

DTU   **KENDAT**

Animal Cart Programme

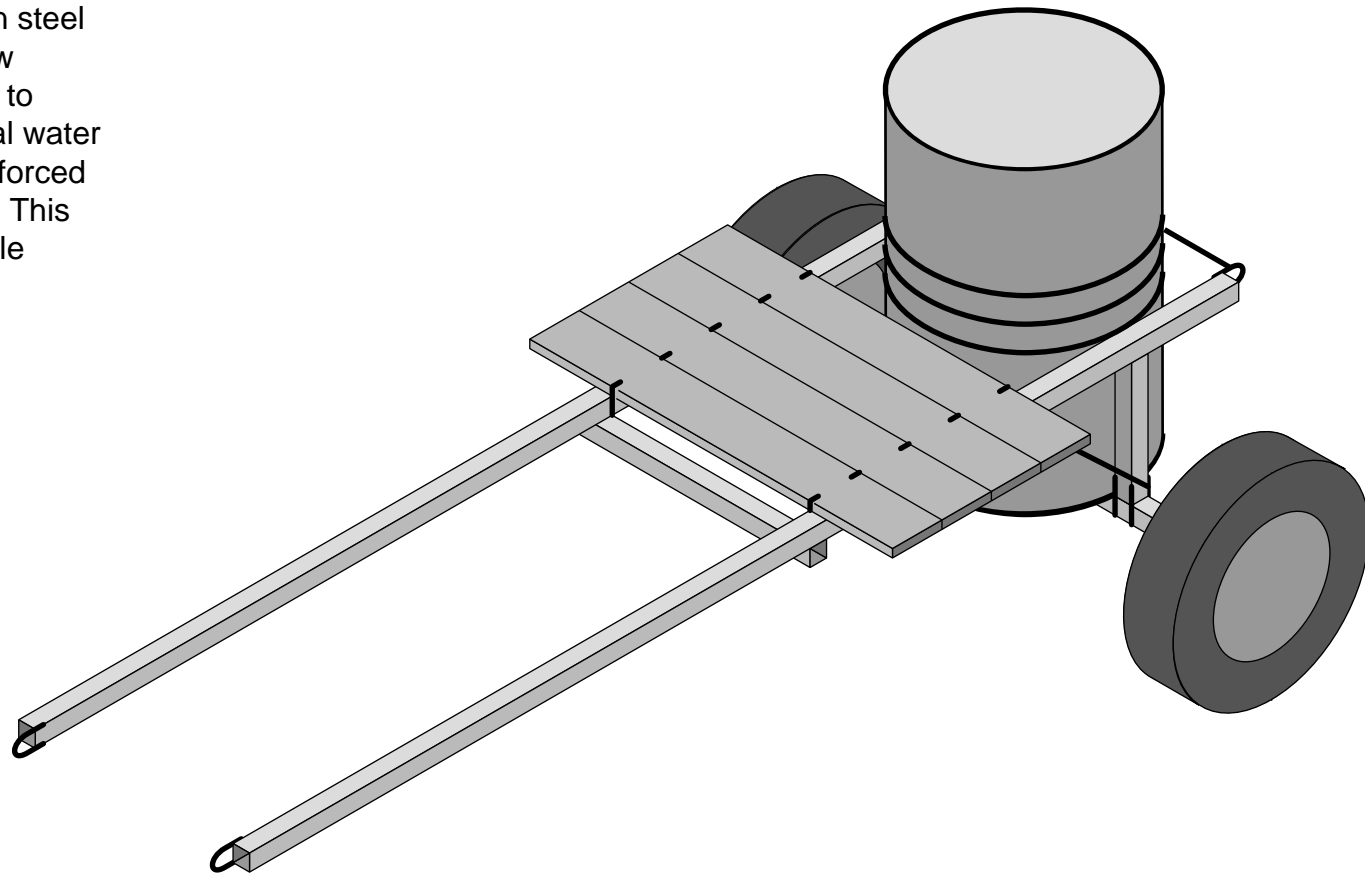
TECHNICAL
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RELEASE

LIGHT SINGLE DRUM WATER CARRIER

Development Technology Unit, Department of Engineering, University of Warwick, Coventry, CV4 7AL UK, tel: +44 (0)203 523523 extn 2339, fax: +44 (0)203 418922, email: esceo@eng.warwick.ac.uk
KENDAT, PO Box 61441, Nairobi, Kenya, tel/fax: +254 2 766939, email: kendat@africaonline.co.ke

Figure 1: donkey cart made from square box tubing.

