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A Study on Floating Concrete by using Light Weight Materials

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***Abstract*: Floating concrete is a special type of innovative concrete whose density is less than 1000 kg/m³. Because of its low density and moderate range of compressive strength, it can be used in non-structural applications as of now. An attempt has been made in this study to develop a Floating concrete based on trials with an emphasis on overall density. Also, attempt has been made to obtain Floating concrete with considerable compressive strength. The primary aim of the project is to develop floating concrete and to achieve this, different mix proportions were adopted based on absolute volume concept. The successfully developed floating concrete was accomplished in different phases. The cement was used in combination with fly ash was in the range of 200-425 kg/m³. In this study, floating concrete was successfully developed for different densities using the ingredients whose specific gravity is less than that in the conventional concrete. Study reveals pumice and Thermocol beads could be successfully used as an alternative to coarse aggregate which in turn results in lower density when compared to conventional material used in concrete.**

***Keywords*: Cement, Fine aggregate, Thermocol, Coarse aggregate.**

1. Introduction

The construction industry everywhere faces the problems and challenges, two-third of the world surface is covered with water. It is therefore not surprising that there has been much activity with concrete in the sea in recent decades. The disadvantage of the conventional concrete is the high self-weight concrete, whereas the density is in the order of 2200 to 2600 Kg/m3. In this technique the self-weight of the concrete is reduce to attain the efficiency of the concrete as structural material. The light weight concrete has the density of 300 to 1850Kg/m3, it helps to reduce the dead weight of the structure.

This Project investigates the properties of the light weight concrete by using a EPS Beads. In this technique the EPS Beads are used for preparation of the light weight concrete and density is reduced to attain the maximum efficiency, whereas the self-weight of the structure is minimized thereby reducing the dead load on structure.

A. Objectives

- Making Boats by using EPS beads as replacement of concrete.
- Optimizing the cost of production.
- Comparison of Floating Concrete Boat with existing conventional boats specially in floods
- Using of Boats with less man power during Floods
- Reuse of EPS beads

2. Methodology and materials

Laboratory investigations carried out on cement, coarse aggregates (Thermocol beads) and also on concrete which are used for test specimens have been presented. This chapter of thesis contains physical properties of various materials used throughout the experimental work.

A. Materials used

The varies materials used in the experimental works are

- Cement.
- Fine aggregate
- Coarse aggregate (thermocol beads).
- Water.
- Admixture.

Cement: Portland cement is the most common type of cement in general usage. It is a basic ingredient of concrete, mortar and many plasters. It consists of a mixture of calcium silicates, aluminates and ferrites. Ordinary Portland cement of 53 grade of Ambuja Cement confirming to IS 12269 standards was used. Test result are taken as it is as given by company. The cement shall be measure on the weight basis each bags weighing 50kg which is equal to 35liters in volume. All standard test shall be carried out to ensure that the cement is of required quality.

Sand: The properties of a specific concrete mix will be determined by the proportion and type of sand used to formulate the concrete. Sand is usually a larger component of the mix than cement. The sand is satisfying all Indian Standard requirement and shall be clean, strong, hard, durable and free from dirt, dust and impurities etc. The sand is natural sand. Particle size shall be 4.75mm maximum. The sand contains more than 4% of dust, clay, etc. It is washed thoroughly before use. Sea sand which contains salts shall not be used. we perform the fineness modulus test on the Sand.

Mesh: Chiken mesh used for giving the tensile strength and bonding to the floating concrete. Chicken wire mesh is formed

by twisting two adjacent wires at least four times, forming a strong honeycomb mesh structure. So, it has a high strength and durability. Even if a place is cut off, it will not lead to the entire chicken mesh structure destroyed. Its hexagonal shape prevents the formation of internal stresses. Due to its flexibility structure, chicken wire is convenient for mounting on curved and angled surfaces. Its other benefits are twisted mesh improved corrosion resistance and no risk of injury at work. As its special physical and mechanical properties, chicken wire is perfectly suited for reinforcement in Floating Concrete.

EPS beads: Expanded Polystyrene (EPS) used in the project was in the form of 'EPS Beads' which is spherical in shape with size varying in between 4 mm to 8 mm in diameter. It is made up of pre-extended Polystyrene globules. It offers a non-hydroscopic and does not readily absorb moisture from the atmosphere. The EPS resin in used for the molding of EPS products. It is manufactured in the form Making of Floating Concrete by Using EPS Beads As Replacement Of Aggregates.

