Water for the World

Designing Bored or Augered Wells
Technical Note No. RWS. 2.D.4

It is important to design bored or augered wells properly to ensure a year-round supply of water and to ensure efficient use of personnel and materials. Designing involves determining how to install the casing, selecting a screen; and deciding on all necessary personnel, materials, and equipment. The products of the design process are: (1) design drawings of the method of installation and the well screen and (2) a detailed materials list. These products, along with the location map from "Selecting a Well Site," RWS.2.P.3, will be given to the construction foreman before construction begins.

This technical note describes how to design a bored well and arrive at these end-products. Read the entire technical note before beginning the design process.

Useful Definitions

AQUIFER - A water-saturated geologic zone that will yield water to springs and wells.

GROUND WATER - Water stored below the ground's surface.

Installing the Casing

Casing may be made of clay tile, concrete, metal, or plastic. The diameter of the casing determines the diameter of the well. It is usually about 100mm.

There are two basic methods for installing the casing: (1) the well shaft is dug and the casing is lowered into place; and (2) the casing is lowered as the shaft is dug. The method used depends on the soil conditions. If the soil is fairly firm and does not cave in, the first method is used. If the soil tends to cave in, the second method is used. Sometimes both methods are employed: the shaft is dug through firm soil until crumbly soil is reached, casing is lowered into place, and the remainder of the casing is installed as the rest of the shaft is dug.

When the method of installing the casing has been determined, prepare a drawing similar to Figure 1 and give it to the construction foreman.

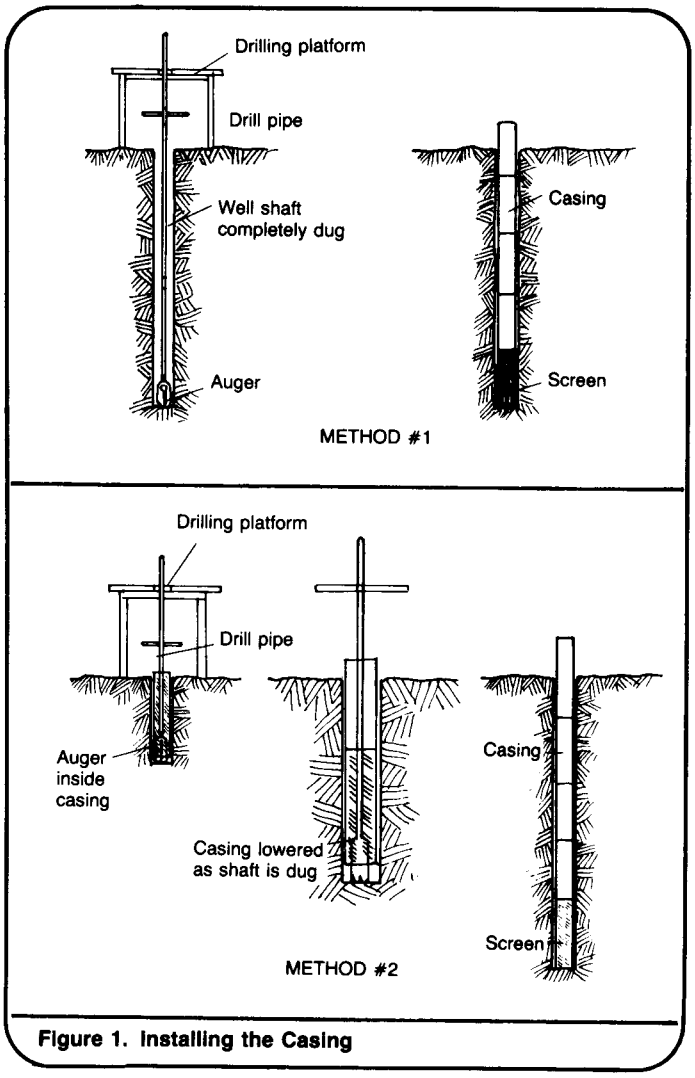

Figure 1. Installing the Casing

Selecting a Screen

The well screen may be the single most important factor affecting the efficiency of the well. Screens can be made either commercially or locally. Commercially-made screens are stronger and allow more ground water to enter, but they may be difficult to obtain. Locally made screens are more readily available, but they are not as strong or as efficient. Figure 2 shows both types of screens.

