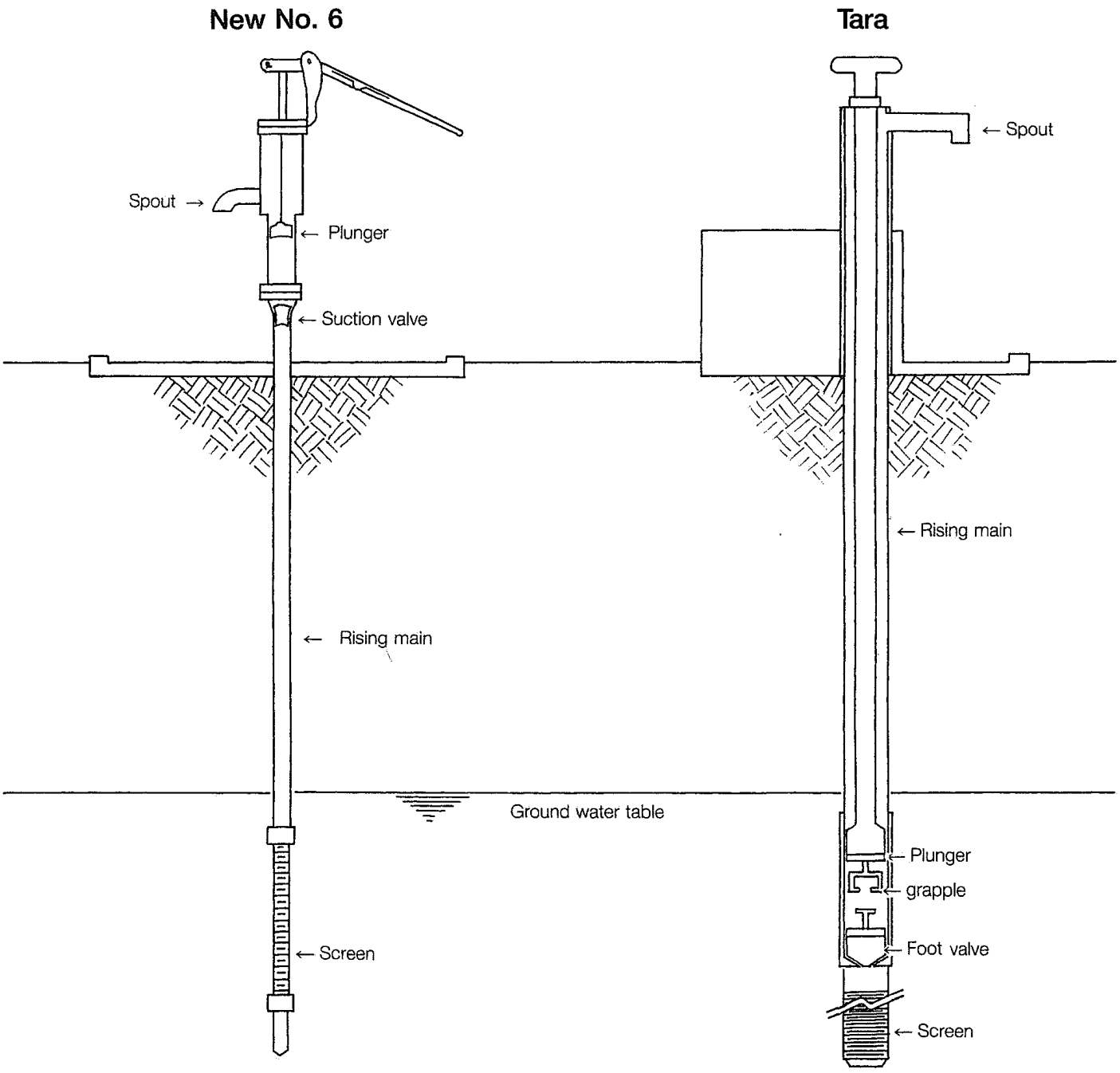
13. Handpumps

Shallow pumps



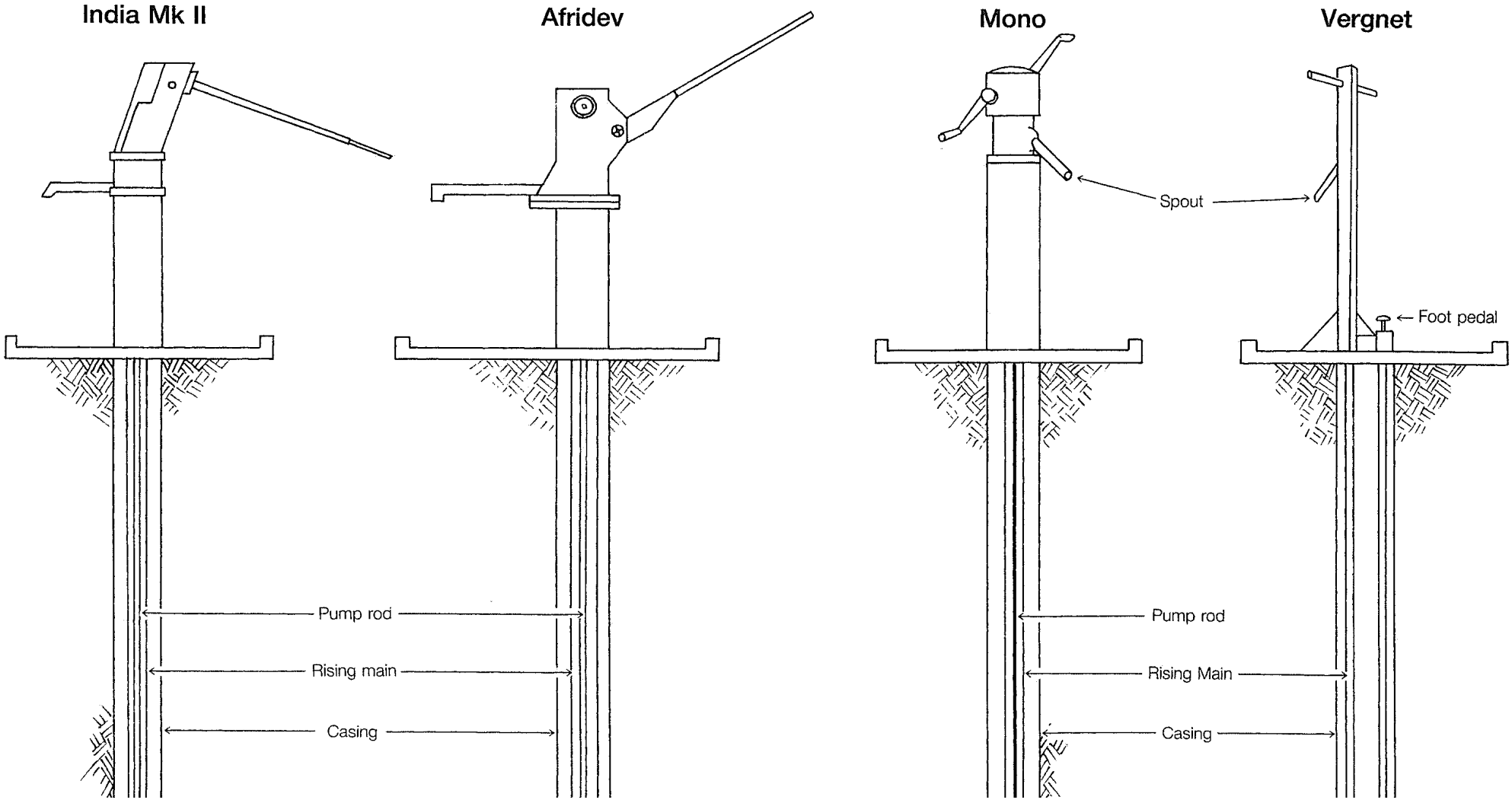
The most common form of shallow pump works by suction. The pumping mechanism is contained in the pump head above ground level. Atmospheric pressure limits maximum pumping depth to 7m at sea level (or 6m at 1,100m elevation). This form of pump requires priming to begin operation. This may mean that polluted water can be introduced into the well.

