

Experimental Study on Mechanical Properties of Floating Concrete

Mr. S.Manishankar¹ Mr.B.Soundarajan²

¹Assistant Professor ²PG Student

^{1,2}Department of Civil Engineering

^{1,2}Mahendra Engineering College, India

Abstract— This project mainly deals the concrete to float in water by using the combination of light weight aggregate and Air entraining agent of Aluminium powder .The main idea of our project is that the light weight aggregate in the concrete reduces the self- weight of the concrete, so that density of the concrete reduces. Hence the density of the concrete is less than 1000kg/m³, the concrete floats in water. For making this type of light weight concrete, we don't know the proportion to be mixed in concrete, So that we have adopted the trial and error method to solve this problem. The density of concrete comes under the limit of 500 to 900 kg/m³. The proper mix design of the floating concrete is not arrived, so we have taken the mix ratio from the help of journals. We have used various materials like Fly-ash, gypsum, Lime powder, Pumice stone, Aluminium powder, Polypropylene, GGBS, Vermiculite, Sand, Cement etc. we have successfully achieved the floating property of the concrete from the combination of below ingredients Cement, Lime powder, Gypsum, Fly-ash, Aluminium powder, Polypropylene, Sand . we have partially replacing the cement by Fly-ash(48%), Lime(17%), Gypsum(6%), and then fine aggregate of the sand is replaced by 50% of polypropylene. We have added air entraining agent of Aluminium powder by 2- 10%. Finally the floating property and the compressive strength of the concrete are tested.

Key words: Floating Concrete

I. INTRODUCTION

This report addresses an engineering consideration for the construction of floating concrete for the reduction in consumption of land. The two-third of the world surface is covered with water and it is not surprising that there has been much activity with concrete in the sea in recent decades. It addresses the procedure of preparation of mix proportion of floating concrete, materials used and various test results of compressive strength at the age of 28 days and the development of water floating type using Aluminium powder as an air entraining agent.

The water floating aerated concrete is made by introducing air or gas into slurry composed of Portland cement and sand, so that when the mix sets and hardens, uniform cellular structure is formed. Thus it is a mixture of water, cement and finely crushed sand. Finally mix fine powder of Aluminium to the slurry and it reacts with the calcium hydroxide present in it thus producing hydrogen gas, thereby increasing the volume-to-weight ratio of the concrete mix. The hydrogen gas foams and doubles the volume of the raw mix (creating gas bubbles up to 1/8 inch in diameter). At the end of the foaming process, the hydrogen escapes into the atmosphere and is replaced by air. This hydrogen gas when contained in the slurry mix gives the cellular structure and thus makes the concrete lighter than the conventional concrete.

II. OBJECTIVE

The current day world is witnessing construction of very challenging and difficult civil engineering structures. This study deals with the development of Floating concrete is made by introducing air or gas into concrete slurry, so that when the mix sets and hardens, uniform cellular structure is formed. Finally to construct floating structures using floating concrete. The main objective of the floating concrete is to increase the resisting capacity of the concrete while the external loads acted on it and to set them in stable condition without disrupting the environmental surroundings. The floating concrete provides the solution for the land reclamation and it also promotes the protection for the coastal area region from the high wave's intensity and therefore minimizing the damage in the coastal body caused due to the intensity of waves.

III. SCOPE OF THE PROJECT

Two-thirds of the world's surface is covered with water. It is, therefore, not surprising that there has been much activity with concrete in the sea in recent decades. Numerous ideas and schemes have been promoted and many have been executed. Following the acceptance of concrete by the oil companies and the success of very large structures in the North Sea, the use of floating concrete structures, i.e. mainly temporarily floating structures, is continually growing. The advantages of floating concrete structures lie in the economy of the materials used (concrete is very well suited to a marine environment), in the fact that it is easy to make concrete structures buoyant in the construction stage as well as permanently and for towing, whereas they are or can be made heavy enough for a safe permanent installation, and in the fact that they can also provide storage space. This study is intended for future development of floating structure. The main scope of study with the floating structure by a precast floating slab on water bodies will be a replacement of over bridge and hanging bridge on the water bodies. The floating slab intended to float above the datum line which should also withstand the water forces. The design load and design criteria are to be observed by experimental analysis.

A. Research Significance:

- To reduce the self-weight of the structure. Constructions on water bodies.
- Used as an acoustic medium.
- Low thermal conductivity.

