

DTU   **KENDAT**

Animal Cart Programme

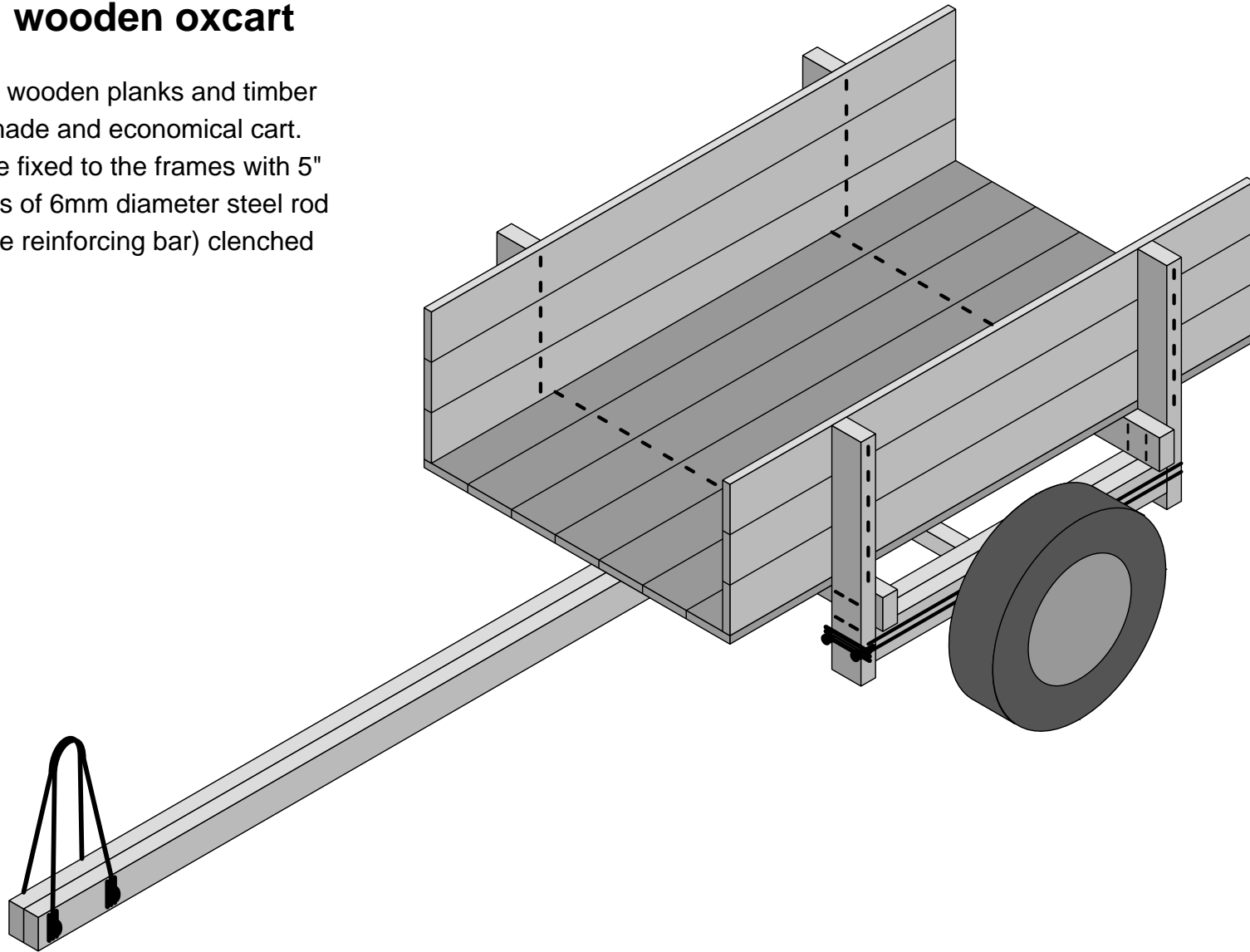
TECHNICAL
34
RELEASE

VESTIGIAL WOODEN FRAME 2-OX CART

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Figure 1: wooden oxcart

This cart uses wooden planks and timber for a quickly made and economical cart. The planks are fixed to the frames with 5" nails or lengths of 6mm diameter steel rod (small concrete reinforcing bar) clenched over.



