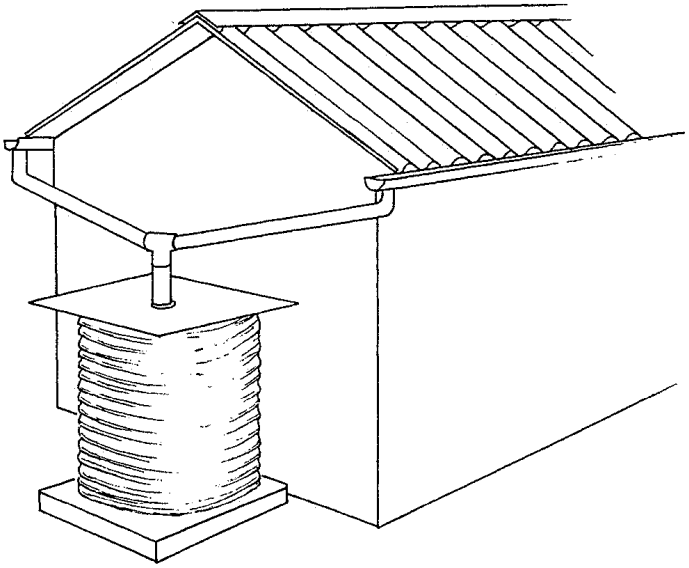
14. Above-ground rainwater storage

A rainwater collection system has three essential components.

- an impervious roof to collect rainfall;
- gutters and downpipes to convey collected water to a storage tank;
- a tank for the storage of collected rainfall.

The tank is the most expensive item.



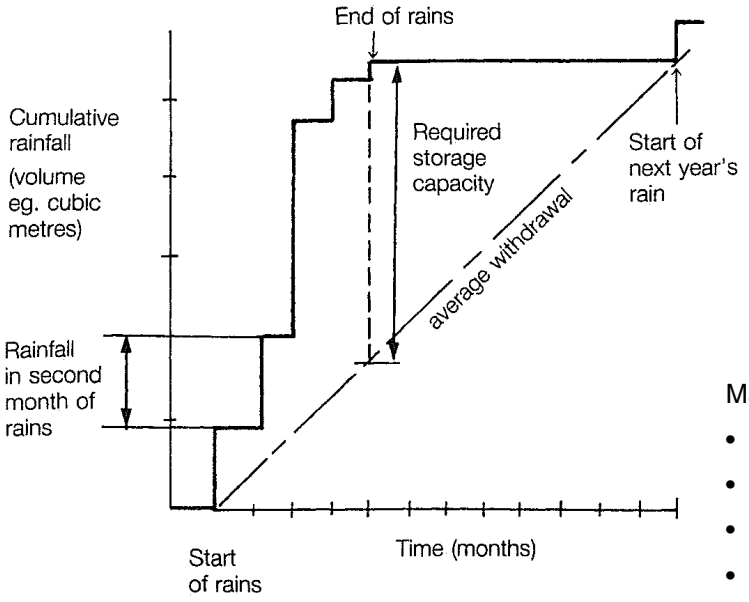
The capacity of the tank

What is needed:
The total quantity required each day multiplied by the longest period without rain.

What is available:

The total quantity of rain falling on the roof during the rainy season, less the water drawn from the tank during that period, less losses due to evaporation and soaking into the roof etc.

A cumulative rainfall diagram may be used to calculate the required capacity.



Materials which are used for tanks include:

- corrugated iron
- cement jars and cement-covered baskets
- granary bins lined with mortar
- concrete or sancrete blocks, bricks and masonry
- pre-cast concrete rings and panels
- in-situ concrete and soil-cement
- ferrocement

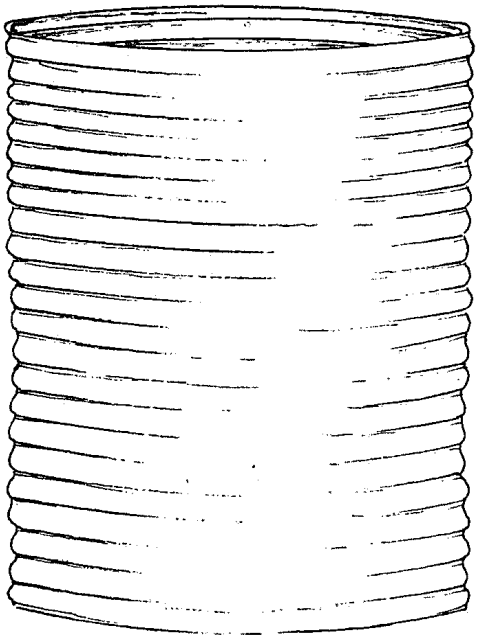
Above-ground rainwater storage

Corrugated iron

These are often available commercially. Erection is simple on a flat concrete slab. They are usually expensive.

