

# Research on Light Weight Concrete Canoe

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**Abstract:** Concrete canoe is a very durable and light weighted water transportation medium. It is very helpful for reduction of cost in marine transportation. Concrete has higher durability about fifty to sixty years with less amount of maintenance during its life span. Thus concrete canoe can be a way to enhance the life standard of seller or people, whose income source is fishing business or any other sea or river area. Concrete canoe is made from light weighted fiber -plastic concrete which has higher durability and its load bearing capacity is also high due to presence of cement as a binding material. Better life span will increase the economic factor and makes it reliable for human society. Plastic crush and other elastic material will induce flexibility which will prevent cracking in the canoe during water transportation or in working atmosphere. Therefore concrete canoe is an economical, Reliable and durable source of marine or water transportation which will definitely create a new way to human society or people who depend on the fishing business.

**Keywords:** Light Weight Concrete

## I. INTRODUCTION

A concrete canoe- Rajasthali Tarni is a medium of enhancing of knowledge about various applications of light weight concrete. Light Weight Concrete is a very durable and strengthened material thus we are using it for making of economical, durable and good transportable canoe.[1]

Concrete canoe is based on new techniques and fundamental laws of stability of flow-able structure like Archimedes law etc.

Main prospective behind making of canoe was to make transport easy through water and cheaper. By utilization of modern concrete techniques, this canoe has reached according to our target and need of strength or durability of structure.

During the manufacturing of concrete canoe, it explores different material applications and properties which can be used for stability design for any structure such as GP-2, PLASTIC CRUSH etc.

These all materials will definitely bring an elastic change in making of concrete structure which will reduce the cost and increase durability, strength and corrosiveness. This concrete canoe is also based on industrial waste like material like Fly-Ash, Fine Aggregate etc. which are available widely and have nuisance value in itself. It reduces the cost and as well as it decreases environmental pollution.

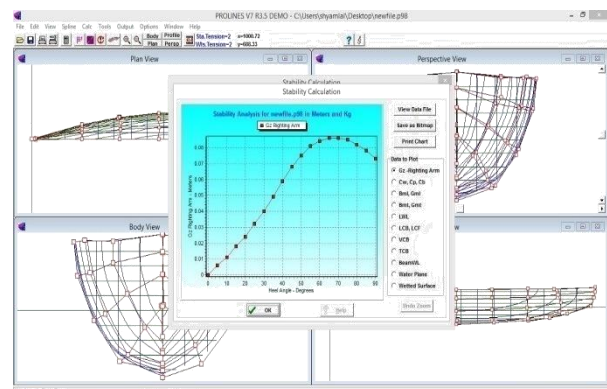
Thus it helps us for reduction of waste material but also utilize it in different structures and make them applicable in various parts of concrete structure.

## II. STABILITY DESIGN

Stability is a very important factor for any structure. For the stability of concrete canoe we balance the different forces like buoyancy force, self-weight due to gravity and also water wave force during movement of canoe in water.

We conducted analysis on Proline software and got results as per given below.

(Fig-1, Analysis of stability in Proline Software)

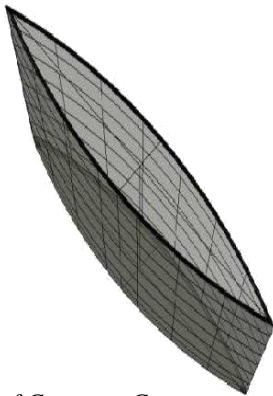


In fig-1 we can see the different views and every point on the canoe is a part playing a role for stability. As we can see the front curve shape of the canoe will make it more stable and reduce water pressure force on it. Thus, it increases stability[2]. For getting more information about the stability of the canoe, the wave and friction drag graph which is given below.

## III. STRUCTURAL DESIGN

The structural design is the most important part for any construction. In the casting of canoe, its structural design is first decided in AutoCAD-2012 software and finally in PROLINE software. The 3-D diagram of the canoe along with AutoCAD drawings:

a) Wire frame structure – Pro Line



b) 3-D Structure of Concrete Canoe



When we apply the load on different parts of the canoe the some facts are visualized by us. We found different section strained by after applying of permissible load.

