INTRODUCTION

The low cost series of Blair Latrines were developed by the Blair Research Laboratory in 1989 and 1990 as a response to the situation where cement supplies for the national latrine programme were becoming increasingly more difficult to procure.

The standard Blair Latrine consumes between 5 and 6 bags of cement, and provides a sturdy structure that will in most cases outlast the pit , which for most family latrines lies between 12 - 15 years.

The simplest model of the low cost Blair Latrine uses one bag of cement, a commercial vent pipe, normally made of asbestos, a concrete slab placed over a brick collar and a structure and roof made of grass or reeds. The two bag model is the same with a fully lined pit.

The 3 bag model described in this manual has a fully brick lined pit, a concrete slab, a brick vent pipe and brick superstructure. The roof is made of grass, but can be replaced with a ferrocement, asbestos or tin roof later. Less cement is used in the pit lining because the pit diameter (internal) has been reduced from 1.2m to 1.1m a modification which reduces pit life by about 2 years. Cement is also saved with the concrete slab, which is 1.3m in diameter, compared to 1.5m in the standard Blair Latrine. This slab uses one half a bag of cement. With great care at the curing stage, it is possible to make a concrete slab without reinforcing wire, although this will not normally be the standard practice. The brick pipe is made with 4 bricks per course compared to 6 bricks per course for the standard model. Where 4 bricks are used per course very great care is required to ensure that the internal surface of the brick pipe is smooth and not obstructed with cement mortar. When the pipe is made correctly the ventilation effect is maintained. The screen for the smaller brick pipe can measure 225mm X 225mm which also saves on screen material - the standard screen measures 300mm X 300mm. The superstructure foundation and the first course of brickwork for the superstructure is made with cement mortared brickwork. From then on traditional mortar, using anthill soil, often combined with sand or cow dug is used for building the wall of the structure. This technique also saves on the use of cement. The internal walls of the structure are lined with cement mortar and a hard surface latrine floor can also be built. The roof in the 3 bag model is made in the tradtional way using poles and grass thatch.

It is therefore possible to make a sound Blair Latrine with less than half the subsidy required for the standard model, but more maintenance will be required for the roof. The provision of an extra pocket of cement makes possible the fitting of a ferrocement roof, which forms part of the stadard model and is more permanent.

Lower cost models are being tried out in only a few areas of the country at the moment, but they will become more common in the future. Models which use less cement and more traditional material are cheaper to construct and this may have important implications in the future. From the users point of view any technique which saves on cost is welcome. This will be particularly important in the future when the users will be expected to provide far more of the toral value of the subsidy and eventually the enire cost. This makes the technique more sustainable in the long term. The high levels of subsidy, currently provided by donor organisations through the Ministry of Health, cannot be sustained for ever, and now is the time to introduce options which retain all the properties of a standard Blair Latrine, but provide it at lower cost. In any event, only the first Blair Latrine can be subsidised for any household. The second must be built and paid for by the family itself.

I wish to acknowledge the full support of the Ministry of Health in this venture, and the Department of Environmental Health in particular. The drawings have been adapted from the work of Kors de Waard originally presented in the early manuals produced by Sue Laver. Their contribution has been invaluable.

Much credit is also due to the Field Teams who have played an important part in designing, building and testing these new structures. In particular the efforts of Ephraim Chimbunde, Cornelius Mukandi, Fambi Gono, Philimon Kademetema, Joshua Mazanza and their supporting staff are to be commended.

I also wish to acknowledge the financial support of the Swiss Federal Institute for Water Resources and Water Pollution Conrol. I also wish to thank SIDA who have encouraged the wider use of lower cost options in water and sanitation projects in Zimbabwe.

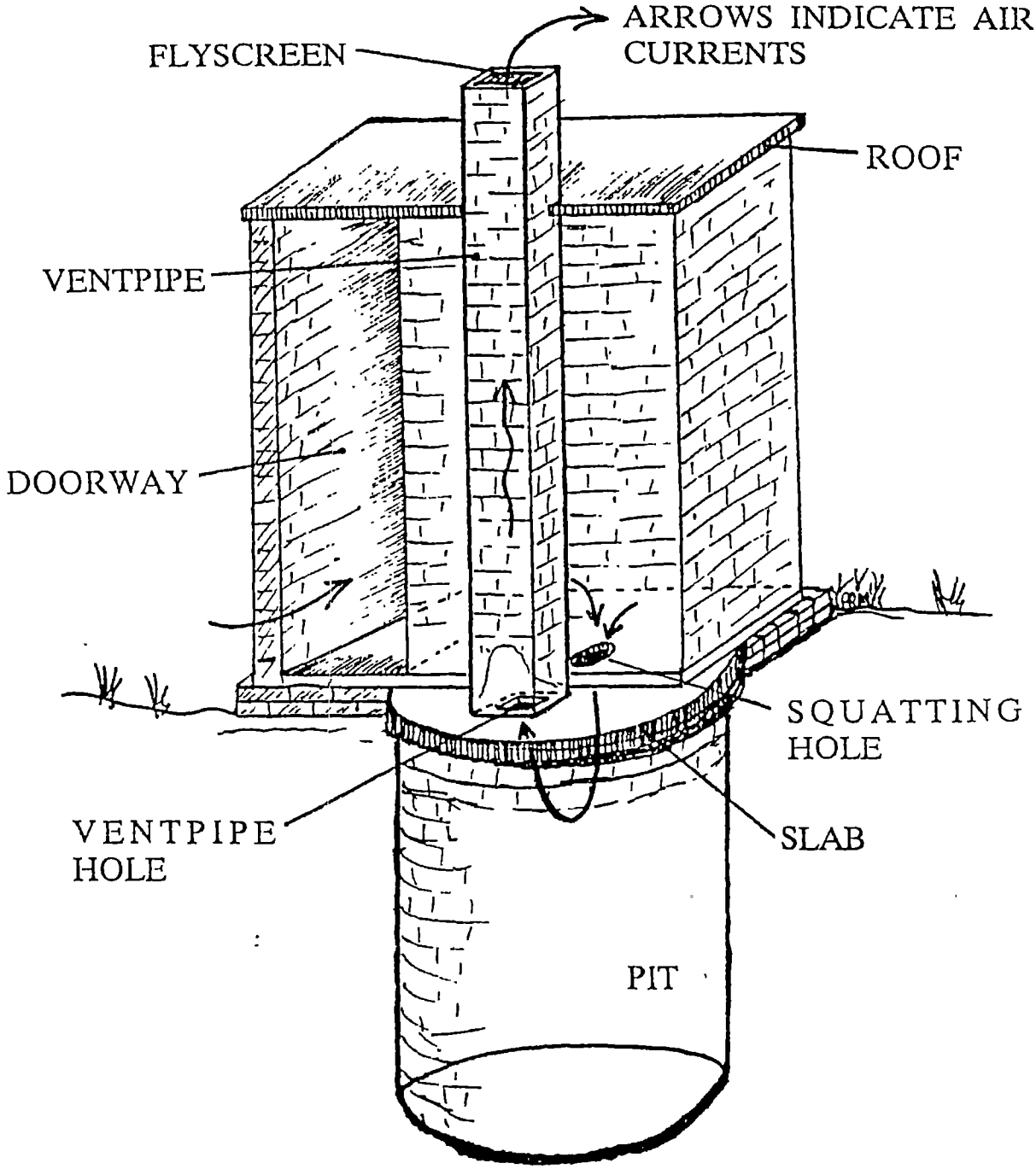
Peter Morgan
Harare.
August 1990.

HOW THE BLAIR LATRINE WORKS

The latrine slab is made with two holes, one for the squatting hole and one for the vent pipe. The vent pipe sucks air from the pit and fresh air is drawn down through the squat hole. The latrine itself is therefore odourless.

