AN EXPERIMENTAL STUDY ON GEOPOLYMER PAVER BLOCK BY USING WASTE PLASTIC

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ABSTRACT

Plastics are rapidly growing segment of the municipal solid waste. Disposal of waste materials including waste plastic bags has become a serious problem. Amount of waste plastic bags being accumulated in 21st century has created big challenges for their disposal. The waste plastics in house hold is large and increases with time. In each country waste consumption is different, since it is unaffected by socioeconomic characteristics and waste management programs, but the level of plastics 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 plastics into pavement blocks area 511cm2 and depth 5.5cm study their characteristics .use material flyash(20-30%),plastic waste (5,10,15%),chips stone (35-45%),M-sand (25-35%) Pavement blocks are perfect materials on the pathways and streets for simple laying and finishing. Here the strength properties of pavement blocks comprising of waste plastics and the design considerations 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. Ultimate aim of compression strength, water absorption

KEYWORD: waste plastic, chips stone, fly ash, M-sand

1.INTRODUCTION

Plastic material is a made up of resin which is easy to change it form. Pieces Polyethylene bag which are commonly used for the packaging and carrying goods are used in concrete. Used Plastic bags, pieces of plastic sheets and bottles of diverse sizes, colours and textures are found flying around freely, scattered in the streets, swimming in the gutters, posing a serious environmental threat. These keep the environment dirty and cause blockages to our sewer system. Several attempts were made to discourage plastic bags and other plastic products but yield no result due to its versatility in daily use. Being cheap and easily available now it look like that we have to live up with it.

Large quantity of plastic waste is produced every year. Recycle process and reused of plastic waste products amount for vast manpower and huge processing cost resultantly very small amount of plastic waste is recycled and used and rest going into landfills, incinerators and dumps. Now the question arise how to effectively minimize the impact of plastic waste with minimum cost? Many researchers have tried for the utilization of plastic waste and few have suggested its utilization in concrete in many forms.

The utilization of waste in the construction industry has two glaring dividends, one, environmental impact is addressed by disposal of the waste and second, the economic impact and this waste has the edge of being available large quantity, everywhere and at low value.

2. OBJECTIVE

- The main target of this study is to analyse the carbon dioxide free cementations

material, various properties and their effects on Geopolymer concrete.

- The efficient usage of waste plastic in plastic paver blocks has resulted in effective usage of plastic waste and thereby can solve the problem of safe disposal of plastics, also avoids its wide spread littering.
- A Present Study aims at evaluating the Performance of Plastic for Paver Blocks Use in Pavements and Other application areas.
- As Properties for Plastic Paver Blocks, the same Have Been of Studied For Various Mixes varying % of Materials.

3. SCOPE OF PROJECT

- The reduce the Co Emissions of Plastic Paver blocks.
- To Control the Environmental Pollution & Remove Waste Plastic On Society.
- The Plastic are Using Show May Problems, Effects Are Affected on Human & Animals .Plastic is a very Toxicity Materials**.**

4. METHODOLOGY

4.1MATERIALSUSED AND THEIR PROPERTIES

4.1FINE AGGREGATE

TABLE 4.1 PHYSICAL PROPERTIES OF FINE AGGREGATES

S.No	Test for fine aggregates	Apparatus	Value obtained
1.	Fineness modulus	Sieve	2.4
2.	Specific gravity	Pycnometer	2.7
3.	Water absorption	Bowel	1.6%

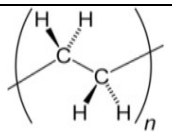
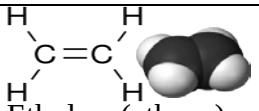
4.2COARSEAGGREGATE

TABLE 4.2PHYSICAL PROPERTIES OF COARSE AGGREGATES

S.NO	TEST FOR COARSE AGGREGATES	APPARATUS	VALUE OBTAINED
1.	Fineness modulus	Sieve	6.70
2.	Specific gravity	Cylindrical container	2.61
3.	Water absorption	-	0.71%
4.	Impact value	Impact testing machine	9.68%

