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Review Paper- Experimental Investigation of Green Concrete in Construction Industry by Using Recycled Aggregate

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ABSTRACT

In order to reduce the usage of natural aggregate, Recycled aggregate concrete can be used as the replacement materials. Recycled aggregate concrete are consists of crushed concrete, inorganic particles processed from the materials that have been already used in the structural constructions and demolition waste. New technologies have evolved very fast to cater different difficulties in the construction industry, Production of concrete which will leave a substantial mark on the environment. The concrete is made with concrete wastes which are eco-friendly to environment is known as Recycled aggregate concrete. This thesis covers the aspect on how to choose a material for Recycled aggregate concrete. By the use of Recycled aggregate concrete it is possible to reduce the CO2 emission in atmosphere. To avoid the pollution and reuse the material, the present study is carried out.

Keywords: RCA, Concrete,

1. INTRODUCTION

To achieve sustainable issue in construction area, researchers and companies focus on using waste concrete as a new construction material. It is called recycled aggregate which can be produced by concrete crusher. The aggregates are categorized by size as coarse and fine aggregate. If recycled aggregates were practically useful in construction area, two aspects would be expected. One is illustrated at the beginning of introduction; the other one is that we could reduce consumption of natural aggregate resources. Although using recycled aggregates has great opportunity to preserve healthy environment, the properties and characteristics of recycled aggregates has not been fully investigated yet. Since it is hard to standardize the characteristic of recycled aggregates, all the researchers who study recycled aggregate should perform experiment of their concrete, which will be used for recycled aggregate, to gain the characteristics of their specimens. The characteristic of recycled aggregates could be different by its parent concrete because the parent concrete was designed for its purposes such as permeable, durable and high strength concrete. For example, water to cement ratio of parent concrete will give an impact on water absorption capacity of recycled aggregates which is related to characteristics of concrete issue such as durability, permeability, strength and elastic modulus.

2. REVIEW OF PAPERS

2.1 Review:

{1} Rayachoti Narayana et.al (2019):. The main aim of this experimental work is to study the experimental investigation on concrete with different waste stone aggregate as a partial replacement of coarse aggregate in comparison with the physical and mechanical characteristics of normal aggregates and different waste stone aggregates. The experimental investigation has been carried out to study the effects on compressive strength, split tensile strength and flexural strength on concrete

{2} Krishan Pareek et.al (2019): The objective is to study the mechanical properties (such as Compressive Strength, Splitting Tensile Strength and Flexural Strength) and durability properties (such as Resistance to Chloride, Carbonation and Freeze and Thaw) of concrete using reused aggregate.

{3} Shamsher Singh et.al (2018): In this study the laboratory test results indicates that as the percentage of Natural Aggregate in the mixture decreases by replacing the Recycled Aggregate, the corresponding strength of these mixtures goes on decreasing, however up to the 60% replacement level, it achieves target mean strength. Hence, for the structural concrete Natural Aggregate can be replaced by the Recycled Aggregate up to 60% range.

{4} Shamsher Singh et.al (2018): Reviewed on recycled aggregate concrete can be used as the replacement materials. Recycled aggregate concrete are consists of crushed concrete, inorganic particles processed from the materials that have been already used in the structural constructions and demolition waste. New technologies have evolved very fast to cater different difficulties in the construction industry, Production of concrete which will leave a substantial mark on the environment.

{5} Prof. Rahul Hodage et.al (2018): To avoid the pollution and reuse the material, the present study is carried out. Thus, green concrete is an excellent substituent of cement as it is cheaper, because it uses waste products, saving energy consumption in the production. The concrete is made with concrete wastes which are eco-friendly so called as Green concrete. Over and above all green concrete has greater strength and durability than the normal concrete.

{6} Manik Goyal et.al (2018): The present study outlines literature related to green concrete manufactured from some industrial wastes such as fly ash, silica fume, slag modified, glass modified, rubber modified and recycled aggregate concrete. The suitability of green concrete as an alternative for demolishing the carbon emissions is studied, hence reduces negative impact on environment and improves the sustainability of concrete structures.

