UTILISATION OF WASTE PLASTICS AS A REPLACEMENT OF CEMENT IN PAVER BLOCK

S. Raju[1], M. Amarnath[2], M. Anandhakumar[3], K. Elavarasan[4], A. Naveenkumar[5]

[1]Assistant Professor, Department of Civil Engineering, Paavai College of Engineering, Namakkal, Tamilnadu, India.
[2,3,4,5]UG Students Department of Civil Engineering, Paavai College of Engineering, Namakkal, Tamilnadu, India.

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.In this the cement is replaced with the Plastic Wastes, Quarry waste and M-Sand are used. And their physical properties were studied. Various mixes with different proportions of these wastes were casted and tested as per the standards.

1. INTRODUCTION

Paver block paving is versatile, aesthetically attractive, functional, and cost effective and requires little or no maintenance if correctly manufactured and laid. Most concrete 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.

With the view to investigate the behaviour of quarry rock dust, recycled plastic, production of plastic paver block from the solid waste a critical review of literature was taken up. Three replacement levels of 25 %, 50 %, 75 by weight of quaary dust were used for the preparation of the block.

2. EXPERIMENTAL PROCEDURE

2.1 Properties of Materials

PLASTIC WASTE: Plastic is any synthetic or semisynthetic organic polymer. In other words, while other elements may be present, plastics always include carbon and hydrogen. While plastics may be made from just about any organic polymer, most industrial plastic is made from petrochemicals. Thermoplastics and thermo setting polymers are the two types of plastic. The name "plastic" refers to the property of plasticity, which is the ability to deform without breaking.

TABLE 1: PROPERTIES OF WASTE PLASTIC

S.NO	DESCRIPTION	RESULTS
1.	Specific gravity	1.4
2.	Water absorption	0.5%
3.	density	1130 Kg/m^3
4.	Melting point	150°

M-SAND: Manufactured sand is an alternative for river sand. Due to fast growing construction industry, the demand for sand has increased tremendously, causing deficiency of suitable river sand in most part of the word.

Due to the depletion of good quality river sand for the use of construction, the use of manufactured sand has been increased. Another reason for use of M-Sand is its availability and transportation cost.

TABLE 2: PROPERTIES OF M-SAND

S.NO	DESCRIPTION	RESULTS
1.	Specific gravity	2.68
2.	Water absorption	2.2%

3.	fineness	2.72
4.	Grading zone	II
5.	density	1830 Kg/m^3

QUARRY DUST

Crushed sand less than 4.75 mm is produced from rock using state of crushing plants. Production of quarry fines is a consequence of extraction and processing in a quarry and collected from the near-by quarry.

TABLE 3: PROPERTIES OF QUARRY DUST

S.NO	DESCRIPTION	RESULTS
1.	Specific gravity	2.62
2.	Water absorption	1.80%
3.	fineness	2.952
4.	Grading zone	II
5.	density	1640 Kg/m^3

3. MIX RATIO

Block type1- Three paver blocks were casted using mix ratio provided below
Plastic waste = 1
M sand = 1
Quarry dust = 0.25
Block type 2 – Three paver blocks were casted using mix ratio provided below
Plastic waste = 1
M sand = 1
Quarry dust= 0.5
Block type 3 – Three paver blocks were casted using mix ratio provided below
Plastic waste=1
M sand =1
Quarry dust= 0.75

4. 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 quarry dust, aggregate and other materials 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 mould and ready for the use.

Figure 4.1 Heating and Adding

Figure 4.2 Casting and compaction

5. TESTING OF SPECIMENS

5.1Compressive strength for paver blocks: Plastic paver blocks of size 200X100X60 mm 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))

Figure 5.1 compressive test

5.2 Water absorption test

In this the bricks first weighted in dry condition and they are immersed in water for 24 hours. After that they are taken out from water and they are wipe out with cloth. Then the difference between the dry and wet bricks percentage are calculate.

