VARIOUS COMPONENTS OF MODERN CONSTRUCTION TECHNIQUE AND DEMOLITION WASTE FOR CIVIL ENGINEERING

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ABSTRACT

The largest contribution to waste construction comes from the demolition of buildings. As a rule the demolition of old buildings generates waste such as brick, wood and steel. In recognition of the need to reduce waste, the study of this paper has been developed to provide practical guidance for professionals in the building industry. These are usually mixed with cement, mortar or lime. The stone originates during excavation or from the demolition of old buildings. According to the survey's findings, the "major reason for not recycling waste from the construction industry is the lack of information about recycling technologies". In this paper we are presenting a review of modern construction techniques and demolition waste. Modern construction techniques are a very important part of civil engineers. A good number of old buildings in India are mainly made of good quality bricks. Where is all this waste of C&D going? It is being used extensively by land sharks to fill water bodies and wetlands around urban centers for real estate development. It is easy just being thrown into rivers and open places.

Keyword: - Waste, Bricks, C&D, Modern, Construction, Demolition, TIFAC, MT etc

1. INTRODUCTION

Recently, environmental sustainability became a significant problem from the point of view of natural resources and waste. Both the construction and construction materials sector processes include: the construction industry is the largest user of natural materials and in addition a large proportion of the waste arises from the demolition of the constructions. The building materials industry is an area of interest for using waste and researchers have tried to produce new building materials that incorporate waste. The new generation of building materials is developing on other principles along with environmental sustainability.

Construction and disposal of demolition waste at the landfill has given rise to major environmental concerns. Thus, total C&D waste in India was generated by buildings in just one year - 2013 - a humble 530 MT volume, 44 times more than official estimates. Imagine the scenario if waste generated from infrastructure projects such as roads and dams are added. Not surprisingly, in India, if the amount of C&D waste is determined, it will be higher than all other types of solid waste. This estimate is for new construction only. Demolition and renovation / repair-related wastes of old stock generate additional waste. The waste generated per demolition per square meter is 10 times during construction: according to TIFAC, 300–500 kg of waste per square meter. If it is assumed that five percent of the existing building stock is completely demolished and completely rebuilt, then approximately 288 metric tons of C&D waste is generated only in 2013 due to the demolition would have gone. Concrete in waste appears in two forms. The structural elements of the building have reinforced concrete, while the foundation consists largely of

non-reinforced concrete. Excavation produces topsoil, clay, sand and gravel. After the excavation is complete it can either be re-used as a filler at the same location or moved to another site. Large quantities of bricks and masonry become useless during demolition.

2. 12 BASIC BUILDING STRUCTURE COMPONENTS

Here we see that foundations, floors, walls, beams, columns, roofs, ladders etc. are the basic components of a building structure. These elements serve the purpose of supporting, enclosing and protecting the building structure. There are the 12 basic components a building structure Mention as below [1]

1. Roof 2. Parapet 3. Lintels 4. Beams 5. Columns 6. Damp proof course (DPC) 7. Walls 8. Floor 9. Stairs 10. Plinth Beam 11. Foundation 12. Plinth



Fig.1.1. Building Basic Components : Image Courtesy: Decole (Source: https://theconstructor.org/building/12-basic-components-building-structure/34024/)

