KENDAT

DTU

Animal Cart Programme

TECHNICAL
20
RELEASE

STEEL FOUR FRAME CART FOR ONE DONKEY

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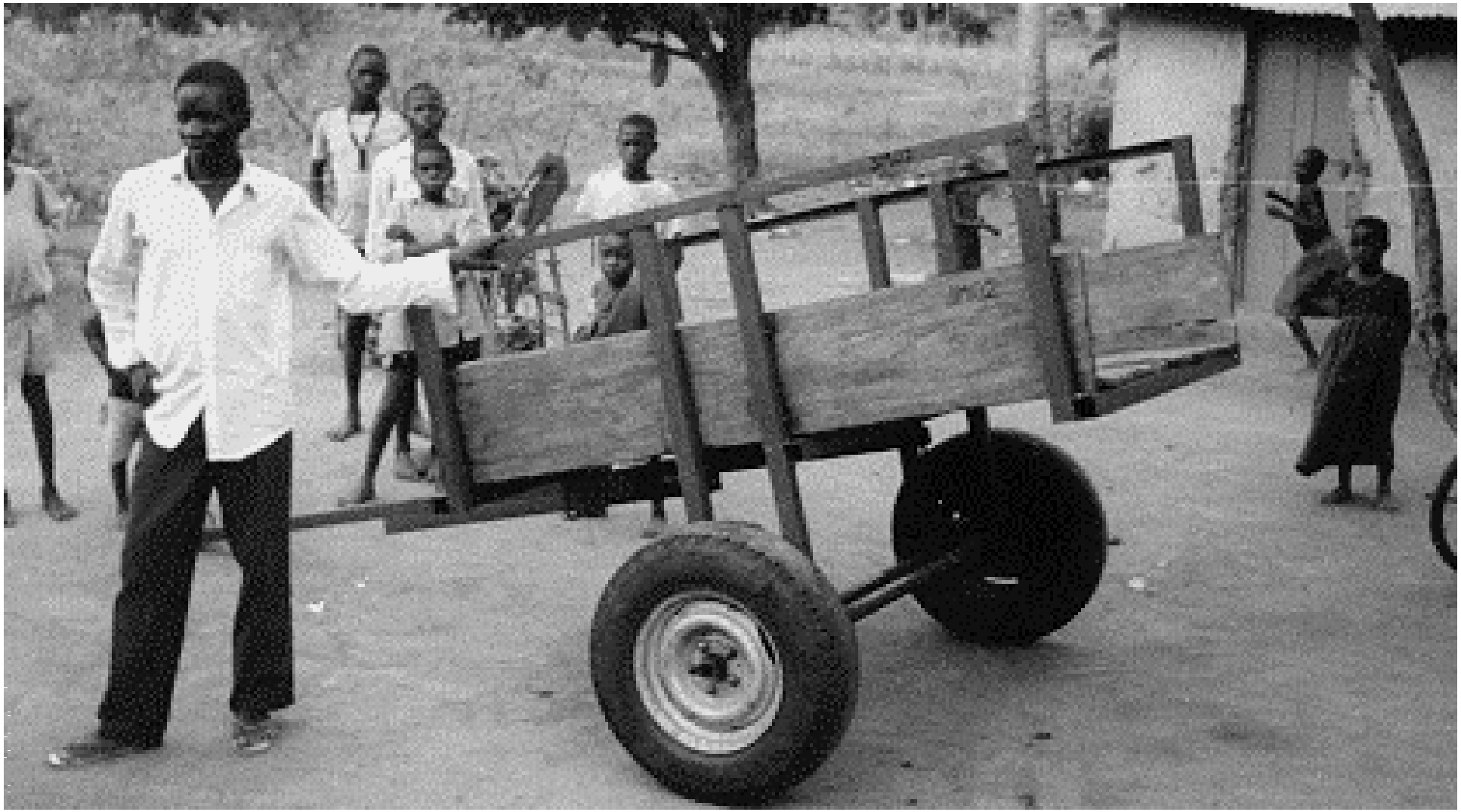

Figure 1: four frame cart with extended frames and twin live axles.

Steel four frame cart for one donkey

This is a light cart for one donkey or for use as a handcart. It is made from square steel tube welded together and timber planks fixed with clenched studs. The planks are part of the structure of this cart and so must be fitted.

Suitable axles

We recommend that you use the PVC plain bearing fixed axle described in Technical Release 28 with this cart, or one of the twin offset axle systems described in Technical Release 36, 37 or 41. An alternative is the needle roller bearing axle described in Technical Release 21, but this is more difficult to make.

