

Cleaning and disinfection of wells

Why is it important to clean and disinfect a well ?

When a well is sunk or upgraded, some contamination almost always gets into it. This contamination comes from the soil, from animals such as rats and mice, from water used for washing sand and gravel, and from the feet or boots of the workers who are sinking or improving the well. It is important to kill any germs which are in the installation before it is used by the community.

Germs from latrines or animal excreta may seep into the soil and get into a well even though the well is a long way away. In some cases, it is difficult to find out where the contamination is coming from, and the germs have to be killed by putting disinfectant into the well every day. If contamination is very serious and cannot be improved, provided that there is an alternative source, the well may have to be abandoned.

Making up a chlorine solution

There are various ways of disinfecting wells, but the most common is to use chlorine. The two forms of chlorine suitable for disinfecting wells are calcium hypochlorite and sodium hypochlorite. These are described in Fact Sheets 2.19 and 2.20.

Normally, a 0.2 per cent solution of chlorine should be made up using either sodium hypochlorite (liquid bleach) or calcium hypochlorite (HTH).

Safety for operators handling chlorine

The operation and maintenance of equipment for dosing of chlorine from cylinders should only be undertaken by trained and authorized personnel.

Chlorine is a hazardous substance. In solution it is highly corrosive and splashes can cause burns and damage the eyes.

When handling concentrated chlorine solutions, appropriate precautions should be taken. Ideally, gloves and protective eye glasses should be worn. In the event of splashes and especially splashes to the eyes, it is important immediately to rinse thoroughly with water.

All containers in which chlorine is stored should be labelled, identifying the contents, and with a hazard warning in a form which is readily understood locally.

Storage sites for chlorine in any form should be secure against unauthorized access and especially against children.

Sodium hypochlorite or liquid bleach

Liquid bleach is normally bought in bottles or sachets. Check that the contents are sodium hypochlorite and water only. The normal concentration of chlorine in liquid bleach is five per cent, but this may be lower if the bottle has been opened or stored for a long time (Fact Sheet 2.20 gives further details). Make up the solution as described in Box 1.

Box 1. Using sodium hypochlorite (liquid bleach) to make a chlorine solution

- Fill three plastic buckets with clean water to about 5 cm from the top to allow for the bleach to be added. Most commercially available buckets hold 12.5 litres, but the quantity of water should be checked.
- Add enough liquid bleach to each bucket to make up a 0.2 per cent solution of chlorine.

Example : Capacity of bucket, 12.5 litres water = 12500 millilitres.

Need 0.2% or 0.2 grams of chlorine per 100 millilitres of water,

therefore $\frac{12500 \text{ ml}}{100 \text{ ml}} \times 0.2 \text{ grams} = 25 \text{ grams}$ chlorine is needed per bucket.

Liquid bleach is assumed to contain 4% or 4 grams of chlorine per 100 millilitres,

therefore $\frac{25 \text{ grams}}{4 \text{ grams}} \times 100 \text{ millilitres} = 6.25 \times 100 \text{ millilitres} = 625 \text{ millilitres}$ of liquid bleach must be added to 12.5 litres of water to make a 0.2 per cent solution of chlorine.

So, 625 millilitres of liquid bleach must be added to each bucket of water.

- Mix the water and bleach well, before use.

Calcium hypochlorite or HTH

Calcium hypochlorite or high test hypochlorite (HTH or HTHC) comes as white granules and can often be bought from a local ministry of health office or from commercial warehouses and pharmacies. Calcium hypochlorite is much stronger than liquid bleach and does not lose strength so quickly. Calcium hypochlorite comes in various forms which can have from 20 to 70 per cent chlorine. Fact Sheet 2.19 covers calcium hypochlorite in more detail.

The best type of calcium hypochlorite to use is high test hypochlorite (HTH or HTHC), as this normally contains 50 to 70 per cent chlorine. Always check with the supplier or on the side of the container to be sure of the percentage chlorine content. Make the chlorine solution as described in Box 2.

Box 2. Using calcium hypochlorite to make a chlorine solution

- Fill three plastic buckets with clean water to about 5 cm from the top to allow for the calcium hypochlorite to be added. Most commercially available buckets hold 12.5 litres, but the quantity of water should be checked.
- Add enough calcium hypochlorite to each bucket to make up a 0.2 per cent solution of chlorine.

Example : Capacity of bucket, 12.5 litres water = 12500 millilitres.

Need 0.2% or 0.2 grams of chlorine per 100 millilitres of water,

therefore $\frac{12500 \text{ ml}}{100 \text{ ml}} \times 0.2 \text{ grams} = 25 \text{ grams}$ chlorine is needed per bucket.

If calcium hypochlorite contains 50% chlorine or 50 grams of chlorine per 100 grams of powder, then 25 grams (the amount of chlorine needed per bucket) is contained in

$\frac{25 \times 100 \text{ grams}}{50} = 50 \text{ grams}$ of powder.

