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Paver block production from ceramic waste

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Abstract The aim of this project is to replace cement with ceramic waste in paver block and to reduce the cost of paver block when compared to that of conventional concrete paver block. In recent constructions, consumption of ceramic materials is increasing day by day in the form of tiles, sanitary fittings and electrical insulations etc. But a large quantity of ceramic waste material is changes into wastage during processing, transportation and fixation due to its brittle nature. In this study, the Ordinary Portland cement (OPC) has been replaced by crushed ceramic tile by various percentages such as 10%, 20% and 30%. Paver blocks were casted, tested and compared with conventional blocks by finding their compressive and flexural strength through experimental investigation. The test was carried out to evaluate hardened properties of paver block. This project proves that the waste produced in tile industry can be used as partial replacement of cement in paver block.

Index Terms - ceramic waste, Compressive strength, Paver block

I. INTRODUCTION

Block paving also known as brick paving is a commonly used decorative method of creating a pavement or hard standing. Paving blocks have made a fast inroad into the construction industry, and have almost become the de-facto choice. Most construction firms nowadays prefer paving blocks over slabs, asphalt, stone or clay. Mass production of paving blocks has reduced their price, and made it easily affordable. With the advent of paving block machines, it has become even simpler to complete their laying. The performance characteristics of concrete paving blocks make it suitable for the heaviest duty applications, able to support substantial loads and resist shearing and braking forces. Many block paving manufacturing methods are now allowing the use of recycled materials in the construction of the paving bricks such as crushed glass, plastic waste and crushed old building rubble.

II. LITERATURE REVIEW

RM Senthamaraj, P Devadas Manhoharan et al[1] "Concrete with ceramic waste aggregate". Cemented concrete composites, no. (9-10), 27(2005)910-3

Experiment were carried out to determine the compressive, splitting tensile and flexural strength and modulus of elasticity of concrete with ceramic waste coarse aggregate and to compare them with those of conventional concrete with crushed stone coarse aggregate.

Medina C. Frias M. et al[2] "Reuse of sanitary ceramic wastes as coarse aggregate in eco efficient concretes". Cement and concrete composites, 34(2012)48-54.

The reuse of these wastes as recycled coarse aggregate in partial substitution (15%, 20% and 25%) of natural coarse aggregates in the manufacture of structural concretes. The results demonstrate the recycle, eco-efficient concerts present superior mechanical behavior compared to conventional concrete and it was moreover appreciated that the recycled ceramic aggregate does not interfere in the negative way during the hydration process.

C.Medina, MIS de Rojas et al[3] "properties of recycled ceramic aggregate concretes: Water resistance". Cement and concrete composites, 34(2013)23-26.

Water permeability is a durability indicator, for it quantifies concrete resistance to penetration by external agents, due to that water is one of the main carries of aggressive substances.

III. PROPERTIES OF MATERIALS

(OPC43 grade)

Cement is a crystalline compound of calcium silicates and other calcium compounds having hydraulic properties. 43 grade of cement means that the compressive strength of the cement after 28 days is 43N/mm^2 when tested as per Indian Standards under standard conditions. This grade of cement is used for plain concrete work and plastering work.

TABLE 1. PROPERTIES OF CEMENT

SI.NO	Properties	Result
1.	Initial setting time	38min
2.	Final setting time	3-4hrs
3.	Specific gravity	3.15
4.	Fineness test	7

Fine aggregate

Fine aggregates generally consist of natural sand or crushed stone with most particles passing through a 3/8 inch sieve. Specific gravity 2.67, Fineness modulus is 2.7, Bulk density (partial compact) is 1461 kg/m^3, Bulk density (full compact) is 1635kg/m^3.

TABLE 2. PROPERTIES OF FINE AGGREGATE

SI.NO	Properties	Result
1.	Specific gravity	2.65
2.	Water absorption	1.2%
3.	Fineness modulus	2.92
4.	Bulk density	1688kg/m^3

Coarse aggregate

Coarse aggregate is the proportion of the concrete which is made up of the larger stones embedded in the mix. Specific gravity is 2.5, Fineness modulus is 0.25%, and Water absorption is 4.1%.

TABLE 3. PROPERTIES OF COARSE AGGREGATE

SI.NO	Properties	Result
1.	Specific gravity	2.75
2.	Water absorption	0.53
3.	Bulk density	1406kg/m^3

Ceramic waste

The ceramic tiles are collected and then break into pieces by hammering.

TABLE 4. PROPERTIES OF CERAMIC TILES

SI.NO	Properties	Result
1.	Specific gravity	2.45
2.	Water absorption	0.72
3.	Fineness modulus	6.88

IV. MIX DESIGN

Mix ratio as per IS method is adopted for the design mix. M30 grade of concrete is chosen and the design mix is adopted for the test specimen is 1:1.36:2.23

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V.PREPARATION OF SPECIMEN

The ceramic tiles are break into pieces by hammering. Then these wastes added as a partial replacement of cement as 10%, 20% and 30%. The materials fine aggregate, coarse aggregate are added it in a correct proportion and mixed properly.

VI .TESTS ON PAVER BLOCK

Compressive strength test

After the casting of paver block they were let them to curing and dry. Then the block is transferred to testing.

