COST EFFECTIVE BUILDING BY USING FOAM CONCRETE

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ABSTRACT

In India construction progress developed rapidly because more vast area remaining to develop. During developing day's foam concrete is best solution to construct high rise building by cost effectively. Foam concrete is produced by adding foaming agent into the mix proportion.in foam content isolated or circular bubbles, which creates million of unconnected tiny voids in the mix resulting in lighter weight of concrete. A light weight concrete obtain by adding air or other gas into plastic concrete mix. In foam concrete content of mixer cement, foam, fine aggregate without coarse aggregate. In these foam concrete fist of all making a slurry of cement and fly ash or sand and water .by using foam concrete weight of superstructure is reduced. The density of foam concrete is vary in between 300 to 1600 kg/m The foam is advantage sly because its environment friendly material. The reduction of raw material are done; because by adding air enclosed form bubbles. Because of weight reduction cost is reduce automatically. Also Reduction of transportation cost.

Keyword: fly ash, foam concrete,admixture

INTRODUCTION

Concrete known as a common material which is widely used in the construction industry, from basic work to multi-storey building and mega structure. Concrete is a material where mixture by cement, water, and aggregate (fine and coarse) which must be workable, resistance to freezing, chemicals resistance, low permeability, wear resistance, and economy (Metha & Monteiro), (2006) .Lightweight foamed concrete was used nearly a century ago in the special precast application of autoclaved aerated concrete, with the first reported applications being two apparently independent initiatives in 1923, one in Denmark the other in Sweden. In this application, the entrained gases is actually produced by the generation of hydrogen gas using powdered aluminum in a slurry mix made alkaline by the inclusion of Portland cement and sometimes lime addition Benin field et al. Lightweight concrete also know as foamed concrete which is lightweight material formed by entrapping or generating small bubbles of air into Portland cement mix by mechanical or chemical means. Lightweight foamed concrete with density from 400 kg/rn3 to 1800 kg/m3 can be produced strength up to 12Mpa.

The symptoms of light foam concrete are dependent on the mixture design, although there are many common properties which are stable in a series of mixture designs, low weight of weight ratio, permeability, low water absorption, good freeze / thaw resistance, high modulus of elasticity, low Shrinkage, thermal insulating properties, and fire resistance. It is important for determining the performance of light foam concrete by adding different percentages of the light as a sand replacement by the weight of sand and determining the infectious power of it and determining the effect of using different percentages of the lite. Make, as a sand replacement for light foamed concrete

The objectives of this study are: -

i.) To determine the compressive strength of lightweight foamed concrete with different percentage of laterite (LWC-Laterite) as sand replacement.

ii.) To determine the modulus of elasticity of lightweight foamed concrete with different percentage of laterite (LWC-Laterite) as sand replacement.

iii.) To determine the effect of using different percentage of laterite as sand replacement to lightweight foamed concrete.

LITERATURE REVIEW

Rudnai et al., (1963) and Narayanan et al., (2000) stated that lightweight foamed concrete also includes in structural elements, non-structural partitions and thermal insulating materials. Manufacturers developed lightweight foam concretes of different densities to suit the above requirements. The density of lightweight foamed concrete ranges from 300 kg/M3 to 1800 kg/M3 and these products were used in trench reinstatement, bridge abutment, void filling, roof insulation, road sub-base, wall construction, tunneling etc.

According to ***Gao*** etal., (1997) noted that self-weight represents a very large proportion of total load on the structure, and there are clearly considerable advantages in reducing the density of concrete in concrete construction. A decreased Density of concrete for the same strength level permits a saving in dead load for structural design and foundation. Lightweight foamed concrete can be applied in the field of construction such as: in lightweight bricks or blocks for high-rise buildings, in panels and partition walls of various dimensions either pre-cast or poured in place, cast in-place for a unit of low cost terrace houses and bungalows, in all types of insulation works, including cavity walls, in roofing and ceiling panels, in sound proofing application, in pre-cast industrial and domestic building panels, both internal and external, in pre-cast or in place exterior wall facades for all sizes of buildings, in foundations for roads and sidewalks, in sub-surface for sport arenas, e.g. tennis courts.

Kaushal Kishore*, Materials Engineer, Roorkee* Foamed concrete, also called cellular light weight concrete is produced by the mixing of Portland cement, sand including or alone fly ash, water and preformed stable foam. The foam is produced with the help of a foam generator by using foaming agent. The air content is typically between 40 to 80 percent of the total volume. The bubbles vary in size from around 0.1 to 1.5 mm in diameter. Foamed concrete differentiates from (a) gas or aerated concrete, where the bubbles are chemically formed through the reaction of aluminum powder with calcium hydro oxide and other alkalis released by cement hydration and (b) air entrained concrete, which has a much lower volume of entrained air is used in concrete for durability.