Ox Cart Body Made From Timber

Introduction

This Technical Release tells you how to make a low-cost wooden cart to be pulled by two oxen. It does not cover the construction of the axle. You can use either a scrap axle from a pick-up truck or car or you can make one. We can supply a number of Technical Releases which cover different axle designs.

We have designs for fixed axles with PVC plastic bearings or roller bearings you can make yourself if you are a good welder/fabricator. And we have double axle systems using wooden

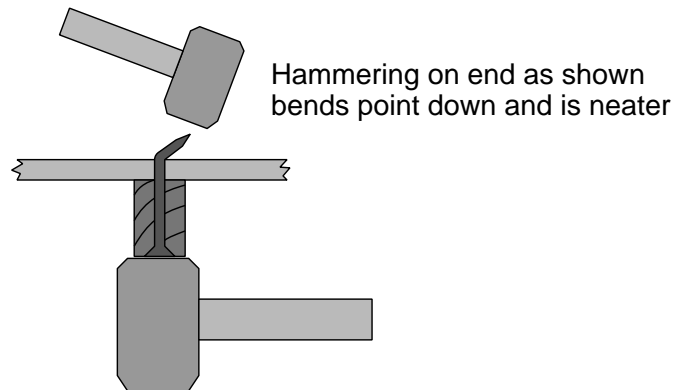


Figure 2: using two hammers to clench nail.

bearings, PVC bearings and ball bearings. These ball bearings can be new or scrap and no machining is needed.

You should find that you can make the cart body for about £ 30 depending on the cost of the materials and labour. Once you get organised, two men can make a cart body in one day. This is quite a lot faster than most carts can be made and it follows from the simplifications which we have made to the design. We've designed it to be easy to make.

Idea Behind Design

We have designed this cart to be easy to make without lots of special tools and jigs, and without any hard-to-get materials. The only tools which you must have are a woodsaw, a hacksaw or cold chisel and a hammer and for some of the components

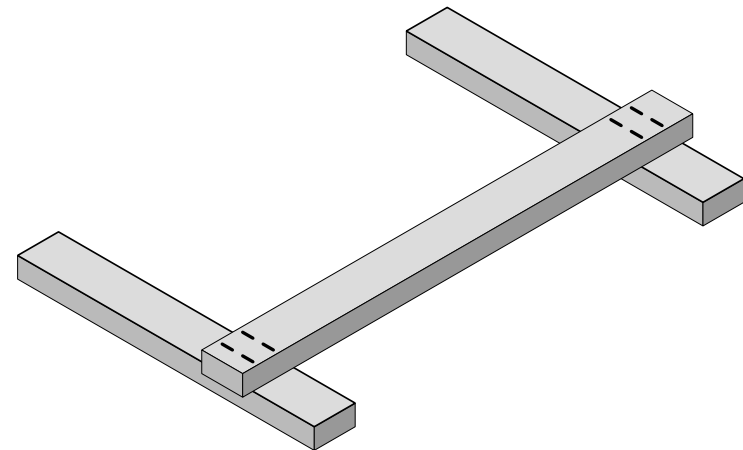


Figure 3: finished U-frame.

shown below you must be able to **weld** - there are alternative ways of making these but they are not as strong. In any case if you make an axle you will have to weld. You might find that a couple of 4" or a 5" G clamps (or something like it) are useful too. For drilling wood we have used flatbits sometimes (Figure 11). We have a Technical Release which describes how to make them.

