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UTILIZATION OF WASTE PLASTIC IN MANUFACTURING OF PAVER BLOCK

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ABSTRACT

In this article, we examine the acceptability of recycled plastic shredded in various proportions in concrete mixes. Because of its limited biodegradability and prevalence in huge amounts, the disposal of plastic garbage in the environment is regarded as a major issue. This will go a long way in solving part of our environmental and ecological problems resulting from indiscriminate dumping of plastic wastes. Plastic wastes (LDPE type) shredded and mixed in different proportions (80:20, 70:30, 60:40 and 50:50) with cement, sand and coarse aggregate to produce sample paver blocks. The 200x100x80 mould was also used to produce cement paver blocks. These blocks were subjected to flexural, compressive-strength, water-absorption. The results of these tests revealed that paver blocks produced from plastic additives show more tensile strength, better water absorption. more resistant to corrosion and good heat absorber compared to the blocks produced from cement. Plastic paver blocks also showed abnormally low water absorption than the cement blocks. Industrial wastes such as plastic bottles, pallets, carry bags, polypropylene (PP), and polyethylene Terephthalate (PET) were investigated as possible alternatives to traditional concrete cement. If plastic wastes can be mixed with concrete mass in a certain quantity or in a certain form without changing the fundamental and other qualities of the concrete or causing a little reduction in its strength. Industrial wastes made of polypropylene (PP) and polyethylene Terephthalate (PET) were investigated as alternatives to traditional concrete cement. For the concrete preparation, four replacement levels of 20%, 30%,40%,50% by weight of cement were used.

Keywords*: Plastic waste, Fine Aggregates, CTM, UTM*

1. INTRODUCTION

The amount of plastic garbage generated in the home is substantial, and it continues to grow with time. The trash composition varies by country due to socio economic factors, consumption habits, and waste management systems, although plastics account for a significant portion of waste in most cases. Polyethylene is the most common type of plastic waste, followed by polypropylene, polyethylene Terephthalate, and polystyrene. The high volume of materials required for construction could be a significant area for waste material reuse. Concrete recycling has the advantage of being widely utilized and having a long service life, which means that the trash is eliminated from the waste stream for an extended period of time. The environmental benefits are significant due to the massive cost of aggregates required in concrete.

Definition of Plastic: Plastic is defined as "a substance that contains one or more polymers with a high molecular weight in their final state or in the state in which they will be manufactured or processed into finished goods. Because concrete is the second most sought material by humans after water, researchers planned to use plastic waste as a concrete ingredient. The use of post-consumer plastic waste in concrete can increase concrete qualities such as tensile strength, chemical resistance, drying shrinkage, and creep in the short and long term.

Why The Plastics: - Plastics are strong yet lightweight, and so they are easy to transport and manufacture. it is waterproof and insulating easily available and making it suitable for building in many different types of climates in constructional areas.

- Durable and corrosion resistant
- Good Insulation for cold, heat and sound saving energy
- It is economical and has a longer life.
- Easy of processing/installation
- Light weight

2. LITERATURE REVIEW

- **Revathi et al. (2015)** It has been observed that concrete paver blocks are commonly employed in road paving. When a road has limited traffic, concrete paver blocks are a preferable option because they are less expensive and require less maintenance than typical bituminous roads. M40 concrete mix proportions were used to make this pre-cast concrete block. "Rice husk ash is a waste material that can be used as an alternative to fine aggregate in a space with a percentage range of 0% to 60%. The density of paver blocks ranges from 1888 to 2202 kg/m3, and density values decrease as the amount of groundnut husk ash increases. The use of groundnut husk ash is appropriate for reducing water absorption to less than 7%."

  Reddy and his colleagues (2015) "According to research, concrete paver blocks are manufactured from nylon fibers."

- **Neekhra et al. (2015):** It was determined that nylon fiber is utilized to test paver block strength. Nylon fibers are strong fibers that are utilized in construction. Nylon fibers are also thermoplastic polymers. "It was discovered that adding 0.3 percent nylon fibers to the pr oportion of cement in concrete gives a maximum strength of 7,14, and 28 days of age after executing varied percentages of nylon fibers in the concrete paver block."

- **Raja et al. (2014):** Analyze that manufacturing sand is the greatest fine aggregate option for concrete paver blocks. "As a result of using manufactured sand, we were able to obtain compressive strength of 43.80N/mm2 in M30 grade paver size 200mmX200mmX50mm," says the company. Manufacturedsand is a good substitute for river sand, and it is also less expensive."

- **Mall et al. (2014)** Examine that Paver Block is a better alternative for road construction in terms of cost and stability when compared to roads constructed of bitumen and gravel. Paver block manufactured with 10mm coarse aggregate, OPC 43 Grade Cement, and Fine Aggregate with dimensions of 200 x 160 x 80 mm made using Cement Concrete mixture of Design Mix M35. “To investigate this process, partial replacement of cement with fly ash in percentages ranging from 0% to 30% was used, with Gypsum added at a constant rate of 2% by weight of cement and Superplasticizer added at a rate of 2% by weight of cement. It was discovered that 25% fly ash gives higher strength and economic value when compared to 0% fly a sh.

