

# 4. Lining a hand-dug well

There are as many different ways of building a well as there are different sites.

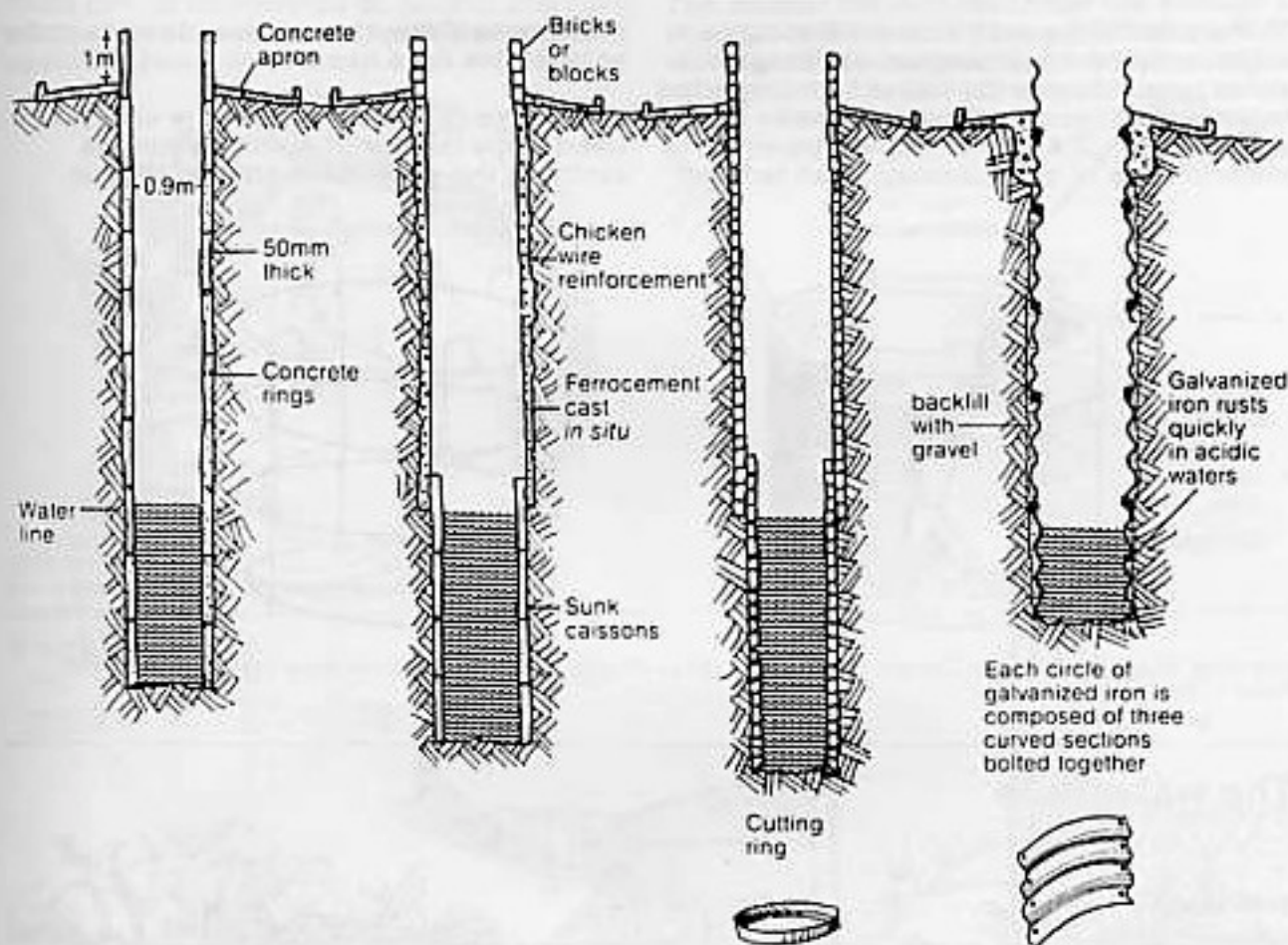
## Alternative methods

1. Sinking caissons (Concrete rings).

2. Reinforced concrete or ferro-cement cast *in situ* above waterline, concrete rings sunk below waterline.

3. Masonry lining of burnt bricks above waterline, caisson made of blocks with cutting ring below waterline.

4. Galvanized iron rings bolted together as a temporary measure for emergencies.



This Technical Brief concentrates on sinking caissons as one of the most useful methods. It is safe, efficient and economical where the cost of equipment, notably the steel moulds for casting the concrete rings, can be spread over several wells. The skill of the well-diggers will also build up with experience. A tube of rings is built upwards and is allowed to sink under its own weight to its final position as the soil is excavated from within it.

