BALANTA TANK, MANUAL, concept

CONSTRUCTION OF WATERTANK FOR RAIN WATER HARVESTING DAY TO DAY,

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Objective

This manual explains from **day 1 until day 7**, the construction of the 5000 litre Balanta tank. The Balanta tank is a simple, affordable (€ 250, =), available and repairable container for drinking water, made by local masons and with local material. It is used for Rain Water Harvesting for poor households. Water stored in the dark tank is safe during the year.

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Material

- 9 bags of cement, 50 kg.
- 10 kilo soft steel wire.
- 7,5 metre of chicken wire
- 8 metre of plastic sheet, 2 m wide
- 50 cm steel bar, round 6 or 8 mm. for the lid.

Tools

- Wheel barrow
- 3 shovels
- 3 spoons
- 3 cement plates
- 1 pincers to cut the steelwire
- 1 tape measure of 3 m.
- 1 hack
- 1 chopper knife, assagaai?
- 2 brushes
- 1 steel brush
- 1 water level

Day 0.
This is an extra day before the construction of the tank starts. This day is not necessary, only if you want to build a platform under the tank.


A squaire: 220 x220 cm


filit up with grind, termite sand or shell


Altogether you need 2 sacs of cement


cover with plastics. Platform is ready for the tank


When the ground is weak, use a steel bar between first and second layer of blocks to reinforce

Day 0. Platform or not? Location?
It depends on the tank owner if he chooses for a platform or not, because the extra costs are for the owner.

Arguments to choose a Platform:
-Easier to empty the lower part of the tank by tap.
- Beauty and status reasons.
A platform makes the tank considerable more expensive.

Day 1. Construction of foundation floor.

How to choose the location?
Stable ground
Not far from a roof in case of rooftop water
Not far from the kitchen
Possibility to control the tap

Place and orientation
1. Find a horizontal square (3x3m) of ground, not far from the house or kitchen, depending on the wishes of the tank owner.
2. the ground should be stable to carry 7000 kg on 3m2. Normally you can use a dry sandy bottom or with small stones or gravel, or dry clay.
3. clean a horizontal space.
4. Carve a circle in the floor with a diameter of 210 cm.
5. Cut a circular lowering of 5 cm in the floor with a hack or a chopper knife.
6. Make a circle of clay blocks exactly around the circle
6. Put plastic sheet in the circle and over the blocks, to prevent water of the cement enters the dry ground. The cement has to stay wet during the process.
7. Prepare the cement: mix one volume of mortar (the 50kg bag)with 3 volumes of sand
8. Put the cement into the circular shape on the plastic. Measure the thickness on different spots.

Do not wait, but continue the work on the wet cement floor !!
9. Put 3 pieces of 2, 5 m. chicken mesh on top of the wet cement floor. Make a closed circle of clay blocks (diameter of 210cm.) on the ground and bend the chicken mesh up by hand.
10. Put the second volume of cement (50 kg and 3 volumes of sand) within the circle of clay blocks.
11. In the middle you can thicken the cement like a small hill.
12. In the end the thickness of the floor is min.10 centimetre ad in the middle a few centimetres more. Measure the thickness during the process with a nail or stick.
13. Cover the floor with plastic and let it dry during the night.

Day 1, pictures

4

6, 7, 8, 9

10

10

11

12

Same construction on platform

13

Day 2

To build the mould with clay blocks and wet sand

1. Take away the plastic sheet and store it properly.
2. Draw a circle on the cement floor with a diameter of 200 centimetre. There is left 5 cm for the wall thickness. You can use a nail and a piece of steel wire.
3. Build a round wall of clay blocks within the circle and a height of at least1.70 m.
4. The wall is the mould; it has to be vertical with a regular surface.
   You can use a chopping knife.
5. When the wall is ready, you can plaster by hand it with wet sand
6. First clean the outer edge of the floor to make a good connection with the wall !!!
7. Let the wall dry about one hour. Do not make it too wet.
8. Plaster it with cement. Not too thick, that can make the load too heavy. Cement bag 3
9. Cover the construction with the plastic sheet.

Day 2.

3

4

5

5

6

8

8

9

Day 3. Continue to construct the wall. Start constructing the roof

Wall

1. Take away the plastic sheet and store it carefully
2. Prepare cement to plaster the second layer on the outside. (sack number 5)
3. Moisten the outer wall before you plaster.
4. Plaster the second layer
5. Clean the chicken mesh at the bottom and bend it upward, tira rede fora de ciment.
6. Cover the building with plastic sheet to keep it moist.

Roof

1. clean a square of horizontal ground not far from the tank.
2. make it flat and horizontal. Use the water level.
3. draw a circle with a diameter of 210 cm.
4. make a small and regular hill of sand to be the form of the roof, a height of de 15 – 20 cm in the middle.
5. you can put clay blocks around to prevent the wet cement streaming away.
6. cover the sand with wet paper of the old cement bag.
7. install a tub of 40 cm diameter at the right location to be the manhole in the roof.
8. plaster the form with the first half of a sack of cement.(sack 5)
9. put 4 circles of twisted steel wire in the wet cement to be the reinforcement (photo)
10. finish plastering, second half of cement bag.
11. make the ridge, the lips of the manhole right away !! When later they will break!!
12. cover with plastic sheet.

