitive Land Uses**, No. 3, EPA, June 2005 (web link http://www.epa.wa.gov.au/docs/1840_GS3.pdf). This guidance document recommends a separation distance of 1000m between premises that crush or screen C&D waste. It is important to note that the separation distance is not intended to represent an absolute separation distance and does not replace the need to demonstrate best practice in the prevention and minimisation of emissions at prescribed premises. It is however, a useful tool to factor into impact assessments.
2. CPCB recognises that in some urban areas it may be difficult to achieve this separation distance due to mixed land-uses (non-compatible landuse). It is

suggested that the operator of the facility should demonstrate to the concerned authority through a site specific impact assessment that there will not be any unacceptable impacts on nearby receptors as a result of the recycling activities, taking into account pollution abatement measures that will be adopted.

3. Separation distances are necessary in order to minimize potential environmental conflicts between non-compatible land uses. Any or combination of the following restrictions can be considered regarding separation distances / buffer area from the boundary of the such C&D facilities / activities for example , shall not be located within the following receptor setback distances:
 - a. 300 metres from institutional land use property / any residential area / designated protected area
 - b. 150 metres from any Industrial/Commercial land use property / bank or high water mark of any watercourse or wetland /
 - c. 150 metres of the right-of-way boundary of a public highway;
 - d. 50 metres from any other adjacent property;

The above setback distances may be revised by the concerned authority - Under the C&D waste management rules the threshold processing facility has been defined as 'exceeding 20 tons or more in one day or 300 tons per project in a Month of installed capacity' – (bulk C&D waste generator)

4. Other environmental factors that may be considered are :
 - i. Site within compatible land uses
 - ii. provide all weather access roads
 - iii. providing access to a year round suitable cover to the C&D waste material
 - iv. no water collection within premises during rains / washings
 - v. providing controlled access to the site
 - vi.** providing a visible fence and placards (do's / donts) at the waste disposal face

Common environmental impacts from C&D operations

C&D operations generate noise : Major operations in a recycling plant are sorting, crushing, classification/sieving and washing. Sorting can either be done manually or using advanced devices. Before feeding the material into the crusher, a grizzly can be

used to ensure the maximum feeding size of debris for the respective crusher. Generally, jaw crushers or horizontal impact crushers are used to crush the debris. Size classification is performed using appropriate screens of required sizes. Washing is done to separate fine particles (silt and clay particles) and this operation can be done combined with size classification. Sorted aggregates of specific sizes are stored separately.(study by IIT Madras on C&D waste Chennai)

C&D debris management activities are dusty. Depending on the level of urbanization , growth of city , development plan w.r.t. landuse the quantum of C&D waste generation vary , there are varying amounts being quoted however on an average C&D waste accounts for 30 percent of all solid waste produced in a city.

Environmental pollutants highlighted under C&D Waste Management Rules

In the Construction and Demolition Waste Management Rules, 2016 under **Schedule I** *Criteria for Site Selection for Storage and Processing or Recycling Facilities for construction and demolition waste* [See Rule 7(1)] in the table below the following environmental conditions have been listed.

Table : Environmental conditions for C&D waste processing facility

Sl. as per Schedule I	Recommendation on environmental issues
(7)	Processing or recycling site shall be fenced or hedged and provided with proper gate to monitor incoming vehicles or other modes of transportation.
(8)	The approach and or internal roads shall be concreted or paved so as to avoid generation of dust particles due to vehicular movement and shall be so designed to ensure free movement of vehicles and other machinery.
(9)	Provisions of weigh bridge to measure quantity of waste brought at landfill site, fire protection equipment and other facilities as may be required shall be provided.
(10)	Utilities such as drinking water and sanitary facilities (preferably washing/bathing facilities for workers) and lighting arrangements for easy landfill operations during night hours shall be provided and Safety

	provisions including health inspections of workers at landfill sites shall be carried out made.
(11)	In order to prevent pollution from processing or recycling operations, the following provisions shall be made, namely: (a) Provision of storm water drains to prevent stagnation of surface water; (b) Provision of paved or concreted surface in selected areas in the processing or recycling facility for <u>minimizing dust</u> and damage to the site. (c) <u>Prevention of noise pollution</u> from processing and recycling plant: (d) provision for treatment of effluent if any, to meet the discharge norms as per Environment (Protection) Rules, 1986.
(12)	Work Zone air quality at the Processing or Recycling site and ambient air quality at the vicinity shall be monitored.
(13)	The measurement of ambient noise shall be done at the interface of the facility with the surrounding area, i.e., at plant boundary.

