Compressive Strength of Concrete Using Sea Sand As A Partial Replacement For Fine Aggregate

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Abstract- *Concrete is a major construction material used in the construction now a days. It is the composite material containing cement, course aggregate, fine aggregate and water. Fine aggregate is required in large quantities for manufacturing of concrete. Generally river sand is used as a fine aggregate. Due to increase in the utilization of concrete in construction sector, the need for river sand has been increased enormously. Limitation have been laid on the large scale mean of river sand from river beds. In this content these are case of illegal mixing of sea sand with river sand. This paper mainly presents the practical study of the compressive strength of the concrete in which sea sand was used as fine aggregate is partially replaced. The M20 grade used in concrete. The fine aggregate proportion from the design mix was replaced partially by a sea sand. The compressive strength of concrete specimen for respective mix proportions were tested at 7 and 28 days of water curing. The behavior of concrete by partial replacement of fine aggregate with sea sand has been studied.*

Keywords- Sea sand, Calcium Carbide (CaC_2)

I. INTRODUCTION

The fine aggregate, which consist of sizes below 5mm and above 150mm, is an important constituent of concrete because it occupies above 30.0, 28.6, 27.3 and 25.0 percent of the volume for grades 10, 20, 25 and 30 of local concrete; affects properties of hardened concrete such as durability, strength, shrinkage, creep, thermal properties, unit weight, modules of elasticity, surface friction properties and economy; and affects properties of freshly mixed concrete such as mix properties of freshly mixed concrete such as mix proportion, workability, serviceability, finishing characteristics of unformed concrete, air content, setting time and bleeding.

In Nagapattinam, river sand is the mostly widely used form of fine aggregate. In some large scale construction sites. Where a high degree of quality controls is possible due to the availability of qualified personnel and site testing facilities, Crushed stone fine aggregate has been used. Use of sea sand locally is prohibited by specification. However, sea sand or a mixture of river and sea sand has been used, surreptitiously, in some medium to small scale constriction project where quality of supervision available is poor.

NEED OF THE PROJECT

River sand is an essential raw material in construction industry. Especially during monsoons the source of river sand are unpredictable due to the rise in river water table. Also governments have imposed norms on the mining and utilization of river sand for construction purpose. Due to these reasons different construction companies have started mixing sea sand illegally with river sand. In this scenario there is a need to study the mechanical properties of concrete with sea sand as a partial replacement to fine aggregate.

OBJECTIVE OF THE PROJECT

To study the practical utilization of sea sand as fine aggregate partially.

To determine the compressive strength of concrete with different percentage of sea sand as fine aggregate as partial.

II. LITERATURE REVIEW

S.R.De.S.Chandrakeerthy, (April 2015) suitability of sea sand as a fine aggregate for concrete production. The following conclusion are made from this study most local sea sand are suitable for concrete production normal or water retaining. Site location can be found where sea sand mined can be used of the washing to remove salt contamination except for sea sand from few location, river sand performed better then sand ; threshold level of chloride iron to initiate corrosion is 0.125 to 0.25 % by weight of cement. Other factors such as permeability are important when chloride iron is at a greater

concentration. The maximum value of water soluble chloride iron in concrete _ 0.06. Some useful values recommended for sea sand are oven dry relative density _2.66 compacted bulk density _ 1644.0 kg/m^3 . and un compacted bulk density 1508.0 Kg/m^3.

W.Sai Deepak and G.Thirupathi Naidu (June 2016) Effect on compressive strength of concrete using sea sand as a fine aggregate in case of 20% replacement of fine aggregate in case of 20% replacement of sea sand as fine aggregate the characteristic compressive strength reduced by 38.23%. At 40% replacement of fine aggregate with sea sand the characteristic is reduced by 38.33%. 60% replacement of fine aggregate with sea sand reduced the characteristic of compressive strength by 44.9%. Incase of 80% replacement of sea sand as fine aggregate with sea sand as fine aggregate the characteristic compressive strength reduced by 49.37%. The reduction in compressive strength of concrete for 7 days is 44.68% for 14 days is 46.68% for 14 days is 46.6% and for 28 days is 53.82%. The reduction in characteristic of compressive strength of the concrete signification for partial replacement of sea sand as fine aggregate.