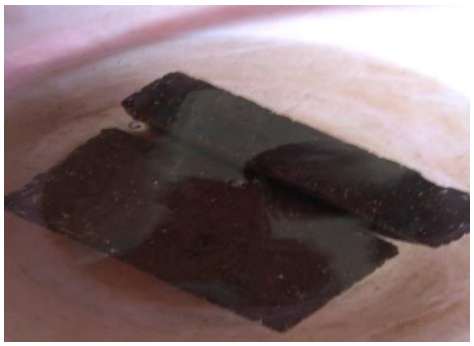

Figure 5.2 water absorption test

6. RESULT AND DISCUSSION

6.1 Compressive Strength

TABLE 4: COMPRESSIVE STRENGTH TEST(N/mm²)

S.NO	SIZE (mm)	RATIO	COMPRESSIVE STRESS (N/mm²)			AVERAGE (N/mm²)
1.	200X100	1:1:0.25	5.8	6	5.9	5.9
2.	200X100	1:1:0.5	15.8	16	15.9	15.9
3.	200X100	1:1:0.75	7.7	8	7.9	7.86

6.2 Water Absorption

TABLE 5: WATER ABSORPTION TEST(%)

S.NO	RATIO	WATER ABSORPTION (%)			AVERAGE (%)
1.	1:1:0.25	0.732	0.720	0.735	0.729
2.	1:1:0.5	0.45	0.43	0.47	0.45
3.	1:1:0.75	0.426	0.43	0.45	0.435

TABLE 6: COMPARSION OF COMPRESSIVE STRENGTH OF PLASTIC PAVER AND ORDINARY BLOCKS

S.NO	TYPE OF PAVER BLOCK	COMPRESSIVE STRENGH (N/mm²)
1.	Plastic block	15.9
2.	Ordinary block	10.5

TABLE 7: COMPRESION OF WATER ABSORPTION OF PLASTIC PAVER AND ORDINARY BLOCKS

S.NO	TYPE OF PAVER BLOCK	WATER ABSORPTION (%)
1.	Plastic block	0.43
2.	Ordinary block	3.71

7. CONCLUSIONS

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 plastic waste.
- The cost of paver block is reduced when compared to that of concrete paver block.
- Paver block made using plastic waste, quarry dust, coarse aggregate and ceramic waste have shown better result.

- 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.

8. REFERENCES

1. Dr.prahallada M.C and Dr.prakash K.B "strength and workability characteristics of waste plastic fibre reinforced concrete produced from recycled aggregates"international journal of engineering research and applications(IJERA) ISSN:2248-96
2. Ganesh Tapkire. Satish Parihar. Pramod Patil. Hemra, R. Kumavat. (2014). Recycled Plastic used in Concrete Paver Block. International Journal of Research in Engineering and Technology, 3(09).
3. Poonam Sharma. Ramesh kumar Batra. (2016). Cement Concrete Paver Blocks for Rural Roads. International Journal of Current Engineering and Scientific Research, 3(1), 114-121.
4. Joel Santhosh. Ravikant Talluri. (2015). Manufacture of Interlocking Concrete Paving Blocks with Fly Ash and Glass Powder. International Journal of Civil Engineering and Technology, 6(4), 55-64.

BIOGRAPHIES

Mr.S. Raju, M.E., Project Guide, Department of Civil Engineering, Paavai College of Engineering for his immense help and motivations that enable us to finish this project successfully.

Amarnath.M,Under Graduate, Civil Engineering. I hereby declare that the above furnished information is authentic to the best of my knowledge.

Elavarasan.K , Under Graduate, Civil Engineering. I do here by declare that all the details above mentioned are true the best of my language.

Anandhakumar.M,Under Graduate, Civil Engineering.I here declare that all information mentioned above is true to my knowledge and bear to responsibility.

Naveenkumar.A,Under Graduate, I hereby declare that the particulars given above are true to the best of my knowledge and belief.