## LINING A HAND-DUG WELL

### Before you start digging —

Know the community, meet leaders, talk to the women who will be using the well. Involve the community, which should provide the money for materials, and provide skilled and unskilled labour.

Look at existing water sources. If you are going to convert an existing water hole, it should be well away from pit latrines but convenient to reach.

Is a well the simplest solution?

Check dry and wet season water levels.



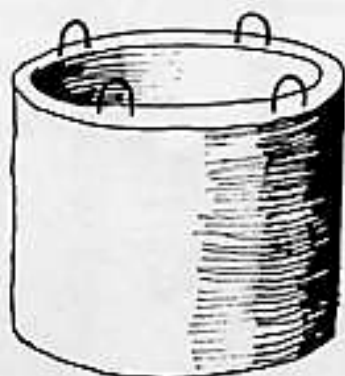
### Concrete rings

These need to be cast from steel moulds which must be accurately made. Rings can either be cast beside the well or be transported to the site. Concrete should be made in the proportions 1:2:4 cement:sand:aggregate (if materials are of good quality), well tamped

into the mould and kept covered and damp for at least five days to cure.

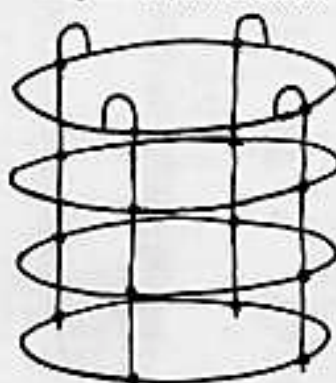
Shorter rings can be lifted more easily, but need to be thicker. If reinforcement is omitted, the walls must also be thicker.

Finished ring



Walls  
50mm  
thick  
Height  
0.8m  
Diameter 1m

Diagram of reinforcement

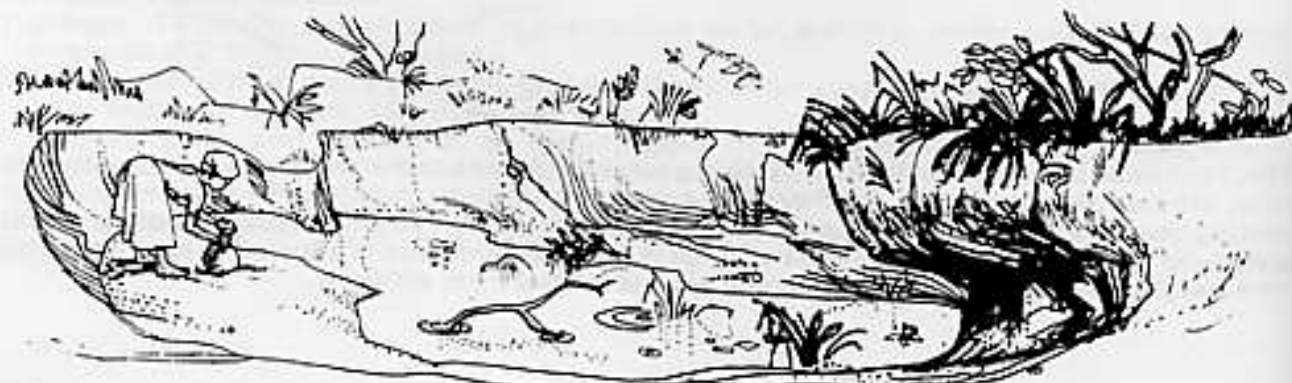


6mm or 8mm  
rebar with  
loops for  
lifting tied  
or welded

Cut off three  
of the lifting  
loops when the  
ring is in place  
and bend the other  
over to make a step  
ring inside the well

Quantities for 1 ring (1:2:4 ratio): Cement - 1 bag. Clean sand - 45 litres. Gravel - 90 litres, not larger than 15mm diameter. Rebar - 16m, of 6mm diameter.

