Construction and Demolition waste its reuse and recycle and its cost benefits

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Abstract: Construction and Demolition waste its reuse and recycle for the cost benefits is the wide range aspect for the project work. The Indian construction industry grows very fast as the India is developing country so that the infrastructure of country grows rapidly. The construction industry of India produces huge amount of construction and demolition waste it measures about 20 to 30 million tons annually. The construction waste generated is bulky and very huge amount so that proper C and D waste management is needed for the disposal of this waste. In India the C and D waste does not disposed properly the waste is disposed along the roadside, into the canals, on the open lands and sometimes it may disposed into the landfills so that it may occurs the serious environmental problems in the future. Most of the construction materials are gained from the natural resources so that it affects the natural resources also. The demand of the construction material is very high and the supply is comparatively low therefore to attain the need of construction materials the reuse and recycling of C and D waste is needed. Reuse and recycle is one of the important aspects in the C and D waste management. Recycling of C and D waste is the step towards reducing the saving natural

Resources and to fulfill the demand of the market supply. Aggregate is one of the major components which can be recycled on the huge amount. In this project we select the sites from the Pune region to recycle the aggregate from the construction and demolition waste. The various tests like screening, washing, sieving, and impact value test were performed over the samples collected from the various sites and the results were found. The findings which go from the tests were that the aggregate which is retained from the separation process is workable and can be used for the pavement design and other construction work also. It may also produce sand, silt and clay. So that about 40 to 50 percent of aggregate can be achieve by recycling of the C and D waste. The recycling cost of the aggregate is also less and it gives cost benefits for the project.

Keywords: construction material; disposal; recycle; reuse; land filling; silt; clay

1. INTRODUCTION

Construction and demolition waste is the waste which is produced in the construction and demolition activities it consists of mainly two parts i.e. the waste which is produced during the construction activity are called as construction waste and the waste which is produce during the demolition activity is called as demolition waste. Indian construction industry is one of the largest industries in terms of the economical expenditure so that the C & D waste management plays an important role into the cost

saving of the project and to attain the economy from the proper management of the C & D waste. Projections for building material requirement of the housing sector indicate a shortage of aggregates up to 55,000 million m3. Additional 750 million m3 would be required for achieving the targets of the road sector. Recycling of aggregate material from construction and demolition waste may reduce the demand-supply gap in both these sectors. In this paper some samples were collected from the various sites of pune region and the tests were carried out 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 helpful to reduce the demand of natural resources also. And automatically it will reduce the environment pollution.

1.2Aim 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 the project is 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.
- To study the cost benefits of reuse and recycle of C & D waste.

2. LITERATURE REVIEW

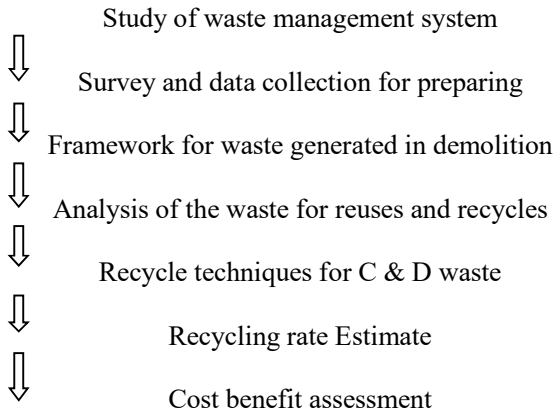
2.1. C and D Waste Management

Recycling of demolition waste was first carried out after the Second World War in Germany to tackle the problem of disposing large amount of demolition waste caused by the war and simultaneously generate raw material for reconstruction. Considerable research has been carried out in U.S.A, Japan, U.K, France, Germany, Denmark etc. for recycling concrete, masonry, bricks, bituminous and other constituents of waste from Construction Industry. These studies have demonstrated possibility of using construction waste to substitute new materials of recycling. Work on recycling of aggregates has been done at Central Building Research Institute (CBRI), Roorkee, and Central Road Research Institute (CRRI), New Delhi. The study report stresses the importance of recycling construction waste, creating awareness about the problem of waste management and the availability of technologies for recycling. According to a study commissioned by Technology Information, Forecasting and Assessment Council (TIFAC), 70% of the construction industry is not aware of recycling techniques. The study recommends establishment of quality standards for recycled aggregate materials and recycled aggregate concrete. This would help in setting up a target product quality for producers and assure the user of a minimum quality requirement, thus encouraging him to use it.

