



Short Review Paper

## Effective utilization of construction and demolished waste concrete-review

N.K. Dhapekar<sup>1\*</sup> and S.P. Mishra<sup>2</sup>

<sup>1</sup>Kruti Institute of Technology and Engineering and Research Scholar Bhilai Institute of Technology, Durg, Chhattisgarh, India

<sup>2</sup>Department of Civil Engineering, Bhopalrao Pawar Govt. Polytechnic College, Dhamtari, Chhattisgarh, India  
profdhapekar@gmail.com

Available online at: [www.isca.in](http://www.isca.in), [www.isca.me](http://www.isca.me)

Received 8<sup>th</sup> April 2017, revised 10<sup>th</sup> July 2017, accepted 23<sup>th</sup> July 2017

### Abstract

*The mass production of construction and demolition waste and its deposition are creating serious problems in India. In most of the countries, applicability of construction and demolished wastes are restricted to non-structural concrete, pavements and backfilling. The recycling and reapplicability of construction and demolition (C&D) waste as an alternative to aggregates for the production of fresh concrete has attracted attention from the construction sector. Environmental benefits of using recycled aggregates are well accepted but its wide application in major structural components is still restricted. This paper discusses rules for management and use of construction and demolition wastes. Innovative steps to reduce, recycle and reuse of wastes are also proposed in this paper. Construction and Demolition waste management is designed to promote development for sustainability, protection of environment and optimum use of natural resources. Promotional and confidence building measures are discussed in detail. Rules for effective utilization of construction and demolition waste by various government bodies are highlighted in this paper. Rules and suggestions for construction and demolition waste are also presented in research paper.*

**Keywords:** Construction, Demolished, Promotional, Concrete, Guidelines, Policy.

### Introduction

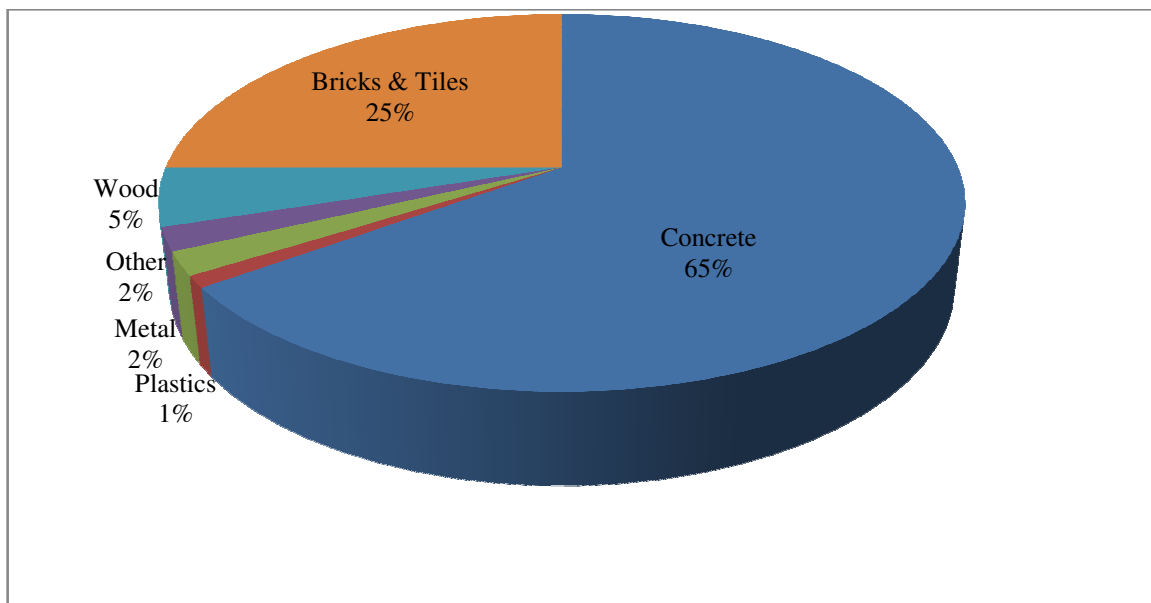
Construction and demolition waste is defined as waste which are produced from construction, repairing and demolition activities including damaged products and materials arising from construction works. Construction sector is one of the biggest waste producer worldwide. Landfill is the best cheapest and traditional disposal method for C&D wastes, but in accordance with the existing tremendous pressures on landfill area, recycling should be the main focus for the waste management. Waste utilization and management involves ecofriendly and socially favourable way. Management of waste generated from construction and demolition activities may prove to be useful for developing environmental conditions, pollution control, land conservation and energy resources. Precise data on C&D waste generated in India is unavailable. This is because of the absence of rules laid down by regulatory bodies. C&D waste management in India is not well designed as

