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Use of Plastic Waste and Glass Fibre in Paver Block and Compared with Normal Concrete Paver Block

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Abstract*: The use of plastic is increasing day by day, although steps were taken to reduce its consumption. This creates substantial garbage everyday which is must unhealthy. A healthy substantial reuse of plastic offers a host of advantages. The suitability of recycled plastic aggregate as a regular aggregate in concrete and it's discussed here. The plastic aggregate replacing to regular aggregate in paver block. The percentage are 10 %to 30%. and glass fibres replacing to percentage of cement are 0.1% to 0.3%. Water absorption and compressive strength tests are conducted.
Keyword: Substantial, plastic aggregate, glass fibre

I. INTRODUCTION

Every year more than 500 billion plastic bags are used (nearly 1 million bag per minute) hundreds of thousands of sea turtles, whales and marine mammals die every year eating discarded plastic bag for mistaken food. On land many animals suffer from similar fate to marine life. Collection and hauling add disposal of plastic bag waste creates and additional environmental impact. India as a population of over 1 billion and plastic consumption of 4 million tones.

1) *Properties of plastic :* Durable and corrosion resistance, Light weight, Good insulation for cold heat and sound saving energy, Easy of processing / installation., It is economical and has longer life, Maintenance free (such as a painting is minimized), Hygienic and clear, Fibre or fibre (form the Latin fibre) is a normal or synthetic substance that is significantly longer than it is wide .fibres are often used in the manufacturing of the corporate fibers , for example carbon fibre and ultrahigh-molecular weight polyethylene. Fibre or fiber (form the Latin fibre) is a normal or synthetic substance that is significantly longer than it is wide. fibres are often used in the manufacturing of the corporate fibres , for example carbon fibre and ultrahigh-molecular weight polyethylene.
2) *Properties of fibre:* High fiber length to width ration, Tenacity (adequate strength, Flexibility or pliability, Cohesiveness or spinning pliability.

II. OBJECTIVE

To obtain strength to the paver block.
By using plastic in concrete mix to reduce the weight of cement
To increase the compressive strength of paver block by adding glass fiber & plastic aggregate 0.1%to0.3% wt. of cement is replaced by glass fibre and 10%to30% regular aggregate is replaced by plastic aggregate.
To obtain a minimum water absorption to plastic mix paver block.
To obtain a paver block which does not affect environment and human health.

III.METHODOLOGY

1) Sampling of materials: Sample of aggregates for each batch of concrete shall be of the desired grading of shall be in an air-dried contain. the cement sample an arrival at the laboratory shall be through mixed dry arrived at the laboratory mixer in such as to ensure the grateful possible blending & uniformity in the material.
2) Proportioning: The properties of the materials including water in concrete mixer used for determining the suitability of the material available. Used M10 grade of concrete with 1:3:6 proportion.

For making 5 paver blocks the following proportional material will taken,

TABLE I (Mix proportion of concrete paver)

Cement(gm)	Sand (gm)	Fine aggregate (gm)	Coarse aggregate (gm)	Water (litter)	Harder (ml)
3000	9000	600	1200	8	5

3) Weighing: The quantities of cement each size of aggregate & water for each batch shall be determined by weight to accuracy.
4) Mixing concrete: The concrete shall be mixed by hand or preferably in a laboratory batch mixer in such a manner as to avoid loss of water or other material.
5) Mould: The moulds are made up of rubber and having standard square shape.
6) Vibrating: The test specimen shall be made using mould. After that these specimen with mould is vibrated with help of table vibrate to remove air voids & place the material in mould properly.
7) Curing: The test specimen shall be stored in place free from moisture for 1 day.

IV. RESULT & DISCUSSION

Following test results are shown it conclude that the plastic aggregate are mix with proportion 10% - 30% by replaced by regular aggregate its give maximum compressive strength & minimum water absorption than control mix paver block & also glass fibre are mixed with proportion of 0.1% – 0.3% by weight of cement its also give maximum compressive strength & minimum water absorption than control mix paver block.

A. Testing of Control Mix Paver Block

1) *Compressive Strength Test:* This is done to know the compressive strength of the paver blocks. This is also called crushing strength of paver blocks. Generally five specimens of paver blocks are taken to laboratory for testing and tested one by one. In this test a paver block specimen is put on crushing machine and applied pressure till it breaks. The ultimate pressure at which is crushed is taken into account. All five paver block specimens are tested one by one and average result is taken as paver block's compressive /crushing strength. The plastic and glass fiber paver blocks of different ratios are tested one by one and in this the high compression is found and comparison made between the plastic and glass fiber mix paver block and concrete paver block

Grade of concrete: M10

TABLE II (Compressive strength of control mix paver block)

Sr No.	Age (days)	Weight (gm)	Dimensions (cm)	Cs (cm^2)	Load (KN)	Compressive strength N/mm^2	Average compressive strength N/mm^2
1	1	5480	19×19×6	232.5	860.2	36.90	
2	1	5480	19×19×6	232.5	720.3	30.98	33.88
3	1	5480	19×19×6	232.5	785.4	33.78	

2) *Water Absorption Test:* In this the block test first weighted in dry condition and they are immersed in water for 24 hrs. After they are taken out from water and they are wipe out with cloth. Then the difference between the dry and wet bricks percentage are calculated.