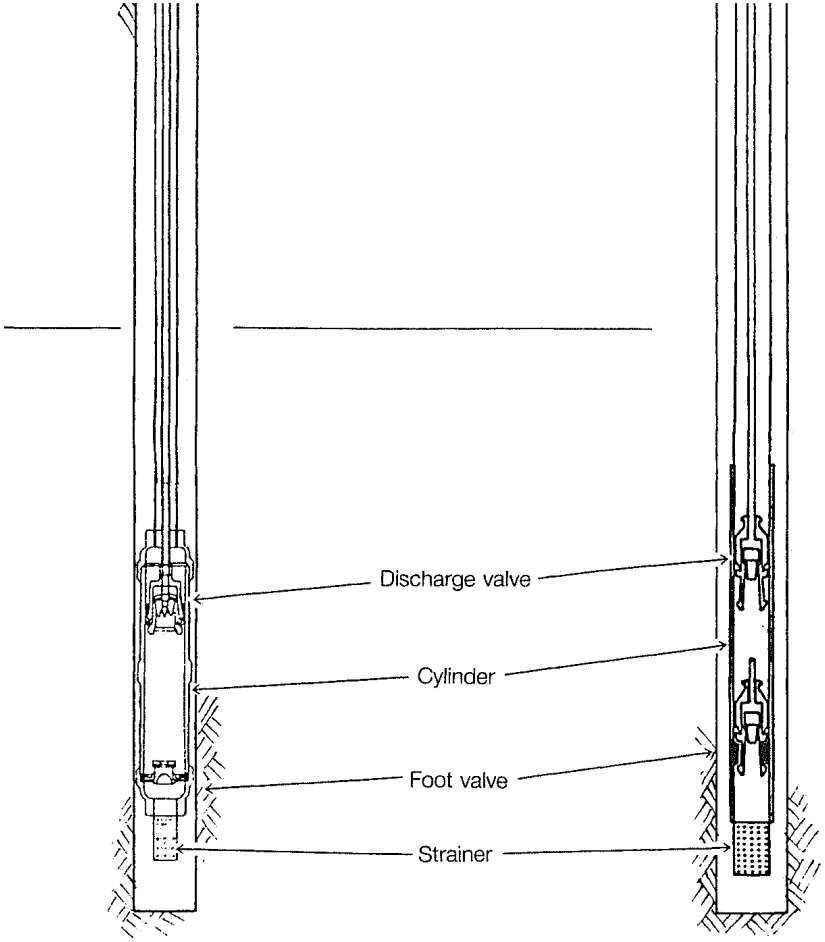
A direct action pump such as theTara does not have a lever handle and bearing. The pumping mechanism is moved to a cylinder below the level of the groundwater and when the handle is raised the plunger lifts the column of water to the surface whilst the foot valve opens to allow the cylinder to refill. The pump is not limited by atmospheric pressure, though it is most efficient at depths of up to 15m. The pump rod is a hollow sealed PVC pipe, which, by using the effect of bouyancy, distributes the force required for pumping more equally between the up and down stroke.

