

Study of Light Weight Cellular Block

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Abstract— Light weight cellular concrete is not a new technology, its first use recorded in early 1920s. Its applications are limited due least knowledge about its properties and stability. Light weight cellular concrete is type of aerated concrete having cellular structure in it which makes it lighter, good thermal and sound insulator material. This paper is attention to study the properties, applications and production method of light weight cellular concrete.

Key words: Light Weight Cellular Concrete, Foam Concrete, Foaming Agent, CLC Blocks, Aerated Concrete

I. INTRODUCTION

Light weight cellular concrete is defined as the aerated concrete in which air voids or air bubbles are introduced with the help of air entrainment by using foaming agent or surfactant. Basically foaming agent or surfactant is used to reduce the self-weight of the concrete and makes it lighter than conventional concrete with dry density less than 2000 kg/m³.

It can be produced in wide range of density starting from 400kg/m³ to 1800 kg/m³. The density of light weight concrete below 400 kg/m³ creates instability in the product.

Light weight cellular concrete is a green building produced, which require least energy in the production, uses waste product like fly ash which is basically a byproduct of thermal power plant, huge saving of materials and emits no pollution.

II. MATERIALS

A. Cement:

Cement is the prime ingredient of the light weight cellular concrete which acts as a binder in the mix and also enhances the strength of the product. Generally ordinary Portland cement is used in the production of light weight cellular concrete. Mostly ordinary Portland cement 53 grade is preferred in the production of light weight cellular blocks.

B. Fly Ash:

Fly ash is the byproduct of thermal power plants which is obtains during the combustion of pulverized coal. It is very widely used in the construction processes. It does not have its self cementitious properties but when it reacts with calcium hydroxide at ordinary temperature, makes the compound possessing cementitious properties. A good fly ash possesses high fineness, low carbon content, good reactivity which enhance the quality of the light weight cellular concrete.

C. Water:

Portable water is used to produce the light weight cellular blocks. It is also used to make the solution with foaming agent.

D. Foaming Agent:

Foaming agent is the air entraining agent which is generally a protein based solution comes from animal's protein out of blood and bones of pigs, cows and other remainders of animal carcasses [8].

III. MANUFACTURING PROCEDURE

Light weight cellular concrete is not a concrete because its main ingredients which includes cement, fly ash, water and foaming agent. No coarse aggregate is used so that concrete word is inappropriate.

The manufacturing procedure is totally different from conventional concrete because mix design is not fit for light weight cellular concrete. It's done by trial and error process.

The manufacturing of light weight cellular concrete completes in two phases.

- 1) Preparation of cement based slurry.
- 2) Formation of foam by using foaming agent.

Start with the fly ash and water, mixed thoroughly for few minutes to achieve good consistency. Add cement and mix properly again for few minutes after that the cement based slurry is obtained having homogenous consistency, and the first phase is completed

The second phase is start with protein based foaming agent. The foaming agent is diluted with water (generally the dilution ratio is 1:30 to 1:40) and make the solution. Prepared foaming agent and water solution send into the foam generator which is basically a foam producing unit. Foam generator sucks the solution and compressed air is blown. Compressed air expands the foaming agent when it goes through the foam lance and converted into the stable foam.

Finally, the foam is added into the cement based slurry and mixed thoroughly. Stable foam makes the cellular matrix in it and foamed concrete is prepared.

IV. PROPERTIES OF LIGHT WEIGHT CELLULAR CONCRETE

A. Water absorption

The closed air voids are created into the light weight cellular concrete with the help of foaming agent, due to which the water absorption is very low. Generally it is less than 5% by volume. And it is very less as compare to burnt clay bricks[7].

B. Compressive strength

The compressive strength is influenced by the many factors like density, age and moisture content. There is wide range of density in which the light weight cellular concrete falls; as the density is decreases the compressive strength of light weight cellular concrete also decreases [2]. And as the age increases strength is also increases. The compressive strength is affected by the curing conditions. The compressive strength

is obtained by autoclaving curing is higher as compare to moist curing.

C. Shrinkage

Light weight cellular concrete shrinks during the setting stage, which is also depend upon the many factors like type and amount of cement, density of concrete, water to cement ratio, type of curing method, type of foaming agent, and size of the element [7].

Dry shrinkage generally occurs due to the loss of adsorbed water from the cellular concrete because it's high porosity 40% to 80% [1]

D. Thermal Conductivity

Thermal conductivity is depended upon the density, moisture content and its ingredients [4]. Generally the thermal conductivity is the function of density, so that it does not matter the curing process. The air voids and its distribution critical for thermal insulation [3].

E. Fire Resistance

The fire-resistance of light weight cellular concrete is more than as ordinary dense concrete [5]. The reason behind that is material is homogeneous compare to normal concrete in which the coarse aggregate are responsible for differential rate expansion, cracking [6].

V. ADVANTAGES

- 1) It is light in weight which reduced the self-weight of the structure and also reduced the element size.
- 2) It requires last energy in the production process.
- 3) It uses fly ash, which is the waste produced of thermal power plants, and makes the production economical.
- 4) It is good thermal and sound insulator material.
- 5) It has great advantage in high rise building and structures.
- 6) It is highly workable, self-flowing, and self-compactable.
- 7) It is highly durable against freeze and thaw cycles.

VI. CONCLUSION

Light weight cellular block is relatively a good material, having impressive properties. It can be produced in wide range of density for non-load bearing or load bearing walls as well. Its properties low density, compressive strength, water absorption, thermal insulation, fir resistance and sound insulation are remarkable. Light weight cellular blocks can be the best alternative of burnt clay brick, fly ash brick, and hollow concrete blocks. It is green product and least energy required. It uses the waste industrial products which good for environment and huge saving of material.

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