

5. Slotted bamboo tubewell screen

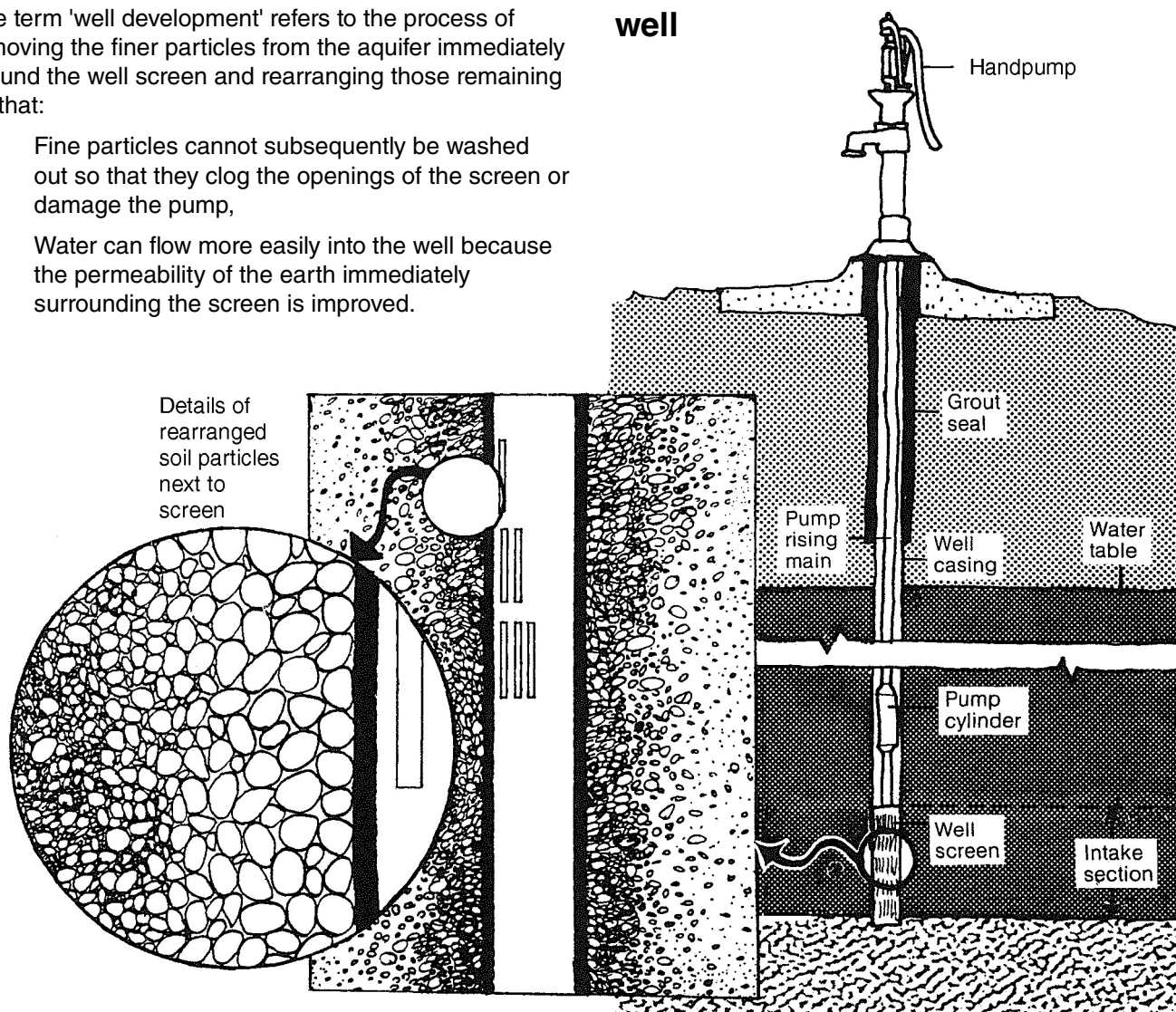
Where the ground is soft enough, tubewells can be constructed by hand with simple drilling tools. They can be much easier to install and cost much less than large diameter wells.

The storage capacity of tubewells is limited because of their small diameter. Therefore the rate at which water flows into the well from the surrounding soil is critical. This is governed mainly by the design and positioning of the well screen and how the well is developed.

