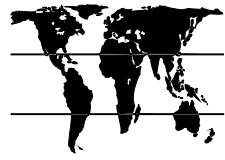



DTU   **KENDAT**

Animal Cart Programme

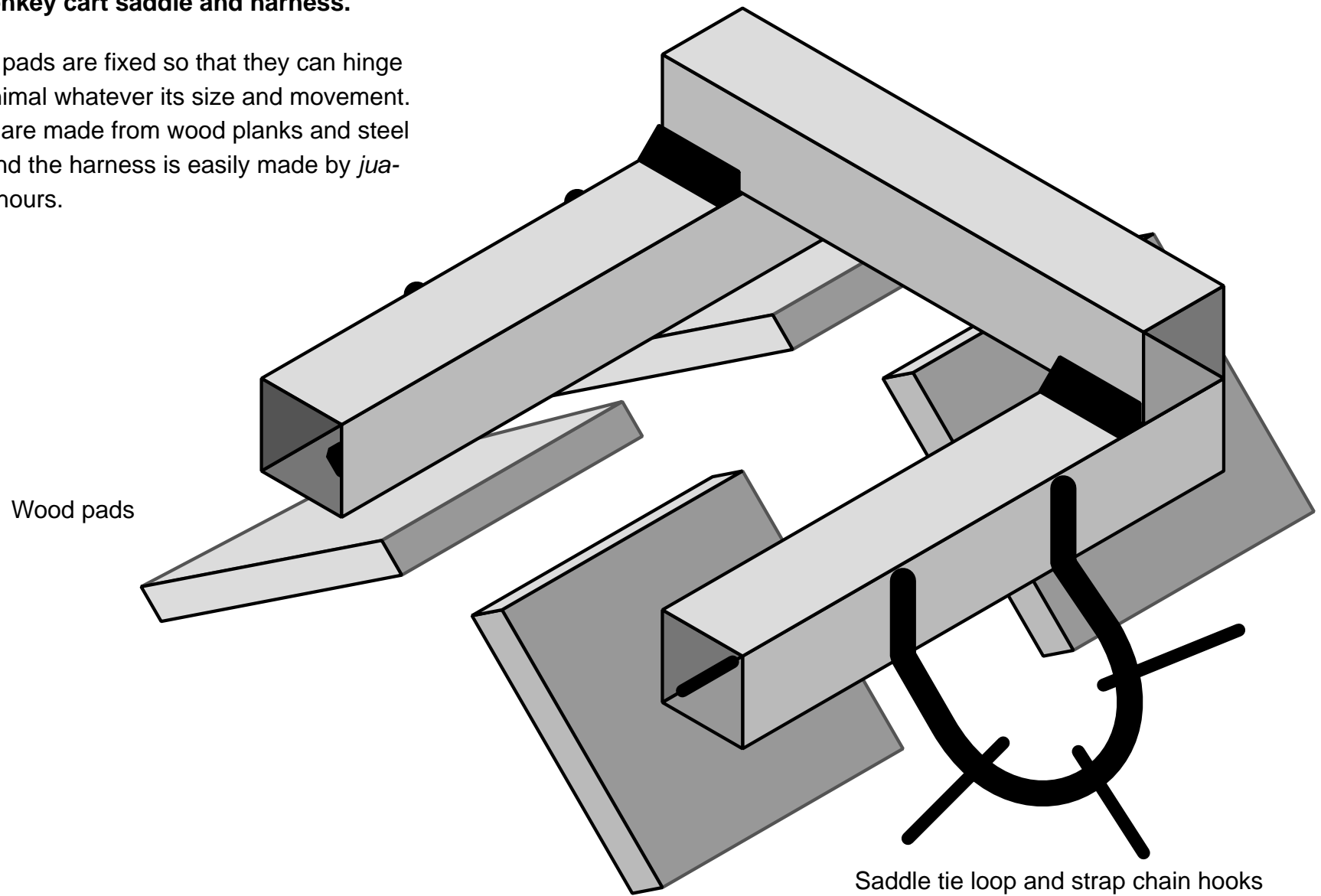
TECHNICAL
27
RELEASE

Single Donkey Harness for Cart Pulling

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Figure 1: donkey cart saddle and harness.

