

A FERRO-CEMENT TANK

The following is a brief guide to the construction of 10,000 litre ferro-cement tanks. (When designing and sizing a tank it is important to consider the stock sizes of materials, especially reinforcement sheets and chicken wire and to work within these in order to economise on the amount of materials purchased.)

Tools Needed

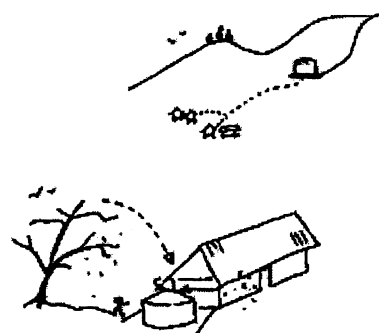
Bush knife, spade (2), sieve, bucket (3), mixing board, float, tape, level, wood saw, hack saw, axe, hammer, nails, tap wrench, wire cutters, pliers (a small, hand operated or powered, cement mixer can be used to make construction quicker and the cement stronger).

Materials Needed for a standard ATCDI 10,000 litre ferro-cement tank.

- Labour-4 people or more.
- Tie wire (1.6mm) 4kg
- Sheet arcmesh reinforcement. 6.0 x 2.4m, F42 mesh (14.21kg/sheet) x 4 sheets.
- Steel bar (6m length, 8mm diameter x 4 lengths).
- Chicken wire (18gm or 20gm)-12mm, 2 x 50m x 0.9m wide rolls.
- Cement (40 x 40kg bags).
- Fine sand 2m³.
- Clean oil drum (for water).
- Fly wire.
- Wooden boards and posts for form-work (Timber, 300mm x 25mm x 12 metres).
- Hardcore (rubble and big stones).
- Short lengths of pipes.
- Sun cover (Large tarpaulin).

Site Choice

- Close to building for rain-catchment.
- Level ground with good drainage.
- Remove dangerous overhanging trees.
- For gravity-feed systems the site should be well above the village or buildings you want to supply.



Locate the tank near the building and away from trees

Dig Ground

- Dig out a 300mm depth of ground in a circle about 3 metres wide (or 200mm wider than the tank which will be about 2.8 metres in diameter and 1.8 metres in height).
- Put timber around the edges of the hole to hold up the sides of the hole.
- Secure by hammering in pegs.
- Level the ground (Do this by tying a bit of string between two posts and making it level by using a spirit or line level. Then measure down the same depth from the string to the ground across the whole area).
- Then compact the ground by stamping with feet and hitting it with spades.

Making the Base

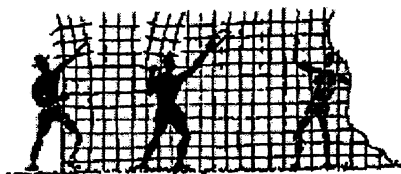
- Half fill the hole up to a height of 150mm with big stones and stamp it down as before.
- Lay out one sheet of arcmesh and cut it to the same size as the hole for the base reinforcement. (You may have to join two sheets.)
- For larger tanks a plinth is needed. This is a deeper rim of reinforced concrete 300mm x 300mm around the outer edge of the tank base.
- Lay base arcmesh on stones 50mm high above the hardcore and tie the cage on top.

