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Research Paper on Floating Concrete

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Abstract

Floating concrete is a fluid mixture of density less than water, which is suitable to build floating structures, reducing the consumption of land for buildings. This project report addresses the procedure of preparation of mix proportion of floating concrete, materials used & various test results of compressive strength at the age of 7 days & flow, for acceptance of this concrete. Also, it presents an application of this concrete for canoe construction along with a light weight but, strong reinforcement. Despite the self weight of the canoe, it can bear a certain amount of external load.

- **INTRODUCTION**

What is concrete? (Conventional & Floating Concrete)

Concrete is the most widely-used composite material in the construction industry. It is durable, weather-resistant, environmentally neutral and economically affordable.

There are many types of concrete each designed for fulfilling specific technical, structural and aesthetic requirements. In the broadest definition, concrete is a mixture of Portland cement, aggregate (gravel and sand) and potable water.

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Fresh concrete is a workable, form-able, non-toxic paste that can be easily poured and formed as per design requirements. During the hydration process, the water reacts with Portland cement to form a crystallized and permanent matrix holding aggregates together. In few days after casting the concrete, the concrete body reaches the pick of its strengths provided curing process is supervised by experienced and trained team in a conditioned environment.
Concrete compressive strength can easily surpass the compressive strength of many naturally occurring rocks; a compressive strength of 70 MPa can be easily achieved in a precast concrete factory and many cast-in-situ concrete elements achieve a compressive strength of 40 MPa and more.

What is floating concrete structure?

A floating concrete structure is usually a solid body made of reinforced concrete & an inner chain of chambers filled with a lightweight impermeable material, typically polystyrene but, here the concrete is made to float by addition of aluminium powder as an air entraining agent. In addition to this, the concrete includes polypropylene fibers for good binding, nano silica for increasing its strength, $CaCl_2$ as an accelerator & Dr. Fixit for water proofing. Aluminium mesh instead of steel

mesh is used for reinforcement, for making it light weight & corrosion resistant.

- **MATERIALS USED:**

The cement used is somewhat similar to Ferrocement but, instead of steel wire mesh, aluminium wire mesh is used possessing a light weight than regular chicken mesh making an innovative type of "Aluminicement"(Carbon fiber mesh can also replace the aluminium mesh as it is the best among the light weight but strong meshes available). Pozzolanic Portland Cement (PPC) reinforced with polypropylene fibers, for increasing the binding among particles was used, pursuing following physical & chemical properties:

Physical properties of Portland Pozzolanic Cement and

Property	**OPC Results**	**Ordinary Portland Cement**	**Blended Pozzolanic Cement**
Compressive Strength (MPa)			
3 Day	**11.3**	**10.7**	
7 Day	**13.2**	**14.3**	
28 Day	**16.9**	**21.2**	
Setting time (min)			
Initial	**120**	**164**	
Final	**166**	**203**	
Specific Gravity	**3.107**	**2.936**	
Fineness %	**85.4**	**86.2**	
Soundness (mm)	**0.5**	**1**	

Chemical properties of Portland Pozzolanic Cement and OPC

Property	**Results**	
	Ordinary Portland Cement (%)	**Blended Pozzolanic Cement (%)**
Loss on Ignition	**2.05**	**1.05**
Insoluble Residue	**4.1**	**20**
Total alkalis	**0.59**	**0.71**
Chloride Content	**0.07**	**0.01**
SiO2 Content	**28.7**	**23.5**
Al2O3 Content	**13.5**	**12.9**
CaO Content	**53.6**	**47**
MgO Content	**2.21**	**1.74**
Fe2O3 Content	**2.27**	**2.04**
SO3 Content	**2.9**	**2.21**

Ordinary Portland cement is replaced by PPC because of its pozzolanic property as well as making it economical by the use of cheaper pozzolanic material such as fly ash for sustainable development.

Aggregate

Locally available natural sand with 300 microns maximum size was used as fine aggregate.