The wooden pads are fixed so that they can hinge and fit the animal whatever its size and movement. The saddles are made from wood planks and steel box tubing and the harness is easily made by *jua-kali* in a few hours.



Donkey Harness for Carts Made From Steel Box Tubing, Timber and Canvas/Sacking

Introduction

This Technical release tells you how to make a saddle and harness system for one donkey to pull a cart with two shafts. Another Technical Release tells you how to make a saddle and yoke harness for two donkeys and a cart with a single draw pole.

You should find that you can make the whole harness for less than £_{UK}5, depending on the cost of the materials and labour. Once you get organised, two men can probably make a complete harness in two hours - we have designed this harness to be easy to make.

Other booklets in this series tell you how to make simple low-cost axles and carts: we have designs for steel framed and wooden framed carts and for many different kinds of axle. All carts and axles can be made without special tools - even drilling metal is not required.

Idea Behind Design

Saddles are used in many countries to hitch animals to carts. Our saddles use a system of hinged pads which swivel to fit

any animal in any reasonable condition. As the animal moves and changes condition the saddle still fits. Using this harnessing method carts can be pulled, steered and braked, and stabilised if the load is too far back on the cart body.

These harness has been tested in Kenya and work well - we have even had donkeys jump over a hedge pulling a cart with this harness! But we would like to test them for a year or two more to see how the animals react.

Special tools and jigs and hard-to-get materials are not required to make the harness. The only tools which you must have are a simple welder, a woodsaw, a hacksaw and a hammer.

The saddle frame is welded and the wooden pads are fixed to the frames with nails which are put through holes in the steel

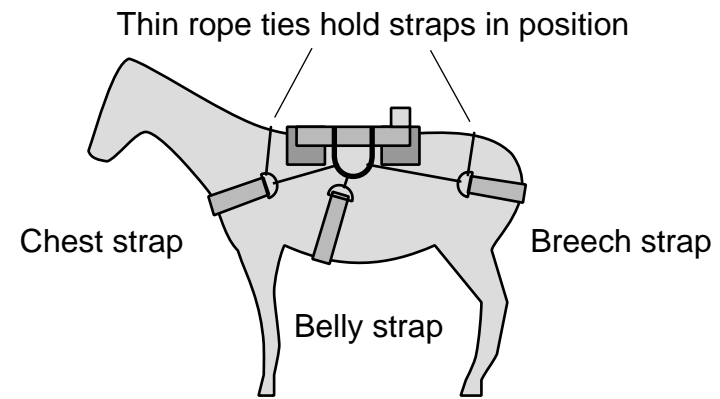


Figure 2: saddle secured to donkey with straps.

frame and welded so that they are loose and allow the pads to follow the shape of the animal.

Cutting list and costs

Table 1 shows a cutting list for a complete harness - recent prices of materials in Kenya are shown converted into £_{UK}.

Construction step by step

- 1) The first job, is to get all the material together and clear a space to work. Ideally you will be able to work on a flat area of concrete.
- 2) Make up the U-shaped frame as shown in Figure 4. If you have a G clamp you can use it to hold two pieces of the frame together during welding.

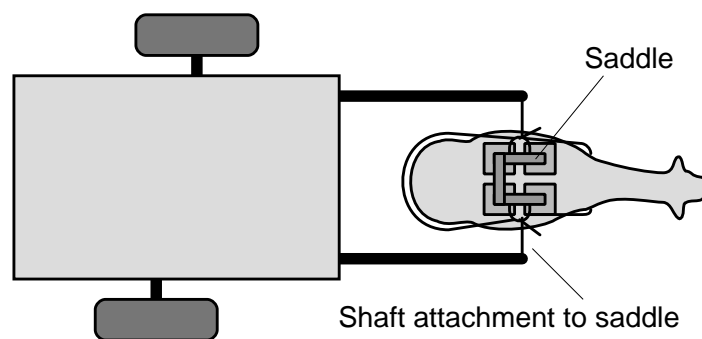


Figure 3: donkey harnessed to cart.

