A Brief Review on Experimental Study On Behaviour of Recycled Aggregate Concrete with Ground Granulated Blast Furnace Slag Flyash

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Abstract – This project represents the quality of the concrete by adding the cement with GGBS (ground granulated blast furnace slag) and replacement of Natural aggregate with RAC (recycled concrete aggregate) This type of concrete giving more strength to the building. In this project the strength of concrete found after cast of the cubes, cylinder. GGBFS and fly ash giving good quality to the concrete. This type of concrete giving less cost and waste products are also saved. This type of concrete strengths is evaluated by Based on the strength test that is compressive strength, split tensile strength, flexural strength. From this study the mixing properties are giving better result.

Index Terms – GGBFS, RAC, Strength, Workability, Cement, NAC.

1. INTRODUCTION

Slag is a product getting from during manufacturing of iron and steel produced .Slag wastes consist of calcium, magnesium ,nickel & phosphorous. Slag physical properties are changed but chemical properties are unchanged .During pig iron manufacturing time iron produced the slag it is called blast furnace slag and steel produced the steel slag. The industry producing this type of wastes every year. That is 60 to 65% of waste produced from 300 to 540 kg/ton of iron.

Solid wastes are generated from construction industries by which sand, gravel, bitumen,, bricks , masonry and concrete. Some quantity of wasted materials are recycled and reused. Reusing materials varies from 25% in old buildings and 75% in new buildings. Normally demolished construction structures wastes are concrete rubble, bricks, tiles, sand and dust, timber, plastics, cardboard, paper and metals. The demolished concrete wastes are then separation from other wastes then sieved. Concrete waste of coarse aggregates are used for substitute of sub base (or) sub base layer in pavements. This type is called recycled aggregate.

2. OBJECTIVES

The objectives are

- To assess the properties of concrete that combination of both GGBFS and recycled concrete aggregate materials.
- To find out the maximum mix combination with a small effect on strength & durability characteristics.
- To assess flexural strength of GGBFS based recycled aggregate concrete beam.

3. LITERATURE REVEIEW

3.1. GGBS

Qasrawi H., Shalabi F. and Asi I. (2009) this paper investigates the using GGBFS instead of sand for the strength of concrete. The following strength, compressive, flexural strength, water absorption and density are tested at 14, 28&56 days. Total 40 concrete samples are tested in this study. The ratio of material cement 400kg/m^3, slag/sand ratio 30%, water cement ratio 0.4.Superplasticers was used 1.5% per weight of cement. This result affected the mechanical properties of concrete and dry density increased and water absorption decreased.

Sarkar R., Singh N. and Das S. (2010), “This study represents are carried out the replacing the fine aggregate with blast furnace slag on various properties of concrete. The important object of this study to identify the quality of the materials. The effect of the replacing the natural fine aggregate by slag on the compressive strength of cubes, split tensile strength of cylinder and flexural strength on beams are evaluated. Using the slag in concrete is the industry waste product. The test results are conducted by adding the replacement of fine aggregate and stone aggregate in the various % of 0%, 20%, 40%, 60%,

80%&100% after 28 days curing. Then finally observed blast furnace slag aggregate is good replacement.

Mohammed Nadeem, Arun D. (2012) in this study discussed about global warming and environment destruction. In the industry producing the green gas has changes the climate condition. To preventing these gas and waste material from Industries can reuse (or) recycled. The reusing procedure is challenges are to scientist & Engineers. Lots of studies have been conducted by to protect the natural resources, environmental pollution. For economical purposes using this waste material. The major byproducts of industry are slag. .To solves these the slag is used in concrete by replacing the coarse aggregate. The steel slag is replaced with different proportions of 0%,20%,40%,60%,80%.M_{40} Grade of concrete is used and water cement ratio is 0.40. Test on compressive split tensile, flexural strength are conducted 7 & 28 Days after curing. The result is optimum strength is obtained 60% of replace4d coarse aggregate by steel slag.

