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### A COMPREHENSIVE STUDY OF CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT

DHAVAL BHALANI<sup>1</sup>, LABDHI SHETH<sup>2</sup>

1. PG Student, Department of Civil Engineering, LDRP institute of Technology and Research, Gandhinagar, Gujarat-382015
2. Professor, Department of Civil Engineering, LDRP institute of Technology and Research, Gandhinagar, Gujarat-382015

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**Abstract:** Construction and Demolition (C&D) waste constitutes a major portion of total solid waste production in the world, and most of it is used in landfills. There is a large amount of demolished waste generated every year in India and other developing countries. Since very small amount of this waste is recycled or reused. So, disposing this waste is a very serious problem because it requires a large amount of space. And also there is an increasing pressure on the construction industry to reduce costs and improve the quality of our environment. This study is a part of comprehensive program wherein experimental investigations have been carried out to evaluate the effect of partial replacement of coarse aggregate by demolished waste on compressive strength and workability of DAC (Demolished Aggregate Concrete).

**Keywords:** Construction and Demolition (C&D) Waste, Partial replacement, DAC (Demolished Aggregate Concrete)

Corresponding Author: DHAVAL BHALANI



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## INTRODUCTION

Development of infrastructural facilities is accompanied by construction, excavation, renovation, demolition, and roadwork associated activities. The construction industry in India is booming already at 10 per cent of the GDP.

It has been growing at an annual rate of 10 per cent over the last 10 years as against the world average of 5.5 per cent per annum. Almost 70 per cent of the building stock in India is yet to come up. The built-up area is expected to swell almost five times from 21 billion sq. ft. in 2005 to approximately 104 billion sq. ft. by 2030.<sup>[1]</sup>

Buildings are at the core of all over demands like water, energy and materials but they also create waste while its construction, renovation and mostly while demolition. Construction and demolition waste defined as a mixture of solid waste materials arising from any above mentioned activities. In other word, C&D waste was usually defined as a mixture of inert and non-inert materials produced by any activity related to construction industry. Inert materials can be comprised of whether soft inert materials like soil, earth and slurry, hard inert materials of rocks and broken concrete. Non-inert materials have also involved wastes of metals, timber, plastics and wrapping.<sup>[2]</sup>

There is now a developing emphasis on environmental management which has resulted in growing pressure to investigate the viability of reuse of all categories of waste materials such as C&D waste materials. The use of recycled C&D waste material would greatly reduce the demand for landfill sites and for virgin sources of materials by reusing what would be normally regarded as a waste material. The use of secondary materials may not completely remove the problem of the resulting shortage of any material or it may not give equivalent performance as virgin or fresh material but it can be used as its properties allows it and could alleviate the shortage of any material e.g. recycled wood, recycled aggregate, recycled brick, etc. Construction and demolition waste is increasingly seen as a valuable source of engineering materials for the construction industry. However the percentage of use of these materials is not at desired or sustainable level. There is also far too little knowledge of technically realistic ways to reuse C&D waste.

### Recycled aggregate

Recycling is the act of processing the used material for use in creating a new product. The usage of natural aggregate is getting more and more intense with the advanced development in infrastructure area. Recycled aggregate is comprised of crushed, graded inorganic particles processed from the materials that have been used in the constructions and demolition debris. Recycled aggregates are produced from the re-processing of mineral waste materials, with the largest source being construction and demolition waste. These wastes are normally composed of concrete rubble usually, constitutes the largest proportion of C&D waste. It has been shown

that crushed concrete rubble, after separation from other C&D waste and sieved, can be used as a substitute for natural coarse aggregates in concrete or a sub-base or a base layer in pavements.

### Description of the Selected Site

**Owner Name:** Anandbhai Ramnikbhai Fadadu

**Address:** "Vandana", Laxminagar Road,  
Near Alpha Primary School,  
Junagadh-36201,Gujarat.

**Plot Area:** 855 sqft

**Contractor Name:** Goganbhai Hajabhai Odedara

**Type of Building:**G+1, Load Bearing Structure

**Approximate Life of Building:**30+



Fig.1 Front Side of Building



Fig.2 Demolition Building



Fig.3 Demolition Building



Fig.4 Up Side of Building

### Types of Materials collected from the site as a sample



Fig.5 Concrete



Fig.6 Ceramic material



Fig.7 PVC Pipes



Fig.8 Bricks



Fig.9 Reinforcement



Fig.10 Glass

### Properties of Aggregate

After collecting concrete rubble waste sample from the site, it is crushed by hand hammer in the laboratory of LDRP-ITR and then sieved in different sizes from 10mm to 20mm.