Corrosion may set in quickly, especially at joints, so the life of the tank is often limited to 5-10 years.

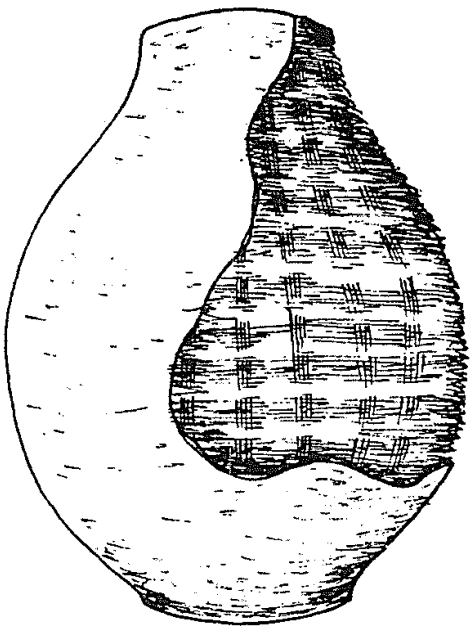
Corrosion can be reduced by painting tanks inside and outside with bitumen.



Cement jars and cement covered baskets

Jars ar made by spreading layers of cement mortar to a thickness of 10mm or more.

A sack is filled with straw, sand or sawdust, and a metal ring is placed at the top for the opening. (see Technical Brief No 1, Waterlines, Vol 3, No 1, July 1984.)



OR

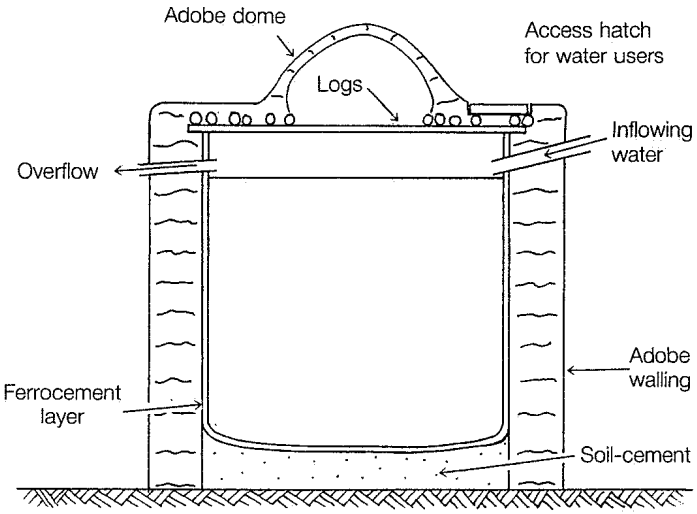
A granary basket is made with woven sticks.

The capacity can be up to 3.5 cubic metres with plain mortar, or up to 10 cubic metres with reinforced mortar.

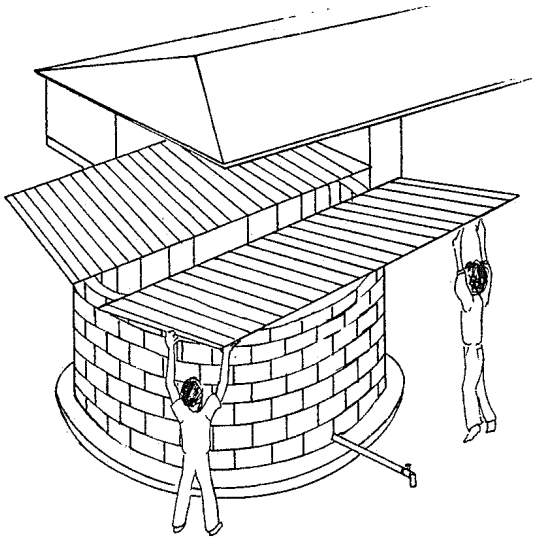
Granary bins lined with mortar

In Mali, bins built of adobe for grain storage have been converted to water tanks by lining with cement mortar or ferrocement 10mm thick. A curved base is made of soil-cement, (10 parts soil to 1 part cement).

