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Strength Studies on Recycled Aggregate Concrete with Partial Replacement of Cement by Using Flyash

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Abstract : Use of recycled aggregate in concrete can be useful for environmental protection. Recycled aggregates are the materials for the future. The application of recycled aggregate has been started in a large number of construction projects of many European, American, Russian and Asian countries. Many countries are giving infrastructural laws relaxation for increasing the use of recycled aggregate. This paper reports the strength properties of recycled aggregate concrete with partial replacement of cement by using fly ash with various proportions (10%,20%,30%) Similarly concrete properties like compressive strength, flexural strength, etc are studied and compared with normal aggregate concrete. Recycled aggregate was made by crushing the waste concrete of laboratory test cubes and fly ash are collected from thermal power plant.
Keywords: Recycled aggregate, fly ash

I. INTRODUCTION

Concrete is an artificial material similar in appearance and properties to some natural lime stone rock. It is a manmade composite, the major constituent being natural aggregate such as gravel, or crushed rock, sand and fine particles of cement powder all mixed with water. The concrete as time goes on through a process of hydration of the cement paste, producing a required strength to withstand the load.

In recent times the importance and use of recycled aggregate has grown so much that it has almost became an ingredient in concrete and also fly ash is used as best replacement material.

II. SIGNIFICANCE OF THE PROJECT

There is a range of environmental and economic benefits in recycling concrete rather than dumping it or burying it in a landfill. To avoid the landfills of an construction wastes the recycled aggregates are used in concrete to find the strength properties and also cement is partially replaced by fly ash for cost economic.

III. MATERIALS AND METHODS

3.1 Cement

Cement is the most important constituent of concrete, in that it forms the binding medium for the discrete ingredients made out of naturally occurring raw materials and sometimes blended with Industrial wastes used for experimental study. It serves as a binder to aggregate. Portland cement is the most common type of cement in general usage. It is a basic ingredient of concrete, mortar and plaster.

3.2 Aggregates

Aggregate is a collective term for the mineral materials such as sand, gravel and crushed stone that are used with a binding medium (such as water, bitumen, Portland cement, lime etc.) to form compound materials. Aggregate is also used for base and sub base courses for both flexible and rigid pavement. It is chemically inert material. It occupies 70-80 percent of the volume of concrete

3.3 Water

The water reacts with the cement, which bonds the other components together, creating a robust stone like material. Water is then mixed with this dry composite, which produces a semi-liquid that workers can shape a chemical process called hydration. The cement paste glues the aggregate together, fills voids within it, and makes it flow more freely.

3.4Mixing Proportions

The mixing proportions is developed has per IS code method for characteristics strength of 25 Mpa The process of selecting suitable ingredients of concrete are determining their relative amount with the objective of producing a concrete of the required strength, durability and workability as economically as possible, termed the concrete mix design.

3.5 Casting of Test Specimen

Concrete is mixed by hand .oil is applied inside cube and cylinder. Materials should be mixed in various proportions. Care should be taken to see that the concrete is properly placed beneath and also along the sites of the mould with the help of trowel and the tamping rod conventional concrete and coconut shell concrete.

3.6 Preparation ofRecycled Aggregate Concrete by Using Fly Ash

The Flyash is added to the recycled aggregate concrete by various proportions in M25 grade of concrete

3.7 Curing

The concrete surface is kept wet for 7and 28 days period after placing of concrete. It consists of a control of temperature and the moisture movement in to the concrete term curing of concrete is used to in all such procedures and process

3.8 Testing of Specimens

3.8.1 Compression Test

Compression test is the most common test on hardened concrete. Concrete is strong in compression and weak in tension. Partly because it is an easy test to perform, and partly because most of the desirable characteristic properties of concrete are qualitatively related to its compressive strength.

The compression test is carried out on specimens cubical or cylindrical in shape. Prism is also sometimes used. The cube specimen is of the size is 150x150x150mm.