Fig.11 Crushing of Concrete Rubble



Fig.12 Sieve Analysis

Laboratory tests for aggregate have been conducted on crushed concrete aggregate

#### Specific Gravity:

The specific gravity in saturated surface dry condition of demolished concrete aggregate was found from 2.5 which is less but satisfying the results. If specific gravity is less than 2.4, it may cause segregation; honeycombing & also yield of concrete may get reduced.

**Water Absorption:**

The DCA from demolished concrete be made of crushed stone aggregate with old mortar adhering to it, the water absorption ranges from 0.32%, which is comparatively more than that of the natural aggregates. Thus the water absorption results are satisfactory.

**Bulk Density:**

The bulk density of demolished aggregate is lower than that of natural aggregate, thus results are not satisfactory; due to low Bulk Density the mix proportion gets affected.

**Crushing and Impact Values:**

The demolished aggregate is comparatively weaker than the natural aggregate against different mechanical actions. As per IS 2386 part (IV), the impact and crushing values for concrete wearing surfaces should not exceed 30% & for other than wearing surfaces 45% respectively. The crushing & impact values of recycled aggregate satisfy the BIS specifications limit. From crushing and impact test it is found that use of recycled aggregate is possible for application other than wearing surfaces.

**Aggregate Test**

| SR. NO. | PROPERTIES       | NATURAL AGGREGATE        | RECYCLED AGGREGATE       |
|---------|------------------|--------------------------|--------------------------|
| 1       | Specific gravity | 2.4-3.0                  | 2.5                      |
| 2       | Water absorption | 0.29%-0.3%               | 0.32%                    |
| 3       | Bulk density     | 1678.2 KN/m <sup>3</sup> | 1469.8 KN/m <sup>3</sup> |
| 4       | Crushing value   | 18.4%                    | 36.3%                    |
| 5       | Impact value     | 17.65%                   | 35.2%                    |

**Table.1 Properties of Recycled Aggregates compared with Natural Aggregate**

**Properties of Cement (OPC 53 Cement):**Cement: Shree Ultratech Ordinary Portland cement of 53 grade is used and on batch is utilized throughout the work. This ordinary cement consists of two materials namely argillaceous and calcareous.

| Sr No | Tests                          | Results                             | IS code              |
|-------|--------------------------------|-------------------------------------|----------------------|
| 1     | Fineness test                  | 8.25 %                              | IS:4031(part-1)1988  |
| 2     | Soundness test                 | 10 mm                               | IS:4031(part-3)1988  |
| 3     | Consistency test               | 30 %                                | IS:4031(part-4)1988  |
| 4     | Specific Gravity               | 3.048                               | IS:4031(part-11)1988 |
| 5     | Initial and final setting time | Initial – 30 min<br>Final – 685 min | IS:4031(part-5)1988  |

**Table.2 Properties of Cement**

**Properties of Fine aggregate:** Locally available river sand of is used as a fine aggregate it passes through the sieve of 4.75mm.

| Sr No | Tests            | Results | IS code             |
|-------|------------------|---------|---------------------|
| 1     | Specific gravity | 2.66    | IS:2720(part-3)1980 |
| 2     | Absorption       | 0.60 %  | ASTMC 128-15        |

**Table.3 Properties of Fine Aggregate**

## CONCLUSION

The Study is carried out for the increasing price of land in recent years has led to high dumping costs at landfill sites. The construction waste should be reduce by effective management or improve the techniques atthe site and the demolition waste should be reuse and recycle into usable materials which can be used in new construction work for the economical purpose because Sometimes overall cost of the project increases by the shortage of materials which led to the increment in material market prices. So the main aim of this Study is to protect environment from adverse impact of hazardous C&D waste like demolished concrete and for minimising the overall cost of any construction work.

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