Most of this cart is joined together using clench nailing which is a bit like riveting. You use nails which are about an inch (25mm) longer than the total thickness of the wood. You probably need to put a piece of scrap timber under the timber

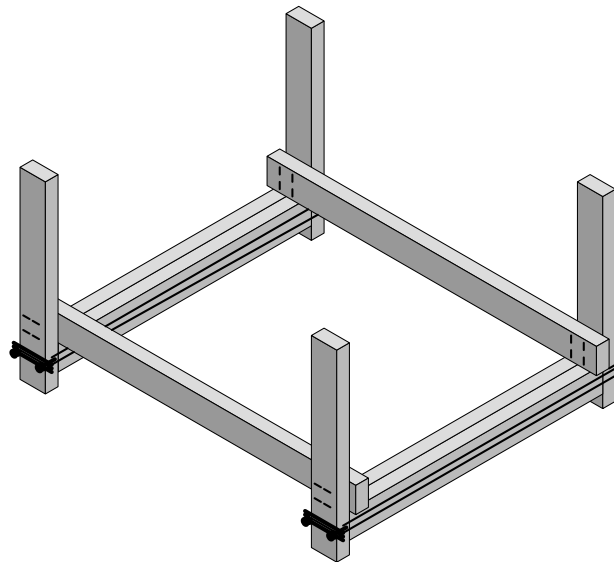


Figure 4: finished framework before planking.

you are working on to stop the nails going into the floor. When you have put all the nails in you put a hammer against the head of each nail in turn and then knock the pointed end over as shown in figure 2. Knock the end of the nail into the timber to make it neat.

If you do not have any nails you can use 6 mm round bar. We tell you how to make joints with 6mm bar at the end of this booklet.

You will see that there are no mitres and complicated angles to

TABLE 1: cutting list for wooden oxcart.				
component	material	# lengths & length reqd [#*mm]	total material in cart [mm]	material s cost in Kenya [£]
animal shaft/ boom	100x50 r/s timber or bush pole	2x3400	6800	2.23
body frame bottoms	100x50 roughsawn timber	2x1100	2200	0.72
body frame sides	100x50 roughsawn timber	4x725	2900	0.95
axle beams	100x50 roughsawn timber	4x1000	4000	1.31
axle chocks	100x50 roughsawn timber	4x500	2000	0.66
tray planks	25x150 or similar timber	13x1800	23400	5.76
tray ends planks	25x150 or similar timber	6x1000	6000	1.48
plank fixing nails/ rivets	6" nails/ 8mm dia re-bar	13x4	6.50	3.25
body frame nails/ rivets	6" nails/ 8mm dia re-bar	4x4	2.00	1.00
axle beam ties	8-12mm dia re-bar or similar	4x2400	9600	1.76
axle fixing loops	12mm dia re-bar or similar	2x400	800	0.23
draught pole bolts	M12 bolts	4x50	4	1.04
draught pole bolt extns	12mm dia re-bar or similar	2x520	1040	0.30
draught pole vertical extn	12mm dia re-bar or similar	2x900	1800	0.53
dr. pole vertical extn bolts	M12 bolts	2x75	2	0.52
d. pole vert extn bolt extns	12mm dia re-bar or similar	2x120	240	0.07
TOTAL->				21.81

cut in the timber so you save time when making the cart. Also the exact lengths of the components are not very critical - again it saves a little time, but you will find that the carts look better if you take a little trouble to get things square and even etc.

We have tested these carts in Kenya and Uganda and we think that they are strong enough, but we cannot be sure. So treat the cart carefully at first!

Construction step by step

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

- 1) The first job, is to get all the materials together and clear a space to work. Ideally you will be able to work on a flat

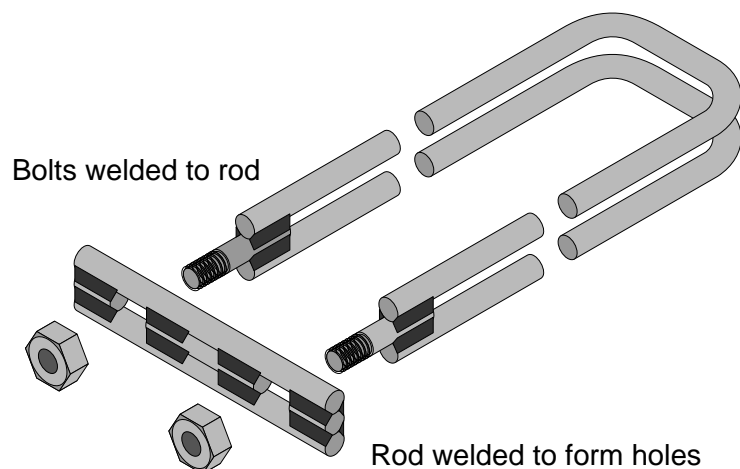


Figure 5: U-bolts for fixing axle beams to U frames.

area of concrete. Start by cutting the 100x50 timber into the right lengths, as in the cutting list, and then you can cut the bottom and side planks. Because timber comes in such variable sizes its best not to cut the steel components until you are sure how big they must be.

