KENDAT

DTU

Animal Cart Programme

TECHNICAL
49
RELEASE

Wooden Single Donkey Harness for Cart Pulling

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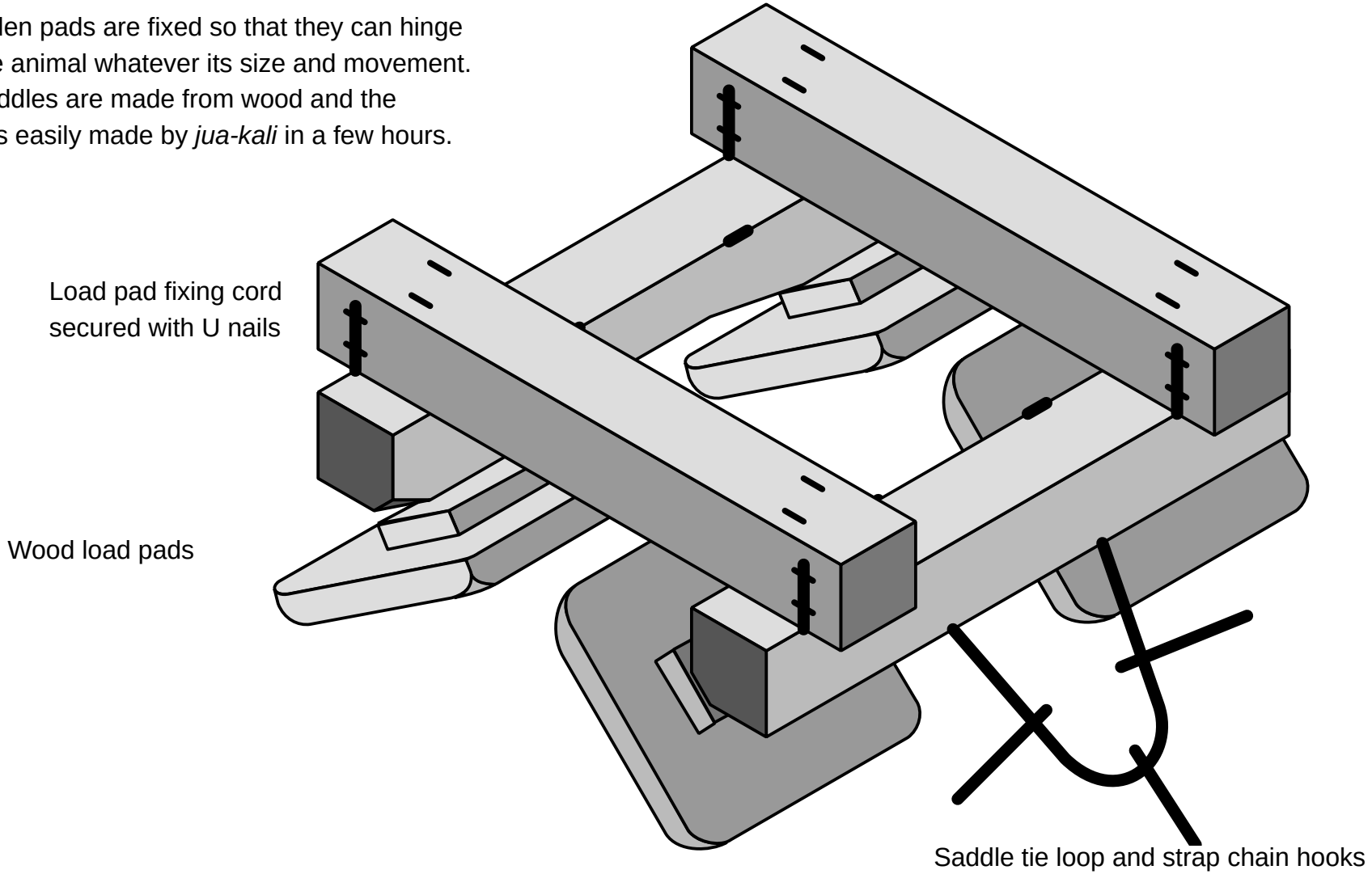
Figure 1: donkey cart saddle and harness.

