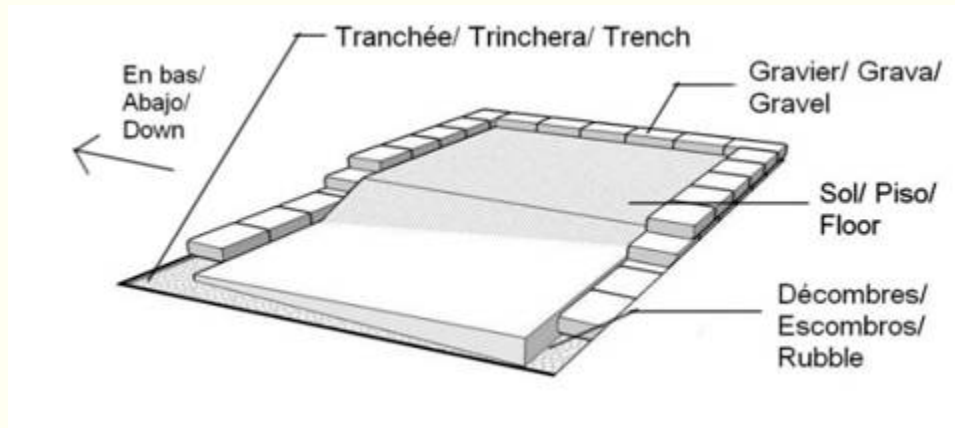


SITE WORK II: Footings, Cisterns

RUBBLE FOOTINGS FOR EARTHBAG BUILDINGS

Materials: Rubble, stone, gravel

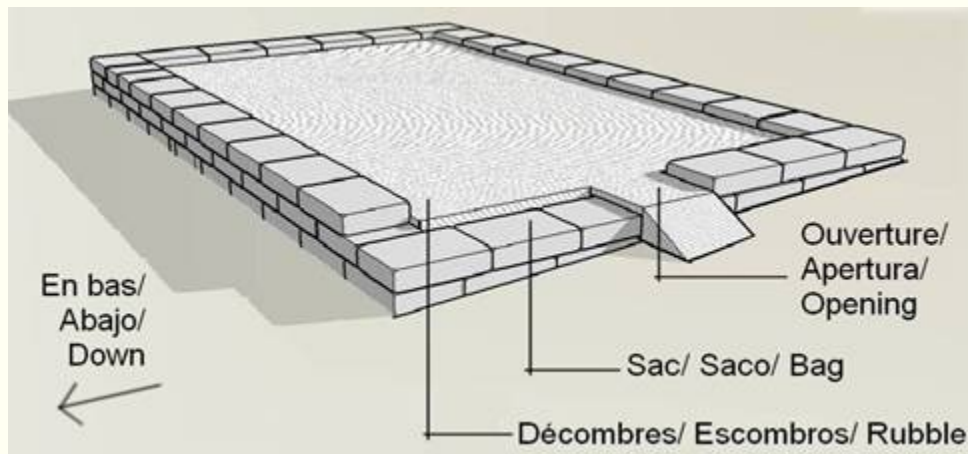


Tranchée/ Trench: The bottom of the trench must be level and at least 20 cm (8") deep on the downhill side of the building. It must be dug down to firm, undisturbed subsoil. The trench must be 45- 50 cm (18- 20") wide, as wide as the bags and the plaster layers both inside and outside.

Gravier/ Gravel: Use finely crushed rubble or gravel to fill 3 courses of doubled poly bags for a footing.

Sol/ Floor: Fill the interior of the building with rubble or clean fill and earth.

Décombres/ Rubble: Use a 12 - 15 cm thick layer of rocks and pieces of rubble mixed with gravel for the trench footing.



