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Study of Concrete by Replacement of Lateritic Soil as a Partial Replacement in the Fine Aggregate

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Abstract: Concrete producing trade is one in all the carbon emitting sources besides deforestation and burning of fossil fuels the world cement trade contributes regarding seven-membered green house gases emissions to earths atmosphere..so as to handle environmental effects related to cement producing and perpetually depleting natural resources,theres a need to develop different binders to form concrete trade property.sand is the main component in the concrete.due to different environmental issues like river erosion,or any other windforces scarcity of river sand is happening. So as to preserve these type of river sand etc., alternative need for sand is searched and laterite soil which is available as local saoil will helps to replace the sand portion thereby to control the scarcity of sand. this work examines the chance of utilization of lateritic soil was partly replaced as 5%-25% of fine aggregate in concrete for M25 grade and tested for its compressive strength,durability,water absorption and dry density up to twenty-eight days and compared with typical concrete.from the results obtained,its found that lateritic soil may be used as fine aggregate replacement upto 10% by weight..
Keywords: Compressive strength, Durability, Dry density, Lateritic soil, split tensile strength, water absorption, workability.

I. INTRODUCTION

Construction activities are taking place on huge scale all over the world and demand of construction materials are increasing day by day. Production of concrete and utilization of concrete has rapidly increased, which results in increased consumption of natural aggregates and sand. Aggregate is one of the main ingredients in producing concrete which covers 75% of the total for any concrete mix. Strength of concrete produced is dependent on the properties of aggregates used conventionally concrete is mixture of cement, sand and aggregates since all the ingredients of the concrete are of geological origin, the construction industries are in stress to identify alternative materials to replace the demand achieving a strong, durable concrete rests in the careful proportioning, mixing and compacting of the ingredients. Lateritic is a soil and rock type rich in iron and aluminum and is commonly considered to have formed in hot and wet tropical areas. Nearly all laterities are rusty-red coloration because of high iron oxide content.They develop by intensive and prolonged weathering (linearization) is a prolonged process of chemical weathering which produces a wide variety in the thickness,grade, chemistry and ore mineralogy of the resulting soils.Laterities are formed from the leaching of parent sedimentary rocks(sandstone, clays,limestone) This project is mainly to know the importance of lateritic soil replacement in concrete.

II. OBJECTIVE

A. The objectives of this Paper Is

1) To study the influence of partial replacement of sand with lateritic soil and fine aggregates to compare it with the compressive and tensile strength of ordinary M25 concrete.

2) We are also trying to find the percentage of lateritic soil by sand replaced in concrete that makes the strength of the concrete maximum.

III. MATERIALS USED AND METHODOLOGY

A. Cement and Aggregates

Ordinary Portland cement of 53 grade is used,sieved under 90µ sieve.fine aggregate which is sieved under 4.75mm IS sieve and conformed as zone II as per specifications is used ,coarse aggregates which is passed under the sieve 25mm IS sieve is used through out the work which are having the specific gravity6 2.65,2.67.

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B. Lateritic Soil

Literate soil was first studied by F. Buchanan in 1905. The name was derived from the Latin word 'Later' meaning brick. Literate is a soil and rock type rich in iron and aluminum and is commonly considered to have formed in hot and wet tropical areas. This soil is rusty red color because of high iron oxide content. These are formed from the weathering of parent rock. Chemical composition of literate soil/gravel varies widely based on genesis, climate conditions, and age of laterization. Lateritic soil contains more than 60% Fe203 and little of Al203. The chemical analysis of Indian soils shows that soils rich in iron and aluminum but poor in nitrogen, potassium, lime and organic matter

Table 1: Chemical Compostion Of Lateritic Soil

Color	Cherry Red
Form	Powder
Silica Sio_2	25.56%
Alumina $Al2o_3$	31.0%
Iron Oxide $Fe2o_3$	35.53%
Calcium Oxide Cao	Nil
Carbon Dioxide	7.91%

Fig 1 : Lateritic soil

Fig 4: slump cone test

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IV. EXPERIMENTAL INVESTIGATION

Table 2 : Tests results of cement:

SL.NO	TESTS ON CEMENT	RESULT	REQUIREMENT AS PER IS 4031
1.	Normal consistency	32%	Not to exceed 35%
2.	Initial setting time	38min	>30 min's
3.	Final setting time	550min	<600min's
4.	Soundness test	2mm	Not exceed 10
5.	Specific gravity	3.16	
6.	Fineness modulus	2%	

Table 3: Tests results of fine aggregates

SL.NO	TESTS ON FINE AGGREGATE	RESULT	REQUIREMENT AS PER IS 2386
1.	Fineness Modulus	2.45	2.3-2.7
2.	Specific gravity	2.62	2.2-2.6
3.	Water absorption	1%	<3%

Table 4 : Tests results of Coarse aggregates

SL.NO	TESTSON COARSE AGGREGATE	RESULT	REQUIREMENT AS PER IS 2386
1.	Fineness Modulus	4.9	3.4-6.0
2.	Specific gravity	2.78	2.4-2.9
3.	Water absorption	0.4	<0.6

V. MIX PROPORTIONS

The concrete mix design of M25 grade concrete by using IS 10262-2009 with water cement ratio of 0.45.