The term 'well development' refers to the process of removing the finer particles from the aquifer immediately around the well screen and rearranging those remaining so that:

- Fine particles cannot subsequently be washed out so that they clog the openings of the screen or damage the pump,
- Water can flow more easily into the well because the permeability of the earth immediately surrounding the screen is improved.

Cross section of a hand-drilled well



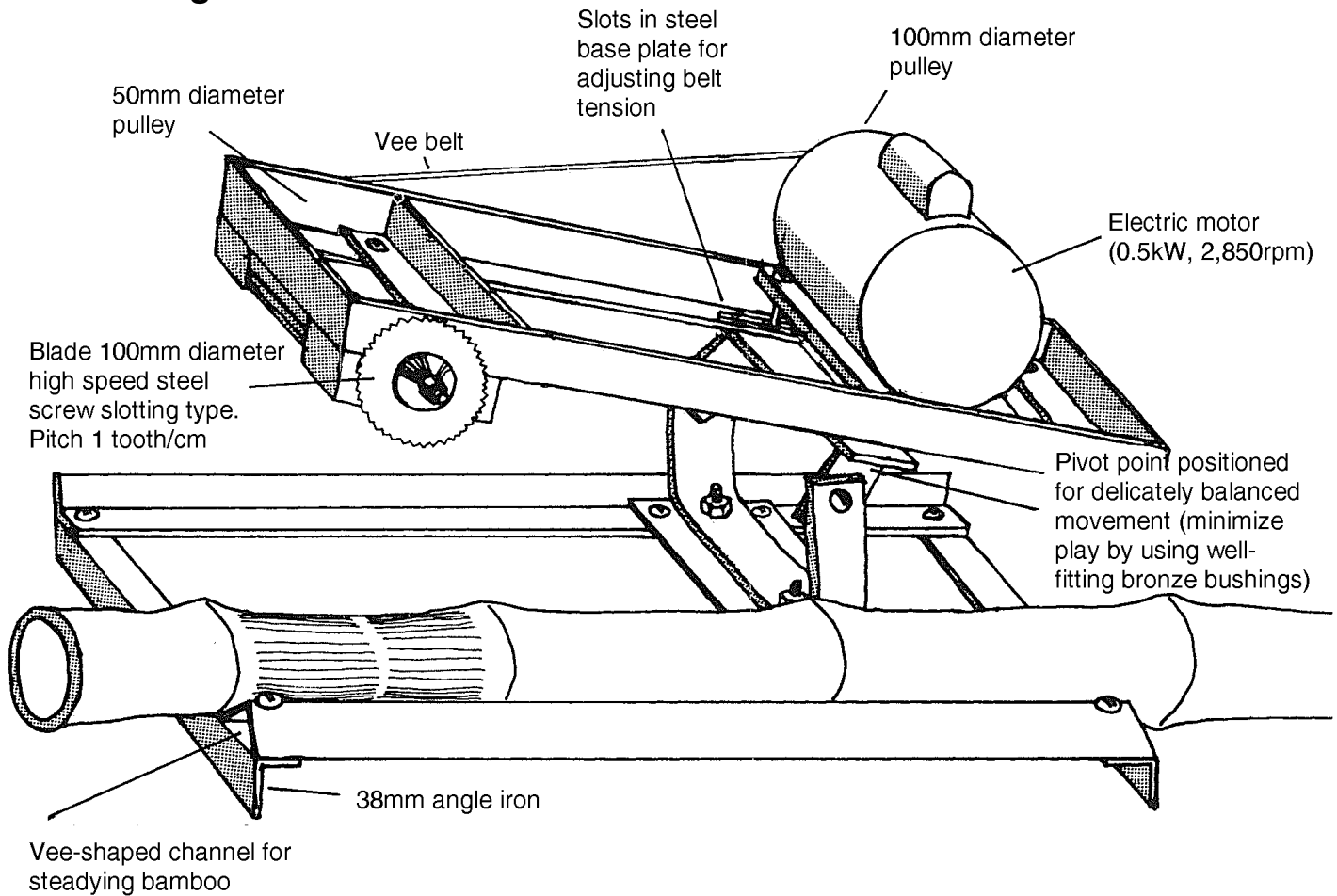
A good screen should hold back sand particles after the initial development of the well and let water flow in freely at the same time. It should be strong enough to withstand handling during installation. It should also be resistant to corrosion.