This cart uses square section steel box tubing (RHS rolled hollow section) and a 200 litre drum to make a quick and economical water carrying cart. The cart is reinforced with concrete reinforcing bar. This cart has two shafts for a single donkey.



Lightweight water carrier cart for one donkey.

Introduction

In many towns and villages in Africa water is delivered commercially. You buy water from people selling it from carts. This cart design was developed in Kenya where water is widely sold like this and the cart is as simple and cheap as we can design it from new materials there.

This booklet tells you how to construct a water carrier cart - you will need to use another booklet Technical Release 28 to tell you how to make the axle. You should be able to make the cart

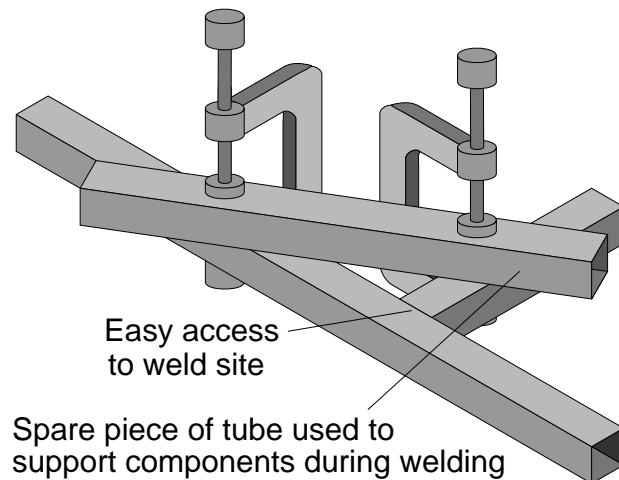


Figure 2: supporting components during welding.

make one cart including the axle per day.

In other booklets in this series we tell you how you can make other simple low-cost carts and axles

Idea Behind Design

The idea behind the designs in these booklets is to allow construction without lots of special tools and jigs, and without any hard-to-get materials. The only tools which you must have are a welder and a hacksaw. You might also find that a couple of 4" or a 5" G clamps (or something like it) are useful too. A wheelbrace or carpenters brace is also useful - you can make the drill bit yourself.

You will see that there are no mitres and unusual angles to cut in the square tubing so you save time when making the cart. Also the exact lengths of the components are not very fussy. But you will find that the carts look better if you take trouble to

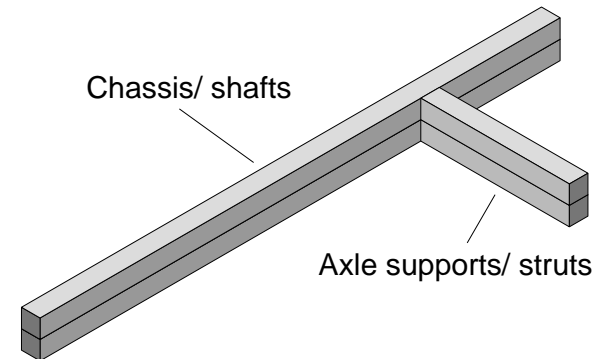


Figure 3: welding animal shaft and axle support strut assemblies.

get things square and straight.

Carts like these have been tested in Kenya. We have not had problems with them but if you find that the square tube breaks too easily you can reinforce it by welding on some round bar or concrete reinforcing bar 8mm, 10mm or 12mm. If you used tubing with a wall thickness of 2.0 mm or more you probably would not need to put these strengtheners on.

Cutting list and costs

Table 1 shows a cutting list for a complete cart. Recent prices of materials in Kenya are shown converted to £ UK. The

Table 1: materials and costs.