- 3) Then weld the tie loops and the yoke attachment stub and loop onto the U frames so that the frame looks as shown in Figure 5.

- 4) Next cut the wooden load pads and round off all the edges so that there are no sharp corners to stick into the donkey.

Hammer two nails through each of the pads in the positions shown in the drawings. With some timbers you may need to drill holes for the nails to avoid splitting or burn the holes with a hot nail. Then cut the nails so that about 30 mm projects from the timber as shown in Figure 9.

- 5) Now mark the position of the holes required to accommodate the pad nails in the steel tubing. These holes

TABLE 1: harness materials cutting list.

component	material	# components	total mat [mm]	mat cost [£ _{UK}]
main frames	50x50 box tubing	3x325	1800.00	1.06
strap loops	12 mm re-bar	2x300	1200.00	0.19
load pad pivots	12 mm re-bar	4x20	160.00	0.03
load pads	25x150 timber	4x150	1200.00	0.14
pad fix nails	nail or 6mm re bar	8x50	800.00	0.04
strap rings	6mm re bar	6x180	2160.00	0.11
strap clencher	6mm re bar	6x120	1440.00	0.07
strap hooks	6mm re bar	6x150	1800.00	0.09
straps	CC5 canvas	3x4x65	1560.00	1.97
strap chains	dog chain	3x300	900.00	0.70
			TOTAL =	4.40

should be 15 mm and 65 mm from the ends of the square tube as shown in Figure 7. Blow the holes through with the welder at maximum current setting or use an angle grinder or file or hacksaw.

- 6) Next you can weld on the pad pivots blocks as shown in Figure 7.
- 7) Now put the nails through the blown holes and weld a piece of nail across the ends of the nails as shown in Figure 10. Welding down inside the tube looks difficult but skilled workers can weld the pads in about one minute.

An alternative way of doing it is to cut slots 70 mm long along the corners where the holes would be as shown in Figure 8. The slots should be 8 mm wide so that the nails

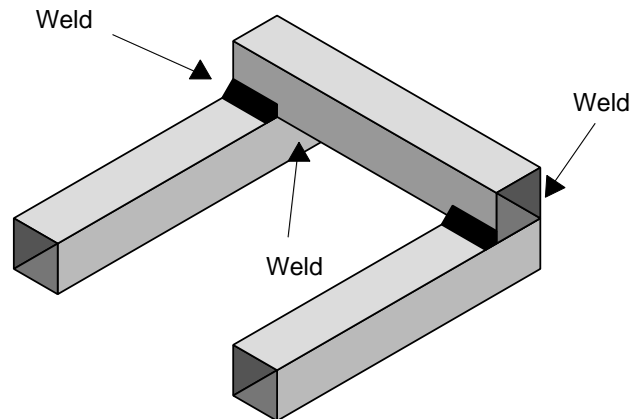


Figure 4: welding of frame cross piece.

are very loose in them. Make up the pads as shown in Figure 9, put the nail loop into the slot in the right place and weld the pad pivot blocks into place across the slot so that they are in the same place as in Figure 7.

- 8) Next you need to make up the six straps to hold the saddles onto the donkeys. The D rings at the end of the straps can be made from 6 mm diameter concrete reinforcing bar as shown in Figure 11. A separate piece of the re-bar is clenched over the strapping using hammer blows to fix the D rings to the ends of the straps as shown.