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



Donkey Harness for Carts Made From 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 to suit a cart with a single draw pole or even to pull a light plough. If you would prefer it there are steel versions of these saddles.

You should find that you can make the whole saddle and harness for less than £$_{UK}$7, 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 Technical Releases in this series tell you how to make a wooden pannier saddle for awkward loads and simple low-cost carts and axles: we have designs for steel framed and wooden framed carts and for many different kinds of axle. All 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. This saddle, and the similar ones made from metal, 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.

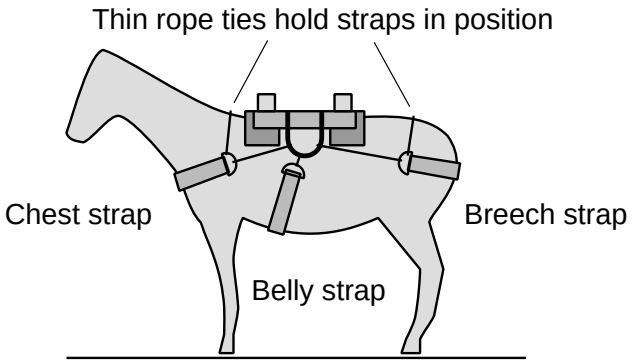


Figure 2: saddle secured to donkey with straps.

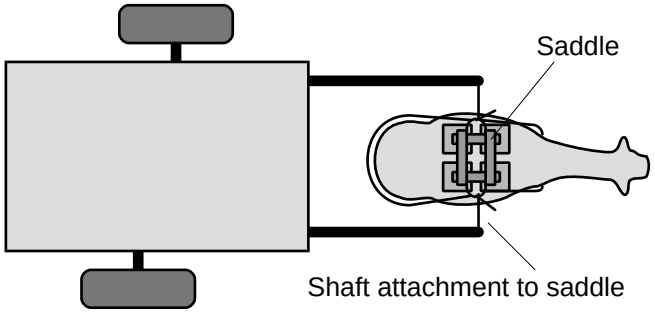


Figure 3: donkey harnessed to cart.

These harnesses has been tested in Kenya and work well - we have even had donkeys jump over a hedge pulling a cart with this harness!

Special tools and jigs and hard-to-get materials are not required to make the saddle and harness. The only tools which you must have are a woodsaw, a hand drill with a 4 or 5 mm and a 10 mm drill bit and a hammer.

The saddle frame is clench-nailed together and the wooden pads are fixed to the frames with thin rope or cord so that the pads are free 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 £$_{UK}$.

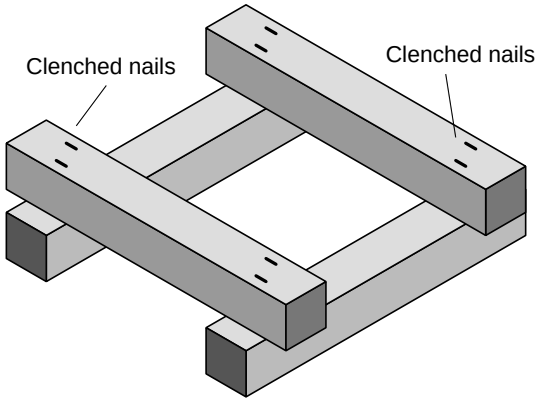


Figure 4: clench nailed frame.

TABLE 1: harness materials cutting list.

component	material	# components	total mat [mm]	mat cost [£$_{UK}$]
main frame	50×50 timber	4×370	1480	0.88
saddle tie loops	10 mm re-bar	2×300	600	0.19
load pads	25×150 timber	4×150	1200	0.40
load pad packing	25×50 timber	4×100	400	0.09
load pad fixing cord	6mm dia rope	4×300	1200	0.15
pad cord fix U nails	U nails	16	0.1kg	0.20
strap rings	6mm re bar	6×180	2160	0.11
strap clenchers	6mm re bar	6×120	1440	0.07
strap hooks	6mm re bar	6×150	1800	0.09
straps	CC5 canvas	3×4×65	1560	3.63
strap chains	dog chain	3×300	900	0.90
drawpole fixing hooks	6mm re bar	2×300	600	0.06
			TOTAL =	**6.78**

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 work bench or a flat area of concrete.