TABLE 1: cutting list.				
component	material	# lengths & length reqd [#*mm]	total material in cart	materials cost in Kenya [£uk]
animal shafts	50x50 RHS	2x3000	6000	14.37
body cross pieces	50x50 RHS	2x700	1400	3.35
axle struts	50x50 RHS	2x375	750	1.80
shaft strengtheners	8mm to 12mm round bar ¹	4x600	2400	0.66
axle strut braces	8mm to 12mm round bar ¹	2x600	1200	0.33
axle fixing bars	8mm to 12mm round bar ¹	8x70	560	0.15
hitch/ drum tie loops	8mm to 12mm round bar ¹	2x250	500	0.14
TOTAL =				20.67
¹ The round bar can be anything actually - it doesn't even have to be round, so deformed or high-yield re-bar is fine. You could even use flat strip as long as its more than say 8mm thick.				

method shown in Figure 2 is probably the easiest way to support the components during welding the first shaft and support. It's quick and if you do not tighten the clamps too tight to start with, you can tap the parts with a hammer until everything is square and straight. Then tighten the clamps before you weld.

Repeat the process using the first shaft and support as a pattern for the second as shown in Figure 3. Make sure you do not weld the two assemblies together!

- 3) Now you can weld the cross pieces under the animal shafts after you have checked for squareness etc.
- 4) Next weld the axle on using the method shown in Figure 4. Here small pieces of round bar eg 12 mm are welded across the join. If you do it like this you can easily remove the axle just by cutting the rod. This is much easier than grinding welds away. Alternatively you can bolt the axle on

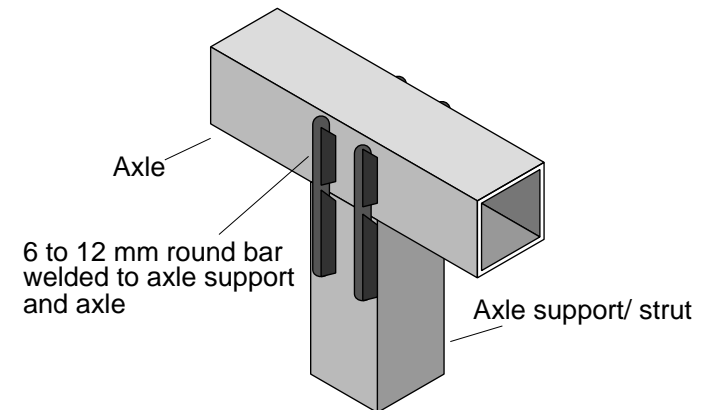


Figure 4: method of fixing axle to axle supports.

as shown in Figure 5.

- 5) Next you need to weld on the axle support strut braces to the square tube. Figure 5 shows the frame nearly ready.
- 6) Now fix the planks on using clenched over 8 mm re-bar as shown in Figure 6
- 7) Paint the cart. You've finished it!

Getting water out

Users usually cut a hole in the top of the drum or cut the whole top off to make it easy to pour water in quickly. To get water out some users in Kenya fix some 3 inch layflat hose onto a piece of pipe fixed to the larger threaded hole in one end of the drum. Tying the end up stops water coming out and letting it down squirts water out very quickly.

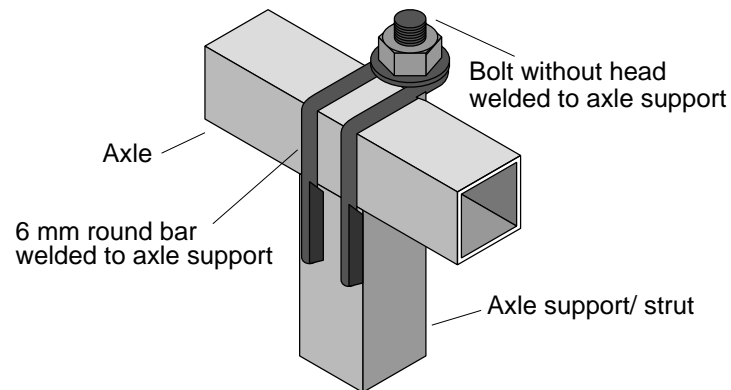


Figure 5: fixing planks to frame with clenched studs.

