Case study 10
Cement mortar jar, 1.0 cubic metre capacity

Introduction

This Case Study is taken from Rainwater Harvesting The collection of rainfall and runoff in rural areas, Pacey and Cullis by IT Publications, 1986. The book can be purchased from the IT Bookshop which can be found at http:/../www.oneworld.org/itdg/publications.html. Information has also been used from a recent EU funded Water and Sanitation Programme in Tanzania.

This type of water vessel was originally developed in Thailand but has also been used widely, often with modifications, in East Africa. There are many variations of this type of tank and we try to give some alternative approaches

later in this Case Study

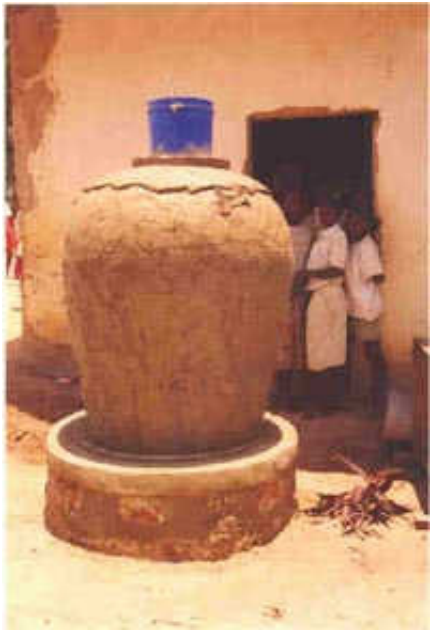

Photo 1 Thai Jar being built as part of a Water and Sanitation Programme in Tanzania

(in this example chicken wire is being used for reinforcing and the bucket is

being used as a template for the opening at the top of the jar; the jar has also been set on a plinth to facilitate extraction of water by gravity)

Construction details

The mould or formwork for a $1m^3$ cement mortar jar is made from 2 pieces of gunny cloth or hessian sacking, cut and stitched together with twine as shown in Figure 1. After sewing, the resulting bottomless bag is turned inside out.

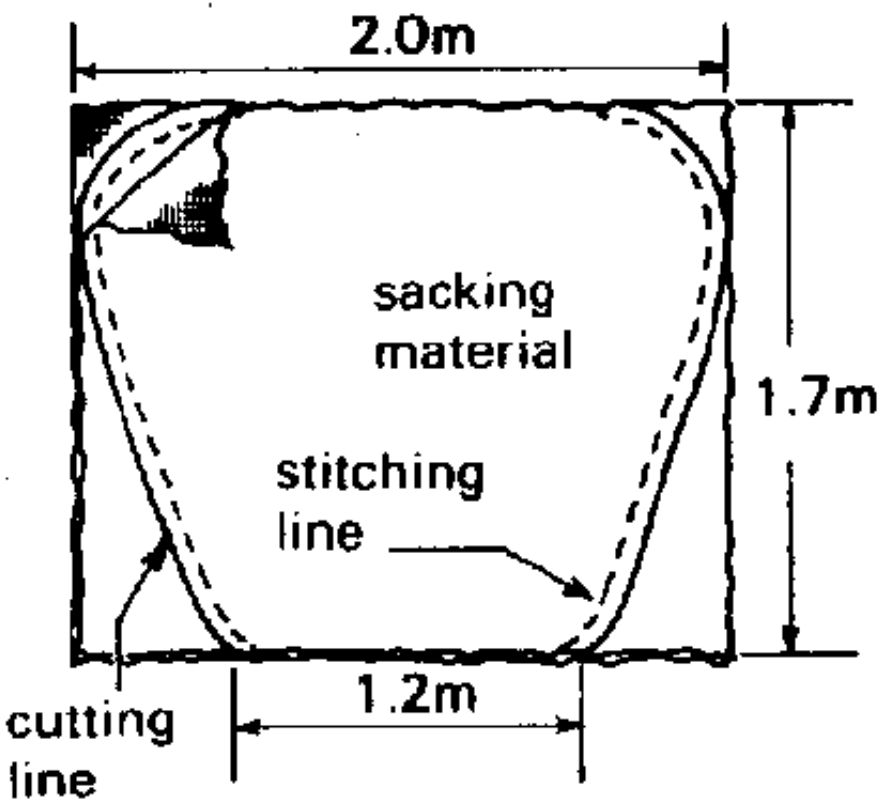

Figure 1 Dimensions for cutting sacking (Pacey and Cullis 1986)

To make the bottom of the tank, amrk out a circle on the ground of 1m

diameter and place bricks or other suitable material around its circumference to act as a formwork. Spread paper or plastic sheeting on the ground within the circle to stop the mortar sticking. Mix a 1:2 cement:sand mortar and spread within the circle to a depth of 15mm.

When the bottom plate has set, place the sacking bag narrow end down on the plate and begin filling it sand, sawdust or rice husks. Make sure that the mortar base sticks out from under the sack as shown in Figure 2, and tuck the edges of the sacking under the filling material, so that the weight of the filling holds the sacking on the plate.

Fill the sack, fold the top and tie it closed. Then fold and smooth the sack into a regular shape. Make a circular ring from wood or cement mortar and place this on top as the formwork for the opening in the top of the jar (Figure 3).

