

Experimental Investigation for Utilization of Beach Sand in Concrete as a Partial Replacement for Fine Aggregate

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Abstract: *The top most surface of the earth has a part of sand which is been used in construction industry. There are different types of sand. In this project we are mainly dealing with the type of sand like beach sand and river sand. The aim of this project titled "Experimental Investigation for Utilization of Marine sand in concrete as partial replacement for Fine Aggregate" is to compare the difference between the two types of sand by conducting experiments. It has been known that sea sand is avoided in construction industry due to many reasons. When sea sand is mixed with cement in place of normal river sand to make concrete for buildings, the high content of chloride in sea sand leads to structural integrity problems. This composition absorbs humidity with causes erosion and rusting in the steel rods used in reinforced concrete.*

Keywords: *River Sand, Sea Sand, Partial Replacement, Cement Concrete, Compression Strength Test.*

I. Introduction

Sand is a naturally occurring granular material composed of finely divided rock and mineral particles. The composition of sand is highly variable, depending on the local rock sources and conditions, but the most common constituent of sand in inland continental settings and non-tropical coastal settings is silica (silicon dioxide, or SiO₂), usually in the form of quartz. The second most common type of sand is calcium carbonate, for example aragonite, which has mostly been created, over the past half billion years, by various forms of life, like coral and shellfish. It is, for example, the primary form of sand apparent in areas where reefs have dominated the ecosystem for millions of years like the Caribbean.

II. Advantages & Disadvantages:

Advantages:

- I. Marine sand is easily available in nature.
- II. It reduces the requirement of river sand .
- III. It reduces the cost of the concrete.
- IV. Digging of the river bed is reduces hence it reduces erosion.
- V. It is very economical compare to river sand.

Disadvantage

- I. Sea sand tends to very fine and rounded, smooth rounded particles would offer less.
- II. Resistance to rearrangement than angular or elongated particles with rough surfaces. In sea water, chloride is present which will cause corrosion of steel and iron.
- III. Ultimately leads to reducing carrying capacity of steel and iron so that the structure built using this may not be sustainable. sea sand contains large amount of salt particle and also dirt particles like micro and microscopic.
- IV. It is very expensive to remove them and its a tedious process.

III. Materials And Methodology:

Materials:

The materials required used cement ,sea sand , river sand , coarse aggregate,water

Cement:

Cement is a binding material or a substance which is used for the construction that sets, hardens and adheres to other materials to bind them together. Cement is seldom used on its own, but rather to bind sand and gravel together. Cement mixed with fine aggregate and water produces mortar and if cement mixed with sand, water and gravel, it produces concrete.

Grades of cement:

I. 33 Grade Ordinary Portland Cement

This cement is used in widely in the world. It is more suitable cement for masonry and general concrete works where the members are not taken to very high stresses. It is not suitable where Sulphate is in the soil or in the ground water

II. 43 Grade Ordinary Portland Cement

This cement is used where high early strength in 1 to 28 days range is required. These days the Structural Engineers propose these cements mainly for RCC works, where a member takes high tensile stress.

III. 53 Grade Ordinary Portland Cement

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Properties of cement:

It is always desirable to use the best cement in construction. Therefore, the properties of good cement must be investigated. Although desirable cement properties may vary depending on the type of construction, generally good cement possesses following properties (which depend upon its chemical composition, thoroughness of burning and fineness of grinding).

- Provides strength to masonry
- Stiffness or hardness early
- Possesses good plasticity
- An excellent building material
- Easily workable
- Good moisture-resistant.

Sea sand:

Sea sand can become a potential resource capable of supplying fine aggregate material for domestic civil engineering and construction usage. In addition, using sea sand is economic than using river sand because river sand is more expensive. Sea sand mainly contains much salinity as sodium chloride. If the salt is not treated and sea sand is directly utilized for civil engineering and construction concrete project, the durability of the structural may be affected and as the result the concrete might be swelling, precipitating, sulphating and other adverse consequences. Therefore, the salt content of the sea sand must be eliminated before it is utilized to avoid the potential hazards. The sand dunes are formed by sand particles blown by wind from sea shore. The top most layers of sand dunes contain higher chloride content due to continuous exposure to sea breeze. However, when sea sand is actually utilized, the first problem encountered is the salt contained in the sea sand. A distinction must also be made between sea sand and sand deposits in dry coastal areas. The latter would tend to have very high chloride contents resulting from salt spray and evaporation over long periods of time.

coarse aggregate:

The coarse aggregate forms the main matrix of the concrete. The retained material on IS 4.75 mm sieve is termed as coarse aggregate. The most commonly used coarse aggregate in concrete is crushed stone and gravel conforming to IS 383-1970. Aggregates should be hard, angular, and should have good crushing strength. Angular aggregates have good interlocking effect and high bond strength. In this investigation 70% passing through 20 mm sieve and retained on 10 mm sieve and 30% passing through on 10 mm sieve was used a coarse aggregate throughout the work.

Water:

Water is the most important but the least expensive ingredient of concrete. Clean portable water is used for mixing concrete. Water used for mixing and curing should be clean and free from injurious amounts of oils, acids, alkalis, salts, sugar, organic materials or other substances that may be deleterious to concrete and steel.

IV. Conclusion:

1. In the presence of some salts the strength of concrete in RCC reduces hence it can not be used for RCC .
2. The strength will be low it can not be used for columns and beams.
3. It can be used for minor works.
4. It will be used as lean concrete, construction of compound walls, outside flooring tiles.

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