Modifications

This cart could be used as a flatbed cart by removing the drum and putting more planks on top of the shafts.

Other DTU cart developments

The DTU has been working on a range of cart body types for use with both donkeys and oxen. It has designs for both wooden and steel framed types. The wooden types are cheaper in material terms, but the steel framed ones are easier to make because the joints are more straightforward - but you can make either type of cart in only a day or two.

The DTU has also been working on new designs of wheels, hubs and bearings to bring down their costs and make things

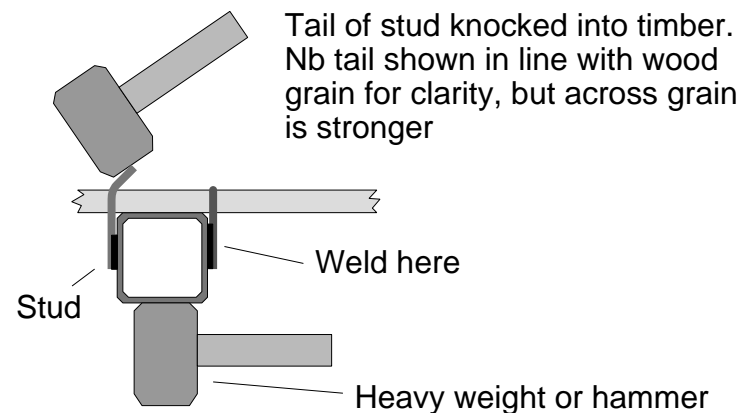


Figure 6: fixing planks to frame with clenched studs.

more locally manufacturable. We have developed easily made wooden bearings, bearings from PVC pipe, axles using old ball races and axles where you make your own roller bearings. Technical releases for all these are available.

Cart Drawings

The drawing for the cart is shown on the following page and the list of materials has been shown on a previous page.

