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LONG –TERM BEHAVIOUR OF GREEN CONCRETE WITH INDUSTRIAL LEFT OVER PRODUCTS

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ABSTRACT :- The proposed study involves the experimental investigation of effect of fly ash and rice husk ash on the properties of burnt clay bricks. Determination of properties of the bricks casted with varying proportions of admixtures is taken up to ascertain whether the admixtures can be used for the production of clay bricks. On seeing the present day demand for bricks, an attempt is made to study the behavior of bricks manufactured using, different waste materials like rice husk ash and fly ash The main aim of this research was to compare the compressive strength of the bricks, so for this purpose different percentage of materials were separately added 5%, 10%, 15%, 20% and 25% by weight and then the compressive strength of the bricks was established, and then with the help of graph a comparison between compressive strength of bricks, made out of clay, Fly Ash, Rice husk ash and combination of all these was determined. The bricks were made, sun dried and burnt in a kiln, and then with the help of Compression Testing Machine (C.T.M.) finely their compressive strength was calculated. From this test in this research work it was concluded that the bricks with fly ash as the waste material admixture, gave the highest compressive strength. The fly ash admixture, in line with its pozzolanic nature, was able to contribute in attaining denser products with higher compressive strength, higher water absorption rates, better durability and better overall performance.

The effects of the addition of rice husk ash and combination of fly ash and rice husk ash by percentage-clay mix was also investigated.

Key Words - Bricks, Clay, Compressive strength, Fly Ash, Rice Husk Ash, Water absorption.

I. INTRODUCTION

In construction industry concrete is a material which is most widely used in the world. Concrete can also be called as man-made stone which is made after solidification of water, cement, aggregates (Badea, 2007) this solidification takes place, after mixing cement, water and aggregate and this chemical reaction is known as hydration.

Cement + Water + Aggregate = Concrete

Environmental Impact of Concrete

The main environmental concern in the production of cement and concrete is the energy consumption. The total production of cement in the world is 1.6 billion tons which produces 7% of the total carbon dioxide transferred to the atmosphere (Mehta P. , 2001).

According to (NRMCA, 2012) during the process of manufacturing cement their are two processes during which CO2 is produced

- Use of fossil fuel in the process of burning.
- Calcinations in which calcium oxide is produced during the heating process of calcium carbonate which releases CO2.

90% of concrete is composed of water, sand and gravel by weight. Small amount of CO2 is produced during mining process of gravel, crushing stone and transportation of concrete to the construction site. The major amount of CO2 is due to the manufacturing of cement.

According to (Obla, 2009) 9 tons of CO2 is emitted in the production of 1 ton of cement and about 10% of cement by weight is used in 1 cubic yard of concrete (weighs around 2 tons) for reducing this CO2 emitting many studies have been made for introducing supplementary cemtions material such as Fly Ash, Rice hush ash and Bick dust.

Fly Ash (FA): As we know that electricity is playing a major role in the development of the country. In India coal is mainly used for the production of electricity. In the production of electricity powdered coal is burnt which results in the production of fly ash. Fly ash is a residue which is obtained after the combustion of coal in the furnace of a thermal plant. Then this fly ash is collected by electrical or mechanical precipitations which is known as dry process or by wet process which is an old method.

Rice Husk Ash (RHA): India is the second highest rice producing country in the world after China. Rice Husk is a by-product which comes from the rice mills. Around 120 million tons of rice paddy is produced in India in which 20 % part is rice husk (Jivani, 2007). Disposal of such a big

amount is hazardous for the rice producing nations. Rice Husk Ash (RHA) is generated by burning rice husk in boilers. For every thousand kilogram of paddy around 220kg of rice husk is produced and on burning this 220kg of rice husk around 55kg of rice husk ash is generated which is 25% of rice husk (Koteswara Rao. D, 2011) .So considering India which is the major producer of rice in the world, disposing this great amount of Rice Husk Ash is a big problem.