1) W1= dry wt. of paver block 2) W2=wt. of wet paver block

% content= (w2-w1)/w1×100

TABLE III (Water absorption of control mix paver block)

SR. No.	Type of Paver Block	W1(gm)	W2(gm)	Water absorption
1	Control mix	3900	4200	7.69%
2	Control mix	4100	4400	7.31%
3	Control mix	3950	4300	8.86%

B. Testing of Plastic Mix Paver Block

1) Compressive Strength Test

TABLE IV (Compressive strength of plastic mix paver block)

SR No.	Size of block (cm)	Cs Cm^2	Plastic aggregate. Replacing to Regular aggregate.	Weight (gm)	Load (KN)	Compressive strength N/mm^2	Compressive Strength h Average. N/mm^2
1	19×19×6	232.5	10%(M1)	4260	1006.6	43.29	44.75
				4000	1130.6	48.62	
				4240	1040.2	44.73	
				4300	1121.2	48.22	
				4200	904.4	38.89	
2	19×19×6	232.5	20%(M2)	4060	1003.2	43.14	45.04
				3880	832.4	45.80	
				4260	1177.2	50.63	
				4060	869	42.37	
				4070	1006.2	43.27	
3	19×19×6	232.5	30%(M3)	4800	1657.2	71.20	63.63
				4700	1342.2	57.22	
				4700	1130.2	71.87	
				5000	902.4	64.86	
				4980	745.5	57.52	

2) Water Absorption Test

TABLE V (Water absorption of plastic mix paver block)

SR No.	Plastic aggregate Replacing to Regular aggregate	W1 (gm)	W2 (gm)	%Water absorption
1	10%	3900	4130	5.89%
2	20%	3900	4120	5.64%
3	30%	4120	4300	4.36%

C. Testing of Glass Fiber Mix Paver Block

1) Compressive Strength Test

TABLE VI (Compressive strength of plastic mix paver block)

SR No.	Size of block (cm)	Cs Cm^2	Glass fibre replaced by wt. of cement	Weight (gm)	Load (KN)	Compressive strength N/mm^2	Compressive Strength h Average. N/mm^2
1	19×19×6	232.5	0.1%(M1)	4860	1600.2	68.82	50.06
				4960	1443.2	62.07	
				5000	1130.2	48.61	
				4860	902.4	38.81	
				5100	745.5	32.06	
2	19×19×6	232.5	0.2%(M2)	4980	1325.2	43.14	55.36
				4720	1405.2	45.80	
				4720	800	50.63	
				4800	1600.4	42.37	
				4720	1406.3	43.27	
3	19×19×6	232.5	0.3%(M3)	4820	960.6	41.31	58.59
				4700	1100.4	47.32	
				4720	1600.4	68.84	
				4800	1705.2	73.34	
				4750	1445.5	62.17	

2) Water Absorption Test

TABLE VII (Water absorption of glass fibre paver block)

SR No.	Glass fibre Replaced by wt. of cement.	W1 (gm)	W2 (gm)	%Water absorption
1	0.1%	4.880	5120	4.91%
2	0.2%	4.860	5160	6.17%
3	0.3%	4.860	5190	6.79%

V. COMPARISON

TABLE VIII (Comparison between Control Mix Paver Block and Plastic used Paver Block and Glass Fibre is used Paver Block:)

SR NO.	Strength and Properties	Control Mix	Plastic used Paver Block	Glass fiber used Paver Block
1	Strength	Minimum compressive strength	Maximum compressive strength than control mix	Maximum compressive strength
2	Water Absorption	Maximum water absorption up to 8.86%	Minimum water absorption as compare to control mix.	Water absorption is more due to hydrophilic nature of fiber.
3	Environmental issue.	Eco-friendly	Create air pollution	Less eco-friendly
4	Availability of material	Easily available nearby site	Extra activities such collection, segregation treat is involve	Available in market in less quantities
5	Temperature	Casting is done in any temp.	For melting of plastic more temp. is required.	Casting is done in normal temp.
6	Mixing operation	Mixing operation is easily carried out with the help of mixer	Non sticky such as metal mould required.	Proper mixing of fiber is required
7	Equipment's	No extra tools are required	Extra tools are required during operation	Some equipment are required
8	Skilled labours	No extra labors are required	Skilled labors are required to treat plastic	Also skilled person is required during process/casting
9	Admixtures	Harder is used for setting	Harder/Latex Polymer is added during process	Also harder/resin is used for setting/harden purpose
10	Cost analysis	Less costly	Uneconomical due to processing	Less economical due to availability of fibrous material in market.

