Experimental Investigation Using Waste Plastic As Binding Material In Pavement Block

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Abstract- *Plastic waste which is increasing day by day becomes eyesore and in turn pollutes the environment, especially in high mountain villages where no garbage collection system exists. A large amount of plastic is being brought into the tourist trekking regions are discarded or burned which leads to the contamination of environment and air. Hence, these waste plastics are to be effectively utilized. High-density polyethylene (HDPE) and polyethylene (PE) bags are cleaned and added with sand and aggregate at various percentages to obtain high strength bricks that possess thermal and sound insulation properties to control pollution and to reduce the overall cost of construction; this is one of the best ways to avoid the accumulation of plastic waste which is an on-degradable pollutant. This alternatively saves the quanta of sand/clay that has to be taken away from the precious river beds/mines. The plastic waste is naturally available in surplus quantity and hence the cost factor comes down. Also Coloring agents can be added to the mixture to attain desired shades. Hence in this thesis, an attempt is made to study regard the properties of the brick which is manufactured using plastic wastes.*

Keywords- Plastic waste, high density polyethylene, polyethylene, properties, bricks.

I. INTRODUCTION

The waste plastic will be large in household time. In many countries the compositions of waste is different, that it is by the socioeconomic characters, waste management programs and consumption patterns, but generally the level of plastic in the waste composition is high. One of the largest components of plastic waste is polyethylene which is followed by polypropylene, Polyethylene terephthalate and Polystyrene. The large volume of materials required for construction is potentially a major area for the reuse of waste materials. Recycling the plastics has advantages since it is widely used and has a long service life, which means that the waste is being removed from the waste stream for a long period. Because the amount of clay required to make bricks is large, the environmental benefits are not only related to the safe disposal of bulk waste, but also to the reduction of environmental impacts that arise due to burning of plastics.Plastics also help to conserve energy at the home Furthermore, the U.S. Department of Energy estimates that use of plastic foam insulation in homes and buildings each year will ultimately save close to 60 million barrels of oil versus there kinds of insulation. The same principles apply in appliances such as refrigerators and air conditioners.

II. MATERIAL USED

2.1 Waste plastic

Waste plastics definition the plastics can be made to different shapes when they are heated. in closest environment it exists in the different forms such as cups, furniture's, basins, plastic bags, food and drinking containers, and they are become waste material. Accumulation of such wastes can result into hazardous effects to both human and plant life. Therefore, need for proper disposal, and, if possible, use of these wastes in their recycled forms, occurs. This can be done through process of plastic management. Waste management in respect to plastic can be done by recycling. If they are not recycled then they will become big pollutant to the environment as they not decompose easily and also not allow the water to percolate in to the soil and they are also poisonous.

2.2 River sand

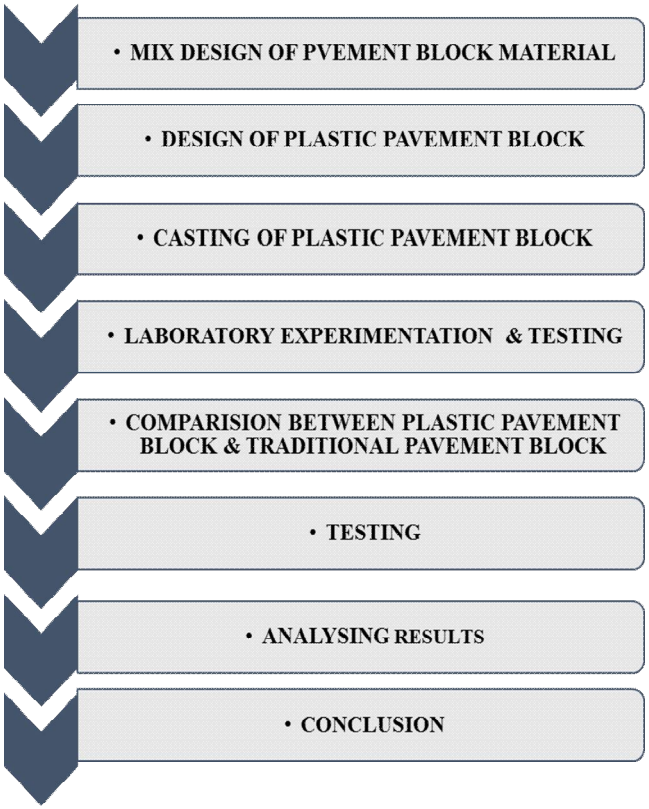
Sand is naturally occurring granular material which is composed of mineral particles and finely divided material. The composition of sand varies depending on the local rock conditions and sources, but the most constituent of sand in inland continental settings and non-tropical coastal region is silica dioxide (Sio2) in the form of quartz. The second commonly used sand is the calcium carbonate, for example aragonite, which has mostly been created, over the past half billion years, by various forms of life, like coral and shellfish. Sand are now used in all the construction process.