III. EXPERIMENTAL INVESTICATION

MATERIALS USED

Cement, Coarse aggregate, Fine aggregate (River sand and Sea shore sand), Water, Calcium Carbide (CaC_2).

SEA SAND

It is the soil obtained from ocean or coastal area. It is contain the silts and sodium chloride partical. It is particles size minimum under the 4.75 mm. Sand is a loose granular material blanketing the beaches, riverbeds and deserts of the world. Composed of different material that very depending on location, sand comes in array of colors including white, black , green and even pink. The most common component of sand is silicon dioxide in the form of quartz. The earth's landmasses are made up of rocks and minerals, including quartz, feldspar and mica. Tropical beaches may also have black sand, which is composed of block volcanic glass. Sometimes, erosive forces separate the mineral olivine from other volcanic fragments, leading to green sand beaches, such as Velankanni Beach.

CALCIUM CARBIDE (CaC_2)

The pure material is colorless, however pieces of technical grade calcium carbide are grey or brown and consist of about 80 to 85 % of Cac2 (the rest is Cao (calcium Oxide), Ca 3P2 (Calcium Phosphide), Cas (calcium sulphide), Ca3N2 (calcium nitride), SiC (silicon carbide), etc..

The presence of trace moisture, technical grade calcium carbide emits an unpleasant odor reminiscent of garlic. Application of calcium carbide include manufacture of acetylene gas, and for generation of acetylene. Pure calcium carbide is a colorless solid. The common crystalline from at room temperature is a distorted rack salt structure with the C22 units lying parallel. Calcium carbide, together with calcium phosphate, is used floating, self – igniting naval signal flares, such as those increase the concrete strength.

IV. EXIPERMENTAL METHOD

i. Following methodology has been followed this experimental investigation.
ii. Preliminary methodology test on cement and sea soil.
iii. Mix design,
iv. Mix preparation for cube, sea soil and calcium carbide.
v. Determination of compressive strength of design mixes.
vi. Casting the cubes with concrete.
vii. Conducting compressive test on specimen.

CALCIUM CARBIDE REACT WITH CONCRETE

Calcium carbide is reacted with sodium chloride it gives the sodium carbide and remaining part of calcium chloride. Calcium chloride presence in the product is used to observe the moisture from air and prevents dust formation and also accelerate quick set of cement.

Calcium chloride both dry liquid is used in a wide variety of application in numeral industries, from dust control on roadways to food produces sing.

It is also used as an antifreeze for local storage and transportation. It is hygroscopic nature, attaching and holdings water.

$$Ca\ C_2 + 2Nacl = 2Nac + Ca\ Cl_2$$

Calcium carbide is a chemical components with the chemical formula of CaC2. It is main uses industries is in the production of acetylene and calcium Cyanamid.

The pure materials is colorless, however pieces of technical grade calcium carbide are gray brown.

In the presence of trace moisture the technical grade calcium carbide emits an unpleasant odor reminiscent of garlic.

Application of calcium carbide includes manufacture f acetylene gas and for generation of acetylene in carbide lamps manufacture of chemicals for fertilizer and steel marking.

$$CaC_2 + 2H_20 = C_2H_2 + Ca(OH)_2$$

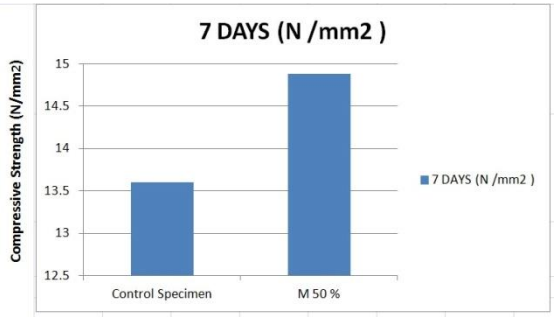
V. RESULT AND DISCUSSION

COMPRESSIVE STRENGTH OF CUBES

The Compressive strength results of cube specimen for 7 days and 28 days are presented in the table 5.1 and the comparisons of the results are shown in fig 5.1.i

