

Dug wells

The dug well is a traditional method of obtaining water, which has been used for thousands of years. In its simplest form, a dug well is a shallow hole dug down into the water table.

Open, unprotected dug wells are common, especially in rural areas. They can become very contaminated from spilt water, animal excreta and objects thrown into the well. Dug wells in this condition pose a major risk to public health and help to spread diseases such as guinea worm, typhoid, cholera, hepatitis A and many diarrhoeal diseases.

Improved dug wells which are lined with concrete, covered and fitted with a secure water lifting device such as a pump or windlass can, however, provide safe drinking water.

Sanitary inspections of dug wells

Sanitary inspections should be carried out on traditional and improved wells (see Fact Sheet 2.1). Where traditional wells are used, a sanitary inspection will indicate the main causes of contamination and how they can be eliminated through improvement. Improved wells, like all protected water supplies, require regular monitoring to ensure that an adequate and safe water supply is maintained.

The community should conduct sanitary inspections of dug wells approximately six times a year and at least once a year an external surveillance agency should make an inspection.

Where a community is served by a dug well, water quality tests should be carried out twice a year, once in the wet season and once in the dry season. If there are many household wells in a community, the surveillance agency should only test a few of the wells each year. The wells selected should be generally representative of wells in the community, so wells in locations where there are several wells nearby should be selected.

The results of the water quality analysis of the wells will show whether there is contamination, and the results of the sanitary inspections will enable the causes of contamination to be identified and eliminated.

The key points to observe in a sanitary inspection of dug wells are shown in Figure 1. Sanitary inspections for all dug wells will follow the same format, but will differ slightly depending on the means of water withdrawal.

Building and upgrading dug wells

Unprotected dug wells should be upgraded to provide clean safe water in order to protect the health of the community and to help prevent the spread of cholera and other diseases. Dug wells may be made deeper to produce more water.

Whenever possible, dug wells should be constructed or deepened during the dry season to ensure a year round water supply. It is important to ensure that the well will produce sufficient water, otherwise alternative, and possibly more contaminated, sources will be sought by the users.

A dug well can be upgraded to provide a clean water supply quite easily. This is done by building a well head with a cover, lining the top of the well shaft and fitting a hygienic system of lifting the water.

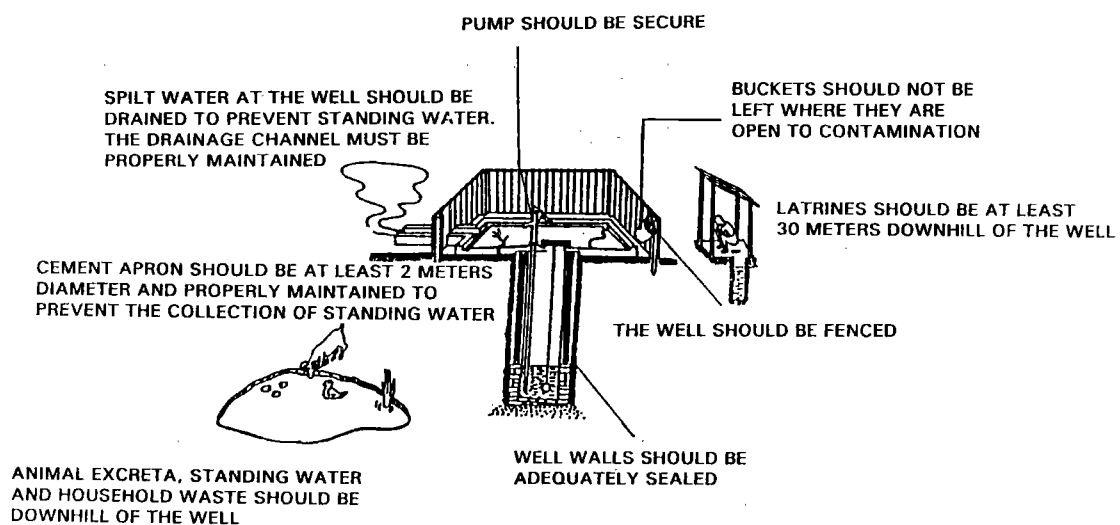


Figure 1. Sanitary inspections of dug wells

When new wells are constructed, the well shaft should be lined with concrete down to the water table and concrete caissons, or rings, should be sunk 3-4 m below the water level. This requires a reasonable level of skill, a fairly high capital input and some specialized drilling equipment. As a result, these wells are relatively expensive and are most likely to be constructed by organizations running large well-sinking programmes with trained technicians and engineers. *This Fact Sheet is only concerned with the upgrading of existing dug wells.*

