Strength of Concrete using Sea Sand and Micro Silica

Dr. G. Elangovan[1]
[1]Assistant Professor, Department of Civil Engineering,
University College of Engineering College,
Thirukkuvalai, Tamilnadu.

A. Arjunan[2]
[2]Assistant Professor,
E.G.S. PILLAY Engineering College,
Nagapattinam, Tamilnadu.

S. Aravind[3]
[3]UG Student,
E.G.S. PILLAY Engineering College,
Nagapattinam, Tamilnadu.

R. Arunkumar[4]
[4]UG Student,
E.G.S. PILLAY Engineering College,
Nagapattinam, Tamilnadu.

***Abstract*–Now a day's the availability of fine aggregate is decreases. In recent years, it has been taken a growing interested in the shortage of natural fine aggregate having good quality across the country, because of deficient natural sand supplies and increased construction demands. So, we find the alternative sources. The main aim of our project to suggest the partially replacement of fine aggregate with sea sand. The investigation carried out to acquire a better understanding of factors which influence the strength properties of concrete. Sea sand can be transformed into fine aggregate. The compressive, split tensile, flexural strength of sea sand replaced concrete is less than the compressive, split tensile, flexural strength of the conventional concrete. Hence micro silica is used in sea sand concrete possesses higher compressive, split tensile, flexural strength than the conventional concrete. In our test programmes the specimens were casted and remoulded after 24 hours and were cured in a curing pond till and date of testing. The specimens used for the test included cube for compression test, cylinder for split tensile test and beams for flexural test. Three specimens were tested for the required age and average value was taken. The tests were conducted for 7, 14, and 28 days.**

I. INTRODUCTION:

In recent years, it has been taken a growing interested in the shortage of natural fine aggregate having good quality across the country, because of deficient natural sand supplies and increased construction demands. There is no significant difficulty to use the coarse aggregate by using not only natural coarse aggregate but also the crushed aggregate. For the fine aggregate, however, it is very rare place the good quality of that can be produced. Therefore it is acceptable that most of already mixed concrete companies have used blended aggregates still has problems, which is only ordinary concrete can be applied due to the lower quality of it. Quarry dust is also one of the alternative raw materials for the construction industry, but most contractors and the house owners are not showing any interest in using quarry dust for their constructions. According to the industry sources, the price level of the river sand has skyrocketed. Tractor load of river sand will cost over 5000 rupees, a leading contractor said. According to the industry figures, the price of the river sand has increased by over 40 per cent after the banning of removing river sand. Due to the government barriers on the removal of river sand, the construction industry faces lots of difficulties to obtain river sand in time.

II. EXPERIMENTAL STUDIES:

a) Concrete constituents:

Cement - OPC
Fine aggregate - River sand& Sea Sand
Coarse aggregate - broken stone
Admixture - Micro silica

Table1: Physical Properties of Fine and coarse Aggregate

Sl.No.	Properties	Fine aggregate	Coarse aggregate
1	Specific Gravity	2.59	2.84
2	Water Absorption	1.2%	0.5%
3	Shape	Round	Angular
5	Fineness Modules	2.70	5.92

Table2: Physical Properties of Sea Sand

Sl.No.	Properties	Sea Sand
1	Specific Gravity	2.71
2	Water Absorption	1.24%

b) Micro Silica:

The optimum method for minimizing the potential for expansion due to alkali-silica reaction in concrete is to replace a portion of the Portland cement by a supplementary cementing material. Ground granulated blast furnace slag, silica, Meta kaolin, micro silica, and natural pozzolans used in the appropriate quantities have been found to be an effective antidote for alkali-silica reaction.

c) Concrete mixes:

The Mix Proportion was arrived with the use of material properties with reference to IS: 10262 – 1982 by weigh batch method.

Table 3: Mix Ratio for M30 grade concrete

Grade of Concrete	W/C ratio	Concrete Mix Proportion		
		Cement	FA	CA
M30	0.42	1	1.22	2.54

d) Casting of Cubes, Cylinders and Beams:

The Mix was prepared for M30 Grade Concrete and the Cubes, Cylinders and Beams were prepared.

e) Test Results:

The specimens used for the test included cubes of size 150mm×150mm×150mm for compression test, cylinder of 150mm×300mm depth for split tensile test and beams of 100mm×100mm×500mm for flexural test. Three specimens were tested for the required age and average value was taken. The tests were conducted for 7, 14, and 28 days.