2) Make up the frame as shown in Figure 4. Each of the four corner joints is made by clench nailing with pieces of R5 or R6 (5 or 6 mm diameter round steel bar or rod often used concrete reinforcement) through holes drilled in the wood (to make sure the wood does not split). Figure 6 shows the layout of the hole positions.

   If you have a G clamp you can use it to hold two pieces of

the frame together while you drill the holes. The holes should be a bit smaller than the rod, say 4mm or 5mm diameter. It is best to sharpen the pieces of R5 or R6 so that they go through the holes smoothly. (Clench nailing just means knocking the ends of the pieces of rod over so that they grip tightly, as shown in Figure 5.)

3) Make up the saddle tie loops from 300 mm lengths of R10 or R12 if the saddle is to be used for heavy work.

4) Drill holes for the saddle tie loop on each side of the saddle frame in the positions shown in Figure 7. Hammer in the loops and clench the ends over so that the frame looks as shown in Figure 8. As before the drilled holes should be smaller than the round bar.

5) Chamfer the inside of the frame as shown in Figure 6 and Figure 7.

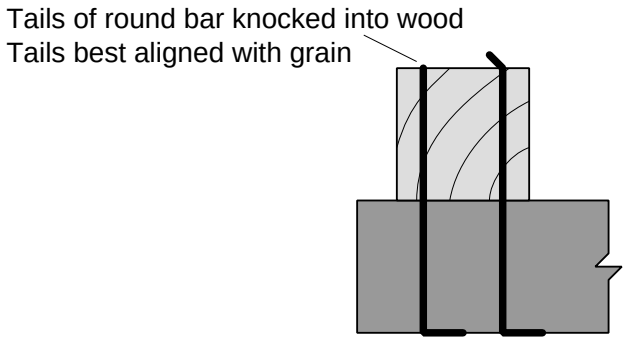


Figure 5: details of clench nailing.

6) 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 100 mm or 120 mm long nails into the edges of each load pad so the nails run across the grain as shown in Figure 9. This should prevent the pads splitting across the grain. Drill two holes through each of the pads in the positions shown in Figure 9 for the pad-to-frame fixing cord or rope. Cut a slot between the holes to accomodate the cord using a chisel or screwdriver.

7) Make the pad packing from pieces of wood 25×50×100 mm. Drill holes 60 mm apart to match the holes in the pads.

8) Now drill the holes required to accommodate the load pad fixing cord in the saddle frame. These holes should be 20 mm and 80 mm from the ends of the timber frame as shown in Figure 7.

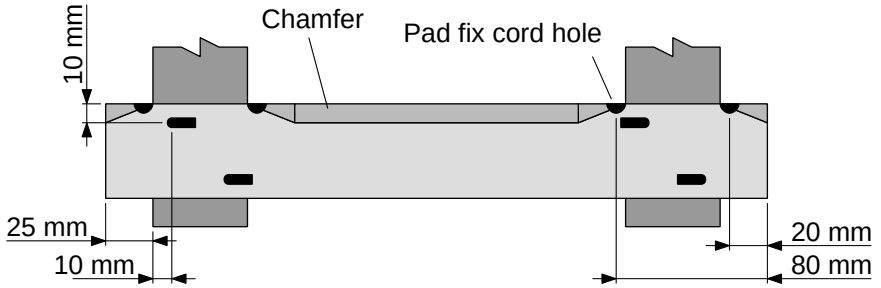


Figure 6: frame joint clench nail layout and pad fix holes.

9) Push the cord through the holes in the pad and the frame and fix the cord with woodscrews and washers or U nails to the frame as shown in Figure 1. The cord should be tight but should still allow movement of the pads.

10) Next make up the three straps to hold the saddles onto the donkey. D rings at the end of the straps can be made from R6 ie 6 mm diameter bar as shown in Figure 10. A separate piece of R6 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 even hessian sacking although sacking only lasts a few months. Use three or four thicknesses of material to make them strong enough and soft enough not to hurt the donkey.