Lining the well shaft

When an existing unprotected well is to be upgraded it may not be possible to line the whole well shaft or to cast and sink caissons. It may only be possible to line the top of the shaft. These wells can be upgraded quite easily by one of two methods.

In stable soils with a fairly regular shaft, a watertight lining, drainage apron and cover slab should be constructed. At least the top 5 m of the well shaft should be lined. This will ensure that the top of the well is stable and not likely to col-

lapse. In addition, water entering the well will have been filtered during its passage through the top layers of soil and so will contain fewer pathogens, or contaminants than before.

The well can be lined with bricks and mortar, and plastered with a rich mortar mix. Alternatively, reinforced concrete can be cast behind a circular mould, but this method is more expensive and it may be more cost-effective to construct a new well.

The well should be dug out to a uniform diameter. Care should be taken to ensure that the base of the lining is wider than the unlined

shaft below it. It is a good idea to lay a supporting foundation that is wider than the lining at its base. This is shown in Figure 2.

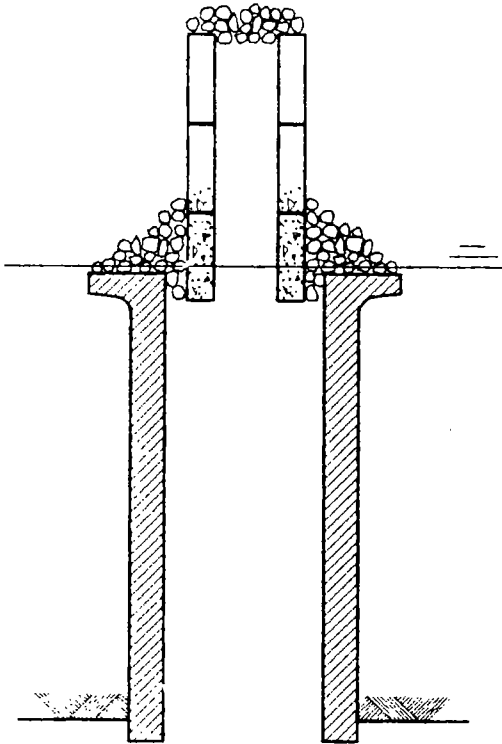


Figure 2. The lining and caissons on a dug well

The lining should extend 30 cm above ground level to prevent surface water from seeping into the well. The headwall, or wellhead, is often made wider than the lining and supports the cover slab. Figure 3 shows how to build the headwall. Figure 3. Building the headwall

The apron and drainage channel

The wellhead should be surrounded by a reinforced concrete apron with a drainage channel. The drainage channel allows spilt or surplus water to be directed to a watercourse, soakaway or irrigation channel to avoid creating a muddy surrounding.

Sometimes the apron is laid before the wellhead is built, and is cast as soon as lining is finished ; sometimes it is laid after the wellhead is built. Either method can be used, but it is important that the join between the wellhead and apron is watertight. Figure 4 shows how to lay the apron.

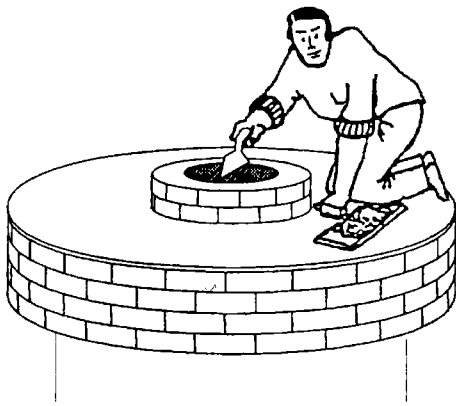


Figure 4. Laying the apron and drainage channel

Improving a well using well rings

Where there is doubt about the stability of the well shaft, an alternative method of strengthening the shaft is to cast well rings, or caissons, and to build them up in a column to the surface, as shown in Figure 5. This has the advantage that the well can be easily re-deepened at the same time. The top of the well ring column should protrude 30 cm above the ground level to provide a wellhead.