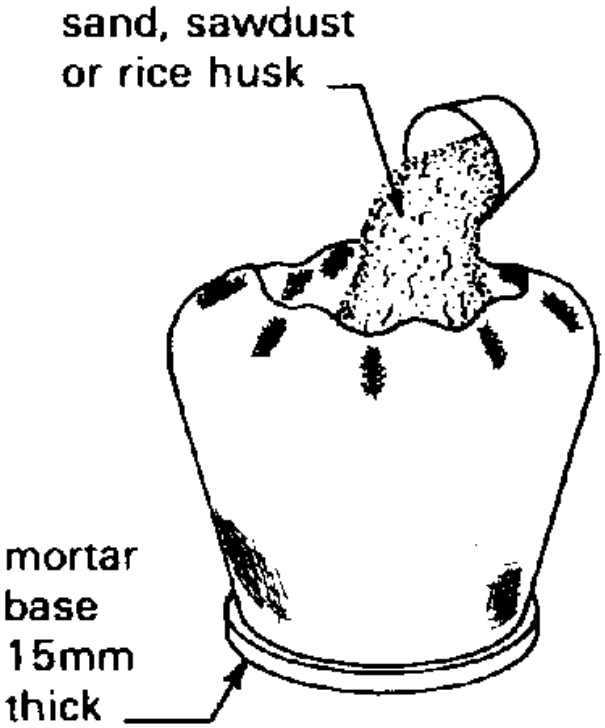

Figure 2 - Filling the sack

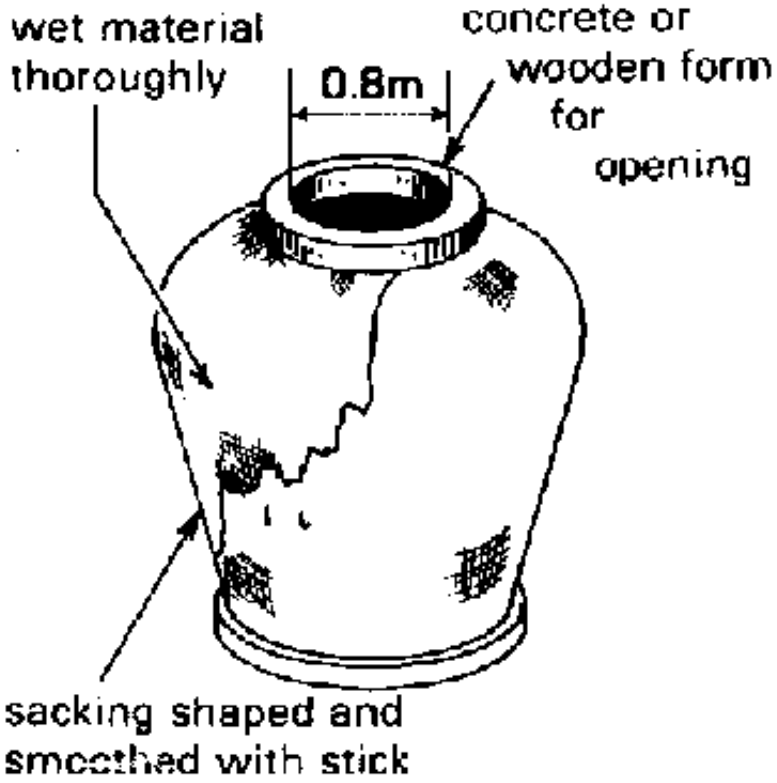

Figure 3 Smoothed sack with circular former in place)

Spray the sacking with water until it is thoroughly wet, then plaster on the first layer of cement mortar o a thickness of 5 7mm.

Plaster on the second 5mm layer in the same manner as the first, checking the thickness by pushing a nail in. Build up any thin spots.

Remove the sack and its contents 24hrs after the plastering is completed. Repair any defects with mortar and paint the inside of the jar with cement slurry. Then cure the jar for 2 weeks protecting it from sun and wind under damp sacking.

General information

This type of jar can be manufactured in any size. However, as the tank size gets bigger the mould becomes unwieldy, and different methods have been devised for making the former. One such example saw the construction of $1.8m^3$ jars using specially made curved bricks to construct the formwork. The blocks are built into shape using mud as a temporary mortar and are then removed once the tank is complete. The formwork can then be reused again and again.

In East Africa, the use of chicken mesh between the first and second coats of plaster is a common addition which gives extra strength to the structure. This type of ferrocement tank can be loaded onto a truck for delivery, and therefore has the advantage that it can be made centrally for later distribution.

Watt, 1978 gives detailed instructions for the construction of a 0.25m^3 jar in Ferrocement Water Tanks. He suggests that similar tanks can be built up to 4m^3 in size. The smaller mortar jars replace the traditional ceramic Thai jars and can be manufactured at about a tenth of the price.

Material requirements

The quantities below are taken form a similar 1m^3 jar used during a recent water and sanitation programme in Tanzania. This tank had reinforcing and a tap and a washout fitted.

Materials	Unit Price	Qty	COST	COST (US$)

	(TSh) 1997 Prices		(TSh)	
Cement (bag)	6,200	2	12,400	27.50
Chicken wire (roll)	25,000	0.25	6,250	13.80
Binding wire (kg)	900	0.50	450	1.00
G.I Pipe 1" (m)	2,000	1	2,000	4.40
G.I F-F connectors 1"	300	2	600	1.30
G.I. Elbows	185	2	370	0.80
Locking Tap 1"	2,500	1	2,500	5.50
G.I. Male plug 1"	800	1	800	1.80

		Total	35,220	56.10

Table 1 - Materials and costs for a 1 cubic metre cement jar

*sand and stone are not accounted for here as they were provided by the community as part of a self-help initiative.

** approximately 1 skilled and 1 unskilled person days are required per tank.

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