

Experimental Study on Light Weight Aggregate in Concrete

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Abstract:- Lightweight concrete can be defined as a type of concrete which includes an expanding agent in that it increases the volume of the mixture while giving additional qualities such as lessened dead weight. It is lighter than the conventional concrete. The use of lightweight concrete has been widely spread across countries such as USA, United Kingdom. The main specialties of lightweight concrete are its low density and thermal conductivity. Its advantages are there is a reduction of dead load, faster building rates in construction and lower haulage and handling costs. Lightweight concrete maintains its large voids and doesn't form laitance layers or cement films when placed on the wall. Lightweight concrete can be manufactured by using several lightweight materials instead of coarse aggregate which forms the major dead load. The lightweight material used in this project is Light Expanded Clay Aggregates (LECA) 2-8 mm. The coarse aggregate is fully replaced and replaced 50% by Light Expanded Coarse Aggregates. This concrete is used in the earthquake resistant structures because the dead load plays major role in the depth of destruction. One of the advantages of using light weight concrete is it will lead to reduction of sizes of corresponding structures and hence the project cost is considerably reduced. In this project, we have casted cubes for checking compressive strength, split tensile strength and flexural strength respectively for 28 days and 7 days.

1 INTRODUCTION

Light weight expanded clay aggregate is made by heating clay to around 1200 degree celsius in kiln. LECA was first developed in Kansas in 1917 following which gravelite, perlite, rocklite etc were developed. Their sizes vary from 0.1mm to 25mm and densities of 250, 280, 330 and 510 kg/m³. The positive characteristics of LECA are lightness, thermal insulation, moisture impermeable, incompressible under permanent pressure, fire resistant, easy movement and transportation. LECA used in structural backfill against foundations, retaining walls, bridge abutments etc., in

addition it can reduce earth pressure by 75% compared with conventional materials, and also increases ground stability while reducing settlement. LECA is also used in water treatment facilities for the filtration and purification of municipal wastewater and drinking water as well as in other filtering processes, including those for dealing with industrial wastewater and fish farms.

2 EXPERIMENTAL PROCEDURE

Mix Design: The proportions for normal mix of M35 Normal Mix are 1:1.6:3 with water cement ratio 0.45. In the present study method for mix design is the Indian Standard Method. But there is no proper IS code provisions for light weight concrete. So we designed the mix proportion for light weight concrete according to ACI 211.2.

Compressive Strength Test: The compressive strength was evaluated as per the test procedure given in Indian Standards IS.516. For the evaluation of compressive strength, all the cube specimens of size 150x150x150 mm were subjected to compressive load in a digital compression testing machine with a loading capacity of 2000 kN. Specimens were placed in the machine in such a manner that the load shall be applied to opposite sides of the cubes as cast, ensuring that it is not from top to bottom. The load was applied at a rate of 14 N/mm²/min until the specimens attain a stage of breaking point. The maximum load applied to the specimen was recorded.

Split tensile strength test: Split tensile strength was evaluated as per the test procedure given in Indian Standards IS.5816. In order to evaluate the splitting tensile strength of lightweight concrete, all the cylinder specimens were subjected to split tensile strength test in a digital compression testing machine. Specimens of 150 mm diameter, 300 mm height were placed in the

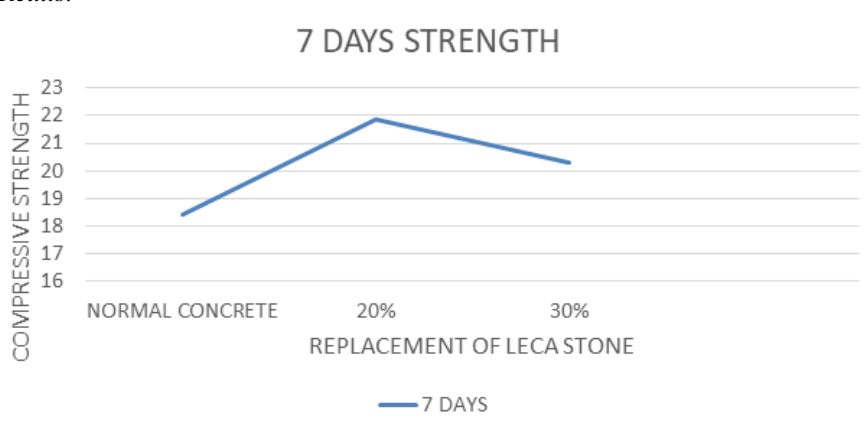
machine in a horizontal manner in between the two parallel steel strips one at top and another at the bottom such that the load shall be applied along the whole 300 mm length. The load was applied at a rate of 2.4 N/(mm² /min) until the specimen failed. The maximum load applied to the specimen was recorded.

concrete was determined using specimens by subjecting them to single point bending in Universal Testing Machine having a capacity of 400 kN. Specimens of 100 x100x500 mm were placed in the machine in such a manner that the load shall be applied to the uppermost surface. The load was applied at a rate of 1800 N/min until the specimen failed. The maximum load applied to the specimen was recorded.