As per C&D Waste Rules (Rule 4 sub-rule (4)) there should be no littering or deposition of construction and demolition waste so as to prevent obstruction to the traffic or the public or drains

Under the C&D waste Rules 2016 ‘*Exemption from the compliance of norms (Schedule I (14))*’, there are exemptions from the norms of pollution from **dust and noise**:

From the above it can be noted that C&D waste management / activities are dusty. The key pollutants that impact environment are **DUST & NOISE** besides other issues.

Overview of environmental impacts from C&D operations

The common four environmental impacts from an activity that may affect its surroundings are :

- (a) Dust
- (b) Noise
- (c) Smoke

(d) odour (fugitive emission)

In case of C&D waste management the key parameters impact environment are **DUST & NOISE**

Public complaints – mainly on NOISE generation

1. Construction & demolition activities often generate noise / vibration which lead to complaints from the public despite the limited time frame over which it takes place. Complaints typically arise when the community has no clear understanding of the extent or duration of the activities. The above underscores the need for identification and assessment of noise generating activities. A timely assessment can aid operators / contractors to change the schedule of activities to reduce noise before the construction / demolition activities and during the process.
2. Unacceptable noise is a nuisance and activities associated in C&D waste processing activity are associated with perceptible noise increases.
3. Noise from a C&D waste management facility is considered an environmental nuisance if the construction / demolition activity is conducted outside the stipulated hours of operation or on holidays.
4. Some health problems caused due to excessive exposure to undesirable noise levels include :
 - a. Sleep problems, insomnia & fatigue
 - b. Fall in speech communication, disturbance and diminished concentration thus adversely affecting job performance efficiency
 - c. psychological disturbance including impaired hearing.

NOISE mitigation strategies in C&D operations

Key noise generating source in C&D waste management activities

- d. Machinery deployed in construction/demolition activities
- e. Operation of Gensets (noisy)
- f. Vehicle movement

1. Noise abatement - Machinery deployed in construction/demolition activities

The following strategies can assist addressing noise complaints & reduce noise levels:

- c) Define Construction / demolition periods / time / duration:
Construction / demolition activities be restricted as per Noise (Regulation & Control) Rules 2000 : Daytime : 6 am to 10 pm ;
Days of the week propose - Monday to Saturday
- d) Days operations are permissible : exclude Sundays and public holidays (as per each State)
- e) Night ban :No C&D activity shall be undertaken within the premise.
Rule 5A under Noise (Regulation & Control) Rules 2000 : Restrictions on the use of horns, sound emitting construction equipments and bursting of fire crackers:- subrule(3) Sound emitting construction equipments shall not be used or operated during night time in residential areas and silence zones.
- f) Define permissible noise levels under Noise (Regulation & Control) Rules 2000 :—The ambient air quality standards in respect of noise for different areas / zones are specified in the Schedule to the rules. The State Government shall categorize the areas into industrial, commercial, residential or silence areas / zones for the purpose of implementation of noise standards for different areas. All development authorities, local bodies and other concerned authorities while planning developmental activity or carrying out functions relating to town and country planning shall take into consideration all aspects of noise pollution as a parameter of quality of life to avoid noise menace and to achieve the objective of maintaining the ambient air quality standards in respect of noise. The noise levels in any area / zone shall not exceed the ambient air quality standards in respect of noise as specified in the Schedule

The ambient the noise levels as per CPCB's noise monitoring in many cities have exceeded the area zone norms due to 'mixed' land-use (non-compatible landuse) , rapid urbanisation , increased vehicular movement due to which there is significant background noise. As C&D waste management requires deployment of heavy machinery there will be significant noise generation. As C&D waste management (includes recycling) demonstrates nature of 'industrial' activity , the concerned authority may stipulate noise limits

between the range applicable between commercial and industry area zone under the Noise (Regulation & Control) Rules 2000.