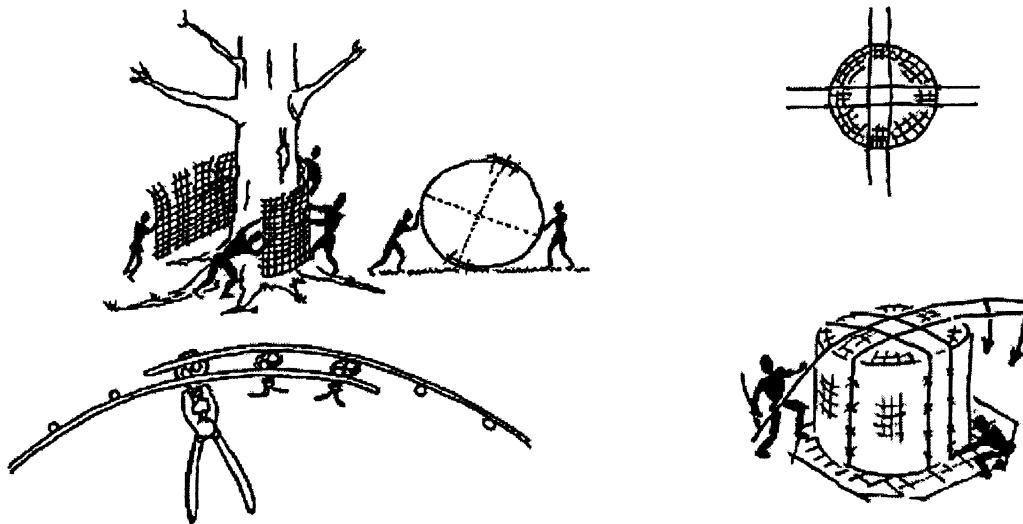
How to Make the Cage

- Cut five slots down every three squares along its length at the top of the arcmesh, before bending to allow it to be folded over to make the roof.
- Roll arcmesh round to form the cylinder walls of the desired tank size. Overlap the ends by 400mm and tie well.
- Then form an opening in the top of the tank using the reinforcement bars. Tie all the arcmesh together with tie wire and fold back any loose ends that might cut you accidentally.

Arcmesh Alternatives

- If using an old galvanised tank instead of arcmesh: clean the rust off, make holes every 200mm from inside and then attach a layer of chicken wire to the inside and outside. If you are using bamboo, use a mesh grid size of 100mm squares. If using steel bars the grid should be no more than 200mm square.





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Adding Chicken Wire and Pipes

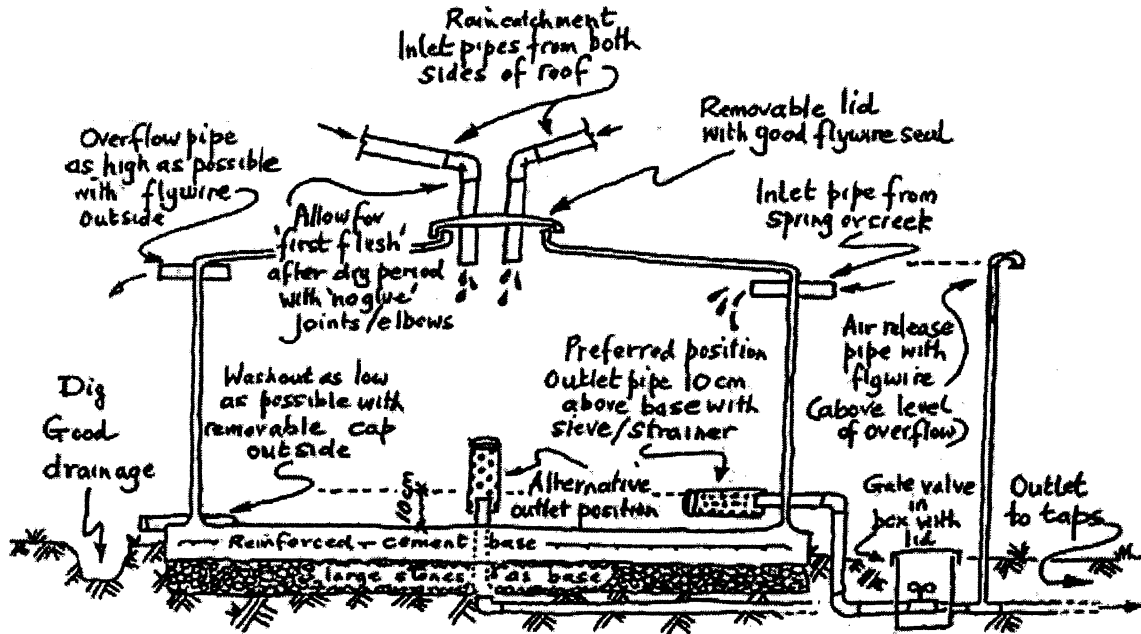
- Attach chicken wire tightly around the inside and outside of the arcmesh using tie wire.
- Fit pipes through the chicken wire and attach with tie wire.