Table 4: Details of specimens with sea sand

SPECIMENS	AGE OF CURING IN DAYS	PERCENTAGE OF REPLACEMENT OF SEA SAND AS FINE AGGREGATE			
		10%	20%	30%	TOTAL IN NOS
Cube	7	3	3	3	9
	14	3	3	3	9
	28	3	3	3	9
CYLINDER	7	3	3	3	9
	14	3	3	3	9
	28	3	3	3	9
BEAM	28	3	3	3	9

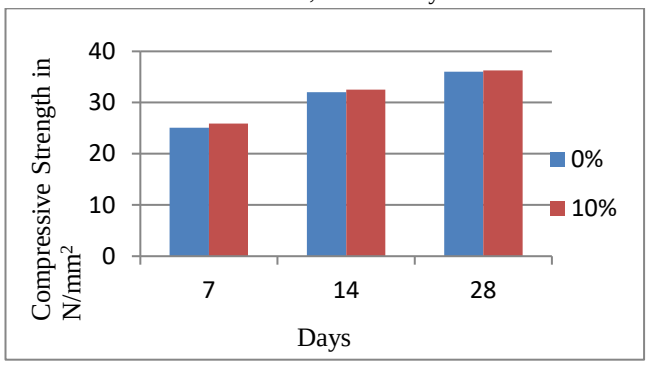
Table 5: Details of specimen with admixture (micro silica)

SPECIMENS	AGE OF CURING IN DAYS	PERCENTAGE OF ADMIXTURE (MICRO SILICA) IN CEMENT			
		10%	20%	30%	TOTAL IN NOS
Cube	7	3	3	3	9
	14	3	3	3	9
	28	3	3	3	9
Cylinder	7	3	3	3	9
	14	3	3	3	9
	28	3	3	3	9
Beam	28	3	3	3	9

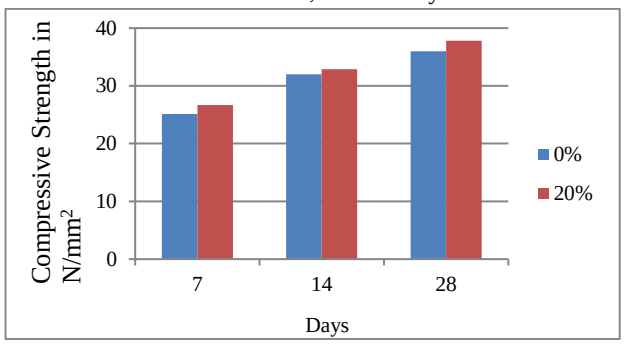
Table 6: Compressive strength of cube with sea sand

S. No.	Percentage of sea sand	Compressive strength of cubes in N/mm^2		
		7days	14days	28days
1	0%	27.68	33.24	38.96
2	10%	27.72	35.4	40.1
3	20%	27.7	34.3	39
4	30%	25.1	32	36

2.5 Comparison- compressive strength of nominal cubes and 10% sea sand of 7, 14 & 28 days:



2.6 Comparison- compressive strength of nominal cubes and 20% sea sand of 7, 14 & 28 days:



2.7 Comparison- Compressive strength of nominal cubes and 30% sea sand of 7, 14 & 28 days:

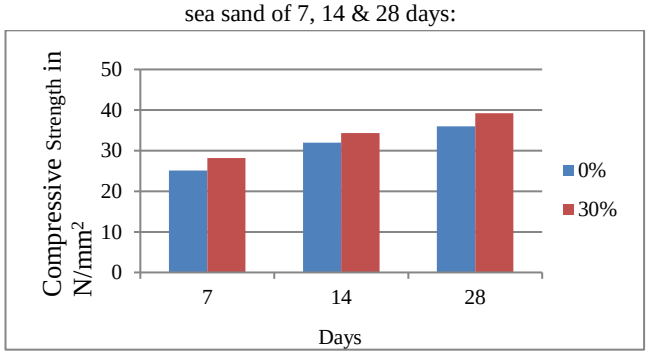
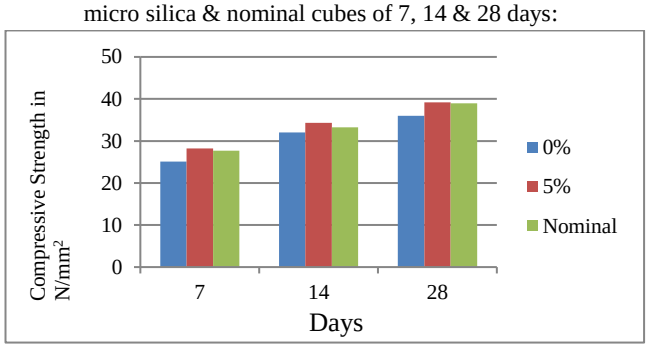