SCHEDULE

(see rule 3(1) and 4(1))

Ambient Air Quality Standards in respect of Noise
Noise (Regulation & Control) Rules 2000

Area Code and Category of Area / Zone	Day Time Limits in dB(A) Leq*
(A) Industrial area	75
(B) Commercial area	65
(C) Residential area	55
The above measurements are measured as LAeq which is the equivalent continuous (energy average) level (A-weighted).	

2. Noise abatement - Genset noise

Refer CPCB weblink on Genset standards: <http://cpcb.nic.in/Generator.php>

3. Noise abatement - due to vehicle movement

Due to vehicular traffic and material transportation within applied area. Abatement due to transport activities arising due to vehicles movement (operation of vehicles within, entering or leaving the site) :

- a) Regular checking and maintenance of vehicles should be ensured
- b) For long distance transportation overhaul routes to be judiciously selected
 - a. No parking outside the plant premise
 - b. Earmarked areas for parking vehicles
 - c. Smooth movement of incoming & out going vehicles / trucks
 - d. Roads within premise tarred
 - e. Minimum use of horns within premise
 - f. Weigh bridge (to be operational)

4. Noise abatement measures - Other areas

There will be noise due to heavy earth moving machinery / crushing etc. – depends on extent of mechanization & machinery Deployed. Machinery deployed in construction / demolition activities: The dominant source of noise from most construction equipment is the engine, usually a diesel, without sufficient muffling (acoustic provision).

- a) Noise control: To control the noise regular preventative maintenance of equipment to be carried out. regular and proper maintenance of noise generating machineries to avoid noise increase
- b) Periodical monitoring of noise will be done to adopt corrective actions wherever needed
- c) Ear plugs to be made available to workers during the operational hours
- d) Besides the above it is preferable Operators prepare : Noise Mitigation Plan (NMP) which addresses : management and mitigation strategies to prevent an environmental nuisance caused by construction / demolition / recycling activities impacting ambient noise levels. Other initiatives include
 - i. Maintain records of equipment / machinery maintenance
 - ii. Maintain records of monitored noise levels
 - iii. maintain records of complaints on noise
 - iv. Comply with Consent conditions issued by State Pollution Control Boards / PCCs and concerned authority
- e) Plantation activities: Plantation in applied area helps to reduce propagation of noise outside the core zone.

DUST –environmental pollutant in C&D waste operations

The importance of controlling dust / fine particles from construction and demolition activities are :

- a. Dust emissions arising from C&D activities are an environmental nuisance both within the site and beyond the plant site / boundary
- b. Dusts from various C&D activities release wide range of particle sizes and material types and can cause both serious health problems ranging from eye irritation, nose, mouth and respiratory system.

The larger heavier particles settle out of the air quickly and are hazard to the operators of plant and equipment and those in the immediate vicinity. The smaller particles (usually invisible) can be transported further in the air and can cause health hazards beyond plant premise (several km away)

DUST mitigation strategies in C&D operations

C&D debris management activities are dusty. Major dust generating sources in C&D management sites are :

- a. Loading & unloading activities : waste & C&D products
- b. Incoming / out going vehicles
- c. due to machinery used in C&D operations

1. Dust Noise abatement - Dust from loading / unloading operations

- a. Areas to be earmarked for delivery / deposition of C&D wastes
- b. a sheet cover over the debris : over designated transport vehicles at waste processing sites
- c. Sign boards to be displayed indicating do's & donts
- d.** dust (fugitive emissions suppression systems in place) : Water sprinklers to be sprayed at all unloading points.
- e. For containing fugitive emissions (dust) also refer CPCB's report : Inventorization of Railway Sidings and Guidelines for their Environment Management

weblink :

http://cpcb.nic.in/upload/NewItems/NewItem_216_Report_Invent_Railway_Sidings.pdf

2. Noise abatement - due to vehicle movement

Transport movement : Dust abatement due to transport activities arising due to vehicles movement (operation of vehicles within, entering or leaving the site) can also include the following :

- i. Monitor movement of vehicles (incoming / out going) carrying C&D wastes or processed C&D waste products
- ii. Transportation of C&D wastes should be done in covered vehicles to prevent fugitive dust emission.

