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EXPERIMENTAL INVESTIGATION OF PARTIAL REPLACEMENT OF CEMENT WITH RICE HUSK ASH AND FINE AGGREGATE WITH GLASS POWDER

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ABSTRACT

We all know India is a developing country. For developing infrastructure leads to consumption of concrete. Sand containing big amount in concrete. But natural sands are limited resources. River sand is most common fine aggregates used in concrete. Due to excessive production of the river sand, it is banned by the government of India. Thus contribute to a good point to the research area. Number of researcher doing work on the replacement of sand by number of material for example waste glass powder, crushed fir bricks, saw dust and etc. Light weight concrete (LWC) found very similar properties and constructability with respect to normal concrete (NC). LWC was prepared using red clay (RC), sodium lauryl sulphate (SLS) and borax with the addition of waste materials like rice husk ash (RHA) and glass powder (GP) in aggregate composition. The compressive strength of NC and LWC found almost similar for 7, 14, 28 days with the inclusion of RHA and GP as the partial replacement of light weight aggregate in composition. Apparent porosity (AP) the NC. SLS (10% of water solution) was used as foaming agent. Borax (10% of water solution) might effect on hydration rate and temperature. The partial incorporation of GP and RHA in LWC lessen the thermal conductivity as compared to NC.

Preservation of environment and conservation of natural resources is the essence of any development. Also the present R and D continuously deal with technological and industrial development on waste management. In order to address environmental effects associated with cement manufacturing, it is crucial to advance alternative binders to compose concrete. Consequently extensive delving is continuing, on the substitution of cement by differing waste materials and industrial offshoot. As partial replacement of cement attempts on fly ash, waste glass, rice husk, etc have already been accomplished in concrete industries. If little waste material found convenient and economical for concrete manufacturing, a major gain will be achieved in disposal of waste management and depression in construction cost.

Keyword:- *Glass powder, Rice Husk Ash, Lightweight Concrete, Compressive Stength, Construction Cost.*

1. INTRODUCTION

Rice husk debris (RHA) fillers are gotten from rice husks, which are typically seen as agrarian waste and an environmental risk. Rice husk, when expended in outside the rice plant, yields two sorts of flotsam and jetsam that can fill in as fillers in plastics materials. The rice paddypreparing adventures give the outcome rice husk. As a result of the extending pace of environmental defilement and the idea of practicality factor have made utilizing rice husk. The clarifications for the use of rice husk as a possibility for concrete in strong gathering are explained in the going with zones. To have a fitting idea on the introduction of rice husk in concrete, a point by point concentrate on its properties must be finished. Around 100 million tons of rice paddy make reactions are gotten the world over. They have a low mass thickness of 90 to 150kg/m^3. This results in a more vital estimation of dry volume. The rice husk itself has an unforgiving surface which is harsh in nature. These are therefore impenetrable to normal defilement. This would achieve unseemly expulsion issues. Among all dares to reuse this thing, cement, and strong gathering ventures are the ones who can use rice husk in a prevalent way. By and by a-days Concrete is the most comprehensively used improvement material. Strong accept basic occupation in the arrangement and advancement of nation's establishment of strong volume is made out of coarse aggregates which are gotten from typical rocks. In view of this the defilement of regular resources occurs. To fulfill the overall need of concrete later on, it transforms into an also inciting endeavor to find fitting alternatives as opposed to standard aggregates for preparing concrete. To beat the above said issue wastes made from elective sources are used. Steel slag is a mechanical reaction procured from the steel creating industry. Which utilize Electric Arc Furnace (EAF) and can in like manner be set up by melting iron mineral in the Basic Oxygen Furnace slag (BOF).Steel slag made around reciprocals to the 20% by mass of steel yield. Steel slag can be used in the improvement business as all out in strong replacing normal sums. Various piece of our regular day to day existence depend really or in an indirect manner on concrete. Conventional concrete a versatile material is set up by mixing various constituents like solid, aggregate, water, etc. which are financially available. Concrete is unique among noteworthy advancement material since it is arranged unequivocally for explicit basic structure adventure. Strong accept an essential activity in the arrangement and advancement of the nation establishment. More than ten billion tons of concrete are exhausted yearly .Based on overall se it is set at second circumstance after water.

2. MATERIAL:-

2.1 Cement:

The Ordinary Portland Cement of 53 Grade conforming to IS 12269 – 1987 was used in this study. The specific gravity, initial and final setting of OPC 53 grade were 3.08, 28 and 320 minutes respectively.

2.2 Rice husk ash

Reactivity and pozzolanic property. Indian Standard code of practice for plain and reinforced RHA, produced after burning of Rice husks (RH) has high concrete, IS 456- 2000, recommends use of RHA in concrete but does not specify quantities.

