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Case study 7

10 cubic metre ferrocement water tank using former

Introduction

This example has been taken from Ferrocement water tanks and their construction by S. B. Watt and published by Intermediate Technology Publications which can be found at

<http://../www.oneworld.org/itdg/publications.html>

Watt states that these tanks have been used for many years in parts of Africa and have been designed to be as simple as possible to build in self-help

programmes. The users, who are at first unskilled in this sort of construction, can contribute their time and efforts in collecting sand and water, digging the foundations and preparing the mortar under the general guidance of a trained builder. With experience they quickly learn how to make the tanks without further guidance.

A trained builder with 5 helpers takes approximately 3 days to complete the tank. The users often contribute some money towards the cost of the tank, which helps to cover the builders wages, the cement, reinforcement and the hire of the formwork.

Design

The tanks have been designed for construction by relatively unskilled workers. They have a diameter of 2.5m, a height of 2m, giving a capacity of 10cubic metres. The final wall thickness will be about 4cms. The tanks are built on site and should not be moved.

Formwork

The 2m high formwork is made from 16 sheets of standard galvanised roofing

iron, 0.6mm thick with 7.5cm corrugations rolled into a cylinder with a radius of 1.25m. Steel angle iron (40 x 40 x 5mm) is bolted vertically on the inside face at the ends of each set of 4 sheets this allows the sheets to be bolted together to form a circle. Between the edge of each section is placed a wedge which is pulled out to allow the formwork to be dismantled (see Figure 1).

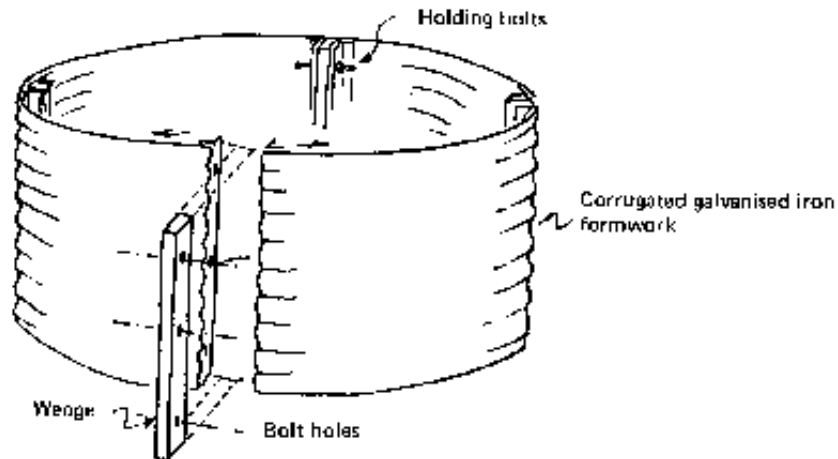


Figure 1 Assembling the formwork (Watt 1972)

Construction

A circular area 2.8m in diameter is cleared at the required site for the tank and excavated down through the loose topsoil. A 10cm layer of sand is laid evenly over the excavation and a 7.5cm layer of concrete mix of 1:2:4 (cement:sand:gravel by volume) will form the foundation slab under the tank. Into this concrete foundation is cast a 1m length of 20mm bore steel water pipe with a tap on the outside end. The pipe is curved so that it projects 10cm above the floor of the tank; a piece of wire is threaded through the pipe to act as a pull through after the tank has been built (see Figure 2).

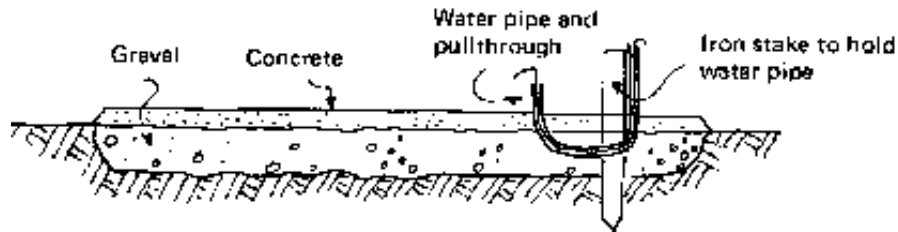


Figure 2 Foundation of tank (Watt 1972)

When this concrete slab has hardened the formwork of the tank is erected. The bolts passing through the angle iron and wedges are tightened to provide a rigid cylindrical form. This is cleaned free of cement and dirt, oiled and the wire netting wrapped around it to a single thickness and tucked under the forms. The netting has a 50mm mesh, and is made from 1.0mm wire.