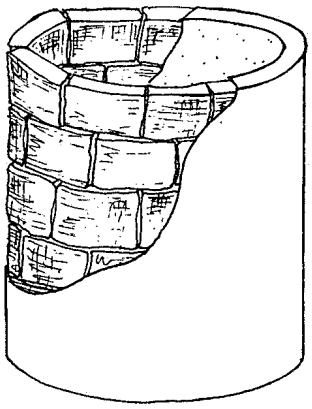
The size is typically 2.6m diameter and 2.4m high.

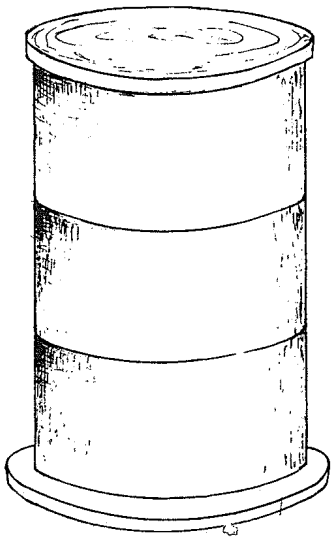


Blocks, bricks and masonry



Depending on local traditional building practice, circular tanks are made with blocks of con crete or sandcrete; sun-dried, kiln-dried and adobe bricks; or masonry (natural stone). The inside is always plastered with cement mortar. The outside may also be plastered.





Pre-cast concrete rings and panels

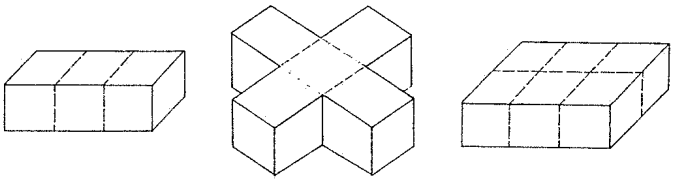
Large diameter concrete pipes and rings fabricated for sewer manholes and septic tanks are built into a tank. Joints must be laid with a strong mortar mix.

Pre-cast concrete panels have been used in the South Pacific – first in the Cook Islands; also in Tonga, Kiribati, the Solomon Islands, Samoa, Papua New Guinea and Fiji.

Panels are 1.65m by 1.65m, reinforced with wires in both directions, or 1.20m by 1.20m unreinforced concrete, with wires sticking out for jointing.

A 1:2 cement:sand mix is used, reinforced with steel fibres.

Multiple tanks are made by joining panels.