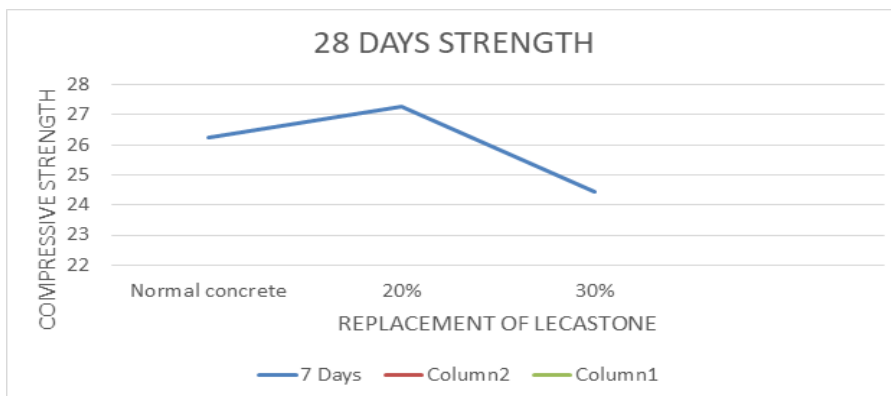
Flexural strength test: Flexural strength of light weight

3 RESULT:

Compressive strength Results:

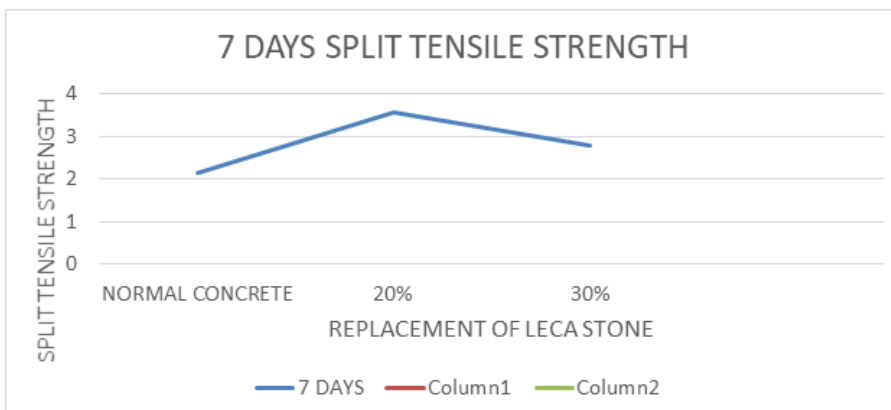


Graph 1. Graph showing compressive strength of specimens with 20 and 30 percent replacement of aggregate

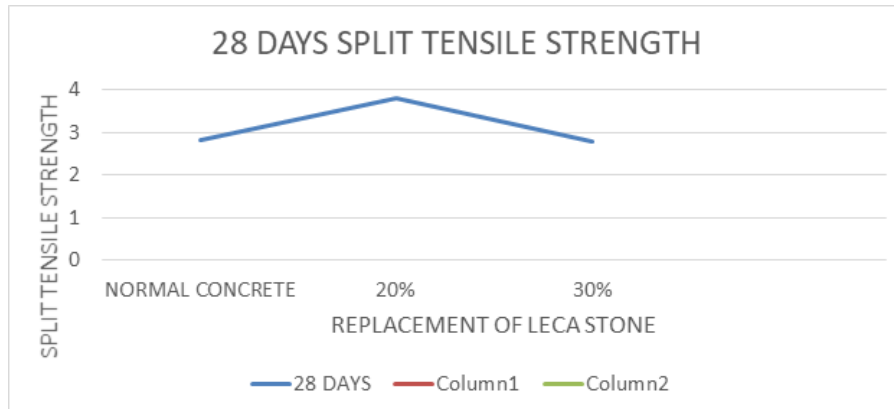


Graph 2. Graph showing compressive strength of specimens with 20 and 30 percent replacement of aggregate

Split Tensile Strength Results:



Graph 3. Graph showing split tensile strength of specimens with 20 and 30 percent replacement of aggregate



Graph 4. Graph showing split tensile strength of specimens with 20 and 30 percent replacement of aggregate

4 CONCLUSION:

Occured results are reducing when we reduce the usage of coarse aggregate in concrete . But for partial replaced concrete the values obtained are nearly satisfactory. So we conclude that, if the percentage of replacement of LECA material is reduced, the satisfactory results will be obtained.

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