2.3 Aggregate

2.3.1 Fine Aggregate

The sand that was used for the research work was obtained locally that fulfills the requirement provided by Indian Standard 383 1970.The purity of the sand was analyzed glancing the code provided by Indian Standard.

2.3.2 Coarse Aggregate

Locally available blue metal was used. Crushed granite stones of size passing through 20mm sieve and retained on 4.75 mm sieve as per IS: 383-1970 was used for experimental purpose. The sieve analysis of natural coarse aggregate

2.4 Glass Powder

Approximately 100µm. Size of glass powder less than 75µm possessed cementitious capability and improves compressive strength, resistance to sulphate attack and chloride ion penetration. The presents of alkali in glass may cause alkali-silica reaction and change the volume but it has been found that finely ground glass does not contribute to alkali-silica reaction. Less than 90- micron size of glass powder was use in this study. Application of glass powder – Glass powder use in paint and lining in chemical plants, marine construction & harbour facilities and petroleum tanks. Glass powder use in pollution control facilities, plating metal industries, boiler & water tanks, food industries, transportation concerns and fishery concerns. Glass can be used as blasting media as dry of slurry form mixed with water. It has excellent anticorrosion characteristics in the fields of paint and lining.

Glass powder collected from post-consumer source in Indore city. The main sources of waste glasses are waste crockery, broken glass window glasses, window screen, medicinal bottles, liquor bottles, Tube light and bulbs, electronic equipment's etc. Only pre-sorted by colour and type waste glass can be used in recycling. The waste glass when powderized to a very fine powder shows some pozzolanic properties. Therefore, the glass powder can be ingredient that can mix with the cement and contribute to development of strength. The typical glass contains 70% silica approximately. Past study shows Pozzolanic properties of glass are noticeable on particle size.

3. OBJECTIVE:-

- Replacement of cement with the rice husk ash and comparison of strength of concrete thus obtained with conventional concrete.
- Designing of concrete mixes using varying gradation of rise husk ash as replacement of cement.
- Evaluation of strength characteristics such as compressive strength , flexure strength ,split tensile strength of concrete and comparison of the same with conventional concrete.
- To check the compressive strength of concrete using the waste glass powder. To check the workability of concrete using the waste glass powder.
- To check the density of the concrete.

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4.0 METHOD AND METHODOLOGY

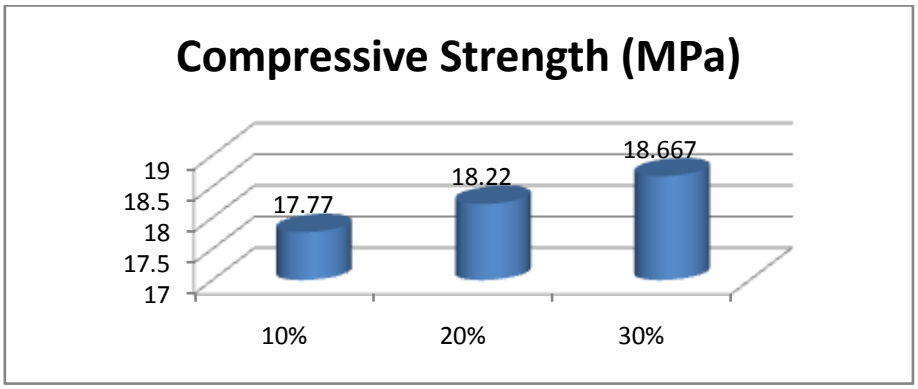
In this study of testing cement, coarse aggregate fine aggregate will be done. In this study property of fresh concrete and hardened concrete such as workability test, compressive and flexural strength test to be done. In the mix cement will replace by 5% ,10%, 15%, 20% of Glass powder and Rise husk ash mix suitable percentage will be carried out by the mix giving maximum compressive and flexural strength after 7 Days and 28 Days. Then Cost analysis will be done between conventional concrete and modified concrete.

Laboratory Test For The Properties Of Materials:-

Sr. No.	Description of different tests	Theoretical Range	Value obtained in lab
a)	Fineness Test	<10%	3.5%
b)	Consistency Test	<35%	26%
c)	Initial Setting Time	30min	35min
d)	Final Setting Time	10 Hours	185 min
e)	Soundness Test	<10mm	2mm

Table4.3.1: Test Result of used Portland pozzolana cement.

5.Compressive test in Mpa:-



Taking mean of compressive strength obtained in 7 days= 18.219MPa Result: The obtained compressive strength in 7 days is 18.219MPa

Which is 13<18.219<19.6 (Hence this mix design is safe.