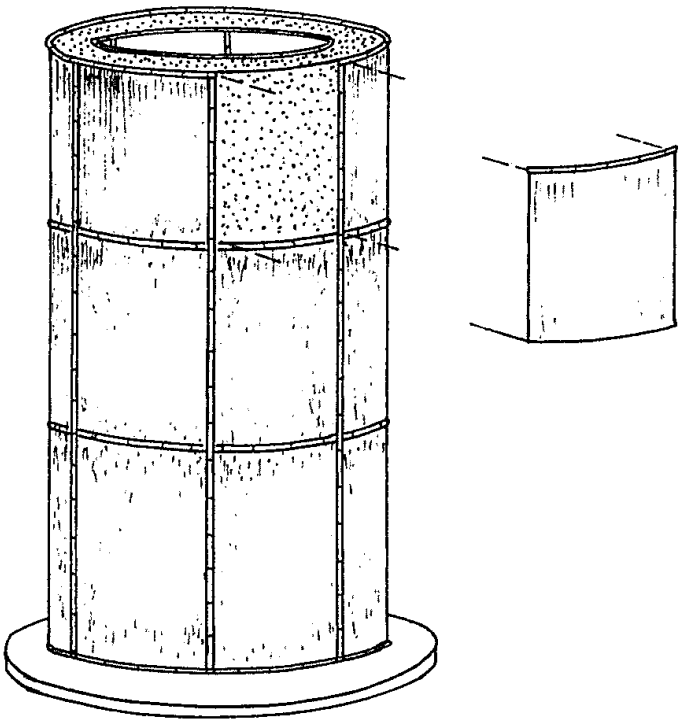
Above-ground rainwater storage

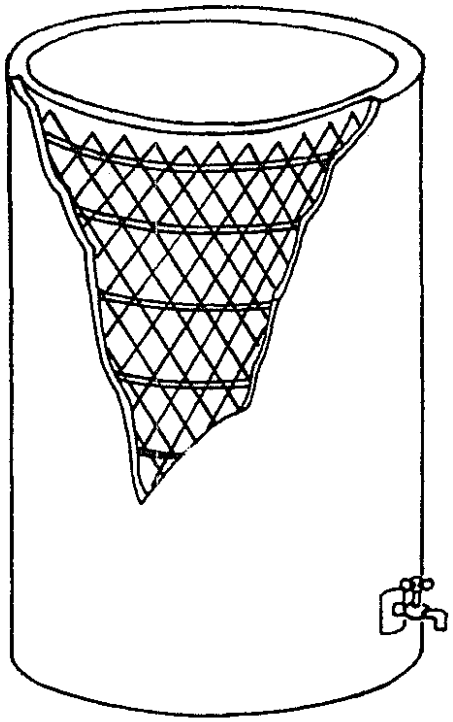
In-situ concrete and soil-cement

Circular concrete tanks are made with steel or plywood shutters. Steel shutters are expensive, but may be used many times.

Walls of 12:1 soil:cement, 100mm thick have been built in Brazil, using plywood shuttering. The tanks are rectangular.

(see Waterlines, Vol 5 No1, July 1986, pages 25-28).





Ferrocement

Tanks with a capacity of 10 cubic metres have been built from ferrocement.

For domestic tanks a capacity of 10 cubic metres is provided by making the diameter 2.5m and the depth 2m.

Shuttering can be made from 16 sheets of corrugated iron.

Timber and adobe can also be used for shuttering.

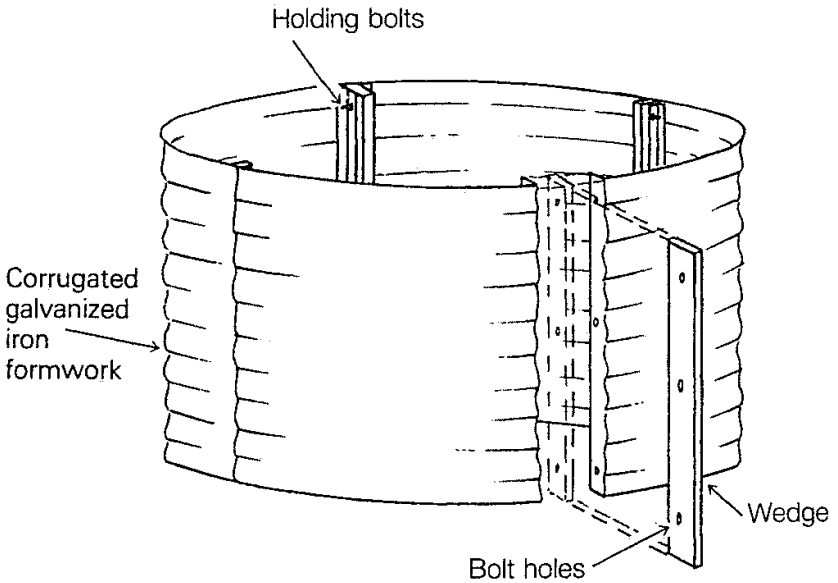
The cement mortar is usually made with 1 part cement to 3 parts sand by volume, ½ part water to 1 part cement by weight.

The mortar is applied in layers not more than 10mm thick to give a total thickness of 40mm.

Reinforcment is provided by chicken wire, barbed wire or spot-welded wire mesh.

For small tanks the floor and walls are often made as a continuous construction, avoiding the need for a flexible joint at the base of the wall. The internal angle should be coved with extra mortar.

Alternatively, the floor can be made of puddled clay or a plastic sheet between layers of sand.



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