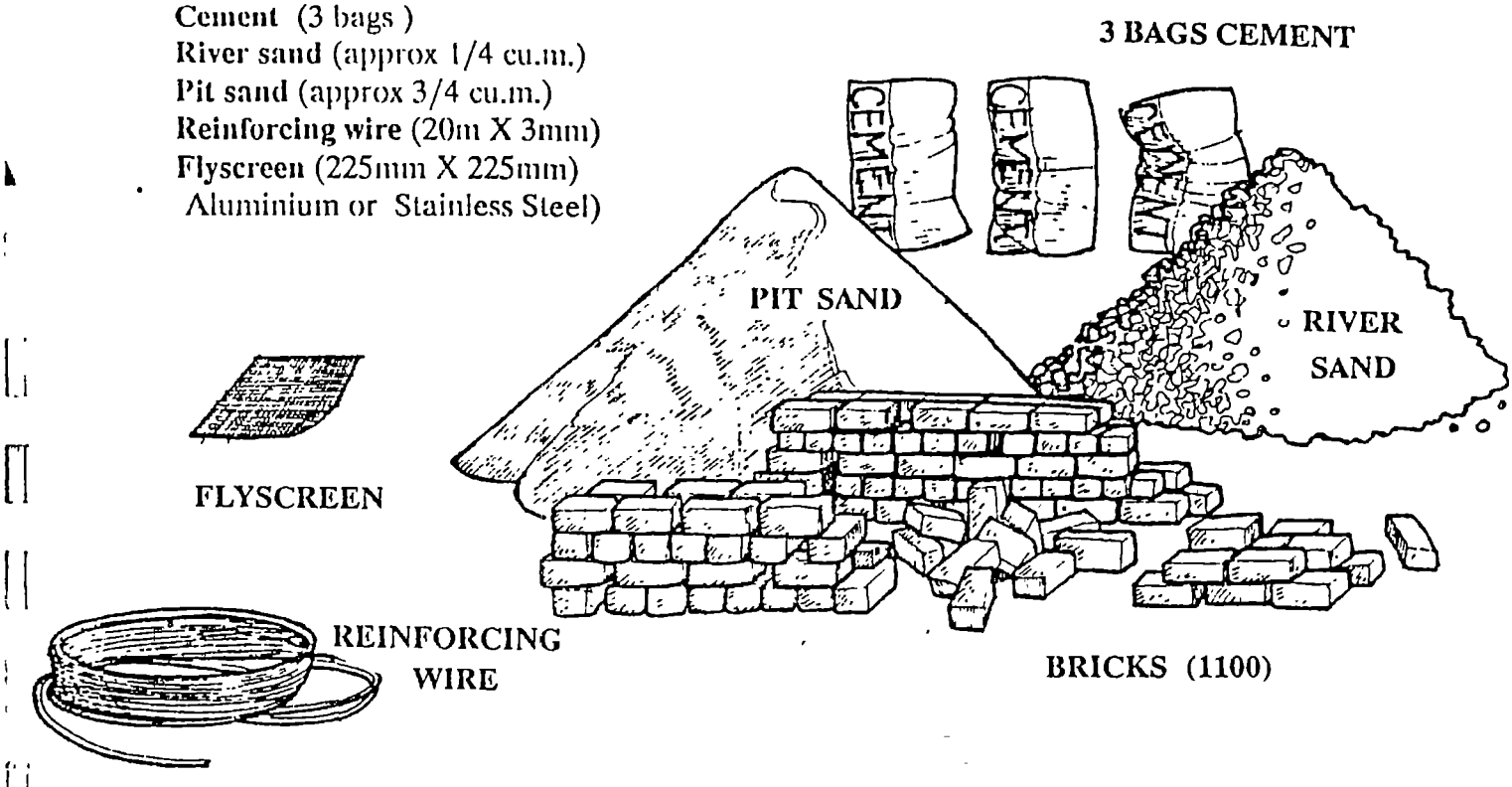
Flies approaching the latrine are attracted to odours coming from the pipe but cannot pass the screen to enter the pit. Flies escaping from the latrine are attracted to the light coming down the pipe but are trapped by the screen and cannot escape.

THIS IS A CUT OPEN VIEW OF A BLAIR LATRINE



MATERIALS REQUIRED TO BUILD A 3 BAG BLAIR LATRINE

Cement (3 bags)
River sand (approx 1/4 cu.m.)
Pit sand (approx 3/4 cu.m.)
Reinforcing wire (20m X 3mm)
Flyscreen (225mm X 225mm)
Aluminium or Stainless Steel)



SITING THE BLAIR LATRINE

The site should chosen by the family with assistance from an Environmental Health Technician and should be at least 30 metres from a well.

The site should be:

Down hill from a well or borehole - so that waste from the latrine does not drain into the water supply.

Where the soil is firm - so that the latrine will not collapse

On slightly raised ground - so that rainwater can drain away

Near the house - so that the latrine can be used easily

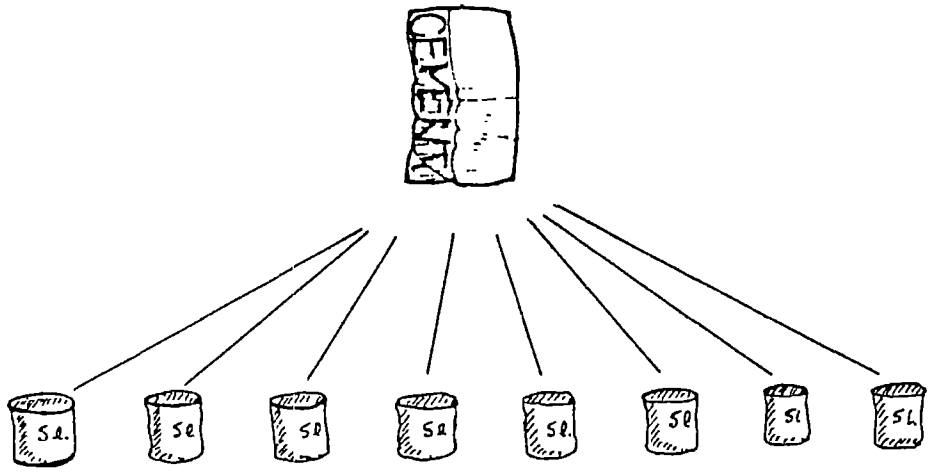
Away from trees - so that air can flow easily over the pipe

Facing the wind - so that air blows into the entrance

MEASURING THE CEMENT

WHERE A LIMITED NUMBER OF BAGS OF CEMENT ARE BEING USED FOR THE CONSTRUCTION OF A BLAIR LATRINE IT IS IMPORTANT TO MEASURE THE CEMENT ACCURATELY, SO THAT MAXIMUM BENEFIT CAN BE MADE OF THE CEMENT.

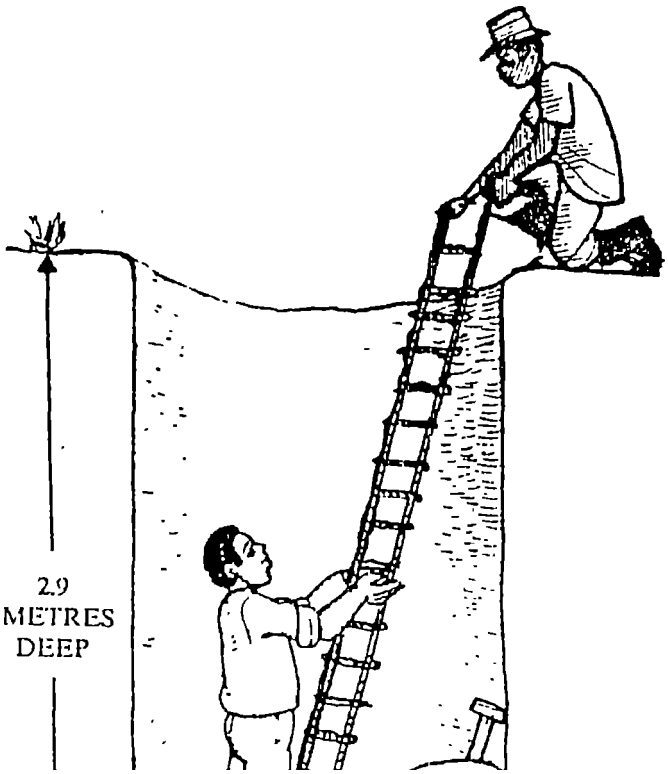
ONE BAG OF CEMENT CAN BE DIVIDED INTO 8 X 5 LITRE TINS OF CEMENT, AND THE FIVE LITRE TIN MAKES A CONVENIENT MEASURE.



THE FOLLOWING AMOUNTS OF CEMENT SHOULD BE USED TO MAKE DIFFERENT PARTS OF THE THREE BAG MODEL OF THE BLAIR LATRINE (AND OPTIONAL FERROCEMENT ROOF).

