

# Study of Construction and Demolition waste for reuse and recycle

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**Abstract:** The construction and demolition waste is the waste mainly generated from the two activities i.e. from the construction activity and demolition activity. The waste which is produced during construction activities are called as construction waste and the waste produced during demolition activities are called as demolition waste. The Demolition waste is generated from the demolition of old structures like buildings, bridges, malls and roads. Construction industry in India generates about 20-32 million Tons of waste annually. So this C and D waste should be managed properly. Most of the construction and demolition waste in India is getting disposed into the landfills. This may lead to the environmental pollution. The rules and regulations regarding to the land filling disposal are not implemented properly So this paper is expected to reduce the landfill disposal of the construction and demolition waste and to achieve the aim of reuse and recycle of that construction and demolition waste. The objective of this paper is to study the various strategies of the reusing and recycling of the C & D waste adopted by different countries. The paper also focus on the recycling of the aggregate for its reutilization in the construction activities, so that by using the Recycled aggregate the cost of the project also gets down. By taking the sample tests in the Pune region the recycling of the aggregate is done and which can be used for the pavement designs and other construction purposes.

**Keywords:** demolition waste<sup>1</sup>; disposal<sup>2</sup>; recycle<sup>3</sup>; reuse<sup>4</sup>; pollution<sup>5</sup>

## 1. INTRODUCTION

The infrastructure of India is growing rapidly so that fast growth of construction industry will cause the generation of construction and demolition waste therefore proper management of construction and demolition waste should be needed. Reusing and recycling is one of the measures to reduce the construction and demolition waste. The market demands for the material which is used for the construction purpose is more and the supply of the material is low comparing with the demand so to attain the demand of the market recycling is one of the major aspects. So reusing and recycling is the important term in the market to satisfy the demand of construction material in the market. Concrete is the major product of

the construction and demolition waste. So by applying recycling techniques we can recycle the ample amount of good quality of aggregate. Recycling of aggregate material from construction and demolition waste may reduce the demand-supply gap in the construction market. The aggregate from the construction and demolition waste can be utilized from the construction and demolition waste by applying some tests over it. Aggregate is one of the major components which get recycled. So that aggregate recycling helps to reduce most of the construction and demolition waste. In this paper we perform some tests on construction and demolition waste and try to recycle the good quality of aggregate from the construction and demolition waste. So that by proper construction and demolition waste recycling we can recycle almost 50 to 60 percent of aggregate and some amount of sand, silt and clay also utilized. The recycled aggregate can be used for the pavement designs as well as many other construction purposes also. So that the recycling of aggregate may meet the demand of market and it may help to reduce the demand of natural resources also. And automatically it will reduce the environment pollution.

## 2. AIM AND OBJECTIVE

The construction and demolition waste management is one of the vast aspects of the construction industry. The main aim of this project is to reduce the construction and demolition waste generated by reusing and recycling the construction and demolition waste our approach is to fulfill the increasing demand of the resources by providing the recycled materials and to minimize the earth pollution. The main objectives of the project are as follows

- To study demolition waste management policies of different countries.
- To study the role of regulatory authorities in demolition waste management.
- To study the C and D waste generation, its sources and streams.

- To understand the recycling of C and D waste for reutilization.
- To study the feasibility of C & D waste in terms of reuse, recycle and disposal.

### 2.1 The scope of this work is

A general approach to an integrated solid waste management plan would comprise of the following:

- understanding the various waste management practices
- identifying waste management needs
- identifying budget requirements (financial targets)
- identifying the stakeholders & coordinating with to achieve the targets
- arriving at a rational basis for setting up a waste processing / disposal facility
- Select appropriate medium for mass awareness

### 3. METHODOLOGY

The methodology includes survey, discussion, interviews and questionnaires. The data and information from interviews and questionnaires will be primary data for study. All information collected from interview and questionnaires is arranged and compounded in well manner before start to analysis.