4.3 PLASTIC

TABLE 4.3. PHYSICAL PROPERTIES OF PLASTIC

IUPAC name	Polyethenes or poly(methylene
Other name	polyethene
Chemical formula	
Density	0.91-0.96g/cm^2
Melting point	115-135^{0}c
Magnetic susceptibility(χ)	9.67x10^{-6}
Monomer	 Ethylene(ethane)

4.4 FLY ASH

TABLE 4.4 PHYSICAL PROPERTIES OF FLYASH

SI.NO	TEST	VALUE
1	Specific gravity	2.00-2.05
2	Physical form	powder
3	Class	F

5 MIXDESIGN

5.1 PROCESS DETAILS – MINI HOT MIX PLANT

Step I:

Plastics waste (bags, cups, flexible films, plastic bottle) made out of PE, PP, and PS cut into a size between 2.36mm and 4.75mm using shredding machine, (PVC waste should be eliminated)

Step II a:

The aggregate mix is heated to 165^0c (as per the HRS specification) and transferred to mixing chamber.

Step II b:

Similarly to be heated up to a maximum of 160^0c (HRS Specification) to have good binding and to prevent weak bonding. (Monitoring the temperature is very important)

Step III:

At the mixing chamber, the shredded plastics waste is to be added. It get coated uniformly over the aggregate within 30 to 60 secs, giving an oily look.

Step IV:

The plastics waste coated aggregate is mixed with hot chips stone ,M-sand ,flyash and the resulted mix is used for paver block. The paver block laying temperature is between 110^0c to 120^0c.

6TEST OF SPECIMEN

- Compressive test
- Water absorption test

6 .1 COMPRESSIVE STRENGTH COMPRESSIVE TEST

Compressive strength of a paver block is determined by testing the paver block under standard conditions using a Compression testing machine. The procedure as mentioned in shall be used to determine the compressive strength of paver block work

The following apparatus is required for testing the paver block:

1. Measure scale
2. Compression Testing Machine

fig 1compression testing machine

NUMBER OF SPECIMENS:

Three (3) number of paver blocks are to be tested and the average compressive strength value has to be reported.

PRECONDITIONING:

The following steps are to be done on all the specimens before they are

1. Measure the dimensions of the top surface (frog side) of the paver block to the nearest 1 mm.
2. Remove any unevenness observed on the bed faces (i.e., frog side and on the opposite side) by grinding.
3. Immerse the paver block in water for a period of 24 hours. The specimen should be then removed and excess water is drained out at room temperature.
4. The frog portion and voids on the top surface if any has to be filled with cement mortar (1 cement,1 clean coarse sand of grade 3mm and down).
5. Store the paver block under a damp jute bag for 24 hours. Following this immerse the paver block in clean water for a period of 3 days. Remove and wipe out any traces of moisture in the paver block

fig 2 compression test

TESTING PROCEDURE:

1. Place the specimen prepared with flat faces horizontal and mortar filled faces (i.e., frog face) upwards between two 3mm plywood sheets and carefully centred between plates of testing machine. The plywood sheets will ensure that the load is transferred uniformly.
2. Now apply axial load at a uniform rate of 14 N/mm2 (or 140 kg/cm2) per minute till failure occurs.
3. Note the maximum load at failure and repeat the procedure for other specimens

COMPRESSION TEST OF A PAVER BLOCK SPECIMEN

Compressive Strength:

Compressive strength of the paver block is calculated in the following way.

compression test = ultimate load in N

cross section area in mm^2

The average of the 3 specimens have to be reported as the compressive strength of the paver blocks in the lot.

Compressive strength of a paver block is determined by testing the paver block under standard conditions using a Compression testing machine

TABLE 6.1MEAN VALUES OF COMPRESSIVE STREGTH (N/mm^2)

PROPORTION	SPECIMEN AREA CM^2	LOAD KN	COMPRESSIVE STRENGTH (N/mm^2)
I (5% plastic)	511	450	8.80
II(10% plastic)	511	540	10.56
III(15%plastic)	511	600	11.74