PART OF LATRINE	CEMENT USED (5 LITRE TINS)	SAND USED (5 LITRE TINS)	MIX
PIT LINING	8	80 PIT SAND	10:1
SLAB	4	20 RIVER SAND	5:1
BRICK VENT PIPE	2.5	20 PIT SAND	8:1
FOUNDATIONS	2	16 PIT SAND	8:1
INTERNAL PLASTER	4	32 PIT SAND	8:1
FLOOR	3.5	14 RIVER SAND	4:1
(FERROCEMENT ROOF)	8	32 RIVER SAND	4:1

THE CONSTRUCTION

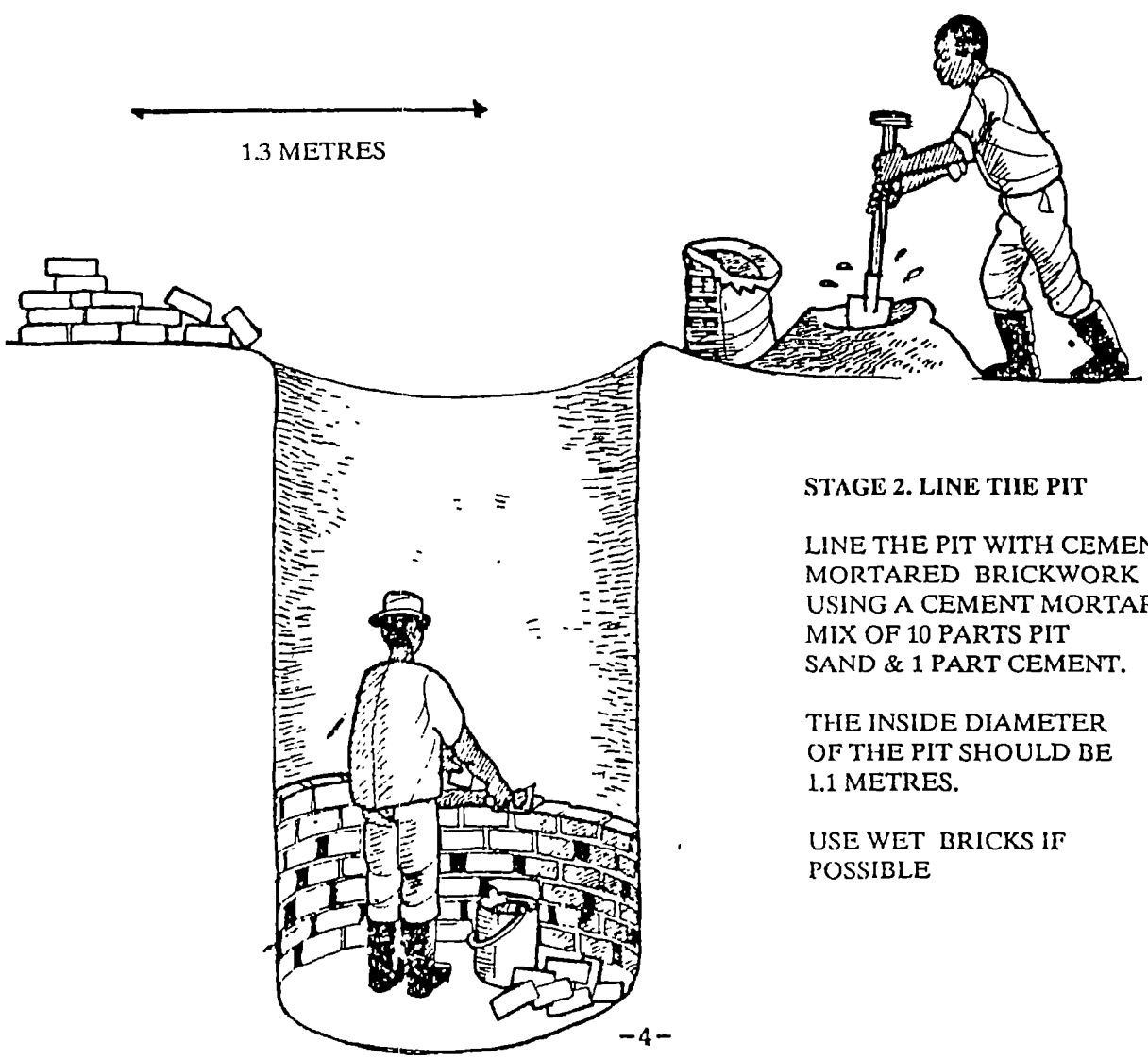


STAGE 1. DIG THE PIT

DIG A ROUND PIT
1.3 METRES IN
DIAMETER AND
2.9 METRES DEEP

DIG THE PIT
WITH STRAIGHT
SIDES

IF HALF BRICKS ARE USED MORE CEMENT WILL BE REQUIRED FOR EACH METRE DEPTH. IN THIS CASE THE PIT SHOULD BE DUG TO 2.5 M DEPTH



STAGE 2. LINE THE PIT

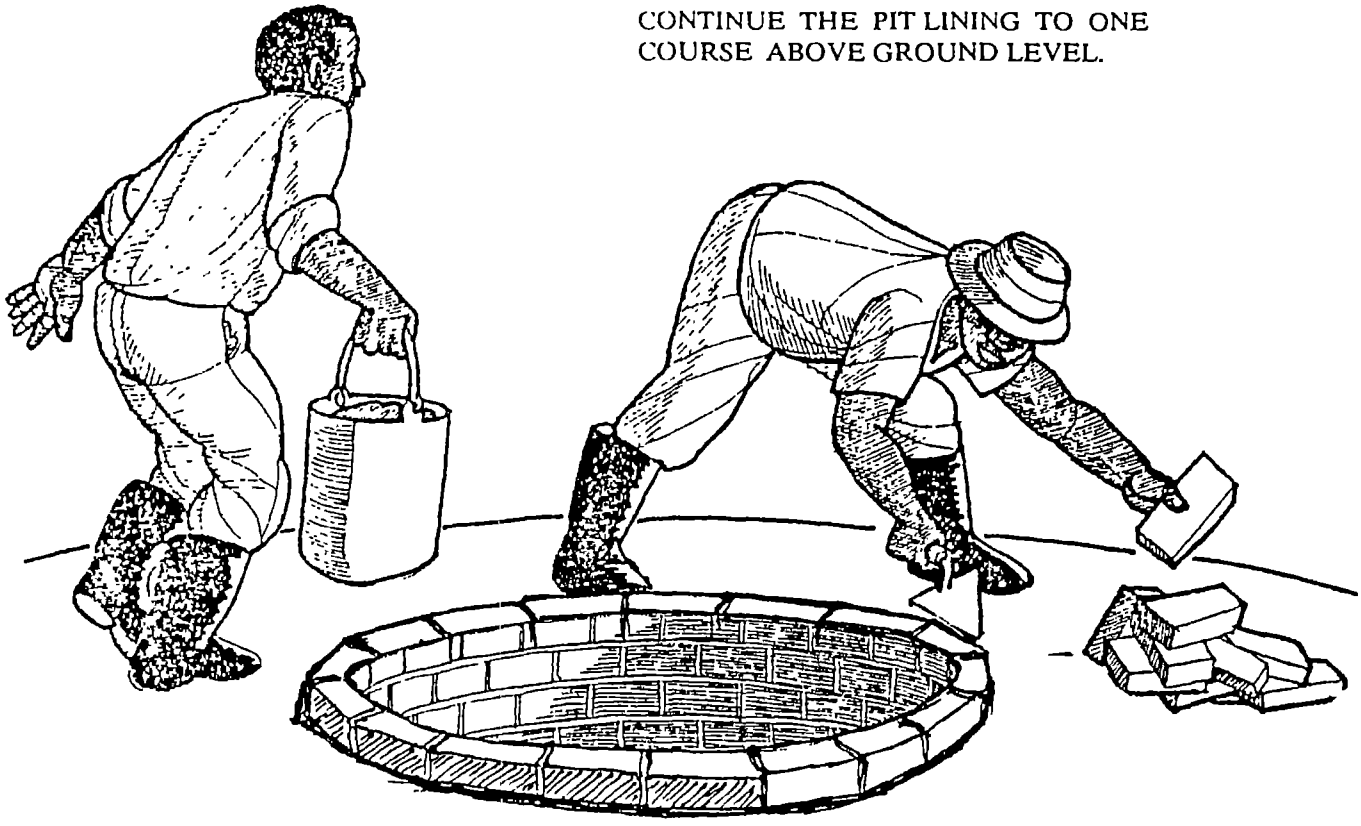
LINE THE PIT WITH CEMENT MORTARED BRICKWORK USING A CEMENT MORTAR MIX OF 10 PARTS PIT SAND & 1 PART CEMENT.

THE INSIDE DIAMETER OF THE PIT SHOULD BE 1.1 METRES.

