

Fabrication of a Canoe Hull with a Capacity of 6 People as a Means of Transportation in Swamp Waters in the Bagan Benio Area

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Abstract. The water transportation route from Bagan Benio Hamlet, Tasik Serai Village, Talang Muandau District, Bengkalis Regency to Tarik Serai Village is via a small river which is very dependent on tidal conditions. Therefore, the hull shape that is suitable for this area is a flat hull model. In this research, a canoe hull design has been made with dimensions LoA = 5.5 m, B = 1 m, H = 0.35 m and T = 0.15 m with a passenger capacity of 6 people. The material used is mangrove meranti wood. To strengthen and prevent water seepage, the outer hull is coated with fiberglass material. The fabrication process begins with forming the shape of the canoe body in accordance with the position of the tusks which are 0.5 m apart. After the body frame is formed according to the plan drawing, the next step is to install the bottom and side slab boards and provide jelicot between the boards to prevent leaks at the joints. After the hull is closed, the next step is to laminate the outer hull with a layer of Matt and Woven Roving which is evenly moistened with resin. Between the Matt and Woven Roving layers, threaded nails are provided to strengthen the stickiness of the wood to the fiberglass layer. After the bottom has been finished and finished, the boat body is turned over and the interior and seating facilities for passengers are completed.

Keywords: Canoe hull, Bagan Benio, laminate, fabrication process, wood

INTRODUCTION

Bagan Benio Hamlet is one of the areas in Tasik Serai Village, Talang Muandau District, Bengkalis Regency. Bagan Bonio has a population of 1,512 people in the SM Giam Siak Kecil area and is administratively included in Tasik Serai Village, Kec. Tualang Mandau, Kab. Bengkalis. The majority of Bagan Boneo residents are Malays (99.9%) whose livelihood is fishing, rubber farming and other businesses. Supporting facilities such as health services and accessibility are still very limited.

Based on observations made by researchers during the initial survey, the condition of the area really needed resolution, especially regarding transportation equipment. To get to the hamlet from Tasik Serai Village, you have to walk along narrow and shallow swamps, then along the Siak River tributary until you reach the pier in Benio Hamlet. The condition of the swamp route is very influenced by the tides, so it requires an appropriate boat hull design and propulsion system to be able to operate in the swamp route. Hydrodynamic design of the ship's hull below the water surface is one way to reduce the magnitude of the waves that occur due to the movement of the ship and prevent damage to the waterside wall environment which is prone to landslides [2].

METHODS

In this research, a canoe was created using data from existing comparison vessels that operated well in water conditions similar to or close to the target area. The design process is assisted by using engineering software for depiction and stability analysis. The stability analysis process uses parameters that are close to those of a canoe when it is fully loaded. After the stability analysis meets the requirements, the next step is the fabrication process by making a canoe according to the design drawing that has been made at a scale of 1:1. The fabrication process uses wood and is coated with fiberglass.

RESULTS AND DISCUSSION

LINES PLAN

The lines plan design is drawn using the application software to help get better images. The canoe is made using the sister ship method which has dimensions of length (L) 550 cm, width (B) 100 cm and total height (H) 35 cm and draft (T) 15 cm. The choice of main size refers to data on existing canoes that are already operating in the river area. The hull shape of the canoe made is U-shaped with a flat bottom. The choice of hull shape is based on the condition of the water in the river channel that will be passed, which is relatively shallow and there are many tree trunks along the river channel. The dimensions and shape of the canoe hull are as shown in the following **FIGURE 1**.

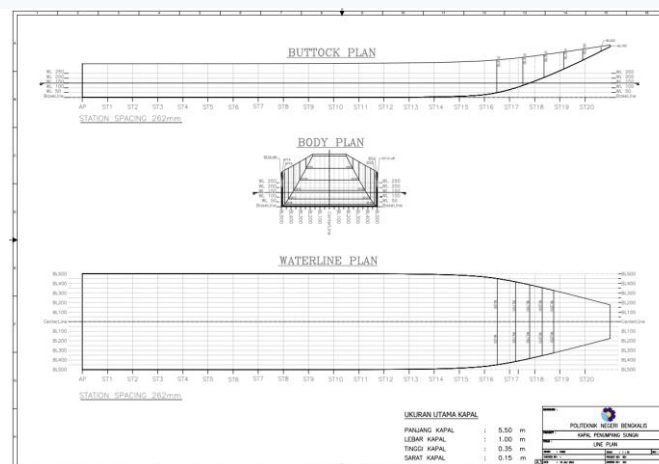


FIGURE 1. Lines plan drawing of a canoe
(source: Design results)

GENERAL ARRANGEMENT

Based on the results of the Line Plan drawing, spatial planning for the canoe is then carried out. The canoe is made with a passenger capacity of 6 people in a seated passenger position. The driving engine is placed on the rear main deck with a long shaft that forms a tilt angle. The General Plan image is as shown in **FIGURE 2**.