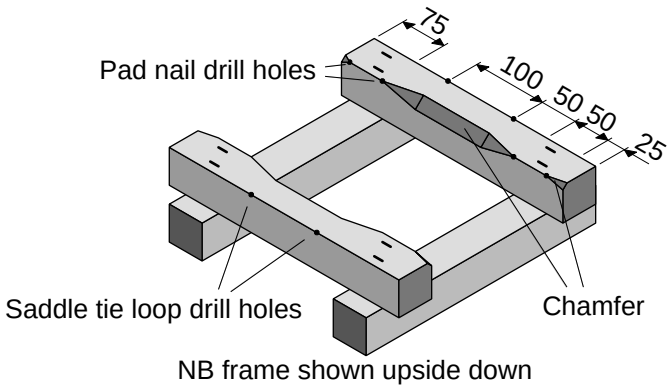


Figure 7: chamfered inside of frame.

11) Make the strap chain hooks from more R 6 as shown in Figure 11 and fit the fixed ends to the saddle tie loops.

12) Make up the saddle tie loop to cart draw pole hooks as shown in Figure 12.

13) Paint, oil or creosote the saddle. You've finished it!

14) Many cart users like to have the padding and saddle blanket actually fixed to the saddle. This can be done using small nails to fix the padding to the wooden load pads. It is quicker to put such a saddle on but it does make cleaning the padding more difficult. Padding becomes dirty from sweat and oil from the animal and needs regular (weekly or monthly) cleaning if possible to reduce friction and damage to the animal.

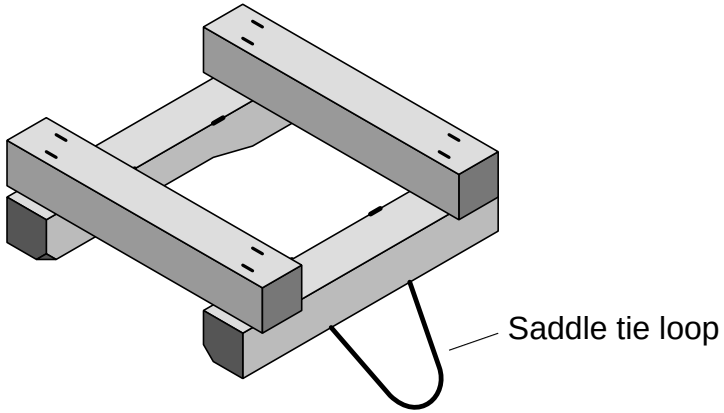


Figure 8: tie loops fitted through holes drilled in frame.

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 for it can work harder if it is comfortable and will not get sick from skin wounds.

2) Put the saddle on so that the strap attachment loops come down the sides of the animal. Position the fronts of the wood pads about 100 mm behind the animal's shoulder blades.

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 strap up as shown in Figure 2.

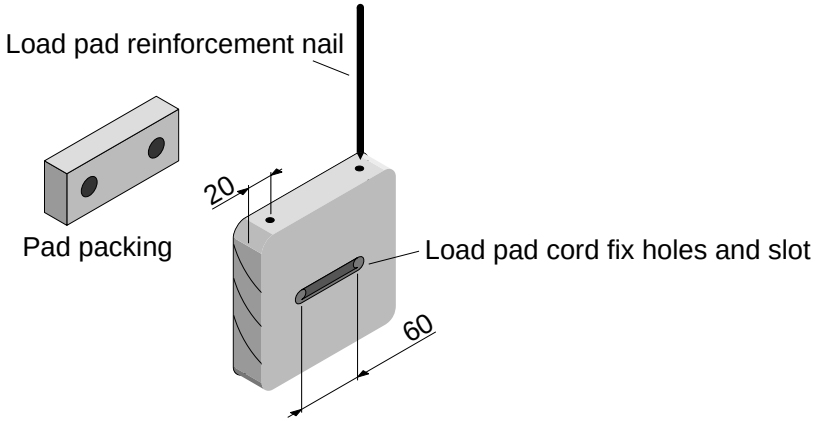


Figure 9: load pad reinforcement by nails across grain

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 belly 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 as shown in Figure 2. The strap only goes tight when the

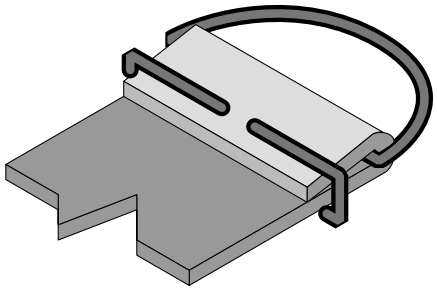


Figure 10: D rings for straps made from re-bar.

animal pulls really hard. We have noticed that the belly strap and breaching strap are nearly enough without the chest strap and so we can leave the chest strap a bit loose most of the time.