Table 5: Mix Proportions

LATERITE SOIL %	W/C RATIO	CEMENT kg/m3	LATERITE SOIL kg/m3	FINE AGGRGATE kg/m3	COARSE AGGREGATE kg/m3	WATER kg/m3
0%	0.45	3.28	0	3.28	4.36	3.15
5%	0.45	3.28	0.164	3.16	4.36	3.16
10%	0.45	3.28	0.328	2.95	4.36	3.17
15%	0.45	3.28	0.492	2.78	4.36	3.19
20%	0.45	3.28	0.656	1.96	4.36	3.11

Table 6: Tests Results Of Workability Tests

LATERITIC SOIL %	SLUMP VALUE (MM)	COMPACTION VALUE (MM)
0%	24	0.94
5%	23	0.84
10%	22	0.85
15%	18	0.94
20%	14	0.82
25%	12	0.76

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Table 7: Compressive test results(N/mm^2):

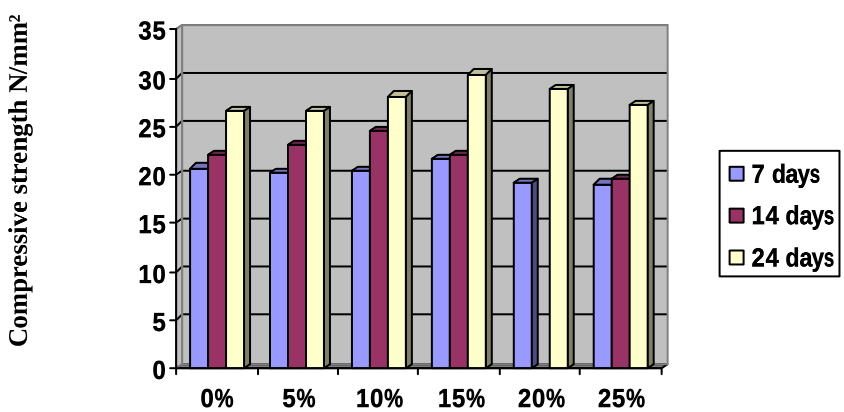
MIX DESIGNATION	PERCENTAGE OF LATERITIC SOIL %	7 DAYS	14 DAYS	28 DAYS
M0	0	20.72	22.01	26.55
M1	5	20.14	23.02	26.62
M2	10	20.44	24.54	28.14
M3	15	21.59	22.03	30.37
M4	20	19.20	21..02	28.88
M5	25	19.05	19.57	27.22

M1,M2.., M4 = Mix trail 0,Mix1,Mix2..,

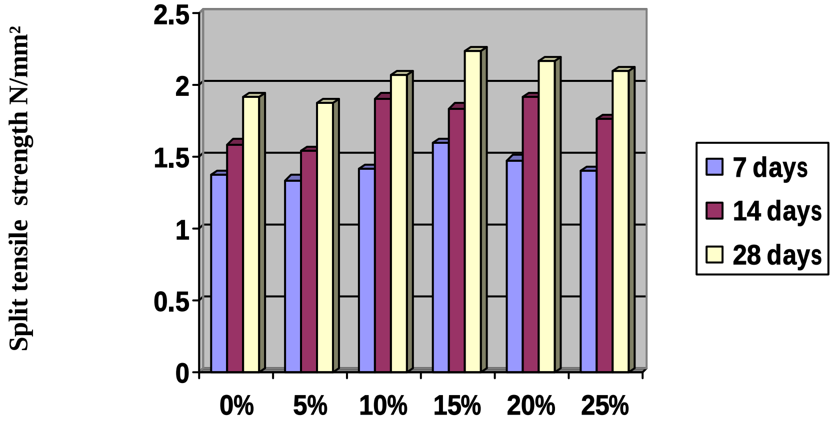
Table 8: Split tensile test results(N/mm^2):

MIX DESIGNATION	PERCENTAGE OF LATERITIC SOIL %	7 DAYS	14 DAYS	28 DAYS
M0	0	1.38	1.59	1.92
M1	5	1.34	1.54	1.88
M2	10	1.42	1.91	2.07
M3	15	1.60	1.84	2.24
M4	20	1.48	1.92	2.17
M5	25	1.40	1.76	2.10

VI. RESULTS AND DISCUSSION



Lateritic soil (%)
Fig 5: Graphical representation of compressive strength test results



Lateritic soil (%)
Fig 6: Graphical representation of split tensile strength test results

Mechanical behaviour of concrete cubes prepared without chemical admixtures was studied by compressive tests (Grade M25and curing time of 7,14 and 28 days. It can be noticed that 10% replacement of sand with lateritic soil in mild condition, are showing increase in compressive strength.

