



# Animal Cart Programme

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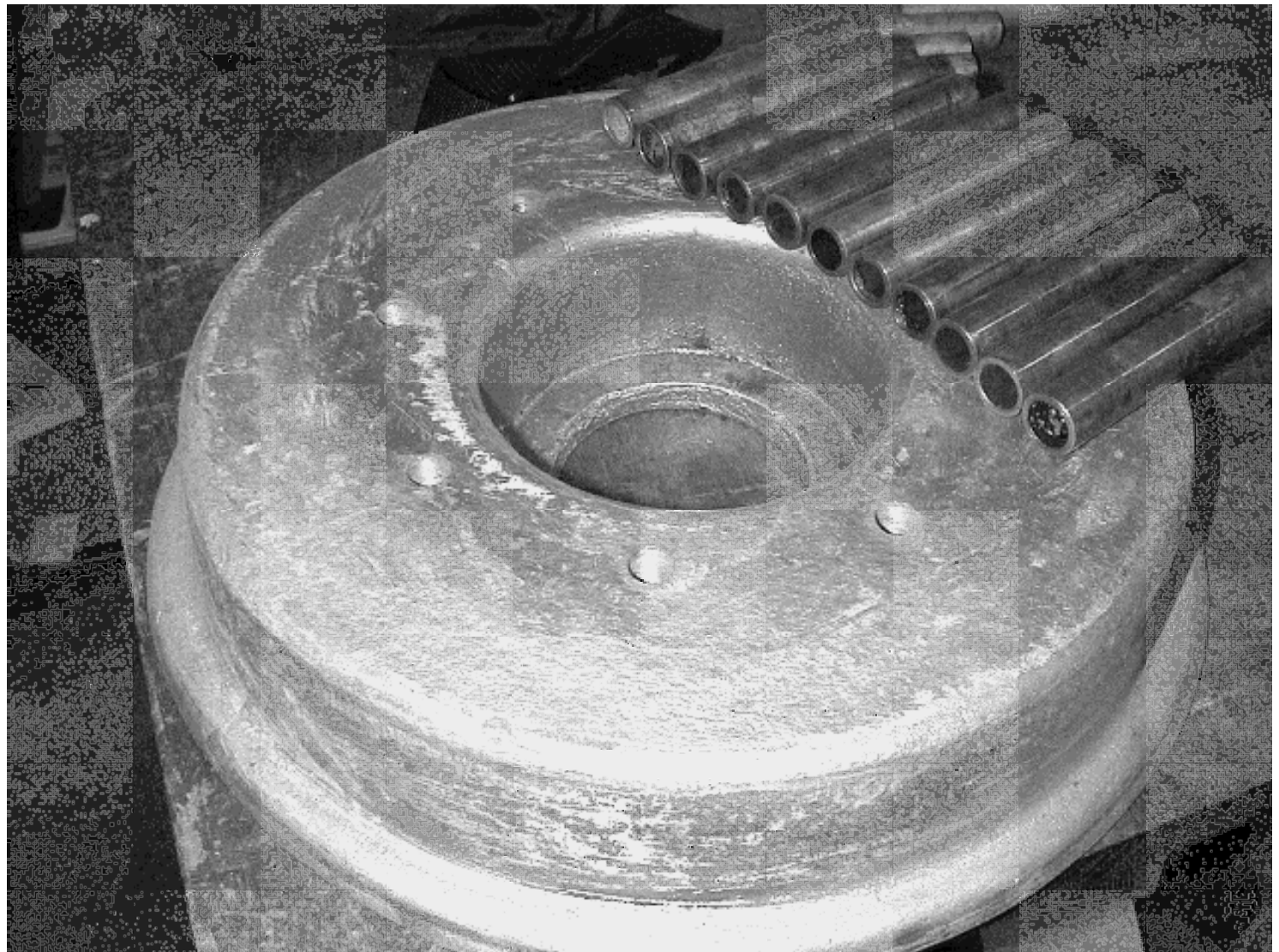
As cast aluminium wheel with integral roller bearing

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**Figure 1: unmachined cast aluminium wheel for animal carts using simple pipe rollers as a low cost roller bearing.**

**This photograph shows one half only of the wheel. Also missing is the axle - just a piece of 2" pipe (outside diameter 60mm) and the thrust washers.**

**Note the polish on the rollers and the scuff marks in the aluminium casting where the ends of the rollers rub.**



# As Cast Aluminium Wheel for Animal Carts.

## Introduction

This booklet describes work carried out at Warwick University on as cast aluminium wheels with integral roller bearings for animal carts. This work grew out of work we had performed in Nigeria.

