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FEASIBILITY STUDY OF USING EPS AND GEOPOLYMER IN LIGHTWEIGHT CONCRETE- A REVIEW

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ABSTRACT- This paper reviews the literature on research conducted on study of lightweight concrete by using expanded polystyrene and geopolymer. polystyrene is one of the highly popular plastic packaging material, which turns into waste material and also harmful to ecosystem. as 75% of the world surface is covered with water, find faces problems in acquisation of land properties. it is an mixture of concrete having density less than water (i.e. for floating structures). expanded polystyrene is an composed of 98% air and 2% of polystyrene material. with infrastructure development growing and the housing sector booming the demand for cement is also bound to increase. that's why geopolymer is the best replacement for the cement concrete now a days as it is innovative and eco-friendly construction material.

Keywords– expanded polystyrene, cement, fine aggregate, coarse aggregate, geopolymer concrete processed fly ash, sodium hydroxide.

I.INTRODUCTION

Now a day's concrete is one of the mostly used material in construction industry. Concrete can be defined as composite mixture of cement, sand, aggregate and water. In order to reduce the self weight of the structure lightweight concrete can be used instead of conventional concrete.(2) Lightweight concrete can be used in construction of jetty and in temporary floating structure. It can be also used in construction of partition walls and panel walls in frame structure.(1) Lightweight concrete produced with the replacement of coarse aggregate with thermocol in standard proportion.(4)

Fig. 1 Expanded polystyrene (4)

Geopolymer is produced from the waste materials i.e. waste fly ash from thermal industry and waste water from chemical refineries. As geopolymer replaces the cement in concrete so the production of cement shall be reduced and the pollution is also reduced.(5) Cement production generates carbon-di-oxide ,which pollutes the atmosphere and the waste water from the chemical industries discharged into groundwater, so to overcome such pollution geopolymer can be used instead of cement. Geopolymer technology is most advanced in precast application due to the relative ease in handling sensitive material like high alkali activating solution.(6)

Fig. 2 Fly ash (5)

II. LITERATURE REVIEW

Study on floating concrete by using lightweight aggregates is done. Cubes are casted and size is taken as 15cm X 15cm X 15cm. Compression test is conducted on the concrete cubes after the 7th day of the curing. For mix design M20 grade of concrete with nominal mix proportion are used. In this study he observed that it is possible to produce the lightweight concrete with adequate strength by using pumice stone as aggregates. (1)

Study on lightweight concrete by replacing coarse aggregates with thermocol beads is done. Compressive strength test is conducted on the cubes of the concrete which is casted by using different proportions. In this water cement ratio of 40% is maintained throughout the mixing process. (2)

The study on properties of concrete such as density compressive strength and splitting tensile strength of lightweight (Expanded Polystyrene)beads concrete is done. He made three types of mixes in which first was 0% aggregates, second 0% aggregates but expanded polystyrene content changed less and in third aggregates and EPS changed .Testing of concrete sample was done by UTM(Universal Testing Machine) and split tensile strength test is also done to determine the load at which cracks occurred. (3)

The experimental study on lightweight concrete by partial replacement of fine aggregate using fly ash and adding thermocol is done. By conducting workability test and compressive strength test the strength is checked. He made the five types of the mix proportions in which first is o% fly ash and thermocol , second is 20%fly ash and aggregates and 0.1%thermocol where the next three proportions are varying by adding 20% to each fly ash and aggregates and thermocol by adding 0.1% to each.. After the 28 days so curing period it is observed that the strength of concrete at partial replacement with fly ash and thermocol is increased compared to the normal concrete mix. In this they concluded that the concrete with partial replacement of fine aggregates with thermocol and fly ash can be float on water as it possess the low density than water. (4)

Evaluation of strength of geopolymer concrete by using oven curing method is done. They studied the strength on geopolymer concrete by using oven curing. In this study geopolymer concrete is being prepared by mixing sodium silicate and sodium hydroxide with processed fly ash. The concrete is cured at different conditions and different temperatures i.e. 60 to 120 degree C. so as to increase the strength of concrete. Compressive strength test is conducted at different temperature i.e. at 60, 90 and 120 C. (5)

Study on fly ash based geopolymer concrete using admixtures is done. Firstly they prepared the alkaline solution and then mixing of geopolymer concrete is done. After that cubes are casted and the strength is checked by compressive strength test. They observed that the compressive strength is increased with the increase in the molarity of sodium hydroxide. (6)

III. CONCRETE MIX DESIGN

Typical Mix design M20 calculations per unit volume of concrete :-

a. volume of concrete = $1m^3$
b. volume of cement = $0.127m^3$
c. volume of water = $0.197m^3$
d. volume of aggregates = $0.676m^3$
e. weight of coarse aggregates = 1159.61 kg
f. weight of fine aggregates = 669.527 kg

IV. TESTS TO DETERMINE COMPRESSIVE STRENGTH

Concrete cube casting will be in laboratory and tests will be conducted using compression testing machine after 28 days of curing. Load should be applied gradually at the rate of 140kg per cm^2 per minute till the specimen fails. Load at the failure, divided by the area of specimen gives the compressive strength of concrete.

V. LITERATURE OUTCOME

Lightweight concrete has low density than water and desirable strength as compared to conventional concrete. Different variations in proportions give varied strengths. Higher curing temperature resulted in larger compressive strength in geopolymer concrete. Increased molarity of sodium hydroxide results in larger compressive strength**.** By using fly ash as ingredient in concrete which enhance properties of concrete and utilization of fly ash which is helpful for consumption. Due to use of cement, cement industries are polluting environment, to avoid these here they introduce fly ash.

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REFERENCES

1. Arpit Sharma “Floating concrete by using light weight aggregate” international journal of current research VoL 9, ISSUE,05,pp.49842-49845(May 2017).
2. Er. Arvind Singh gaur Study on light weight concrete (engineering and technology journal ISSN:2456-3358) Volume 2 Issue 9 (Sept. 2017)
3. Aman Mulla “Lightweight Expanded Polystyrene Beads Concrete” International Journal of Research in Advent Technology , VoL 3 pp: 2321-9637.(March 2016)
4. Dr. G. Elangovan Dean (sept.2015) study on lightweight concrete by partial replacement of fine aggregate using Fly Ash and adding thermocol. International Journal on Engineering Technology and Sciences- IJETS Volume 2, Issue 9,September-2015.

5. Prof. P. K. Jamdade1, Prof. U. R. Kawade Evaluate Strength of Geopolymer Concrete by Using Oven Curing IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) Volume 11, Issue 6 Ver. V (Nov- Dec. 2014), PP 63-66
6. S. Jaydeep1, B.J. Chakravarthy Study On Fly Ash Based Geo-Polymer Concrete Using Admixtures International Journal of Engineering Trends and Technology (IJETT) – Volume 4 Issue 10 - Oct 2013 ISSN: 2231