III. OBJECTIVES OF PAVEMENT BLOCK

- To reduce the waste plastic quantities on earth.
- Replace the plastic to the cement as a binding agent.

- To compare cost of plastic pavement block with cement pavement block.
- To prepare light weight concrete block.

IV. METHODOLOGY



4.1 procedure:

This procedure carried out by casting paver block. The materials we use 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 200x100x75mm size we need 1kg of plastic, 1kg sand

Step1:

Take one pan & heated pan by using fire timber. Then material added 1kg of sand in pan. After few time increase temperature of sand then added 1kg plastic& mix properly by using trowel.

Step2:

Oiling it on its inner surface for the easy remolding of the block, then put mixing the material simultaneously fill the bottom layer of the mould by the plastic and sand by using trowel.

Step3:

Then remove voids in putted mixture by using method of tamping and set for 10 minutes.

Step 4:

After setting time remove mould & wet for cooling block.

In the same way we test it for replacement with plastic & sand for another proportion.

4.2 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, 1:4) /{(50%:50%),(33%:67%),(25%:75%),(20%:80%)}These are the ratio which represent the plastic, river sand respectively.

4.3 Design Of Plastic Pavement Block

We have to first design pavement block mould with standard size & made in fabrication shop.

Mould design size:- 20cm x10cm x7.5cm

Photos of casting pavement block with procedure

Step 1: Sand heating with flame

Step2 : Addition of plastic

Step3: Plastic and sand mixing with trowel

Step4: Mixture put in mould

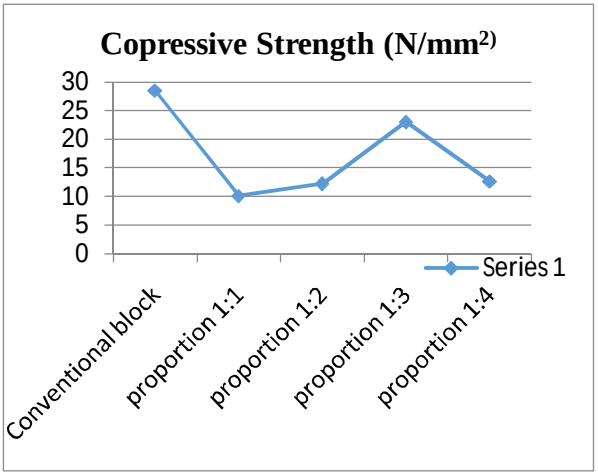
step 5: tamping of mixture

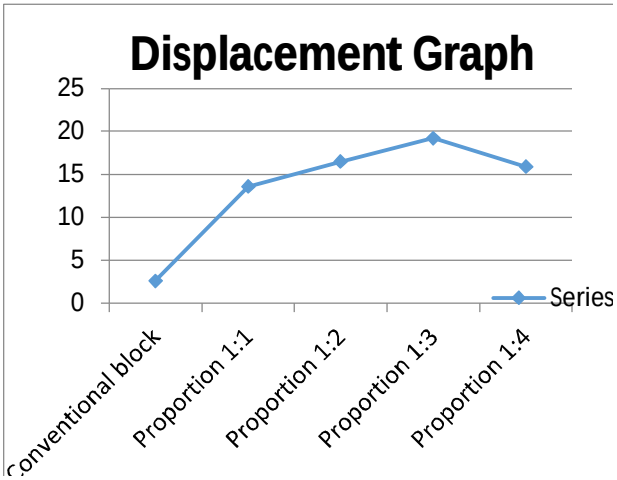
Step6: Final specimens

V. RESULTS

To calculate the compressive strength of paver block the universal testing machine is used.