6) Now fix the ends of the cart draw poles to the saddle tie loops using more R6 loops like those shown in Figure 12. You may have to change their length to suit the cart and saddle, but if you make them from pieces of R6 300 mm long it will be close. This harness suits drawpoles which are well apart; 700 mm is good and makes sure the poles do not rub on the animal. The loops on the draw poles should be at the ends of the poles so that the poles cannot impact the animal.

7) You are ready to go! You should be able to saddle an animal in only a few seconds when you get practised because you will know how big your animal is and how many links of the chain you need between the hook and the D-ring for each strap.

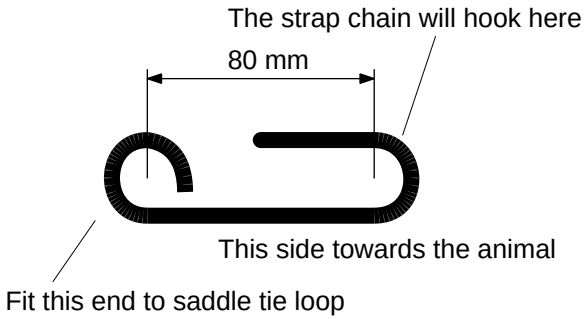


Figure 11: chain hooks for straps.

Saddle Drawing

You will find drawings of the saddle 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 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

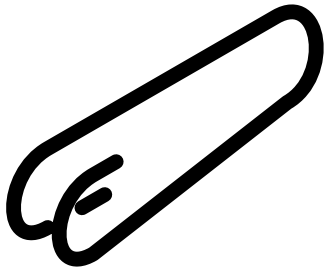


Figure 12: saddle tie loop to cart draw pole fixing hooks.

machining and they only take two men a day to make.

Acknowledgements

The DTU would 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 help.

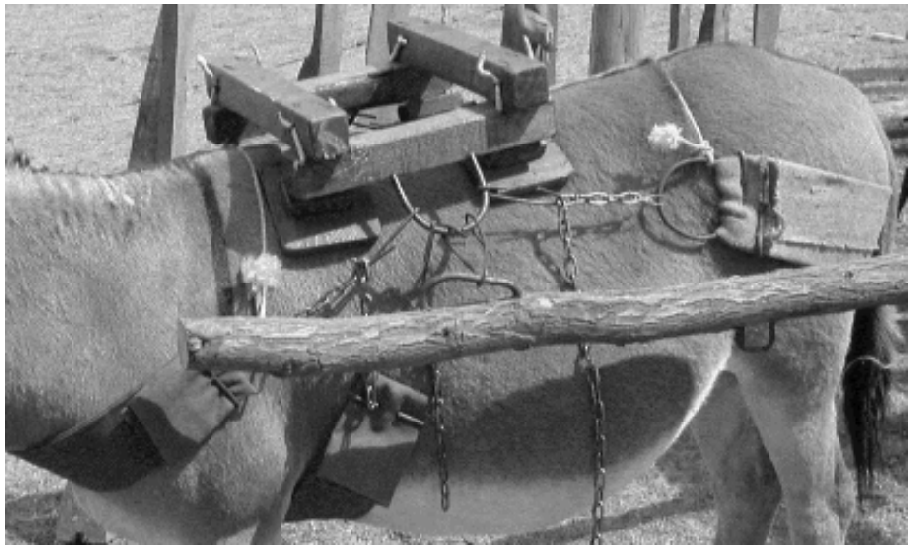
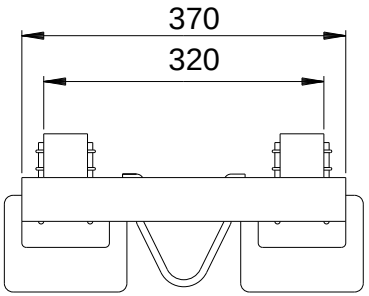
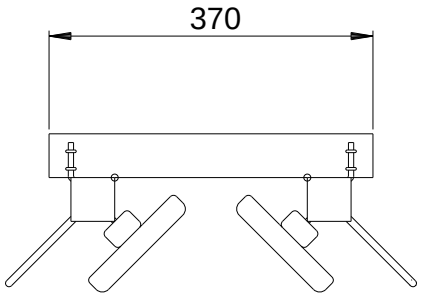
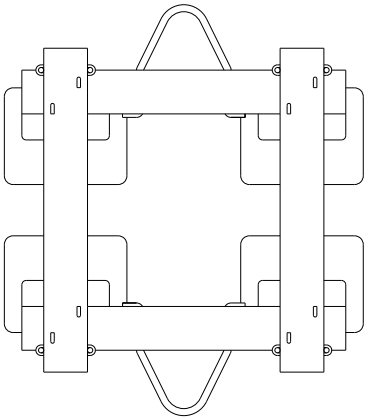