6.1 COMPRESSIVE STRENGTH GRAPH

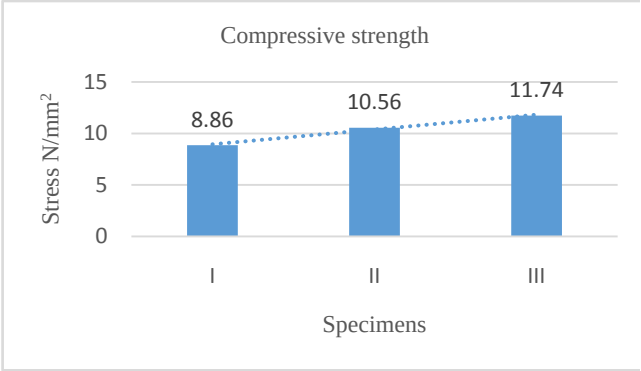


fig 3 compression strength test

6.2 WATER ABSORPTION TEST

WATER ABSORPTION TEST ON PAVER BLOCKS

Water absorption test on paver blocks are conducted to determine durability property of paver blocks such as degree of burning, quality and behavior of paver blocks in weathering.

A paver block with water absorption of less than 7% provides better resistance to damage by freezing. The degree of compactness of paver blocks can be obtained by water absorption test, as water is absorbed by pores in paver blocks.

The water absorption by paver blocks increase with increase in pores. So, the paver blocks, which have water absorption less than 3 percent can be called as vitrified.

This test provides the percentage of water absorption of paver blocks and procedure of the same is discussed below.

APPARATUS

A sensitive balance capable of weighing within 0.1% of the mass of the specimen and ventilated oven

SPECIMEN

Three numbers of whole paver blocks from samples collected for testing should be taken.

PROCEDURE OF WATER ABSORPTION TEST

1. Dry the specimen in a ventilated 2 to 3 day sun light temperature of till it attains substantially constant mass.
2. Cool the specimen to room temperature and obtain its weight (M1) specimen too warm to touch shall not be used for this purpose.
3. Immerse completely dried specimen in clean water at a temperature of 27+2°C for 24 hours.
4. Remove the specimen and wipe out any traces of water with damp cloth and weigh the specimen after it has been removed from water (M2).

Fig 4Dry paver block

fig 5Wed paver

CALCULATION OF WATER ABSORPTION OF PAVER BLOCKS

Water absorption, % by mass, after 24 hours immersion in cold water in given by the formula,

$$W = \frac{M_2 - M_1}{M_1} X\ 100$$

W =water absorption
M_1= dry paver block
M_2= wed paver block
The average of result shall be reported.

Result

Water absorption of the given paver blocks = ……%

Water Absorption Values for Paver blocks

When tested as above, the average water absorption shall not be more than 20% by weight up to class 12.5 and 15% by weight for higher class.

TABLE 6.2 WATER ABSORPTION RESULT

Proportion	Wet weight Kg	Dry weight Kg	Water absorption %
I(5%plastic)	7.200	7.153	0.65
II(10%plastic)	7.160	7.130	0.42
III(15%plastic)	7.212	7.190	0.305

6.2 WATER ABSORPTION GRAPH

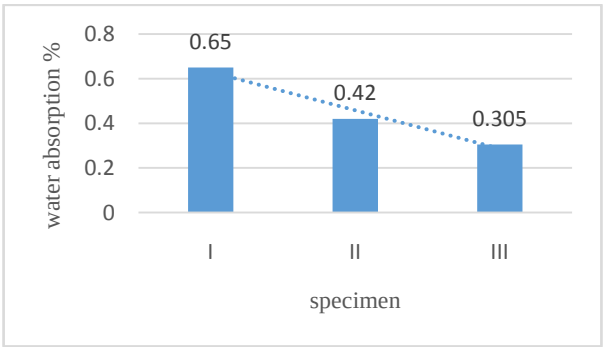


Fig 6 Water absorption

7 CONCLUSION

Based on this experimental investigation

- It is found that the proportion III which having the plastic 15%,flyash 15%,m-sand 30%,chips stone (12mm)40%used gives more strength when comparing with all other proportion.
- From that we have conclude that solid waste (m-sand ,flyash, plastic ,chips stone) can be used as an main constitution for the preparation of paver block with the increased strength

8 REFERANCE

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