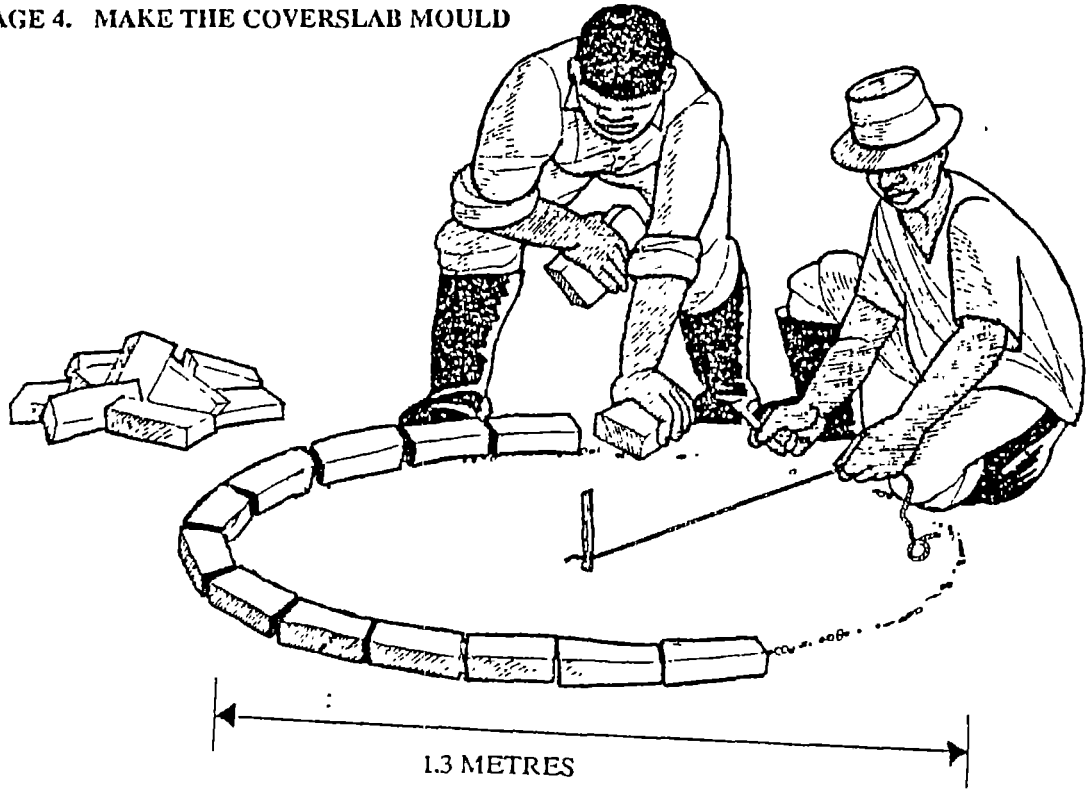
USE WET BRICKS IF POSSIBLE

STAGE 3. FINISH THE LINING

CONTINUE THE PIT LINING TO ONE COURSE ABOVE GROUND LEVEL.