You should find that you can make the body for about £$_{UK}$50, depending on the cost of the materials and labour. Once you get organised, two men can probably make one body in a day. We've designed these carts to be easy to make.

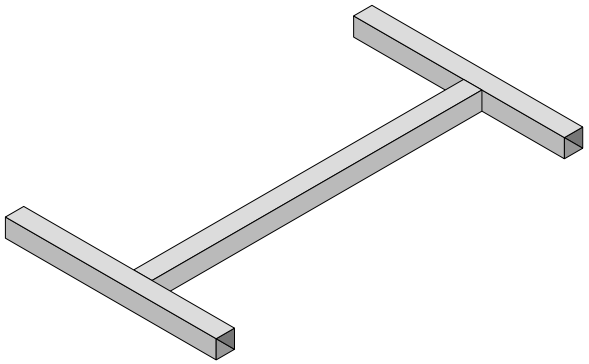

Figure 2: an H shaped centre frame.

To make this cart you must have a simple welder, a woodsaw, a hacksaw, and a hammer.

Construction step by step

Table 1 shows a cutting list for a complete cart body. Recent (1998) prices of materials in Kenya are shown converted into £$_{UK}$.

1) Start by getting all the material together and clear a space to work. Ideally you will be able to work on a flat area of concrete.

2) Cut the 50 × 50 box section steel into the right lengths, as in the cutting list, then cut the bottom and side planks. Lastly cut the 6 mm or 8 mm diameter re-bar for the fixings ie studs.

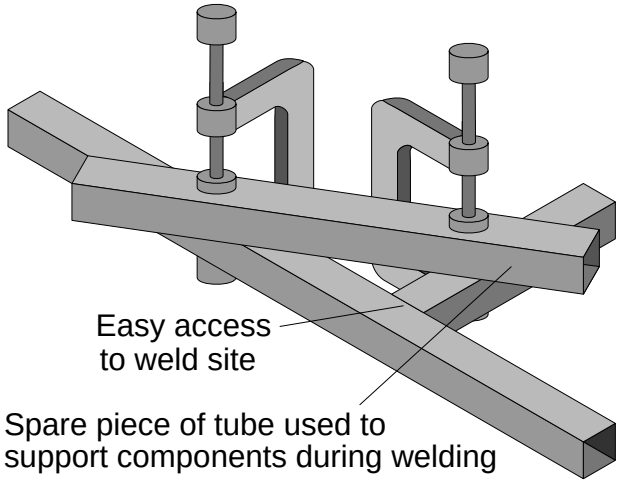

Figure 3: supporting components during welding.

3) Next make up the two H shaped central frames which will support the axle. Figure 2 shows one of these. Figure 3 shows how two pieces of square tube may be held in the right place when welding. Once you have made one frame, make the other the same by welding it on top of the first.

4) Then make up the U shaped end frames as shown in Figure 4. Again, make them as accurately as you can by building them on top of the H frames.

5) Now stand the H frames on the two axle support beams, tack or spot weld them and check that all the joints are square. Figure 5 shows what the finished centre frame assembly should look like.

Table 1: materials and costs.

component	material	# lengths & length reqd [#*mm]	total material in cart [mm]	materials cost in Kenya [£$_{UK}$]
animal shafts	50×50 RHS	2×2200	4400	8.80
body frame bottoms	50×50 RHS	4×1000	3000	6.00
body frame sides	50×50 RHS	4×325	1300	2.60
axle struts	50×50 RHS	4×625	2500	5.00
axle beams	50×50 RHS	2×400	800	1.60
shaft strengtheners	8mm to 12mm round bar1	8×600	4800	1.52
draw pole loop	12mm round bar	2×500	1000	0.32
axle strut braces	8mm to 12mm round bar	2×600	1200	0.38
axle fixing studs	M12 threaded rod or bolts	2×100	200	2.00
axle fixing loops	6mm dia re-bar or similar	2×200	400	0.04
plank fixing staples	6mm dia re-bar or similar	30×250	7500	1.25
tray bottom planks	1"×6" or similar timber	6×1800	10800	3.54
tray side planks	1"×6" or similar timber	4×1800	7200	2.36
tray ends	1"×6" or similar timber	4×900	3600	1.18
TOTAL				36.59

6) Now you can fit the side and the bottom planks to the end frames and then the middle frame. Figure 6 shows how to position these studs and how they can be tightened with a hammer and a weight or another hammer.

7) Fix the axle to the axle support beams as described in the Technical Release on the axle you have chosen.

8) Nearly there! Now you need to fix the draw poles or 'shafts'. It is best to fix them to the body so they can be taken off and replaced if they get damaged. Figure 7 shows how they can be fixed using short lengths of round bar.

