

Enhancing The Strength Properties Of Recycled Aggregate Concrete Through The Use Of Supplementary Cementing Materials

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ABSTRACT

Recycling of concrete waste aggregate is a hot topic. Numerous papers, reports and articles have been prepared illustrating how we could and should make greater use of recycled aggregate in the construction industry. The present project makes an effort to assess a safe and economic use of such concrete as a structural grade concrete M15 and M20. Extensive tests for structural properties such as workability, compressive strength, split tensile strength and flexural strength tests on concrete specimens made up of recycled and natural aggregate were carried out. The experimental results showed that recycled aggregate has a significant effect on the overall property of the concrete. The recycled aggregate concrete can be used as a substitute for the natural aggregate and it is necessary from viewpoint of environmental preservation and effective utilization of resources. Further the replacement of crushed concrete waste will lead to saving in the cost of the aggregate.

INTRODUCTION

Portland cement concrete can be reclaimed during demolition operations and crushed into a coarse granular material that can be used as a substitute for crushed virgin rock. Aggregate processors are beginning to accept reclaimed concrete for a "tipping fee" significantly lower than the cost of land filling the material and to supply recycled concrete aggregate of sufficient quality for many applications. As landfill costs for Construction, Demolition, and Land clearing debris (CDL) continue to rise and the landfills become more heavily regulated, it makes economic sense to seek alternative means of disposal of concrete from construction and demolition operations. More disposal sites are opening up and contractors are incorporating recycling into their

operations to decrease disposal costs. Recycled concrete aggregate is increasingly available and is often an economical alternative to new aggregate. Project managers can ensure that their contractors are aware of opportunities to recycle this material and can require the use of recycled material in construction. Users of recycled concrete aggregate should take customary precautions to ensure that the material is suitable for the intended application.

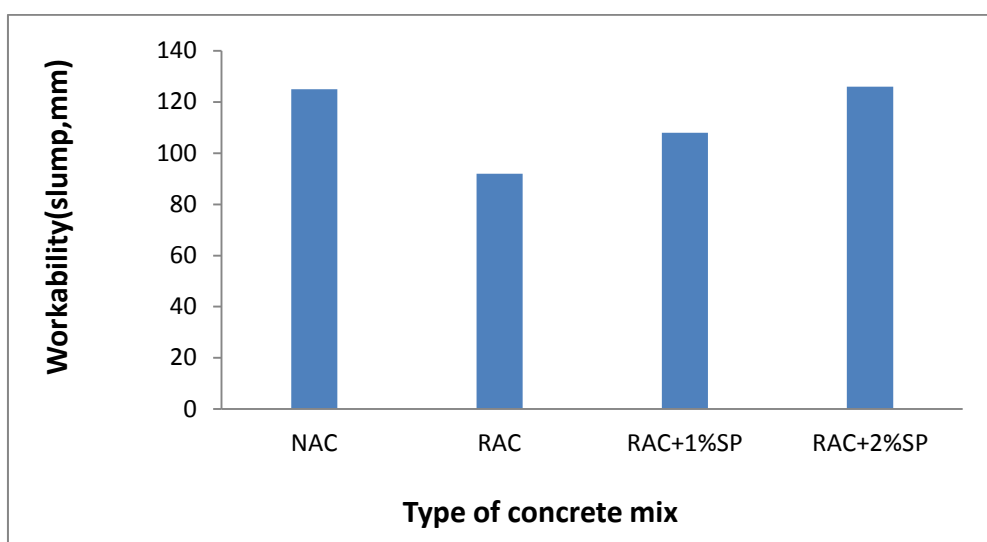
SILICA FUME

Silica fume also referred to as micro silica or condensed silica fume is another material that is used as an artificial pozzolanic admixture. It is a product resulting from high purity quartz with coal in an electric arc furnace in the manufacture of silicon or ferrosilicon alloy. Silica fume rises