Table 5.1 Compressive strength at 7 days

SPECIMEN	7 DAYS (N /mm$_2$)
Control Specimen	13.6
M 50 %	14.88



Mix Proportion

Fig. 5.1.1 Compressive Strength at 7 Days

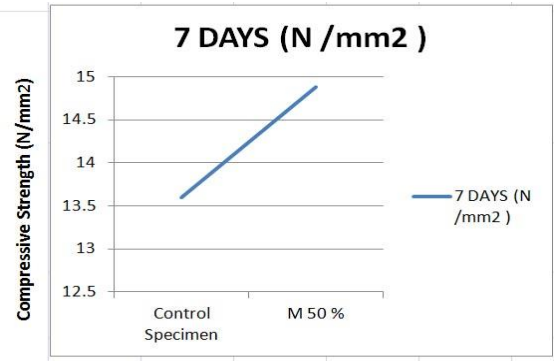


Fig 5.1.2 Graphical representation at 7 days

5.2 Compressive Strength at 28 days

Specimen	28 Days (N/mm^2)
Control Specimen	20.9
M50 %	22.44

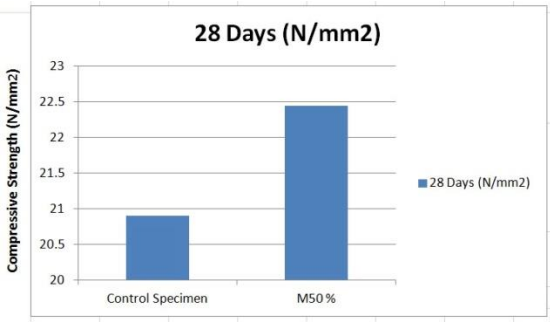


Fig 5.2.1 Compressive strength for 28 days

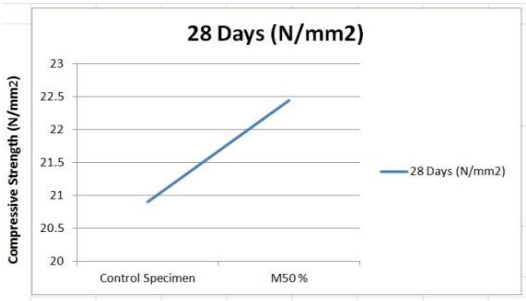


Fig 5.2.2 Graphical representation of compressive strength for 28 days.

Table 5.3 Compressive strength test result

Specimen	7 Days (N/mm$_2$)	28 Days (N/mm$_2$)
Control specimen	13.6	20.9
M50 %	14.88	22.44

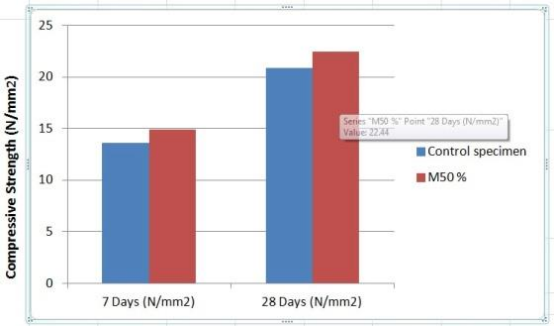


Fig 5.3.1 compressive strength for mould.

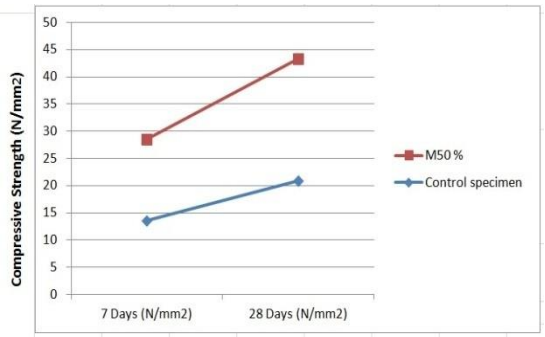


Fig 5.3.2 Graphical representation of compressive strength for mould.

VI. CONCLUTION

In this project, we are calculated compressive strength of mortar cube using sea sand it give except strength of cube and minimize the cost. It ensured sustainable development and also gives better sea soil partially replaced with the natural sand. The effect of sea sand have been studied.

From compressive strength of mould result M20 (cement + river sand 50% + Sea Soil 50 % + CaC2 + aggregate) specimen achieved more compressive strength compare then other. Hence it is calculated that sea sand can be effectively used as a partially replacement for sand in cube.

VII. ACKNOWLEDGEMENT

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