9) Figure 8 shows how you can make the ends of the load tray easily removable.

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

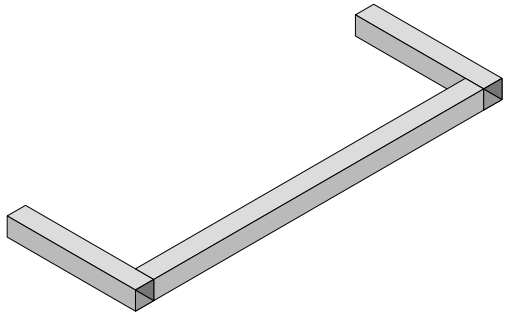

Figure 4: a U shaped end frame.

Modifications

You can try longer or shorter carts and you can make them wider or narrower. When you do this, check the length and width of the planks of wood that you will use to avoid waste. Figure 1 shows a cart made in Uganda with axle support struts extended upwards to carry light foliage.

Cart Drawings

You will find two drawings on the next pages, the first one gives a general view of the cart, and the second gives a view of the main components. As we have said you can vary the size of the cart quite a bit.

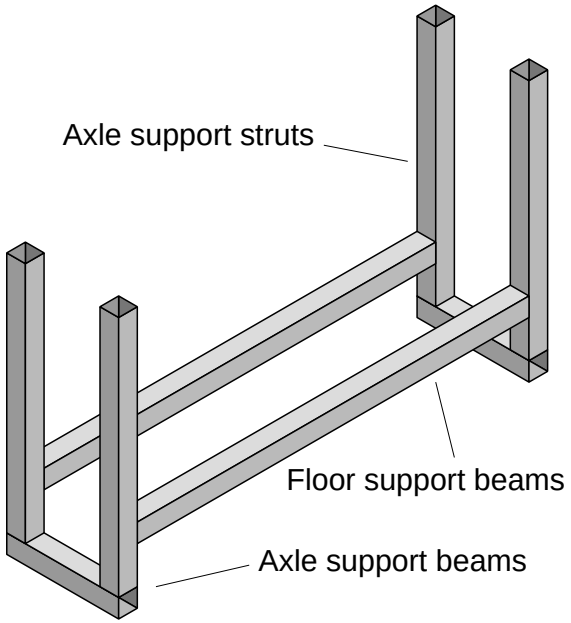

Figure 5: finished centre frame assembly.

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 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.

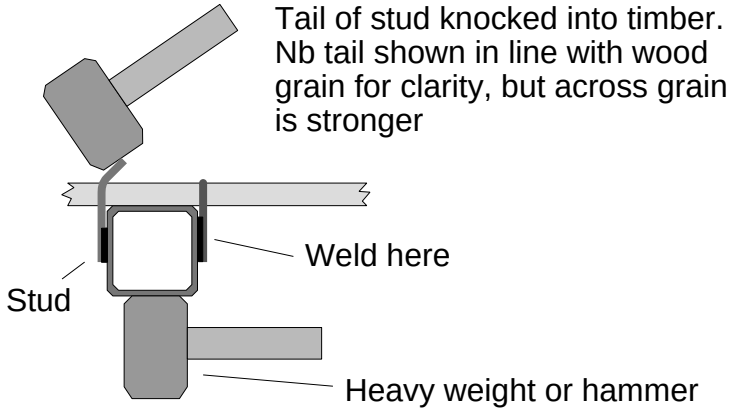

Figure 6: fixing planks to frame with clenched studs.

Technical releases for all these are available.

Acknowledgements

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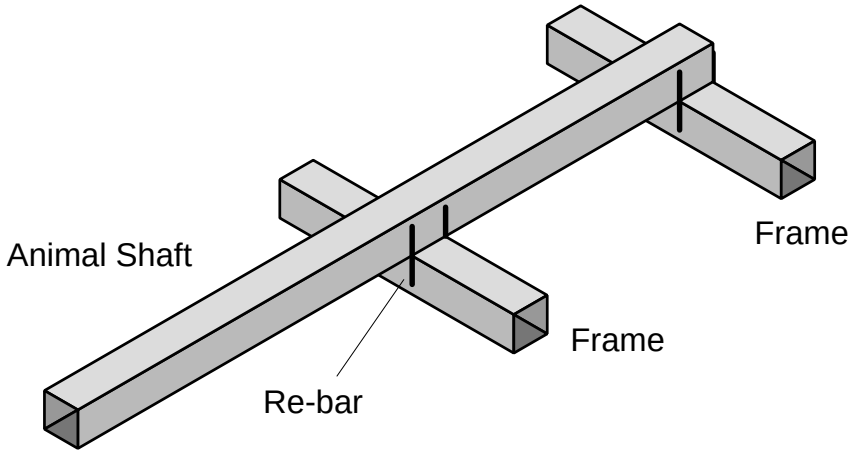


Figure 7: fixing to frame with studs.

