EXPERIMENTAL INVISTIGATION ABOUT REPLACEMENT OF CEMENT WITH PLASTIC WASTE IN PAVER BLOCK

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***Abstract* – The aim of this project is to replace cement with plastic waste in paver block and to reduce the cost of paver block when compared to that of convention concrete paver blocks. At present nearly 56 lakhs tones of plastic waste is produced in India per year. The degradation rate of plastic waste is also a very slow process. Hence the project is helpful in reducing plastic waste in a useful way. In this project we have used plastic waste and coarse aggregate. The paver blocks were prepared and tested and the results were discussed.**

Keywords – P aver block, P lastic waste, coarse aggregate

I. INTRODUCTION

Plastic waste used in this work was brought from the surrounding areas. Currently about 56 lakh tonnes of plastic waste dumped in India in a year. The dumped waste pollutes the surrounding environment. As the result it affects both human beings and animals in direct and indirect ways. Hence it necessary to dispose the plastic waste properly as per the regulations provided by our government. The replacement of plastic waste for cement provides potential environmental as well as economic benefits.

The wastes plastic in household is large and increases with time. In each country the waste composition is different, since it is affected by socioeconomic characteristics, consumption patterns and waste management programs, but generally the level of plastics in waste composition is high. The largest component of the plastic waste is polyethylene, followed by polypropylene, polyethylene Terepthalate and polystyrene. The large volume of materials required for construction is potentially a major area for the reuse of waste materials. Recycling in concrete 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 mineral aggregates required in concrete is large, the environmental benefits are not only related to the safe disposal of bulk waste, but also to the reduction of environmental impacts arising from the extraction of aggregates.

Paver block paving is versatile, aesthetically attractive, functional, and cost effective and requires little or no maintenance if correctly manufactured and laid. Most block paving constructed in India also has performed satisfactorily but two main areas of concern are occasional failure due to excessive surface wear, and variability in the strength of block. Natural resources are depleting worldwide at the same time the generated wastes from the industry and residential area are increasing substantially. The sustainable development for construction involves the use of Non-. conventional and innovative materials, and recycling of waste materials in order to compensate the lack of natural resources and to find alternative ways conserving the environment

1.1 Definition of Plastic

A material which contains one or more number of polymers having large molecular weight. Solid in its finished state or same state will manufacturing or processing into finished articles is known as Plastic. Looking to the global issue of environmental pollution by post-consumer plastic waste, research efforts have been focused on consuming this waste on massive scale in efficient and environmental friendly manner. Researchers planned to use plastic waste in form of concrete ingredient as the concrete is second most sought material by human beings after water. The use of post-consumer plastic waste in concrete will not only be its safedisposal method but may also improve the concrete properties like tensile strength, chemical resistance, drying shrinkage and creep on short and long term basis.

Why The Plastics:- Polymers **have a number of vital properties, which exploited alone or together, make a significant and** expanding contribution to constructional needs.

- Durable and corrosion resistant.
- Good Insulation for cold, heat and sound saving energy.
- It is economical and has a longer life.
- Maintenance free (such as painting is minimized)
- Hygienic and clean
- Ease of processing / installation
- Light weight

1.2 OBJECTIVE

- To reduce the plastic waste in environment.
- To produce the low cost paver block
- To reduce the dumping of plastic in environment

II. EXPERIMENTAL

PROCEDURE ***2.1 Properties of Materials***

Plastic waste (LDPE)

Plastic waste used in making paver block was collected from the surrounding locality LDPE is indicated by resin number 4. It includes plastic bags. The plastic bag used is of about 50 microns. The basic properties are provided below.

Table I. PROPERTIES OF LDPE

Sl.No.	Particulars	Value
1	Melting point	150˚
2	Thermal co efficient of expansion	100-200X10^{-6}
3	Density	0.910-0.940
4	Tensile strength	0.20-0.40(N/mm^2)

Coarse Aggregate

Locally available coarse aggregates were used in this work. Aggregates passing through 12mm sieve and retained on 10mm sieve were sieved and tested as per Indian standard specification IS:383-1970

2.2 Mix Ratio

- Block type1- Three paver blocks were casted using mix ratio provided below
  Plastic waste = 1
  Aggregate= 0.5
- Block type 2 - Three paver blocks were casted using mix ratio provided below
  Plastic waste = 1
  Aggregate = 0.75
- Block type 3 - Three paver blocks were casted using mix ratio provided below
  Plastic waste=1
  Coarse aggregate**=1**

2.3 Preparation of Test Specimens

Plastic wastes are heated in a metal bucket at a temp of above 150˚. As a result of heating the plastic waste melt. The materials aggregate as described in previous chapter are added to it in right proportion at molten state of plastic and well mixed. The metal mould is cleaned through at using waste cloth. Now this mixture is transferred to the mould. It will be in hot condition and compact it well to reduce internal pores present in it. Then the blocks are allowed to dry for 24 hours so that they harden. After drying the paver block is removed from the moulds and ready for the use

2.4 Testing of Specimens
Compressive strength for paver blocks

Plastic paver blocks were casted. The maximum load at failure reading was taken and the average compressive strength is calculated using the following equation.

Compressive strength (N/mm^2) = (Ultimate load in N / Area of cross section (mm^2))

Oven test

As the paver block is made of plastic we need to know its melting point hence over test is performed. The paver block is kept in oven for 2houes in oven and after 2 hours its condition is verified.

III. RESULT AND DISCUSSION Compressive Strength

Table IV. COMPRESSION STRENGTH RESULT FOR BLOCK TYPE I

Proportion name	Plastic Waste	C. A.	Compressive stress (N/mm²)
PPB-1	1	0.50	18.34
PPB-2	1	0.50	19.65
PPB-2	1	0.50	18.89
		Avg	18.96

Table V. COMPRESSION STRENGTH RESULT FOR BLOCK TYPE II

Specimen	Plastic waste	C. A.	Comprsive stress (N/mm²)
PPB-1	1	0.75	25.44
PPB-2	1	0.75	25.21
PPB-3	1	0.75	24.67
		Avg	25.11

Table VI. COMPRESSION STRENGTH RESULT FOR BLOCK TYPE III

Specimen	Plastic waste	C. A.	Compressive stress (N/mm²)
PPB-1	1	2	36.17
PPB-2	1	2	38.50
PPB-3	1	2	36.43
			37.03

Fig 4 Comparison of Compressive Strength of Blocks

Oven Test Result

Since the paver block is made of plastic it is required to know its heat resistance. Hence plastic paver block is placed in oven for 2 hours.

Table VII. OVEN TEST RESULT

Specimens	Temperature (°C)	Remarks
SPECIMEN I	50	no change
	100	no change
	150	Melts
SPECIMEN II	50	no change
	100	no change
	150	Melts
SPECIMEN III	50	no change
	100	no change
	150	Melts

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IV. CONCLUSION

The following conclusions were drawn from the experimental investigation

- The utilization of waste plastic in production of paver block has productive way of disposal of Splastic waste.
- The cost of paver block is reduced when compared to that of concrete paver block.
- Paver block made using plastic waste, coarse aggregate have shown better result.
- It also shows good heat resistance.
- Though the compressive strength is low when compared to the concrete paver block it can be used in gardens, pedestrian path and cycle way etc.
- It can be used in Non-traffic and light traffic road.

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