VI. CONCLUSION

The concrete consist of cement, sand, aggregate of water out of which the aggregate is 60 to 70% in concrete and form the above observation it is computed 20% of plastic aggregate is used with replacement of regular aggregate and its give maximum strength. By using plastic in concrete mix to reduce the weight of paver. It is possible to use the plastic in cement is the best option for disposed of plastic and ultimately reduces the plastic pollution in the environment. Compressive strength and flexural strength of paver blocks increases by addition of glass fibre and optimum content of fibre inclusion was 0.2% by out of cement.

There was decrease in water absorption at replacement of cement by glass fibre due to hydrophilic nature of fibre.

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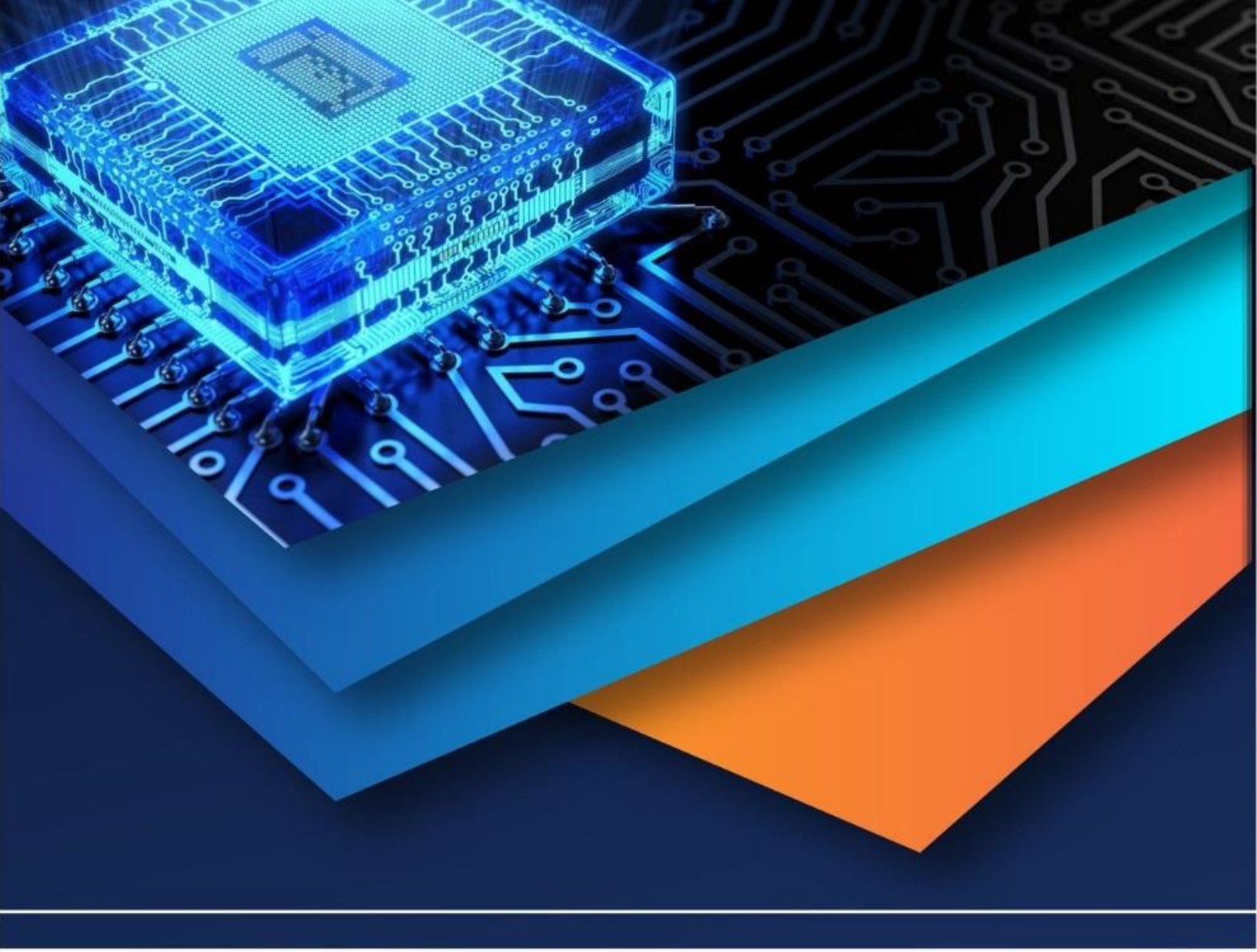

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