We have made several wheels to the design in the drawings in this document and tested them in a machine which makes them revolve under load. Figure 1 shows one half of one wheel. We ran them for many days and then took them apart to see how much they had worn. We were surprised that they had worn only a little.

We think that they could be used in some countries where scrap aluminium is cheap and where there is good enough communication to allow manufacture in a few workshops around a country and a trade in wheels to develop. Unfortunately we thought that these conditions did not exist in Kenya and Uganda.

We expect that you could make a pair of these wheels including the bare steel axle pipe for about £30. This cost will depend on the cost of the materials and labour.

## Easy to cast design.

We have designed this wheel to be easy to cast. You need only to feed the molten aluminium to three or four places around the rim and if you make the gates quite big (about 30 mm by 20 mm) you may be able to avoid using feeders. All the components of the wheels and axle can be made without machine tools though you may need to drill the holes for the bolts joining the two halves of the wheel together if you cannot cast them.

## Construction

We have not developed these wheels and so we do not have proper instructions for their casting. We cast our wheels in a special casting laboratory at our university. But we did do some quite complicated casting in Nigeria and we are sure that it would be possible to do this work in most other developing countries. Certainly we identified several companies who could have cast the wheels in Kenya.

Unfortunately therefore you will have to get local expert casting workers to make a suitable wooden pattern from the drawings and then make the castings. After that you can make up the rollers and the rest of the axle yourself.

- 1) The first job, is to get all the material together including the castings and clear a space to work. Ideally you will be able to work on a flat area of concrete.

- 2) Clean up the castings and cut off all the excess lumps from the casting process. Remember that the inner tube will press on the casting so you don't want sharp points left to make punctures.
- 3) Line up two wheel halves and drill six or eight bolt holes through as shown in the drawings. It is probably worth making these holes 13 or 14 mm diameter if you are using M12 bolts because it is hard to get all the holes to line up accurately.
- 4) Cut lengths of 1/2" steel pipe to act as rollers. You should file the ends of the rollers smooth and square to the length so they revolve smoothly.
- 5) Make the big washers from 5 mm or 5 mm steel plate. You do not need to make them very accurately but they must go over the axle and they must not have any bumps on the

sides. So you could make the hole in the middle with a welder as long as you file the bumps off afterwards.

- 6) Cut the axle to length and assemble the wheels and washers on it in the right place. You do not need to put the rollers in at this stage. Mark the position of the cross bolts in the axle and blow the holes with an electric welder or drill them.

A useful way of cutting pipe square at the ends is to wrap a piece of paper or cardboard around the pipe and push it until the edge of the paper is level all the way round and the paper is tight on the pipe. Then mark around with felt tip pen. Finally cut to the line.

- 7) Next remove the components, clean everything and put it all together with some oil or grease.
- 8) You've finished it!

**TABLE 1: materials for cast aluminium wheels.**

component	material	# lengths reqd [#*mm]	total material for two wheels [mm]	cost [UK£]
aluminium castings	scrap aluminium	28 kg	28.00	14.00
wheel studs	75xM12 nuts and bolts	4	4	1.04
axle thrust washers	6 x 40 flat bar	16 x140	2240.00	1.68
axles	2" BSP malleable iron pipe	1 x 1500	1500.00	4.87
rollers	1/2" BSP malleable iron pipe	2x11x225	4950.00	6.19
			<b>TOTAL</b>	<b>27.78</b>

## Other DTU cart developments

The DTU has been working on new designs of carts and all their components to bring down their costs and make things more locally manufacturable. It has designs for bodies, wheels, hubs, bearings and animal harness all available from DTU as Technical Releases.