- iii. Regular checking and maintenance of vehicles should be ensured
- iv. For long distance , transportation routes of C&D wastes to be selected after discussion with local authorities
- v. Earmark areas for parking vehicles
- vi. Smooth movement of incoming & out going vehicles / trucks
- vii. Roads within premise tarred
- viii. Weigh bridge (to be operational)
- ix. dust suppression systems in place (fugitive emissions) : Dust from roads , regular water sprinkling on haul road will suppress the dust.

3. **Noise abatement – due to machinery used in C&D operations**

The C&D operations include: crushing / hammering etc. from machineries deployed at site causing dust emissions from machineries / equipment
Water sprinklers is a good practice to suppress dust emission.

Other pollution abatement measures and safety issues

i. Inspect C&D waste load

- a. C&D waste processing facility shall inspect each waste load before unloading debris
- b. shall accept only C&D Debris - no industrial waste shall be accepted at the C&D facility unless otherwise approved received from concerned authority. No industrial effluent / wastes are to be accepted at the facility

ii. Water requirement

- a. water will be required for dust suppression , for plantation and for drinking & domestic purpose.
- b. No fresh water requirement for dust suppression

iii. Use of treated waste water in sprinklers for dust suppression

- a. As ambient air quality standards need to be complied, any manmade intervention (like dust generating activities in C&D waste management) need adopt necessary dust suppression measures ex. Water sprinklers using treated waste water (controlling the dust particles in the air is as

important as minimizing water usage) . Site operators need to demonstrate both (a) control of 'visible' dust in particular besides (b) fine dust from activities within their premises.

- b. Treated waste water (sprinklers) to be used for washings / unloading areas / roads to suppress dust
- c. Import treated waste water from other STPs for dust suppression/sprinklers

iv. Waste water management

- a. Adopt ZERO effluent discharge system
- b. All wash down of vehicles and equipment will take place in designated areas and wash water will be treated for reuse within plant for suppression of dust

v. Drainage

A drainage plan ensures planned disposal of water during rains

vi. Residual waste disposal

Solid waste generation / management in C&D waste operations- residues (C&D waste processing facility) to be sent to landfill in consultation with concerned authorities

vii. Diesel use

Diesel use in equipment / gensets / vehicle movement generate emissions : Necessary pollution control measures to be adopted to reduce emissions

viii. Plantation / greenery (use of local species / low water uptake)

- a. Grow trees at the periphery - The plantation minimizes propagation of noise and also arrests dust
- b. To add to aesthetics : maintain water fountains , water bodies , landscaped areas wherever possible
- c. plantation helps to reduce fugitive of emission and noise control

ix. Emergency facilities : Equipment & Facilities: • Mobiles • Fire fighting equipment's • Emergency medical assistance

x. Protective gear i.e. for dust and noise , goggles, helmet, face shield, hand gloves. First aid facilities to be in place

xi. Training : Training at all levels to staff on the following:

- a. Knowledge of machineries being used • Procedure for reporting emergencies • location and use of fire fighting equipment • knowledge of alarm system • Training in first aid
- b. Environmental head to be aware of need for proper maintenance and operation of equipment / machineries etc. and conduct environmental awareness / safety program to the workers, supervisory staff and contract workers periodically

C&D waste processing facility – ‘ORANGE’ category activity

Consent to establish under section 21 of Air (Prevention & Control of Pollution) Act 1981 and under section 25/26 of Water (Prevention & Control of Pollution) 1974 has been treated as an **ORANGE** category project by Delhi Pollution Control Committee (DPCC) under the Product/activity: Processing/recycling of construction & demolition waste debris (malba) to IL&FS, the operator that established the 1st C&D waste processing facility in Delhi. The categorisation as ORANGE to be considered by all SPCBs/PCCs to maintain homogeneity when dealing with the activity. Note in Office Memorandum (OM) vide letter dated June 10, 2014 MoEF&CC on - Applicability of EIA 2006 Notification as amended from time to time for *stand alone Construction & Demolition Waste processing facility* – MoEF&CC mentions that this activity does not attract the provisions of the EIA 2006 Notification however the said activity will be governed by the consent mechanism under Air (Prevention & Control of Pollution) Act 1981 and under Water (Prevention & Control of Pollution) 1974.

