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# USE OF WASTE PLASTIC AS BINDING MATERIAL IN PAVER BLOCK

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## ABSTRACT

Plastic is rapidly growing, segment of trash disposal in municipal solid waste disposal of waste materials including waste plastic bags has become is serious problems. Amount of waste plastic bags being accumulate in 21st century big challenges for these disposals, waste plastic in houses hold is large and increases with time. In each country waste consumption is different, since it is unaffected by socioeconomic characters and waste management programs, plastic content in waste consumption is high. In order to overcome this issue, we have to use it in effective way. This project is about recycling waste plastic into pavement blocks and study their characteristics. Pavement blocks are perfect materials on the pathways and streets for simple laying and finishing. Here the pavement characteristics of strength blocks comprising of waste plastics and the design consideration for pavement block incorporating waste plastic bags is presented. It will be a boon to modern society and environment. The main aim is to use the plastic nature in construction fields with limited additions. It will be definitely a cost economical and can be applied in different forms.

**Keywords:** Cement Replaced, Paver Block, Plastic Waste, Compressive Strength.

## I. INTRODUCTION

Management of solid waste continues to be major challenge, particularly in the urban agglomeration in low and middle-income countries. Plastic waste use in this work was brought from the surrounding areas. Currently around 25,940 tonnes of plastic waste per day approximately 9.46 million tonnes per year.one of the largest component of plastic waste is polyethylene and polypropylene. The dumped waste pollutes the surrounding environment, as the result of its affect the both human beings and animals directly and indirectly. The billions of tons plastic is ending of in the world's oceans it adversely affected to the humans, animals, marines and as well as environment.

Current study introduces various types of plastic waste as a binding material to completely substitute cement to produce cement less paver block. The constituent of paver block comprised of mixer of different types of plastic waste in different proportions mix with nature fine aggregate. The plastic waste replacement for cement provides environmental as well as economic benefits.

Various plastics can be blended with sand without affecting its other properties or causing a little reduction in strength, according to the findings of the study. on WCEM campus where shredded or melt and use in production of paver blocks.

**Fig. 1.1** plastic pollution in ocean

**Fig. 1.2** plastic pollution in city

## II. NEED OF STUDY

The use of plastic material such as PET bottle, carry bags, cups etc. is constantly increasing, once use plastic material thrown out, they do not undergo bio decomposition. Hence, they are either landfill or incinerated. Both are not eco-friendly process as they pollute the land and air. Any method that can use this plastic waste for the purpose of construction is always welcomed.

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**Aim**

The goal of this study is to establish the waste's appropriateness. PET bottle, polyethylene bags etc. in the process of development of paver blocks for construction.

**Objective**

1. Cement is replaced with plastic.
2. Decrease setting time of paving block.
3. Decrease the cost of paving block.
4. Curing is not important.
5. Plastic paving block is light in weight as compare to normal paving block.
6. Paving block is water resistant.
7. Strength comparison between plastic used paving blocks and normal paving bocks.

## III. METHODOLOGY

1. Selection of material.
2. Checking the material properties.
3. Proper mix design for the recycled plastic using paving block.
4. Melting the plastic waste, at the temperature of 140 $^0$C to 160 $^0$ C.
5. Mixing of sand in melted plastic.
6. Molding.
7. Unmolding.

**1. Selection of material.**

In paver block manufacturing require huge plastic. According to analysis the 1kg plastic required 4kg of sand. The sand quantity is depending on the use of plastic for blocks.

**2 .examining the material's characteristics**

The various plastics provides different properties such assemirigid very tough, weather proof chemical resistance low water absorption.. The fine aggregate generally consists of natural sand or crushed stone with most particle passing through a 9.5 mm sieve. For good mixing aggregate should be clean, hard, strong particle free of absorbed chemical or coating of clay and another fine material.

**3. Proper mix design. (1:3).**

When plastic is heated at 140 $^0$ to 160 $^0$ C it is melted in to a liquid from and this liquid is calculated into a ml. if ½ kg of plastic bags is heated up to a 450ml of liquid is obtained Similarly the mix proportion of plastic ratio is denoted by liquid (ml). in order to check the workability of plastic mix we made of trail and error method while during the manufacturing process.

**4. Melting the plastic waste.**

The metal drum are placed over the setup, then add the plastic in the drum. Plastic are started to melt and it turn into a liquid at the temperature between 140 $^0$Cto 160 $^0$C. The setting time of melted plastic is very low.

**5. Mixing of sand in melted plastic.**

After plastic melted in liquid form in metal drum add the proper proportion of material and mix properly. After proper mixing of material, then the mixing material are transferred to the mould.

**6. Moulding and Unmoulding.**

Handel the proper metal drum by conducting the moulding and mixing process of the material because its too hot. Filled the mould by material and tamped properly to do not occur any voids and properly leveled with the help of trowel. When the mixer as hardened enough that slab will not collapse, remove the mould. It should harden in around 2 hours.

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**Fig. 3.1** plastic paver block

## IV. RESULTS AND DISCUSSION

The tests are necessary for determining the strength of specimen and therefore its suitability for the job.Out of many tests applied to the paver, this is the outmost important which gives an ideal about all the characteristics of specimen. By this single test one judge that whether specimen has been done properly or not.

