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A LITERATURE REVIEW ON LIGHT WEIGHT CONCRETE USING WASTE MATERIAL

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Abstract: - Now a day's number of researches have been done on lightweight concrete but in this research we have tried to make a concrete having possible lesser density and higher compressive strength using waste and eco-friendly material like EPS beads , Rice Husk Ash , Fly Ash. These three materials are easily available and easy to use. In this research coarse aggregate are replaced with EPS beads with different percentage by weight/Volume and fine aggregate is replaced with fly ash and rice husk ash. With use of EPS beads in concrete it will gives a insulation against sound as well as heat. Total cost of construction will be reduced as we are using waste materials to make concrete.

Keywords: EPS beads, Rice Husk Ash, Fly Ash, and Light weight concrete, Compressive strength

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INTRODUCTION

Light weight concrete is defined as the concrete having density less than 1800 Kg/m^3 and greater than 400 kg/m^3 [1] which is much less than regular concrete this type of concrete having advantages like lesser dead weight which results in ease of construction of any structure and easy to transport. This type of concrete also reduces the overall coast of construction. The use of lightweight concrete is spreads across number of several countries like USA, UK and India. Normally replacement of Coarse aggregate by EPS beads results into the lesser compressive strength of concrete so in this particular research minimum quantity of EPS beads have been founded to achieve maximum compressive strength with minimum density of concrete . As this research done with use of maximum waste material so the particular concrete will be made at lesser coast than other light weight concrete. The waste materials used in this research are eco-friendly so impact of this concrete on environment will not be harmful.

II. Review of Literature

S. G. Park & D.H. Chisholm concludes that Polystyrene aggregate concrete is very prone to segregation. Placing and compacting the polystyrene aggregate concrete can be quite difficult. Polystyrene aggregate concrete with densities less than 1000 kg/m3 has very low strength for the quantity of cement that it contains. The mean 28-day compressive strength results ranged from 0.7 MPa for the P600 mix to 6.7 MPa for the P1000 mix.[2]

H j h Kamsiah & Mohd. Ismail(2003) determines that The initial findings have shown that the lightweight concrete has a desirable strength to be an alternative construction material for the industrialized building system. The strength of aerated lightweight concrete is low for lower density mixture. This resulted in the increment of voids throughout the sample caused by the foam. Thus the decrease in the compressive strength of the concrete. The foamed lightweight concrete is not suitable to be used as non-load bearing wall as the compressive strength is 27% less than recommended. Nevertheless the compressive strength is accepted to be produced as non-load bearing structure.[3]

Tengku Fitriani & L. Subhan (2006) Expanded polystyrene beads are waste material from packaging industry that can create disposal problem. However, despite its disadvantages as chemical material, polystyrene beads can be used as lightweight concrete making material and environmentally save. Utilizing crushed polystyrene granules in concrete is a valuable waste disposal method. Light weight high strength concrete produced has applied in lots of countries around the world, mostly for non-load bearing structures. Significant researches are

continuously done to improve the quality of lightweight high strength concrete with expanded polystyrene beads.

M. H. Ahmadn , L. Y. Loon , R. C. Omar, M. A. Malek, N. M. Noor, S. Thiruselvam (2008) determines that 1. FIP Lightweight Mix design produces better compressive strength at 28-days compared to Advanced DOE Methods.

2. Lightweight Styrofoam concrete series with 10% fly ash replacement in cement content produce higher compressive at 28-days than other PFA replacement level

3. 10 square mm lightweight Styrofoam concrete produces higher compressive strength at 28-days

Compared to 20 square mm Styrofoam aggregates used.

4. There is no single mix design can produce compressive strength more than 17 N/mm2 to be used as structural members.[4]

5. The Styrofoam need to be treated before it might be suitable for structural purposes applications.

Henry G. Russell (2009) for the articles of the AASHTO LRFD Bridge Design Specifications discussed in this paper,

The existing provisions are generally adequate for the design of lightweight concrete members with concrete compressive strength up to 10.0 ksi. Refinement of some provisions would

Improve their consistency and accuracy.[5]

Serkan Suba(2009)it was determined that density increased by an average ratio of 3%;porosity decreased 24%; ultrasonic pulse velocity increased 3%; compressive strength increased 8%; and split tensile strength increased 9% for the con-crates With various cement contents**.**[6]

Jorge A. Tito , Luis Hernandez, Jaime Trujillo (2010) Lightweight concrete is used to construct a segmental bridge, which is a project for students of Structural Analysis and Design of the University of Houston Downtown. The lightweight concrete is done with expanded shale and clay, an industrial material provided by a local industry. As part of the student project, the most important properties of the aggregate are obtained in the laboratory and used for the trial mix design. The resulting concrete has a density of 112 lb/ft3, design strength of 9,000 psi, and modulus of elasticity of 3'700,000psi, values that compare well with the literature. A total of 23 ft3 is prepared in the laboratory to make the 21'3"long post tensioned beam.[7]

Dr. N. Arunachalam , V. Mahesh P. Dileepkumar ,V. Sounder (2012) 1. 1:6 mix proportions gives more compressive strength than the other two mix proportions in both the cases with quarry dust and sand.

2. Compressive strength decreases as aluminum powder is increased.

3. The use of aluminum powder decreases the dead weight and the strength of the concrete as compared to normal concrete.

4. The ultimate strength of LWC is of the range between 3N/mm2 – 10.5N/mm2 for sand mixes and 3N/mm2 – 7N/mm2for quarry dust mixes with different aluminum content.

5. Compared with quarry dust mixes, sand mixes gives more strength.[8]

B. A. Herki, J. M. Khatib, E. M. Negim(2013) This research concludes that There is a tendency for the compressive strength and UPV to decrease when natural sand and Portland cement are replaced with the increasing amount of Stabilized Polystyrene aggregate and fly ash, respectively.

AnanyaSheth, AnirudhGoel, B.H.VenkatramPai(2014) Greater surface area of the aggregate provides a larger area for bonding contact with the cement paste. Therefore, the strength of the concrete matrix will be higher. A smaller sized aggregate would yield greater surface area and hence would provide more surface for coating with binders. Thus, the usage of smaller size aggregates of styrofoam is preferable. Moreover, due to the structure of the Styrofoam cubes, the compressive strength at the corners was observed to be stronger and the faces notably remained soft. The highest compressive strength was obtained using minimum RHA content with the minimum Styrofoam content of size roughly 10 cubic mm. However, all the Styrofoam concrete series exhibited lower strength compared to the standard concrete mixture referring to the available literature. The concrete mixes under consideration produced strength in the range of 17-26 MPa at 7-days which is beyond the minimum requirement for structural lightweight applications.[9]

Dr. V. Bhaskar Desai, Mr. A. Sathyam(2014) 1. From the study it is concluded that the cube compressive strength is decreased continuously with the increase in percentage of cinder and also the percentage of decrease in cube compressive strength is increased continuously with increasing cinder. However even with 75% replacement of conventional aggregate by cinder aggregate more than target mean strength of concrete is achieved.[10]

2. From the study it is concluded that the cylinder compressive strength is decreased continuously with the increase in percentage of cinder and also the percentage of decrease in cylinder compressive strength is increased continuously with increasing cinder.

B. Singh, M. Gupta , Monika Chauhan , S. K. Bhattacharyya Results indicate that expanded polystyrene beads can be effectively used as part replacement of the normal aggregates in making lightweight geopolymer concrete indifferent densities. The mix was cohesive with SBR latex pre wetted EPS beads. The floating and segregation of EPS beads can be minimized by using low slump of mix and fast setting of geopolymer with hardener.

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