To form the hoop reinforcements, the straight galvanised iron wire, 2.5mm diameter, is wound tightly around the tank from the base at the following spaces:

- 2 wires in each corrugation for the first eight corrugations
- 1 wire in each corrugation for the remaining corrugations
- 2 wires in the top corrugation

About 200m of 2.5mm diameter wire will be needed, weight 8 kg. The netting provides vertical reinforcement to the tank and also holds the hoop wire out of the corrugations. The outside is then plastered with a layer of mortar made from a mix of 1:3 (cement : sand by volume) and as soon as this has begun to

stiffen a second layer of mortar is trowelled on to cover the reinforcing wire to a depth of 15mm. The surface is finished smooth with a wooden float.

After a day or so the formwork is dismantled by removing the holding bolts and by pulling out the wedges which will leave the shuttering free to be stripped away from the inside mortar wall. The sections are lifted clear of the tank to be thoroughly cleaned of any mortar or cement. A 20cm length of 8cm diameter downpipe is built into the wall at the top of the tank to act as an overflow and the inside of the tank of plastered with mortatr to fill up the corrugations. When this has hardened sufficiently, a second final coat is trowelled onto the inside and finished with a wooden float.

A 5cm thick layer of mortar is next laid onto the floor of the tank and the junction of the floor with the walls built into a coving. The floors are not reinforced and so the tank wold fracture if it were moved. Take care that the mortar does not fill up the outlet pipe. Before the mortar on the floor has stiffened, form a shallow depression in the middle; this will allow the tank to be cleaned at a later date the sediment can be brushed to the hole and cupped out (see Figure 3).

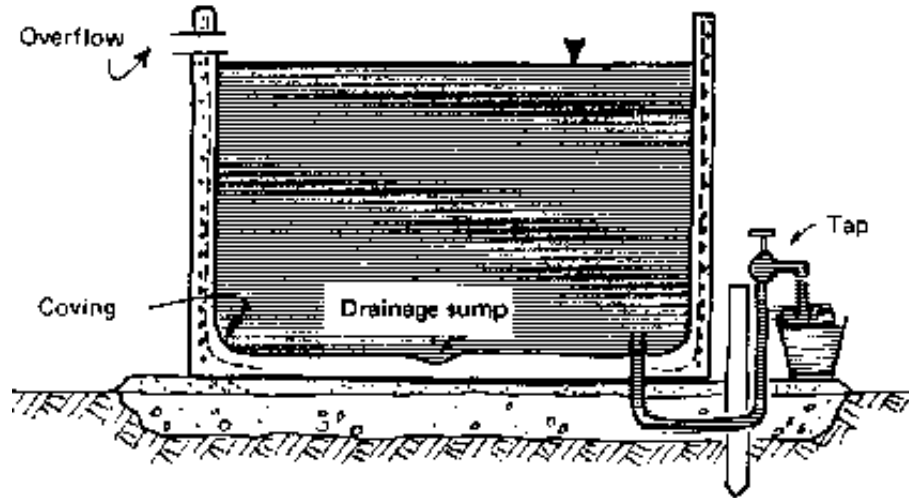


Figure 3 The completed tank (Watt 1972)

The inside of the tank is painted with a thick cement slurry to seal the inside of the tank the a small of water is allowed to stand in the bottom of the tank and the tank is covered and cured for seven days.

Roof

The tank is covered with sheets of 0.5mm galvanised sheeting supported on two lengths of angle iron. Alternatively, a reinforced mortar roof may be built in the way described in Case Study 8 (Factory Made Tanks New Zealand). Building a mortar roof is not difficult but does require more formwork.

Materials

Materials required for a 10m³ tank with galvanised iron roof.

Cement	600 kg
Plain wire 2.5mm diameter	200m
Chicken mesh 1m wide	16m
Water pipe 20mm bore	1m
Water tap	1 No
Overflow pipe 8cm bore iron or	0.2m

concrete	
Sand	1.0m3
Gravel	0.5m3
Galvanised iron sheet and angle iron	

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