Some GOOD PRACTICEs in C&D waste management

A number of civic bodies in various cities have initiated the process of establishing C&D waste processing facilities in cities. India’s first plant for recycling of C&D waste was commissioned during 2009 at 10 acre site at Burari, Jahangirpuri in North Delhi by Infrastructure Leasing & Financial Services (IL&FS) under an agreement with North Delhi Municipal Corporation. Some GOOD PRACTICEs in C&D waste management are mentioned below :

- i. Roads sides and vacant plots could be freed from debris dumps and clogging of sewage carrying drains if C&D waste if C&D waste is properly managed.

Though stringent laws are being formulated by the civic bodies their enforcement however needs to be further strengthened

ii. Options to overcome land availability a major constraint:

a. The existing landfills are nearing their shelf lives and land is not easily available to create new landfill areas that includes the increased costs of building landfills and public resistance to in creating environmental treatment infrastructure (ex. landfills) , thus opening avenues in major cities for municipalities/ administrators to adopt reuse and recycling of C&D waste and explore setting up facilities in existing landfills that have been capped / closed.

b. Encouraging setting up C&D waste recycling facilities on-site ex. Operate mobile or semi mobile C&D waste processing operational plants

iii. It is imperative that C&D waste are recycled to the greatest practicable extent.

iv. Utilization of C&D waste products:

The building construction products manufactured from C&D wastes have been reported to satisfactorily meet necessary requirements of compressive strength and water absorption. The end products such as kerb stones, paving blocks of different shape, size and colour, hollow and solid blocks, manufactured sand etc. have been tested in the laboratory and found to be satisfactory. They are also being used and found to be suitable for load bearing structures. Use of fine aggregates and coarse aggregates manufactured by recycling of C&D waste has also been validated scientifically for part replacement of natural aggregates

v. Full advantage should be taken of all opportunities for the reuse of construction materials. Material that is generated should be reused on site or salvaged for subsequent reuse to the greatest extent possible and disposal should only be considered as a last resort. Initiatives should be put in place to maximise the efficient use/reuse of materials.

vi. Management of C&D waste should reflect the waste management hierarchy, with waste prevention and minimisation being the first priority succeeded by reuse and recycling. Waste prevention to be noted at all stages of a project , need to consider opportunities for the prevention of waste, since reduces the work load associated

with respect to the recovery and disposal of C&D waste. Prevention is financially advantageous as it reduces the purchase of construction materials and obviates the need to remove wastes from site.

- vii. Excavated spoil/topsoil can be carefully set aside and also be used creatively in the landscaping of developments and for the construction of embankments and screening / noise abatement berms in civil engineering projects.
- viii. Sorting and restoring the C&D waste at the source is a GOOD PRACTICE. The C&D waste may be segregated into following categories:
 - for structures for buildings
 - for use in in road works
 - building parts that could be salvaged
 - wastes from site clearances.
- ix. Another level of segregation can be done among materials such as plastic, cables, glass, wood and plaster board.
- x. Regarding generation / management of C & D waste a good practice in management of Hazardous C&D wastes streams : Hazardous wastes / toxic wastes streams should be kept separately from other wastes to avoid further contamination ex. lead, tars, adhesives, sealants , containing asbestos are classified as hazardous
Where the waste originates from a building constructed ex. before 1900 (generally there is uncertainty over this issue), the risks associated with hazardous ex asbestos in the waste must be established
- xi. Wastes that have been recycled from demolished masonry and concrete may be used in within the construction activity itself. The wastes could be used as fillers in the same site post-completion of work or in other sites.
- xii. Some recommendations for use of recycled C&D wastes include (a) to source the recycled concrete aggregates from sites being re-developed for use in the same site. (b) for a given structure, only one type of manufactured coarse aggregate and one type of manufactured fine aggregate to be used
- xiii. Besides cost savings, use of on-site crushers to produce such aggregates can reduce the transportation impacts of a project associated with the removal of C&D waste from site and the transportation of quarried aggregates.