VII. CONCLUSION

From the results obtained , the following conclusions are taken as:

A. Reflection of lateritic beam is more than deflection of ordinary beam but within the limit.

B. Hence it is recommended for structural concrete up to 10% replacement of fine aggregate with lateritic soil and save 25% in cost of fine aggregates

C. The load deflection behaviour of lateritic beam under flexure is found to be bilinear.

D. From the result it can be seen that the maximum tensile strength is obtained at 10% replacement of lateritic soil.

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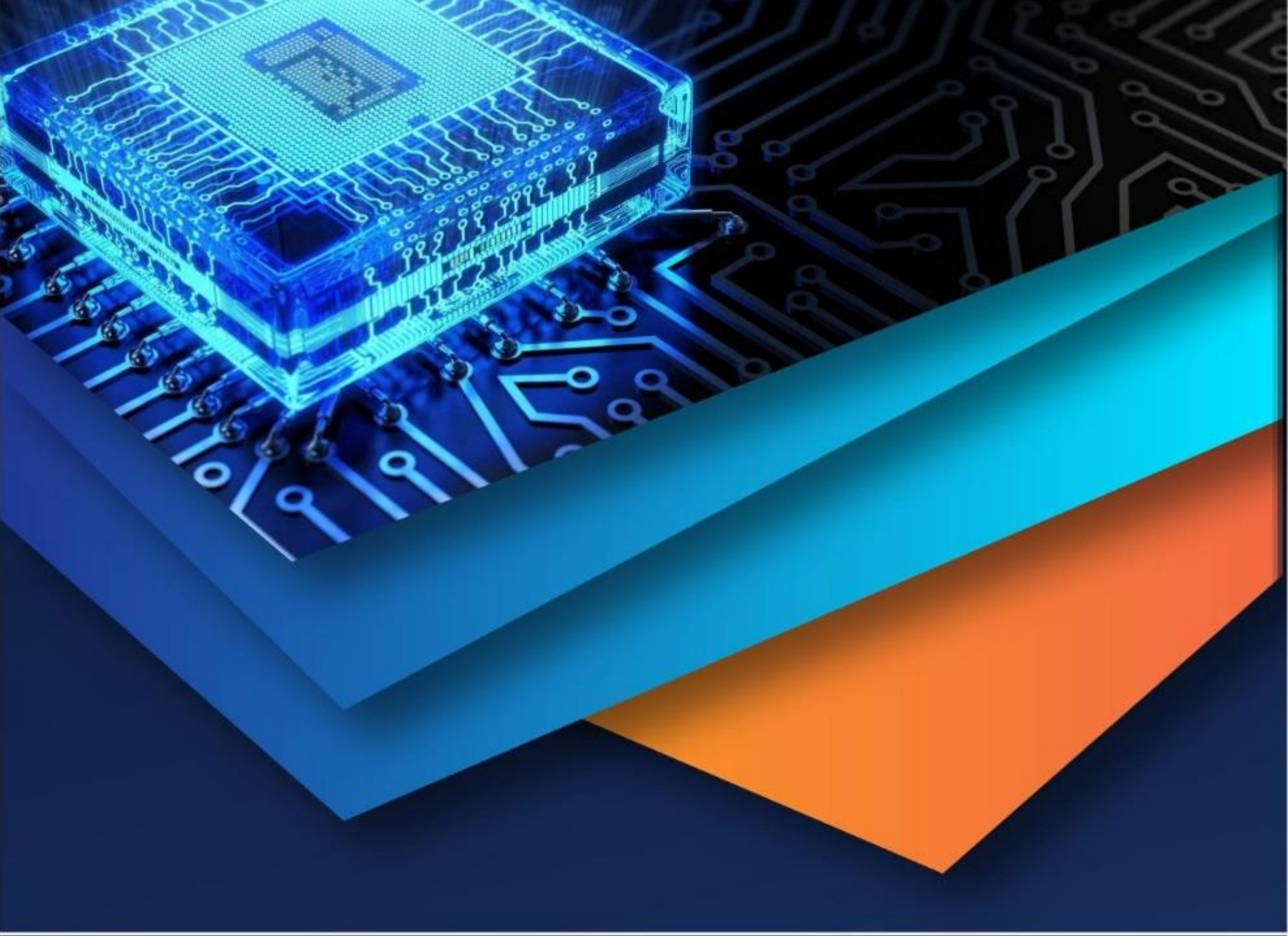

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