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# Utilization of Waste Plastic in Paver Blocks

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***Abstract***— *The aim of this project is to replace bonding of given by cement in paver blocks with melted plastic waste .Around 5.6 million tonnes of plastic waste is generated in country per annum. The degradation of plastic is very long process, it may take thousands of years. Hence, project is helpful in reducing 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 results showed more strength as compared to paver blocks.*

## I. 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.

## II. Experimental Procedure

### 2.1. Properties of Material

Plastic waste (LDPE)

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 |

**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 |

**Fig.**Sp.Gravity Test

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% |

Cement:

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. consistency | 32% | 30-35% | IS: 4031 (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 |

**Table No. 5** Compression strength result for conventional paver blocks sold in market

| SR. NO. | Concrete Paver Block No | COMPRESSION STRENGTH N/mm² |
|---|---|---|
| 1. | 1 | 17.01 |
| 2. | 2 | 17.70 |
| 3. | 3 | 17.15 |
| 4. | AVERAGE | 17.28 |

**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 .

Preparation Of Test Specimens

The plastic wastes are heated in a metal container like iron pan at a temperature of above 170℃. 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.

**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.

Tests On Paver Bl Ocks :

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 ( $N/mm^2$ ) = load (N) / cross section area of specimen ($mm^2$)

**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 |

## III. Conclusion

- 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.

## Referance

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