Day 3, plastering the second layer of the wall

the chicken mesh has to stay clean

roof

3

4

6

7

9

10


11. shape the manhole in the wet cement of the roof….. finish it next day

Day 4

Take out the clay blocks and wind the first layer of steel wire

1. Takes out the clay blocks. Use a shovel as tool.
2. Take them out carefully, not to damage the wall and you can use the clay blocks once more.
3 Pile the clay blocks nicely at a few meters distance from the tank.
4. Clean the inside of the tank with a steel brush.
5. Make a small hole where the tap is going to be.
6. Wash the inside with slurry, mortar and water only, with a brush. It is necessary to make the wall more watertight.

Steel wire

1. Wind the steel wire around the tank. A spiral with a distance to the next wire of 1,5 -2 cm.
2. Do this work neat and regular. You need three persons for it and gloves.
3. Wind until about 1.5m. in height. The second wind will go to the top.

4. Wet the outer wall and plaster it. Sack 6
5. Cover the construction with plastic also on top.

Day 4

Watch the upper ridge

Cleaning inside with steel brush and soft brush

5 wash inside with slurry, pure cement and water. The hole for the tap


Steel wire

Day 5

Finishing inside, construction of lid for manhole

1. Take away the plastic sheet and store it carefully.
2. Wet the inside wall and floor with water.
3. Paint slurry (water and cement) on the interior wall and the floor with a brush
4. Plaster the inside wall and bottom with cement (1: 3): sack nr 7
5. Make a round edge at the connection of the wall and the floor
6. Paint once more slurry (water and cement) on the interior wall and the floor with a brush, two layers. This is important to make the wall water tight.

Lid

Construction of lid directly in the opening of the manhole, to make it fit exactly and to keep the light out.
Give it a position sign, a stroke on the edge of the manhole and the lid.

Day 5

Construction of lid, use a bar of construction steel round 8mm inside

Day 6

How to lift he roof and put it safely on the tank. So that nobody gets hurt and the roof does not brake

1. The weight of the roof is about 200kg.
2. Find 10 strong men.
3. Clean the spot, so that nobody can fall.
4. The responsible mason explains the tem clearly how to lift and carry the roof
5. Situate 4 clay blocks beside near the tank
6. Carry the roof with 8 men, keep it low and put it on the clay blocks.
7. Turn the manhole in the deserved position.
8. Two experienced men enter the tank.
9. When everybody ready and concentrated, the chef-mason counts: 1…2…3…Lift!
10. Only **one** chef who commands to lift !!!, avoid confusion!
11. The team of 8men lifts the roof above the heads and place one side on the tank wall.
12. Take it easy the roof is not so heavy as you might think.
13. Drag the roof carefully on the right position. The two men inside can control.
14. Put small stones to close the eventual cleft between edge and roof.
15. The two men inside can easily escape by help of a jerry can, to stand on it and climb out. With a rope you can pull out the plastic 25 l. bidon.
16. Cover the roof with plastic.

Day 6

Two masons are inside the tank, to adjust the roof carefully in the right position

Day 7

Finishing touch

1. take away plastic sheet and store it carefully, you will need it one week more!
2. Wind steel wire vertical, every 10 – 15 cm: see picture
3. Wind steel wire horizontally very regular, a spiral with 1, 5 until 2 cm distance to the next wire. A job for 3 persons. Use gloves!
4. Wet the wall
5. Last plastering, bag 9
6. Finish the nose. The nose prevents people to step in the tap.

Day 7 pictures






How to fill the tank with rainwater

Usually we construct the tank for skilful farmers which takes responsibility to fill tttheir own tank.

The farmers found several solutions, see the pictures:
by gutter,
by plastic sheet,
by hand, etc.

When they have a grass roof, a plastic sheet is a clever solution.

They use a piece of textile over the manhole as a filter against tree leaves and dust.

They close the manhole carefully, when the tank is filled.
Water stored in a 100% dark container is save drinking water for the whole year.

How to fill the tank with rainwater

Collect water of grass roof to put in tank by hand.

7 years old watertank, one of the first models, still in use

Problems and solutions

Problem: the first layer of cement on the mould drops off.
The sand on the clay mould is too wet
The layer of cement is too thick and too heavy
Solution: start again

Problem: leakage between bottom and wall. Mention the wet soil around the tank
Solution: to be repaired from the inside when tank is empty.

Problem: leaking floor:
Solution: Inside reparation: do **not** use a plastic sheet ,as you see on the picture!
Use a well shaped piece of chicken mesh and a bag of cement. Clean and scrub the floor before applying cement.