Admixtures

Aluminium fine powder is used as gas forming admixture. It generates fluffiness in the concrete same as baking soda does in a cake. This admixture when added to mortar or concrete mixture react chemically with hydroxides present in the cement & form minute bubbles of hydrogen gas of size ranging from 0.1 to 1 mm throughout the cement-water To shorten the setting time of the mix, the accelerating admixture used is Calcium Chloride ($CaCl_2$).

Mineral additives

Since we have made a light weight concrete with density less than that of water, it possesses a little less strength as compared to the conventional concrete. So, to overcome this drawback, nanotechnology is taken as a support.

Nano-SiO_2 having particle size less than 100 nm, has been found to improve concrete

workability & strength, increase resistance to water penetration & to help control the leaching of calcium, which is closely associated with various types of concrete

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 almost be equal to zero.

For this reason a water proofing substance is required.

Fixit powder is added to the mortar for making it water resistant.

Images of materials used

- **PROPERTIES**

Light Weight: Density range from 650 Kg/m3 to 1850 Kg/m3 as compared to 1800 Kg/m^3 to 2400 Kg/m3 for conventional brick and concrete respectively. Despite millions of tiny air filled cells, it is strong and durable. There is Lightweight advantage for the structure design, leading to savings in supporting structures and foundation.

Compressive Strength: 2.0 to 7.0N/mm^2.

Excellent Acoustic Performance: It can be used as effective sound barrier and for acoustic solutions. Hence, highly suitable for partition walls, floor screens/roofing and panel material in auditoriums.

Earthquake Resistant: Since lighter than concrete & brick, the lightness of the material increases resistance against earthquake.

Insulation: Superior thermal insulation properties compared to that of conventional brick and concrete, so reduces the heating and cooling expenses. In buildings, light-weight concrete will produce a higher fire rated structure.

Workability: Products made from lightweight concrete are lightweight, making them easy to place using less skilled labor. The bricks can be sawed, drilled and shaped like wood using standard hand tools, regular screws and nails. It is simpler than brick or concrete.

Lifespan: Weather proof, termite resistant and fire proof.

Savings in Material: Reduces dead weight of filler walls in framed structures by more than 50% as compared to brickwork resulting in substantial savings. Due to the bigger and uniform shape of blocks, there is a saving in bed mortar and plaster thickness. In most cases the higher cost of the light-weight concrete is offset by a reduction of structural elements, less reinforcing steel and reduced volume of concrete.

Water Absorption: Closed cellular structures and hence have lower water absorption.

Skim Coating: Do not require plaster and water repellent paint suffices. Wallpapers and plasters can also be applied directly to the surface.

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.

Therefore more deflection is there in lightweight concrete

- **EXPERIMENTAL VALUES**

COMPRESSIVE STRENGTH TEST:

Concrete is primarily meant to withstand compressive stresses. Hence, behavior of concrete in compression is of foremost importance.

A cube of 10cm×10cm×10cm was prepared by taking cement:sand ratio as 1:3 & adding 0.08% of aluminium powder by volume of cement, polypropylene fibers in equal amount of cement, 2% $CaCl_2$ by weight of cement, 10% nano silica by weight of cement & a small quantity of Dr. Fixit powder.

