Double rebar tied.

Tying off welded wire mesh.

Hog ring pliers and cool magnetic glove loaded with rings.

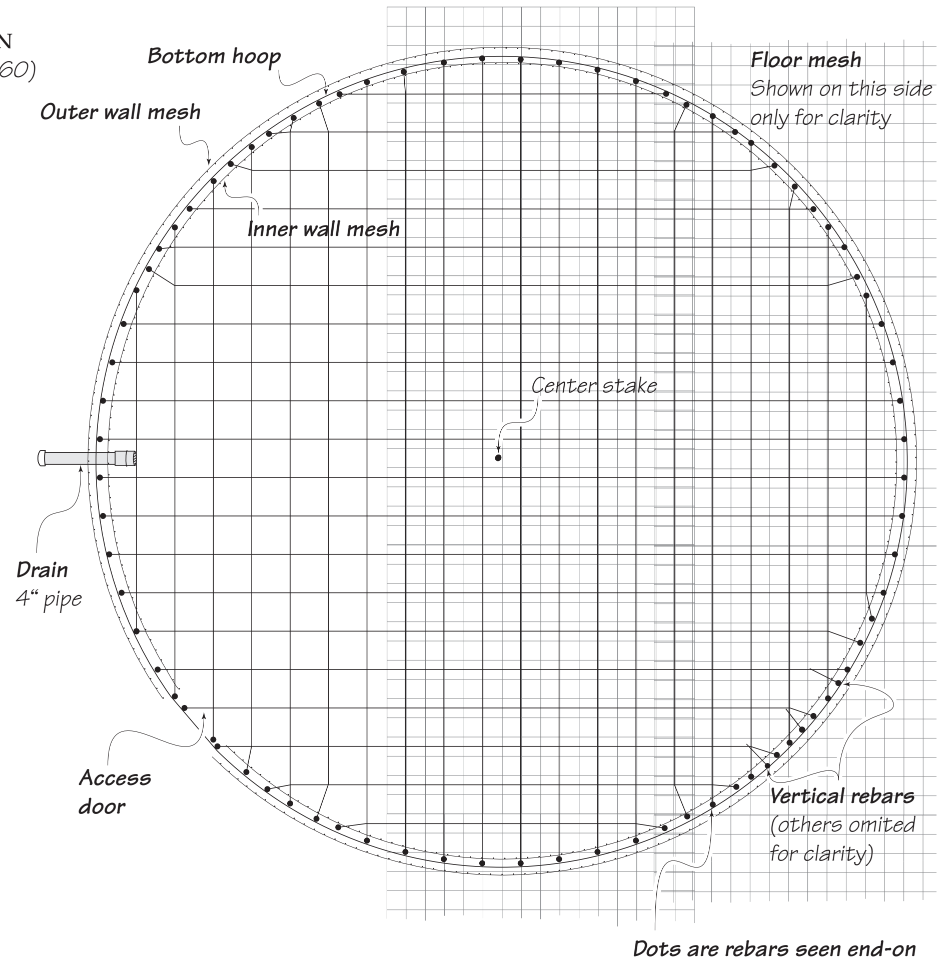
Pneumatic hog ring gun.

CO2 tank to run pneumatic hog ring pliers without a compressor.