### The water hole

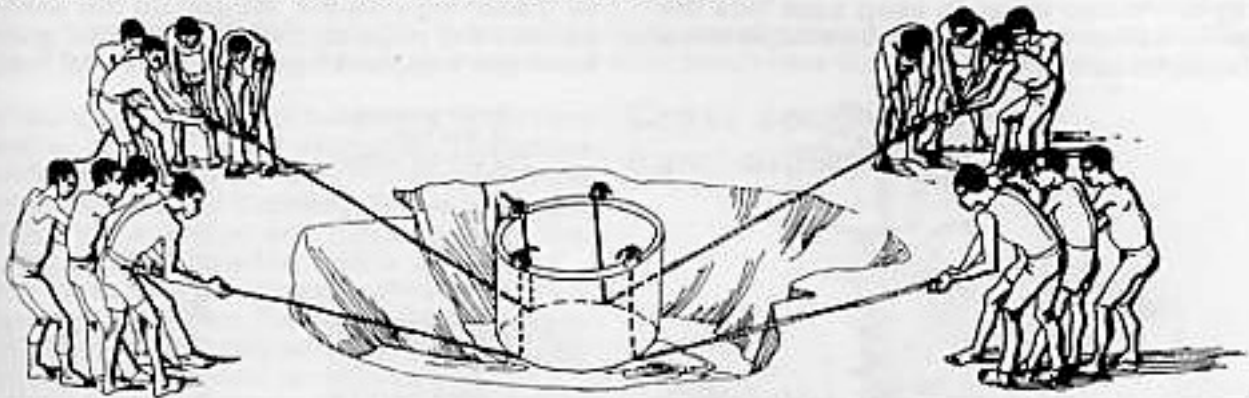


Clean out mud and organic matter. Dig the hole wide enough to accommodate the ring and as deep as it is safe to go without the sides collapsing.

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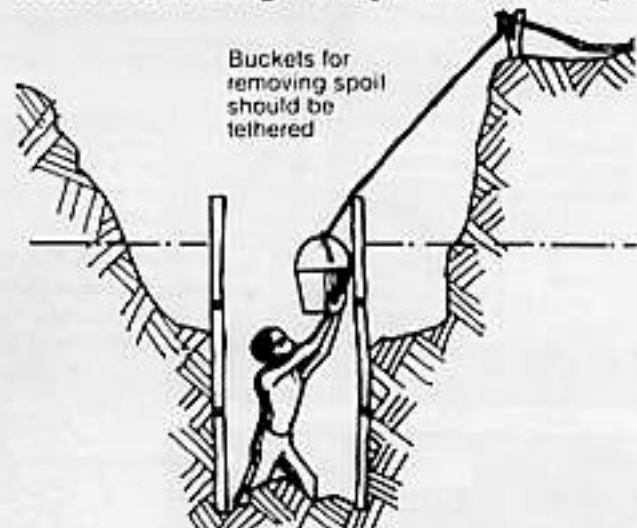
## Sinking rings

Suspend the first ring on ropes as shown, using about 15 people to hold the ropes to be safe, and lower it until it sits *level* at the bottom of the hole.

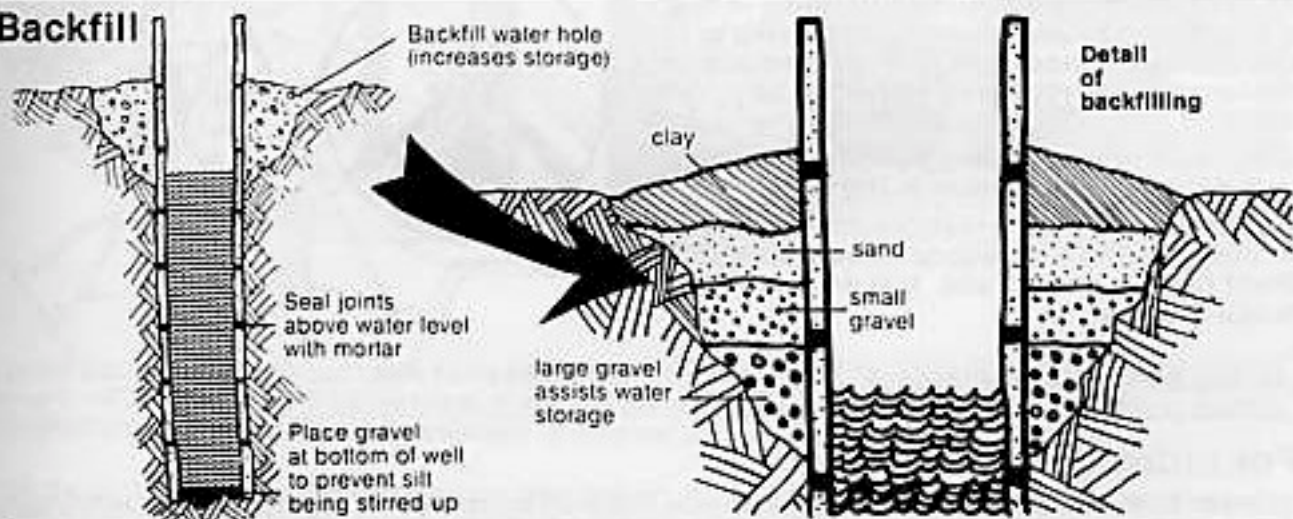


Continue digging inside the ring. Wells can be de-watered by bucket and hard work, or by a small diesel, petrol or hand-operated diaphragm pump.

Lower further rings as the first one sinks. The deeper the well the larger the amount of storage and in some cases infiltration. The well is used during the day and refills at night.