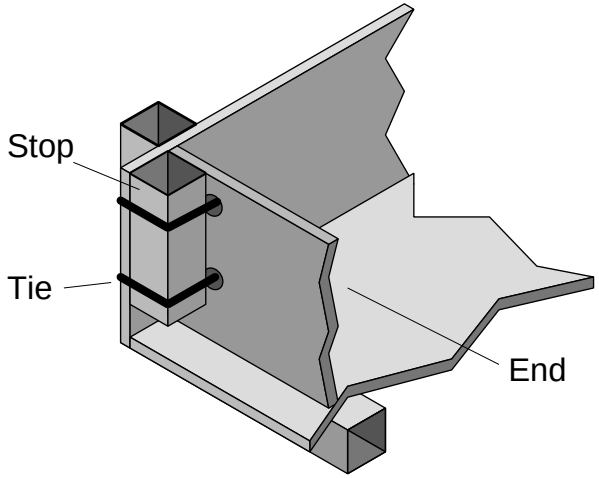
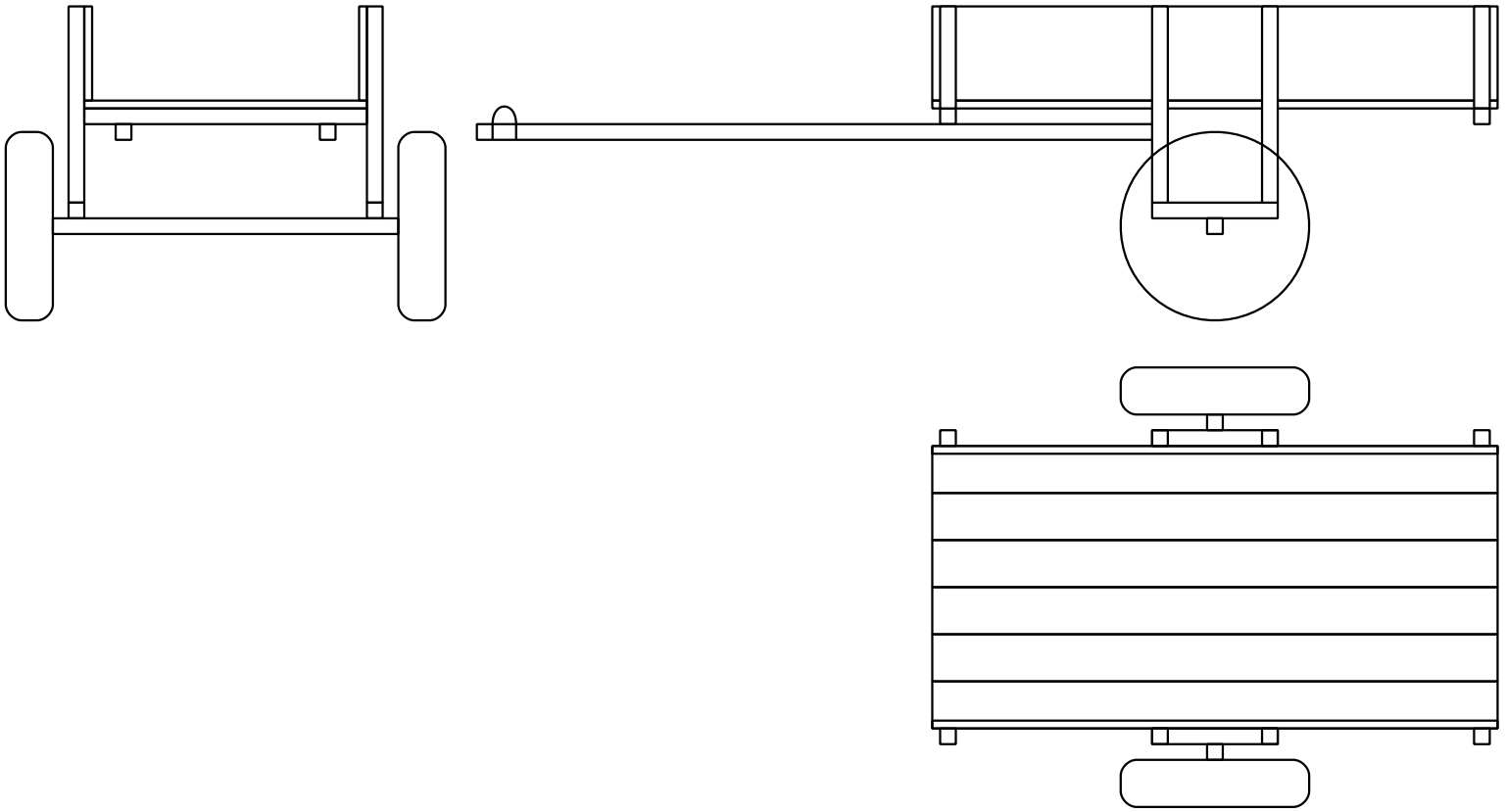


