UTILIZATION OF WASTE PLASTIC IN PAVER BLOCKS

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ABSTRACT

Plastic is a non- biodegradable material. The quantity of plastic waste in municipal solid waste is expanding rapidly day by day. Plastic is made from hydrocarbons found in different sources like oil, coal and some other minerals. At the time of need, plastic is found to be very useful but after its use, it is simply thrown away, creating all kinds of hazards. Plastic is of the many different types such as High Density Poly-ethylene (HDPE), Low density poly-ethylene (LDPE), HD, etc. Hence, these waste plastics is to be effectively utilised in making paver blocks. low density polyethylene are clean added with the sand and aggregate at various percentages to obtain high strength bricks that possess thermal and sound insulation properties to handle 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. The aim of this project is to replace the bonding of given by cement in paver blocks with the melted plastic waste .Around 5.6 million tonnes of plastic waste is generated in the country per annum. The degradation of plastic is very long process, it may take thousands of years. Hence, project is helpful in reducing the plastic waste .In this project, we have used plastic waste in different ratio with fine and coarse aggregate. The paver blocks were prepared and tested .The water absorption capacity of plastic paver block is less. The results showed more strength as compared to paver blocks.

Keyword: *Plastic Waste , LDPE, Compressive Strength.*

1. Introduction

Plastic is considered as non- renewable resource because it is non-biodegradable. It takes 1000 years for decomposition. Nearly 56 lakhs tonnes of plastic waste is produced in India per year. Plastic waste needs proper end of life management. Plastic is innovative material for using it in construction purposes. Plastic application is related with their special properties, low density, easy processing, good mechanical properties, good chemical resistance, excellent thermal and electrical insulting properties and low cost.

2. EXPERIMENTAL PROCEDURE

2.1 PROPERTIES OF MATERIAL

1) Plastic :-

Plastic are durable and degrade very slowly. Plastic waste used in making paver block was collected from the surrounding locality low density poly- ethylene this plastic waste available. Shredding is the process of cutting the plastic into small sizes between 2.36mm to 4.75mm with the help of the plastic shedding machine viz. scarp grinder and agglomerater.

Table1. Properties of plastic

Sr. No	Particulars	Value
1	Melting Point	170°
2	Thermal Coefficient of Expansion	100-200×10-6
3	Density	0.910– 0.940
4	Tensile Strength	0.20- 0.40N/mm²

Fig. crushed plastic

3. FINE AGGREGATE (SAND):-

Sand is a granular material composed of finely divided rock and mineral particles. The properties of sand were determined by conducting test as per IS:2386 The results indicate that the sand conforms to zone II of IS:383-1970

Table 2: Properties of sand

Sr. No	Test	Result Obtained	Is Code
1	Fineness Modulus	2.923	IS:383 (part 1) 1970
2	Specific Gravity	1.59	IS: 2386 (part 3) 1963
3	Water Content	1.21%	IS: 2386 (part 3) 1963

3.1 Coarse aggregate:

Aggregate are classified in many ways. In this, aggregate of size passing from 6.36 mm and retained on 4.75 mm sieve were sieved and tested as per IS: 383- 1970

Table 3. Properties of coarse aggregate

SR.NO.	Test	RESULT OBTAINED
1	Impact Value	36.33%
2	Abrasion value	40%

3.2CEMENT:

A cement is a binder, a substance used for construction that sets, hardness, and adheres to other materials to bind them together. In this, ordinary Portland cement of 53 grade conforming to IS: 456-2000 was used. Tests were carried out on various physical properties of cement and the results are shown**.**

Table 4. Properties of cement

SR. NO.	TEST	RESULT OBTAINED	STANDARD VALUE ACCORDING TO IS CODE	IS CODE
1.	Initial setting time	65 min	30 min	IS: 4031 (part 5) 1988
2	Fineness	98%	Not Less than 90%	IS: 4031 (part 1) 1996
3	Std. consisten	32%	30-35%	IS: 4031

	cy			(part 1) 1988
4	Compressive strength	For 3 days =11.77N/mm^2 For 7 days=14.32N/mm^2	For 3 days = Should not be less than 11.5 N/mm² For 7 days = Should not be less than 17.5 N/mm²	IS 4031 (part 6) 1988

4. MIX RATIO:

Three paver blocks of size 240×120×60 mm of ratio 1:4, 1:5, 1:6 were prepared. These are the ratio which represents plastic : fine aggregate, coarse aggregate .

4.1 PREPARATION OF TEST SPECIMENS:

The plastic wastes are heated in a metal container like iron pan at a temperature of above 170°C. As a result of heating the plastic waste melt and it shows in the form of black colour liquid. The materials fine aggregate, coarse aggregate added to it in a right proportion and mixed properly.

4.2 MOULDING:

The mould of size 240×120×60 mm is cleaned through at using waste cloth. Now this mixture is transferred to the mould. It will be in a hot condition so handle it carefully 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 use.

5. TESTS ON PAVER BL OCKS :

5.1 COMPRESSIVE STRENGTH :

After the casting of paver blocks they were placed to let them dry. Then blocks are transferred to testing. The maximum load at failure reading was taken for three samples of the same ratio. The average compressive strength is calculated by the equation Compressive strength (N/mm²) = load (N) / cross section area of specimen (mm²)

Table 1. compressive strength result for block of ratio 1:4

Sr.No	Plastic Waste (Kg)	Sand (kg)	Coarse Aggregate (kg)	Compressive stress(N/mm²)
1.	0.75	1.5	1.5	28.95
2.	0.75	1.5	1.5	27.95
3.	0.75	1.5	1.5	28.56
			Average	28.48

Table 2: Compressive Strength Result for Ratio 1:5

Sr.No	Plastic Waste (Kg)	Sand(kg)	Coarse Aggregate (Kg)	Compressive stress(N/mm²)
1.	0.8	2	2	10.06
2.	0.8	2	2	10.59
3.	0.8	2	2	11.90
			Average	10.85

Table 3: Compressive Strength Result for Ratio 1:6

SR .No	Plastic Waste (Kg)	Sand(kg)	Coarse Aggregate (Kg)	Compressive stress(N/mm²)
1.	0.5	1.5	1.5	19.31
2.	0.5	1.5	1.5	20.28
3.	0.5	1.5	1.5	21.01
			Average	20.02

4. CONCLUSIONS

- Plastic is an innovative material for using it in construction purpose.

- Plastic sand paver posses more advantages which includes resource efficiency.

- Plastic paver block is a productive way of disposal of plastic waste.

- It shows better results such as strength, good heat resistance, etc.

- It can be used in light traffic road or footpath.

- It requires less time for manufacture.

- The cost of paver block is reduced when compared to that of concrete paver block

- Though the compressive strength is low when compared to the concrete paver block.

5. REFERENCES

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