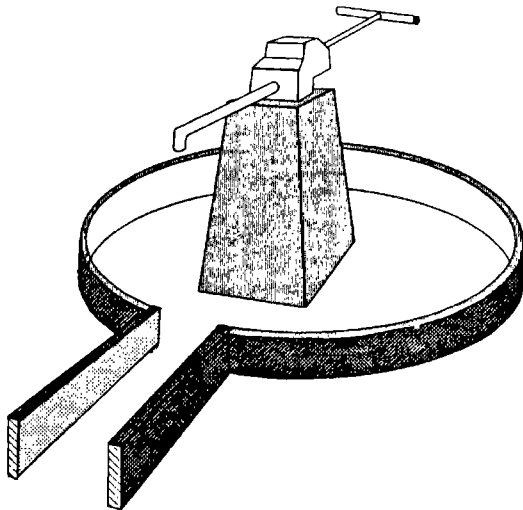


Figure 5. Improving a well using caissons

Sinking a well ring column correctly requires experience, and the casting of well rings can be expensive. Well rings made from reinforced concrete are strongest, but they can also be made using bricks, masonry or concrete blocks. These are often fitted on top of a reinforced cutting ring or shoe. Timber cutting rings and temporary timber well rings, later replaced with brick well rings, can also be used.

The gap between the well rings and the well shaft should be filled with gravel in the bottom half of the well. This will act as an extra filter for water entering the well. In the top half of the well the gap should be filled with an impermeable material, such as puddled clay. A drainage apron and cover slab should be cast to protect the well.

Cover slab

When the lining has been completed it is important to cover and protect the well from contamination. A concrete slab with a hole in the centre to draw water, either using a bucket or a handpump, should be made as described below :

- Mark out the slab on the ground with bricks so that it is big enough to cover the well lining. Line the marked area with plastic sheet or cement bags. Reinforce the cover slab with a grid made of 6-9 mm reinforcing steel rod, set about 100 mm apart, leaving a hole for the bucket or handpump to pass through (see Figure 6).

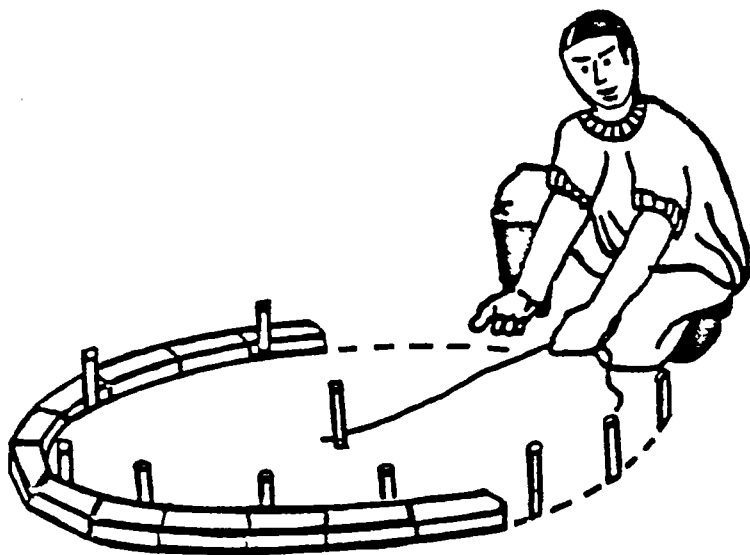


Figure 6. Marking out the well cover

- Place an old metal drum in the hole in the wire grid. Make sure that the bucket that will be used to draw water from the well fits into the drum (see Figure 7).