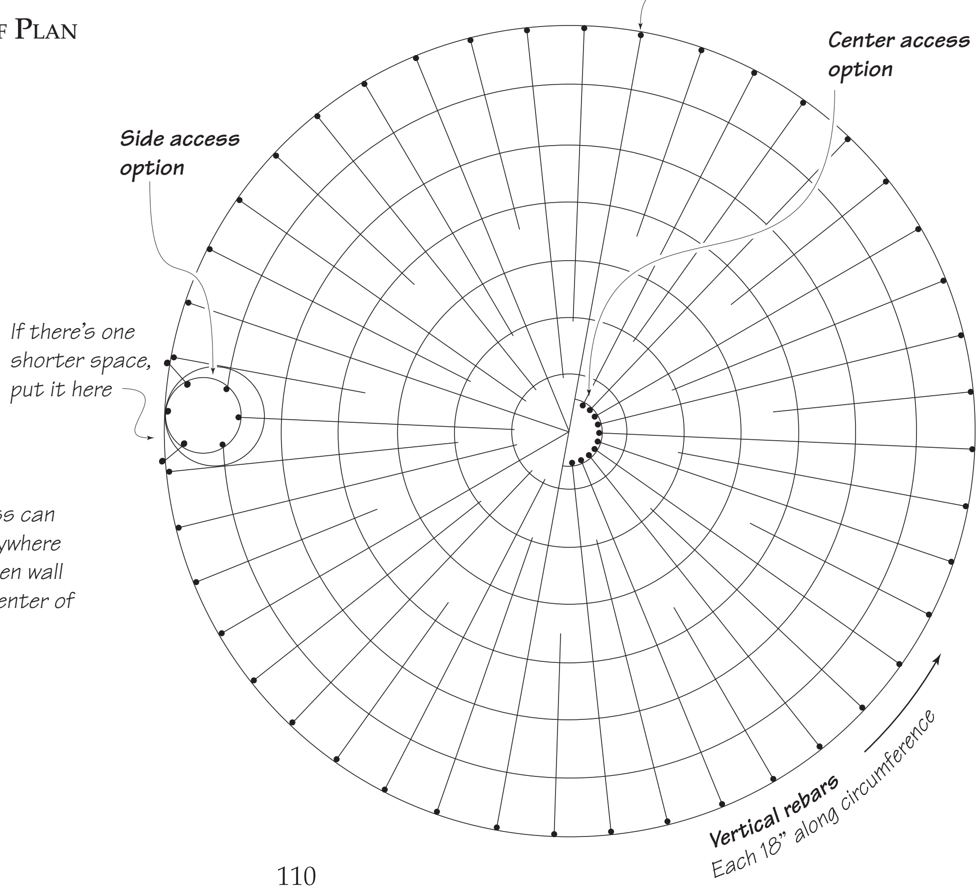
Figure 39: Heavy-Duty Ferrocement Roof and Floor Plans

Floor Plan

Scale 1"=5' (1:60)



Roof Plan



Access can go anywhere between wall and center of roof

Floor and Wall: Rebar

The floor and roof can be reinforced with rebar in a *grid* or a *radial with hoops* pattern (*Figure 39*). Because of the different ways roofs and floors are loaded, roofs are stronger with radial rebars and hoops, and floors are stronger with a grid. If the two systems cross at the floor, there will be an extra concentration of rebar ends at the floor to wall joint, where it is most sorely needed. This is the way I prefer to do it for a tank this size, but either pattern can work for either roof or floor. (Note: If you make both floor and roof radial, you can run rebars continuously from the middle of the floor to the middle of the roof, simplifying the construction of small tanks.)

For radial with hoops, bend the rebars into long-footed “L” shapes. Slide the feet of the Ls through the bottom hole in the mesh (so the feet are on top of the floor mesh and the verticals are outside the wall mesh). Now tie them in place to the wall mesh with one double rebar tie, to keep them from flopping over. The first two verticals should go on either side of the door. The rest go along vertical wires on the mesh, every two, three or four squares, depending on the size of the tank. Every 2' (four squares) has proven to be enough for tanks smaller than 20,000 gal, every 18" for up to 30,000 gal, and every foot for 40,000-100,000 gal.

