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# DESIGN AND CONSTRUCTION OF A SIMPLE BOAT TRAILER FOR FEDERAL COLLEGE OF FRESHWATER FISHERIES TECHNOLOGY NEW BUSSA.

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## ABSTRACT

*A simple boat trailer with an overall length of 4.59m, breathes 1.68m, and weight of 87kg was designed and constructed using locally available metals and scrap materials. The boat trailer was used to tow a boat of 250kg weight through a distance of 14km without affecting the safety and speed of the car. The construction resulted to the production of an open cart that is light and easily maneuvered that one person can move it manually without difficulty. The total production cost was N32, 300 which is affordable in relation to the cost of transporting boats through the use of pick up vans. The boat trailer can be easily maneuvered when coupled to any car or van. This makes it adequate for towing and for safer movement of boats from the school boat yard to any water bodies.*

**Keywords:** boat, towing, construction

## INTRODUCTION

A boat trailer is a cart designed to launch, retrieve, carry and sometimes store boats (Wikipedia, 2011). Due to the fact that towing device is not available in the college boat yard, conveying a boat to the lake or any water body for fishing and related practical works have always been with difficulties and full of risk. Boats were always conveyed by carrying them on pick up vans, which is not a good option as the boat could be scratched or damaged on transit and the occupants of same van could be endangered in addition to high cost for hiring. Learning how to build a boat trailer can be a fun project that will save money, boat trailers are very expensive and hard to find. Trailing or towing a boat imposes several challenges, selecting the right towing equipment, driving safely and launching and retrieving the boat on a slippery boat ramp, all while other boater wait their team and look on critically, Responsible boat owners understand that meeting these challenges is just as important as handling a boat safely and courteously on the water (Tyler 2010). To tow safely and effectively depends on many factors, most of which are elemental in their simplicity. Yet critical when taken as a whole for example, having your tow vehicle equipped with the right towing equipment and proper drive train components is not sufficient in and of itself. Neither is keeping your tow vehicle in top condition. However, this work was prompted by the need for a towing device that will make movement of boats from the college to any water body easy with the following objectives.

- To build on the technical knowledge and capacity to upgrade the college fishing boat yard through the use of locally available materials for safety and cost reduction.
- To produce a towing device that will make movement of boats from the college to any water body easy.

## MATERIALS AND METHODS

### DESIGN

The design was kept simple to allow anyone to be able to build their own trailer; however, a lot of detail was kept in the design to give the most realistic look possible. The boat trailer was first drawn free hand on a sheet of paper with IIB pencil. The details of component parts were projected in a profile

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view. The layout of the construction was drawn indicating all dimensions of the parts.

## **CONSTRUCTION**

### **The skeleton**

The main skeleton or rail was constructed with 50mmx50mm mild steel hollow pipe. The pipes were measured and cut into the required pieces with tape rule and hacksaw respectively. The cut pieces were joined by arc welding to form the required skeleton.

### **The fixings**

The fixings to the skeleton includes: Chine bunk, Axle, Rollers, Winch stand, winch and the Coupler. 25mmx50mm hollow pipe and 25mmx25mm mild steel angle bar were measured and cut out to the required pieces. The pieces of hollow pipe were first joined in 'I' shape by welding, and then the pieces of angle bar were used as reinforcement at the angles. 17mm bolt and nut with 3mm thick iron plate welded to the rail were used to construct the adjustable securing point of the bunk to the skeleton. 25mm thick rubber was fixed to the top surface of the bunk with (ivostick) gum. The axle was constructed with 5mm 'H' bar cut to required size. The bar was set with try square and welded to a mechanical disc brake assembly (car front hubs) on the two sides to carry the wheels. Size 14 wheel and tire were coupled to each side. 6 rubber bushings were used to form the rollers. 2 bushings were put together by passing a central rod through them, then fixed to a small frame made with 25mm flat bar. This was then fixed at 3 positions along the centre of the main frame of the trailer. 37mm and 25mm galvanized pipes were cut to required sizes and fitted together by sliding the 25mm into the 37mm in an adjustable position secured with 17mm bolt and nut. This was fixed on the skeleton towards the front by welding at an angle of 60° to serve as the winch stand. 2 plain helical gears were meshed together in a simple constant mesh arrangement as tow and drive gear, such that the drive gear was connected to the winding handle and to the tow gear 12mm pipe was fixed to hold the towing cable. The coupling part was reinforced by welding 50x50mm mild steel angle bar at the two sides. 20mm M/s rod was cut to required length and bent by tightening on a bench vice then forced to bend to shape with the aid of a short pipe for easy handling. 3mm M/s plate was fixed to cover the open spaces.

