

Exploiting Waste Material as an Alternative for Conventional Paver Block

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Abstract

Plastics are very quickly increasing parts of the municipal plastic waste. Disposal of waste including waste plastic has become a serious issue. Huge number of bags which are in the form of waste plastic being accumulated in this century has created many problems for their disposal, in order to come out of this issue we have to use it in an effective way. This project is about recycling waste plastic into paver block which can be used for many purposes such as footpaths, streets, parking's and also to study the characteristics of the plastic paver block. Here we are going to present the strength properties of the pavement blocks comprising of the waste plastic. The innovation of plastic paver block will be a boon to our society and also to the environment. The main aim is to use the waste plastic in the construction field which will prove to be economical and also helpful to the environment.

Keywords— Paver block, Plastic waste, Polyethylene, Recycle.

I. INTRODUCTION

Plastic has more versatile use in almost every sector due to its durability, light weight and relatively inert properties. Also it is a very cheaper option as compared to other materials. The synthetic polymers or plastic was created in the early 20th century and now can be seen everywhere. In India an average person consumes 11kg plastic every year. But as being that versatile it has so many disadvantages too. Major issue of use of plastic is its reusability and recyclable property. As being the cheapest option most of the plastic materials are usable only once and disposed directly. Every day India generates 15 million kilograms of plastic out of which only 9 million kilograms are collected and recycled leaving the rest to pollute water, clog drains, kill cows and degrade soil. Also as India is a developing country with its population growing much rapidly. Its construction business to accommodate this significant growth. As increase in construction business there is a significant demand of economical resources too. So use of waste plastic the construction industry can be an economical solution. This waste plastic can be used in the manufacturing of construction materials. This can be an effective, easy way to dispose off plastic and also this can reduce the load over the need of construction materials. As plastic has longer life we can use it in paver block. The replacement of plastic waste for cement provides potential environmental as well as economic benefits.

A. Waste Plastic

High density polyethylene(HDPE) plastic waste is usually recyclable. Plastic bags fall under this category. Hence waste plastic used in product was mainly plastic bags which were collected from Municipal Kachra Depot.

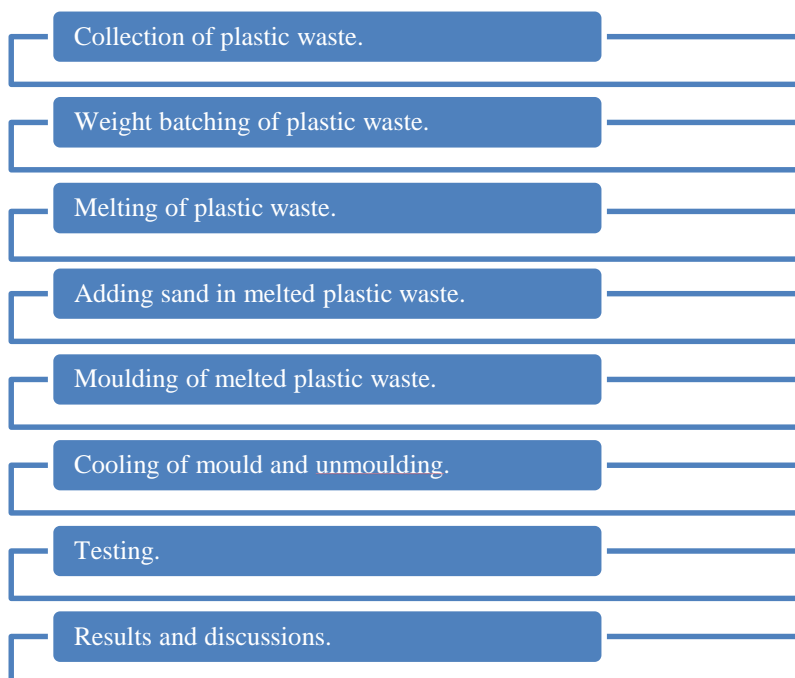
B. Fine Aggregate (Crush Sand)

Crushed sand is manufactured by crushing rocks, quarry stones, larger aggregate pieces into sand size particles in a factory. It's chemical and physical properties such as colour, size and shape, surface texture up particles depend upon types of stone and its source. The artificial sand produce by machine can be a better substitute to natural river sand.

C. Scope of the work

1. Use of plastic waste as binding material will be done for preparation of paver blocks.
2. Use of plastic waste as binding material.
3. Cost comparison between conventional paver block (PB 1), Plastic waste as binding material and sand as fine aggregate (PB 2).
4. Strength comparison between conventional paver block (PB 1), Plastic waste as binding material and sand as fine aggregate (PB 2).
5. Materials used in conventional paver block (PB 1), Plastic waste as binding material and sand as fine aggregate (PB 2).

II. METHODOLOGY



A. Procedure

The materials used in the mixture of the paver blocks are in the ratio (1: 1) (plastic: sand). For the purpose of making 2 block of paver of size 180 x 90 x 60 mm size, the required material is 1kg of plastic: 1kg sand. The procedure carried out for casting of paver block is as follow:

1. For melting and mixing of sand and plastic pan was used and was lit by using fire timber. First 1 kg of plastic waste was brought to melt in the pan. Later 1kg sand was added and mixed properly by using trowel.
2. Oiling was done on the mould on its inner surface for the easy remolding of the block, and then by continuously mixing, the mixture was poured by using trowel.
3. Then by removing voids in poured mixture by tamping and the mixture was left for setting for 2 minutes.
4. After completion of setting time remove the mould and wet the blocks for cooling them.

The same procedure was repeated for other proportions as well.

Mix Proportion of Pavement Block Material:

In order to find the plastic block that they possess high compressive strength with various mix proportions are made and they are tested using compressive testing machine. The mix proportion were in the ratio of (1:1, 1:2, 1:3) (50%:50%), (33%:67%), (25%:75%). These were the ratio which represents the plastic and crush sand respectively.

Mould:

The mould required for paver block was fabricated in the fabrication shop. Mould design size: 18cm x 9cm x 6cm.



Fig. 1 Mould



Fig. 2 Plastic and sand mixing with trowel



Fig. 3 Mixture after pouring and tamping



Fig. 4 Final product

III. RESULTS AND DISCUSSIONS

TABLE I
COMPRESSIVE STRENGTH

Proportion	Compressive strength
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Conventional Concrete Blocks	24.67 N/mm ²
Paver Block (1:1)	15.34 N/mm ²
Paver Block (1:2)	19.83 N/mm ²
Paver Block (1:3)	25.54 N/mm ²

The compressive strength of paver block was tested on the universal testing machine. It was observed that the paver block with proportion 1:3 shows better results than conventional paver block.

IV. CONCLUSION

1. Productive way of disposal of plastic waste can be done by utilization of waste plastic in production of paver blocks.
2. Better results are obtained from paver blocks consisting of plastic waste and sand.
3. Though the compressive stress is low as compared to the concrete pavements, it can be used in garden, pedestrian path and cycle walk.
4. By using the plastic the weight reduces of the plastic pavement block as compared to the conventional pavement block.
5. The strong conclude is that, the use of recycled plastics in pavement blocks is the best option for the disposal of plastic and ultimately reduces plastic pollution in the environment

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