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A Review on Floating Concrete

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A B S T R A C T

Concrete that floats are a fluid mixture with a density lower than water that can be used to construct floating structures, saving land for construction. The process of preparing the mix proportion for floating concrete, the materials utilized, and various test results of compressive strength at the age of 7 days & flow are covered in this project report. Additionally, it shows how this concrete may be used to build canoes along with a lightweight but powerful reinforcement. The canoe can support a certain amount of external load despite its own weight.

Keywords:Floating concrete, Floating Structures, Lightweight and Concrete.

1. INTRODUCTION

Fresh concrete is a formable paste that is easy to pour and shape according to design specifications. It is also non-toxic and workable. Water and Portland cement interact during the hydration process to create a crystalline, long-lasting matrix that holds particles together. The concrete body achieves the peak of its strengths within a few days of being cast, provided that the curing process is managed by a skilled crew in a controlled setting.

A compressive strength of 70 MPa can be easily attained in a precast concrete factory, and many cast-in-situ concrete pieces achieve a compressive strength of 40 MPa or more. Concrete can easily outperform the compressive strength of many naturally occurring rocks.

They deal with difficulties and issues in the building sector. Water covers two thirds of the earth's surface. Therefore, it is not surprising that there have been a lot of physical activities in the ocean recently.The drawback of standard concrete is its weight, which ranges from 2,200 to 2,600 kg/m3 (often 2500 kg/m3). In order to maximize concrete's effectiveness as a structural material, this method reduces the weight of the material. The low density and low heat conductivity of floating concrete are its primary properties.

Fig 1Floating concrete structure

2. MATERIALS USED

Although the cement is somewhat akin to Ferrocement, aluminum wire mesh, which is lighter than conventional chicken mesh, is utilized in place of steel wire mesh to create an inventive product called "Alumni-cement" (Carbon fiber mesh can also replace the aluminum mesh as it is the best among the light weight but strong meshes available). To increase the bonding between particles, pozzolanic Portland Cement (PPC) reinforced with polypropylene fibers was employed, pursuing the following physical & chemical properties:

Physical properties of PortlandPozzolanacement and OPC:

Property	Ordinary Portland cement	Portland Pozzolanic cement
Initial Setting time	Initial setting time is 30 minutes	Initial setting time is 30 minutes
Final Setting time	Final setting time is 280 minutes	Final setting time is 600 minutes
Specific gravity	3.15	2.90
Fineness	225 sq. m/kg	300 sq. m/ kg
Soundness (mm)	10 mm	10mm
Durability	OPC is less durable than aggressive weather	PPC is more durable than aggressive weather

Table-1: physical properties of OPC &Portland pozzolanic cement

Chemical properties of Portland Pozzolana cement and OPC:

Compound	OPC	PPC
Cao	63.0-64.0	40.0-43.0
Sio_2	18.8-19.1	28.0-32.0
Al_2o_3	4.6-6.4	8.3-10.0
Fe_2o_3	3.7-5.2	3.8-6.0

Table-2: Chemical properties of OPC & Portland Pozzolanic cement

2.1. Admixtures:

As an additive for gas formation, fine aluminum powder is employed. Like how baking soda produces fluffiness in a cake, it produces it in concrete. When added to mortar or concrete, this additive reacts chemically with the hydroxides in the cement to produce tiny hydrogen gas bubbles that range in size from 0.1 to 1 mm throughout the cement-water combination. To shorten the setting time of mix, the accelerating admixture used is calcium chloride ($Cacl_2$).

2.2. Mineral additives:

We have created a light weight concrete that is somewhat less strong than regular concrete since its density is lower than that of water. Therefore, nanotechnology is used as a support to get over this problem. It has been discovered that nano-SiO2 with particle sizes smaller than 100 nm increases concrete workability and strength, increases resistance to water penetration, and helps manage calcium leaching, which is strongly related to different types of concrete.

2.3. Water proofing agent:

One of the major requirements of floating concrete is, it should not have any leakage through it. The porosity of the concrete mortar should be equal to zero.

3. PROPERTIES OF FLOATING CONCRETE

1. **Light weight:**

As opposed to 1800 Kg/m3 to 2400 Kg/m3 for ordinary brick and concrete, respectively, the density ranges from 650 Kg/m3 to 1850 Kg/m3. It is robust and long-lasting despite having millions of tiny air-filled cells. The design of the structure benefits from lightness, which reduces the need for foundation and supporting structures. Compressive strength varies from 2.0 to 7.0 N/mm^2.

2. **Excellent acoustic performance:**

It can be utilized for acoustic and sound-barrier purposes. As a result, it is excellent for paneling, floor screens, and roofs in auditoriums.

3. Earthquake resistant:

Since the material is lighter than brick and concrete, its earthquake resistance is increased.

4. Insulation:

Superior thermal insulation qualities in comparison to traditional brick and concrete, which lowers the cost of heating and cooling. Lightweight concrete will result in a structure with a higher fire rating for buildings.

5. Workability;

Lightweight concrete products are simple to assemble and require less trained labor to install. Using common hand tools, common screws, and common nails, the bricks can be sawed, drilled, and moulded like wood. Compared to brick or concrete, it is easier.

6. Lifespan:

Resistant to fire, termites, and the elements.

7. Water absorption:

Reduced water absorption due to closed cellular architecture.

8. Modulus of elasticity:

The modulus of elasticity of the concrete with lightweight aggregates is lower 0.5-0.75 to that of the normal concrete.

4. APPLICATIONS OF FLOATING CONCRETE

- Nowadays mostly the floating concrete are used as break water structures which is low cost and efficient.
- It can also be used as airport runways if there is no enough space and when the airport near to the offshore.
- It can also be used as bed for wind turbines in sea.
- These are used as docks for boats, piers, jetys and other harbor related structures.

5. CONCLUSION

Building constructions like slabs, barges, buildings, etc. can be successfully constructed with floating concrete. Since the majority of the earth's surface is covered by water, using this technology to build boats instead of using wood or metals reduces the amount of land needed for building.

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