Brick Dust (BD): One of the oldest construction materials is brick, which was first used in Southern Turkey and around Jerico dating 7000 Bc(Brick Directory 2015). According to (Kidder, 2015) their are two major ingredients from which building bricks are made, one is clay and other is sand.

Brick dust is the waste product which comes from the field where bricks are made and from the demolition waste of the building. As Brick is composed of clay which contains sufficient amount of soluble silica and alumina finely grounded brick dust when combined with lime shows pozzolanic reaction (Rogers, 2011). As earliest said that Brick is the oldest and majorly used construction material so large amount of Brick dust is generated during manufacturing of Bricks and demolition of the constructional structure so it is a major problem to dispose such a large amount of Brick Dust.

Concrete Making Materials:

Cement: The most widely recognized cement utilized is an Ordinary Portland Cement (OPC). The Ordinary Portland Cement of 43 grade (Jaypee OPC) adjusting to IS:8112-1989 is utilized. Numerous tests were directed on cement; some of them are explicit gravity, consistency tests, setting time tests, compressive qualities, and so forth. (IS8112, 2013)

Aggregates: Fine and coarse aggregate make up the greater part of a concrete mixture. Sand, common rock and squashed stone are for the most part utilized for this reason. Reused aggregates (from development, annihilation and unearthing waste) are progressively utilized as incomplete replacements of characteristic aggregate, while various fabricated aggregates, including air-cooled impact heater slag and base cinder are additionally allowed.

Chemical Admixtures: Concoction admixtures are materials as powder or liquids that are added to the concrete to give it certain qualities not possible with plain concrete mixes. In ordinary use, admixture measurements are under 5% by mass of cement, and are added to the concrete at the season of clustering/mixing.

Fly Ash: Fly Ash used was taken from L&T plant which is bought and brought from ramagundem power plant with a density of 746kg/m3

Brick Dust: Brick Dust was collected from the fields of Brick Kilns near Chotuppal Nalgonda. The brick waste collected was then ball grinded. After grinding Brick Dust was sieved from 300µ sieve and the portion which passed from the sieve was used in the experiment. Density measured was 1542kg/m3

Rice Husk Ash: Rice Husk taken from Nalgonda district was singed in the gasifier plant in G.S.K. Bharat pvt limited under a controlled consuming of 600-800 degree celcius and after that the buildup fiery remains was ball pounded to a fine powder. In the wake of granulating Rice Husk Ash was sieved from 300µ strainer and the segment which go from the sifter was utilized in the examination. Density estimated was 167kg/m3.

Table 1: Grades of Concrete

Grade Designation	Specified Characteristic Compressive Grade Designation Strength In N/Mm2 At 28 Days Curing
M 10	10
M 15	15
M 20	20
M 25	25
M 30	30
M 35	35
M 40	40
M 45	45
M 50	50
M 55	55
M 60	60

Table: 2 Assumed Standard Deviation (S)

Grade Of Concrete	Standard Deviation (N/mm2)
M 10	3.5
M 15	3.5
M 20	4
M 25	4
M 30	4
M 35	5
M 40	5
M 45	5
M 50	5

Table: 3 Consistency for Cement

S.No	1	2
% of Water (P)	32	34
Initial Reading	6	6
Final Reading	13	12
Height not penetrated (mm)	7	6

Table-4 Compressive Strength of Cement

S.No	Compressive strength at age of		
	3 days	7 days	28 days
1	21KN/mm^2	32KN/mm^2	45KN/mm^2

RESULTS & DISCUSSION

This thesis deals with the presentation of test results, and discussions on Compressive strength and development of Control concrete, Fly ash concrete, Rice Husk Ash concrete and Brick Dust concrete at curing period of 28 days. The present investigation is based on the IS method for Control concrete. For Fly Ash concrete, Rice Husk Ash concrete and Brick Dust concrete, replacement method is considered. Mix proportions have been obtained for M20 grade concrete from the mix design. By conducting design mixes, an optimized proportion for the mix is obtained for M20, grade control concrete. Compressive strength behaviour of Fly ash concrete, Rice Husk Ash concrete and Brick Dust concrete designed by the replacement method are studied, where the effect of age and percentage replacement of cement with Fly Ash, Rice Husk Ash and Brick Dust on Compressive strength is studied in comparison with that of M20, grade Control concrete.