no separate designed action plan is available with government departments and municipal corporations. Use of construction and demolition materials satisfying requirements of quality for the use should be made mandatory for new constructions with affordable rates. Utilization of C&D waste in construction industry is a new innovative practice. Use of C&D waste concrete will promote and encourage green construction for sustainable developments. Use of C&D waste material will lower the energy within the buildings which will make them more energy efficient<sup>1</sup>.

**Composition of C&D Waste:** C&D waste comprises of bricks, masonry, concrete, wood, metals, plastics and ceramics etc; originated from repair, renovation and demolition of old constructions. The percentage composition of the C&D waste is represented in Figure-2.



Figure-1: Site at Moudapara, Raipur showing debris of demolished structures.



**Figure-2:** Percentage composition of construction and demolition waste.

**Worldwide scenario of C&D waste:** Quantity wise scenario of construction and demolition waste of some country are given in Table-1.

**Table-1:** Quantity wise scenario of construction and demolition waste.

| Country     | Amount per year (Million Tons) | Years        |
|-------------|--------------------------------|--------------|
| Germany     | 223                            | 2003         |
| Japan       | 85                             | 2000         |
| China       | 200                            | 2005         |
| Australia   | 19                             | 2008-09      |
| Ireland     | 11                             | 2004         |
| South Korea | 61.7                           | 2013         |
| Norway      | 1.5                            | 2003         |
| India       | 14.7<br>20                     | 2001<br>2016 |

shutters, frames (doors/windows) etc; Recycling comprises of crushing of components, large aggregates and using the various sizes of remains to make different products which can be reused. Intensive monitoring is required to implement the policies into field. The policy should clearly mention the need to modify the rules for construction activities in such a manner that waste produced from repairing and demolition activities can be used after required tests. The various Government bodies may promote setting up small plants at least one in each state which will act as pilot project to check and validate the results. Corporates and public sector companies, especially those involved with waste management and construction activities should be actively involved for giving their feedback. Dates from international agencies may also be studied, particularly mentioning technical knowhow and analysis<sup>2</sup>. But it should be kept in mind that waste utilization and management is a big area and any technology update or transfer would require through study and practical applicability. Briefly rules and guidelines are mentioned - i. Proper planning to construction new one and to demolish old ones. ii. Location and community level storage. iii. Proper guidelines for placing on public roads. iii. Transportation and processing of C&D waste. iv. Utilization of processing residues. v. Practical use of C&D waste. vi. Cost recovery and feedback from pilot projects for management of C&D waste.

**Guidelines and rules for management of construction and demolition wastes**

The main objective should be to optimize utilization and recycling so that minimum land area is required for its disposal and simultaneously natural resources will be saved. The principle of '3Rs'- Reduction, Reuse and Recycle holds true for C&D waste. Proper planning may possibly minimize waste generation by reducing wastage followed by reuse or salvage of the materials and even items like doors, windows, panels,

**Innovative steps to reduce and reuse wastes**

**Waste Prevention:** Total cost is reduced, as the construction materials to be procured are in small quantity and there is less wastes to be removed from the site. Assuring proper spaces to store and management of construction materials to minimize production of demolished materials/waste i.e; maintaining materials properly until they are ready to be utilized. Implementing proper sequence of activities<sup>3</sup>.

**Reuse of recycled waste:** Recycled material, if cannot be used immediately, should be managed in such a way that it's reuse should be ensured in future projects. Recycled materials should be clearly specified which can be reused or can be reutilized after their useful period of life in the building. Special provisions or techniques should be applied for reusing in construction of existing structures on similar site<sup>4</sup>.