- xiv. During site clearance / re-modelling / renovation / re-development works, there are opportunities for beneficial re-use and re-cycling of the demolition materials. The subsequent use of recycled materials in reconstruction works also reduces the quantities of waste which would be destined for landfill sites.
- xv. Road projects : There are a number of established markets available for the beneficial use of C&D waste: Waste concrete can be utilised as fill material for roads or in the manufacture of new concrete when arising at source; In addition, the technology for the segregation and recovery of stone, for example, is well established, readily accessible and there is a large reuse market for aggregates as fill for roads and other construction projects. Bitumen and Asphalt can also be recycled in roads projects.
- xvi. Marketability of C&D waste products : A Committee at city level can be constituted to co-ordinate with other on-going developmental projects for management of C&D wastes

Initiatives by some civic bodies (ULBs) in C&D waste management

1. Urban Local Body (ULB) : Bruhat Bengaluru Mahanagara Palike (BBMP)

- a. Generation of C&D wastes : A study estimated that the city produces around 2500 tonnes of C&D waste each day.
- b. Proposed C&D recycling facilities by ULB in major cities : BBMP proposes to set up three construction waste and debris recycling plants on the outskirts of the city at the following proposed locations of total capacity 2250 tonnes/day :

- Kannur, off Bande Hosuru Road to the north-east of the city
- Mallasandra off Jalahalli West to the north of the city
- Anjanapura to the west of the city

Each plant to be of 750 tonnes/day capacity ,

- c. LAND provision - BBMP, which will provide land for the plants, the private firms operating the facility will be given a twenty-year lease of the land, with a profit-sharing agreement with the civic agency. As per proposals, those who run the plants should also run transport services to collect construction waste from doorstep, within 48 hours of you booking a slot, either online or over the phone

d. Proposed activities at the C&D recycling C&D wastes :

- At the plant, the concrete part of the waste shall be separated both manually and using mechanised segregators
- Magnetic separators shall be used to pick the metal, metal shall be sold as scrap
- The concrete part of the waste will be crushed, washed to make cement kerbs, hollow bricks or manufactured sand
- The plastic and wood waste will be sent for waste-to-energy plants

The above steps ensures almost all C&D waste is recycled and reused.

e. C&D waste management Policy : Bruhat Bengaluru Mahanagar Palike Municipal Solid Waste (Prohibition of Littering and Regulation of Segregation, Collection, Processing & Disposal) Rules 2012 (N O T I F I C A T I O N w.e.f. 1st Oct 2012)

Ref.

[http://greenfootprint.in/downloads/back%20end/b\)%20BBMP%20waste%20management%20rules,%202012.pdf](http://greenfootprint.in/downloads/back%20end/b)%20BBMP%20waste%20management%20rules,%202012.pdf)

BBMP C & D Guidelines : Refer

<http://bbmp.gov.in/documents/10180/452630/Guidelines+For+Construction+And+Demolition+%20Waste+Management.pdf/5c9699ff-0f2e-45ce-b17f-413aca3b0b8e>

2. Urban Local Body (ULB) : Greater Chennai Corporation , TN

- Generation of C&D wastes: Some 30 per cent of the waste collected and dumped in Chennai is categorised as inert, a major part of it being construction debris. Every week, the city generates more than 8000 tonnes of construction and demolition debris. IIT Madras study estimates - 1.25 million tonnes of C&D waste generated annually in the city
- Collection of C&D wastes: The Chennai Corporation collects 1,143 tonnes of construction and demolition (C&D) waste a day and charges Rs. 532 a tonne for its removal from the site.
- Penalty : . “The Corporation imposes a fine of Rs. 2000, but this does not prove to be much of a deterrent,” a Corporation official said.