This Technical Brief concentrates on one option for constructing well screens: bamboo. In north-east India and Bangladesh, many thousands of bamboo tubewells have been installed, and some have performed satisfactorily for seven years or more. Even if they last for a shorter time, their very low cost makes replacement feasible. They are an alternative to commercially-produced well screens made from brass, steel or plastics.

The technique described here can also be used to slot pvc pipe.

Slotted bamboo tubewell screen

The slotting machine



Note: For clarity, this drawing shows the machine without safety guards on belt and blade. These are essential for safe operation.

Cutting the slots

A 0.5kW motor will drive a 100mm diameter blade through dry bamboo.

The power requirement increases dramatically if the bamboo is wet, or if multiple blades are used to cut more than one slot at a time.

It may be easier to hold the bamboo in its vee-shaped holder than to clamp it in, due to its uneven shape and size.

Slots should be a maximum of 100mm long.

If it is necessary to move the bamboo longitudinally during cutting, beware of the blade binding and making an uneven slot.

Rotate the bamboo by hand before starting the next parallel slot.

A minimum of 6mm should be left before starting the next series of slots. This will ensure that the screen is strong enough.

The slots should ideally take up more than 10 per cent of the screen area

If the slot is narrow enough, there will be no need to gravel-pack the well. Carefully-graded gravel is placed round the screen during construction of the tubewell to assist in well-development.

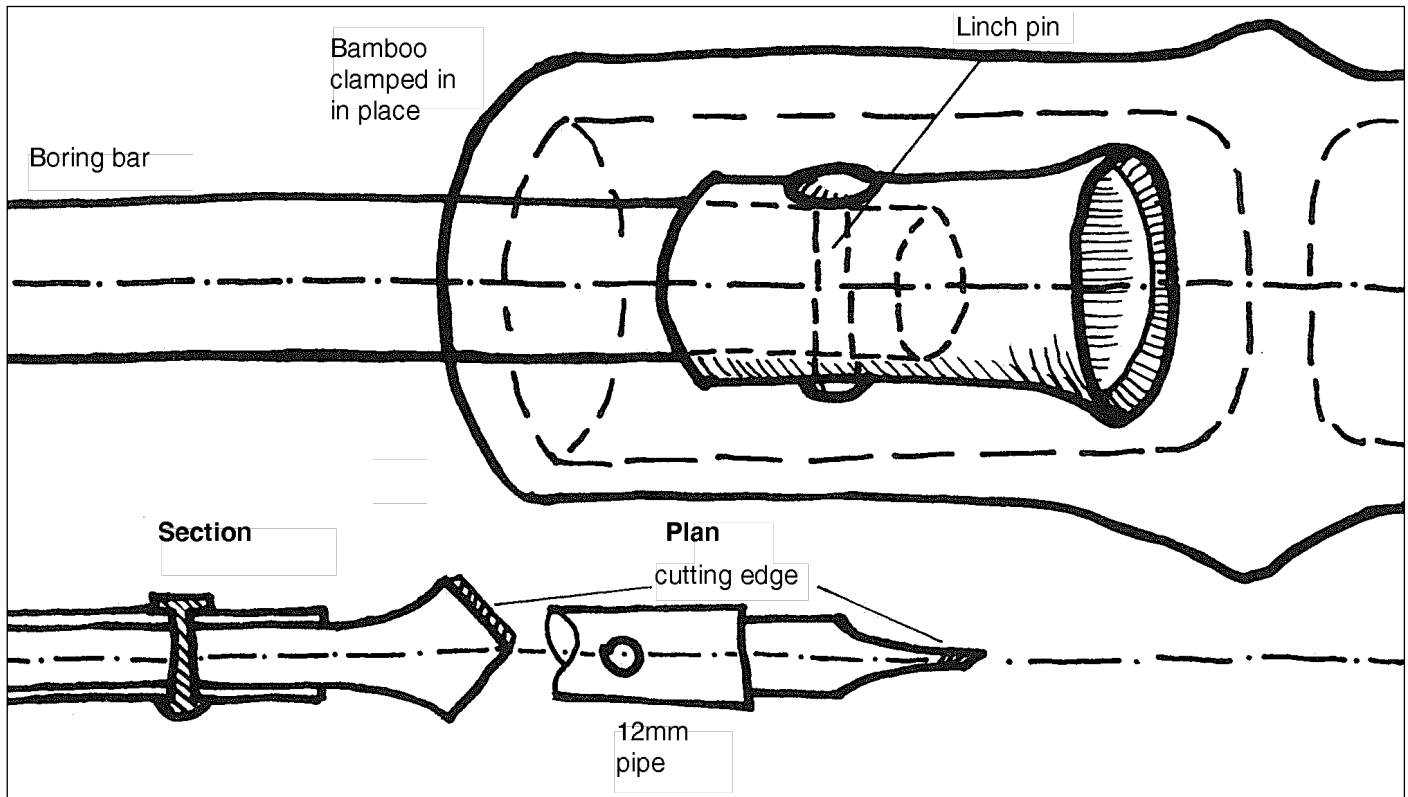
For best results, bamboo slotted when dry should be soaked in water before installing, as slots shrink by about 30 per cent on immersion in water.