- **Kashiyama et al. (2013)** Study said that addition of polypropylene fibers in paver block to so the change in the result of Abrasion Resistance and FlexuralStrength of paver blocks improved with compare standard paver block and reduces the maintenance cost of paver block. Mix proportion for concrete paver block used in top layer is 1:3 (Cement: dolomite powder) and polypropylene fibers with the different percentage rate and 1:1:2:3.75 (Cement: sand aggregate: Quarry dust) in the bottom layer of paver block “Result shown that after 28day percentage of polypropylene 0.3% and 0.4% gives good results for abrasion resistance and flexural strength”.

3. EXPERIMENTAL INVESTIGATION

3.1 MATERIAL USED

Cement:

Cement is a binder, or a substance that binds other materials together by setting and hardening independently. There are numerous varieties of cement available on the market. Ordinary Portland cement is the most often used cement. For the test, ordinary Portland cement of grade 43 was employed. Ordinary Portland cement had a specific gravity of 3.15 g/cm3.Material

Coarse aggregate:

As much as feasible, coarse aggregate must meet the requirements of IS 383 crushed aggregates must be utilised to ensure acceptable durability. The aggregate used to make blocks must be sound and free of soft and honeycombed particles. The maximum nominal size of coarse aggregate utilised in paver block production is 10 mm. Retaining on 4.75 mm sieve is taken

Fine aggregate:

Fine aggregate as per IS 383. This standard covers the requirements for aggregates, crushed or uncrushed, derived from natural sources such as river sand. Sand retaining on 2.5mm sieve.

TABLE I

Test	Types of Aggregate		
	Coarse	Fine	Plastic
Specific Gravity	2.66	2.61	1.04
Water Absorption	0.85%	1.0%	Nil
Density (Kg/m^3)	1865	1080	640

	Kg/m^3	Kg/m^3	Kg/m^3
Moisture Content	Nil	1%	Nil

Water:

Water is an important ingredient of concrete as it actively participates in the chemical reaction with cement. The water, which is used for making concreteshould be clear up and free from harmful impurities like oil, alkalis, acids etc.

TABLE II

As Per Design M20- Grade Material Requirement For paver block200mmX100mmx80mm	
Material	**Quantity(g)**
Cement	800
Fine Aggregate	250
Coarse Aggregate 10mm	500
Water/Cement	450

Plastic shredded:

Recycled plastic a size which is retain and pass on 0.45U sieve.

1.1 Cement:

Cement Ordinary Portland Cement of 43-grade was used as it satisfied the requirements of IS: 269-1969 and results have been tabulated in table.

Table III: Properties of cement

Sr. No	**Property**	**cement**
1	Consistency	28.66%
2	Specific gravity	3.15
3	Fineness	Not less than 225 m sq./Kg
4	Initial Setting Time	Not less than 30 min
5	Final Setting Time	Not less than 600 min

Details of concrete mix:

As per design mix M20 grade given table shows the quantity of material for this reference to take the material quantity for cube each proportion material required

Table IV: Proportion of mixture

Material Proportion in weight batching (All weight in)				
Material	20%	30%	40%	50%
Cement	800	700	600	500
Fine Aggregate	2.5	2.5	2.5	2.5
Coarse Aggregate	5.5	5.5	5.5	5.5
Plastic shredded	200	300	400	500
TOTAL	18			

After 24 hours of casting, remove the block from the mold and place it in the curing tank for 14 days of curing and 28 days of curing. After the curing iscomplete, remove the block from the curing tank and dry to normal atmosphere for at least hours for the surface to dry before checking it for compression testing machine results.

Compressive Strength Test: Compression testing is a very common testing method that is used to establish the compressive force or crush resistance of a material. Overall specimen of blocks taken to laboratory for testing and tested one by one. In this test a paver block specimen is put on crushing machine and applied load till it cracks. The ultimate load at which block is crushed is taken into account.

Compressive strength = Maximum load/Area of the specimen =P/A

Water absorption test:

In this test, blocks are weighed in dry condition and let them immersed in fresh water for 24 hours. After 24 hours of immersion, those are taken out from water and wipe out with cloth. Then, block is weighed in wet condition. The difference between weights is the water absorbed by block. The percentage of water absorption is then calculated. Water absorption = [W2 – W1] / W1 x 100 Where, W1= Weight of dry block (kg) W2 = Weight of weight block.

4. CONCLUSION

1. From literature review and present study, it is concluded that, Plastic is very hard polluted ingredient in the nature, so use in the paving bock to reused the pollution in the area.
2. The finishing, shape, interlocking and appearance of the plastic paving block are good, as conventional concrete paving block.
3. Cost of plastic used paving blocks is less as compare to normal paving blocks.
4. This block was used in park, walking space in house and foot-path of the road.
5. It provides better drainage system and also prevent rainwater from gathering or flooding.

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