{7} A.Naveen Arasu et.al (2018): Found that strength has been increased to about 5% in compressive strength, 6% in flexural strength and 8% in tensile strength by different test. Floor corner admixtures are used to increase the compressive, tensile and flexural strength of concrete with replacement crushed C & D waste of 30%, 40% and 50%. The strength has been increased to about 5.5% in compressive strength, 6.25% in flexural strength and 9% in tensile strength by different test.

{8} Vardhan Nagarkar et.al (2017): conventional concrete is responsible for amount of carbon-dioxide emission to some extent. So to reduce the emission, various types of concrete are developed using waste products from industries and agricultural use like blast furnace slag, silica fume, fly ash which requires low amount of energy and also cause least harm to the environment. Green concrete is a new technology developed now days to reduce the effect on environment by production of cement. Cement contains high amount of carbon-di-oxide which harms the environment drastically, so by replacing the cement by various materials which causes harm to the environment we not only reduce the problem of disposal of these materials but we reduce the emission of carbon-di-oxide from cement and as a result of which we reduces the negative effect on environment.

{9} Wenchao et. al. (2017) has shown Recycled aggregate concrete is an environmentally friendly building material. This paper investigates the mechanical behaviour of recycled aggregate concrete filled steel tube columns exposed to fire. Two groups of 12 columns were designed and tested, under axial compression, before and after fire, to evaluate the degradation of bearing capacity due to fire exposure. Six specimens were subjected to axial compression tests at room temperature and the other six specimens were subjected to axial compression tests after a fire exposure. The main parameters of the specimens include the wall thickness of the steel tube (steel content) and the type of concrete materials. Several parameters as obtained from the experimental results were compared and analyzed, including the load-bearing capacity, deformation capacity, and failure characteristics of the specimens. Meanwhile, rate of loss of bearing capacity of specimens exposed to fire were calculated based on the standards EC4 and CECS28:90. The results show that concrete material has a large influence on the rate of loss of bearing capacity in the case of a relatively lower steel ratio. While steel content has little effect on the rate of loss of bearing capacity of concrete-filled steel tube columns after fire, it has a relatively large influence on the loss rate of bearing capacity of the recycled aggregate concrete filled steel tube columns. The loss of bearing capacity of the specimens from the experiment is more serious than that from the calculation. As the calculated values are less conservative, particular attention should be given to the application of recycled aggregate concrete in actual structures.

{10} Junak and Sicakova (2017) has presented the experiment aims to test the specific way of producing concrete with recycled concrete aggregate. To reduce its negative impact on the concrete properties, two different ways of treatment of the recycled concrete aggregate with geopolymer slurry were applied—coating during the mixing using the specific mixing approach and coating prior to the mixing of concrete. As control samples, a mixture prepared by natural aggregate only and a mixture with recycled concrete aggregate that was prepared by standard mixing with no coating process were tested as well. The results of density, total water absorption and compressive strength in periods of 28, 90, 180, and 365 days of curing are presented and evaluated. Both methods of coating of the recycled concrete aggregate with geopolymer slurry allow for the preparation of concrete with properties comparable to those of normal concrete (prepared by standard mixing with natural aggregate); thus, it seems to be a promising way to enhance the rate of recycled concrete aggregate application. The positive effect of coating is clearly visible after a longer period of curing (180 days). When comparing the methods of recycled concrete aggregate coating, coating directly during the mixing yields somewhat better results; it is also positive from the technological point of view, since the process is simpler in practice.

3. CONCLUSIONS

From the above discussion following conclusions can be made.

1. Recycled concrete can be effectively used in low cost housing where slab load is not high, it can also be used in the construction of boundary wall columns and for other construction where compressive load is not too much.

2. By using recycled aggregates in concrete problem of dumping demolished waste can be minimized.

3. Using recycled aggregates in concrete also reduces environmental pollution, which would otherwise would have been produced during crushing of gravels as coarse aggregate for concrete

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