Do not leave bamboo in sunlight and open air, where it will decay quickly unless it has been treated with preservative. It has a long lifespan providing it is permanently saturated, however.

Slotted bamboo tubewell screen

Removing the nodes

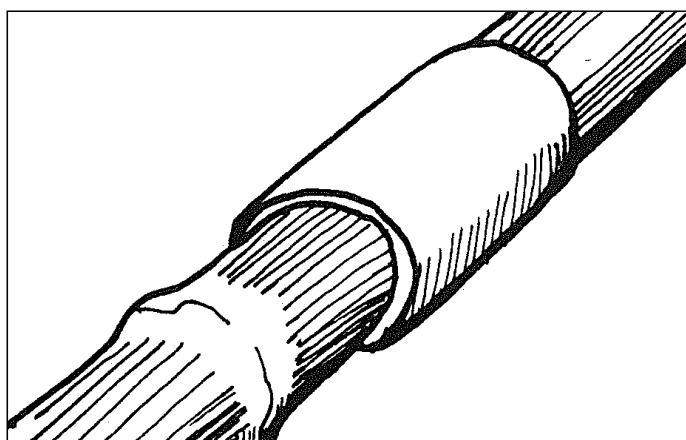
Bore the nodes of the bamboo out manually using a home-made bit attached to 12.5mm diameter galvanized iron (GI) pipe or another length of bamboo (as shown in the top diagram). The bit can be arrowhead-shaped or star-shaped, consisting of four blades.



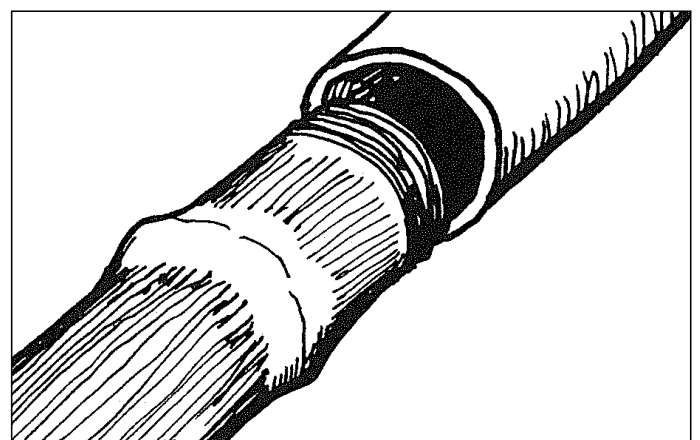
To make the bit illustrated (top), bell out the end of a short length of steel pipe to increase its diameter, and sharpen the edge. Slide the 12.5mm diameter steel pipe inside as a boring bar. Drill a small hole through the assembly and drive a nail through it as a linchpin.

Making joints

Bamboo to bamboo: use a bamboo socket caulked with cotton wool and tar, and nails.



Bamboo to GI: cut threads in the end of the bamboo filter and use a threaded GI socket.