The straps themselves can be made from heavy canvas or hessian sacking. You should use three or four thicknesses

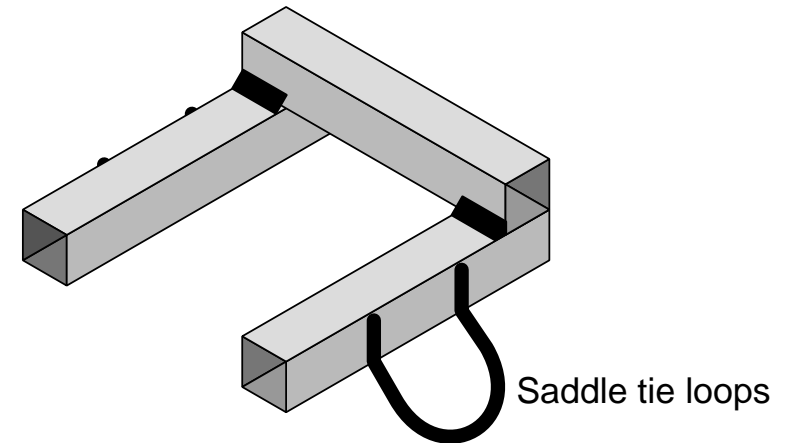


Figure 5: tie loop welded to U-frame.

of material for them to make them strong enough and soft enough not to hurt the donkey.

- 9) Make the strap chain hooks from more 6 mm re-bar as shown in Figure 12 and fit the fixed ends to the saddle tie loops.
- 10) Paint and creosote the saddle. You've finished it!

Method of harness use

- 1) First put a blanket or two folded hessian or jute sacks (not plastic) onto the donkey's back to protect it.

Remember that protecting the donkey will save money because it can work harder if it is comfortable and will not

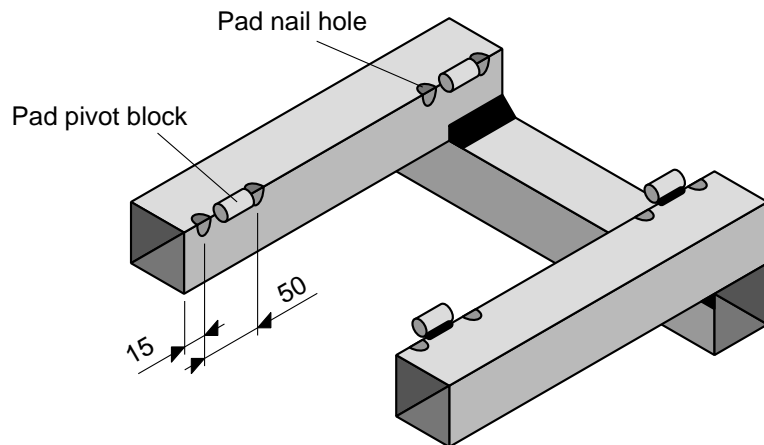


Figure 6: pad nail hole positions and pad pivots.

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get sick from skin wounds.

- 2) Put the saddle on so that the cross beam is towards the animal's rear. Position the fronts of the wood pads about 100 mm behind the animal's shoulder blades. This means that the saddle should never come near parts of the animal's back which move.
- 3) Next hook the breaching strap to the loops hanging from the side of the saddle. It should be tight enough to tend to pull the saddle a little rearwards. Make sure that the breaching strap is pulled up high so that it does not rub the backs of the legs. But it should not be so high that the animal cannot defecate. Tie a piece of thin rope across the animal's back between the rings of the strap to hold the

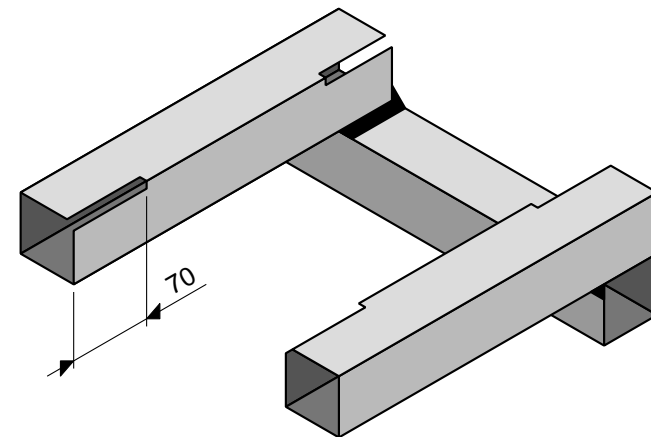


Figure 7: pad nail slots.

strap up.