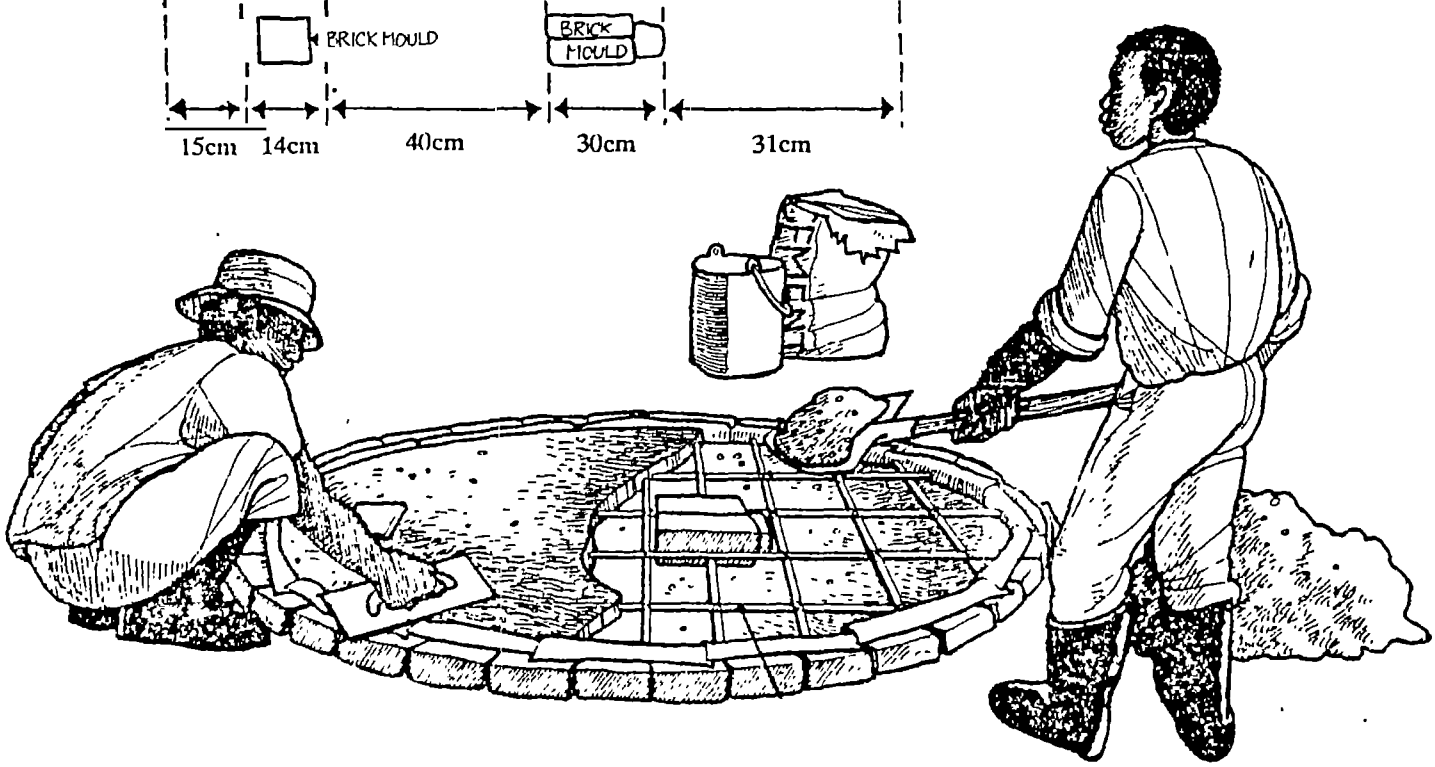
STAGE 4. MAKE THE COVERSLAB MOULD



MAKE A CIRCLE OF BRICKS WITH INTERNAL DIAMETER OF 1.3 METRES
LAY CEMENT BAG PAPER OR PLASTIC UNDER THE MOULD SITE

STAGE 5. MAKE THE COVERSLAB

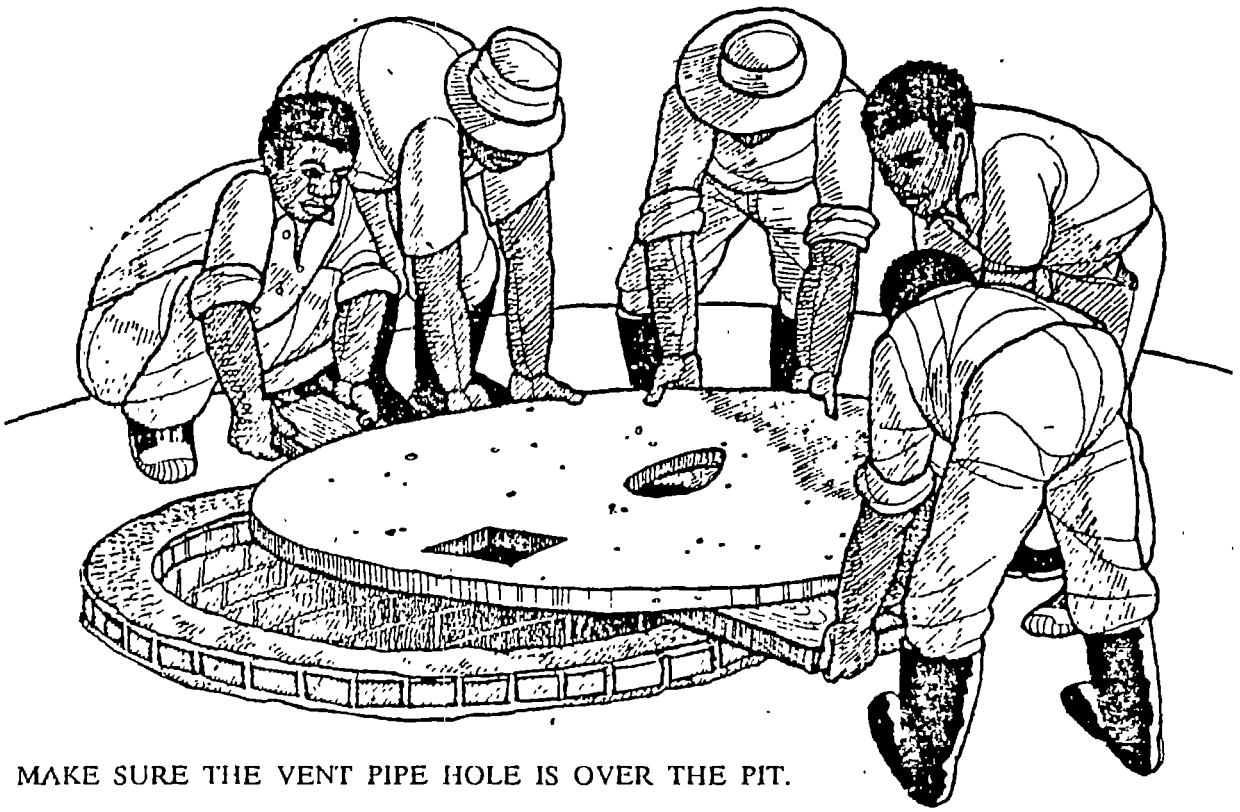
ARRANGE BRICKS TO FORM VENT PIPE HOLE AND SQUAT HOLE AS SHOWN
VENT PIPE HOLE IS 140mm X 140mm SQUAT HOLE IS 280mm X 140mm.
CONCRETE MIXTURE IS 5 PARTS WASHED RIVER SAND 1 PART CEMENT
ADD HALF THE MIXTURE FIRST (FULL MIXTURE USES HALF BAG CEMENT)
ADD 3mm REINFORCING WIRE WITH 150mm SPACES
ADD REMAINING MIXTURE UNTIL SLAB IS 75mm THICK
LEAVE FOR AT LEAST 5 DAYS TO CURE- KEEP WET.



NOTE: THE SLAB CAN BE MADE WITHOUT REINFORCING IF THE SAND IS WELL CHOSEN (CLEAN AND SHARP) AND THE CONCRETE IS ALLOWED TO CURE FOR AT LEAST 7 DAYS AND KEPT WET.

STAGE 6. PLACE COVERSLAB ON PIT

BED DOWN THE COVER SLAB ON CEMENT MORTAR LAID OVER THE BRICKS ENSURE THE ORIENTATION OF THE COVERSLAB IS CORRECT. THIS IS NORMALLY TOWARDS THE HOMESTEAD AND TOWARDS THE WIND. THE VENT PIPE WILL BE BUILT ON THE SAME SIDE AS THE DOORWAY.

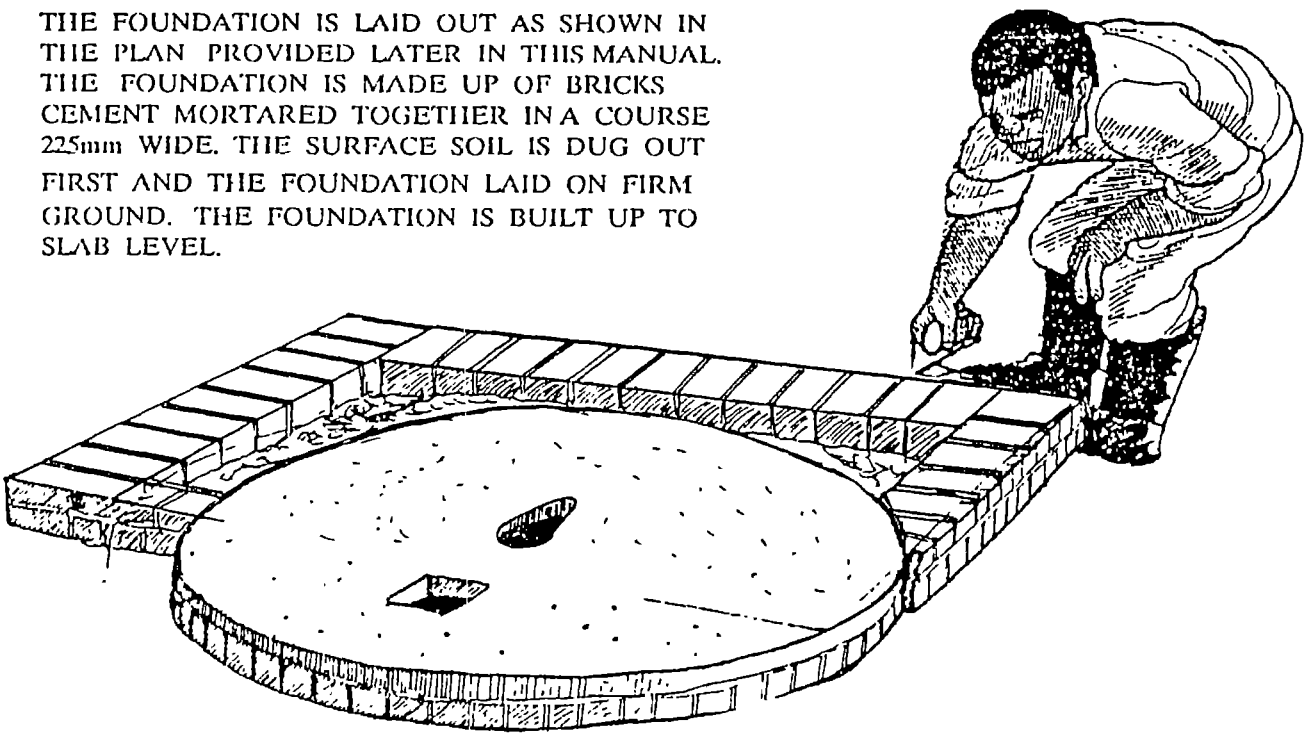


MAKE SURE THE VENT PIPE HOLE IS OVER THE PIT.

A GOOD SEAL BETWEEN THE COVER SLAB AND THE COLLAR PREVENTS FLIES FROM ENTERING AND LEAVING THE PIT OTHER THAN THROUGH THE SQUAT AND VENT PIPE HOLES.

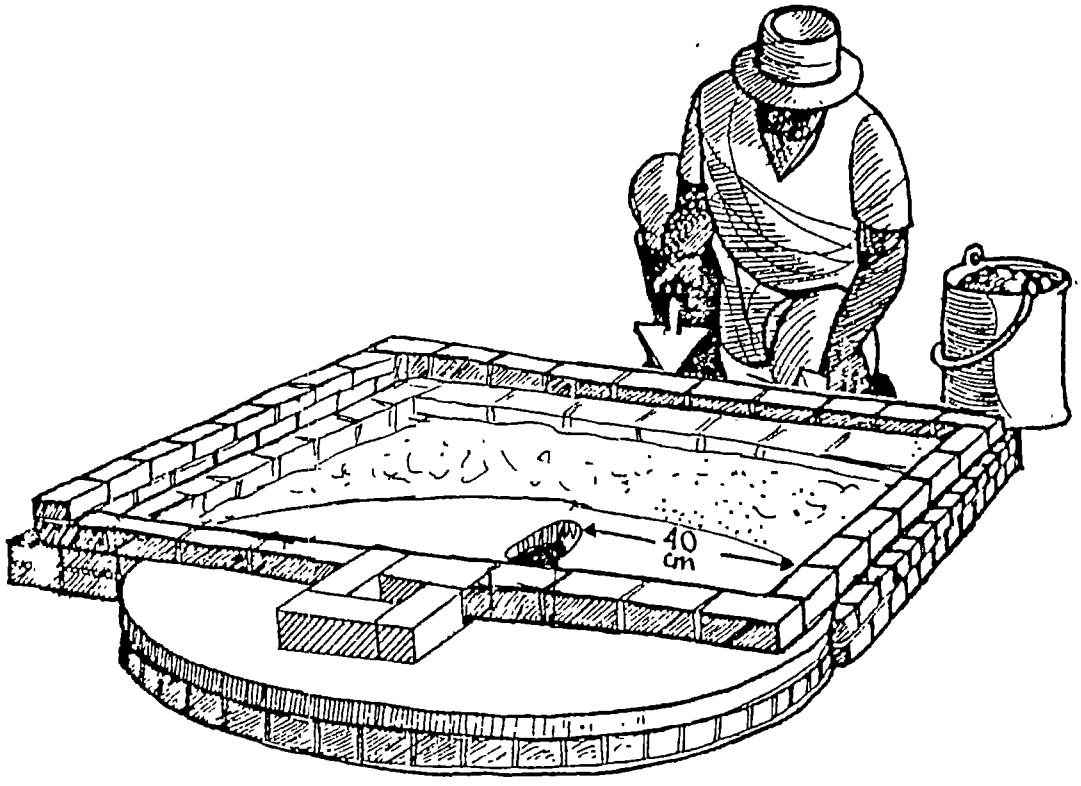
STAGE 7. MAKE THE SUPERSTRUCTURE FOUNDATION

THE FOUNDATION IS LAID OUT AS SHOWN IN THE PLAN PROVIDED LATER IN THIS MANUAL. THE FOUNDATION IS MADE UP OF BRICKS CEMENT MORTARED TOGETHER IN A COURSE 225mm WIDE. THE SURFACE SOIL IS DUG OUT FIRST AND THE FOUNDATION LAID ON FIRM GROUND. THE FOUNDATION IS BUILT UP TO SLAB LEVEL.

