

INVESTIGATION ON GLASS BEADS AND COCONUT SHELL AS PARTIAL REPLACEMENT OF COURSE AGGREGATE IN CEMENT CONCRETE

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Abstract

In India, Concrete is the main essential material for construction purpose. Concrete consists of cement, sand, aggregate and in some cases admixtures are used. Since concrete is majorly used in construction field. The high cost of conservative construction materials is dominating factor affecting housing system around the world. This has necessitated research work into substitute materials in construction field. This study investigated the use of coconut shell and glass beads as replacement for coarse aggregates in cement concrete. Concrete cube and cylinder measuring 150mm x 150mm x 150mm and 150mm x 300mm were casted. Compressive strength and split tensile strength were evaluated at 7, 28 days. In this study, M 20 grade of concrete was replaced by coconut shell and glass beads. First part of the study deals with the compressive strength of concrete by partial replacement of coarse aggregate with crushed coconut shell and glass beads with various percentages such as 10%, 15%, 20%, 25% and 30%. Replacement of coarse aggregate by coconut shell attained 28 days compressive strength and split tensile strength. The results showed that coconut shell which has more impact value than crushed stone aggregate which indicates that this aggregate have good absorbance to shock and glass beads which gives more compressive strength than coconut shell concrete and normal concrete due to its hardness of 515 and compressive strength of 36000 psi. Its utilization is cost effective and eco-friendly.

Keywords: Construction material; Coconut shell; Glass beads; Compressive strength; Splitting tensile strength; Concrete; Eco friendly

1. Introduction

The construction industry relies heavily on conventional materials such as cement, granite and sand for the production of concrete. The increasing cost of these materials has greatly hardened the development of shelter and other infrastructural facilities in developing countries. There arises the need for engineering consideration of the use of cheaper and locally available materials to meet desired need enhance the self-efficiency, and lead to an overall reduction in construction cost for sustainable developments.

Concrete versatility, durability, sustainability, and economy have made it the world's most widely used construction material. The term concrete refers to a mixture of aggregates, usually sand and either gravel or crushed stone, held together by a binder of cementitious paste. The material used in concrete required to design and control mixture for a variety of a structure.

In recent years, aggregates became costly for the usage in construction industry. So many innovations were made for replacement of aggregates in concrete. In the past studies, there were many materials like coconut shell, recycled aggregates, brick dust, solid waste etc., which was the replacement of fine and coarse aggregate. Attempts have equally made by various researchers to reduce the cost of its constituents and hence total construction cost, by replacement of the materials which could be classified as agricultural or industrial waste. Some of these wastes include saw dust, coconut shell, fly ash etc.

Increase in percentage replacement by coconut shell reduces compressive strength and split tensile strength of concrete (Miss. Anjali et al. 2015). The coconut shell aggregates have higher water absorption because of higher porosity in its shell structure (S. A. Kakade et al.2015). Coconut shell exhibits more resistance against crushing, impact and abrasion, compared to crushed granite aggregate.(Akshay et al.2014) Waste glass may open a new path of economic and pollution free concrete (T. S. Serniabat et al.2014).

In this study, the glass beads and coconut shell was replaced, as a partial replacement of coarse aggregate. In this project, hardened property of concrete such as compressive strength and split tensile strength, were determined by the partial replacement of coarse aggregate with glass beads and coconut shell in cement concrete with comparison of normal concrete.

2. Materials and Setup

The project work requires preliminary investigations in a methodology manner. Concrete is the mixture of cement, fine aggregate, coarse aggregate. In present of, Ordinary Portland Cement (OPC) of 53 grades was used. The various test on cement were conducted as per IS code provision 1996 (Part-I). The fineness of cement IS-4031 (Part-I):1996 was found to 8%.The standard consistency value of cement IS-4031 (part-IV):1996 was founded as 28%.The initial and the final setting time of cement IS-4031 (Part-V):1996 was found to 27 minutes and 530 minutes. The compressive strength test for cement IS-4031 (Part-VI):1996.

Locally available natural river sand was used in this study. The specific gravity of fine aggregate 2.5 was obtained from the test conducted as IS-2386 (Part-III):1963. As per IS-383:1970 the particle size below 4.75mm confirming to the zone II was founded. The water absorption value was founded 8%. As per IS-2386 (Part-III):1963, crushed stone of size less than 12.5mm with specific gravity of 3. The water absorption value was founded by 1.2%.

Design of concrete mix involves determination of proportion of above components for the investigation of normal strength concrete is used. The trial mix was done as per IS-10262:2009. The mix proportion of normal concrete was 1:1.4:2.9.