Therefore, 50 grams calcium hypochlorite must be added to 12.5 litres of water to make a 0.2 per cent solution of chlorine. So, 50 grams of calcium hypochlorite should be added to each bucket of water.

- Mix the water and calcium hypochlorite well and leave to dissolve for an hour. Some white sediment will sink to the bottom of the bucket ; only the clear liquid should be used to disinfect the well and the sediment should be thrown away.

Disinfection of a dug well

All dug wells should be thoroughly cleaned and disinfected once they are completed and before they are used. Three buckets of 0.2 per cent chlorine solution are made up as described above. A brush on a long handle is then used to scrub the inside walls of the well with the solution (see Figure 1).

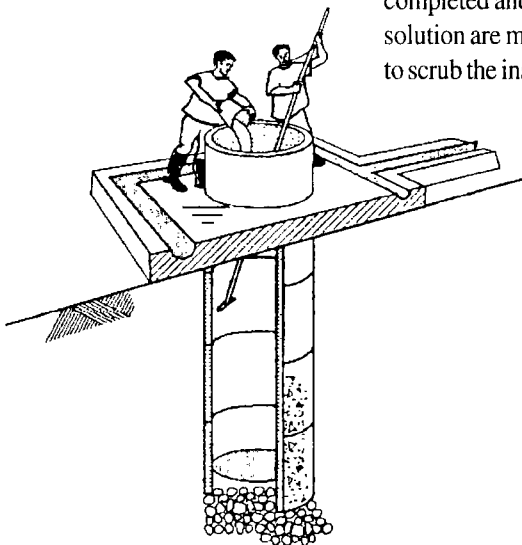


Figure 1. Disinfection of a dug well

After the walls of the well have been scrubbed, pour the remaining chlorine solution into the well. Mix up three more buckets of chlorine solution and pour them also directly into the well. If the well has a pump, then the outside of the rising main should be scrubbed and the pump operated to allow chlorine to enter the pump. The well should be left for 24 hours. A bacteriological test should be done to check that the water is safe to drink after disinfection. If the results show continued contamination, the well should be disinfected again.

After 24 hours, the well can be used as normal. If there is a pump, then pump water to waste until the smell and taste of chlorine is acceptable to the users. Where there is no pump, water should be withdrawn and thrown away until the users are satisfied with the taste and smell. If the smell and taste of chlorine is very strong and persists, then the water may be left to stand in a covered container for several hours until the taste is acceptable.

Many wells are disinfected only once, after which they continue to provide a safe water supply. In many areas, however, the aquifers are contaminated, and protecting a groundwater source no longer guarantees safe water. In these circumstances, regular or continuous disinfection will be required to produce adequate quality water. Generally, hypochlorite is the preferred disinfectant as it is safer and easy to use. The method of disinfection is likely to be either by diffusion hypochlorinator or by continuous addition of hypochlorite. These are covered in more detail in Fact Sheet 2.21.

Boreholes

The procedure for cleaning and disinfecting boreholes is very similar to that of dug wells. Make up two buckets of 0.2 per cent chlorine solution and pour these down the borehole. Operate the pump until the water pumped out starts to smell of chlorine, then leave the borehole overnight. It may be a good idea to chain and padlock the pump to stop people using it while the chlorine is working.

In the morning, operate the pump until the water no longer smells strongly of chlorine. If possible, check the level of chlorine in the water using a chlorine tester, as shown in Figure 2.

Some boreholes operated with mechanical or electrical pumps are connected to pipe distribution networks and the water is continuously disinfected using chlorine dosing from cylinders. This is covered in more detail in Fact Sheet 2.23. Where the borehole is fitted with a handpump or supplies a small community piped supply with a storage tank, then any continuous disinfection is more likely to be by the addition of hypochlorite either directly into the borehole or into the tank. The disinfection of storage tanks is covered in more detail in Fact Sheet 2.26.

Testing for bacteria

All wells and boreholes should be tested for contamination with faecal indicator bacteria every six months. If the results show contamination of the well, it should be continuously disinfected with chlorine solution. The level of chlorine in the well should be checked every morning using a pocket tester, like the one shown in Figure 2, to make sure that there is enough chlorine to kill the germs.

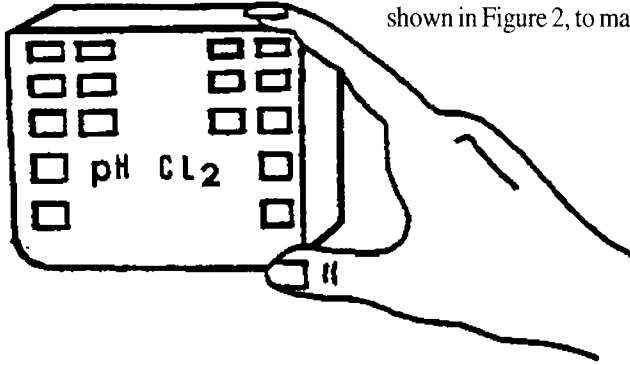


Figure 2. Pocket chlorine tester