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LIGHT WEIGHT CONCRETE

Miss Akshata A Mulgund[1], Dr. Dilip K Kulkarni[2]

[1]Asst Professor, Civil Engineering Department. S G Balekundri Institute of Technology. Belagavi, Karnataka. India
[2]Professor,Civil Engineering Department. S D M College of Engineering and Technology. Dharwad. Karnataka. India.

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1. INTRODUCTION

Density of the normal concrete is 2200 to 2600 kg/m^3. This weight will make it an uneconomical structural material. Attempts have been made in the past to reduce the self weight of concrete to increase the efficiency of concrete as a structural material. The light-weight concrete is a concrete which has a density of 300 to 1850 kg/m^3 .There are many advantages of having low density. It helps in reduction of dead load, increases the progress of building. The weight of a building on the foundation is an important factor, in case of weak soil . Floors and walls if made up of LWC will result in economy. It has low thermal conductivity, which improves with decreasing density. Buildings where air-conditioning is required the use of LWC with low thermal conductivity will be appropriate. The use of LWC uses industrial wastes such as clinker, fly ash, slag etc. There is only one method for making LWC i.e., by the inclusion of air in concrete. It can be done by three different ways.

(a) By replacing the usual mineral aggregate by light-weight aggregate.

(b) By introducing gas or air bubbles in mortar - Aerated concrete.

(c) Without sand fraction - 'No-fines' concrete.

2. Types of LWC

1.Light Weight Aggregate Concrete

2.Aerated Concrete

3.No Fines Concrete

1.1 Light Weight Aggregate Concrete:

Light weight aggregate concrete are of two types:

a) Natural

b) Artificial

Natural lightweight aggregates are Pumice, Diatomite, Scoria, Volcanic cinders, saw dust, rice husk.

Artificial lightweight aggregates are Artificial Cinders, Coke breeze, Foamed slag, Bloated clay, Expanded shales and slate, Sintered Flyash, Exfoliated Vermiculite, Expanded Perlite, Thermocole beads.

Different light-weight aggregates have varying densities. By using expanded perlite , a concrete of density as low as 300 Kg/m^3 can be produced, and by the use of expanded slag, sintered fly ash, bloated clay etc., a concrete of density 1900 kg/m^3 can be obtained. The strength of the light-weight concrete may also vary from about 0.3 N/mm^2 to 40 N/mm^2.

1.2 Aerated Concrete:

Aerated concrete is prepared by inclusion of air or gas into a mix containing Portland cement or lime and finely crushed siliceous filler so that when the mix sets and hardens, a uniformly cellular structure is formed. It is a mixture of water, cement and sand. It is also called as gas or foam concrete.

There are several ways in which aerated concrete can be manufactured.

(a)By the formation of gas

(b)By mixing foam

(c)By using finely powdered metal (usually aluminium powder) with the slurry and made to react with the calcium hydroxide liberated during the hydration process, to give out large quantity of hydrogen gas. This hydrogen gas when contained in the slurry mix, gives the cellular structure. Powdered zinc , Hydrogen peroxide and bleaching powder can be used. In the second method,foam is mixed with cement and sand resulting in the cellular structure, after setting. Air entrained agent can also be used to introduce cellular aerated structure in the concrete.

1.3 No-fines Concrete

The third method of producing light concrete is to prepare concrete without fines. No-fines concrete as the term implies, is a kind of concrete in which the FA is not used. This concrete is made up of only coarse aggregate, cement and water. Only single sized CA is used. The practice of using preformed foam with slurry is limited to small scale production. But the advantage is that any density can be made in this method. Gasification method is used.

3. PROPERTIES OF LIGHT WEIGHT CONCRETE

1. Compressive strength
2. Modulus of Elasticity and Poisson's Ratio
3. Water absorption and moisture content:

4. Creep and Shrinkage
5. Durability, Thermal conductivity

ADVANTAGES

1) Reduction in weight from 10% to 87% can be achieved.

2) Lower dead weight.

3) It is possible to add fibers to the foam Mix to obtain lightweight composite concrete.

4) The local industrial waste, can be used.

5) It results in the reduction of cost of about 30 to 40 percent.

6) The LWC has less tendency to spall.

7) Aerated LWC can be sawn, sculptured and penetrated by nails.

8) Compressive strength can be varied.

9)Less water is absorbed.

10) It reduces transport cost.

DISADVANTAGES

The only drawback of LWC is that the depth within which corrosion can occur under suitable conditions is nearly twice than that of NC. Hence, special care has to be taken to provide sufficient cover to reinforcement of the LWC structures for protection against corrosion.

APPLICATIONS

1) Aerated LWC is widely used in the manufacture of single skin lightweight concrete wall panels, employing tilt-up construction.

2) Aerated LWC can be used as a filling material between dense weight concrete to provide insulation.

3) Sandwich panels with various surface materials, using Lightweight Concrete as columns & filler, are gaining increased acceptance for partition walls. centers and internal walls of residential houses and flats.

4) Lightweight Concrete is often specified for use as a lightweight filling material.

5) Lightweight Concrete is also recognized as a cost effective way to rehabilitate old floors.

6) Currently used in the mining industry and applications in sewage lining grouting.

8) Its applications as decorative facades, lightweight garden ornaments, lightweight blocks and reconstituted stone titles.

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