Size of the hexagonal mould = 314.36 cm $^2$

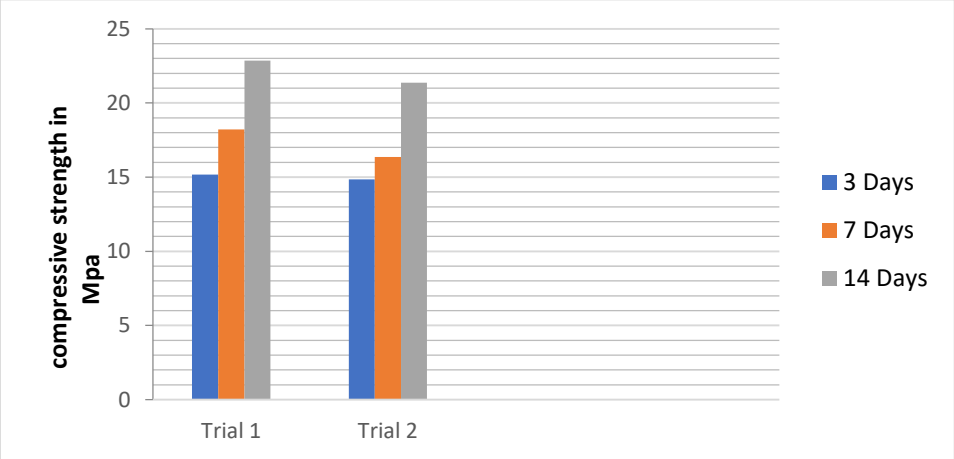
Ratio of mix

(P: F.A) = 1:3

**1. Compressive strength for trial 1 and 2**

**Table no. 4.1** compressive strength result

| Sr. No. | TRIALS | CPMPRESSIVE STRENGTH IN Mpa | | |
|---|---|---|---|---|
| | | 3 DAYS | 7 DAYS | 14 DAYS |
| 1 | TRIAL 1 | 15.18 | 18.21 | 22.85 |
| 2 | TRIAL 2 | 14.85 | 16.35 | 21.36 |




**Bar graph 4.1.** Compressive strength result

**2. Compressive strength for trial 3 and 4**

Size of cube = 400 cm $^2$ (square)

**Table no. 4.2** Compressive test result

| Sr. No. | TRIALS | COMPRESSIVE STRENGTH IN Mpa | | |
|---|---|---|---|---|
| | | 3 DAYS | 7 DAYS | 14 DAYS |
| 1 | TRIAL 3 | 18.22 | 21. 45 | 24.21 |
| 2 | TRIAL 4 | 17.87 | 19.68 | 22.93 |

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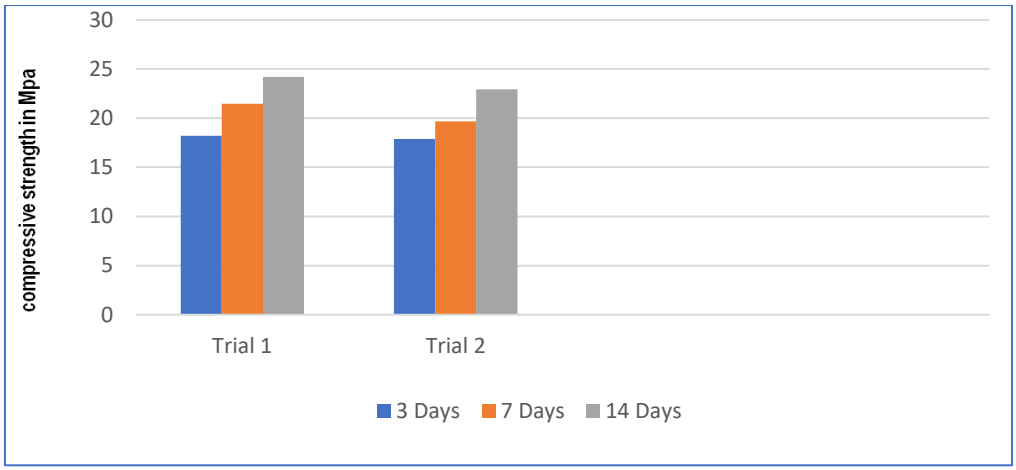


**Bar graph 4.2.** Compressive test result

**Fig 4.1**. Compressive testing

**Water absorption test result**

**Table no. 4.3** water absorption test result

| Sr. No. | Specimen | Dry Weight | Wet Weight | % Of water absorption |
|---|---|---|---|---|
| 1 | A | 3.480 | 3.535 | 1.58 |
| 2 | B | 3.563 | 3.623 | 1.68 |
| 3 | C | 3.583 | 3.647 | 1.78 |
| 4 | D | 3.616 | 3.689 | 2.01 |

## V. CONCLUSION

From the above study the analysis concluded that the waste plastic can be use in pavement block production. This modified pavement block is applicable in the construction of footpath, public buildings, government sectors, educational buildings and all parking areas that is for low traffic. The block consists of plastic waste and fine aggregate the various percentage of plastic waste are used for various compressive strength, durability and workability and most important minimize the plastic waste.

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