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EXPERIMENTAL ANALYSIS OF CONCRETE WITH RICH MINERAL SILICA ADDITIVES

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ABSTRACT

Silica mineral (Ecosand) being a waste material generated from manufacture of cement from industry. It can be used to increases efficiency in concrete. An experimental study has been done to achieve high strength concrete using silica mineral (Ecosand) from manufacture of cement as the partial replacement of natural sand (upto 50%) in concrete and studied its mechanical properties .Experimental results are also shows that the compressive strength, flexural strength, splitting tensile strength and structural behaviour of beam of silica mineral (Ecosand) and natural sand such that the combination of two aggregate can be increased efficiency in concrete. The combined grading of fine aggregate of tested results shows closest to zone III and zone IV

INTRODUCTION

The construction industry has long relied on traditional materials like sand and cement to produce concrete. However, the growing demand for concrete, combined with environmental concerns about the depletion of natural sand resources and the carbon footprint of cement production, has led researchers to explore alternative materials. One promising solution is the incorporation of rich mineral silica, commonly known as EcoSand, into concrete mixes. EcoSand is a by-product of various industrial processes, such as the extraction of minerals or the processing of certain types of ore. It is rich in silica and, due to its mineral content, is believed to enhance the properties of concrete. The use of EcoSand in concrete offers multiple advantages, including improved durability, higher strength, and reduced environmental impact compared to conventional sand. Additionally, EcoSand can provide a sustainable alternative to natural sand, which has been increasingly scarce in many regions due to over-extraction.

Experimental Material

} Fine aggregate.
} Coarse aggregate
} Cement
} Eco sand

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Fine aggregate

Manufacturing sand was used throughout the investigation as the fine aggregate conforming to grading zone III. The properties of sand by conducting tests according with IS 2386(part -1) -1963. The Specific gravity, fineness modulus and moisture content were determined.

TEST PARTICULARS	RESULT OBTAINED
Specific gravity	2.53

Coarse aggregate

Locally available coarse aggregates having the size of 6 mm were used in the present work. The gradation, specific gravity, water absorption, density were found. Testing on coarse aggregates was done as per IS: 2386 (Part I) – 1963, IS : 2386 (Part III) - 1963 IS : 2386 (Part III) - 1963 and the results obtained were referred with IS 383 : 2016.The test results conducted on coarse aggregate are reported in Tables 3.

PROPERTY	VALUE
specific gravity	2.76
water absorption	0.67%
Bulk density	1642.47kg/m^2

Cement

Cement is obtained by grinding the raw materials (calcareous materials like limestone, chalk, marine shell and argillaceous materials containing silica, alumina and iron oxide).The mixture is then burnt in a large at a temperature of 1300□ C to 1500□ C.OPC53gradeconfirming IS 8112: 1989wasuse

TEST PARTICULARS	RESULT OBTAINED
Specific gravity	3.15
Normal consistency	32
Initial setting time (minutes)	130
Final setting time(minutes)	240

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Eco sand

EcoSand, a material that's often promoted for its sustainability and potential environmental benefits. If I'm correct, EcoSand is typically a form of silica-rich sand, possibly sourced from industrial waste or designed as a more environmentally friendly alternative to conventional construction materials. It could be used in various applications, from construction to water filtration, depending on its properties.

Mix Proportion

Control Mix: 1 part cement : 2 parts sand (fine aggregate) : 3 parts coarse aggregate.

For Eco Sand replacements, your mix proportions might look like:

10% replacement: 1 part cement : 1.8 parts EcoSand + 0.2 parts traditional sand : 3 parts coarse aggregate.

20% replacement: 1 part cement : 1.6 parts EcoSand + 0.4 parts traditional sand : 3 parts coarse aggregate.

30% replacement: 1 part cement : 1.4 parts EcoSand + 0.6 parts traditional sand : 3 parts coarse aggregate.

40% replacement: 1 part cement : 1.2 parts EcoSand + 0.8 parts traditional sand : 3 parts coarse aggregate.

Result and Disscussion

The Discussion will be focused on the performance of lightweight expanded clay aggregate. All the Tests Method adopted were describe in the previous one. The results Presented on regarding the Compressive strength, Bulk Density, Moisture content, split tensile strength and Flexural strength. The performance of concrete is influenced by proper and good practice of mixing which can lead to better performance and quality of the concrete. In the present study, M20 grade of concrete cubes of size 150×150×150mm, cylinders were cast for determining the compressive strength,The cast specimens were remoulded at the end of 24 hours ,7 days cured for 28days .Concrete is an artificial stone like material having an excellent resistance to compression