- 2) Next make up the two U-shaped front and back frames like those shown in figure 3. If you have a G clamp you can use it to hold two pieces of the frame together during nailing and clenching. It's quick and you can tap the bits with a hammer until everything is square and straight.
- 3) Next fit the axle beams in between the two U frames to make the frame shown in figure 4. The best way to join the U frames and the axle beams together strongly is to make up some big U bolts like those shown in Figure 5. These are made from 8 to 12mm round bar and some bolts. You will see from the drawing that they are made by welding rod together, not drilling holes.

If you cannot get these U-bolts made, use some 6 mm or

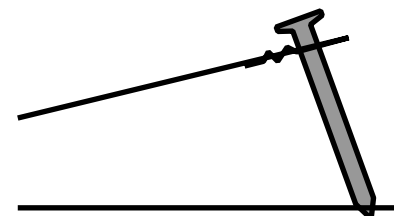


Figure 6: tightening wire by angled nailing.

8 mm round steel bar to tie the frames and beams together. Be very careful if you twist the ends together because some wire breaks quite easily. You can tighten the wire by nailing at an angle as shown in Figure 6 it. You can also tighten the wire slightly after nailing by kinking it.

- 4) Next you can fit the side and the bottom planks with more clenched nails.
- 5) Now you need to fix the draught pole. The best way is to use a big U-bolt to fix it to each U-frame. Do not drill holes in the U-frames or the draught pole for these bolts but arrange them as shown in Figure 7. If you cannot get U-

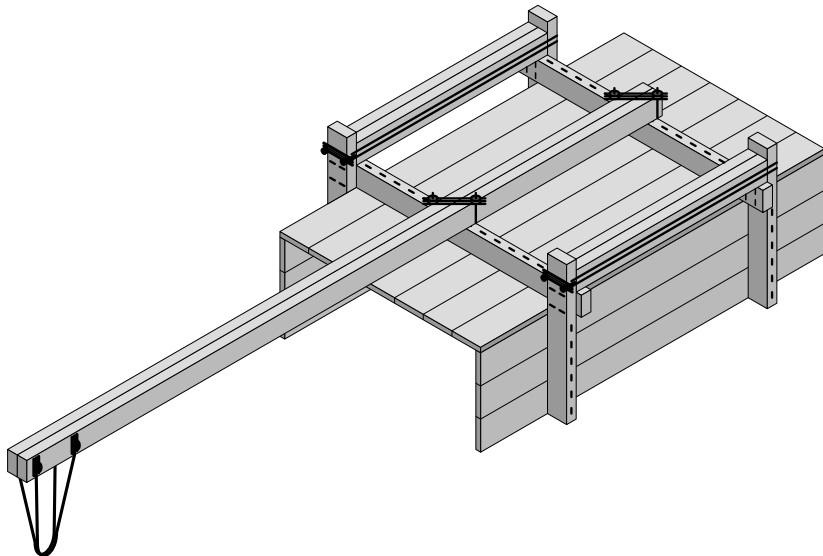


Figure 7: method of fixing draught pole using U-bolts.

bolts made up you will need to fix the draught pole with wood clenched nails and wire.

- 6) The draught pole vertical extension is made from 12mm round bar. To fix it you will need to make long bolts as in Figure 8 from round bar and M12 bolts.
- 7) Nearly there! Fix the axle with more U-bolts around the axle and the axle beams as shown in Figure 9. If you are using a scrap vehicle axle you may need to weld extra pieces of steel to it to make it fit properly to the cart axle beams. Whichever axle you use you will find it stronger to nail pieces of wood to the bottom of the axle beams to stop the axle sliding along it.
- 8) Removable ends for the load tray can easily be provided in the way we have shown in Figure 10. The end is tied against the stop with rope or rubber. (Notice that there is a gap between the stop and the load tray so that the tray can be cleaned easily.