#### 3.1. Method of Approach for Achieving the Objective

1. Collect literature from internet and journal
2. Visit a major site where demolition is going on
3. Study the methodologies adopted by them and verify with norms of regulatory authority
4. Suggest improved methods of recycling/reuse/disposal of demolition waste
5. Suggest the modifications required in regulations in vogue for demolition waste disposal

#### 3.2 The following aspects are going to be studied.

1. Classification of various major and minor components of demolition waste
2. Properties of various major and minor components of demolition waste
3. Methods of sorting, collection, transportation and storage of demolition waste
4. Recycling and reuse of various components of demolition waste
5. Need for safe methods of disposing demolition waste
6. Planning and management aspects
7. Institutional and regulatory aspects

### 4. RECYCLING CONSTRUCTION AND DEMOLITION WASTES

#### 4.1. Introduction

The reasons to recycle construction and demolition wastes are simple but compelling:

- Construction and demolition wastes are one of the largest waste streams in the country.
- Almost all job site wastes are recyclable.
- It costs less - usually much less - to recycle job site wastes than to throw them away.

Almost all Job Site Wastes Are Recyclable. This waste stream is also very large. While construction or demolition the major part of the waste is nothing but the concrete. So by recycling the concrete we can get the recycled aggregate which could be workable and will be in good condition. So that aggregate recycling give the good recycling results.

#### 4.2 Recycling of Aggregate C and D Waste

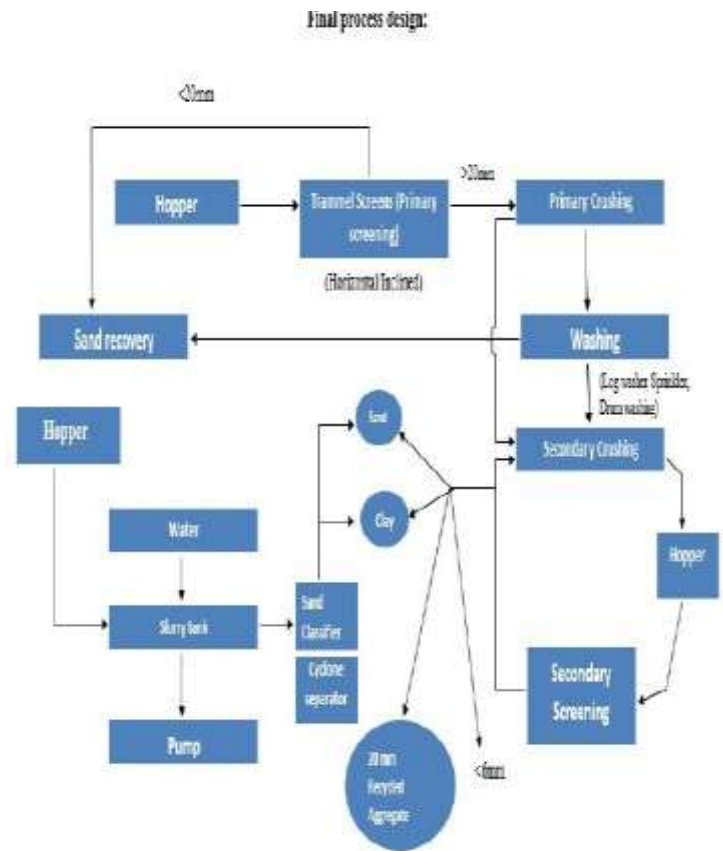
The main aim of our project was regarding research and development (R&D) of construction and demolition(C&D) waste by further studying its properties in detail at

various construction sites in Pune. The general scenario of construction and demolition waste is seen on various construction sites. During our primary survey of construction and demolition waste quantity we found that in Wagholi Pune itself 35000MT of waste is dumped at Sai Construction D Block and daily 300MT of construction waste is collected. So in line with our Pune Municipal Corporations policy of Reduce Reuse Recycle we derive our methodology for recycling of construction and demolition waste and making useful products out of it. So we carried out sampling of concrete, bricks, tiles, wood, metals, plastic etc. i.e. the different components of C&D waste from the various sites. In-depth testing of these approximately 37kgs of C&D waste collected from different sites. On the basis of various result of these testing we designed a process.