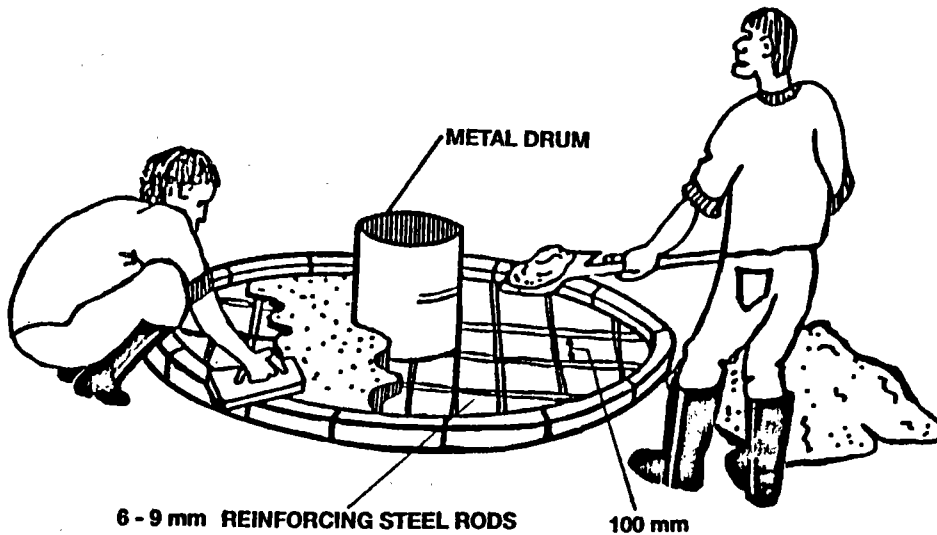


Figure 7. Making the well cover

- Make a cement mix of 1 shovelful of cement, 2 shovelfuls of sand and 3 shovelfuls of gravel, keeping the shovelfuls as equal as possible. Add just enough water to make the mixture damp, mix well and pour into the well cover mould until it is about 5 cm thick. If the mixture is too wet the strength of the concrete will be reduced.
- Remove the metal drum after about 3 hours when the cement is beginning to get hard. Then cover the slab with cement bags, cloths or grass and keep it damp for 5 days while the cement approaches full strength. Remove the cover after 5 days. The cover can then be cemented in place over the well lining.

Brick collar

It is important to build a brick collar around the hole in the centre of the cover to stop spilt water running back into the well (see Figure 8). The collar should be made smooth with cement mortar. Where a handpump is to be installed it is wiser to make the collar from concrete so that it is strong enough to support the pump during use.

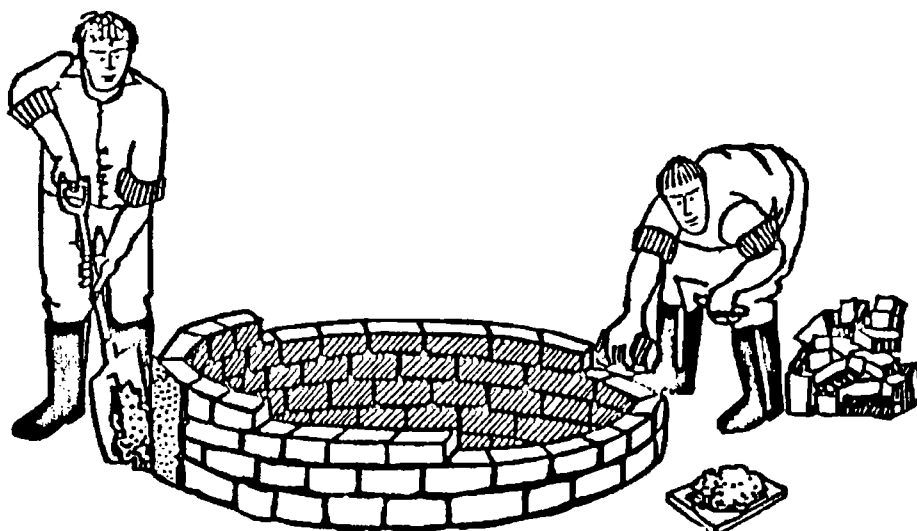


Figure 8. Making a brick collar

Lid and water lifting

A wooden or metal lid should be made for the collar, to close the well when it is not in use. A windlass with a bucket and rope can be built and used to draw water safely and hygienically from the well (see Figure 9). The water lifting device should be carefully planned in advance, so that if necessary it can be incorporated when casting the cover slab.