## Backfill



## Safety

Workers should wear helmets and buckets should be tethered while they are down the hole. Keep engine-driven pumps away from the hole to avoid the build-up of toxic fumes.

## LINING A HAND-DUG WELL

### But don't stop there . . .

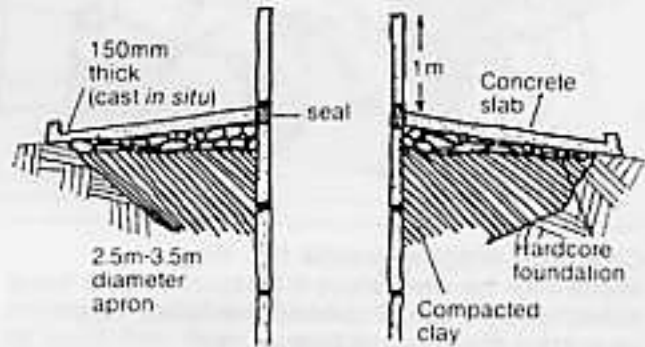
Your well can now provide fresh water, as long as it is properly finished.

The surrounds soon get dirty, allowing contaminated water to seep back into the well. Puddles of spilled water transmit hookworm through feet.

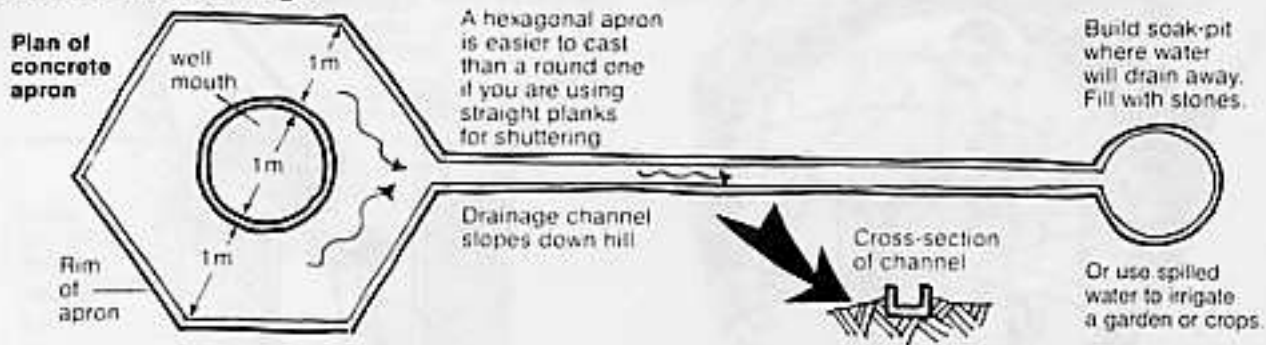
So disinfect the well with chlorine solution or bleaching powder. Mound up the earth around the rings so that water drains away from the well, and compact the earth firmly.



Cross-section of this slab is shown below



Lay hardcore, then cast a concrete apron – reinforced if possible. Make raised edges and cast a channel for drainage.



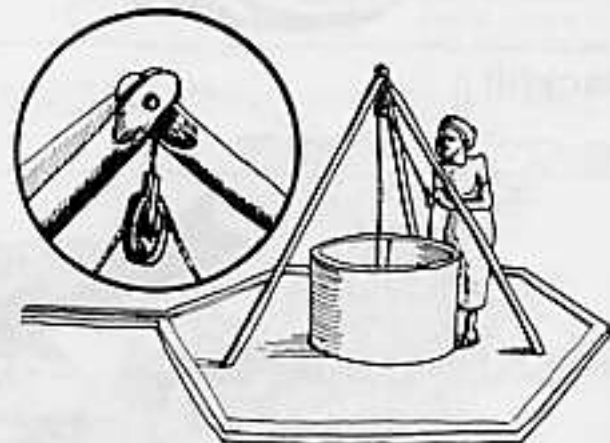
### Pump vs bucket

If handpumps are already being used in the area and can be maintained, cast a slab to fit over the well to mount the pump. (Handpumps designed for bored wells can often be adapted.)

Simplest solution is often a pulley or windlass and a bucket which stays at the well.

Make sure everybody realizes how important it is to keep the well and its surrounds clean. Plant flowers and shrubs. It is advisable to fence the site.

The detail shows a tripod made of old rising mains with the ends flattened, bolted together, fitted with a pulley.



### For more information

1. Watt, S. B. and Wood, W. E. *Hand dug wells and their construction*. Intermediate Technology Publications, London, UK, 1976.
2. DHV Consulting Engineers. *Shallow wells*, DHV Consulting Engineers, PO Box 85, Amersfoort, The Netherlands, 1978.

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