- 4) Now hook the chains for the belly strap onto the hooks fixed to the saddle tie loops. The strap should be 50 mm or 100 mm behind the front legs - check that the legs do not rub on the strap when the animal walks. Tighten the strap so that you can just get a couple of fingers under it between the strap and the animal. This will be much tighter than the other straps.
- 5) Hook the chest strap to the loop and adjust the tension so that it is a little loose. Use another short piece of rope to hold the chest strap up so that it is just below the windpipe. The strap goes tight when the animal pulls really hard. We have noticed that the belly strap and breaching strap are nearly enough without the chest strap and so we leave the chest strap a bit loose.
- 6) You are ready to go! You should be able to saddle an

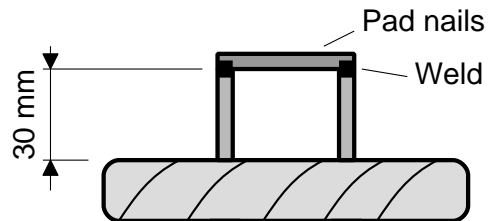


Figure 8: welded pad nails.

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animal in only a few seconds when you get practised.

Saddle Drawing

You will find drawings of the saddle and yoke on the last pages of this Technical Release.

Other DTU cart developments

The DTU has been working on a range of cart designs for use with both donkeys and oxen. It has designs for wooden and

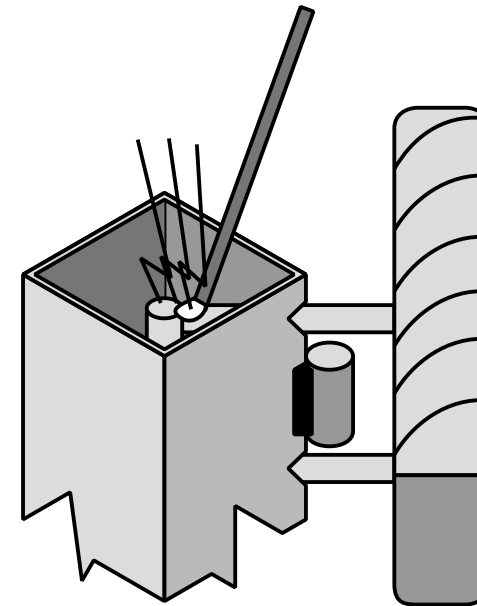


Figure 9: welding re-bar to frames for wooden load pads.

steel framed types. You can make either type of cart in only a few hours, 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 a system of axles with bearings made from PVC pipe, another with wooden bearings and a third using scrap ball bearings. None of these axles need machining and they only take two men a day to make.

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Acknowledgements

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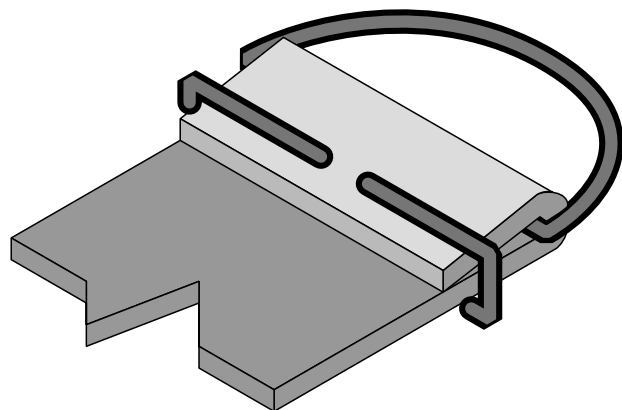


Figure 10: D rings for straps made from re-bar.

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development project under which this product was developed.

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 Kajiado, Mr Patrick Gitari in Wanguru and Mr Mathew Masai in Machakos for their assistance.