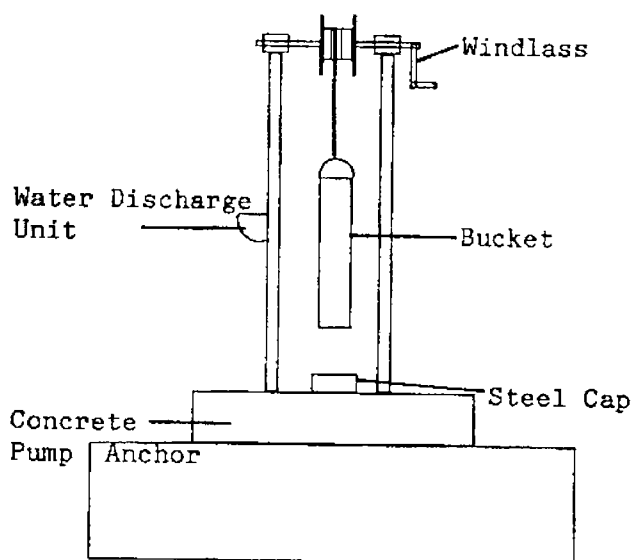


Figure 9. Lid and windlass¹

If a pump is to be installed, the base bolts of the pump should also be cast into the collar slab. Care must be taken to ensure that these are vertical and of equal height. When the pump is installed it can be tightened directly onto the collar, making sure that the base lies flush in the collar. A handpump on a dug well is shown in Figure 10.

¹ After Morgan P. *Rural water supplies and sanitation*. Macmillan Education, Hong Kong, 1990.

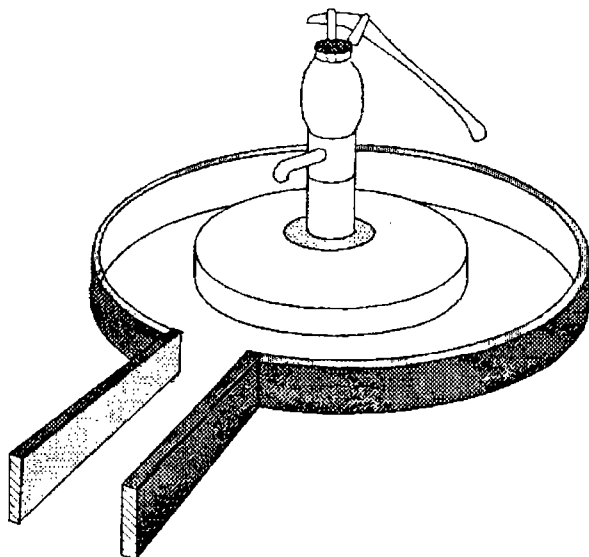


Figure 10. Handpump on a dug well

Protective fence for watering animals

If there are animals in the area, it is a good idea to build a fence to keep them away from the well. In some areas it is common for people to take their animals to the well to drink. This means that the animals leave excreta close to the well and can damage the apron or well cover. If animals are watered at the well, it is good practice to provide a trough outside the fence and several metres away from the well for animals to drink from.

Care of the well

Looking after the well to ensure that the community drink clean water will not take a lot of time, always follow these rules :

- Keep the bucket clean.
- Hang the bucket on the windlass.
- Keep the lid in place.
- Keep the apron and drainage channel clean.
- Always use the same bucket in the well.
- Keep the rope wrapped around the windlass.
- Only one person at a time should use the well.
- The fence should be kept in good repair to keep animals away.
- Washing should be done away from the well.

The well should be inspected regularly and any necessary repairs carried out immediately. This is particularly important if a handpump is fitted to the well. It is important to keep a stock of spares in the community, and for one or two people to be trained in pump repairs for each pump installed.

Disinfection of wells

Before a new or upgraded well is used, it is very important to disinfect the well thoroughly with chlorine solution (see Fact Sheet 2.25).