Each has the following four pipes:

- Inlet-on rain water catchment tanks this will be the outlet from the roof guttering pouring into the top of the tank. On other types this will be an inlet pipe 50mm below the top of the tank wall.
- Outlet-horizontally, 100mm up the wall above the inside base of the tank or, alternatively, vertically, from the side (100mm in) of the bottom of the tank: ensure that the pipe comes up 100mm above the surface of the bottom. The pipe is then taken to beyond the wall of the tank in a shallow trench using a standard 90 degree elbow joint. (In both cases this normally leads to a tap.)
- Overflow-through the top of the wall just below the height of the inlet to allow the tank to overflow.

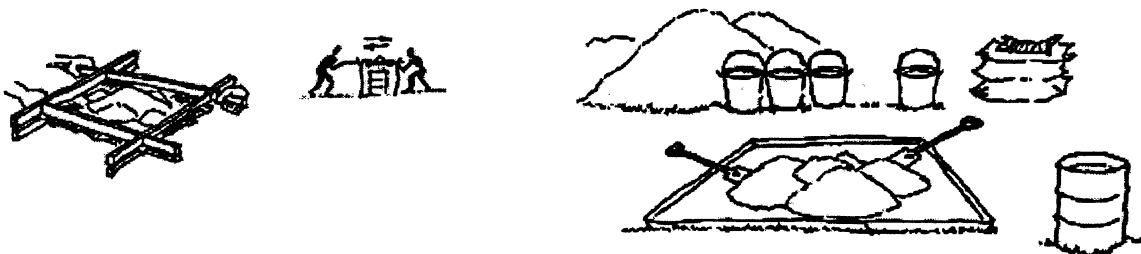
- Washout-a sealable pipe at the lowest point of the tank to allow water to flow out when the tank is being cleaned.

TYPICAL TANK DETAIL SHOWING PIPE POSITIONS



Mixing the Render

- Wash and sieve the sand. Keep the sand and cement dry prior to mixing the render.
- On the mixing board thoroughly mix some of the sand and cement together.
- Mix the sand and cement in a ratio of three buckets of sand to one bucket cement
- Then add a little water in the middle, mix thoroughly, and add more water until all the mix is just wet but not so that the mix becomes runny.



First Coat

- Plaster on one 30mm coat of render all over the mesh. But at the base the render should be 100mm thick. It should also be thicker around all of the pipes to stop leakage.
- Start at the bottom, work upwards and cover all the mesh. Never stop halfway through a section.
- Keep covered from the sun to prevent water loss and cracking (wet with plenty of water each day to prevent it drying too quickly and never let cement dry in the sun)

How to Plaster

- Place some of the render at the base of the wall.
- Using floats on either side of the mesh push the render upwards (this will require two people).
- After the first coat inside and outside, the pattern of the chicken wire should still be just visible. This ensures that the second coat will bond well and that the correct quantity (not too much or too little) of mortar is used on the first coat.