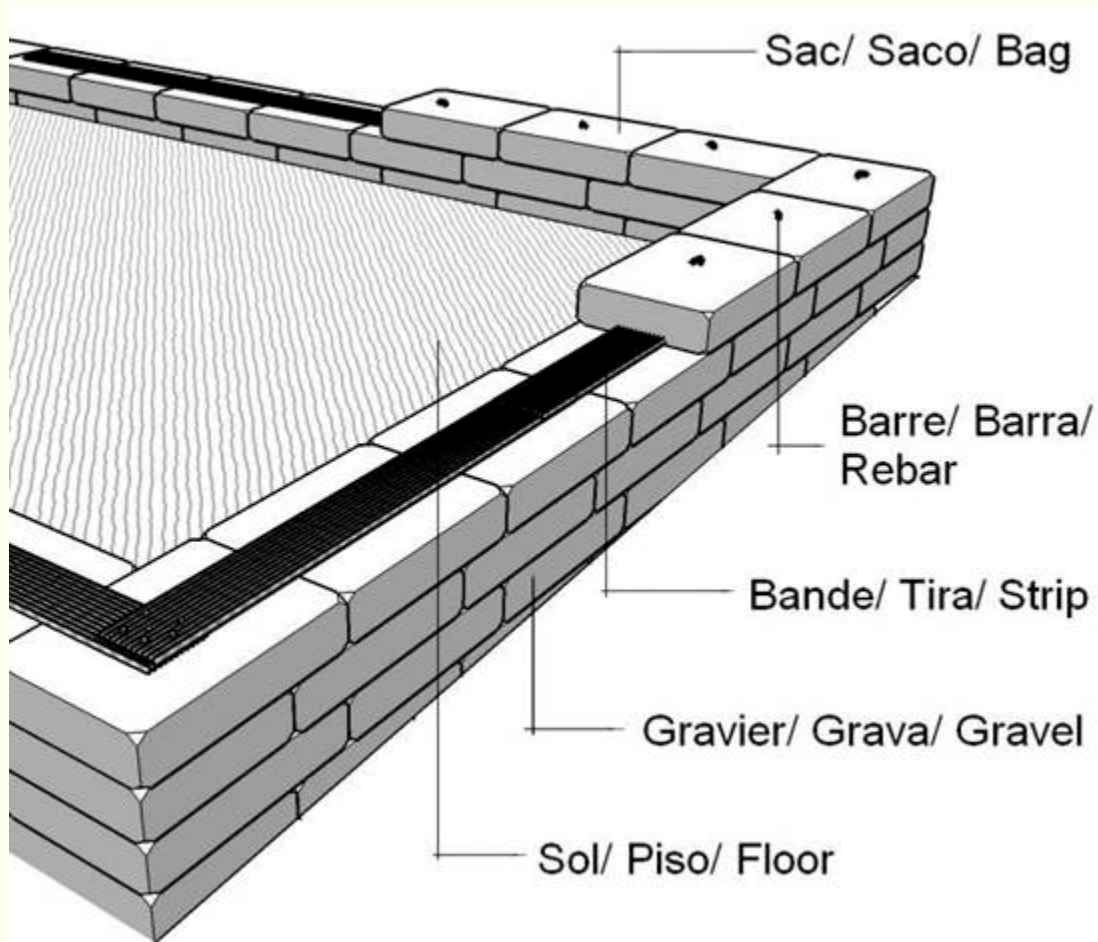
Ouverture/ Opening: Make sure that two courses of bags fit beneath the floor level at the door.

Décombres/ Rubble: Set the floor level 10 cm (4") below the top of the third course of footing bags. If a concrete floor is added later it will still be below the earthbag walls.

Note: In areas that are subject to frost, the rubble foundation should extend below the frost level.

WALL BASE REINFORCEMENTS FOR RUBBLE FOOTINGS

Materials: Tubular bag, cement, rebar, metal for fasteners.



If reinforced cement footings cannot be used in earthquake prone areas, metal can help to reinforce the wall base.

Sac/ Bag: Earth-filled bags are laid on top of the three footing courses of gravel-filled bags.

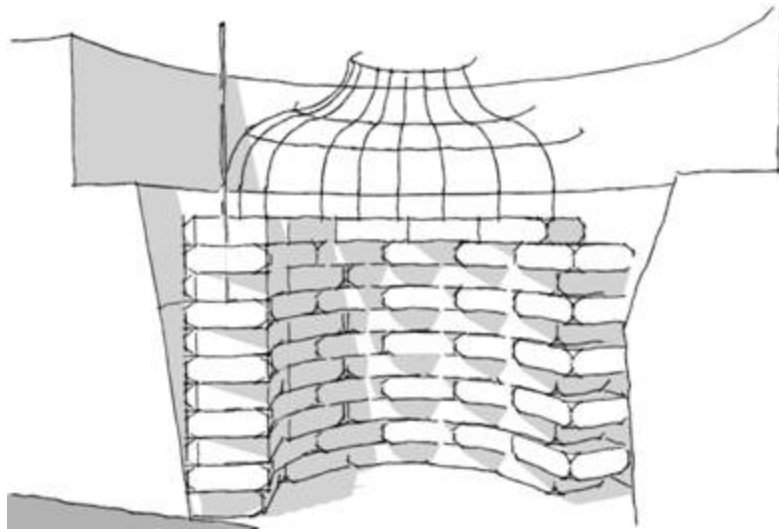
Barre/ Rebar: Hammer 35 cm (14") lengths of rebar into each bag at the second course of earth-filled bags to hold the corrugated strip below in place. Bend the tip of the rebar over.

