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Comparisons Physical Properties Between Concrete Paver Vs Rubber Cement Composite Paver

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ABSTRACT: The objective of this research paper is to study about the waste tyre crumb rubber granules as a partially concrete replacement by different percentage of facing layer thickness and without facing layer in the production of rubber cement composite paver block. The physical properties of RCCRP compressive strength, flexural strength, abrasion strength density, and water absorption testing by the IS 15658:2006 method. This all physical properties are depending upon the ratio of crumb rubber uses. The result showed that the with facing layer at 15 mm, 25 mm,totally rubberized and without facing layer had little effect on compressive strength, flexural strength and abrasion resistance properties. The absorption of water is also important for the service life of the product. The crumb rubber paver block also performed quite well in both compressive strength and abrasion resistance. The rubber cement composite paver block is suitable for nonstructural purpose such as lightweight, easily installation for the walkway, sidewalk and playing area application.

Keywords:-RCCRP, facing layer, compressive strength, flexural strength, application.

I. INTRODUCTION

The utilization of waste tyre scrape materials in construction applications and the solution of environment problem by recycling are becoming greater concern and to achieve the best products. Generally, the cheapest and easiest way to decompose waste or used tire is by burning them. However, the pollution and enormous amount of smoke generated by this method makes burning quite unacceptable and in some countries it is prohibited by law.

Now, one of the most possible and challenging solution for this problem by, the rubber materials are mixed with the cement material and to makes the rubber cement composites. The rubber, cement and water mixing the rubber particles penetrate into the cement material and the hydration of water done during making of rubber cement composites.

In this type the waste tyre rubber gives good hardness and elasticity properties and, gives good resistance to weathering properties can be used for the preventing impact damage. Therefore the crumb rubber and cement composite which are suitable for the manufacturing of rubber paver. Its gives the good impact resistance, increase toughness; skid resistance retaining of pavement structure.

II.TESTING AND QUALITY ASSURANCE

The rubber cement composite rubber paver block all testing tested by IS 15658:2006 standard method. The testing test in GEO TECH HOUSE laboratory, at Vadodara for the Accordingly, a common testing laboratory for both the sections is purposed for the testing of compression strength Flexural strength ,abrasion ,water absorption and density testing of finished products and also to ensure in process to good quality control.

2.1 Compressive Strength

The rubber cement composite paver blocks compressive strength testing by the universal compression testing apparatus. The compression testing machine is equipped with two steel bearing blocks for holding the specimen of rubber cement composite paver. The rubber cement composite paver block requires the 8 nos for the compressive testing result. The maximum load applied to the specimen shall be noted in N. Finally measure the average value of compression test.

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$$Apparent\ compression\ strength = \frac{\text{load}}{\text{plan area}} * conversion\ factor$$

Figure 1: Compressive strength test

2.2 Abrasion Test

The abrasion testing of rubber cement composite paver block is done by using the abrasion testing machine. Abrasion testing gives the surface area abraded during application we gave the how man percentage material abraded. The paver block sample prepare Square-shaped measuring 70*70*40 mm shall be cut from the block specimens selected as per the IS standard sampling procedure and the number of specimens required 8 nos sample.

Figure 2: Abrasion test or RCCRP

The abrasive wear of the specimen after 16 cycles of testing shall be calculated as the mean loss in specimen volume, AV,from the equation:

$$\Delta V = \frac{\Delta \text{m}}{\text{PR}}$$

Where;
AV = loss in volume after 16 cycle, in mm3;
Am = loss in mass after 16 cycles, in g; and
PR **=** density of the specimen, or in the case of two-layer specimens, the density of the wearing layer, in g/mm3.