- For 28 Days

(i):-Target **mean strength for** M20 **grade concrete in** 28 days= (fly * 1.65xS)= (20 *1.65x4) = 26.68 MPa

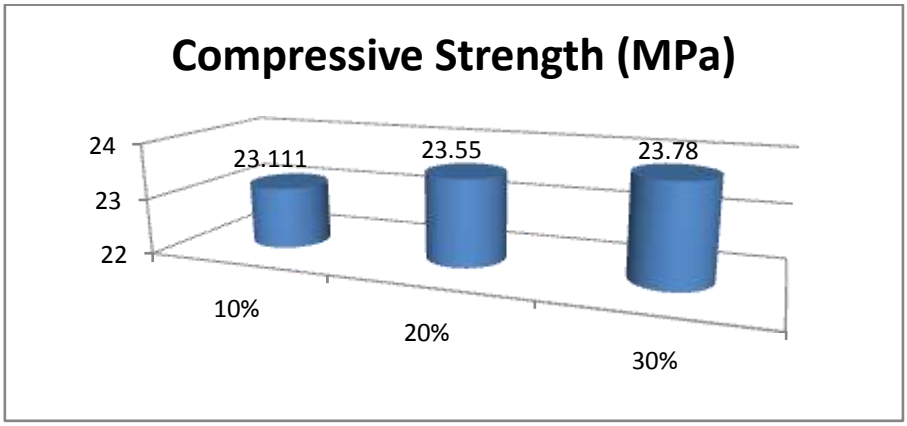
(ii):-Actual compressive strength in 28 days(FA.‹.) >F

0.825 x 4 **(Then** the **value is accepted)**

Actual compressive strength comes out in 28 days by last 3 cubes is shown in the given table (5.1.3)

S/N	Cubes	Load acts on cubes	Actual compressive strength in 28 days.
1-	Cube-1	520 KN/m’	23.111MPa
2-	Cube-2	530 KN/m’	23.55MPa
3-	Cube-3	535KN/m“	23.78MPa

Table- 5.1.3



Taking mean of the obtained compressive strength = 23.48 MPa >23.33

Result: The obtained compressive strength in 28 days is 23.48MPa. Which is (f,t * 0.825xS
< 23.48 < 26.6) Hence this is safe.

Compressive strength after **replacement with Rice Husk** ash aggregates by (10%,20% and 30%) of total weight of natural aggregates:-

The total **quantity of Rice Husk** ash aggregates **used** after **replacement** are shown in to the table (5.1.4):-

S/N	**Bottom** ash **with**	**Quantity with (various** % of natural aggregates) for 1 **cube**	**Total Quantity** for making 6 no. of **cubes.**
1-	10 %	0.425 kg.	2.55kg
2-	20%	0.851 kg	5 kg.
3-	30%	1.276 kg	7.6 kg.

Table- 5.1.4

Total **Quantity of** natural aggregates **used** after **replacement** are shown in the **table (5.1.5) :-**

S/N	Natural aggregate **replaced with**	Quantity **required** for **1 cube**	Quantity **required** for 6 **cubes**
1-	10%	3.83 kg	23 kg
2-	20%	3.40 kg	20.5 kg
3-	30%	2.97 kg	18 kg

Table- 5.1.

(B)-Baching of concrete ingredients after replacement of fine agrregates with Rice Husk ash aggregates for making concrete blocks.

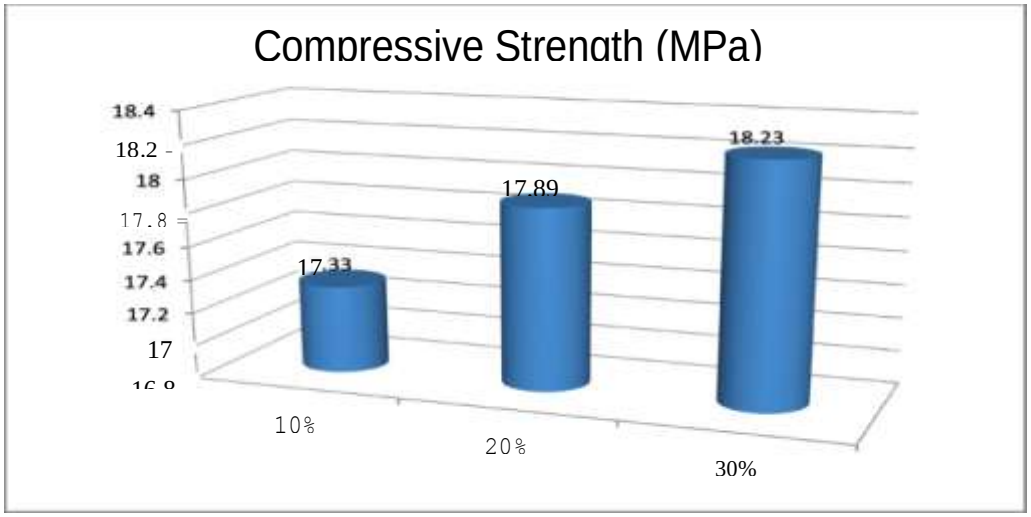
S/N	Materials	Quantity
1-	Cement	9 kg.
2-	Fine aggregates	13.62 kg.
3-	Natural aggregates	
	10%	23 kg.
	20%	20.5 kg
	30%	18 kg.
4-Bottom ash		
	10%	2.55 kg.
	20%	5 kg.
	30%	7.6 kg.
5-	Water	6 L