Compressive Strength:

Most concrete structures are designed assuming that concrete processes sufficient compressive strength but not the tensile strength. The compressive strength is the main criteria for the purpose of structural design. To study the strength development of Fly Ash concrete , Rice Husk Ash concrete and Brick Dust concrete in comparison to Control concrete ,compressive strength tests were conducted at the ages of 7, 28, 90 and 180 days.

Economic Analysis

1. The cost of Ordinary Portland Cement in Hyderabad is about Rs320/50kg bag.
2. The cost of cement per meter cube is around Rs 2700 for M20 grade, Rs 3000 for M25 grade and Rs3300 for M30 grade of concrete.
3. The cost of Fly Ash is Rs 1/ kg in Hyderabad, Rice Husk Ash and Brick Dust will be around 30paisa/ kg as Rice Husk Ash and Brick Dust is locally available material the transportation cost will reduce.
4. Based on the result of the present study a 40% replacement of Fly Ash, Rice Husk Ash and Brick Dust is possible in concrete to achieve desired strength. With this level of substitution the price of Fly Ash concrete will reduce up to 33% and up to 40% in case of Brick Dust concrete and Rice Husk concrete.

Conclusions

The result shows that it is possible to achieve desired strength in concrete by replacing cement up to 40% by Fly Ash, Brick Dust and Rice Husk Ash. The conclusion is as follows:

1. Fly Ash and Brick Dust concrete shows more strength as compare to Rice Husk Ash concrete.
2. Rice Husk Ash makes concrete light in weight as compared to Fly Ash and Brick Dust concrete. So it will be helpful in reducing dead load of the construction.
3. Brick Dust makes concrete heavier so it will be helpful in using it in foundation work and making earthen dams etc. where heavy weight is essential for the structure.
4. There is 33-40% reduction in cost of concrete by using these industrial wastes (FA, RHA and BD).
5. There is 7% reduction in the cost of concrete when using Rice Husk Ash and Brick Dust in Hyderabad Region as compared to Fly Ash concrete.

References:-

1. Ramezanianpour, M. M. (2009). The Effect of Rice Husk Ash on Mechanical Properties and Durability of Sustainable Concretes. International Journal of Civil Engineerng. Vol. 7, No. 2, 83-91.
2. A. Bilodeau, V. M. (2001). Use of high-volume fly ash concrete at the liu centre. Materials technology laboratory
3. A. Camoes, B. S. (2003). International journal of civil and structural engineering international journal of civil and structural engineering. International As Utilization Symposium.
4. Alvin Harison, V. S. (2014). Effect of Fly Ash on Compressive Strength of Portland Pozzolona

Cement Concrete. Journal of Academia and Industrial Research, 476-479.
5. B.Rogers, S. (2011). Evaluation and testing of brick dust as a pozzolanic additive to lime mortars for architecturalconservation.Philadelphia: ScholarlyCommons.
6. Badea, C. (2007). Concrete. University of Timisoara.
7. Berry, M. (1986). Fly Ash in Concrete. CANMET.
8. C, M. (2009). The greening of the concrete industry. Cement and Concrete Composites, 601–5.
9. Columna, V. B. (1974). The effect of rice hull ash in cement and concrete mixes. Asian Institute of Technology.
10. Committee, A. (2003). Use of Fly Ash in Concrete. ACI Manual of Concrete.
11. Cook, D. R. (1977). Lime Cement mixes for use in Masonary Units. Journal of Building and Environment, 281-288
12. Craig Heidrich, H.-J. F. (2013). Coal Combustion Products: a Global Perspective. 2013 World of Coal Ash. Lexington.
13. CRISIL. (n.d.). Real(i)ty Next: Beyond the top 10 cities. CRISIL research.