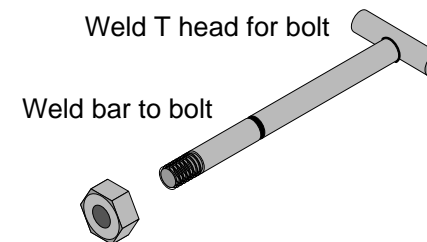


Figure 8: method of fixing draught pole using U-bolts.

9) Paint or creosote the cart. You've finished it!

Modifications

There are many different versions of this cart. You can try longer or shorter carts and you can make them wider or narrower. When you change things check the length and width of the planks of wood that you will use - you do not want to find that you are two inches short of being able to get two runs of plank out of one piece of timber, or that its just too narrow and you have to fiddle about and fit in a narrow strip.

Another modification is to make the cart higher see Figure 11. This lifts the cart body and raises the draught pole reducing the required size of the vertical extension.

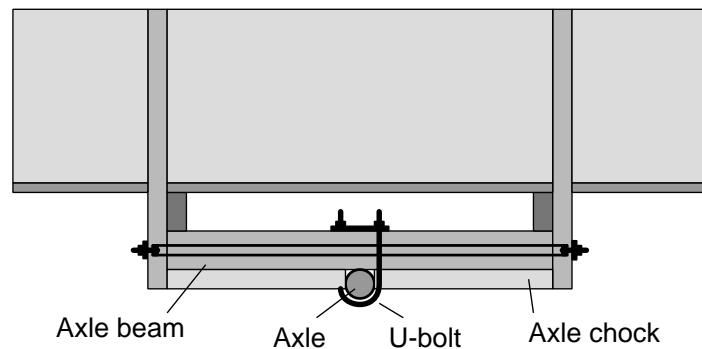


Figure 9: chocking axle to axle beam.

Using 6mm bar instead of nails

You can use 6 mm round bar instead of nails. You will need 16 pieces 150 mm long for the frames and 52 pieces 175 mm long to fix the planks on. You will need to drill a 6mm hole in the wood to use this method. Then put a straight piece of 6mm diameter re-bar (concrete reinforcing bar) right through so it sticks out about 25mm both sides. Then you just knock one end over with a hammer so it lies on the surface of the wood. Next you bend the other end over. Tighten the joint using a second hammer as described above.

You can make the drill yourself if you have to - see our Technical Release on flat bits.

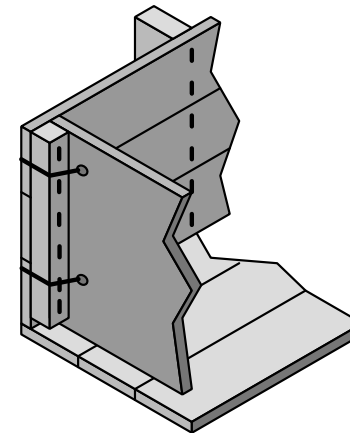


Figure 10: method of fixing tray ends with rubber or rope

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 several designs for 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 - nevertheless you can make either type of cart in only a day or so if you are reasonably set up with tools and materials.

The DTU has also been working on new designs of wheels, hubs and bearings to bring down their costs and make things more locally manufacturable. It has designs for wooden and