Table 7:

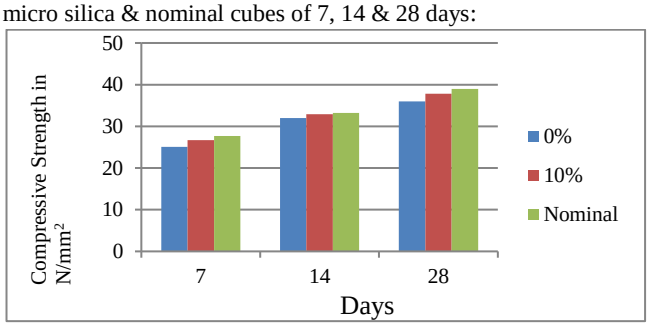
S. No.	Percentage of micro silica and 30% of sea sand	Compressive strength of cubes in N/mm²		
		7days	14days	28days
1	0%	25.10	32	36
2	5%	25.90	32.50	36.30
3	10%	26.70	32.90	37.80
4	15%	28.20	34.30	39.20

Nominal value	Compressive strength of cubes in N/mm²		
	7days	14days	28days
	27.68	33.24	38.96

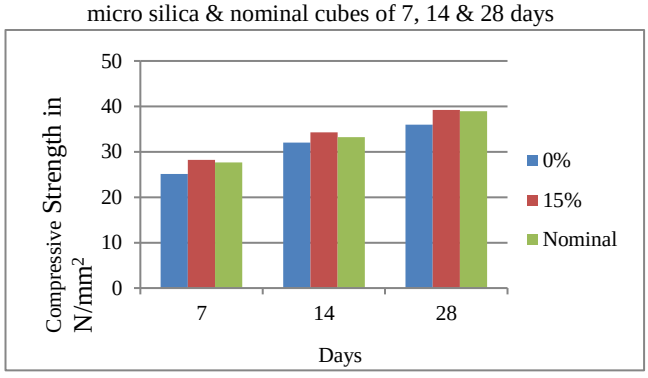
2.8 Comparison- compressive strength of 30% sea sand, 5% micro silica & nominal cubes of 7, 14 & 28 days:



2.9 Comparison- compressive strength of 30% sea sand, 10% micro silica & nominal cubes of 7, 14 & 28 days:



2.9 Comparison- compressive strength of 30% sea sand, 15% micro silica & nominal cubes of 7, 14 & 28 days



III. CONCLUSIONS:

The following conclusions are made from the study of strength characteristics of concrete using sea sand and admixture (micro silica) and their applicable range of parameters and materials used in this study. Sea sand can be transformed into fine aggregate. The compressive, split tensile, flexural strength of sea sand replaced concrete is less than the compressive, split tensile, flexural strength of conventional concrete.

Hence micro silica is used in sea sand concrete possesses higher compressive, split tensile, flexural strength than the conventional concrete. In M30 grade of concrete with15% replacement of micro silica gives more strength than conventional concrete strength. So we can use sea sand in concrete with admixture and used in minor and massive structures.

REFERENCE:

[1]. Construction technology updates no 52, published by IRC, Special Issue on alkali- aggregate Reactivity.
[2]. T.Celik (1996) effects of crushed stone on some properties of concrete journal of cement and concrete research, pp1719-1729
[3]. A23.1-00/A23.2-00 Concrete materials and methods of concrete construction/ method of Test for concrete, sep2000, CSA International,178 Rexdale boulevard, Toronto, ON,M9W IR3,360P.
[4]. IS:456:2000 Code of practice for plain and reinforcement concrete, Bureau of Indian standards, Newdelhi
[5]. IS: 383:1970 Specifications for coarse aggregate & fine aggregate from natural sources for concrete, Bureau of Indian standards,New Delhi.
[6]. www.science direct .com /sea sand
[7]. www.cement.com/id25htm properties of sea sand and micro silica