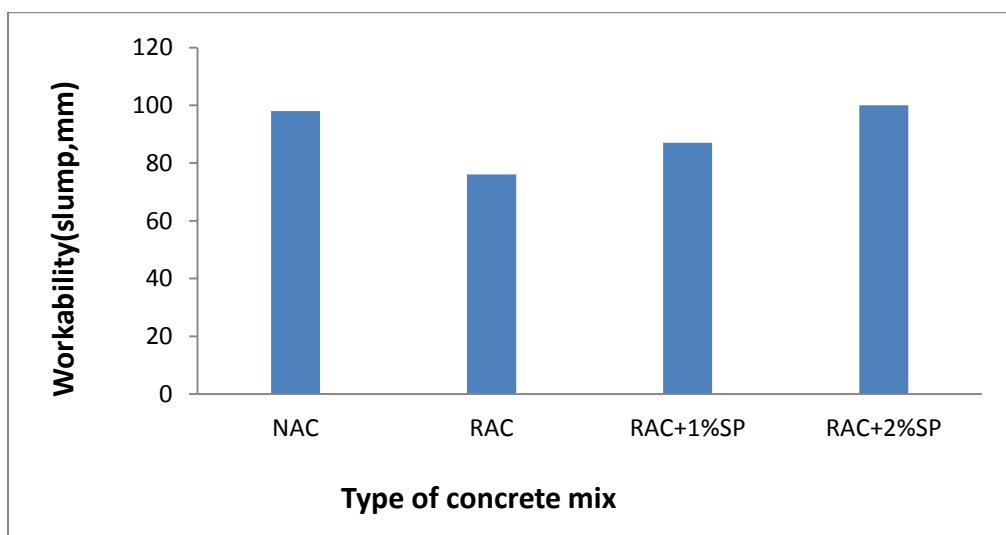
as an oxidized vapour. It cools, condenses and is collected in cloth bags. It is further processed to remove impurities and to control the particle size. Condensed silica fume is essentially silicon dioxide in non-crystalline form. Since it is an air borne material like fly ash, it has spherical shape. It is extremely fine

with particle size less than 1 micron and with an average diameter of about 0.1 micron, about 100 times smaller than average cement particles. By the use of condensed silica fume certain properties of fresh concrete is being altered. This alteration in the properties increases the performance of concrete.