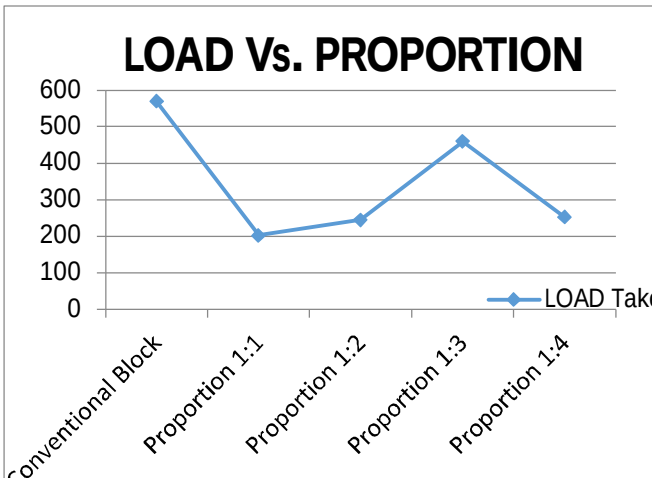
Proportion (Plastic : Sand)	Compressive strength (N/mm)
Conventional block	28.5
1:1	10.1
1:2	12.25
1:3	23
1:4	12.65

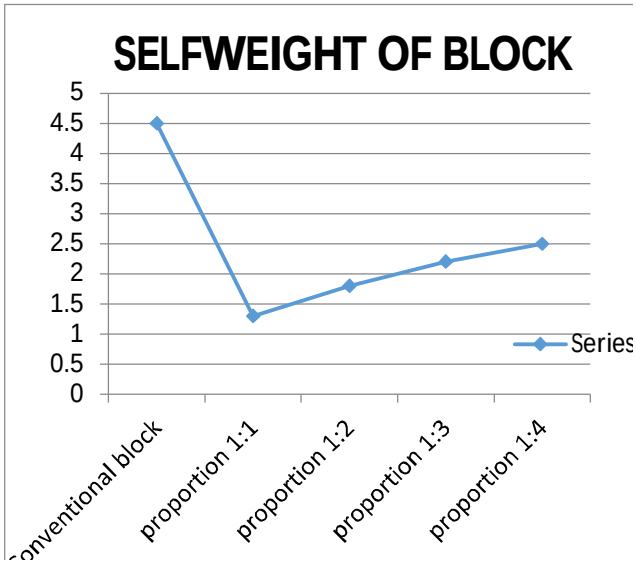




Proportion (Plastic : Sand)	Load (kN)
Conventional block	570
1:1	202
1:2	245
1:3	460
1:4	253

Proportion (Plastic : Sand)	Self weight of block (kg)
Conventional block	4.5
1:1	1.3
1:2	1.8
1:3	2.2
1:4	2.5





Proportion (Plastic : Sand)	Displacement (mm)
Conventional block	2.6
1:1	13.6
1:2	16.5
1:3	19.2
1:4	15.9

Table cost analysis

Proportion (Plastic : Sand)	Cost per 1m3 (667 block)
Conventional block	5271
1:1	7000
1:2	6125
1:3	5750
1:4	5500

VI. CONCLUSION

1. Replacement of plastic helps to create light weight pavement block.
2. As the plastic is non-biodegradable material so after using this plastic in pavement block leads to eco- friendly block.
3. After observation of result it is observed that the failure pattern is non disintegrated
4. From the result table proportion 1:3 gives the desirable strength to the block.
5. Self-weight of plastic pavement block is less compare to conventional block.

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