**4.3 The Procedure for the Sample Separation of C and D waste**

- The given flowchart explains each and every process of the recycling plant. Mainly there are two products for which the whole process is designed, they are aggregate and Sand. The whole process consists of mainly three cycles, crushing, screening and washing. Sand recovery is done in more than one process.
- First of all the construction and demolition waste is sent for initial screening through hopper. This screen may be of many types, for example horizontal and inclined. This screening is mainly done to segregate the large crushable materials which are greater than 20mm while smaller than 20mm
- Particles are directly sent for sand recovery.
- Now primary washing is done of the remaining material and further it is washed with the help of various kind of washers like log washer, sprinkler, drum washer etc. After the completion of washing, the material is taken for secondary crushing. Now with the help of conveyor belt the crushed material is sent for secondary screening through hopper.

- This secondary screening is important part of the process because by doing so the material (C&D waste) is finally differentiated into four products. These products are sand, clay and aggregates (recycled). The material which is still left is sent again for crushing and the cycle is repeated.
- The sand recovered in the initial sand recovery as shown in flowchart is collected in a hopper. It is then sent to slurry tank where the material washed by pumping of water. Now with the help of sand clarifier and cyclone separator, the two products sand and clay are separated respectively.



Flowchart 1: The basic process design of the recycling plant on basis of the whole study of the sample

Fig. C and D waste separation process

## 5. AGGREGATE RECYCLING TESTS

### 5.1 Introduction

The data which is used for the tests is collected from the various sites by survey analysis, questionnaire survey, interviews and site visits. The construction and demolition waste samples which is used for the testing is simultaneously collected from the various sites.

#### A. Sampling

The sampling is the first thing on focus, after the general study of various aspects of construction and demolition waste at national and local level was sampling. The basic meaning of sampling is to collect randomly the desired material from various points/location on which one has to make study. Thus for carrying out any research work practically on any material, sampling is necessary. In context to construction and demolition waste, in Pune city.

#### B. Sampling Sites:

1. Sai Construction Wagholi, Pune.
2. Sanjay Construction Karvenagar, Pune.
3. Siddhi Construction Aakurdi, Pune.

### 5.2 Tests Conducted

#### Sieve analysis (Particle size distribution)

Sieve analysis is the most primary and basic test of civil engineering. It is commonly known as the gradation test. It is a basic essential test for all aggregate technicians. The sieve analysis determines the gradation (the distribution of aggregate particles, by size, within a given sample) in order to determine compliance with design, production control requirements, and verification specifications. The gradation data may be used to calculate relationships between various aggregate or aggregate blends, to check compliance with such blends, and to predict trends during production by plotting gradation curves graphically, to name just a few uses. Used in conjunction with other tests, the sieve analysis is a very good quality control and quality acceptance tool.

#### Impact value test

The property of a material to resist impact is known as toughness. Due to movement of vehicles on the road the aggregates are subjected to impact resulting in their breaking down into smaller pieces. The aggregates should therefore have sufficient toughness to resist their disintegration due to impact. This characteristic is measured by impact value test. The aggregate impact value is a measure of resistance to sudden impact or shock, which may differ from its resistance to gradually applied compressive load.

## 6. CONCLUSION

It has been established that materials and components from demolished buildings are being reused for new construction work as well as renovation projects. In developing countries most of demolition rubble is dumped, the developed world has now started recycle it into aggregate for non structural concrete. It is hoped that recycling waste materials for use in the building will cut down cost of producing new raw materials thereby reducing consumption of natural resources like energy and reduces usage of landfills. By collecting the samples of concrete of construction and demolition waste from the various sites of the Pune region we can apply the various processes like crushing, screening, washing, oven drying we will get the sample for the further tastings. The processed sample is used for conducting the various tests like particle size distribution, sieve analysis and impact value tests. By conducting the tests over those sample we can concluded that the recycled aggregate is in workable condition or not we can also conclude the feasibility and properties of the recycled aggregate. While applying the process like crushing and screening we can get some amount of sand, silt and clay also. The recycled aggregate can be used for the road construction purpose and for many other construction purposes also by recycling the aggregate we can fill the gap between the demand and supply of the construction material and the recycled aggregate used in the project will also help to reduce the cost of the project also. In fact by reusing and recycling the construction and demolition waste we can reduce the use of natural resource and we can minimize the pollution of earth by minimum disposal of constuction and demolition waste into the landfills.

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