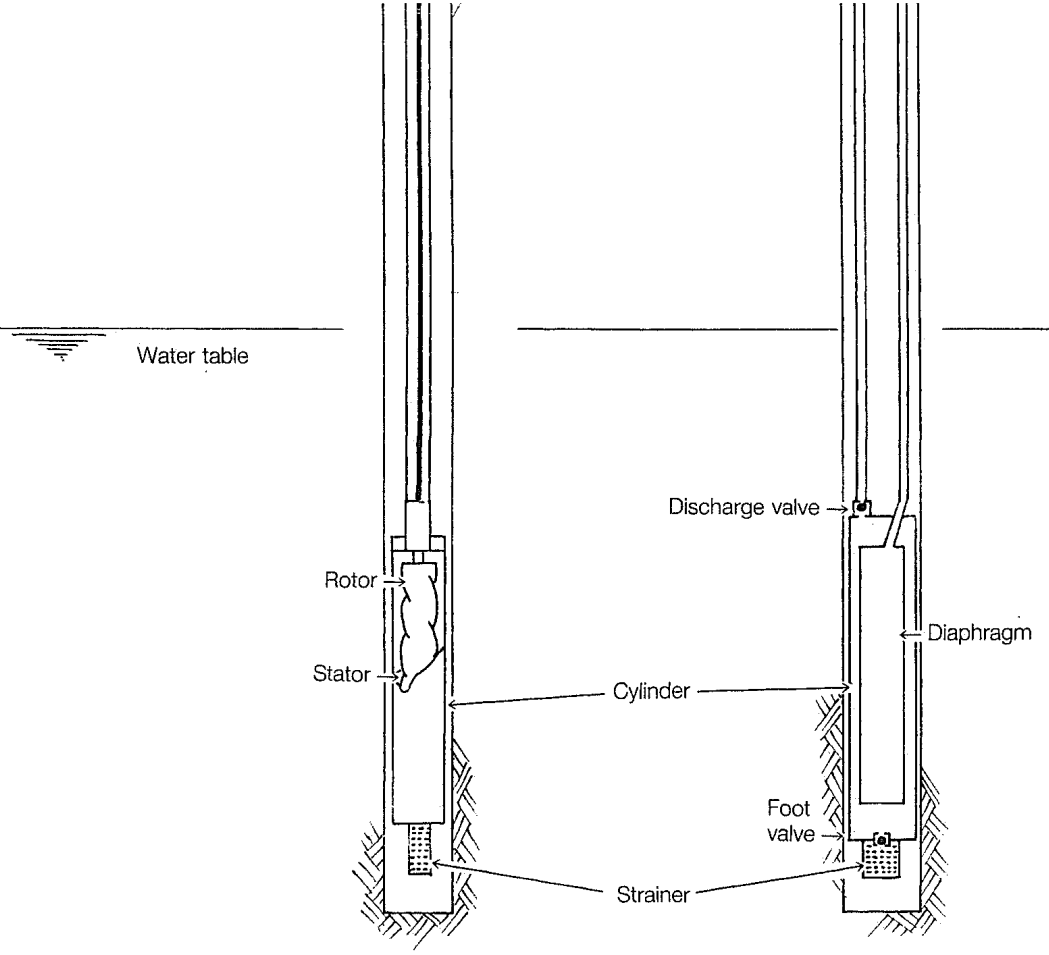
Deep Pumps

For many low-income communities, the installation of a handpump is the cheapest and most effective means of providing an improved water supply. Deep pumps, where the forces on the components are high, must be de signed for use by many different people for up to 18 hours every day.

Pumps should be maintained by local people without special tools and lifting equipment. This is known as a VLOM capability (Village Level Operation and Maintenance). There are many hundreds of different types of handpumps and manufacturers, and the few illustrated here have been chosen to show just some of the alternatives.







Positive displacement pumps

1. Lifting and lowering the pump handle of the India Mk II produces vertical displacement of the pump rod.
2. The discharge valve (plunger) attached to the lower end of the pump rod closes as it moves up, thereby lifting water and allowing the foot valve (check valve) to open and refill the cylinder.
3. The foot valve then closes as the discharge valve opens on the down stroke, moving through the water without pumping.

The Afridev works in the same way as the Mk II, but requires only a single tool for all maintenance and repair. The pump rods have a mechanical linkage rather than screwed connectors. The discharge valve and foot valve (made from identical plastic parts) can be withdrawn for maintenance without having to remove the cylinder and rising main. A similarly designed cylinder is now being developed for the Mk II.

Progressive cavity

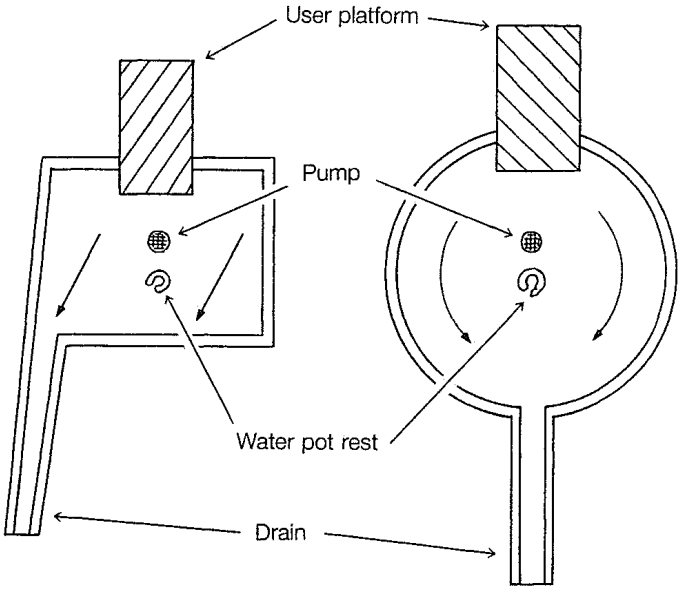
1. Turning the handles of the Mono rotates the pump rod by means of a gear box in the pump head.
2. A foot valve is not needed. A stainless steel rotor twisting within the rubber stator in the pump cylinder creates a moving 'progressive cavity' which 'screws' the water upwards. This design can easily be motorized as finance becomes available.