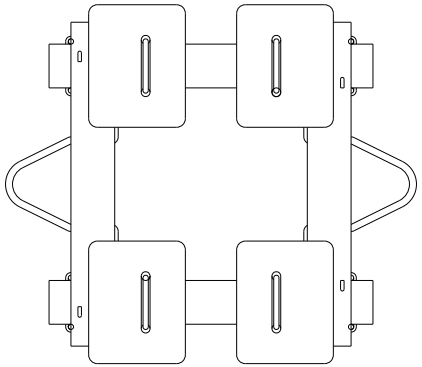
Figure 13: saddle in place - nb cart draw poles too long and saddle blanket not fitted in this demonstration.





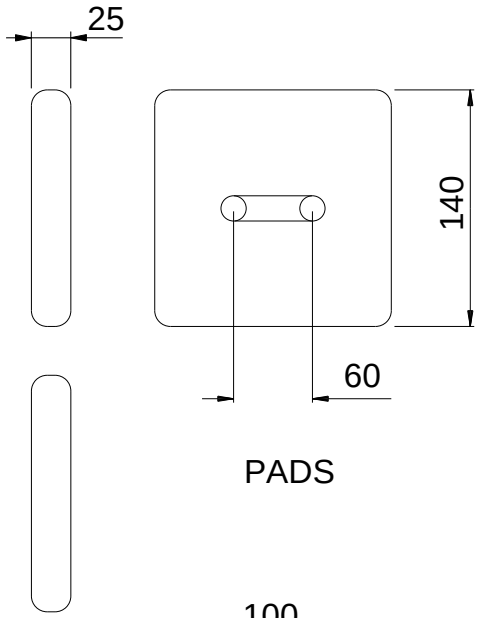


PLAN VIEW FROM ABOVE

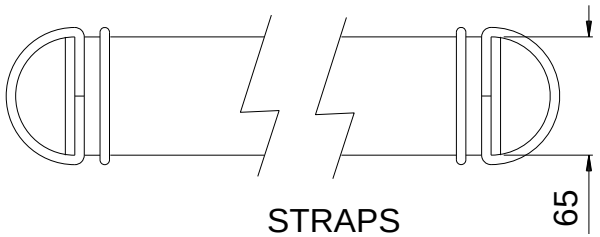


PLAN VIEW FROM BELOW

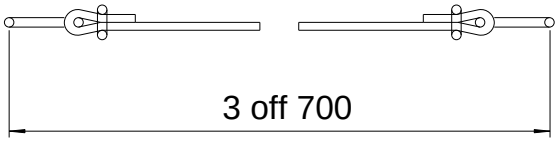
Scale	100 mm	Title Wooden saddle for donkey carts	Drawn	CEO
Date	4/10/02		Dwg #	1/2

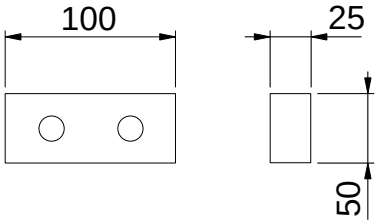


PADS



STRAPS





PAD PACKING

					Scale	50 mm	Title	Drawn	CEO
					Date	4/10/02	Saddle pads & straps	Dwg #	2/2