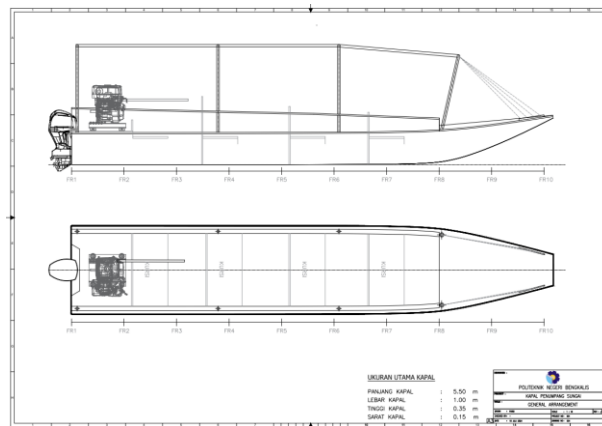


FIGURE 2. General arrangement of canoe (source: Design results)

STABILITY SIMULATION

In order to see the stability of the canoe when fully loaded, a simulation was carried out using Maxsurf Stability with parameters according to the design drawing that had been created to obtain a GZ graph as in FIGURE 3.

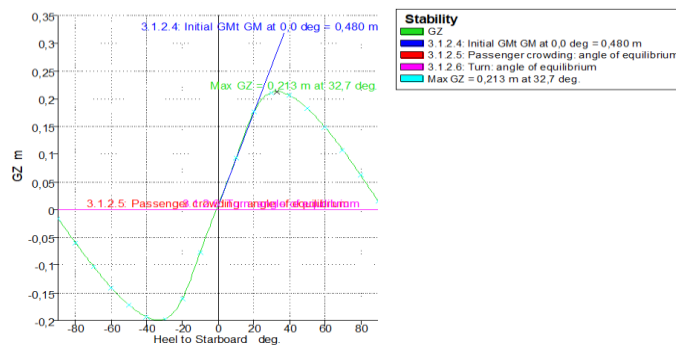


FIGURE 3.. GZ charts (source: simulation results)

FABRICATION PROCESS

The canoe fabrication process starts from making the tusks according to the shape of the body plan drawing that has been made. The material used in making canoes is mangrove meranti wood. The tusks are formed using steel bolt connections for better strength. The shape of the tusks is arranged as shown in FIGURE 4.



FIGURE 4. The process of making frames
(source: activity documentation)

The frames are arranged 5.5 meters long with a distance of 0.5 m between the tusks. To provide good strength the tusks are made of adequate size and large tusks and small tusks are made sequentially. Then a longitudinal construction is given to provide longitudinal strength using wood measuring 5 cm x 5 cm as shown in **FIGURE 5**.



FIGURE 5.. Installation of longitudinal construction
(source: activity documentation)

The next job is installing the hull using wooden planks that have been smoothed and have the sides flattened. To attach the wooden planks to the frame, special boat nails are used. Then, jelcoat is applied between the board joints. After everything is covered, the hull is then laminated using a layer of fiberglass. This is necessary to provide tightness to the hull and to increase the service life of the boat. The wood lamination process using fiberglass looks like in **FIGURE 6**.



FIGURE 6. The canoe hull lamination process uses fiberglass
(source: activity documentation)

In order to get sufficient strength, the fiberglass layer attached to the wooden board is given special nails for fiberglass. With these nails, the strength of the bond between the wood board and the fiberglass becomes stronger. Then the nail heads are covered with the next layer of fiberglass. In the final layer, the fiberglass laminate is mixed with pigment to give the desired color. This is necessary so that the color blends with the resin and is more durable and does not fade easily. As seen in **FIGURE 7**.



FIGURE 7.. The canoe hull lamination process uses fiberglass mixed with pigment
(source: activity documentation)

After the hull has been laminated, the canoe body is turned over and continued with the arrangement of the seat and side finders. The seating arrangement is adjusted to the general plan drawing. Apart from that, the final step in the fabrication process is the installation of the top cover which is planned to use a cloth tarpaulin material that is not easily damaged. This cover functions to protect passengers from rain and hot sun. The finished shape of the canoe is as shown in **FIGURE 8**.



FIGURE 8. Results of a canoe that has been finished
(source: activity documentation)

CONCLUSIONS

Based on the discussion and results of this research, it can be concluded that in the process of fabricating wooden boats that will be laminated using fiberglass, attention must be paid to the sticking strength between the fiberglass layers and the wood. To get this strength, it is necessary to use special nails which are placed in the frame position so that the strength of the nails is maximum. Apart from that, the wood must be completely dry so that shrinkage does not occur when it is installed.

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