International Journal of Advance Research in Science and Engineering
Volume No.07, Issue No.10, October 2018
www.ijarse.com
IJARSE
ISSN: 2319-8354

Study of Lightweight Concrete

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ABSTRACT

The main objective of this project is to compare normal concrete with the lightweight concrete and simultaneously motivate the people about light weight concrete. This focuses on tests such as Compressive test, Water absorption, and flexural test only. The results obtained are interesting and useful to compare the results with that of traditional concrete. The main features of this concrete is to low density and thermal conductivity, Ultimately there is reduction of dead load, faster building rate in construction and lessen haulage and handling costs.

KEYWORDS-: *Lightweight concrete, Comparative Study, Advantages and Disadvantages, Applications*

I.INTRODUCTION

Since concrete is the major building material, there is wide scope in innovation of concrete. "Lightweight concrete can be defined as a type of concrete which includes expanding agents in that it increases the volume of mixture". The study of light weight concrete plays very important role in development of construction field. The light weight concrete is the better option for the replacement of conventional concrete since it is a light weight which helps in economizes the structural design. The densities of lightweight concrete varies between 300- 1800 kg/m3.The main objective of this paper is to aware the people about Lightweight concrete and how is the Lightweight concrete is better option over conventional concrete.

M. A. Caldarone and R. G. Burg (5), Structural lightweight concrete is defined as concrete made with low-density aggregate having an air-dry density of not more than 115 lb/ft3 (1850 kg/m³) and a 28-day compressive strength of more than 2500 psi (17.2 MPa). This paper presented the test results of very low-density structural lightweight concrete mixtures developed in the laboratory for the purpose of finding a suitable mixture for use on a historic building rehabilitation project. Mixture parameters included a specified compressive strength of 3000 psi at 28 days and an air-dry density approaching 70 lb/ft3. Various constituent materials, mixture proportions and curing methods were examined. The result of this research exemplifies the feasibility of achieving very low densities with structural concretes. Watekins and Liu (6) conducted the finite element analysis technique simulating in-plane shear mode, Mode II, was used to analyse fracture behaviour in a short shear beam specimen in plain concrete and fracture toughness, KIIc values were determined. P.S. Raghu prasad, et.al (4), concluded that with the advent of industrial revolution and mass construction in various parts of the world, the pollution levels and the scarcity of materials have reached the peak. The coarse aggregate in the

conventional solid concrete blocks were replaced partially with cinder (12 mm) and tested for compressive strength at the age of 3 days, 7 days and 21 days. From the results of investigation, it can be concluded that solid blocks with 15% replacement of coarse aggregate by cinder records more strength that the conventional one.

II.MATERIAL USED

CEMENT - Its going to be the basic component for the production of lightweight concrete and generally Ordinary Portland Cement 53 grade is used.

FLY ASH - Fly ash is used which is collected from Thermal Power Station with specific gravity 2.56 and fineness 3.5%

WATER – Water should be avoided if it contains large amount of suspended solids, or appreciable amount of organic materials

FOAMING AGENT – They are mainly used for reducing the density of concrete mixture

QUARRY DUST - Quarry dust is collected from nearest crusher plant.

III.TESTING PROGRAM

In order to study the behaviour of lightweight concrete, normal concrete testing will be done to determine the material and structural properties of each type of lightweight concrete and how will these properties differ according
to a different type of mixture and its composition. Once concrete has hardened it can be subjected to a wide range of tests to prove its ability to perform as planned or to discover its characteristics. For new concrete this usually involves casting specimens from fresh concrete and testing them for various properties as the concrete matures.

IV.METHODOLOGY

Compressive Strength:

Compressive strength is the primary physical property of concrete (others are generally derived from it). Compressive strength is one of the most basic properties used for quality control for lightweight concrete. Compressive strength may be defined as the measured maximum resistance of a concrete specimen to axial loading. It is originate by computing the uppermost compression stress that a test cylinder or cube will support.

There are three types of test that can be used to determine compressive strength; cube, cylinder, or prism test. The 'concrete cube test' is the most familiar test and is used as the standard method of measuring compressive strength for quality control purposes (Neville, 1994) [3]. The test for determining the compressive strength is going to be done.

Water Absorption:

These properties are particularly important in concrete, as well as being important for durability. It can be used to predict concrete durability to resist corrosion. Absorption capacity is a measure of the porosity of an aggregates; it is also used as a correlation factor in determination of free moisture by oven-drying method. The absorption capacity is determined by finding the weight of surface-dry sample after it has been soaked for 24 hr. and yet again verdict the weight after the sample has been dried in an oven; the difference in weight, expressed as a percentage of the dry sample weight, is the absorption capacity. The test is intended as a durability quality control check and the specified age is 28-32 days. Test procedure has been described in IS 456 2000 [4].

Density:

The density, or more precisely, the volumetric mass density, of a substance is its mass per unit volume. The study of density of lightweight concrete leads important role in understanding the effect on strength, durability and resistance to permeability. For the determination of density of lightweight concrete, firstly weight the sample using weighing scale. After that get the average weight of at least 3 samples. Finally find out the density using known formula-

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}} \ \text{Kg/m}^3$$

Flexural strength :

Flexural strength which is also known as fracture strength, modulus of rupture or bend strength. Simply flexural strength is ability of material to resist deformation under loading. It is measured in terms of stress. Test is conducted as the test specimen is placed centrally on two roller supports and load is applied through another roller, taking care not to cause local failure. The transverse load is applied at a uniform rate not exceeding 300 N/min through the central roller. The individual breaking load is recorded and flexural strength is calculated using pure bending equation [5].

V.PREPERATION

The production of lightweight concrete can be described in 3 ways -:

1) The first is so-called no fines, where the fine portion (sand particles) of the total concrete aggregate is omitted.

2) The second method is by introducing stable air bubbles inside the concrete body through mechanical foaming and chemical admixture. This type of concrete is known as aerated, cellular or gas concrete

3) The third and most popular method is by using lightweight aggregate. This may come from either a natural or an artificial source

VI.CONCLUSION

Light Weight Concrete is becoming very popular day by day. In this project the performance of Light Weight Concrete obtained from mixing fly ash and aerating agent (Kemilite-PR-Protein Based Foaming Agent) in conventional concrete will be analysed. Finally, the results obtained are going to be published. Jain and Chopra concluded that lightweight concrete can be used to reduce the cost of construction but only in those areas where the intensity of load is less because the compressive strength of LWC is inferior than the normal concrete. But as per the results stated above the density of LWC is also less which results in reduction of transportation cost and makes the handling easier Fire resistance of this type of concrete is much higher than conventional concrete so it can be used in those areas where high fire resistance is required.

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