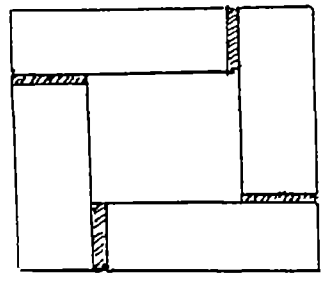


STAGE 8. MAKE THE FIRST COURSE OF BRICKS FOR THE VENT PIPE & SUPERSTRUCTURE

THE FIRST COURSE OF BRICKS IS BUILT UP ON THE FOUNDATION WITH CEMENT MORTAR (8 PARTS PIT SAND & 1 PART CEMENT). THE MEASUREMENTS SHOULD BE TAKEN FROM THE PLAN IN THIS MANUAL. THE VENTILATION PIPE IS MADE WITH FOUR BRICKS PER COURSE ARRANGED AS SHOWN IN THE DIAGRAM. IT IS VERY IMPORTANT THAT THE INTERNAL MEASUREMENT OF 140mm X 140mm IS MAINTAINED THROUGHOUT THE LENGTH OF THE PIPE.

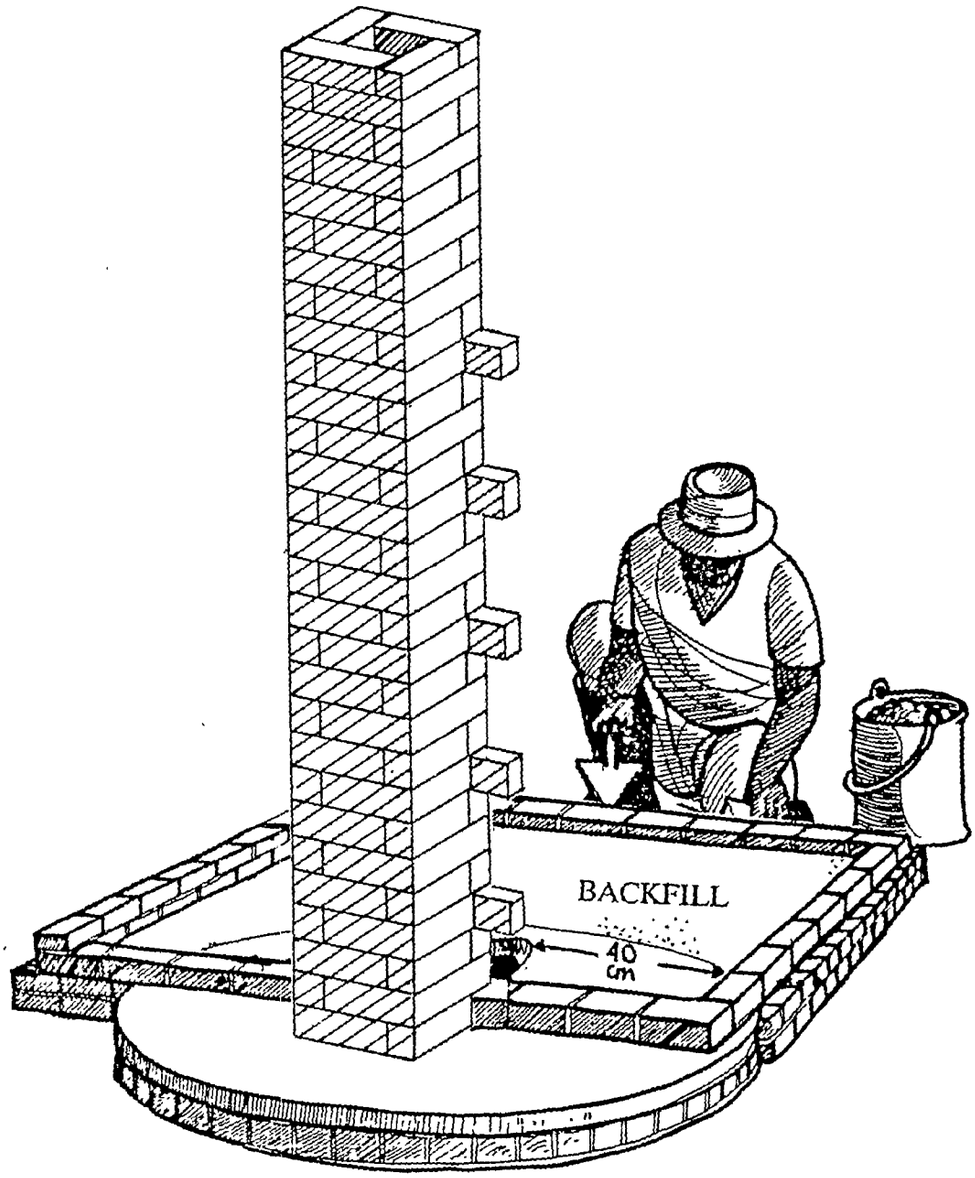


THE BRICK VENT PIPE BUILT ON LOWER COST MODELS OF THE BLAIR LATRINE IS MADE WITH 4 BRICKS PER COURSE. IT IS VERY IMPORTANT TO ENSURE THAT THE INTERNAL MEASUREMENT IS MAINTAINED AT 140MM X 140MM AND THE INTERNAL SURFACE IS SMOOTH.