**Precast construction:** Precast panels are not only economical but also reusable. Use of precast panels also helps in reducing large amount of demolition wastes. This also comprises initial utility for designing of buildings for dismantling a building so that reuse of the building components without demolition can be easily carried out<sup>5</sup>.

**Flexibility in planning:** Buildings should be planned and constructed in such a manner that it can be very comfortably implemented for other uses during it's service period. It is compulsory to understand as to how the building will be used in it's due course of time<sup>6</sup>. All drawings should be properly evaluated including the details of all services and leaving it with occupants and users which will ensure that modifications, maintenance and reconstruction will be easier and useful<sup>7</sup>.

### Preservation of existing buildings

Prior to take decision of demolition of any existing building, one must ensure whether such a building could be repaired or retrofitted. Huge amounts of waste are generated and lot of expenditure is to be made to replace it with new materials<sup>8</sup>.

### Confidential building measures

**Rules and Regulations:** The prevailing rules and regulations for construction activities would have to be modified and changed so that the recycled construction and demolition waste can be utilizes effectively. There should be nominal and cost effective rates for disposal in landfills to promote utilization and recycling of construction and demolition materials<sup>9</sup>.

**Waste Management:** Nowadays it is obligatory for mega infrastructural projects to obtain EIA clearance. Such environmental related clearance should compulsorily comprise of well planned project waste management plan consisting of waste recycling, reusing wastes generated during construction activity as well as effective utilization of waste derived from demolished buildings<sup>10</sup>.

**Commercial:** Group to explore market opportunities and development has to be established at state and national level keeping in mind market potential for the effective reuse of materials obtained from demolition waste Provision for sales and marketing for such waste products should be carried out so that those customers should use them without facing any difficulty<sup>11</sup>.

**Technical:** Bureau of Indian standards (BIS), IRC and other departments should work out to carry detailed investigations of

construction materials obtained from construction and demolition wastes which may act as an alternative material to various types of construction activities. In assessment of Green building processes use of recycled building materials obtained from construction and demolition wastes should be encouraged<sup>12</sup>.

**Education and Information:** As the concept of utilization of construction and demolition waste is new in India, proper and correct information and educating technical persons would be important to impart to change the mentality and approach of the government bodies, private parties and other public sectors etc; Frequent meetings, workshops and training programmes should be frequently conducted.

**Benefits and Incentives:** Constructions in all sectors should be given priority to waste derived from recycled materials of construction .Proper space with all facilities should be made available at nominal rates for establishing the plants for processing of construction and demolition wastes. Recycled and processed building materials should be given exemptions in VAT, Sales tax etc<sup>13</sup>;

### Guidelines for effective utilization of construction and demolition waste (C&D)

General draft of rules shall be applicable to all agencies involved in construction activities and shall be implemented immediately after publications in the official Gazette. Constructor should get proper approvals from the concerned government body before starting construction work and keep updating construction activities from starting stage to final stage. Service departments and other bodies should provide services like water, sewage systems, electricity, communication network, pavements, drainage etc; to generate C&D waste which includes excavation, segregation, civil construction works etc; Government authority concerned to pollution would monitor the proper implementation of these regulations and competent authorities at local level<sup>7</sup>. The central and state Government should be the facilitator. The analysis and feedback at state level shall be collected by the central authority so that framed rules and regulations can be properly implemented. Prestigious institutions like IIT'S and NIT'S should study the data collected at various levels and explore new ways to reuse the material in effective manner<sup>14</sup>. Waste generating site should have sufficient green cover and a buffer zone. Rejected material from the processing plant shall be used in land filled and in other nonstructural applications.

### Conclusion

Production of construction and demolition waste is not regular like municipal solid waste .Authorities should design a plan by which nominal charges can be imposed on the agencies producing construction and demolition waste. As this area is new one in India, intensive efforts are required for marketing

the recycled products and to build trust amongst consumers. IS 456 or IRC112 do not permit applications of construction and demolition waste materials other than those obtained from natural sources. Looking at international advancements and experimentations there is huge shortage of aggregates from natural sources across the country and it is time that recycled materials obtained from construction and demolition waste should be permitted for reuse in concrete constructions. A broad framework is suggested based on which suitable specifications can be drawn up by. Framework of proper guidelines and rules should encourage proper reprocessing, recycling and reuse of aggregates derived from waste materials.

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