Experimental Investigation on PCC for Workability within Partial Replacement of M-Sand by Ecosand

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Abstract. In whole nation, concrete production events are enchanting abode on vast scale. Natural sand (river sand) is unique of the main requirements of concrete and it is pretty demand and exclusive. Manufactured sand (M-sand) is a standby of river sand for concrete assembly which is produced from rigid granite pebble by devastating. Eco-sand is fine particles which is outgrowth from cement trade. Effective use of this waste material should be done for cost efficiency. The present study is about the compressive strength of concrete block with limited surrogating of M-sand by Eco-sand. The conventional river sand is replaced with M-sand and partial amount of silica sand Replacement of M-sand by Eco-sand at various percentages 0%,6%,12%, 18%,24% &30% in PCC. It is verified that the finest spare percentage of M-sand by Eco-sand and the properties of fresh concrete and hard concrete in PCC with eco-sand. The comparison of economic advantages of m sand and eco sand. The main objective of this project is to reduce the air pollution and eco-friendly. The various proportions is carried out and tested.

1. Introduction
Bond concrete has been a mainstream development material on the planet and has fulfilled practically all the necessity of a decent building material. Concrete is characterized as composite blend of bond, sand, and rock in positive extents with water. The functionality for position and quality improvement with age rely on the extent of the constituent materials and their joined activity. Concrete is ordinarily delivered utilizing alluvial waterway rock and sands. These materials are richly accessible and are generally economical to process and consequently they are broadly utilized. Besides they produce great cement because of their physical properties, for example, shape degree. The common procedure of arrangement of these stores happened a large number of years. These stores are over misused. Subsequently there is a shortage of sand. There is overabundance sand mining bringing about consumption of groundwater, making ecological issues. Mining is denied by certain state governments for the accompanying reasons. Diving the sand from riverbed in overabundance amount is dangerous to condition. The profound pits delved in the riverbed influence the ground water level. Disintegration of close by land is likewise because of overabundance sand lifting. Concrete is a regular building substantial that is collected of cement, collective (usually a coarse cumulative made of gravel or crushed shakes and a fine cumulative such as sand) water and chemical admixtures. Thus true to its name, the constituent materials of concrete grow together in a condensed form. Truth is told concrete
is utilized more than some other man-made material on the planet. Starting at 2011, around 9 cubic kilometres of cement made every year which is more than one cubic meter for each individual on earth.

2. Materials

2.1. Eco-sand
Eco sand are extremely fine particles, a side-effect from bond fabricate which can be utilized to expand productivity in concrete. Its small scale filling impact lessens pores in cements and gives better dampness resistivity and along these lines sturdiness. It has more reliable reviewing than many extricated totals. Powerful use for squander material and in this manner savvy and executes just as normally happening sand. The utilization of eco sand as opposed to extricated or dug normal sand will support fashioners and contractual workers address issues of manageability.

Eco sand is finely powdered crystalline silica which can supplant up to a changing level of regular sand utilization in cement and mortars. Its miniaturized scale filling impact diminishes pores in cements and gives better dampness resistivity and hence sturdiness. It has more predictable evaluating than many extricated totals. Viable use for squander material and along these lines practical and executes just as normally happening sand. The utilization of eco sand as opposed to removed or dug normal sand will support originators and contractual workers address issues of maintainability. The present examination is checking the functionality of Solid Square utilizing eco sand as fine total. The eco sand has different focal points, for example, vitality proficient, fireproof, decrease of dead burden, earth amicable, tough, light weight, low support, and low development cost.

2.2. Fine Aggregate
The Mass-produced sand (M-Sand) was used for the concrete. It is a substitute of river sand for concrete structure. Mass-produced sand is produced from solid granite stone by over whelming. The chemical composition of M-Sand is Si, Al, Ca, Na, K, Fe, etc. The specific gravity of M-sand was resulted as 2.6.

2.3. Coarse Aggregates
Coarse Aggregates are the maximum quarried supplies in the world. They are a constituent of combined ingredients such as concrete and asphalt concrete. Here 20mm aggregates are used. The specific gravity of aggregate was resulted as 2.6

3. Literature Review
M Indira April 2017 Increases the compressive quality and elasticity in a higher request of 15% substitution by eco sand increments compressive quality by 24.02% and split rigidity was expanded at 58.14 %. Be that as it may, in mortar, 10% substitution mortar shows 10.45% expansion in compressive quality

Selvakumaret.al April 2016 Eco sand reduces consumption of natural sand by up to 50% and hence reduces ecological footprint.

