

CONSTRUCTING QUICK AND INEXPENSIVE WATER CISTERNS FOR ZONE-ONE USE

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Managing water collection and water storage is key to developing an effective permaculture system in dryland climates. There have been several articles in the *Journal* in the last few years on storing overland flow of water via swales, berms and dams. This article explains how to build an inexpensive water cistern for placement in Zone One, to capture water off a roof. Such cisterns can play the main role in storing this water for later use in the home (Zone Zero) or in the Zone One/Zone Two landscape.

Recently, I received a grant from the Tucson Active Management Area, through the Arizona Department of Water Resources, to construct and test two types of low-cost water cisterns. The requirements of the grant were that the cisterns be made from off-the-shelf components found at home-improvement stores and be easily constructed using simple tools. Also, the cisterns needed to be inexpensive—the materials for the 550-gallon cistern described in this article cost \$63, for a unit cost of \$0.11 per gallon. (For a comparison of this to other kinds of cisterns on a per-unit cost basis, see Table 2, page 10.)

So, if we are going to build or purchase a water storage tank,

where do we put it in Zone One? As usual in permaculture, we can ask where it will receive maximum benefits from, and give maximum benefits to, other elements in the system. My 1,000-gallon cistern is placed on my back porch, where it will serve four functions: water storage, privacy barrier, vine trellis and microclimate enhancer. Another possible function would be providing a good place to paint a mural.

The instructions that follow are for a 550-gallon cistern, but the system lends itself well to larger or smaller units—so feel free to experiment.

INSTRUCTIONS FOR ASSEMBLY

Step 1

Obtain the materials listed in Table 1. Lay out your wire cutters, saw and shovel.

Step 2

Cut a length of field fencing 13' long. The actual circumference of the cistern will be 12.5'; the extra 6" is needed for overlap and tie-off.

Step 3

Make a cylindrical shape with the field fencing, overlapping the ends about 6". Tie each connection with rebar thread wire. For added security, tie each connection twice. Make sure there are no sharp ends of rebar tie wire pointing into the interior of the cistern.

Step 4

Insert a backing into the interior of the cylinder you have just made from the field fencing. This is to help contain the plastic lining, protect it from sun, and prevent it from getting punctured. In this example, 1/8" flexible chipboard is used, available in 4' x 8' sheets; however, any flexible material that would protect the inner plastic liner could be used, such as old carpet or even multiple layers of cardboard. Again, be sure no rebar tie wire is sticking into the interior of the cistern.

Step 5

Pick a place in your yard for placing the cistern. Ideally, this will be a high point near a downspout from the roof to allow you to bring water to the cistern easily and then redistribute it by gravity feed to other places in your yard. If you can't find a high point near a downspout, you can make a base the same way you made the cistern, say about 2' high and a bit larger in diameter than the cistern itself. Fill the base with sand to within 2"-4" of its top, and place the cistern on this base

Fill the cistern itself with 2" of sand to form a soft bottom for the plastic or polyethylene liner. Put the liner into the cistern, allowing at least 1' minimum to drape over the sides.

Step 6

(To calculate the dimensions of the liner, add together the height of the cistern, times two; plus the di-

TABLE 1
Materials List*

<i>Item</i>	<i>Amount Needed</i>
field fencing	13' long x 6' high (or portion of 25' or 50' roll)
rebar tie wire	one roll
1/8" chipboard (or old carpet)	4' x 8' sheets (or 13' x 8' piece)
sand	about 2-3 cubic feet
plywood top	about 1/2 of a 4' x 8' sheet
window screen	about 1' square
6-mil plastic sheet for liner	one or two 18' x 18' square piece(s)

**does not include materials for optional base*

imeter; plus at least 2' extra for overhang.) For the cistern in this example, you will need: 6' (height of cistern) + 6' (height of cistern) + 4' (diameter of cistern) + 2' (overhang) = 18'; in other words, you need a square piece of plastic or a polyethylene tarp at least 18' x 18'. Use a minimum of 6-mil thick plastic. For added strength, double the liner.

Step 7

Make a top for the cistern and put it on securely. A top is important to keep out insects and make sure children or pets don't get into the cistern. Plywood works well. Cut the piece larger than the top of the cistern. Cut a hole for the pipe or gutter inlet and staple screen over it. Cut another smaller hole for putting a siphon hose into the cistern and for checking the water level. Weight the top of the cistern down against the wind with a few bricks or cement blocks. **Important Note:** Local codes may require the cistern lid to be locked in place to ensure child safety. Check it out for your area!

Step 8

If you don't already have one, hook up a gutter system following manufacturer's instructions to get the water to a point near to the cistern, then a downspout to the screen-covered hole in the cistern's top.