STRUCTURAL DETAILING AND DRAWINGS

Structure of canoe has wide variation in shape of structure due to its design and stability in water. Therefore it designs in computer based application like AutoCAD 2012, PROLINE and by the help of these application structural analysis is done as per following analysis:

a) Length/Width/Height:

Overall length=3.521m, Load water line=3.274m  
 Water line beam=0.491m, Deck beam=0.603m  
 Max. free board=0.226m, Fair body draft=0.193m

b) Areas:

Water plane=0.991m<sup>2</sup>, lateral Plane=0.285m<sup>2</sup>, Wetted hull area=1.393m<sup>2</sup>, Total Hull Surface=2.914m<sup>2</sup>

c) Displacement:

Salt Water=106.28kgs  
 Fresh Water=103.291kgs

d) Required power:

Brake horse power=0.284BHP

STRUCTURAL DRAWING OF CANOE

Wt Name	Weight	Beam	Aft Bow	+/-LWL
Name	80	0	760	0.0
Name	50	0	1555	0.0

Ballast Wt	Weight VCG	Weight LCG	Weight TCG
130.00	0.00	1065.77	0.00

Hull VCG - LCG		Net VCG and LCG with Ballast	
VCG	LCG	Net VCG	Net LCG
10.91	1785.69	-2.54	885.65

COMPLETED MATERIAL DESIGN AND FINAL TEST DATA

The table depicts all the material that is being used in mixing of final mix that is used for the casting of Canoe- *RAJASTHALI TARNI*. Each and every material is chosen all after by studying its properties and their advantages and disadvantages. The specific gravity of the canoe should be less than the saline water so that canoe will float and so as the specific gravity of the materials are taken into account. The material chosen for the casting is in 2 parts.

TABLE 1: THE MIXTURE DATA SHEET FOR THE FIRST LAYER IS AS FOLLOWS

S No.	Material	Specific Gravity
1	Ordinary Portland cement	3.15
2	Pozzolana Portland Cement	2.90
3	Plastic Crush	2.65-2.85
4	Fly Ash	2.2-2.8
5	Recron Fiber	<1
6	Fiber Mesh	<1
7	Water	1
8	Water Reducer	-

IV. CONSTRUCTION PROCEDURE

The construction procedure of the Canoe- *RAJASTHALI TARNI* is as follows:

- The construction is gone under systematic layered manner.
- The construction/ casting consist of mainly 3 layers.
- The Canoe is mainly 3 layered casted Canoe.

LAYER 1 (from Inner to Outer Side):-

The material used in this layer: Cement (PC and OPC), Fly Ash and Plastic Crush; with Recron 5s and Fiber mesh.

The ratio of the cement, fly ash and plastic crush is in 1:1.50:1.50.

The amount of Recron 5s added: 4gm.

The Fiber mesh is in a single layer.

LAYER II (From Inner to Outer Side):-

This layer is of water stopper material named GP2.- The layer stops the water to entering the canoe.

LAYER III (from Inner to Outer Side)

This layer is the final layer of the Canoe, which consists of Cement (PC), Fly-Ash Recron 5s and water reducer. [3]

The ratio of the cement and fly ash is in 1:2.

A layer of fiber mesh is also introduced between II and III layer (in single layer).After each layer, a sprinkling hand of Hardtop is done. All the work done is with hand tools. No use of machine (any) is done.The material which is being selected for the casting/ construction of Canoe is done by considering the properties of materials with respect to each other. After that the material which is having good property is being used for the construction.

V. RESULT AND DISCUSSION

Light weight concrete canoe is more durability is approx. 8-10 years due to the help of plastic fiber reinforcement which impart flexibility in canoe structure. Using of fly-ash in the amount of 5-10% of binding material reduce the cost of canoe and it can be utilize as economical factor of manufacturing of canoe at large scale.

Hard-top layer helps to resist the water penetration and reduce corrosion due to contact of water with canoe.

Canoe economic value will be approx. 8000 INR per one canoe and it can express as per the table-2.

TABLE 2: EXPLAIN ABOUT THE CANOE EXPENDITURE

S. No.	Material	Cost
1	Water Reducer	200
2	Gp2	150
3	Hardtop	170
4	Fibre mesh	200
5	Plastic Crush	250
6	Recron	100
7	Cement	250
8		Total= 1320 INR

REFERENCES

- [1] IS Code: 456:2000
- [2] Buoyance force and Metacentric Height, Fluid Mechanics and Hydraulic Machines by R.K. Bansal
- [3] Manufacturing of Concrete Canoe- www.iitm.com/nptel.