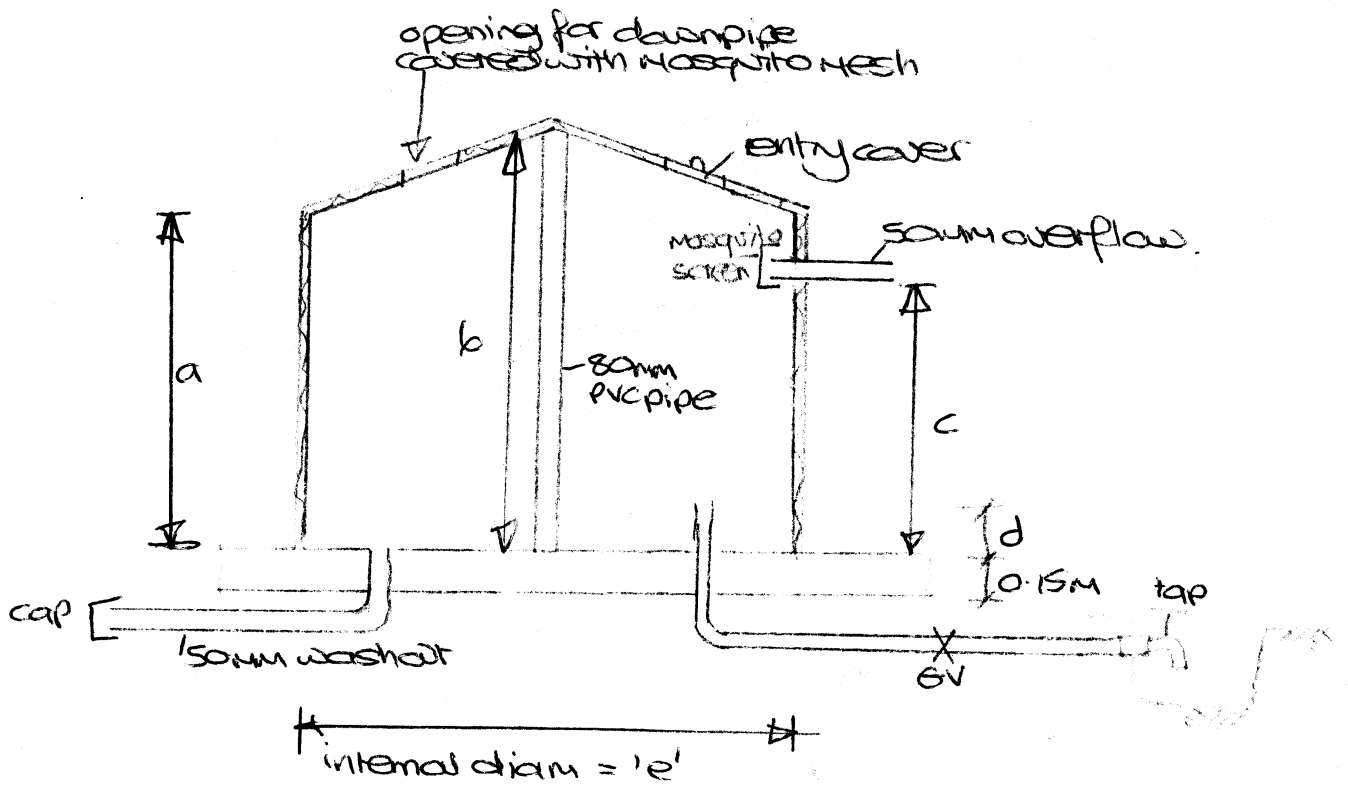
Second Coat

- When the first coat is still sticky (normally this will be the next day) apply a second coat.
- This coat should be very thin, about 6mm. It should cover any chicken wire mesh still left exposed. Apply inside and outside to the roof and base as well.
- As before, keep under cover and do not let the structure dry in sunlight. Wet each day for at least two weeks. A little water can be put inside the tank after a few days. Do not fill the tank completely until one month has passed.

Attachments

- Dig a small ditch to take water away from the overflow and washout pipes.
- Fit flywire to the openings to keep dangerous, disease-carrying insects away.
- Make and fit a cement lid to the top of the tank.
- Clean out the inside of the tank and pipes thoroughly when everything is dry.
- Do not fill with water for thirty days. This is to allow the walls to harden.

DESIGN OF TANK USED IN TEMOTU (ferrocement construction)



TANK SIZE	a	b	c	d	e	no of rebars/ distance between bars
1000G	1.7	1.9	1.6	0.15	2.0	8 @ 785 dc
1500G	1.7	1.9	1.6	0.15	2.45	10 @ 770 dc
2000G	1.7	1.9	1.6	0.15	2.82	12 @ 738 dc
2500G	1.8	2.0	1.7	0.2	3.1	12 @ 808 dc

Material requirements of standard ferrocement tanks.

	1000G	1500G	2000G	2500G
40kg cement	17	23	28	35
ARC Mesh slit	2	3	4	4
Chicken wire (L-SOM)	1	2	2	2
10mm rebar				
Tying wire (3kg)	1	1	1	1

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