Lee N.K. and Lee H.K. (2013) this study was conducted in to two case of investigation .The purpose of the study are to develop cement free concrete without heat curing treatment. Geopolymer (cement free) concrete is added instead of OPC in the concrete. Geopolymer concretes have been produced heat curing treatment in concrete. First case study mixer of optimum content of water ,polycarboxylate based super plasticizer and potassium silicate was determined. Second case mixer of GGBFS, Fly ash and slag based geopolymer was determined. Setting time &workability also conducted with compressive tests. The result was found slag mixer given more compressive strength and water &super plasticizer mixer was given less compressive strength.

Bahador Sabet Divsholi etal (2014) GGBS Ground Granulated Blast furnace slag is used in the concrete to produce durable concrete. The Pozzolonic cement is used to reduce the pore connectivity of the concrete. GGBS &PC mixed with concrete can be reduce the risk of sulphate attack, and chloride penetration. It may be also reduce concrete resistance against carbonation. Many researchers have used the carbonation to reduce the experimental time. Sometime carbonation can affect the test result. In this study 200 samples are casted with various water cement ratio and various % of GGBS. Compressive strength, electrical resistivity, chloride permeability &carbonation test were conducted. This replacement material gives considerable improvement in the properties of concert

3.2 RAC

Hansen T.C. 1992 Recycled concrete aggregate is used due to critical shortage of natural aggregate. Recycled waste concrete using instead of natural aggregate gives reduces the impact and decreases energy consumptions. RCA used for one of the important reason for saving the cost. Recycled coarse aggregate fulfill the basic properties of concrete, workability etc., this study represents status of using RCA is discussed detailed.

collins R.J.1994. In India large construction works are going.so large quantity of demolition of wastes are developed every year. .This demolished waste is a very big problem. .It occupy more spaced. This waste is recycled (or) reused in the concrete due to avoid the environment pollution and also savings the cost. These wastes used in the concrete as a replacement of coarse aggregate. The mechanical properties of the concrete have been investigated for the nominal and mix design as per code. Demolished waste are used various % with cement, water &fine aggregate. This study determined compressive strength in three samples, and porous concrete gives the good result for porous material.

Oikonomou N. D (2005) in this study investigated, the effect of fine recycled concrete aggregate (FRA) that was prepared from concrete waste on the concrete properties. In this concrete mixtures 0, 10, 20, 30, 40, 50&100%.by weight .FRA are used with replaced sand. Then unit weight and water absorption ratio and 28 day compressive strength are determined. From these test result is obtained FRA can be used 10% ratio c_{30} concrete between 20-50% ratios giving c_{25} concrete. The important applications are environmental impacts and consumption of natural resources can be reduced been using RCA.

Chakradhara Rao etal (2010) this study discussed about physical and mechanical properties of recycled concrete aggregate from the concrete waste. .Also discussed compressive strength of recycled concrete aggregate. This result and database are prepared by selected many works from international references. This result indicates the most properties are density and absorption. Analyse of the study mixing procedure presoaking (or) adding extra water in the RAC. The strength of recycled concrete determined high (or) low water cement ratios. To avoid low water absorption using method is called presoaking. To avoid loss in workability adding extra water due to bleeding effect. This study discussed detailed.

Fredonia.2011 Recycled aggregate used in concrete for economic and environmental protection. Recycled aggregate used in construction projects of many countries of European, American and Asian. This study represents properties of recycled fine and coarse aggregate and also compared with natural aggregates. General concrete properties and coal guidelines are discussed here.This study successful utilization were discussed.

4. LIMITATIONS

- GGBS is used high % in cold weather.

- For freeze thaw there is restriction at the higher replacement rates.

5. ADVANTAGES

- To reduce the cost of concrete.
- To restrict the environmental pollution by using the waste product.
- To give the better workability and compaction of the concrete easier.
- To reducing the thermal crack.
- To resist by sulphate attack.

6. CONCLUSION

From these investigation the GGBS and RAC is the good replacement with cement and Natural coarse aggregate in concrete. These replacing materials have good essential properties of physical and chemical properties The replacement of coarse aggregate with steel slag has increased the compressive strength, split tensile strength and flexural strength of concrete. The optimum percentage of steel slag was found to be 60%. The increase in percentage of steel slag in concrete shows higher resistance to acid and sulphate attack. When this optimized value will be used. It will give good strength more durable concrete when compared to conventional concrete and saves material cost up to 10 %.

- High sulphate (or) acid level in a marine (or) salt environment.

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