FLEXURAL COMPONENT

BEAM:-

SPAN LENGTH:1200mm M20 CONCRETE

BREADTH:100mm Fe 500 STEEL

DEPTH:150mm

REINFORCEMENT DETAILS

TENSION AREA:2 nos of 10mm dia rod

COMPRESSION AREA:2 nos of 10mm dia rod

STIRUPPS:8mm dia rod

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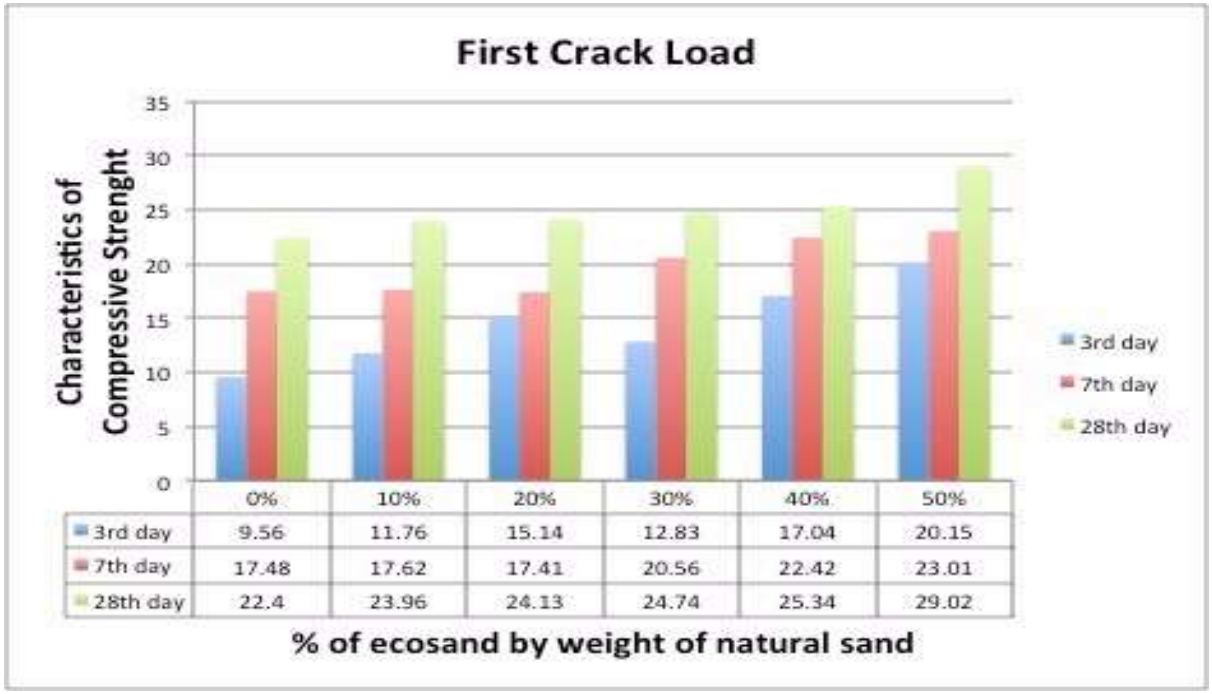
Compressive strength

Cube Testing

CUBE COMPRESSIVE STRENGTH OF CONCRETE FOR FCL



	0%	10%	20%	30%	40%	50%
3rd day	9.56	11.76	15.14	12.83	17.04	20.15
7th day	17.48	17.62	17.41	20.56	22.42	23.01
28th day	22.4	23.96	24.13	24.74	25.34	29.02

CUBE COMPRESSIVE STRENGTH OF CONCRETE FOR

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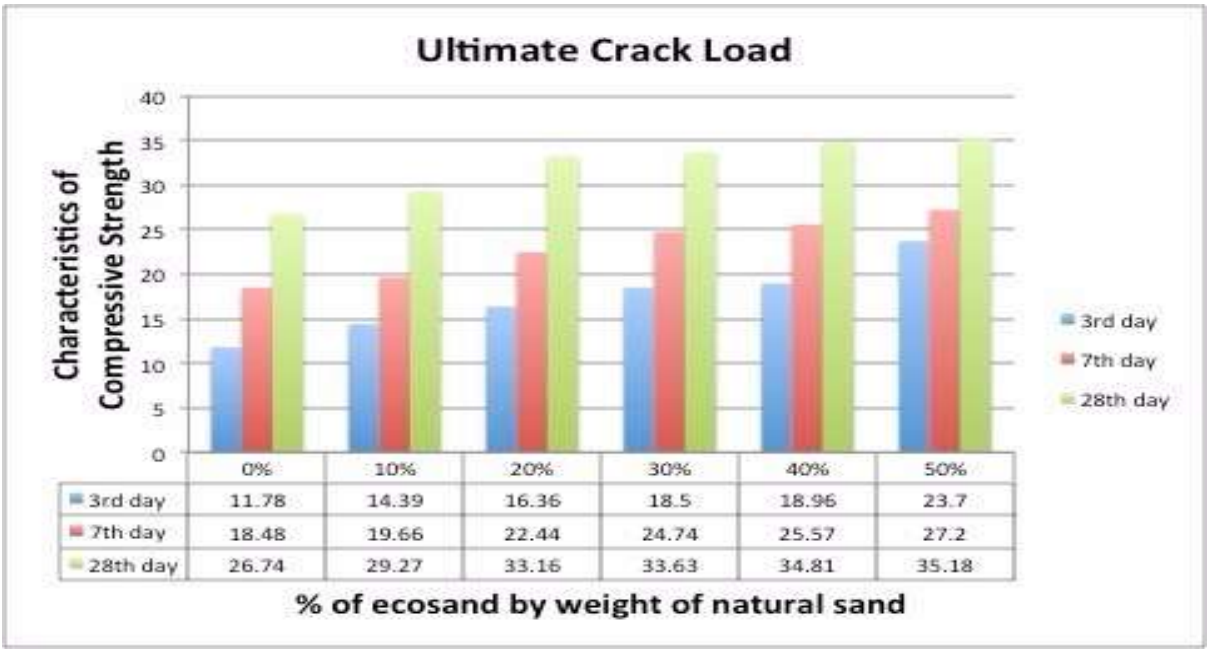
UCL



	0%	10%	20%	30%	40%	50%
3rd day	11.78	14.39	16.36	18.5	18.96	23.7
7th day	18.48	19.66	22.44	24.74	25.57	27.2
28th day	26.74	29.27	33.16	33.63	34.81	35.18

CONCLUSION

The following conclusions are drawn within the limitation of the experimental investigation.

} Eco sand being industrial by product can be used as partial replacement of fine aggregate in concrete.
} The combined grading of fine aggregate confirms better packing pattern
} The cube compressive strength, cylinder split tensile strength obtained by using the combination of fine aggregate and Eco sand gives a higher value up to 50%.

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