3. Construction and Demolition Waste Management

The term "aggregate" is widely used by the construction industry to refer to natural mineral materials used for various types of construction. Robinson, Menzie, and Hyun (2004) described 16 terms as "an industrial commodity term for sand, gravel, and crushed rock material in a natural, processed state," used in bulk, strength, and wear resistance. Construction applications "(Berkdale, 2000, as cited in Robinson, Menzie & Hyun, 2004, p. 276) in the US, primarily Portland cement concrete, as part of the construction of asphalt pavements and as structural fills in construction and maintenance. Is used of roads and buildings (Tepordei, 1999). In Europe, the term "concrete" is also used to describe recycled concrete, Bricks and ceramics that are often crushed and used as filler for civil engineering projects. Recently, these recycled aggregates have begun to be used in Europe for the production of new concrete (Weil, Jeske, and Szebeck, 2006). Aggregates often represent a large portion of an area's C&D waste stream due to its predominance in construction and modern construction techniques. If torn asphalt pavements are included during the repair of roads, the total amount of waste aggregates produced is very large. Whereas in Canada and other northern regions, such as Scandinavia, home foundations, large public buildings, and transportation infrastructure, individual houses are often constructed from wood. In Europe and other parts of North America, aggregates are more commonly used for all types of construction and represent an even greater proportion of total C&W waste produced. For example, a Spanish national plan for C&D waste of 2001 shows that 75% of Spain's C&D waste was made up at that time (Merino et al., 2010).

4. TYPES OF MODERN CONSTRUCTION TECHNIQUE AND DEMOLITION WASTE

A. Classification of construction waste

- Residential
- Industrial

- Commercial
- Institutional
- Agricultural
- C&D
- B. Amount of C&D waste as per types
 - Based on structure type
 - (Residential, Commercial, Industrial, Institutional)
- C. Based on construction structure size
 - (Heavy,Med,Light)

Activity being performed



Fig. 1.2. Types of Construction Technique and Demolition Waste

Table 1.1. Various Components of Modern Construction Technique and Demolition Waste

Cement concrete BricksConduits (iron, plastic)Cement plaster Steel (from RCC, door/window frames, roofing support, railings of staircase etc.) RubblePipes (GI, iron, plastic)Rubble Stone/Timber/wood (marble, granite, sand stone)Bakelite/plastic switches, wire insulation) Panels (wooden,	Major Components	Minor Components			
Others (glazed tiles, glass panes)	Cement concrete Bricks Cement plaster Steel (from RCC, door/window frames, roofing support, railings of staircase etc.) Rubble Stone/Timber/wood (marble, granite, sand stone)	Conduits (iron, plastic) Pipes (GI, iron, plastic) Electrical fixtures (copper/aluminium wiring, wooden baton, Bakelite/plastic switches, wire insulation) Panels (wooden, laminated) Others (glazed tiles, glass panes)			

5. CONSTRUCTION TECHNIQUES AND DEMOLITION WASTE RECYCLING FOR SUSTAINABLE GROWTH AND DEVELOPMENT

This paper highlights the composition of construction and demolition waste, its recycling and the need for alternatives that can be applied to its efficient use in concrete technology in general. Construction and Demolition (C&D) Waste as solid waste generated in the form of construction, remodeling, renovation, renovation, alteration, residential, commercial, government or institutional buildings, industrial, commercial facilities and infrastructure construction, roads, bridges. Is defined in., Dams, tunnels, railways and airports. Construction and demolition waste

is considered high volume, low risk. It is commonly understood that this waste can be considered a resource, either for reuse in its original form or for recycling or energy recovery. Due to increased waste generation and public concerns about the environment, it is desirable to recycle materials from construction demolition. These materials can be advantageously used in concrete if suitably selected, ground, cleaned, and sieved in suitable industrial crushing plants. Despite this, most construction and demolition waste ends up in landfills.

6. FUTURE TECHNOLOGY AND DEVELOPMENT

[10] In a study by Leiva et. al. 2013 It has been found that the fire insulation characteristic of C&D waste blocks is improved. Concrete blocks were prepared using recycled aggregates from 20 to 100% replacement of natural aggregation. These blocks were tested and found to have improved w.r.t reference concrete for fire resistance, heat insulation and acoustic insulation. The reason for this improved properties was the lower density in the blocks and more voids in these blocks thus making them suitable for non-structural use such as blocks and prefabricated concrete. Panels. In another study in Mexico [11] by Osasa et. Al In 2016 it was recommended to use recycled aggregate up to a replacement of 20% in hot asphalt mixtures to pave urban roads. Similar results [21] were obtained by Gomes and Perez et. Al 2014 for using C&D waste aggregate in cold asphalt mixtures. As we have seen the use of RA as Subbase has a huge potential for road construction. These recycled materials are not affected by weathering, Friction, physical and chemical changes are therefore very suitable for the sub-base layer in pavement construction. ([22] Jimenez 2013)