## **FINISHING, TESTING AND COST**

After completing the main construction, the trailer was sanded off thoroughly then cleaned with a rag to prepare a good surface for painting. After sanding, three coats of oil gloss paint were used to paint the whole construction allowing one coat to dry before applying the next. This was to give the trailer a polished surface to avoid easy roasting. The trailer was coupled to a car while carrying a boat, then moved through a distance of about 14km, while observing the drag force, how stable and balanced the boat was during the movement, employing all safety regulations. The trailer was also towed manually by one person then observed as above. The cost of the trailer was estimated based on the local market cost of the materials used for the construction in respect of their sizes and specifications.

## **RESULTS AND DISCUSSION**

The design sketch and layout showing the details and shape of the trailer are presented in figures 1 and 2 respectively. The steps followed in the construction are present in plates 1 to 3. The construction resulted to the production of an open cart that is light and easily maneuvered such that one person can safely move it manually without difficulty. The specifications of the trailer (Table 1), indicates that the breadth overall is 1.68m, and the length overall is 4.59m. These specifications are in line with the trailer design guidelines according to Tyler (2010). The light weight gives the trailer an advantage of been towed with less effort hence can be used to transport boat by towing with any small car. The cost of construction was N32, 300 (table 2), which is affordable in relation to the cost of transporting boats trough the use of pick up vans. These will definitely cut cost for local fishermen during launching and retrieval of boats and canoes on nearby water bodies for fishing activities. When the trailer was coupled to a small car (Toyota Corolla) with a boat of about 250kg weight (plate 4)

and moved through a distance of 14km the drag force was minimal as it did not affect the speed of the car significantly based on the statement of the driver of the vehicle. When one person towed the trailer with boat manually, it was done with less effort in relation to carrying the boat directly.