B.Durg et.al March 2016 the optimum replacement percentage arrived at compressive strength was 60% and split tensile strength it was 40% at 28 days. It was found that the compressive strength increases by 32% on 60% replacement and tensile strength increases by 13% on 40% replacement at 28 days. The particle size of silica sand by magnifying it to different ranges. They found that crystalline in nature it can be used as a filler material.
M. prabu et.alJune 2015. Quality of cement by fractional substitution (0%, 10%, 20%, 30%, and 40%), ideal qualities are By GGBS - 30%, By Eco sand-20%. Eco sand supplanting with fine total with 20% gives ideal outcome however after that the quality got gradually diminishes. The level of functionality of cement improved with expansion of eco sand in concrete up to 20% swap level for M20 grade concrete.

4. Mix Design
Mix proportion is the one of the reason which decides the characteristics and properties of construction components. M 25 grade was taken for the experiment work.

| Grade of concrete | M25      |
|-------------------|----------|
| Size of aggregate | 20mm     |
| Use of cement     | PPC - A Grade |
| Relative density of cement | 3.15 |
| Relative density of C.A | 2.74 |
| Relative density of F.A | 2.63 |
| Relative density of Eco-sand | 2.46 |
| Maximum w/c       | 0.45     |

4.1. Mix Proportion
Mix proportion - 1.0: 1.43: 2.91
Wt of cement - 438.13 kg/m3
Wt of sand (M-sand) - 627.74 kg/m3
Wt of aggregate - 1276.74 kg/m3

5. Workability Test
5.1 Slump Cone Test
The solid droop test measures (functionality) the consistency of new cement before it sets. It is performed to check the functionality of newly made cement and in this way the simplicity with which solid streams. It can likewise be utilized as a marker of an inappropriately blended group.

This is a well-known because of the effortlessness of device utilized and straightforward method. The droop test is utilized to guarantee consistency for various heaps of cement under field conditions.

The cone is loaded up with new cement in three phases. Each time, each layer is packed multiple times with a 2 ft. (600 mm) long slug nosed metal pole. Toward the come to an end of the third stage, the solid is hit off flush with the highest point of the form. The form is deliberately lifted upwards, so as not to upset the solid cone. Thus the droop is named as obvious droop, shear droop or breakdown droop. A breakdown droop means that the blend is excessively wet.

5.2 Compacting Factor Test
The proportion of the mass of halfway compressed cement to the mass of the solid when completely compacted in a similar shape. To make a decision the compaction factor of cement with low, medium and high functionality according to IS 1199-1959.

The solid example is set on the upper container up to overflow, at that point open the snare entryway stream the solid stream uninhibitedly into lower container and afterward rehash the progression to permit to fall into the chamber. The overabundance concrete staying over the top degree of the chamber at that point cut off it and afterward gauged. This is known as weight of halfway compacted cement.
6. Results And Discussion

6.1 Slump Cone Test

| % Replacement | Slump (mm) |
|---------------|------------|
| 0             | 72         |
| 6             | 74         |
| 12            | 79         |
| 18            | 82         |
| 24            | 85         |
| 30            | 91         |

Table 6.1 Slump Cone Test

![Slump Cone Test](image)

Figure 6.1 Slump Cone Test

The slump cone test shows that gradually increases at 2.78%, 9.72%, 13.89%, 18.05% and 26.38% as compared with conventional mix for the replacement of 0%, 6%, 12%, 18%, 24% and 30% in term of mm respectively

6.2 Compaction Factor Test

| % Replacement | Compaction Factor |
|---------------|------------------|
| 0             | 0.85             |
| 6             | 0.86             |
| 12            | 0.90             |
| 18            | 0.91             |
| 24            | 0.92             |
| 30            | 0.94             |

Table 6.2 Compaction Factor Test
Figure 6.2 Compaction Factor Test

The compaction factor test shows that gradually increases at 1.17%, 5.88%, 7.05%, 8.23% and 10.58% as compared with conventional mix for the replacement of 0%, 6%, 12%, 18%, 24% and 30% respectively.

7. Conclusion
After conducting all the tests it has been detected that,
- The slump cone test of concrete is improved by adding Eco-sand in concrete.
- The compaction factor test of concrete is augmented by adding Eco-sand in concrete.

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