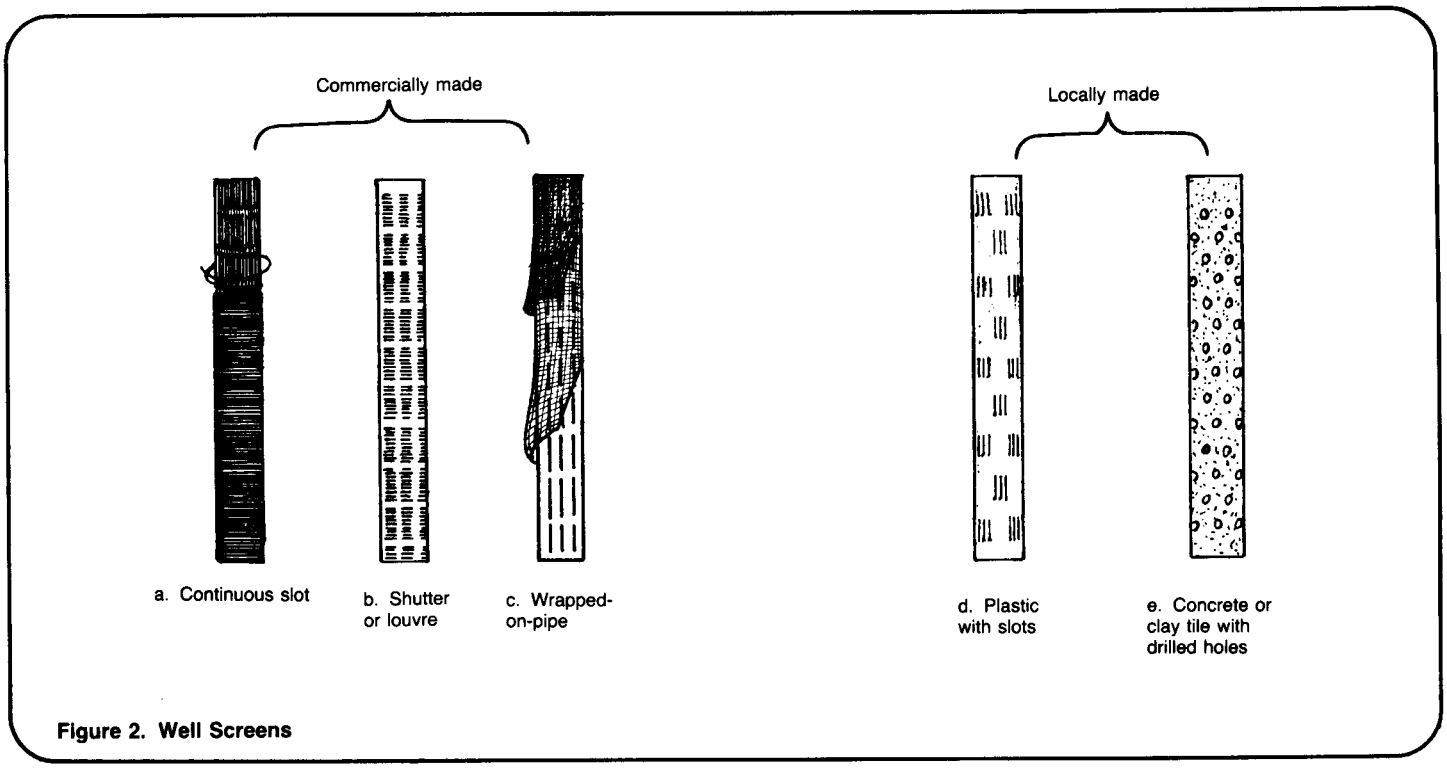

Figure 2. Well Screens

Commercial Screens. Probably the best commercial screen is the continuous-slot type, which consists of a triangular-shaped wire wrapped around an array of rods. The screen offers the largest percentage of open area for water to enter, while retaining a small slot size to screen out particles. Another advantage is that the triangular-shaped openings prevent particles from sticking in the screen and clogging it. The size of the slots can be precisely regulated and can be as small as 0.15mm.

Another commercial screen is the shutter or louver type, which is a metal tube with slots stamped out with a metal die. The disadvantages of this type when compared with a continuous-slot type are: (1) smaller precentage of open area; (2) limited number of slot sizes; (3) tendency for the screen to clog during the development process if the aquifer is composed of fine sand.

