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Investigation and Feasibility of Fly Ash and Rise Husk Ash and Quarry Sand for M-20 Grade Concrete

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Abstract -The proposed research is aimed at investigating the performance of rise husk ash and fly ash and quarry dust and black sand as partial replacement of standard sand in concrete. The study also includes investigation of rise husk ash and fly ash in different proportion in different grades of concrete. The research outcome may also be beneficial in developing and utilizing locally available rise husk ash and fly ash in abundant quantity. The studies also include fly ash used as a admixture or pozzolana in concrete making so in current condition no study available on the use of fly ash, rise husk ash with quarry dust as partial replacement of sand in concrete.

Key Words: Fly Ash, RHA

1. INTRODUCTION Quarry Sand

CONCRETE as is well known is a heterogeneous mix of cement, water and aggregates. The admixtures may be added in concrete in order to enhance some of the properties desired specially. In its simplest form, concrete is a mixture of paste and aggregates. Various materials are added such as fly ash, rice husk, and admixture and with using steel fiber to obtain concrete of desired property. The character of the concrete is determined by quality of the paste. The key to achieving a strong, durable concrete rests in the careful proportioning, mixing and compacting of the ingredients. The detailed experimental investigation is doing to study the effect of partial replacement of cement by FA and RHA with using Steel fiber in concrete. In this project I started proportion form 30% FA and 0% RHA mix together in concrete by replacement of cement with the gradual increase of RHA by 2.5% and simultaneously gradual decrease of FA by 2.5% ,last proportion taken 15%FA and 15% RHA. Numerous tests are performed on wet concrete such as workability tests such as compaction factor test and slump test. The tests on hardened concrete are destructive test while the destructive test includes compressive test on concrete cube for size (150 x 150 x 150) mm, Flexural strength on concrete beam (500 x 100 x100) and split tensile strength on concrete cylinder (150 mm ø x 300mm) as per IS: 516 – 1959, IS: 5816 – 1999 and IS: 516 – 1959 respectively. In actual practice, test on workability of wet concrete are carried out to ensure uniform quality concrete only. Strength is not a measurable at that stage with the available technology. Therefore the concrete samples are to be cured for 28 days in normal method to arrive at the Compressive strength and for necessary follow up action. It is not only difficult to dismantle the suspected portion of concrete at such a stage but also expensive in terms of time and money. Predicting the strength at the manufacturing stage, however, is yet to receive due attention of engineers. Hence, any new approach that is capable of predicting reliably the compressive strength of hardened concrete based on the properties of the ingredients and the wet concrete will be helpful to practicing engineers. Besides, such tests could be performed with the same ease as the workability tests. RHA has two roles in concrete manufacture, as a substitute for cement, reducing the cost and weight of concrete in the production of low cost building blocks. The workability of RHA concrete has been found to decrease but FA increases the workability of concrete so RHA and FA mix together in concrete to improve the workability of concrete. The work presented in this paper reports an investigation on the behavior of concrete produced from blending cement with FA and RHA.