Bande/ Strip: Place 15- 20 cm (6-8") wide strips of corrugated metal on the center of the entire first course of earth-filled bags. Overlap strips 30 cm (12") minimum at ends. Use 7.5 cm nails to pin at overlaps and at corners to the bags below.

Gravier/ Gravel: Three courses of gravel-filled bags will prevent dampness from damaging unstabilized earthbags. If soil is to be backfilled higher against the walls, use enough courses of gravel bags to keep earth-filled bags 15 cm (6") above finish grade.

BUILDING A CISTERN (1)

Materials: Bags and/ or tubes, gravel, cement, #4 (1/2") minimum rebar, galvanized metal mesh, poly or nylon fishnet, latex waterproofing, pipes, strong poly or nylon cord, and lid.



Locate any cistern 1 m (3') or more from any proposed building walls. Be careful to not disturb the soil where the building will be placed.

These designs are only intended for frost-free climates.

Left: Cross-sectional view

Bags filled with only earth are not recommended for underground use. They can be damaged by high water levels or by leaking from the cistern itself. This can cause the walls to fail.

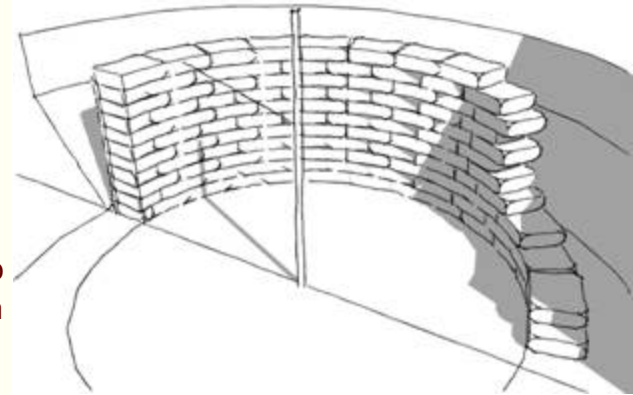
The first 3/4 meter (30") can be built with bags filled with angular gravel if it interlocks well enough to be stable. Bag and test your gravel to be sure. The upper courses must be filled with rubble or gravel mixed with a slurry of cement, or earth mixed with enough cement to fully stabilize it.

The curving top is built of ferrocement tied to a thick interior cement plaster reinforced with mesh.

Left: Use a pole compass to build round walls

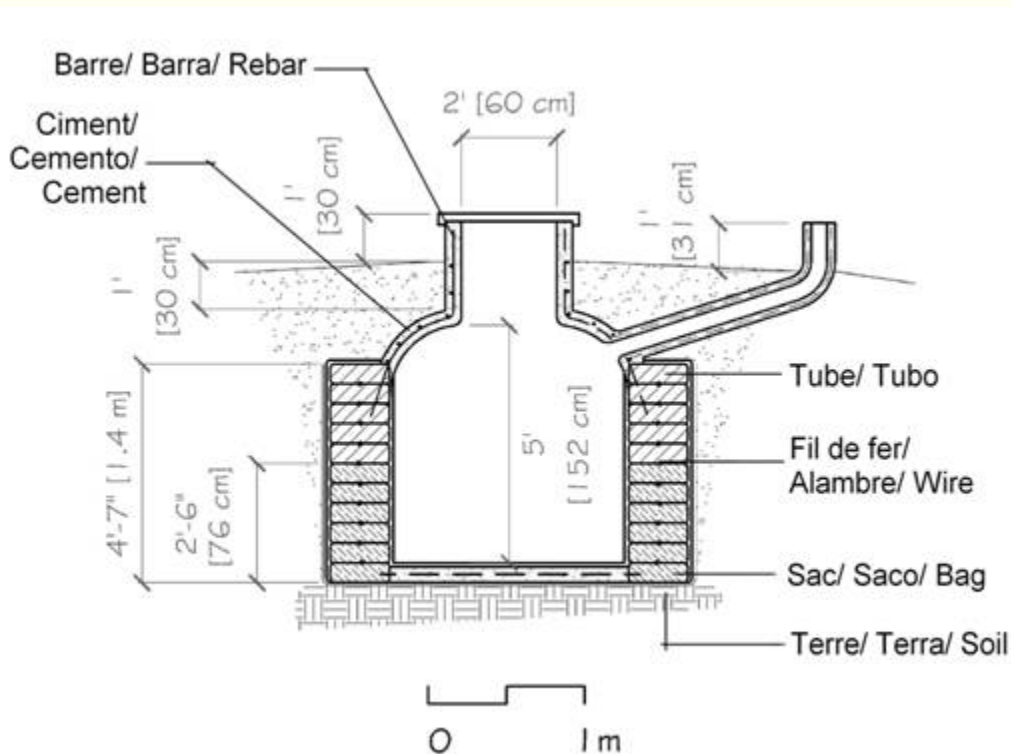
Pound a 60- 90 cm (24- 36") pipe into the ground at the center of the cistern location. Put a 1.6 m (5'-3") height round stake or smaller pipe inside.