Table- 5.1.6

Compressive strength test of replaced concrete cubes with Rice Husk ash aggregate after 7 Days:-

S/N	Values obtained with various replacement percentage.	Compressive strength (MPa)
1-	10%	17.33
2-	20%	17.89
3-	30%	18.23

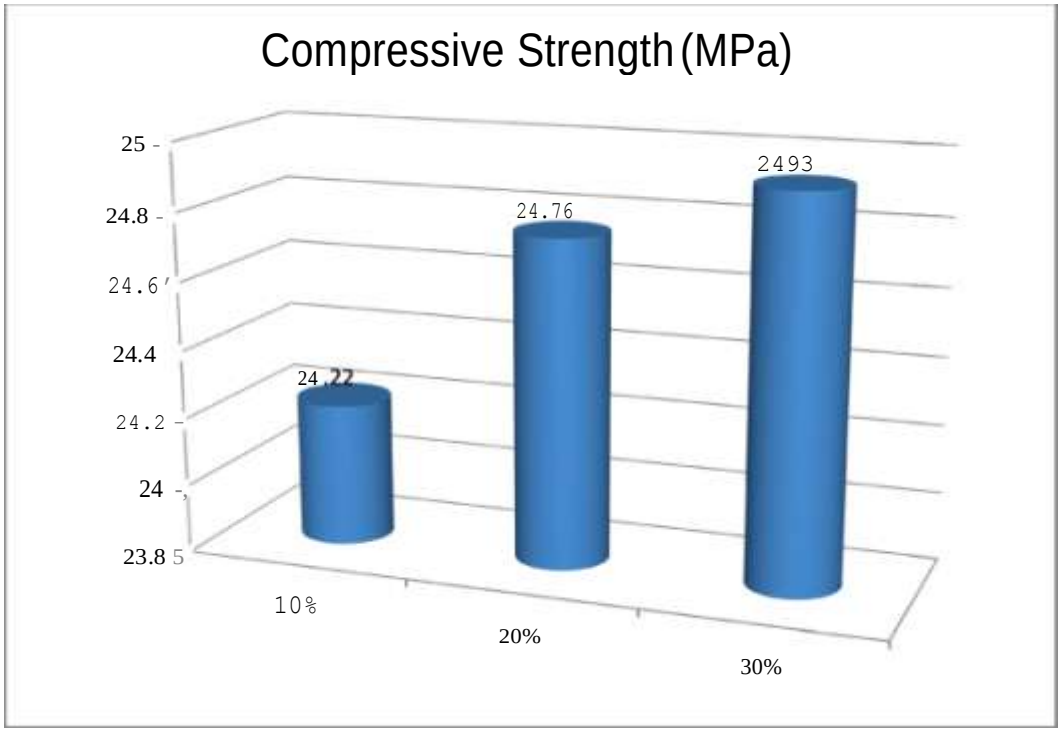
Table- 5.1.7



Compressive strength test of replaced concrete cubes with Rice Husk ash aggregate after 28 Days :-

S/N	Values obtained with various replacement percentage.	Compressive strength(MPa)
1-	10%	24.22
2-	20%	24.76
3-	30%	24.93

Table- 5.1.8



CONCLUSION :-

- W/C ratio is increase respectively compressive strength and flexural strength of pervious concrete is increase.
- Use the Glass Powder as construction material because Glass Powder in concrete can save the disposal costs and produces a „greener" concrete for construction.
- Increasing the amount of glass above 30% in mortar causes a general decrease of compressive strength,
- Average Tensile strength of the concrete containing Glass powder less than 150µ size will increases up to 30% replacement of cement.
- Average Flexure strength of the concrete containing Glass powder of size
- The Flexural Strength of Pervious Concrete is increases when the replacement of Cement with Glass Powder up to 20% replaces by weight of Cement.

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