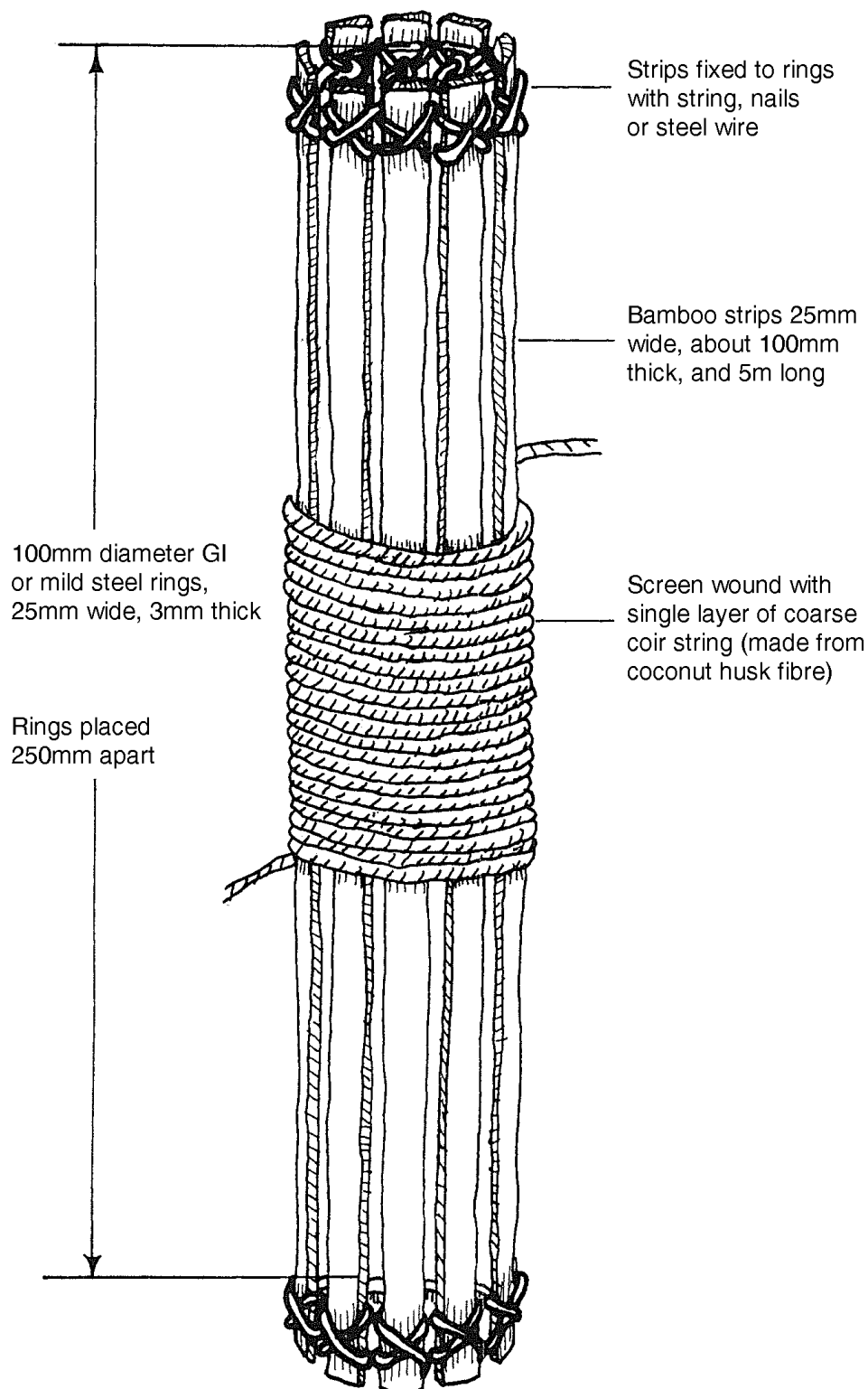


Sample installation

A 2.1m length of 75mm diameter screen with slots 100mm long and 0.9mm wide was installed in a 100mm diameter hole drilled to a depth of 12m. The rising main had a diameter of 38mm. The screen was gravel-packed with 10mm thickness of 3mm size gravel, and the well was developed by powerful pumping and back-washing. It yielded 200 litres/minute of water when connected to a 38mm centrifugal pump. The screen cost a tenth of the price of the cheapest available commercially manufactured screen.

Slotted bamboo tubewell screen

Alternative: a bamboo and coir string screen



References

1. Eaton, Bruce. 'Longitudinally slotted bamboo tubewell filters', *ADAB News*, India, August 1976.
2. *Using water resources*, Volunteers in Technical Assistance, Arlington, Virginia, USA, 1978.
3. Allison, Stephen V., Sternberg, Varon M., and Knight, Robert. 'Well casings and screens from single stalks of bamboo, and a manually operated slotter', *Appropriate Technology* Volume 5 Number 1, ITDG, London, May 1978.

Many thanks to Bruce Eaton.