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.

Proposed work step



4. C AND D WASTE GENERATION

4.1 Sources of Waste Generation in the Construction Industry

The C and D waste generation in India is very huge amount the waste generators can be distributed into two parts i.e. bulk generators and small generators. The bulk generators are of infrastructure and real estate sectors the waste generation from the construction of roads, bridges, flyovers and demolition the structures and the small generators are small buildings, construction waste from the residential and small projects. The components of the waste also distributed as major components and minor components the major components contains rubble, concrete, metals and bricks and the minor components may contain the fittings, plastic and panels these all are the construction and demolition wastes.
Mr. R. B. Waghmode, Dr. P. S. Dange studied Domestic Waste Water Treatment using Modified Root Zone Technology (IJSRD). The sludge generated from such treatment can be used as Construction material after some treatment.

4.2 Different composition of C&D waste.

Typical composition of C&D waste produced in India is shown in figure given below the major part of the C and D waste is concrete about 65% of the concrete is present in the total C and D waste .nearly 25% of bricks and tiles are present in the waste composition, 5% of wood, 2% of metal and 3% of other constituents are present in the total construction and demolition waste composition.

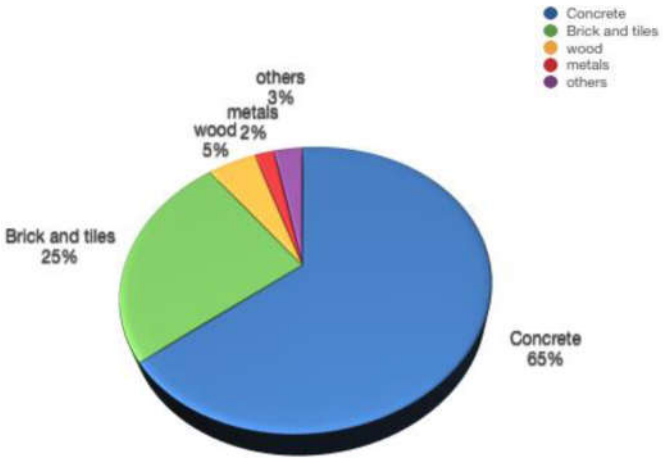


Fig. composition of C and D waste

5. RECYCLING OF AGGREGATE FROM C AND D WASTE

5.1 Introduction

In the construction and demolition waste the composition of concrete is about 65% of the total waste. Therefore recycling of aggregate from the C and D waste is the major product. For the recycling of the waste the various tests like crushing, screening, particle size distribution, impact value test have to perform on the test samples. The data which is used for the calculation is collected from the various sites by survey analysis, questionnaire survey, interviews and site visits. The samples which is used for the testing is simultaneously collected from the three sites namely sai construction at wagholi, sanjay construction from karvenagar and Siddhi construction from the Aakurdi the samples in the form of construction and demolition waste is collected from above three sites. So first of all before carrying out tests on the samples the primary segregation was done. During this the unwanted waste was separated by simply hand picking. This unwanted waste consisted of plastic, metal wastes, bitumen wastes (road debris) etc. Out of the total sample collected i.e. 38.942 kg the unwanted waste separated was 2.637 kg. So the tests were conducted on the remaining amount of material left i.e. 36.305 kg. Whole of the testing process was carried out in laboratory.

5.2 Segregation and Separation of Aggregate The first section is of material which is crushable i.e. particles greater than 20mm. Second section is directly sent for screening i.e. whose particle size is between 6.3mm to 20mm. Now the process of washing is conducted for the remaining portion of the total material left. This is mainly called as sand. Further, the particles whose size is less than 2.75mm is directly sent to washer and the remaining part is again segregated by two methods namely: Wet segregation (mud content >10%) and Dry segregation (mud content <10%). Now the crushed material is washed before undergoing screening. At the end, after completion of each separate process, the screening and washing is done.