2.3 Flexural Strength

The test procedure shall be Flexural strength measure by the flexure testing machine. First the testing required the 8 nos sample for the measure flexural test .Now we marking the all samples marking centre line by using marker pen. Then the sample load on the flexural testing machine. The load shall be applied without shock and increased continuously at a uniform rate of 6 kN/min. The flexural strength of the specimen shall be calculated as follows:

$$\text{Flexural Strength} = \frac{3\text{PL}}{2\text{bd}}^2$$

Where,

Fb = Flexural strength, N/mm^2
P = maximum load, in N

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L = 50 mm distance between two roller,
b = 100 mm average width of the paver block,
d = 60 mm average thickness of paver block,

Figure 3: Three point flexural strength

2.4 Water Absorption Tests

The testing method is to determine the % of water absorb by the paver and % of moisture content of paver measure. Here we require the water tank for immersed process and Owen for drying the paver sample.
The percent water absorption shall be calculated as follows:

$$\boldsymbol{W}\text{percent} = \frac{\text{Ww} - \text{Wd}}{\text{Wd}} * 100$$

III. RESULT AND DISCUSSION

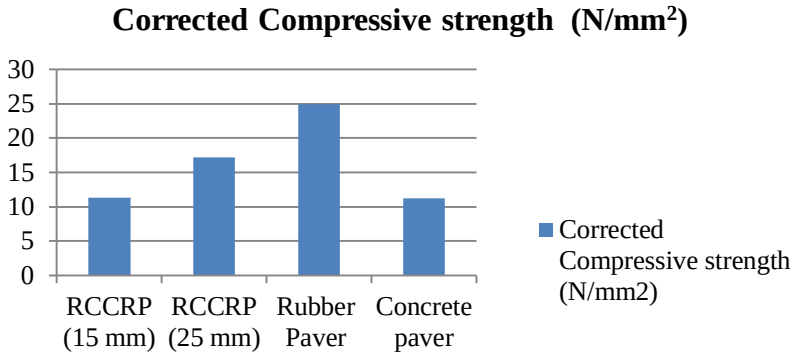

Figure 4: Graph for corrected compressive strength

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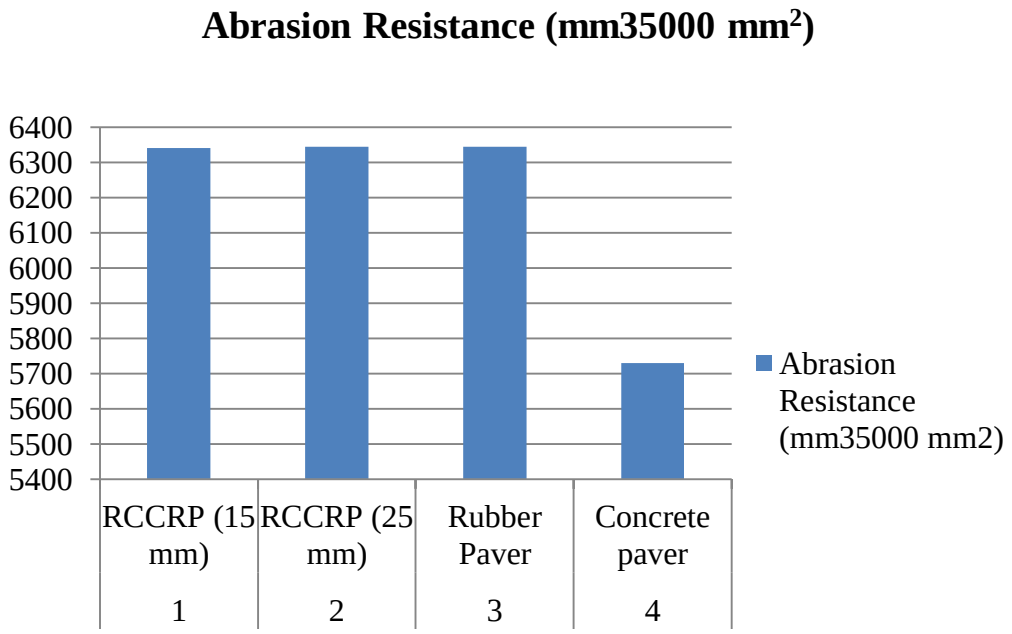