Rice Husk Ash

Globally, an approximately 600 million tons of rice paddy is produced each year. On average 20% rice producing countries much of the husk produced from the processing of rice either burnt or the treatment of rice husk as a 'resource' for energy production is a departure from the perception potential, particularly in those that are primarily dependents on imported oil for their resources, being an ideal fuel for electricity generation. RHA is general term describing all types of ash produced from burning rice husk. Rice milling generates a byproduct known as Husk. This husk is used as fuel in the rice mills to generate steam for the parboiling process. This husk contains about 75% organic volatile matter & the balance 25% of the weight of this husk is converted in to ash during the firing process, is known as Rice Husk Ash (RHA).India is a major rice producing country, the husk generated during milling is mostly used as a fuel in the boilers for processing paddy, producing energy through direct combustion and/or by gasification. Husk ash (RHA) was prepared using charcoal from burning fire wood. This RHA is a create environment threat causing damage to the land and the surrounding area in which it is dumped. Rice husk is unusually high in ash compared to other biomass fuel close to 20% the ash is 92 to 95% silica, highly pores and light weight, with a very high external surface area. it is absorbent and insulating properties are useful to many industries applications. RHA is general term describing all type of ash produced from burning rice husk in practice; The type of ash varies considerably according to burning technique. Silica in the ash under goes structure transformation depending on the condition (time, temperature etc) for combustion .at 550°C-800°C amorphous ash is form and at temperatures greater than this, crystalline ash is form.RHA is a good super-pozzolana .Silpozz can be used in a big way to make special concrete mixes. There is a growing demand for fine amorphous silica in the production of special cement and concrete mixes, high performance concrete, high strength, low permeability concrete, for use in bridges, marine environments, nuclear power plants etc. This market is currently filled by silica fume or micro silica, being imported from Norway and also from Burma. Due to limited supply of silica fumes in India and the demand being high the price of silica fume has risen to as much as US$ 800 / ton in India.RHA is a general term describing all types of ash produced from burning rice husks. In practice, the type of ash varies considerably according to the burning technique. Two forms predominate in combustion and gasification. The silica in the ash undergoes structural transformations depending on the temperature regime it undergoes during combustion. At 550°C – 800°C amorphous silica is formed and at greater temperatures, crystalline silica is formed. These types of silica 4 have different properties and it is important to produce ash of the correct specification for the particular end use.

Chemical composition of Cement in % of RHA and FA are near about same.

Materials	SiO2	Al2O3	Fe2O3	CaO	MgO	LOI	SO3	K2O	Na2O3
Cement	*19.71*	*5.20*	*3.73*	*62.91*	*2.54*	*0.96*	*2.72*	*0.90*	*0.25*
Fly ash	*40*	*25*	*6*	*20*	*3.71*	*3.0*	*1.74*	*0.80*	*0.96*
Rice husk ash	*78.21*	(SiO2+ Al2O3+ Fe2O3) =82.64		*0.99*	*4.89*	--------	--------	---------	---------

MATERIAL TO BE COLLECTED

Fly ash will be collected from koradi khaperkheda power plant.

Rise husk ash will be collected from chimur district from ash agro limited.

Quarry dust will be collected from Sidheshwar crushing plant panchgao.

MATERIAL SELECTION

1. Cement (OPC 53 Grade)
2. Rice Husk Ash (RHA)
3. Fly Ash (FA)
4. Quarry Dust (Stone Sand)
5. Fine aggregate
6. Coarse aggregate.

EXPERIMENTAL METHODOLOGY

- Collection of Materials
- Weight Batching
- Test on Concrete
- Casting of Concrete Cube, cylinder, Beam
- Compaction

  By Hand

  By Vibrator

- Curing
- Specimen Testing
- Compression Testing
- Test Result

TEST THAT WILL PERFORM

1) Compressive strength on cube (150mmx150mmx150mm)
2) Flexural strength on beam (150mmx150mmx750mm)
3) Split tensile test on cylinder as per IS-516 (150mm diameter and 300 mm height)
4) Workability slump test, vee bee test

3. CONCLUSIONS

1) The percentage water cement ratios depend on quantity of RHA and QS used in concrete. Because RHA is a highly porous material.
2) Compressive strength increase with increase in percentage of fly ash and rise ash up to replacement (22.5% FA and 7.5% RHA) of cement in concrete in different mix proportion.
3) Compressive strength increase by addition of quarry sand in addition to FA and RHA
4) The maximum 28 days split tensile strength was obtained with 22.5 % fly ash and rise husk ash mix but with 45 % QS replaced by NS
5) Due the high absorbing quality of RHA the dosages of super plasticizer had to increase along with RHA fineness to maintain the desired workability.
6) Since RHA increase the strength but decreases the workability of material so to increase workability FA is added with combination of RHA.
7) According to combined grading at 45% QS replaced by NS meets the grading limit as per IS 383-1970.

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