7. CASE STUDY AJMER

In collaboration with Ajmer Municipal Corporation (MCA). Construction and Demolition (C&D) Waste Recycling Facility in Ajmer in 2019 with operational capacity (TPD) processing capacity of 100-1100t / h ton per day: 100-1100t / h Input Products: Mixing of Construction Waste Production Products: Iron , Steel, impurities, plastics and stones and bricks of various sizes. The plant is successfully processing C&D waste in recycled aggregates that can be used for brick-making and building roads. This pilot project was set up on a Public Private Partnership (PPP) basis to demonstrate the potential benefits of C&D waste use in the urban city of Ajmer. Around 3 acres of land was given by MCA for a period of 8 years and the plant was commissioned in 2019. This plant is a certain type of recycling plant. The following processes are involved in recycling C&D waste.

Waste material was collected from a local demolition site of a concrete structure located in Ajmer. At the source, concrete and masonry waste were separated from recyclable waste, ie steel, plastic, etc. Large pieces of collected C&D waste were manually crushed into small particles. The crushed material was sieved with a standard sieve of 5.11 mm size to separate fine and coarse material. Aggregates larger than 5.11 mm and less than 8 mm in size were used as coarse aggregate and less than 5.11 mm were used to collect finely in the mixture. The properties of aggregates are given in Table 1.1. The waste was then transported to the brick manufacturing plant site. The distance from thermal power plant to manufacturing plant for fly ash and manufacturing plant for C&D waste from demolition site was less than 40 km. The first separation is done for undesirable items with mechanical and manual means such as plastics, metals, FRP sheets, rags etc., then the remaining waste is separated into three parts a) whole brick b) large concrete pieces c) mixed c & D waste. The entire brick is sold separately, the larger concrete block is broken into smaller pieces (300–500 mm in size) using a rock breaker and mechanical hammer. These are then processed and broken up into small aggregates suitable for making concrete.





Model	WCW-100	WCW-150	WCW-200	WCW-300	WCW-400	WCW-500	WCW-800
Feeding Size	≤500mm	≤600mm	≤60 0 mm	≤750mm	≤750mm	≤750mm	≤900mm
Capacity T/H	100	150	200	300	400	500	800

(Source: https://theconstructor.org/building/12-basic-components-building-structure/34024/)





8. RESULT AND ANALYSIS

A. Brick Test (Strength test) **Concrete Brick** Load = 40 KNArea = 12.3 X 8.3 = 102.09 mm² Strength = load/area $= 39.18 \text{ N/ mm}^2$ Reconstructed brick test Load 20.50 KN Area = 11.19 X 8.23= 92.09 mm² Strength = Load/Area = 22.26 N/ mm² B. Concrete cube test Size of mould 20cm x 20cm x 20cm. For M 30 Grade of Concrete Cement =2.235 kg Sand = 2.933kg Coarse Agg = 4.35 kg W/C = 0.8Strength =24.8 N/mm² (7 Days) =39.56 N/mm² (30 Days)

 Table 1.1: Properties of Coarse Aggregate and Demolished Waste

Parameters	Coarse aggregate	Demolished waste
Specific gravity	4.35	2.51
Water absorption	0.5%	4.54%
Crushing value	25%	40.25%

9. COCLUSION

After conducting the study, it has been concluded from the work on the use of C&D waste that C&D shows a great commercial potential for reuse and recycling of waste. Its success depends on the creation of incentives and standards by the government, strict compliance with regulations and a superior state-of-the-art technology for recycling these wastes. Research deals with building materials by physical means with cost analysis, so that we can

use the reconstruction and construction of paving roads and the construction of low-rise buildings and many other construction works. This paper will help in better utilization of construction waste and property in relation to concrete and will also improve various properties of materials.

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