Figure 8: method of fixing tray ends with rubber or rope



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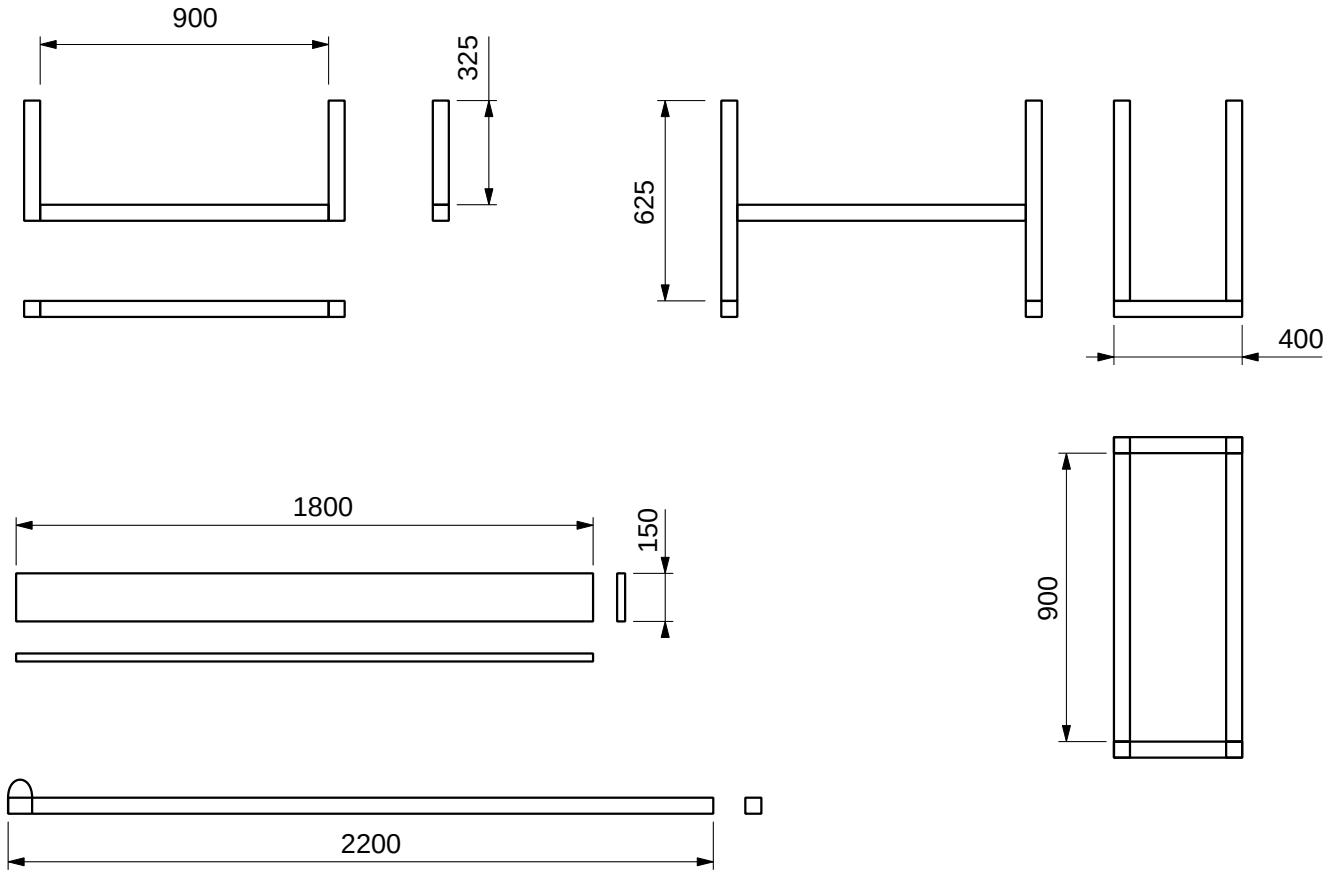

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