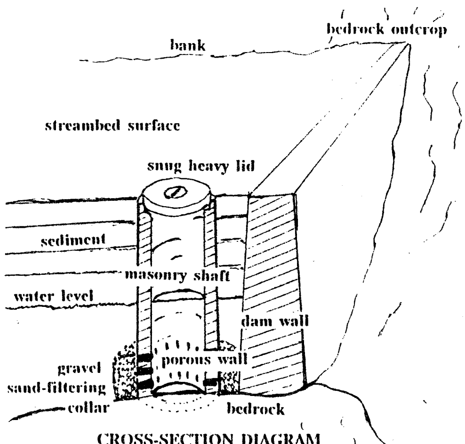
Build Sand Tanks for Dry Land Water Storage

By David Bainbridge

A small but dependable water supply is a prime necessity in the dry lands of the world. Annual rainfall is often less than 250 mm (10 inches) and the pattern and distribution over the year and from year to year may vary widely. Intense short rain storms in the summer may provide most of the precipitation for the year. Because the low humidity and the extreme heat during several months of the year make it difficult to conserve water in an open pond or reservoir the sand tank was introduced. Sand tanks are still in use today and might be used more frequently if their advantages were better known.



CROSS-SECTION DIAGRAM

A sand tank consists of an impervious dam built across a stream bed or desert sand wash, preferably where the stream bed is confined within a rock-bound channel or small canyon. The dam should be well bonded to the bedrock and channel walls to intercept all water moving down the drainage in the form of subsurface flow. The stream's rare heavy flows move large quantities of material which soon fill the impounding basin with sand and gravel. Water is stored in the voids of this material, just as it is in a natural sand-filled rock pocket or tinaja.

The water stored in the sand and gravel is kept cool and free from contamination by animals and insects, and evaporation is greatly reduced for three reasons. First, wind cannot blow across the water surface as it can with an open pond. Second, water generally moves to the surface through pores (capillary action) and the pore spaces in coarse sand and gravel are often large enough to inhibit or stop this movement. As a result little water movement to the surface occurs and evaporation is reduced. And finally, when the upper layers of the wash dry out they act as insulation and keep the moist deep sand cool, which further reduces evaporation. These are the keys to the sand tank's success. In recent small scale tests at DLRI, an experimental sand tank with a gravel layer nearly matched the performance of a tank covered with floats. Both contained more than half the original water when an open tank was fully dry. A full scale field test would probably show even greater advantages because the small size of the test units increased water losses from the sand and decreased evaporation from the open tank.

Experience has shown that it is a good idea to construct a shaft or collecting well against the upstream face of the dam rather than relying on a pipe through the dam. The lower wall sections of this shaft should be built of large loose-jointed rock or gravel with the bottom left open. This permits free percolation of water into the well and the draft pipe which can be led directly out to a pump. A small photovoltaic pump may be installed to move water out to a stock or wildlife water tank or a drip irrigation system. This shaft must be tightly capped or it will fill up with sand during floods.

There are a great many of these structures throughout southern California, Arizona, northern Mexico and parts of Africa. Many of these have been in operation for domestic and stock use for over a hundred years. The Granite Mountain Natural Reserve in the Mojave Desert has several sand tanks. Sand tanks could also be built in level ground using plastic sheets to hold water. Buried under sand and gravel these plastic liners would have a much longer life than those exposed to the ultraviolet radiation of the sun.

Further reading: Sykes, G., "Desert Water Tanks," Engineering News Record, July, 1937. Sykes, G. "Sand Tanks for Water Storage in Desert Regions," Southwest Forest and Range Experiment Station: Research Notes. No. 9, April 1937. Fukuda, H. Irrigation in the World, University of Tokyo Press, Tokyo, 1976. Cluff, C. B. and Frobal, R. K. Water Harvesting Catchment and Reservoir Construction Methods. Water Resources Research Center, University