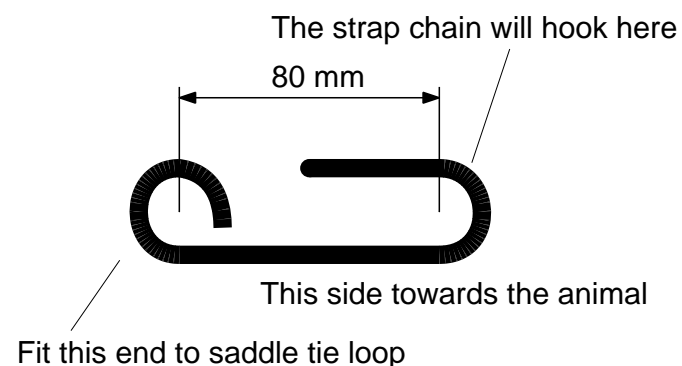
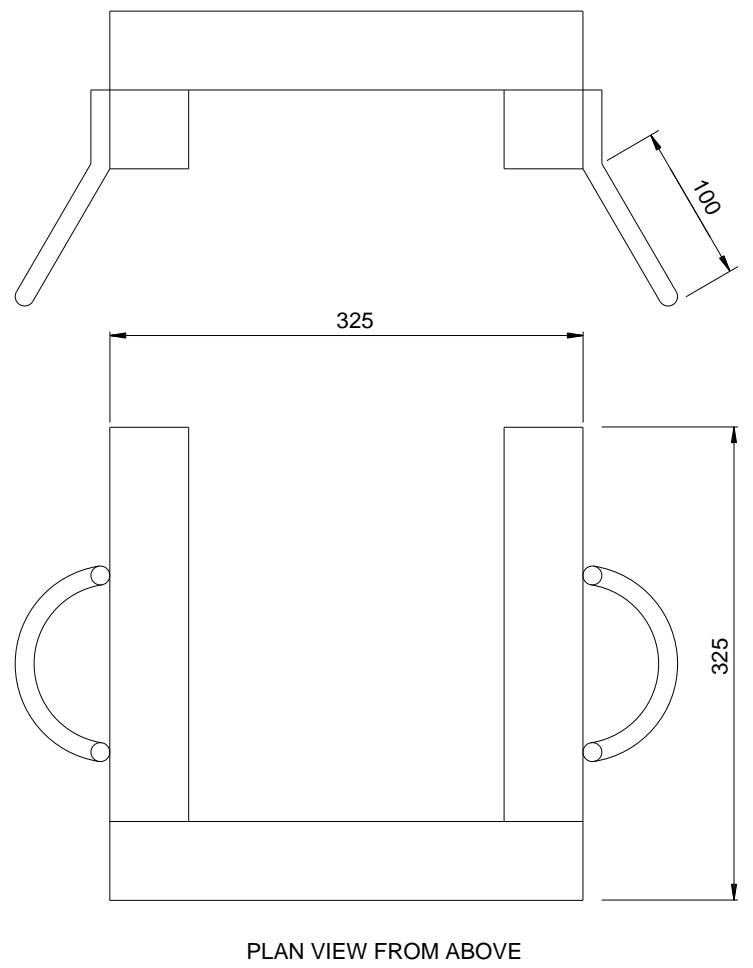
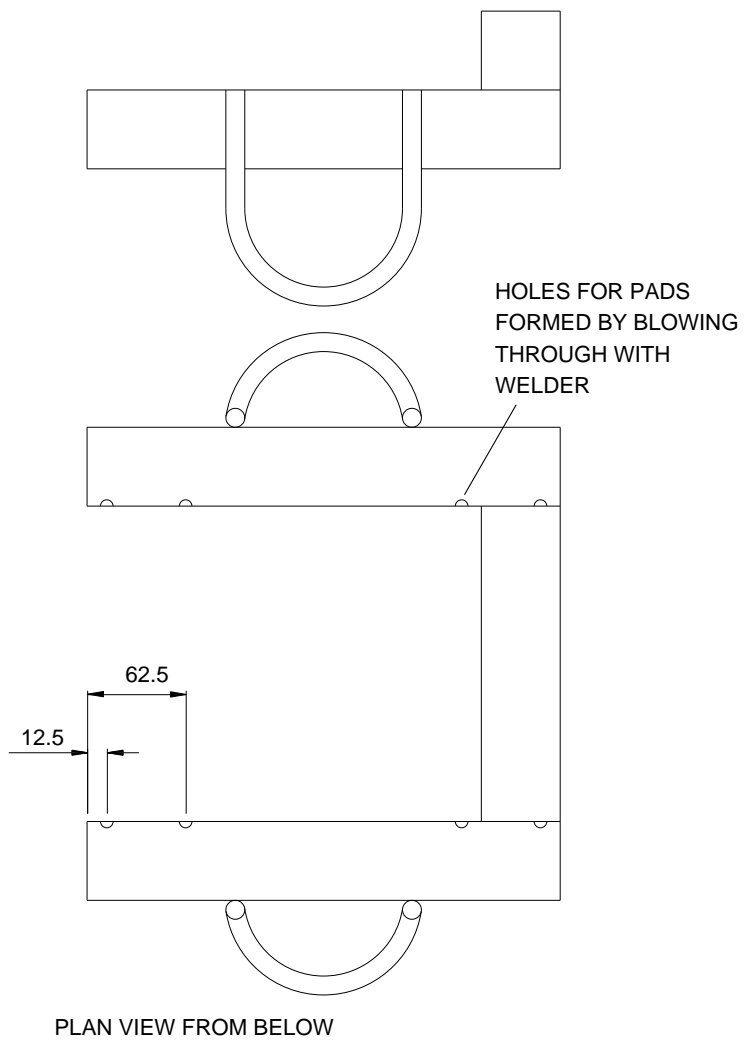
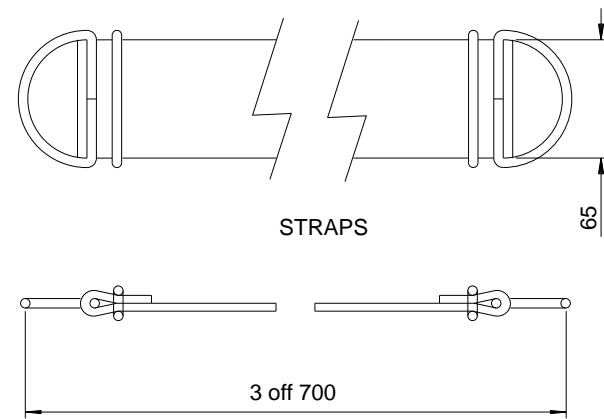
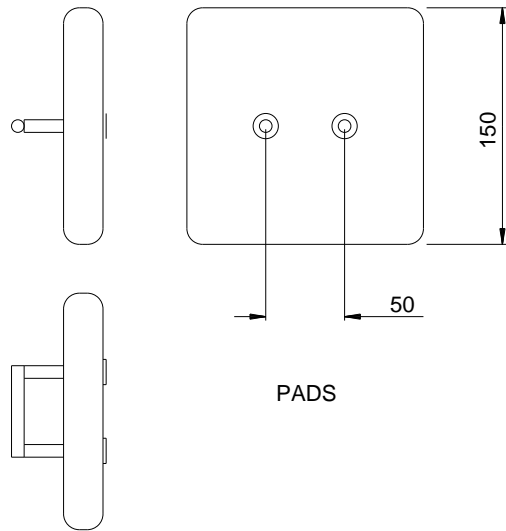


Figure 11: chain hooks for straps.



Scale	50 mm	Title	Saddle for	Drawn	CEO
Date	15/4/99		donkey carts - frame	Dwg #	1/2



					Scale	<u>50 mm</u>	Title	Drawn	CEO
					Date	15/4/99	Saddle pads & straps	Dwg #	2/2