Figure 5: Graph for Abrasion Resistance

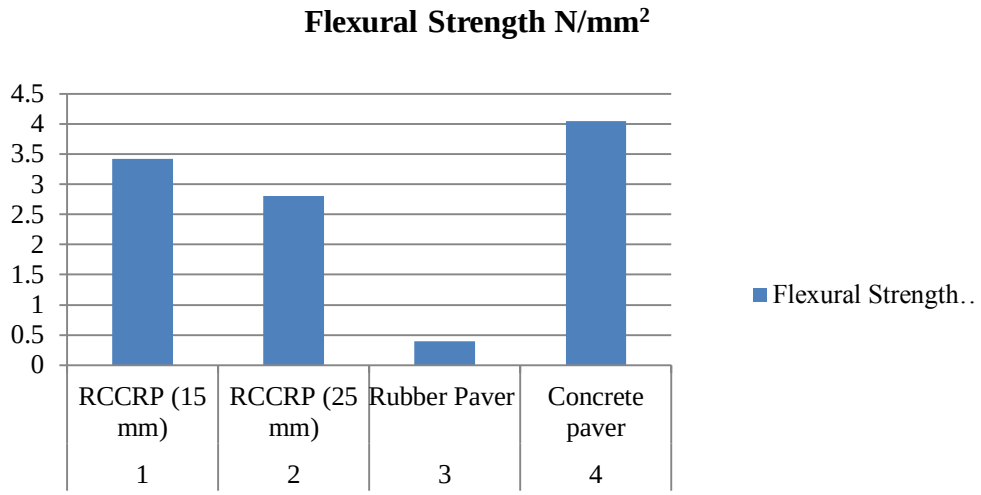

Figure 6: Flexural Strength

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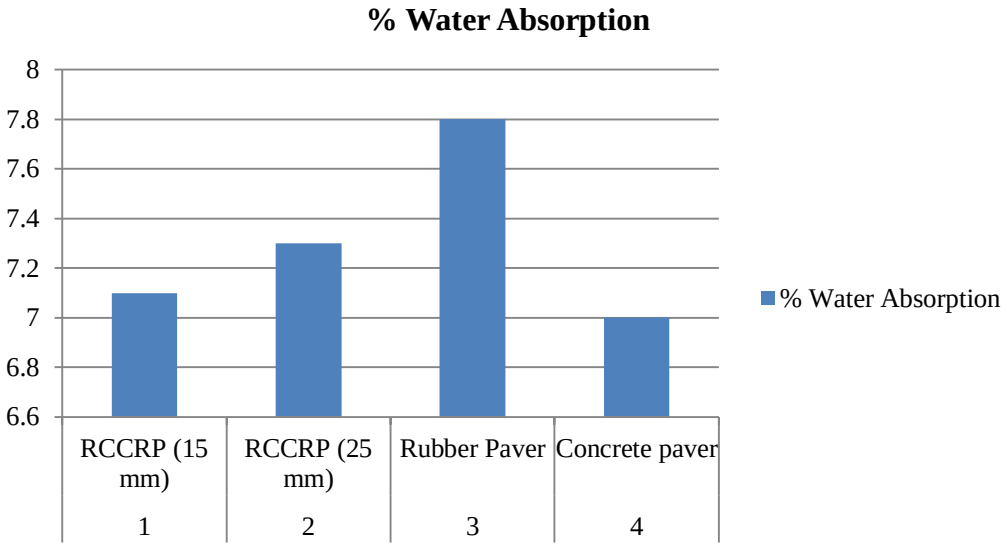

Figure7: Percentage of Water Absorption

The rubber cement composite material rubber paver block physical properties are depending upon the thickness of facing layer. The crumb rubber facing layer ratio will increases so it increase the compressive strength, abrasion strength, and water absorption capacity also increases. But drastically it reduces the flexure strength when the facing layer ratio increases. Also the apperent dispersion of crumb rubber to polyurethane promotes the homogenized mixing. The incorporation of crumb rubber into Pu foam which increased the value of apparent density of the finally mixing material, simultaneously decrease the volumetric expansion rate of foam resulted which increased the apparent density.

IV. CONCLUSION

The rubber cement composite paver block which gives good physical properties than concrete paver block, it noise reduction, increase compression strength, and reduce the total weight of paver block.

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