

Review on Effect of Replacement of Natural Sand by Grit as Fine Aggregate in Concrete

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Abstract— Natural sand are weathered and worn out particles of rocks and are of various grades or size depending on the accounting of wearing. The main natural and cheapest resource of sand is river. Now a day's good sand is not readily available, it should be transported from long distance. Those resources are also exhausting very rapidly. So it is a need of the time to find some substitute to natural river sand. The sand produced by proper machines can be a better substitute to river sand. The sand should be sharp, clean and course. The grains should be of durable material. The grain sizes must be such that it should give minimum voids.

Keywords— durability, natural sand, compressive strength, workability

I. INTRODUCTION

Concrete is the widely used structural material in the world. The demand for concrete has been increased because of the development of infrastructure all over the world. Among all the ingredients of the concrete, aggregates form the major part. Therefore as the demand for concrete has been increasing demand for fine aggregate also been increasing. These aggregates were generally natural river sand which is a non-renewable resource. Natural sand deposits are being depleted and causing serious threat to environment as well as the society. Properties of aggregate affect the durability and performance of concrete, so fine aggregate is an essential component of concrete and cement mortar. Now-a-days good sand is not readily available; it is transported from a long distance. The artificial sand produced by proper machines can be a better substitute to river sand. The sand must be of proper gradation (it should have particles from 150 microns to 4.75mm). When fine particles are in proper proportion, the sand will have fewer voids. The cement quantity required will be less. Such sand will be more economical. Demand for manufactured fine aggregates for making concrete is increasing day by day as river sand cannot meet the rising demand of construction sector. Because of its limited supply, the cost of Natural River sand has sky rocketed and its consistent supply cannot be guaranteed. River sand in many parts of the country is not graded properly and has excessive silt and organic impurities and these can be detrimental to durability of steel in concrete whereas Artificial sand has no silt or organic impurities.

II. LITERATURE REVIEW

“Effect of Replacement of Natural Sand by Grit on Workability of Concrete” A. B. Thombre, A. B. More, S. R. Bhagat (2016)

Globally the construction industry is facing a major difficulty in obtaining natural river sand for making concrete. At national level the scenario is not different than global problem of natural sand. Day by day the sources of natural sand is depleting at a very fast rate and at the other end requirement of concrete is increasing tremendously due to infrastructure developments taking place worldwide. Government has also taken a serious note of the depleting sources of natural sand and is taking a corrective step to protect the environment. River sand is expensive because it is rare to find at every location, at the same time it is required to be transported from long distances ultimately increasing its final cost. Environmental issues and other constraints pose difficulties in availability and use of river sand. To cope up with this global problem and to reduce the pressure on natural resources, one of the alternatives is to replace the natural sand partially or fully by other such materials without compromising the quality of concrete. This has led to a search for different substitute materials for natural sand. Either partial or full replacement of natural sand by other alternative materials like grit, stone dust, manufactured sand, foundry sand or other such materials are being researched. One of the easily available materials is grit which can be obtained from stone crushers and can be used as a substitute material to natural river sand. Natural sand plays an important role in the performance behavior of concrete which directly affects the mix design. Natural sand is rounded and smooth which improves the workability of concrete.

“Effect of Replacement of Natural Sand by M-Sand as Fine Aggregate in Concrete” Shivang. D. Jayswal, Prof. A. G. Hansora, Prof. A. A. Pandya (2016)

The research demonstrates the use of naturally available waste material as a partial replacement of OPC cement resulting in improving the compressive strength of cement. Since cement manufacturing process involves emission of CO₂ to a considerable amount in the environment resulting in global warming, thus use of these partial substituent's in cement reduces this ill effect making an environment free construction. The objective of this thesis is to find optimum percentage up to which these pozzolanic waste materials can replace OPC-43 grade cement to obtain maximum compressive strength. In this thesis OPC-43 grade cement is replaced partially by stone dust & granite powder simultaneously in the proportion of 5%, 10%, 15% & 20% by weight. Mortar cubes were casted, tested and compared in terms of compressive strength to the standard mortar mixtures. Cubes were subjected to compressive strength test to determine strength at 7 days, 28 days & 56 days. The result obtained clearly represents that on partial replacement of cement by 5% with stone dust, compressive strength obtained is maximum. On the other hand, higher strength is obtained when cement is replaced with 10% granite powder.

“Effect of Replacement of River Sand with Artificial Sand on Properties on Cement Mortar” Mr. Rushank Ravindra Patil, Mr. D. N Shinde (2016)

The demand of natural sand is quite high in developing countries to satisfy the rapid infrastructure growth. In this situation the developing country like India is facing shortage in good quality of natural sand. Now-a-days good sand is not readily available; it is transported from a long distance. The artificial sand produced by proper machines can be a better substitute to river sand. River sand in many parts of the country is not graded properly and has excessive silt and organic impurities and these can be detrimental to durability of steel in concrete whereas Artificial sand has no silt or organic impurities.

“Strength Of Concrete Containing Different Types Of Fine Aggregate” Sachin Balkrishna Kandekar, Amol Jagannath Mehetre, Vijayshree A. Auti (2012)

Common river sand is expensive due to excessive cost of transportation from natural sources. Also large-scale depletion of these sources creates environmental problems. As environmental transportation and other constraints make the availability and use of river sand less attractive, a substitute or replacement product for concrete industry needs to be found. River sand is most commonly used fine aggregate in the production of concrete poses the problem of acute shortage in many areas. Whose continued use has started posing serious problems with respect to its availability, cost and environmental impact? An attempt has also been made for strength studies on concrete made up of grit when compared with the concrete made up of Artificial Sand and Natural Sand. Use of grit as a fine aggregate in concrete draws serious attention of researchers and investigators.

III. OBJECTIVES

- A. Effect of grit on workability of concrete.
- B. Effect of grit on compressive strength of concrete.
- C. Comparison between compressive strength of normal concrete and grit concrete.

IV. METHODOLOGY

- A. Test on material:-Natural sand, coarse aggregate, Grit.
- B. Design of concrete mix for M30 grade.
- C. Checking of workability of concrete by using slump test.
- D. Casting of concrete cubes having size of 150 mm X 150mm X 150mm by replacing of natural sand with 10%, 20%,30%, 40%,50%,60%,70%,80%,90% &100% grit.
- D. The curing of concrete cubes for 28days in water.
- E. Testing of compressive strength of grit concrete cubes after 28 days using Universal Testing Machine (UTM) having capacity 1000 KN.

V. FUTURE SCOPE

A review of different experimental studies performed by various researchers has been carried out to examine various operational parameters viz. workability, and compressive strength of concrete with grit as replacement to the natural sand.

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