STAGE 9. MAKE THE BRICK VENTILATION PIPE

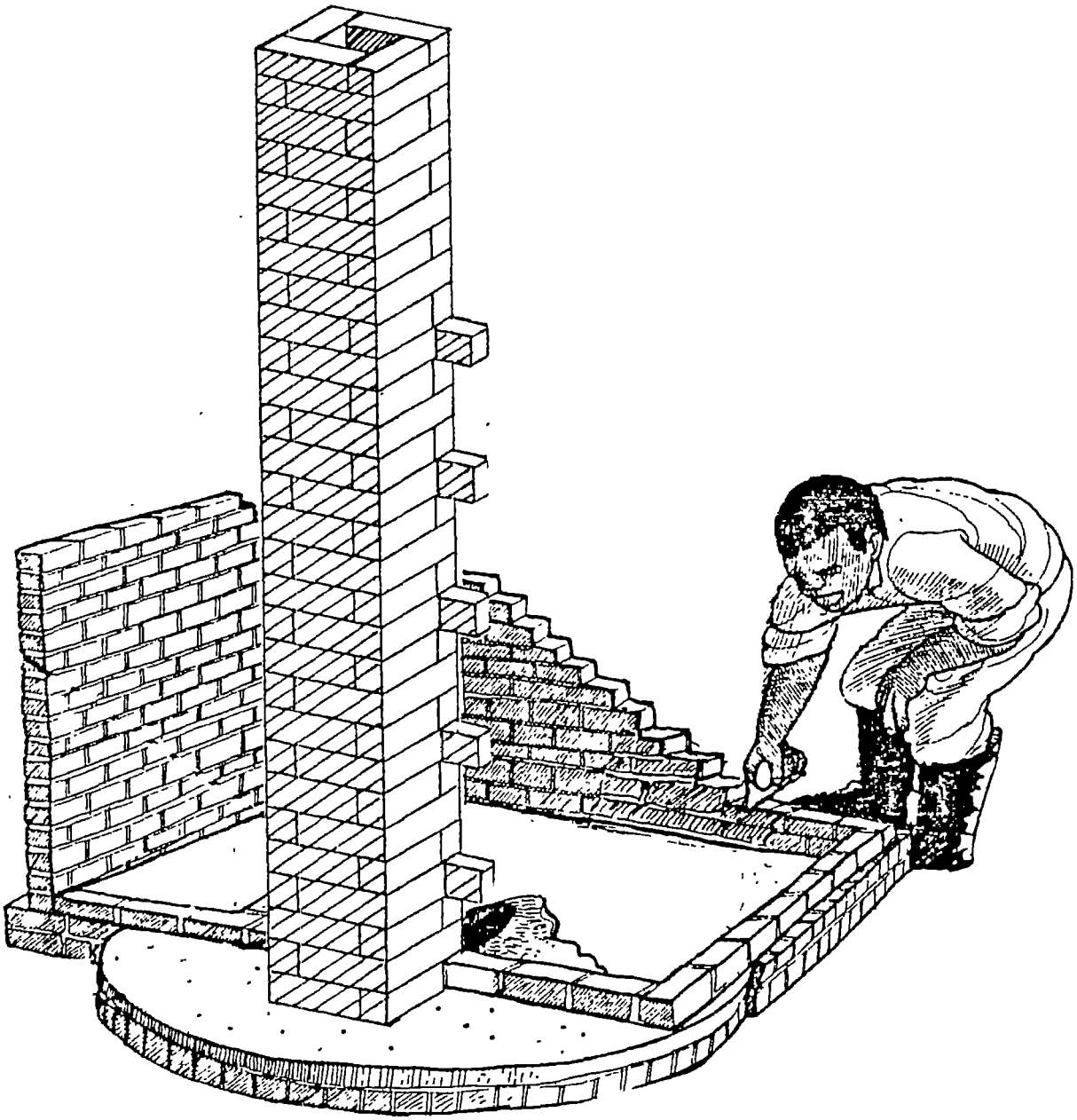
THE BRICK VENTILATION PIPE IS NOW BUILT UP TO 28 COURSES AS SHOWN IN THE DIAGRAM. CEMENT MORTAR IS USED TO BOND THE BRICKS .THE INTERNAL MEASUREMENT OF 140mm X 140mm MUST BE MAINTAINED AT EVERY COURSE AND THE INTERNAL WALLS KEPT SMOOOTH. AT EVERY FOURTH COURSE THE BRICKWORK IS MODIFIED TO INCLUDE A "TOOTH" WHICH WILL LATER FORM THE CONNECTION BETWEEN THE VENT PIPE AND THE WALL OF THE SUPERSTRUCTURE. THESE ARE SHOWN IN THE DIAGRAM.



BACKFILL THE SPACE BETWEEN THE FOUNDATION AND THE COVERSLAB WITH HALF BRICKS, STONES OR WELL RAMMED SOIL. LEVEL OFF TO HEIGHT OF THE SLAB.

STAGE 10. BUILDING THE SUPERSTRUCTURE

THIS IS MADE WITH FIRED BRICKS BONDED WITH ANTHILL MORTAR. THE ANTHILL MORTAR MAY BE MIXED WITH SAND OR COWDUG TO MAKE MORE SUITABLE FOR MORTAR WORK. THE SUPERSTRUCTURE WALL IS BONDED TO THE VENT PIPE THROUGH THE TEETH PREVIOUSLY MADE ON THE PIPE.

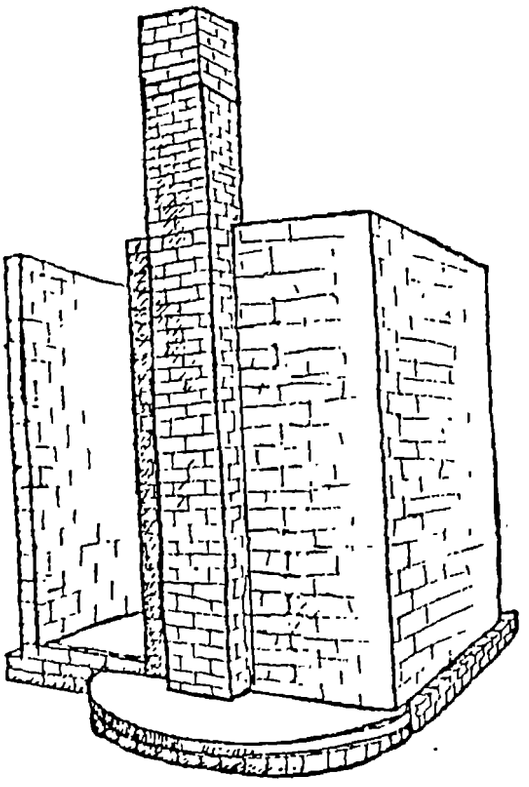


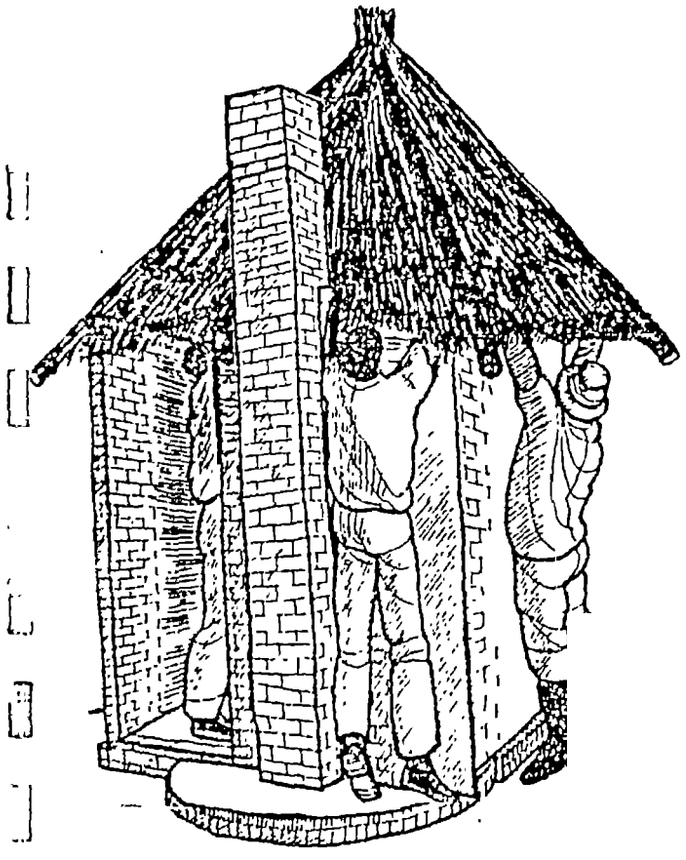
THE WALL IS BUILT UP TO A HEIGHT OF 1.8m (WHICH IS ABOUT 21 COURSES OF BRICKS)

WHEN THE SUPERSTRUCTURE IS FINISHED THE INSIDE WALL IS PLASTERED WITH CEMENT MORTAR USING A MIXTURE OF 8 PARTS PIT SAND & 1 PART CEMENT. THIS PROTECTS THE WALL FROM THE WASHING WATER USED IN THE LATRINE.

STAGE 11. MAKING THE LATRINE FLOOR

ONCE THE BRICK WALLS HAVE BEEN BUILT AND PLASTERED THE LATRINE FLOOR CAN BE MADE. THE CONCRETE FOR THE FLOOR IS MADE WITH 4 PARTS RIVER SAND & 1 PART CEMENT. THE CONCRETE IS LAID SO THAT IT SLOPES DOWN FROM THE BRICK STEP AT THE ENTRANCE TO THE SQUAT HOLE. IT IS FINALLY SMOOTHED DOWN WITH A STEEL FLOAT





STAGE 12. THE THATCHED ROOF

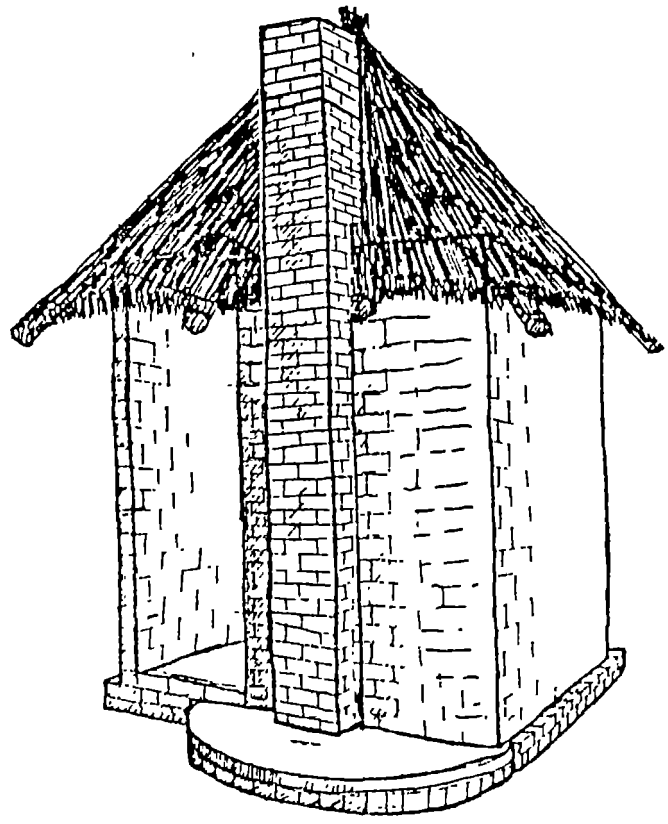
THE THATCHED ROOF IS MADE WITH POLES & THATCHING SO THAT IT WILL FIT OVER THE SUPERSTRUCTURE.