Fig. 1. EPS beads

Water: Water used for the Floating concrete is potable water. This is to ensure that the water is reasonably free from such impurities as suspended solids, organic matter and dissolved salts, which may adversely affect the properties of the concrete, especially the setting, hardening, strength, durability, pit value.

B. Procedure

1) Cube and Cylinder Making

In cube, cylinder and beam chicken mesh is used to achieve tensile strength. The tensile strength is mostly depends on the mix design. But it is affected by several other factors. Such as mixing of concrete, placing of concrete, curing of concrete as well as design we will get desired tensile strength and floating concrete. For knowing Tensile strength, Flexural Strength and Durability Test of concrete, we generally test concrete-cube or concrete-cylinder at laboratory.

We will caste the 9 cube and 9 cylinder specimens were prepared for the project work.

- 150 x 150 x 150 mm standard cubes for compressive strength.
- 150 mm diameter and 300 mm height standard cylinders for split tensile strength.

Material quantity (VOLUME 1 m^3)

- Cement = 280k/m^3
- Fine aggregate. = 693.22 kg /m^3
- Water = 140 kg/m^3
- EPS beads = 9.216kg/m^3
- Water Proofing Solution = 250ml for 50kg cement
- Water cement ratio = 0 .5

2) Quantity for all specimens

- Nine cube
- = 9 x (0.15m x 0.15m x 0.15m) = 0.030375 m^3
- Nine cylinder = 9 x π/4 $(0.15m)^2$ x 0.3 = 0.04771
- Total volume = 0.077m^3
- Cement = 21.75 kg
- Fine aggregate = 53.37kg
- EPS Beads = 709gm
- Water Proofing Solution = 108ml
- Water = 10.78 lit
- Water cement ratio = 0.5

3) Procedures of Making Concrete Cube

Making concrete-cube specimen is simple and it is done in three simple steps.

- Cleaning & Fixing mould,
- Mixing,
- Placing,
- Compacting,
- De-moulding,
- Curing.

3. Results and discussions

A. General

There has been a great need to test concrete before being used in buildings in order to remain safe from disasters. The Floating concrete by using EPS Beads is a new technique so being secure about its performance in practical aspect it is important to perform some regular test on the concrete specimen. To perform the mix design of floating concrete it is also important to perform some of test on the ingredient material also specially the EPS Bead is new material which is used in the concrete so we perform some basic test on the EPS Beads to calculate the unit weight of the EPS Beads.

B. Tests and results

Following are some test that we perform in our project work.

- Density Test on Concrete
- Compressive Tensile strength
- Floating Test
- Density test on concrete

Table 1
Density test on concrete

S. No.	Weight (kg)	Size (m)	Density (kg/m^3)	Avg.
1	2156	0.15 X 0.15 X0.15	653.353	657.27
2	2170	0.15 X 0.15 X0.15	657.575	
3	2181	0.15 X 0.15 X0.15	660.909	

Our investigation aim is to make concrete floatable for that it is necessary to check the density of concrete. For the test three

cubes was casted and their weight is calculated, by dividing this weight by volume we get density.

C. Compressive tensile strength

Compressive strength test of concrete provides an idea about all the characteristics of concrete. By this test one can judge that whether concreting has been done properly or not. Compressive strength of concrete depends on many factors such as water-cement ratio, cement strength, quality of concrete material and quality control during production of concrete etc. Test for compressive strength is carried out on cubes.

For the Compressive strength test we cast nine cubes as per mix design. after demoulding we kept the cubes for curing and perform compressive strength test on every three cubes at 3days,7days and 28 days respectively and we take average of compressive strength for three cube at particular day.

Table 2
Compressive tensile strength

S. No.	Days	Size (m)	Comp strength
1	3 day	0.15 x 0.15 x0.15	2.68 n/mm^2
2	7 day	0.15 x 0.15 x0.15	3.05 n/mm^2
3	28 day	0.15 x 0.15 x0.15	5.2 n/mm^2

D. Floating test

Fig. 2. Floating test

4. Conclusion

This paper presented a study on floating concrete by using lightweight materials.

References

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