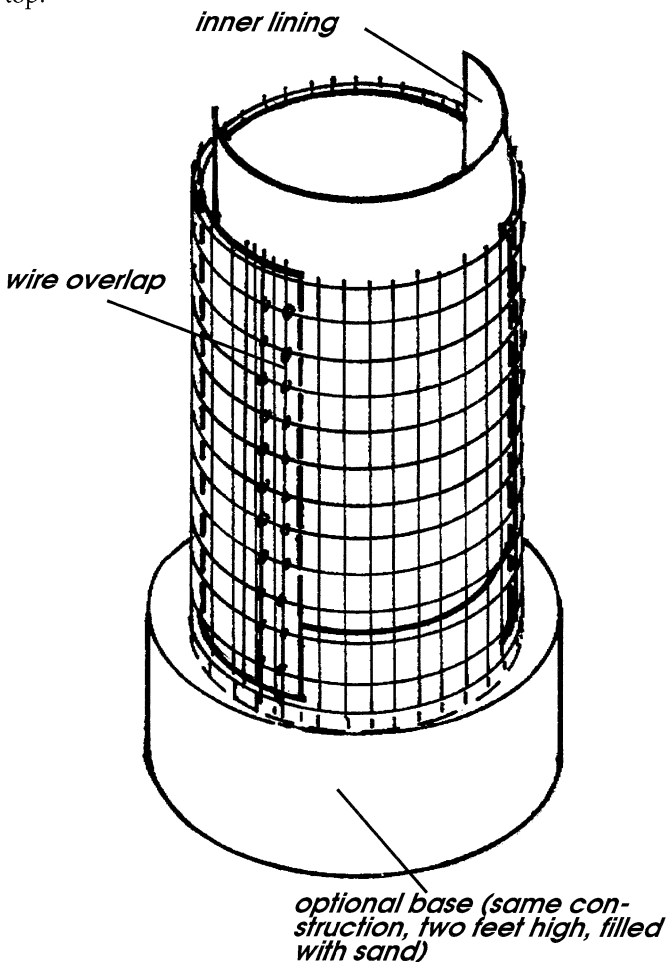


Diagram A:
STEPS ONE THROUGH FIVE

Field fencing forms a four-foot diameter cylinder, six feet high, fastened at overlap with rebar wire. Add the inner lining of chipboard, carpet, or cardboard; and lay two inches of sand in the bottom of the cylinder.

Step 9

Cover the outside of the cistern for aesthetics and to prevent anyone from getting cut on the pieces of rebar tie wire used to tie off the field fencing. Bamboo fencing works well for this.

Step 10

When water has collected in the cistern, siphon it to your landscape by putting one end of a garden hose in the cistern and the other end where you want the water to go (remember that for siphoning to work, the "delivery" end of the hose must be lower than the end that is in the cistern). An effective siphon can be started by turning on a pressurized water hose, holding it against the siphon hose so the siphon hose fills with water, and then backing off with the pressurized hose.

(See page 10 for Table 2: Costs of Storage Tanks & Cisterns.)

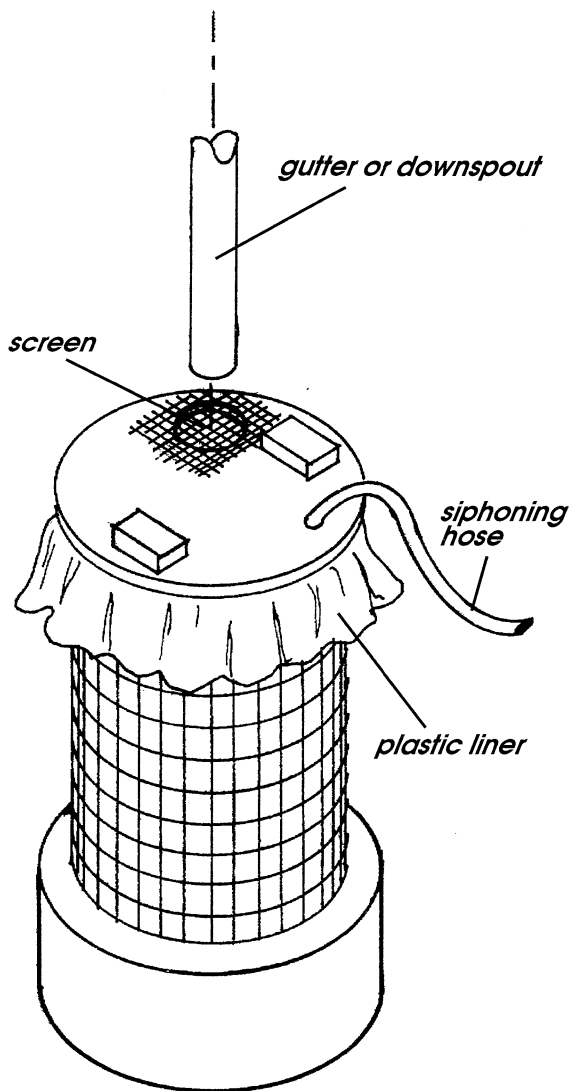


Diagram B:
STEPS SIX THROUGH NINE

Allow at least one foot overhang of plastic liner around the edge; weigh down cover with bricks or blocks; cover hole for siphon when not in use; employ garden hose for siphoning water to tree or garden.

TABLE 2
Costs of Storage Tanks & Cisterns

<i>Type</i>	<i>Gallons Stored</i>	<i>Total Cost</i>	<i>Cost/Gallon</i>
Above-ground swimming pool			
plastic-lined, Sears	5296	\$550	\$.10
	7600	\$670	\$.09
	13,524	\$1,045	\$.08
Septic tanks			
pre-cast	1000	\$310	\$.31
	1250	\$502	\$.40
	1500	\$586	\$.39
fiberglass	1000	\$680	\$.68
Stock tanks			
galvanized steel	300	\$138	\$.46
	721	\$230	\$.32
Stock tanks (round, with closed lid)			
5' diameter	1291	\$308	\$.23
6' diameter	1471	\$345	\$.23
8' diameter	3,278	\$538	\$.16
Storage tanks			
fiberglass, round	1,000	\$962	\$.96
	5,000	\$3,750	\$.75
55-gallon drums			
used	55	\$12	\$.22
new	55	\$35	\$.64
Dan Dorsey's tank	550	\$63	\$.11