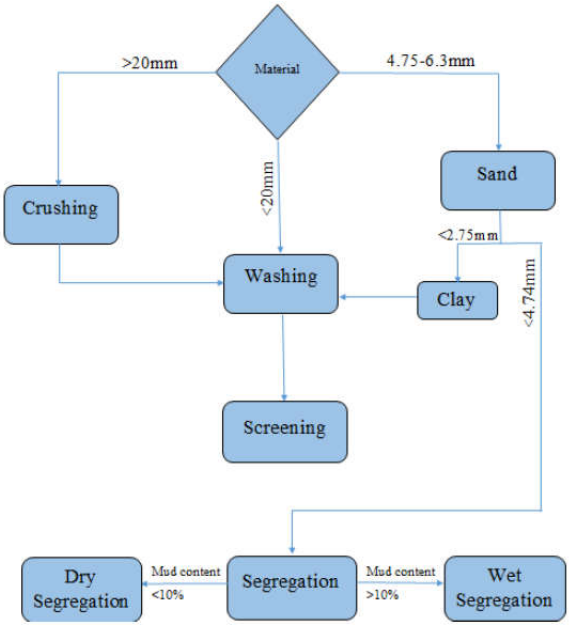


Fig Aggregate separation process

5.3 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

Aggregate impact value (%)	Toughness Properties
<10	Exceptionally tough / Strong
10 – 20	Very tough / Strong
20 – 30	Good for pavement surface course
>35	Weal for pavement surface course

Table1. Results for 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.

5.4 Test Results

The sampling and impact value test was conducted on the three samples collected from the three different sites the average impact value for the test samples are as follows

- The average impact value of the test is 6.59. So, the aggregate is enough workable to the pavement constructions and is applicable for many other construction purposes.

- The impact value for the given sample is 11.34 therefore the sample is tough to resist the load so that the aggregate is in workable condition and which is useful for pavement construction and many other construction purposes.

- The average resulted value for the impact value test is 11.57 it means the sample aggregate is in workable condition so that the aggregate can be used in the pavement design as well as other construction purposes.

5.5 Findings from the tests

1. We carried out total sampling of 38.942 kg of C and D waste collected from 3 different sites of Pune.
2. Various tests namely Crushing, screening, impact value test were carried out on these samples.
3. Out of the total collected sample 2.673 kg of unwanted waste was recovered.
4. The sand and clay content was found to be 12.440 kg i.e. approx. 35 %.
5. The unwanted waste comprised of plastic, metals, ceramics, etc.
6. This unwanted waste cannot be recycled and has to be dumped or incinerated depending on the properties of the waste.
7. The sand and clay content can be recycled for washing and manufacturing of sand which can be further used in new construction.
8. Sieve analysis was also carried out of the crushed materials to determine its properties.
9. The impact value test is conducted on the three different samples the three different trails were taking on them and the results were coming out the aggregate is in workable condition.
10. The recycled aggregate can be used for the pavement constructions and many other construction purposes.
11. The cost for the aggregate recycling is less comparing with the fresh aggregate available in the market.
12. The recycled aggregate will be the best option to provide the demand of the market.
13. The aggregate recycling will also helpful to conserve the natural resources and to control the earth pollution also.
14. The recycled aggregate, sand and clay will become the best to fulfill the demand of the market.

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. Waste can only be reduced once all employees and contractors are fully aware of the extent of the

problem in the company. Each construction employee must be trained on waste management. This training may include waste management induction training to reinforce the importance of waste minimization practices. We carried out total sampling of 38.942 kg of C and D waste collected from 3 different sites of Pune. Out of the total collected sample 2.673 kg of unwanted waste was recovered. The sand and clay content was found to be 12.440 kg i.e. approx. 35 %. The unwanted waste comprised of plastic, metals, ceramics, etc. The sieve analysis and impact value test was performed on the collected sample the results are coming out that the recycled aggregate is workable and it can be used for the pavement design and many other construction works. The aggregate which is recovered or recycled can be used for the construction works so it can be cheaper than the fresh aggregate and will be much beneficial for the cost savings. By recycling the aggregate we can conserve the natural resources and we can avoid the pollution also. The aggregate from the recycling can be covered up to the 50-60% Therefore by using the recycled aggregate we can save the cost of our project.

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