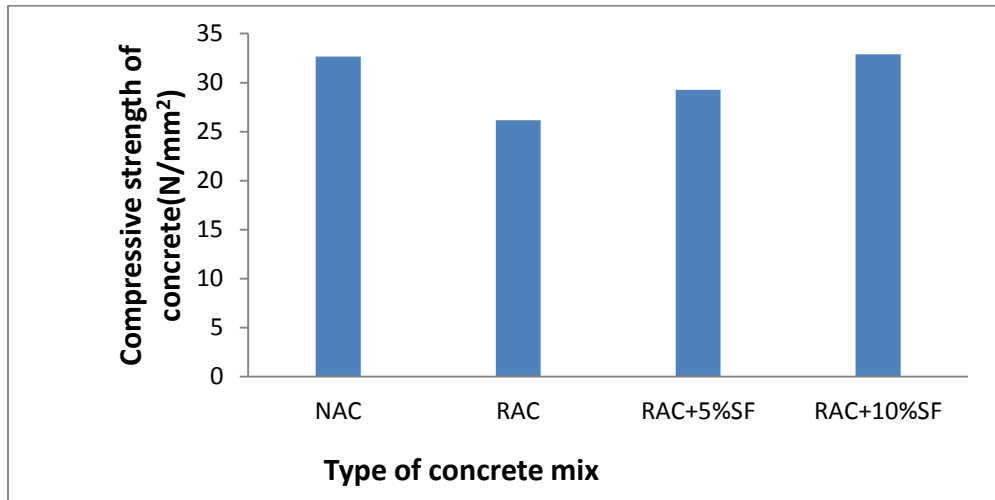
TEST RESULTS



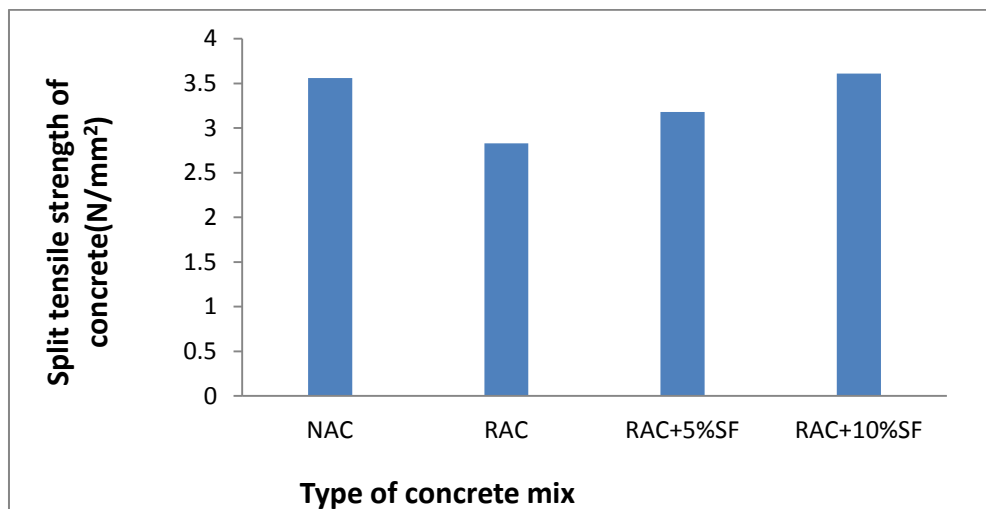
Workability of concrete mixes for M15 grade concrete



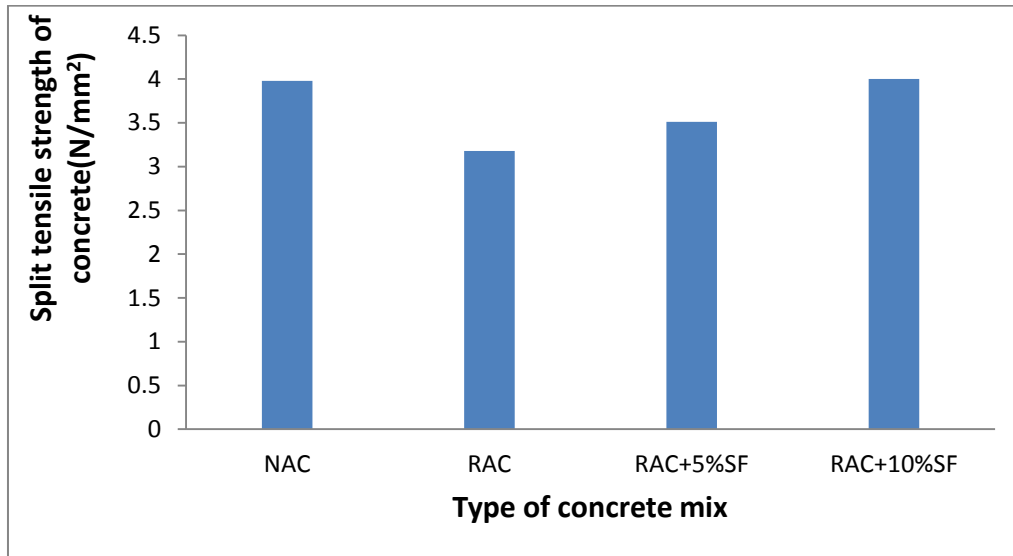
Workability of concrete mixes for M20 grade concrete



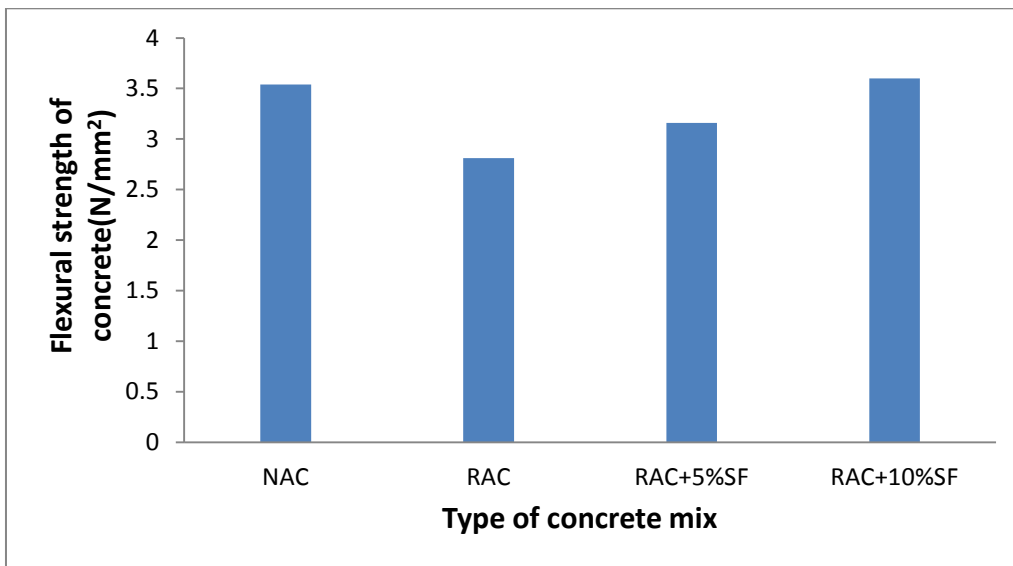
28th day compressive strength of M20 grade concrete