Acknowledgements

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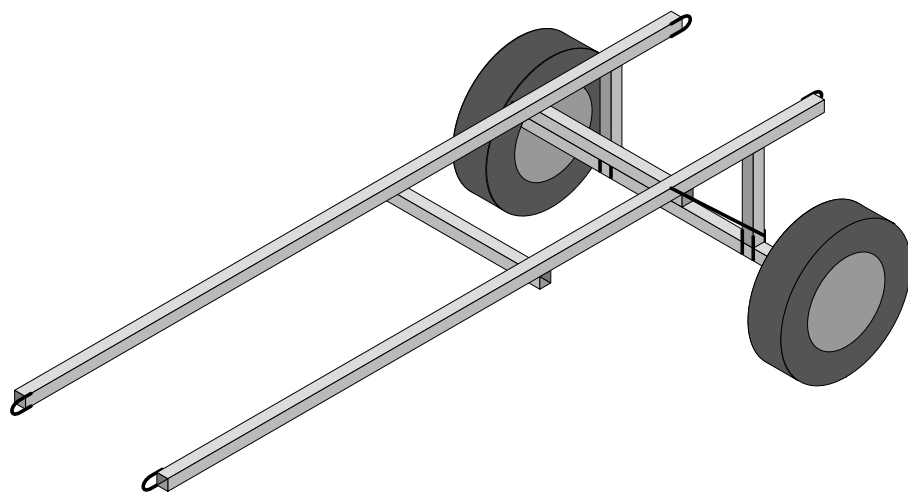
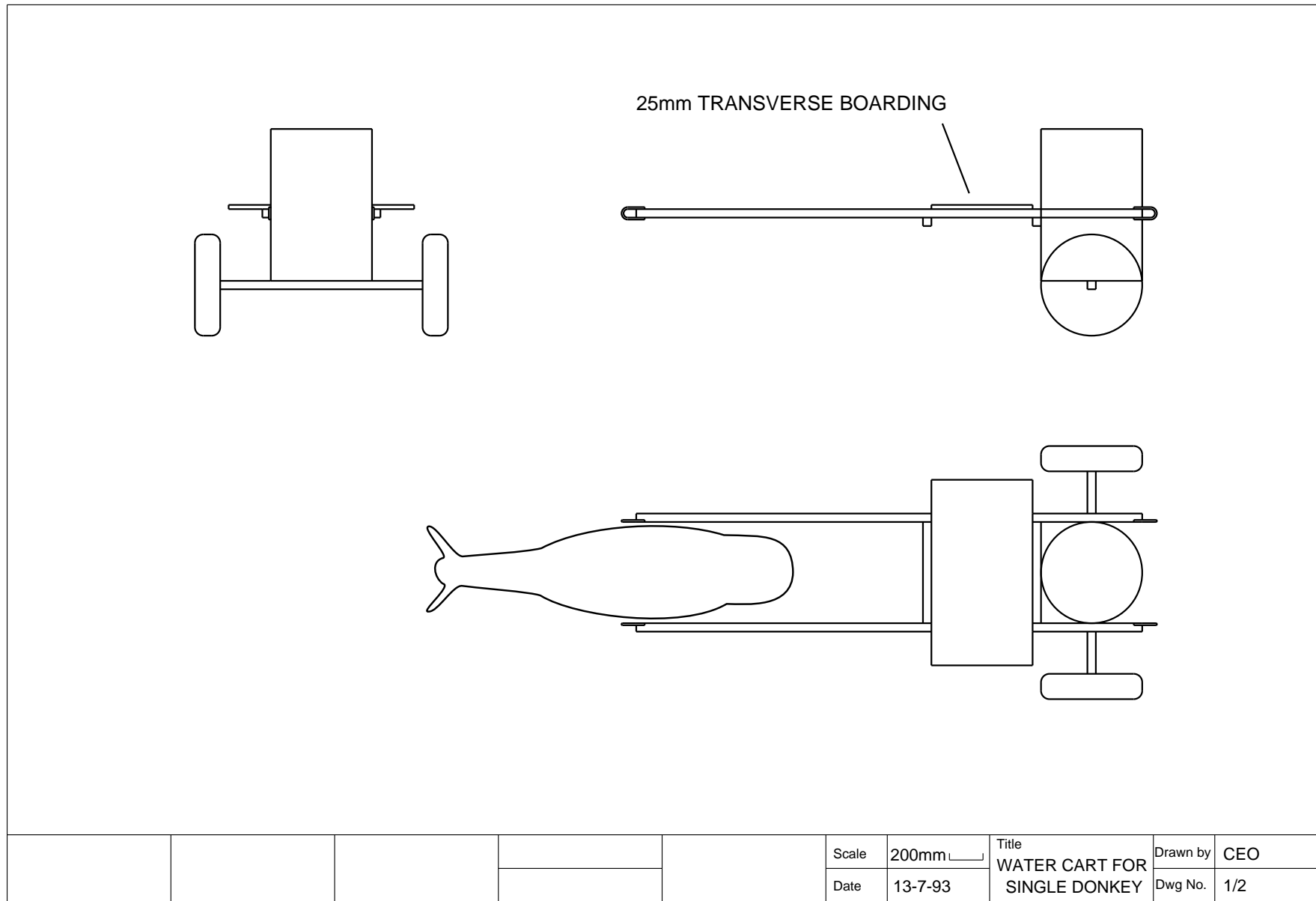
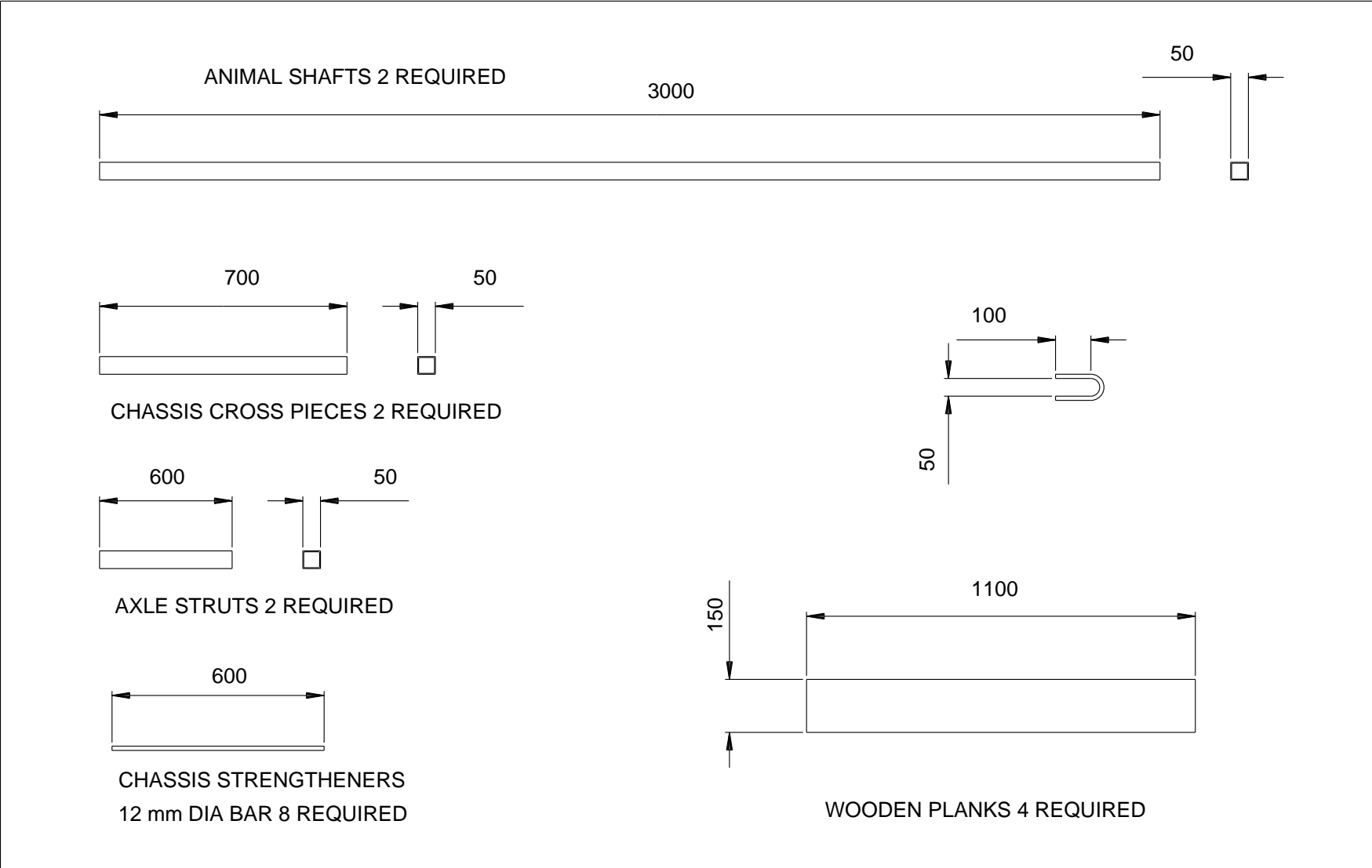


Figure 7: cart frame without drum and planks.

The DTU would also like to thank Dr Pascal Kaumbutho of KENDAT in Kenya and Mr Joseph Mugaga of TOCIDA in Tororo, Uganda for their very considerable help with this project. A large number of other people and organisations have contributed to the success of the project, most notably Mr Anthony Ndungu in Kajiado Kenya, Mr JD Kimani in Kikuyu Kenya and Mr Joseph Gitari in Wanguru Kenya in whose workshops most of the development work of this project was performed. Thanks are due also to Mr Stanley Lameria in Kajaido, Mr Patrick Gitari in Wanguru and Mr Mathew Masai in Machakos for their assistance.





					Scale	100mm	Title WATER CART COMPONENTS	Drawn by	CEO
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