Curing of foamed concrete unit may be done as per IS: 456-2000. Curing can be speeded up by steam. Foamed concrete may be produce by mixing the above mentioned ingredients in ready mix plant or ordinary concrete mixer. Foamed concrete is self-compacting concrete requires no compaction, and will flow readily from a pump outlet to fill mould, form, restricted and irregular cavities. It can be pumped successfully over significant height and distances. The 28 days strength and

dry density of the material vary according to its composition, largely its air voids content, but usually they range from 1.0 to 25.00 N/mm2 and 400 to 1800 kg/m3. The plastic density of the material is about 150 to 200 kg/m3 higher than its dry density.

METHODOLOGY

1) Constituents of base mix

a) Ordinary Portland cement, Rapid hardening Portland cement and, high alumina and Calcium Sulfo aluminate have been used for reducing the setting time and to improve the early strength of foam concrete. b) Fly ash and ground granulated blast furnace slag have been used in the range of 30–70% and 10–50%, respectively and as cement replacement to reduce the cost, enhance consistence of mix and to reduce heat of hydration while contributing towards long term strength. c) Silica fume up to 10% by mass of cement has been added to intensify the strength of cement. Alternate fine aggregates, viz., fly ash and lime, chalk and crushed concrete , recycled glass, foundry sand and were used either to reduce the density of foam concrete The water requirement for a mix depends upon the composition and use of admixtures and is governed by the consistency and stability of the mix.

2) Foam

Foam concrete is produced either by :-

a) pre- foaming method

b) mixed foaming method

a) Pre-foaming method comprises of producing base mix and stable preformed aqueous foam separately and then thoroughly blending foam into the base mix.

b) In mixed foaming, the surface active agent is mixed along with base mix ingredients and during the process of mixing, foam is produced resulting in cellular structure in concrete

MAKING OF FOAMED CONCRETE

The components of foam concrete mix should be determined in order of their functional role:

2) Foaming agent
3) Binding agent
4) Water
5) Fine Aggregate
6) Admixtures

MAKING THE SLURRY

a) The cement used for the slurry is usually Type 1 Portland Cement although other cements can be used. If sand is specified in the mix design ideally it should be fine with 2mm maximum size and 60 to 90% passing through a 600 micron sieve(8).

b) The water/cement ratio of the slurry is usually between 0.5 and 0.6. If necessary more water can be added to increase the workability.

c) The slurry can be made using a ready mix truck mixer. Firstly, the cement mortar slurry is made at the batching plant, according to the mix design, by either the DRY or WET method.

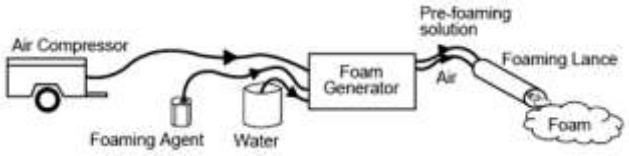

Fig : foam concreting method

RESULTS AND DISCUSSIONS

Resistance to aggressive environment

A) Foam concrete mixture which is made on low density, keeping in mind the initial penetration, absorption and depth of absorption rate, good
freeze-thaw resistant
B) Sulfate resistance of foam concrete, suggests that foam concrete is good resistance to invasive chemical attack.
C) A study by Jones and McCarthy on the quick carbonation of foam concrete indicates that there is low density solid carbonate at a relatively high rate
a) Functional characteristics
b) Fire resistance
c) Thermal insulation
d)Thermal insulation
Due to cellular microstructure in foam concrete,
There are excellent thermal insulating properties.
Of Density 1000 kg / m3 the thermal conductivity of foam concrete is recorded as the value of a sixth cement-sand mortar.

i. Fire resistance
ii. Foam concrete is highly fire resistant and well suited for applications where fire is a risk.
iii. Test has shown that in addition to fire protection for long periods of time, intense heat applications, such as high energy flame near the surface, do not have a reason to spell or explode

Sorptivity : The moisture transport phenomenon in porous materials has been defined by an easily measurable property called sorptivity (absorbing and transmitting water by capillarity), which is based on unsaturated flow theory .

Sorptivity of foam concrete is reported to be lower than the corresponding base mix and the values reduce with an increase in foam volume.

CONCLUSION

In the history of the construction industry, lightweight concrete or foamed concrete is a special concrete which can very useful in the construction sector because it is very lightweight and it can compact by itself at each angle of foam work. Many researchers have been done in overseas, and show that foamed concrete is free flowing material which is ideal for wide range of application. Moreover, material used to produce concrete is cheap to normal concrete. The objective of this thesis is to determine strength of concrete by using different material such as super plasticizer and without using super plasticizer follow by mixing by using water and without using water. The addition of chemical admixture such as super plasticizer (in the form of liquid) can help achieve as it can produce mortar of normal workability but with an extremely high strength owing to a very substantial reduction in the water/cement ratio. There are three test that been through at concrete laboratory such as Flow Table Test, Curing Test and Strength test in order to understand and look out character of the concrete. An inspection from this project can show the nature of foamed concrete when strength test will be done.

Advantages of Foamed Concrete

1) The agreement is not done, so no compaction is required.

2) Lightweight - does not apply large loading

3) Free flowing - spreads to fill all voids

4) The spread of excellent load characteristics

5) Once maintained no maintenance is required.

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