Problem: Horizontal crack in the wall under the roof
Solution: Make a ridge on the weak spot!

Problem: When lorry hits tank
Solution: make a children playground

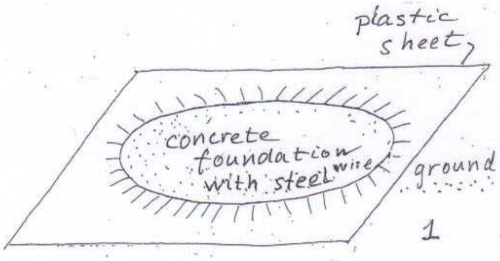
Problem: local sand is salt and gives leakage in the second year
Solution: transport of proper sand.

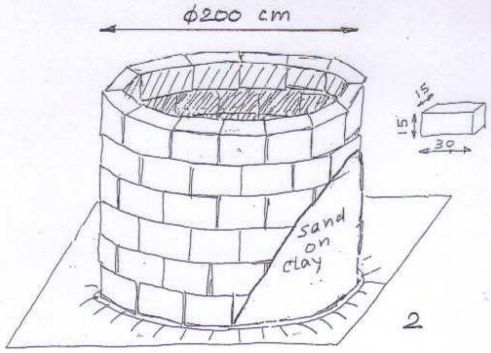
Problem: no clay blocks available,
Solution: you can use cement blocks for the mould and take them out after to use them once more.

System of building, sequence

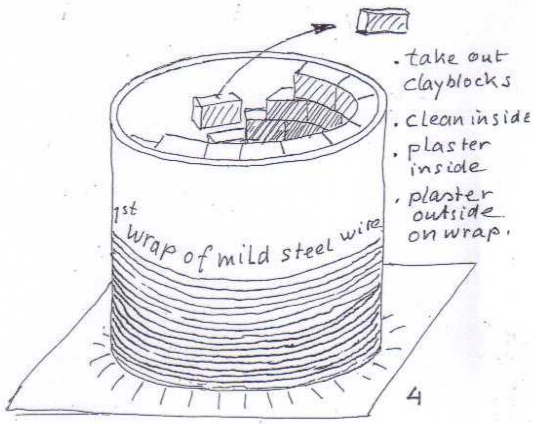
BALANTA TANK

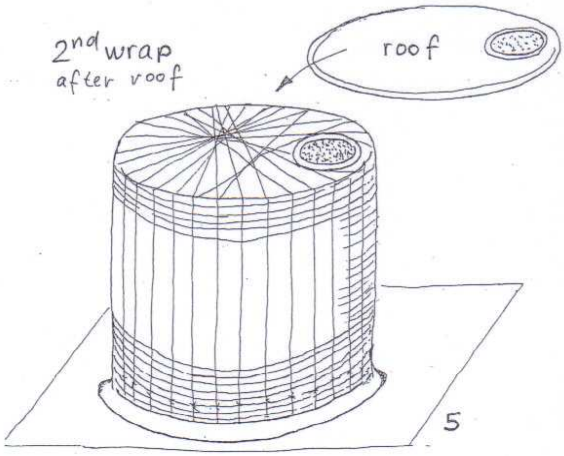
illustration, steps in constuction





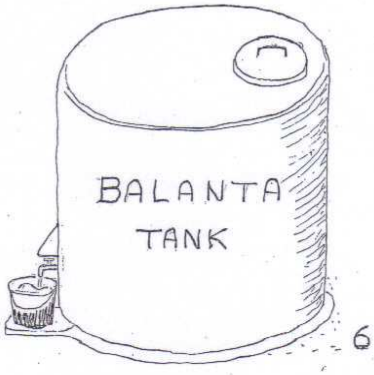
formwork of clay blocks





plaster on 2nd wrap

5 layers of concrete in total



Bill of quantities and prices for a standardised tank

Guinea–Bissau tank / Balanta tank 5000 liter, 2013

Materials	CFA each	CFA one tank	Euro one tank
9 bags ciment	5.500	49.500	76,23
10 kg steel wire	1.000	10.000	15,40
7,50 m. Wire netting		5.000	7,70
8,00 m. plastic sheet	500	4.000	6,16
small material	500	1.000	1,54
		69.500	**107,03**
Tools			
1 wheelbarrow	45.000		
various tools	55.000		
(spade, levelling instr.)			
25 total tools			
for 25 tanks	100.000	4.000	6,16
		4.000	**6,16**
Transport			
Transport	8.000	8.000	12,32
		8.000	**12,32**
Labour and coordination			
1 mason	25.000	25.000	38,50
2 helpers	7.500	15.000	23,10
1 coordinator	13.000	13.000	20,02
material for administration		2.000	3,08
		55.000	**84,70**
Total for one Balanta tank 5000 L		**136.500 CFA**	**€ 210,21**
Contribution of owner (with tap, in concert with owner)		25.000	38,00
20 barrows sand			
130 blocks of clay			
600 Ltr water			