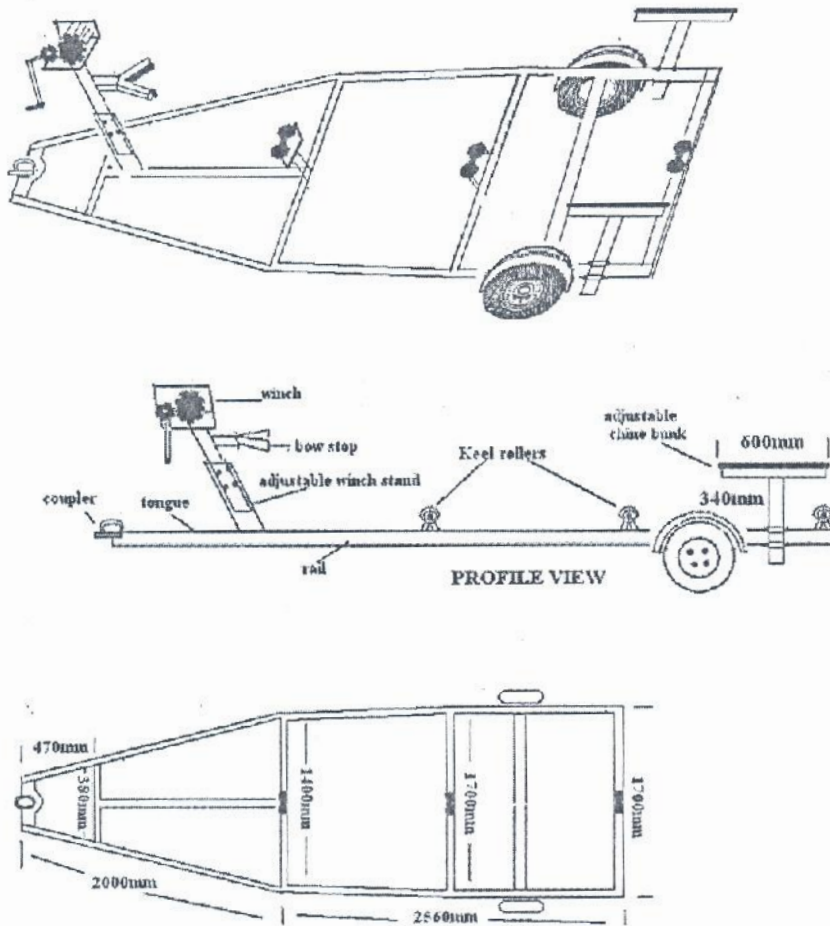


FIGURE 1: DESIGN SKETCH AND DETAILS  
FIGURE 2: DESIGN LAYOUT

**Table 1: Specifications of the trailer**

Length overall	4.59m
Breadth overall	1.68m
Height below frame	0.21m
Maximum height	0.37m

**Table 2: sizes and cost of materials**

Material	Size	Quantity	Unit price	Amount N
M/s Hollow pipe	50x50mm	3No	1,800	5,400
M/s Hollow pipe	25x50mm	2No	1,200	2,400
M/s Angle bar	50x50mm	1No	2,800	2,800
M/s Angle bar	25x25mm	1No	1,200	1,200
M/s rod	12mm	1No	1,800	1,800
M/s rod	6mm	1No	1,250	1,250

Plain gear		2No	500	1,000
Mechanical disc brake assembly		2No	1,500	3,000
Rubber bushings		6No	350	2,100
Gloss paint	gal.	2gl	2,500	5,000
Sanding disc	No	4No	250	1,000
Bolt and nut	17mm	8 No	60	480
Labour cost				4,530
Rubber band	50mm	1roll	500	500
Total cost				N32, 300.

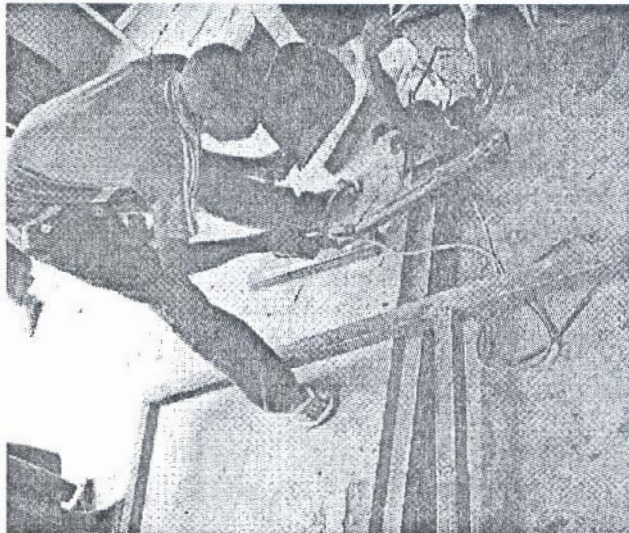


Plate 1: Construction of the skeleton

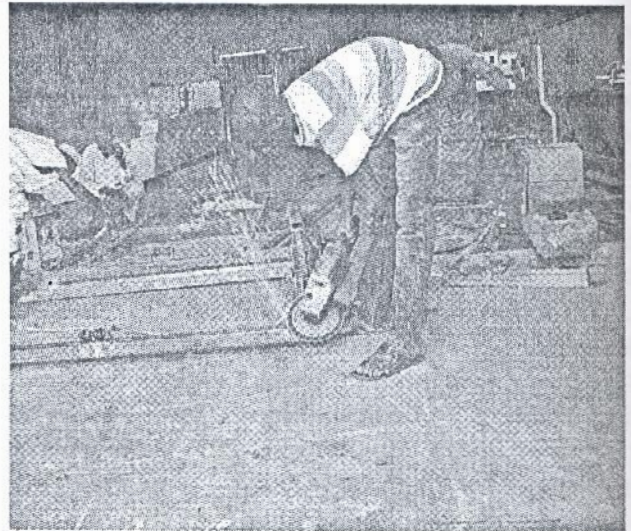


Plate 2: sanding of the constructed trailer.



Plate 3: completed trailer with boat coupled to a towing car.

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## CONCLUSION AND RECOMMENDATION

The trailer, have light weight, least cost and easy maneuverability as its advantages. These important qualities are adequate for a safe towing device required for the easy movement of craft from the college to and from any water body.

It is recommended that same technology be used to construct bigger trailers that can be used to carry larger crafts.

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