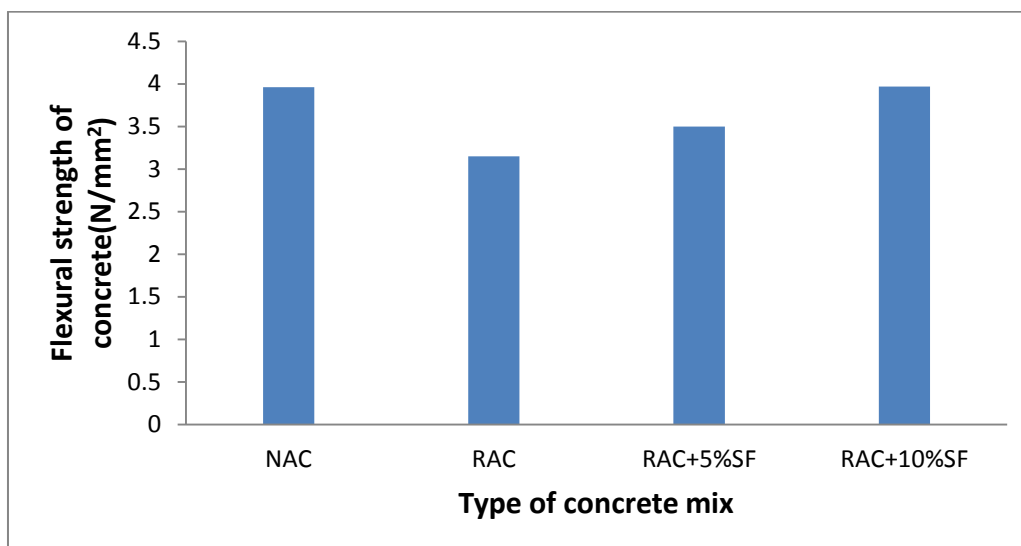
28th day split tensile strength of M15 grade concrete



28th day split tensile strength of M20 grade concrete



28th day flexural strength of M15 grade concrete



28th day flexural strength of M20 grade concrete

CONCLUSIONS

- Recycled aggregate possesses relatively higher water absorption as compared to those of fresh granite aggregates. This is mainly due to the porous mortar adhering to the recycled concrete aggregate.
- Workability of recycled aggregate concrete mix is slightly less than natural aggregate concrete mix.
- Workability of recycled aggregate concrete with 2% super plasticizer is equal to the workability of natural aggregate concrete.
- Compressive strength of concrete cubes made of recycled aggregate is approximately less than 20%. When compared with concrete cubes made of natural aggregate.
- Compressive strength of concrete cubes made of recycled aggregate with 10% silica fume is equal to concrete cubes made of natural aggregate.
- Split tensile strength of concrete cubes made of recycled aggregate is approximately less than 20%.
- When compared with concrete cubes made of natural aggregate.
- Split tensile strength of concrete cubes made of recycled aggregate with 10% silica fume is equal to concrete cubes made of natural aggregate.
- Flexural strength of concrete cubes made of recycled aggregate is approximately less than 20%. When compared with concrete cubes made of natural aggregate.
- Flexural strength of concrete cubes made of recycled aggregate with 10% silica fume is equal to concrete cubes made of natural aggregate.
- Addition of admixtures is essential for concrete with recycled aggregate for improving the strength of concrete.

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