This must be perfectly plumb. Slide a pipe clamp or clip onto the stake. This will be adjusted to the height of the bag course you are measuring. Then add a ring or a short piece of pipe above it. Tie a sturdy rope or fasten a metal arm to this moveable ring or piece of pipe.



BUILDING A CISTERN (2)

Note: Provide bracing if necessary until the cement plaster interior is completed.



Sac/ Bag: Doubled poly bags filled with gravel. Angle bag ends to center of dome to accommodate curve. Fasten interior layer of metal mesh to exterior layer of fishnet every 2 courses and 60 cm (24") horizontal.

Fil de Fer/ Wire: Use 2 rows of barbed wire between each layer.

Tube/ Tube: Tubes or bags filled with stabilized earth or with gravel or rubble in a cement slurry. Test to find the best ratio of cement and/ or lime needed for your fill material.

Terre/ Soil: Place bag walls on undisturbed subsoil.

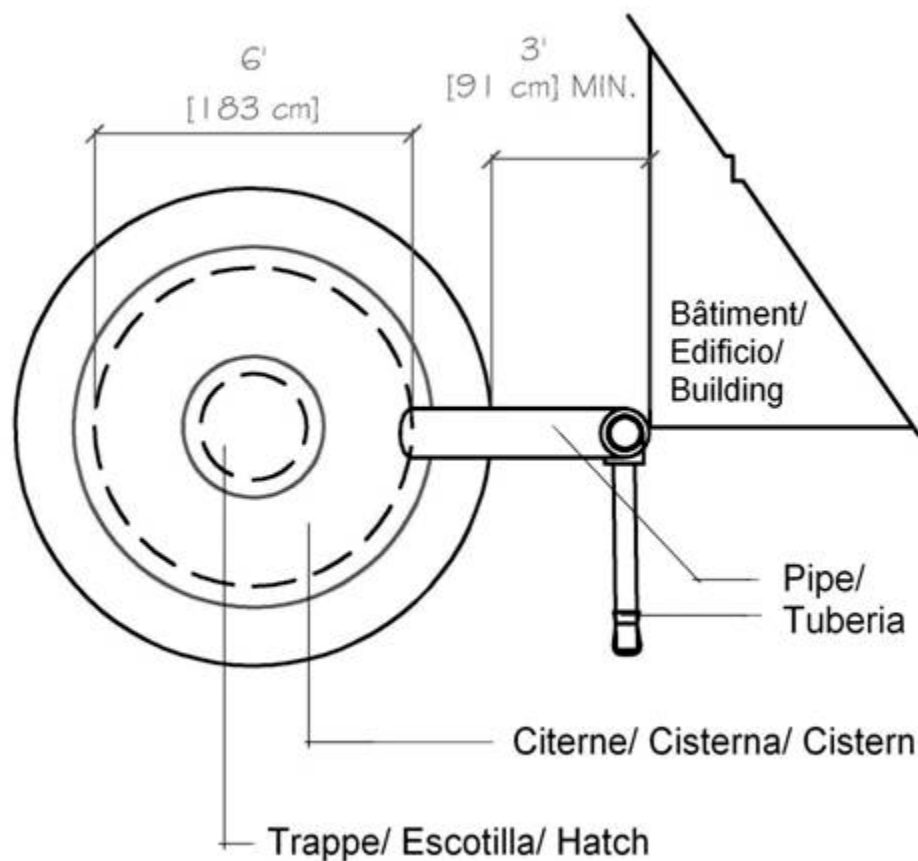
Barre/ Rebar: Hammer rebar for ferro-cement framework through upper courses of bags or tubes before cement sets.

Ciment/ Cement: Bend vertical rebar and wire horizontal rebar to it to form top. Attach mesh for top following best practices for ferro-cement. Place reinforcement of mesh or rebar for tank floor.

When ferro-cement framework is complete add a thick cement finish plaster layer inside of tank and tank top, and pour reinforced concrete floor. Complete as much as possible in one day to avoid cold joints between separate cement areas, which will be more likely to leak. A latex cement additive will also improve waterproof quality. Trowel interior cement smooth for ease of cleaning.

Add rough cement plaster to exterior.

