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Study on Utilization of LDPE Waste Plastic for Manufacturing the Paver Blocks

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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 63 millions 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 in different proportions with quarry dust, coarse aggregate and ceramic waste. The paver blocks were prepared and tested and the results were discussed.***
Keywords: Plastic waste, Paver Blocks, Solid Waste Management, Compressive Strength, Ceramic waste, Low-density Polyethylene, etc.

I. INTRODUCTION

The aim of the current project is to examine LDPE plastic's utilization in paver blocks. In place of cement, LDPE materials are used to make paver blocks. Plastics, which are the most often used material, are made up of organic polymers, and a sizable portion of industrial plastic is created using petrochemicals. Therate at which plastics are being used and the amount of plastic waste produced each year globally are both rapidly increasing. Either the oceans or landfills are utilized to dispose of this wasted plastic, which damages marine life and soil quality. Plastic waste used in this work was brought from the surrounding areas. Currently about 63 million 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 use of waste plastic will reduce the cost of paver blocks and help to preserve environment The aim of the present work is to study the possibility of LDPE plastic in paverblock. The LDPE materials are used to replace cement in paver block. The collection of waste plastic is done from the electronic stores.

As for formation of block need iron mould which is manufactured from welding shop of size 110mm x 110mm x 60mm Square mold as per common size used in garden, pedestrian walks, etc. The effect of adding plastics as partially replaced cement is evaluated by laboratory test.

II. OBJECTIVES

1) To determine the suitability of low-density polyethylene in the development ofpavement blocks for construction.
2) To conduct specific tests on fine aggregates and study on the properties of wasteplastics.
3) To design the mix proportion of materials.
4) The parameter of this project investigation is a compressive strength test and a waterabsorption test to know whether these, blocks are suitable according to use or not.
5) To compare the results between the plastic paver blocks and conventional concretepaver blocks.

III. RESEARCH PROCESS

The aim of the experimental program is to compare the properties of plastic paverblocks made up of LDPE, with conventional paver blocks.

1) To collect the waste plastics from stores , dust andcrushed stones [churii]
2) To acquire the apparatus needed. 3]Clean and Dry the Waste Plastics.
3) Prepare a mixed design for the recycled plastic used in thepaving block.
4) Analysis the results.

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IV. MATERIAL USED

1) Waste Plastics {LDPE],
2) Dust [crushed stone [churii]
3) Paver Mould

A. Methedology

The project has been initiated by gathering
the crucial materials for our project work, including waste plastic (LDPE), fine aggregate, and other materials.

B. Design of Mix Proportion of Plastic Paver Block

Nine paver blocks were cast using our mix ratios of dust and plastics. Each ratio contains three blocks; these blocks are intended for non-traffic zones and light-traffic regions. In which the following table illustrates that

Sr .No	Mix Designation	P:D:C Ratio
1	Mix 1	1:0.5:0.5
2	Mix 2	1:1:1
3	Mix 3	1:1.5:1.5

Table No. 3.2: Mix Design

C. Mix Calculation

The mix calculation per unit volume of concreteshall be as follows:

a) Volume of concrete = 1 m^3

b) Volume of cement = $\frac{\text{Mass of concrete}}{\text{Specific gravity of water}} \times \frac{1}{1000}$

$= \frac{396}{3.15} \times \frac{1}{1000}$

$= 0.125\ m^3$

c) Volume of cement = $\frac{\text{Mass of concrete}}{\text{Specific gravity of water}} \times \frac{1}{1000}$

$= \frac{198}{1} \times \frac{1}{1000}$

$= 0.198\ m^3$

d) Volume of aggregate = [volume of concrete + volume of water]

$= 1-[0.125+0.198]$

$= 0.677\ m^3$

e) Mass of coarse aggregate = Volume of aggregate x Volume of coarse aggregate x Specific gravity .

$= 0.677 \times 0.46 \times 2.74 \times 1000$

$= 853$ Kg.

f) Mass of fine aggregate = Volume of aggregate x Volume of fine aggregate x Specific gravity.

$= 0.677 \times 0.54 \times 2.74 \times 1000$

$= 1001$ Kg

D. Mix Proportion

Cement = 396 kg m^3
Water = 198 Lit
Fine aggregate = 1001 Kg m^3
Coarse aggregate = 853 Kg m^3
Water-Cement Ratio = 0.5
Calculation of Compressive Strength
Size of Cube = 110x110x60
Area of Specimen = 12100 m

E. Calculation

Compressive Strength of the Plastic paver block for 7 days

Sr No.	Ratio P:A:D	Dimension	Area	Crushing load	Crushing Strength
1	1:1:1	110X110X60	12100	70+75+83	18.84
2	1:0.5:0.5	110X110X60	12100	83+86+91	21.48
3	1:1.5:1.5	110X110X60	12100	86+91+97	22.64
				Average	20.98

Compressive Strength of the Plastic paver block for 14 days

Sr No.	Ratio P:A:D	Dimension	Area	Crushing load	Crushing Strength
1	1:1:1	110X110X60	12100	105+108+83	24.46
2	1:0.5:0.5	110X110X60	12100	83+70+91	20.16
3	1:1.5:1.5	110X110X60	12100	97+104+85	23.63
				Average	22.75

Compressive Strength of the Plastic paver block for 28 days

Sr No.	Ratio P:A:D	Dimension	Area	Crushing load	Crushing Strength
1	1:1:1	110X110X60	12100	95+90+87	22.47
2	1:0.5:0.5	110X110X60	12100	108+110+102	26.44
3	1:1.5:1.5	110X110X60	12100	102+100+108	25.12
				Average	24.67

F. Calculation

Compressive Strength of the Concrete paver block for 7 days.