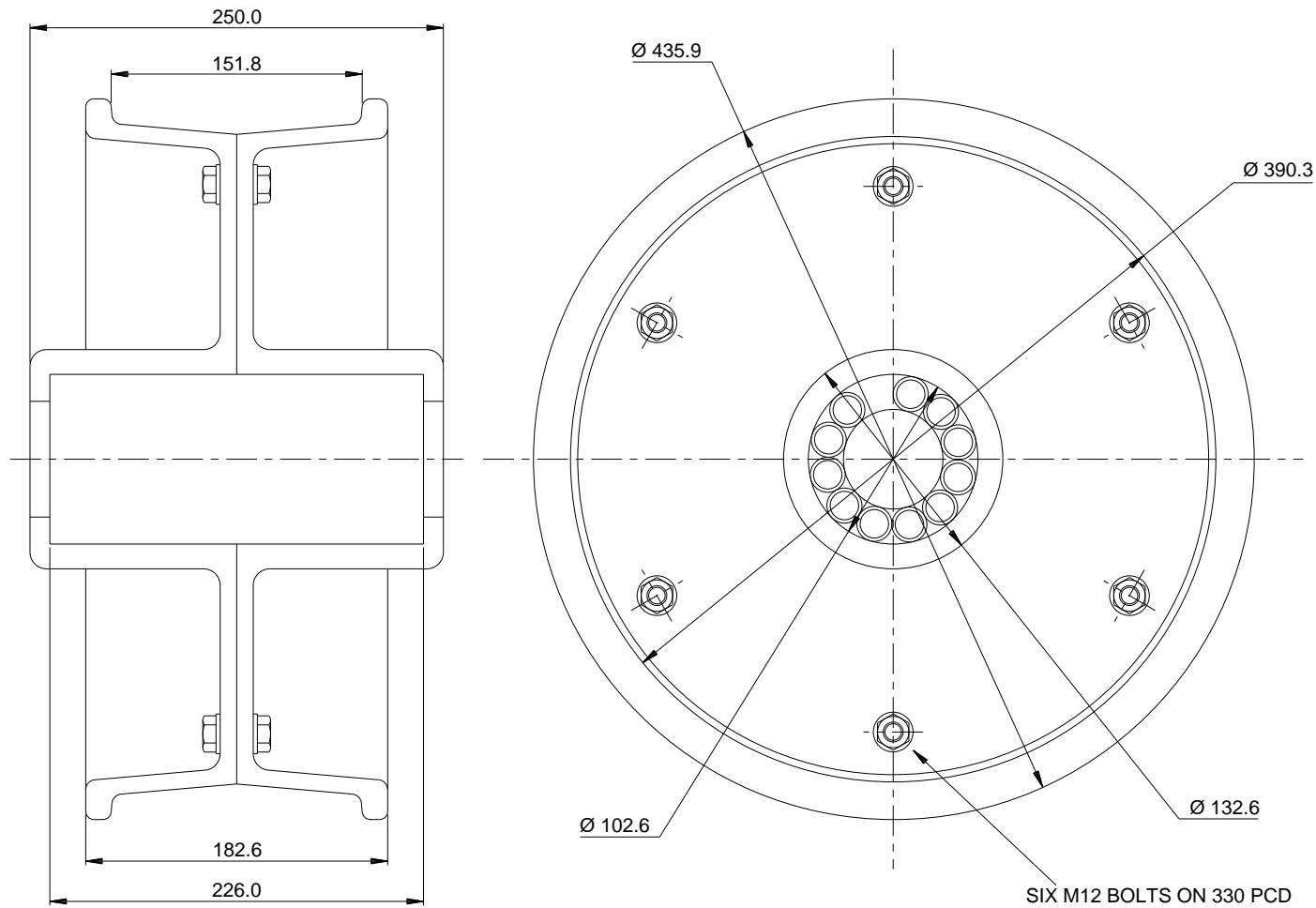
## Drawing

You will find drawings of the wheel and axle on the next pages.

## **Acknowledgements**

The DTU is grateful to the DFID (British Government) for the financial support necessary to carry out the research and development project under which this product was developed.