- iv. C&D dumpsites : Taking the first step towards putting a comprehensive plan in place to deal with the huge volume of C&D waste in the city, the Greater Chennai Corporation has earmarked designated spots in each of the 15 zones where the debris can be dumped. The 15 designated areas are Sathangadu (Tiruvottiyur), CPCL junction (Manali), GNT Road Sembiam Sengundram Road (Madhavaram), Kodungaiyur (Tondiarpet), Moolakothalam crematorium (Royapuram), Otteri disposal yard (Thiru Vi Ka Nagar), Devi Karumariamman Nagar crematorium (Ambattur), 1st Avenue of Gajalakshmi Colony (Anna Nagar), Karaneeswarar Pagoda Street Recycling Plant (Teynampet), Anna Avenue (Kodambakkam), Ramavaram Bharathi Road (Valasaravakkam), MGR Nagar recycling plant (Alandur), Near Kotturpuram Railway Station (Adyar), Perungudi dumpyard (Perungudi) and Gangai Amman Koil Street Extension in Karapakkam (Sholinganallur).
- v. IIT Madras study : Greater Chennai Corporation had sanctioned a detailed project report to IIT Madras to study the problem of C&D waste. The recommends PPP (public private partnership), since the set-up works like a factory. The private agency can undertake running of the plant while the Corporation has to ensure a proper supply of material to recycle. Two recycling plants expected to come up near Perungudi and Kodungaiyur.

Ref:

- a) <http://www.dtnext.in/news/city/2016/02/21201929/closing-the-loop-on-campd-waste.vpf>
- B) <http://www.thehindu.com/features/homes-and-gardens/new-life-to-rubble/article7039678.ece>

3. Urban Local Body (ULB) : Municipal Corporation of Delhi (MCD)

- A) C&D waste generation Delhi estimates generation of about 3000 to 4000 tons per day (TPD) of C&D waste.
- b) Country's 1st C&D processing facility: located in **Delhi**, Burari, Jahangirpuri in North Delhi. In collaboration with MCD, a pilot project was been developed by IL&FS Environmental Infrastructure & Services Ltd (IEISL) to demonstrate the potential of a scientifically managed process in relation to the collection and recycling of C&D waste in Delhi. Plant commissioned during 2009 at 10 acre site at Burari, Jahangirpuri in North

Delhi by IL&FS under an agreement with North Delhi Municipal Corporation. The project has approved 10 yrs operation period. NDMC has earmarked Rs. 23 crore for the expenditure on transporting the material to the plant during 2014-15. The plant was initially set up to process 500 tpd C&D waste. Processing of 1200 tpd was achieved during 2014 and Delhi Pollution Control Committee has awarded the permission to expand the capacity to 2000 tpd. The IL & FS facility gets C&D waste from 28 designated points in three zones of NDMC and transportation charges are borne by NDMC. C&D waste from other major locations is also collected and transported by the civic body. The products being manufactured at this facility are sand, coarse aggregate, RMC, bricks, blocks, curbstones, pavement blocks, hollow bricks etc. Treated effluent is being used for washing of the aggregates, dust control and maintenance of green belt. The plant is working with zero discharge facility. The bulk generators of C&D waste pay Rs. 205/- per ton as transportation cost.

- c) **Delhi East Kidwai Nagar, New Delhi:** 2nd C&D facility set up by M/S Enzyme India Pvt. Ltd. in year 2014 on PPP model with 100% by back by NBCC with a capacity of 150 tpd at the project site of “RE-development of East Kidwai Nagar, New Delhi”. The construction project involves demolition of 2444 existing houses and allied structures for construction of 4747 houses covering 60 lakh sq. ft. area and commercial area of 12 lakh sq. ft. on a plot area of 86 acres. Proposed plan: 30000 bricks/ kerbstone per day for use at the same construction site. The whole process is dust free and eco-friendly.
- d) **Delhi -Shashtri Park, New Delhi:** 3rd C&D plant in Delhi at Shashtri Park in East Delhi at 2.5 acre site with a total cost of Rs. 20 crore to process 500 tonne C&D waste per day. The plant has been built in partnership with IL & FS, which would run it for 15 years before transferring it to EDMC. The facility will get mixed C&D waste from 15 designated sites of East Delhi.