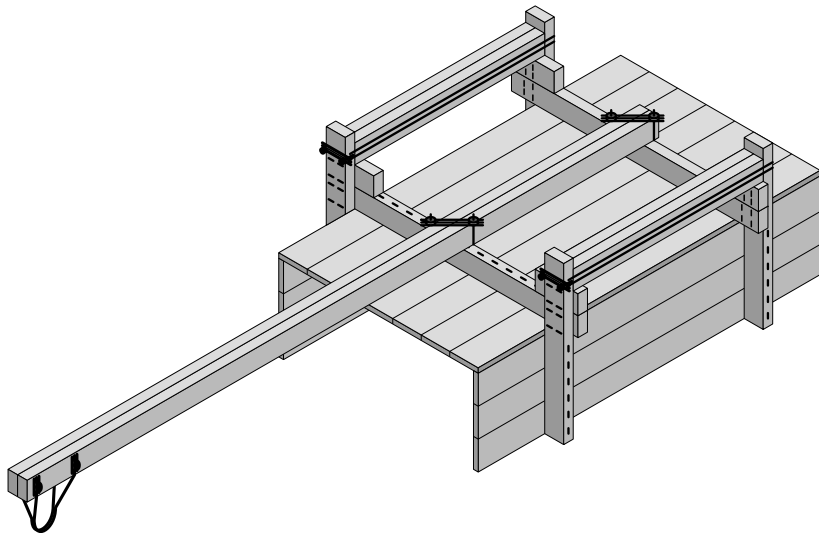


Figure 11: raised cart

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PVC plain bearings and for using scrap or new ball bearings - without needing machining, It also has a system of needle roller bearings which you can make without machining.

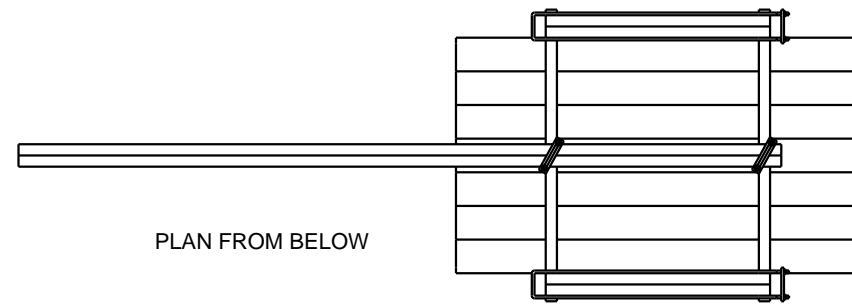
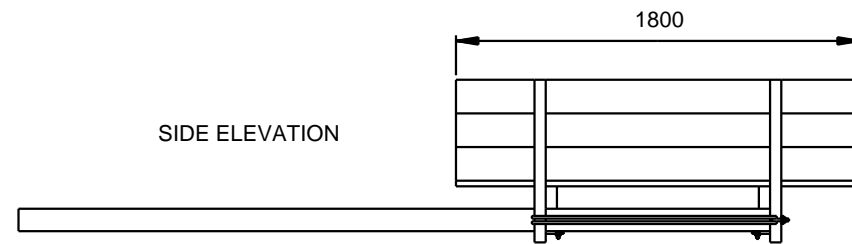
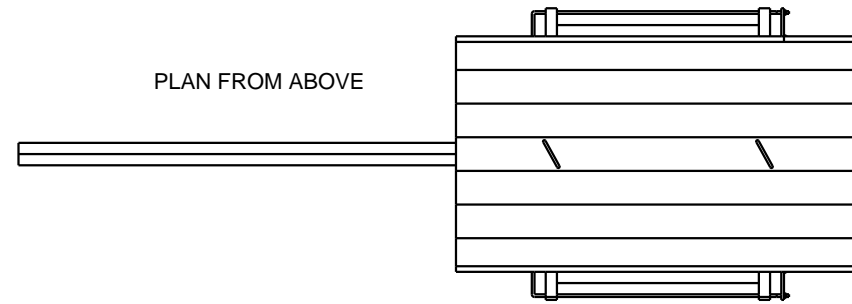
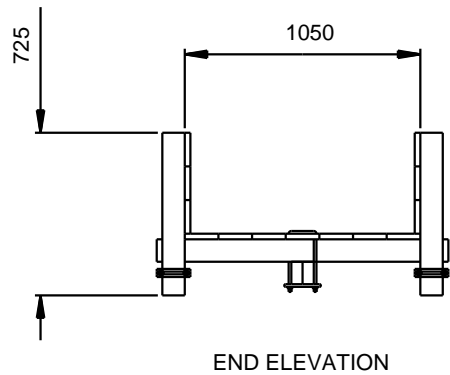
Cart Drawings

You will find two drawings below, the first one gives a general view of the cart and the second, a view of the main components. As we have said you can vary the size of the cart quite a bit and even make it much longer if you add extra frames. You could even make a four wheeled cart like this!