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# WHEEL ASSEMBLY

Scale

Date

15-4-99

Title

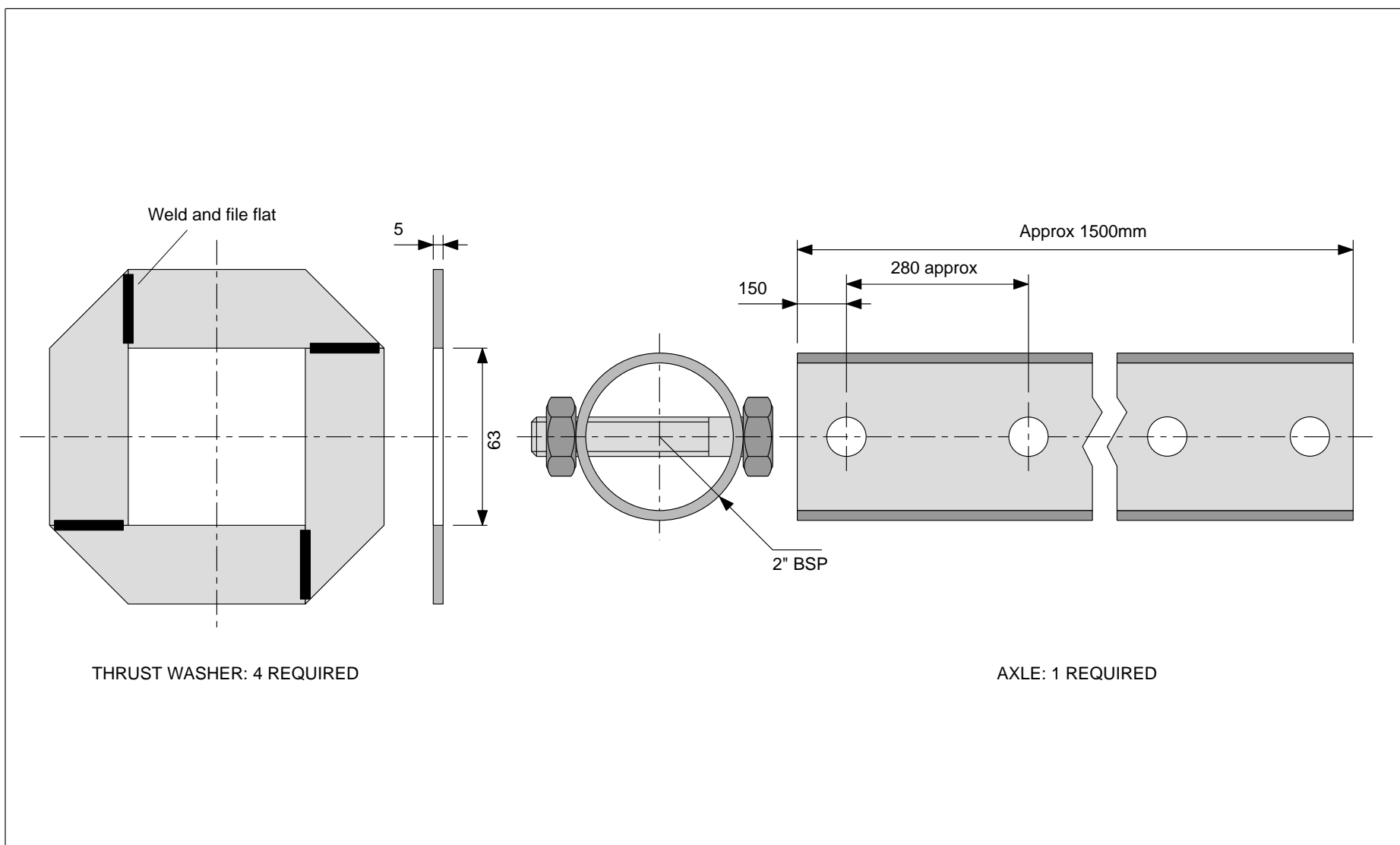
AS CAST ALUMINIUM WHEEL +  
BEARING FOR ANIMAL CARTS

Drawn by

CEO

Dwg No.

1/2



# AXLE COMPONENTS

Scale		Title AS CAST ALUMINIUM WHEEL + BEARING FOR ANIMAL CARTS	Drawn by	CEO
Date	15-4-99		Dwg No.	2/2