IV. MATERIALS

We are choosing the project in some light weight aggregate in concrete for that we collect the materials from different areas

- Aluminium Powder (From Jayam Chemicals, Gandhipuram, Coimbatore)
- Plastic (Polypropylene) (From KCT STC Laboratory)
- GGBS (Ground Granulated Blast-Furnace Slag) (Buy From MARK ASSOCIATES, Veerapandi, Tiupur)
- Gypsum (Buy from SHRI BALAJI TRADERS, R.S.Puram, Coimbatore)

A. Casting



Fig. 1: Materials for casting



Fig. 2: Casting of Slab



Fig. 3: Casting of Cube

S.NO	EXPOSURE	PLAIN CONCRETE (minimum cement content kg/m ³)
1	Mild	220
2	Moderate	240
3	Severe	250
4	Very severe	260
5	Extreme	280

Class F = SiO₂ + Al₂O₃ + Fe₂O₃ > 70%

Table 1: Minimum Cement Content as per IS 456- 2000



Fig. 4: Fly Ash



Fig. 5: Lime Powder

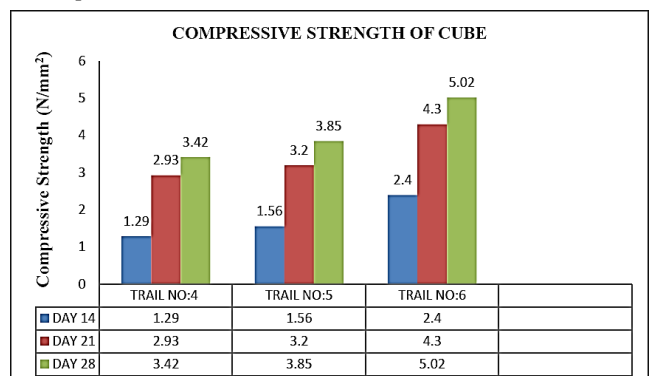
S.NO	Contents	%
1	SiO ₂	52
2	Al ₂ O ₃	36
3	TiO ₂	1.2
4	Fe ₂ O ₃	4.5
5	MnO	0.2
6	MgO	0.3
7	CaO	5
8	K ₂ O	0.5
9	Na ₂ O	0.3
10	pH	6-8

Table 2: Fly ash content

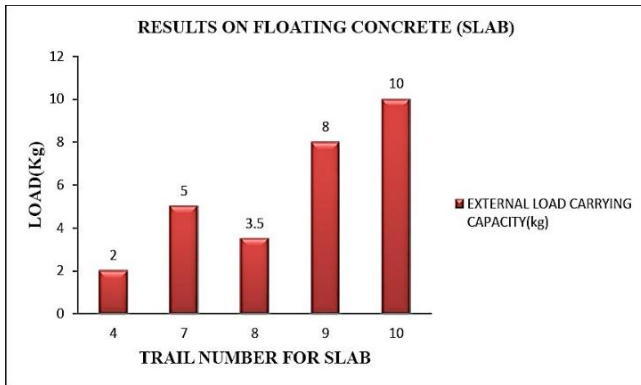
V. RESULTS

S.NO	Contents	%
1	Assay	99.5(min)
2	Arsenic (As)	0.0005(max)
3	Lead(Pb)	0.03
4	Iron(Fe)	0.5

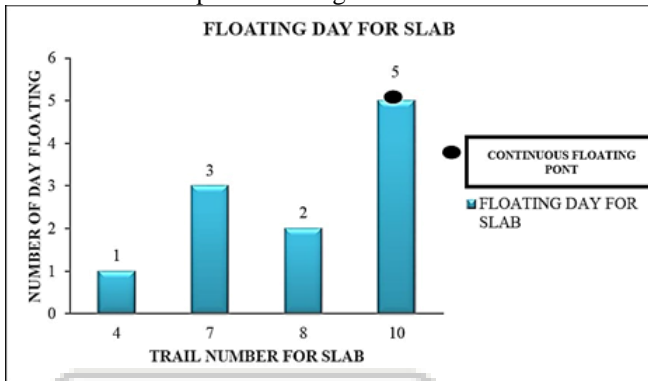
A. Grpahs



Graph 1: Compressive Strength



Graph 2: Floating Concrete Slab



Graph 2: Floating day For Slab

VI. CONCLUSIONS

Based on the study of the literatures and all the references which I have referred to I come to a conclusion that a new type of floating concrete. The aluminium powder used as an air-entraining agent to increase the volume of the concrete by which the concrete becomes light weight and it can float too. Mixing the aluminium powder in the cementsandslurry, the expansion in the volume can be observed. Within 5 minutes it expands by 30%. It consists of many pores and thus is not structurally strong. Other than this the light weight aggregates are also used in the concrete mix to make the density of concrete to become even lighter and the partial replacement of sand used can be polypropylene which reduces the weight of fine aggregate. Moreover, the result showed that it is possible to produce a floating and satisfied strength concrete by using polypropylene as partial replacement of fine aggregate. It was also seen that, using light weight ingredient used in the concrete mixture can reduce the dead load but decreases the concrete strength. However for the trail 6 for cube proportion gives compressive strength 3.90 N/mm², which is good for the light weight concrete having density 573 kg/m³. Finally the next step towards the floating concrete is to increase the concrete strength for resisting the loads acting on it to make the big floating structures.

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