Compressive strength (N/mm^2) = load (N)/ Area of cross section (mm^2)

TABLE 5. COMPRESSIVE TEST RESULT FOR 7TH DAY

S. No	Percentage replacement of ceramic waste	7th day of compressive strength	
		Block type I (zig zag)	Block type II (I shape)
1.	conventional	29.98	30.56
2.	10% of ceramic waste	31.98	32.26
3.	20% of ceramic waste	33.69	35.26
4.	30% of ceramic waste	35.23	36.59

TABLE 6.COMPRESSIVE TEST RESULT FOR 14TH DAY

S.No	Percentage replacement of ceramic waste	14th day of compressive strength	
		Block type I (zig zag)	Block type II(I shape)
1.	conventional	30.89	32.54
2.	10% of ceramic waste	32.56	35.26
3.	20% of ceramic waste	35.91	34.85
4.	30% of ceramic waste	35.52	36.58

TABLE 7. COMPRESSIVE TEST RESULT FOR 28TH DAY

S.No	Percentage replacement of ceramic waste	14th day of compressive strength	
		Block type I (zig zag)	Block type II(I shape)
1.	conventional	38.26	39.21
2.	10% of ceramic waste	39.12	43.45
3.	20% of ceramic waste	38.81	40.89
4.	30% of ceramic waste	42.89	43.42

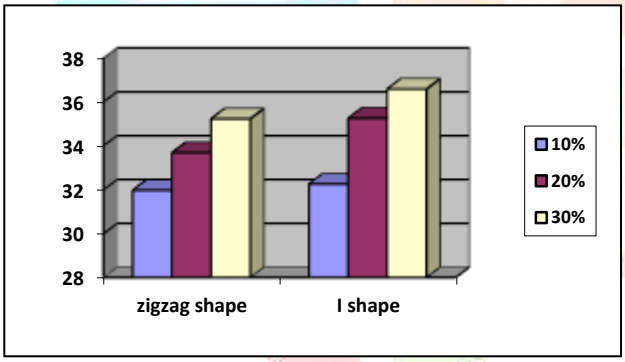

Fig 1. Conventional test results for 7 days

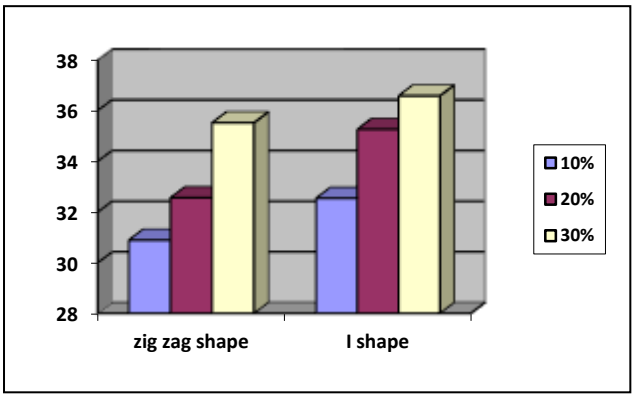

Fig 2. Conventional test result for 14 days

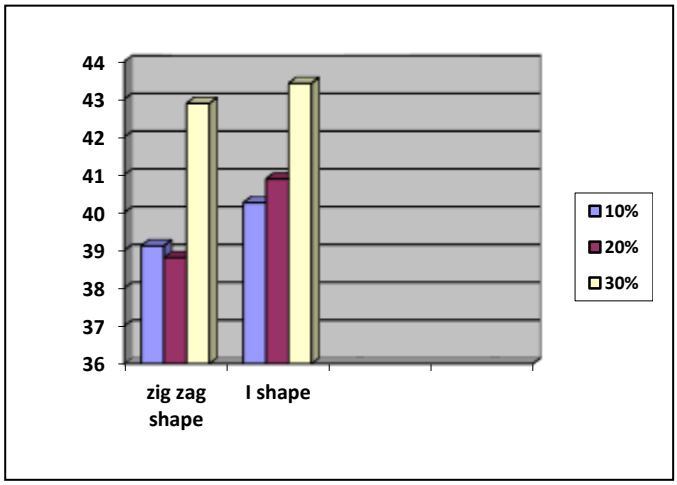

Fig 3. Conventional test for 28 days

VII.CONCLUSION

From the above results it has been found that the compressive strength of paver blocks gets improved by replacement of cement with ceramic tile waste while comparing to the conventional specimen.

The replacement of 10%, 20%, 30% enhances the strength. It has been found that 30% of replacement is optimum.

References

[1] RM Senthamarai, P Devadas Manhoharan "Concrete with Ceramic Waste Aggregates" Cement and concrete composites 27(9-10): 910-913 October 2005.

[2] Medina C, Frias M, "Reuse of sanitary ceramic wastes as coarse aggregate in eco efficient concretes". Cement and concrete composites, 34 (2012)48-54.

[3] C.Medina, MIS de Rojas "properties of recycled ceramic aggregate concretes: Water resistance". Cement and concrete composites, 34(2013)23-26.

[4] Electricwala Fatima, Ankit Jhamb, Rakesh Kumar, "Ceramic dust as construction material in rigid pavement". American Journal of Engineerind and Architecture, 2013, vol. 1, No. 5, 112-116.

[5] I.B. TOBU and M.CANBAZ, "Utilization of crushed tile as aggregate in concrete", Iranian Journal of Science and Technology, Transaction B, Engineering, Vol. 35, No. B5, pp.561565, 2007.