Sr No.	Ratio C:A:S	Dimension	Area	Crushingload	Crushing Strength
1	1:1:1	110X110X60	12100	102+108+115	26.85
2	1:0.5:0.5	110X110X60	12100	97+110+120	27.02
3	1:1.5:1.5	110X110X60	12100	120+107+100	25.53
				Average	26.45

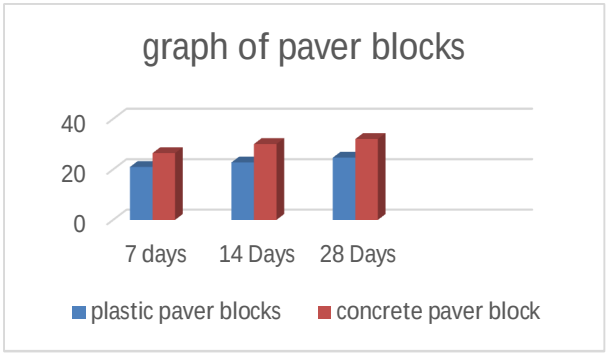
Compressive Strength of the Concrete paver block for 14 days

Sr No.	Ratio C:A:S	Dimension	Area	Crushingload	Crushing Strength
1	1:1:1	110X110X60	12100	105+112+118	27.68
2	1:0.5:0.5	110X110X60	12100	120+122+125	30.33
3	1:1.5:1.5	110X110X60	12100	127+130+131	32.06
				Average	30.02

Compressive Strength of the Concrete paver block for 28 days

Sr No.	Ratio C:A:S	Dimension	Area	Crushingload	Crushing Strength
1	1:1:1	110X110X60	12100	135+130+140	33.47
2	1:0.5:0.5	110X110X60	12100	121+131+143	32.64
3	1:1.5:1.5	110X110X60	12100	125+107+132	30.08
				Average	32.06

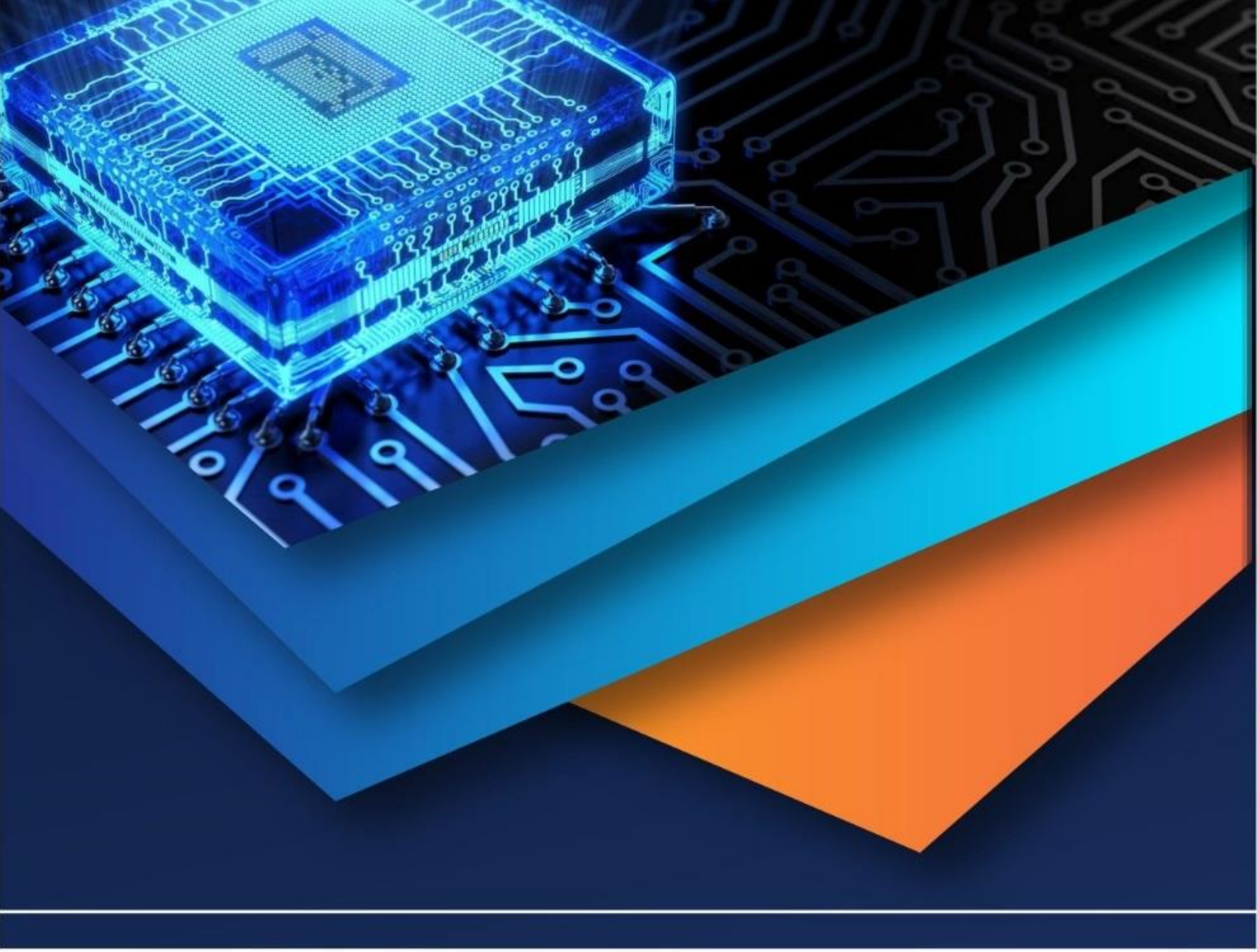
G. Comparission graph of Paver Blocks



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