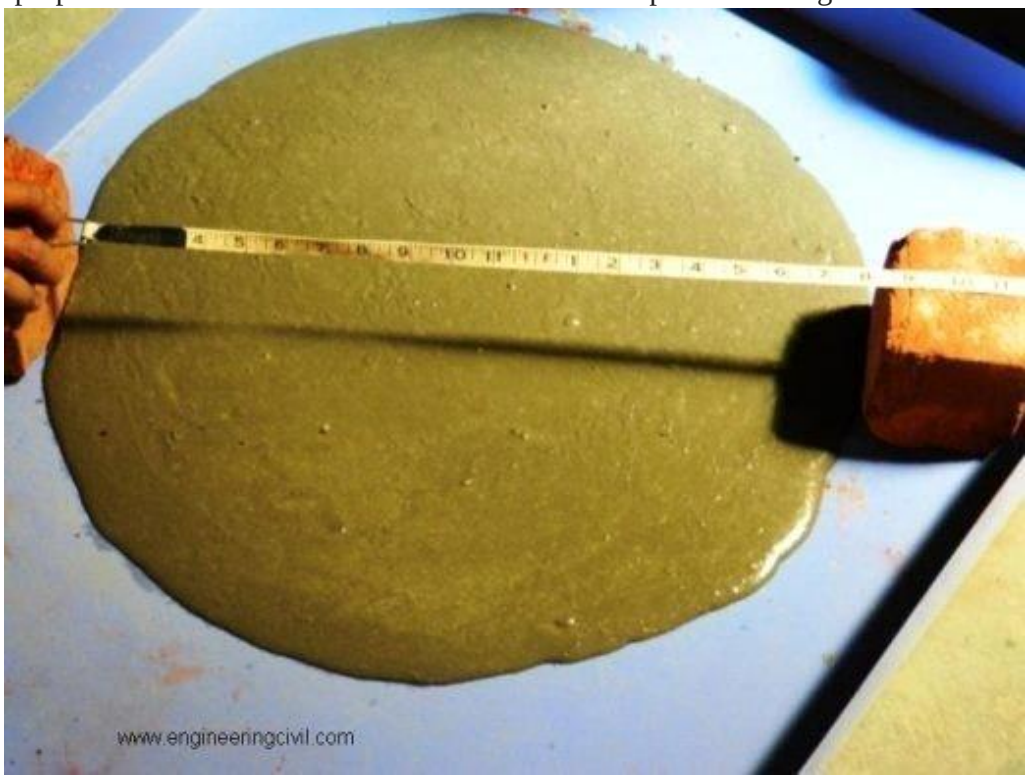
The sample was then tested in compressive strength testing machine as shown above and below.

Recommended limit for compressive strength of the concrete is 2-7 N/mm^2 & the calculated result came to be 3 N/mm^2.

Flow test:

This test gives an indication to the quality of concrete with respect to consistency, cohesiveness & the proneness to segregation.

The mix proportion of concrete is same as mentioned in compressive strength test



Concrete is filled in the mould in two layers, each layer is tamped 25 times & then after removal of the mould, the table on which mould is kept is raised & dropped for 15

The diameter of the spread concrete is measured in about 6 directions & average spread is

Flow is calculated as given below:

Flow, percent = (Spread diameter in cm-25) ×100) / 25

The value could range anything from 0-150 The calculated value of flow came to be 14%.

- **CONCLUSION**

Conclusions on the basis of Compressive strength test:

Test results obtained show that floating concrete is not as effective in compression as the conventional

Its strength can be improved by addition of substances such as carbon nano fibers & silica nano particles which provide sufficient strength to the

With this amount of strength, floating concrete can be used at harbors & docks for loading & unloading of materials to & from the ships, respectively.

Also, a hollow cube can be built with floating concrete slabs & later it can be filled with Styrofoam for making it compact & can be used in floating structures & hence its load bearing capacity can be

Pumice stone (aggregate size approximately equal to 20 mm) can be used as coarse aggregates in the concrete mix to increase its compressive

Conclusions on the basis of Flow test:

The concrete can be used for marine structures as the flow is within the specified The durability of the structures is also high in comparison to that of the conventional concrete The problem of segregation is also reduced to a large extent so; it can be used for construction of piers of marine Advertisements

OVERALL CONCLUSION:

Floating concrete can be effectively used for building structures such as slabs, barges, buildings etc. Since maximum portion of earth is covered with water, it minimizes the consumption of land for construction works & this is an environment friendly method of construction of boats replacing wood & metals.

- **REFERENCES & BIBLIOGRAPHY**

- Concrete Technology by M L Gambhir
- Concrete Technology by M.S. Shetty