

WASTE MINIMISATION FOR HIGHWAY CONSTRUCTION

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Abstract — In present era, safe disposal of Industrial wastes is a great problem. These waste materials create environmental pollution because many of them are non-biodegradable. India has large network of industrial which are in different parts of the country and many more are to come in the near future. Million metric tons of industrial wastes are produced in this industry. The pollution and disposal problems and minimized by utilizing these materials in highway construction. It is essential to test these materials and to find a new methodology and specification to increase the use of these industrial wastes in road construction in India. A review of various Industrial wastes to be used in the construction of highway has been discussed in this paper. The common waste materials are used are construction and demolition waste and tiles waste causing problems in the disposal.

keywords: C & D (Construction and Demolition) waste, Tiles waste, Ceramic waste, Industrial waste.

INTRODUCTION

We know that the India is developing country which means that industrialization is growing day by day. Disposal issue of the waste products is a challenge now a day. Some of these waste materials are not biodegradable and often leads to waste disposal crisis and environmental pollution. Due to increasing in waste volume and a shortage of landfill, waste management is becoming a more significant and important subject. The use of these materials in road making is based on technical, economic, and ecological criteria. India has vast network of industries located in different parts of country. Traditional soil, stone aggregate sand, bitumen, cement etc. are used for road construction. Natural materials being exhaustible in nature, its quantity is declining gradually. Also, cost of extracting good quality of natural material is increasing. If this material can be suitably utilized in highway construction, the disposal problem of the waste may beget reduced it will also help to reduce pollution. Keeping in mind the need for bulk use of these solid wastes in India, it was thought expedient to test these materials and to developed specifications to enhance the use of these industrial

wastes in road making, in which higher economic returns may be possible.

MATERIAL EMPLOYED

Since construction and demolition waste are producing on large scale and ceramic (Tiles) wastes are also generating on large scale. Management of these waste is big problem that world is facing now. Here is the best way to manage these utilizing it in road construction. Hence, we are using these two materials.

Sampling: -

Sampling is the process of collection of materials from their resources. Sampling of C and D waste and Tiles waste can be done as follows.

C and D - due to urbanization of construction domain is increasing drastically along with that environmental issue like landfill due to illegal dumping etc are also increasing and every man-made structure has a certain year of life span. Due to demolition construction waste is produce and due to less land availability disposing is a problem. So, C and D waste is collected from the site where the demolition process is going.

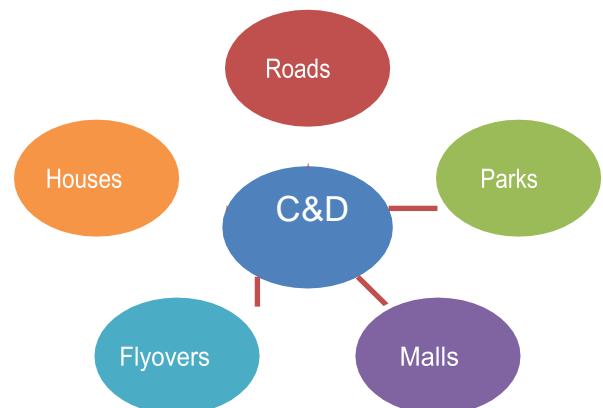


Fig.-1: Various sources of Construction and Demolition waste

Tiles waste: -

Tiles are produced in ceramic industry by metallurgical process. Tiles is composed of various materials and some of them are chemically hazardous which may cause a problem to environment if are not properly manage.

1. Grading of material: -

C and D waste and Tiles waste collected from resources are of irregular grading. It is obvious things that they are waste material, so they don't have required shape and size. The aggregate which are used in road construction are consisting of a standard grading. This grading of aggregate is specified by various agencies like ASTM, BSI, IS, IRC and MORTH.



Fig. 2: Sources of Tiles waste

Material acceptability and suitability

Flexibility pavement is composed of different layers like soil sub-grade, sub-base course and base-course. Different layer contains different composition of aggregate. For conventional material, a number of tests conducted, and their acceptability is decided on the basis of test results. These result gives the performance of the material in terms of strength, toughness, abrasion, durability etc. The tests and specifications, which are applicable for conventional materials, may be similar for evaluation of industrial wastes. Thus, for an appropriate assessment of these materials, new tests are to be devised and new acceptability criteria are to be decided. However, with the result of performance-based tests, it is expected that the performance of conventional as well as new materials can be tested on same set up compared. It is important to consider health issue while handling the waste materials because these waste materials may be harmful tom human. Hence proper inspection should be

done on waste materials. Material acceptability is the important step to check whether the materials are suitable for replacement of aggregate or not,

Table-1: Suitability of waste materials in highway construction

Material	Advantages	Disadvantages
Construction and Demolition waste	Being strong can be used as aggregate granular base.	May show Inconsistent properties.
Tiles waste	Can be used in base-course, subbase course.	May show inconsistent properties

2. TESTING METHODOLOGY

For conventional aggregate number of tests carried out to determine its strength and other characteristics. According to IS 2386: 1960. The tests which are carried out on aggregate are

- a) Elongation Index Test
- b) Flakiness Index Test
- c)Crushing Value Test
- d) Impact Value Test
- e) Abrasion Value Test

Firstly, all the above-mentioned tests are carried out on 100% aggregate and secondly after replacing 50% of aggregate with waste materials. The final proportion of aggregate, C and D Tiles waste taken is 50%, 25% and 25%.

Table 2: Physical properties of materials

Sr. No.	Tests	Aggregate Tests Results	Aggregate (50%) +Water (50%) Tests Result
1	Flakiness Index	18.81%	19.10%
2	Elongation Index	23.87%	20.56%
3	Abrasion Test by Loss Angeles Machine	14%	18%

4	Abrasion Test by Deval Machine	18%	20%
5	Crushing Value Test	24.60%	18.45%
6	Impact Value Test	21.80%	17.57%

The composition is made between the result obtained from 100% aggregate and after replacing 50% it with waste materials. Following graph shows the comparison between them

DISCUSSION ON TEST RESULT

After performing all above tests on 100% aggregate and after replacing 50% aggregate with waste material the result obtained are nearly same and under acceptable criteria specified by MORTH (Ministry of Road Transport and highway).

Hence it is possible to replace 50% of aggregate with 50% of waste (C & D-25% and Tiles waste-25%) and can be effective used in road construction in sub-base course and base-course.

CONCLUSIONS

The industrial waste material construction and demolition waste and tiles waste for use in highway construction has been reviewed in this paper. From all analysis and above study following conclusion are made:

- After doing all test, the result of construction aggregate and aggregate with 50% of waste are almost same and hence we can use C and D waste and Tiles waste in road construction in 50% replacement of aggregate.
- Due to scarcity of natural aggregate it is essential to find its alternative. By using C and D waste and Tiles waste in road construction in place of aggregate we can save its amount by 50%.
- Since due to industrialization the waste is producing of huge amount and is used for their dumping. Hence by using these wastes we can save a land from landfill and we can avoid land pollution.
- By using these waste materials, we can help to maintain the ecological balance in the environment.

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