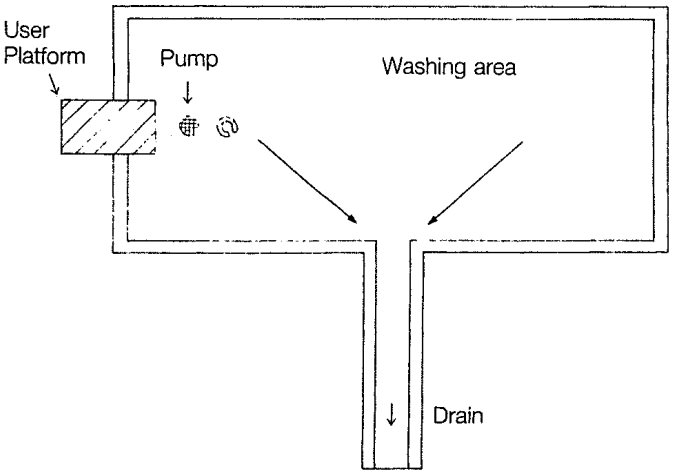
Diaphragm pump

1. Pressure on the Vergnet foot pedal forces water down the closed pipe into the diaphragm or elastic sleeve, which then expands.
2. The increasing volume of the diaphragm forces water out of the cylinder, up the rising main, and out of the spout.
3. As pressure is taken off the pedal, the diaphragm contracts and water enters the cylinder through the foot valve.

Handpumps

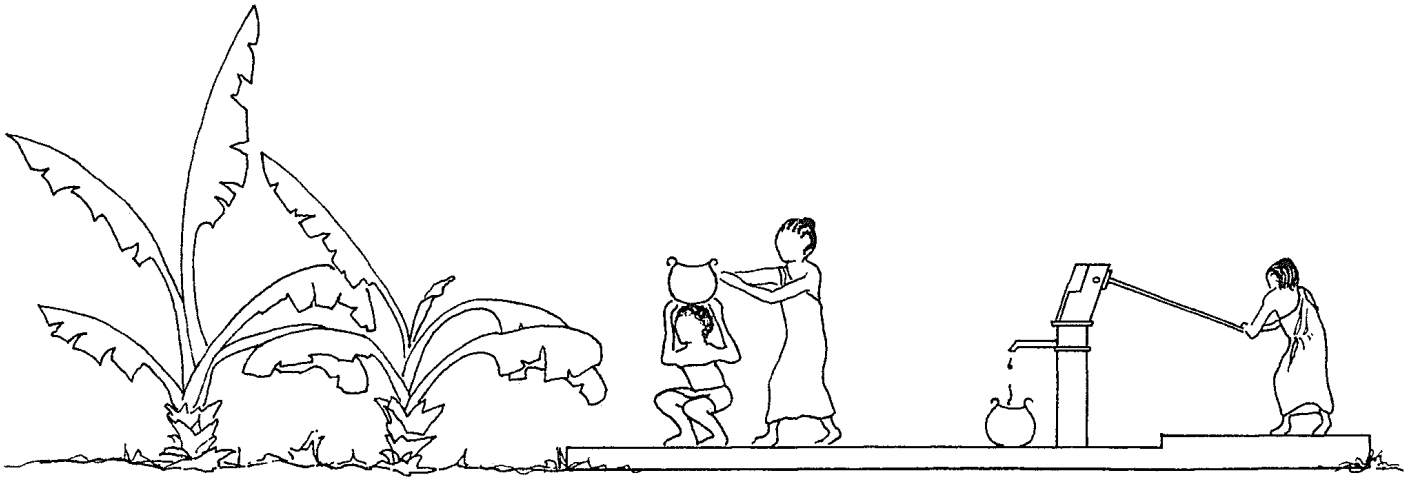
Every handpump must have a concrete surround to prevent polluted water seeping down the side of the casing and polluting the borehole water. This is also needed so that people drawing water do not have to walk through mud or stagnant water where they may pick up disease.





Platforms can be of all shapes and sizes as long as there is at least 600mm of impervious material around the spout. Concrete is normally used to make the surround. It is important not to over economize in the design of the slab – especially its thickness – as a cracked slab is worthless.

There is usually a considerable amount of waste water from a handpump. This must be disposed of into a natural drain or a soakage pit, or perhaps a kitchen garden.



For further information:

Kennedy, W.K. and Rogers, T.A., *Human and Animal-powered Water Lifting Devices,* I.T. Publications, 1985.

World Bank/Rural Water Supply Handpumps Project, *Technical Papers 6, 19, 29, and Community Water Supply — the Handpump option,* World Bank, 1986.

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