BUILDING A CISTERN (3): PLAN FOR A ROUND 3700 LITER (1000 GALLON) CISTERN



Bâtiment/ Building: A cistern should be located at least 1m (3 feet) from an earthbag building wall.

Pipe/ Pipe: Build a ferro-cement pipe with an overflow spout, sloping up from the tank to 30 cm (12") above grade. This pipe must be larger than the gutter downspout, and be screened. Add a second pipe for a water supply line.

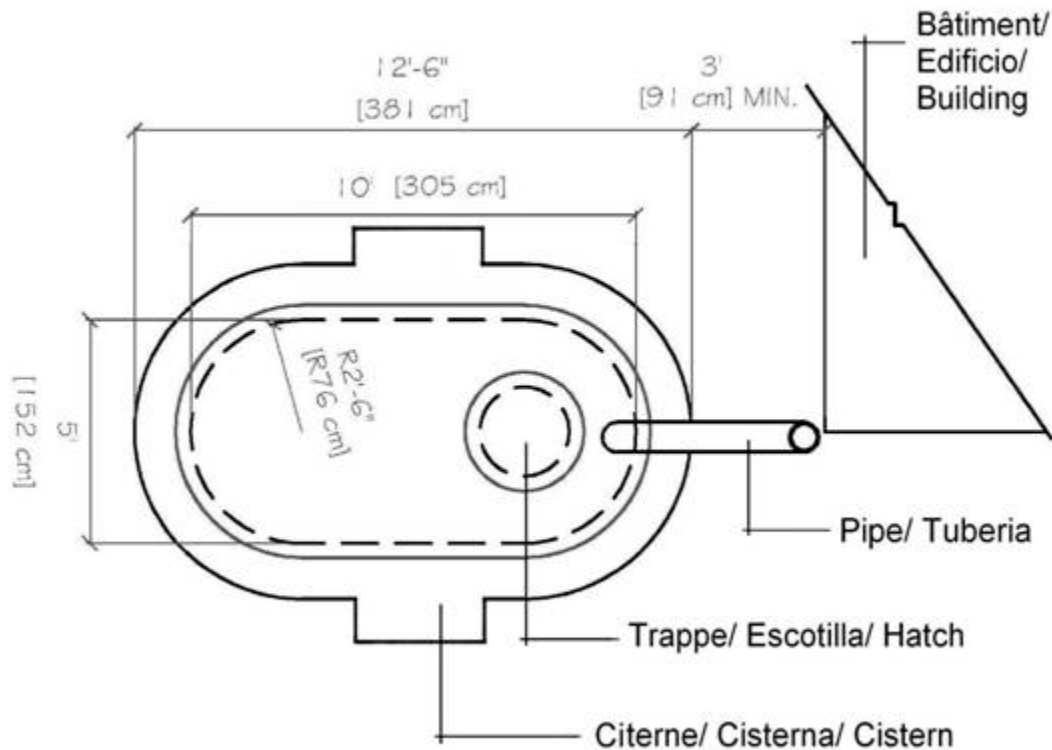
Citerne/ Cistern: The cistern walls and roof must be backfilled and covered.

Trappe/ Hatch: Provide a hatch of 2.5 cm (1") thick cast concrete or heavy metal that overhangs the scuttle beneath it. The hatch should be at least 30 cm (12") above grade to prevent contamination of the stored water.

Do not backfill until ferro-cement structure has completely cured. Use scrap cardboard or straw to protect bags from damage if backfill material contains rocks.

Note: Locate overflow spout above stone water spreader in swale.

BUILDING A CISTERN (4): PLAN FOR AN OBLONG 6000 LITER (1600 GALLON) CISTERN



Bâtiment/ Building: A cistern should be located at least 1m (3 feet) from an earthbag building wall.

Pipe/ Pipe: Build a ferro-cement pipe with an overflow spout, sloping up from the tank to 30 cm (12") above grade. This pipe must be larger than the gutter downspout, and be screened. Add a second pipe for a water supply line.

Citerne/ Cistern: The cistern walls and roof must be backfilled and covered. This oval cistern will be stronger if the straight wall section includes a pier on each side.

Trappe/ Hatch: Provide a hatch of 2.5 cm (1") thick cast concrete or heavy metal that overhangs the scuttle beneath it. The hatch should be at least 30 cm (12") above grade to prevent contamination of the stored water.

Do not backfill until ferro-cement structure has completely cured. Use scrap cardboard or straw to protect bags from damage if backfill material contains rocks.

Locate overflow spout above stone water spreader in swale.

Source: <http://www.earthbagstructures.com/details/sitework/sitework.htm>