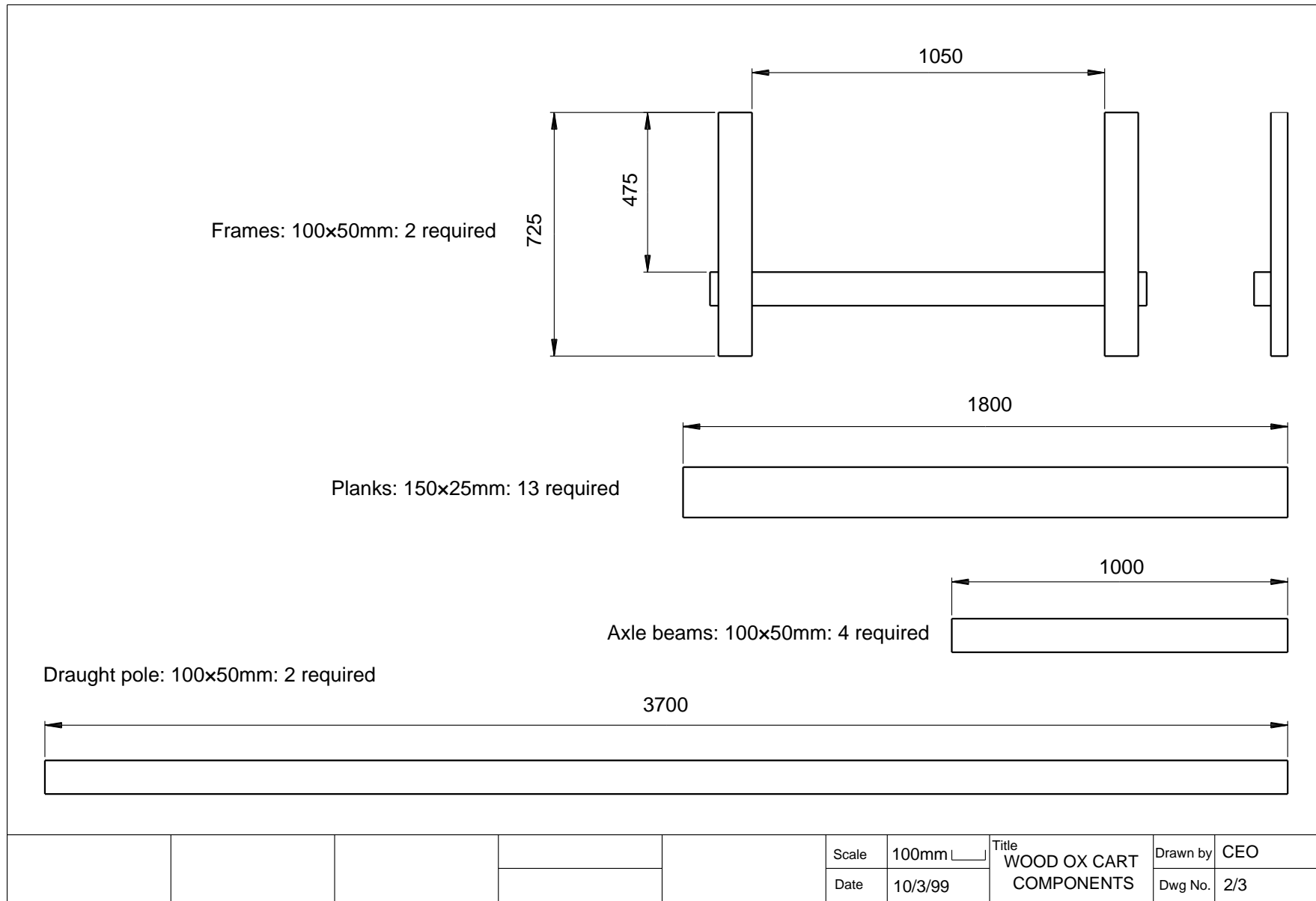
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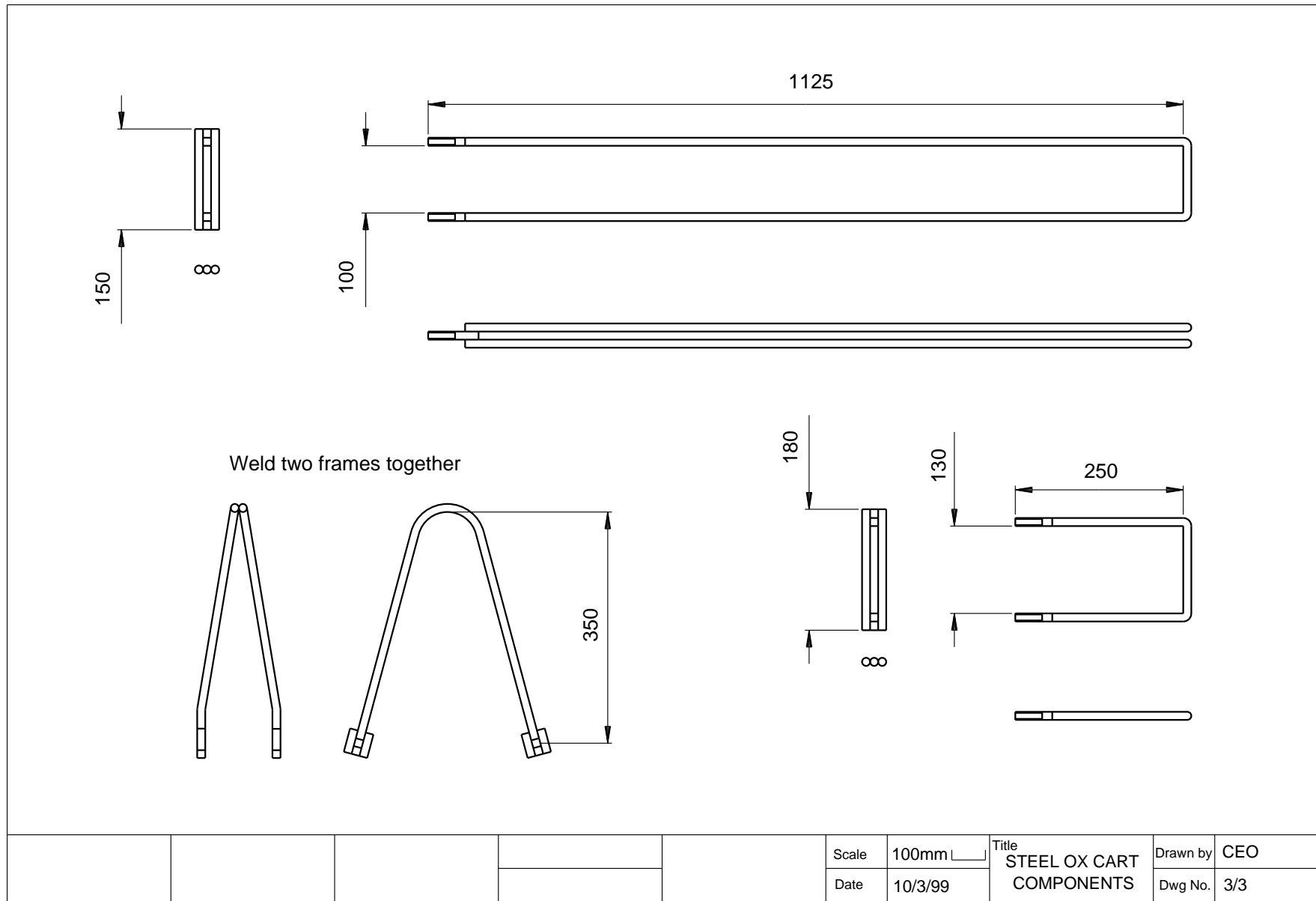
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Scale	100mm <input type="checkbox"/>	Title STEEL OX CART COMPONENTS	Drawn by	CEO
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