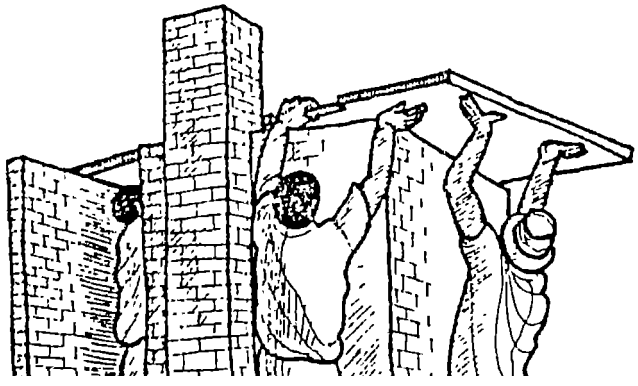
STAGE 13. FITTING THE FLYSCREEN

THIS IS A VERY IMPORTANT PART OF THE LATRINE AND CONTROLS FLIES. THE SCREEN SHOULD BE MADE OF STAINLESS STEEL OR ALUMINIUM. THE SCREEN SIZE IS 225mm X 225mm. IT IS FITTED TO THE HEAD OF THE VENT PIPE IN STRONG CEMENT MORTAR.

STAGE 14. FINISHING OFF

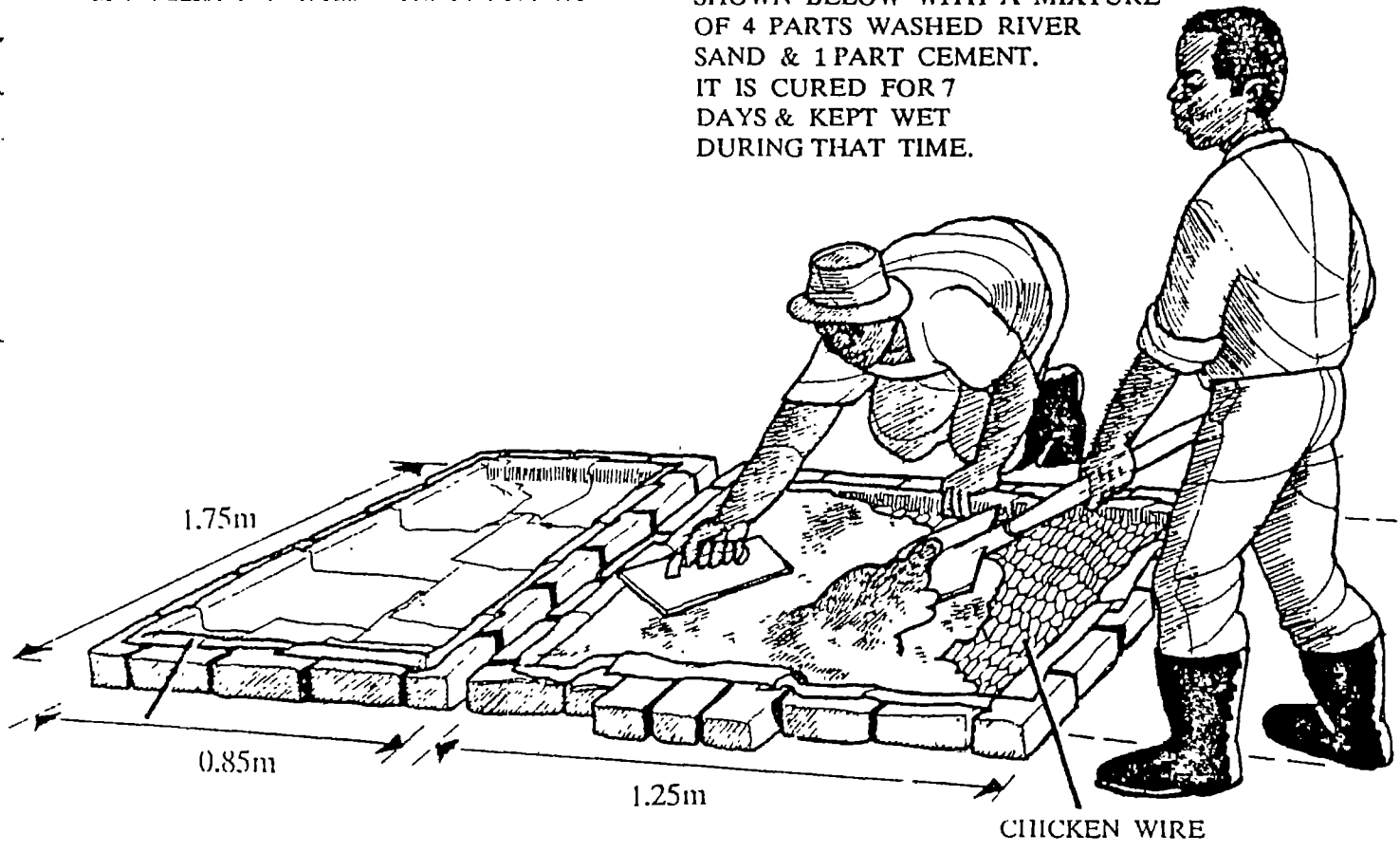
BUILD UP SOIL AROUND THE LATRINE
PLANT GRASS IN THE BUILT UP SOIL
TIDY AROUND THE AREA OF THE LATRINE.





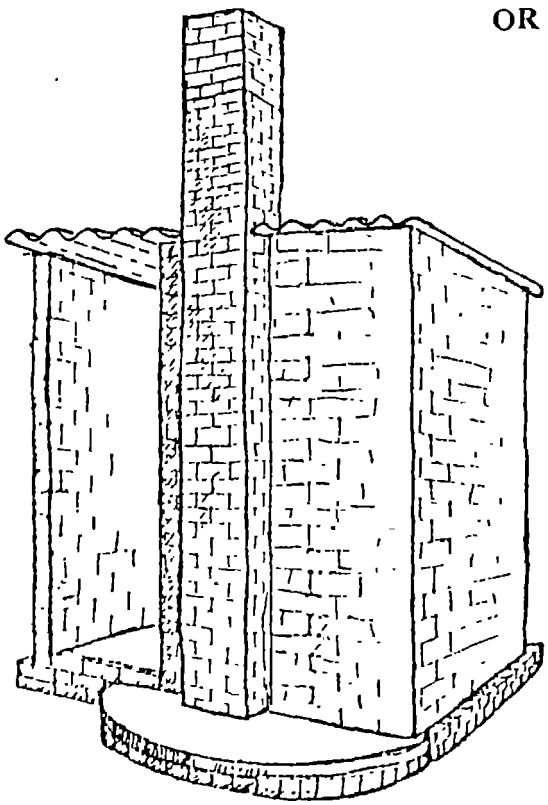
ADDING A FERROCEMENT ROOF

THE 3 BAG BLAIR LATRINE CAN BE UPGRADED WITH ANOTHER BAG OF CEMENT SO THAT IT IS FITTED WITH A PERMANENT FERROCEMENT ROOF. THIS IS MADE TO THE MEASUREMENTS SHOWN BELOW WITH A MIXTURE OF 4 PARTS WASHED RIVER SAND & 1 PART CEMENT. IT IS CURED FOR 7 DAYS & KEPT WET DURING THAT TIME.



OTHER METHODS OF UPGRADING THE 3 BAG MODEL

1. ADD CORRUGATED IRON OR ASBESTOS ROOF



3. PLANT GRASS AROUND LATRINE TO REDUCE EROSION

2. PLASTER THE EXTERNAL WALLS OF THE LATRINE WITH CEMENT MORTAR

MAINTENANCE

THE MOST IMPORTANT MAINTENANCE OF THE BLAIR LATRINE IS TO KEEP IT CLEAN WITH WATER. WASH DOWN THE LATRINE SLAB EVERY DAY.