3.8.2 Split Tensile Strength Test of Concrete

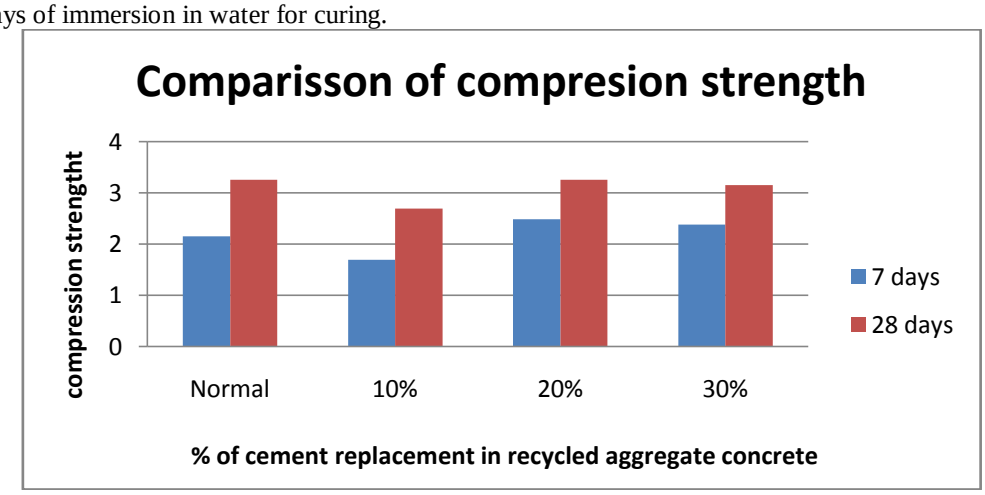
The tensile strength is one of the basic and important properties of the concrete. The concrete are not usually expected to resist the direct tension because of its low tensile strength and brittle nature. However, the determination of tensile strength of concrete is necessary to determine the load at which the concrete members may crack. The cracking is a form of tension failure.

As there are many difficulties associated with the direct tension test. A number of indirect methods have been developed to determine the tensile strength. In these tests in general a compressive force is applied to a concrete specimen in such a way that the specimen fails due to tensile stresses developed in the specimen. The tensile stress at which the failure occurs is termed the tensile strength of concrete.

IV. RESULTS AND DISCUSSION

4.1 Compressive Strength Test

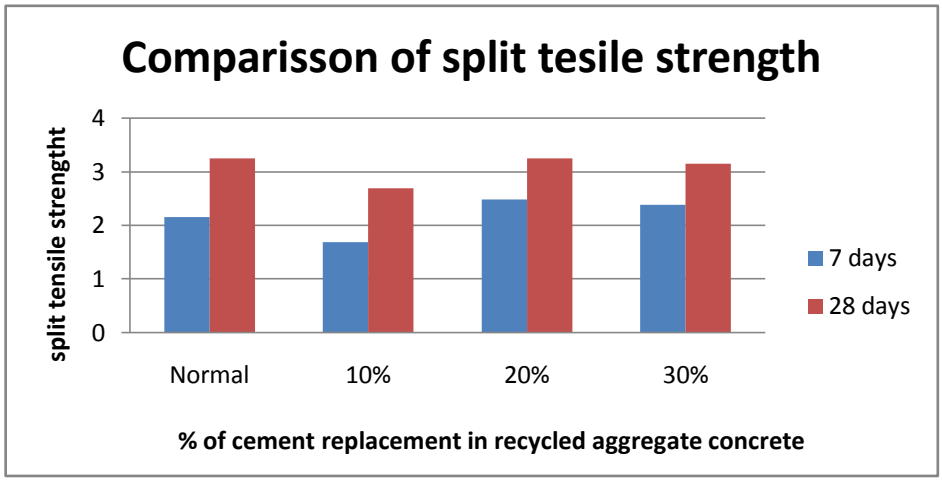
A cube compression test is performed on standard cubes of conventional concrete and recycled aggregate concrete with partial replacement of cement 10%,20% and 30% of size 150mmx150mm after 7 days and 28 days of immersion in water for curing.



The compression strength of concrete increases with recycled aggregate concrete with 20% replacement of cement by using fly ash.

4.2 Split Tensile Test

The split tensile test is well known indirect test used to determine the tensile strength of concrete. Due to difficulties involved in conducting the direct tension test, a number of indirect methods have been developed to determine the tensile strength of the concrete. In these tests, in general a compressive force is applied to a concrete specimen in such a way that the specimen fails due tensile stresses induced in the specimen.



V. CONCLUSION

From the experimental work carried out on "Recycled aggregate concrete with partial replacement of cement by using fly ash". The compressive strength of recycled aggregate concrete with 20% of fly ash has higher strength when compared to normal concrete and split tensile test shows that concrete has good tensile strength when replace up to 20-30%. The water absorption of (RAC) recycled aggregate concrete is high when compared to ordinary coarse aggregate concrete, therefore usage of RAC with addition of proper admixture will reduce water content and increase strength also.

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