4. Urban Local Body : Pune Municipal Corporation (PMC)

- a. C&D waste generation: PMC generates approximately 250 MT per day of C&D waste from various sources.

- b. Ban on C&D waste dumping: The PMC has placed a ban on dumping debris at open spaces, the riverbed, nullahs and quarries, charging a fine of Rs 25,000 for violations.
- c. C&D waste impacts river : CD waste management problem
- d. Dumping of construction debris on both sides of the Mula river resulted in flash floods in year of 2010. On both the Pune and Pimpri-Chinchwad side of the bridge, dumping of debris has reduced the width of the river. (Ref DNA)
- e. C&D waste processing facility: A two-acre plot of barren land at Wagholi has been identified by the civic body to set up a debris processing plant.

5. Urban Local Body : Ahmedabad Municipal Corporation (AMC)

Ahmedabad Enviro Projects Pvt. Ltd. (AEPL) has commenced a 100 tonne per hour capacity plant located at Pirana, Ahmedabad for recycling of C&D waste in phase wise from December, 2013, fully operational since June, 2014. AMC has designated 16 spots around the city where citizen will have to bring the C&D waste at their own cost

6. Urban Local Body : CIDCO Maharashtra

Experience at Mumbai CIDCO-YUVA : Youth for Unity and Voluntary Action (YUVA), a non profit, non Govt. organization has recycled 1500 tonne of C&D waste during 2002-06 at CIDCO-YUVA Building Centre (CYBC), Kharghar. CYBC is a joint venture of City and Industrial Development Corporation of Maharashtra Ltd. (CIDCO) and YUVA. The C&D recycling demonstration plant has manufactured building materials like bricks, blocks, paving blocks, concrete, sand substitute and coarse aggregates. The CYBC project of C&D waste recycling was shut down due to no support from the policy makers as well as the market.

Annexure

Criteria for site selection of C&D waste processing facility (SCHEDULE I)

(Note: numerals in brackets as per Notification of C&D waste Rules 2016)

- i. (4) The processing or recycling shall be large enough to last for 20-25 years (project based on-site recycling facilities).
- ii. (5) The processing or recycling site shall be away from habitation clusters, forest areas, water bodies, monuments, National Parks, Wetlands and places of important cultural, historical or religious interest.
- iii. (6) A buffer zone of no development shall be maintained around solid waste processing and disposal facility, **20 tons or more in one day or 300 tons per project in a month of installed capacity** ~~exceeding five Tonnes per day of installed capacity (copied from SWM Rules 2016)~~ . This will be maintained within the total area of the solid waste processing and disposal facility. The buffer zone shall be prescribed on case to case basis by the local authority in consultation with concerned State Pollution Control Board.
- iv. (7) Processing or recycling site shall be fenced or hedged and provided with proper gate to monitor incoming vehicles or other modes of transportation.
- v. (8) The approach and or internal roads shall be concreted or paved so as to avoid generation of dust particles due to vehicular movement and shall be so designed to ensure free movement of vehicles and other machinery.
- vi. (9) Provisions of weigh bridge to measure quantity of waste brought at landfill site, fire protection equipment and other facilities as may be required shall be provided.
- vii. (10) Utilities such as drinking water and sanitary facilities (preferably washing/bathing facilities for workers) and lighting arrangements for easy landfill operations during night hours shall be provided and Safety provisions including health inspections of workers at landfill sites shall be carried out made.
- viii. (11) In order to prevent pollution from processing or recycling operations, the following provisions shall be made, namely:
 - a. Provision of storm water drains to prevent stagnation of surface water;
 - b. Provision of paved or concreted surface in selected areas in the processing or recycling facility for minimizing dust and damage to the site.
 - c. Prevention of noise pollution from processing and recycling plant;
 - d. provision for treatment of effluent if any, to meet the discharge norms as per Environment (Protection) Rules, 1986.
- ix. (15) A vegetative boundary shall be made around Processing or Recycling plant or site

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