The wrapped-on-pipe screen is a perforated pipe wrapped with one or more screens. The disadvantages of this type are the same as for the shutter type screen.

Local Screens. Screens can be made from the same material used for the casing. Holes can be drilled in metal or clay tile casing or slots can be cut in plastic casing. The disadvantages of these screens when compared with commercial screens are: (1) the percentage of open area is lower, thus restricting the entry of water into the well; (2) the size of the holes or slots cannot be made small enough to screen out fine sand.

When the screen has been selected, prepare a drawing similar to Figure 2a, b, c, or d and give it to the construction foreman.

Determining Personnel, Materials and Equipment

A foreman is needed to oversee construction and two workers are necessary to rotate the auger. It may be convenient to have an additional worker to empty the auger and to assist in attaching and removing section of drill pipe. Materials needed include a well screen and casing material. Concrete mix and/or gravel will be needed to line the top 3m of the well shaft.

Equipment needed includes a drilling platform, sections of drill pipe, joints for connecting sections, and an assortment of augers suited for various soil conditions. Hand tools needed include a hammer, hacksaw, and assorted wrenches.

When all personnel, materials, and equipment have been determined, prepare a materials list similar to Table 1 and give it to the construction foreman.

Table 1. Sample Materials List for a Bored Well

Item	Description	Quantity	Estimated Cost
Personnel	Foreman	1	____
	Workers	3	____
Supplies	Plastic pipe for casing, 100mm diameter, 2.0m long	____	____
	Plastic pipe with slots for screen	____	____
	Cement mix	____	____
	Sealing material	____	____
	Plug for screen	____	____
Equipment	Wooden platfrom	____	____
	Drill pipe, 25mm diameter, 3.0m long	____	____
	Joints for drill pipe	____	____
	Auger	____	____
	Sand auger	____	____
	Handle, adjustable	____	____
	Shovel	____	____
	Hammer	____	____
	Hacksaw	____	____
	Wrenches	____	____
	Measuring tape	____	____
	Plumb bob and line	____	____

Total Estimated Cost = ____

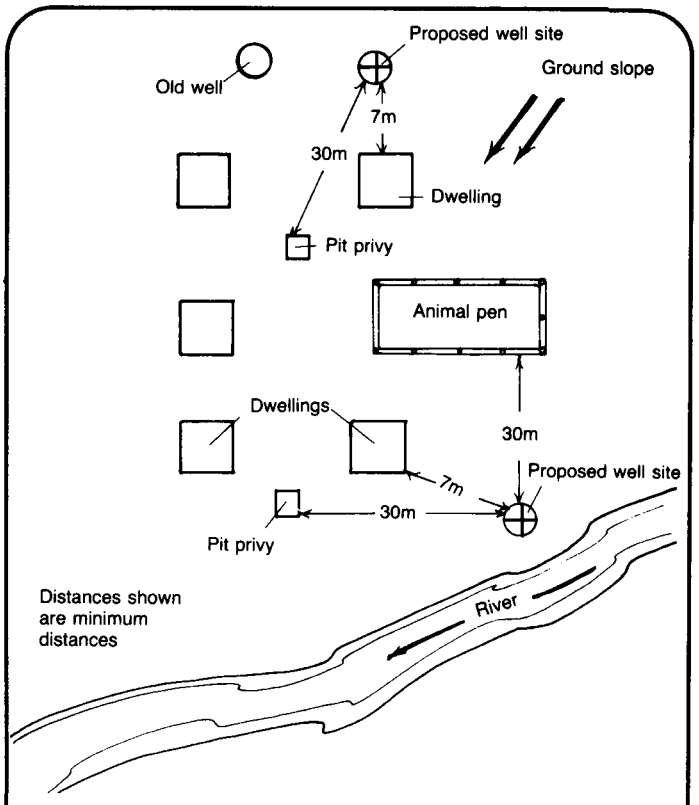

Figure 3. Location Map

To summarize, give the construction foreman a location map similar to Figure 3, described in "Selecting a Well Site," RWS.2.P.3, design drawings of the method of casing installation similar to Figure 1 and the type of screen similar to Figure 2a, b, c, d, or e, and a detailed materials list similar to Table 1.