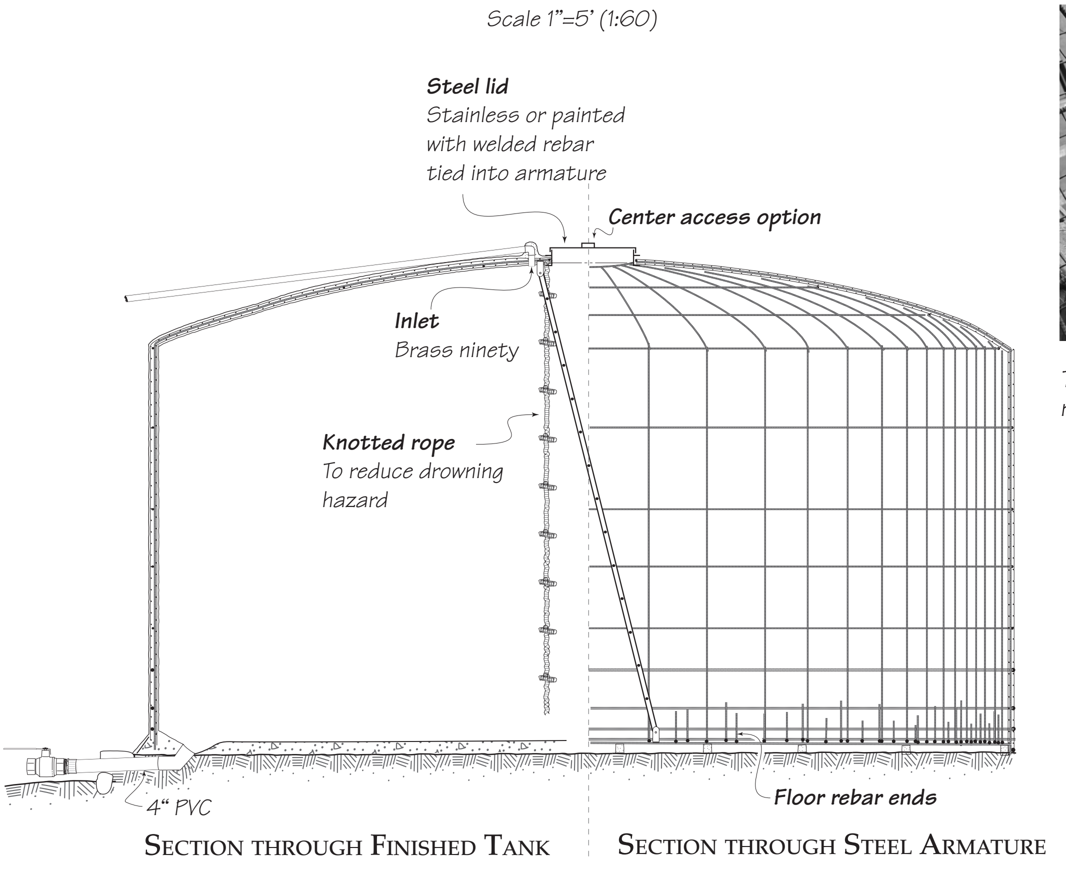
The feet of the Ls should go to a ring around the drain sump, with just a few long enough to be bent and cross under the drain sump to the ring over on the other side. The vertical pieces can just stick up however far they do.

Experimental Center Drain

For a center drain (which is what you'll have with a conical or round floor, Figure 41) you could either fill the whole trench with concrete, or backfill around the pipe with well-compacted, wetted earth or sand, which will save some concrete, at the cost of some extra diddling. If you do this, you reduce the chance of the pipe cracking, but increase the chance of the slab cracking where it spans the trench—perfect compaction is imperative. If you backfill, leave the first foot of the pipe unburied, so it will end up encased in concrete for a good seal. You can hold the pipe in position by wiring it to the rebar with wired-on 3" dobies as spacers between both the rebar and the earth below.

Tying off expanding metal lath on roof with pneumatic hog ring pliers.

FIGURE 40: HEAVY-DUTY FERROCEMENT TANK (SECTION)



Tying off welded wire mesh with hog ring pliers.

Tempting Floor Shape Innovations

Read this section only if you want to innovate...

The walls and roof get their strength from their curved shape. The floor, if it is flat, gets its strength by brute force of being thick (see Appendix B, Structural Considerations*). A flat slab floor is as inefficient structurally as the curved walls and compound curved roof are efficient and elegant. Suppose you were to make the floor conical, with a center drain, or compound curved like the dome roof. Or—the bottom of a glass bottle? In theory you could reduce the slab thickness dramatically.*

Why isn't this done? Is it simply because it is traditional to pour slabs flat on the ground, because it is much more work to dig a dome-shaped hole?

I don't know. Large, buried hemispherical tanks have been made successfully, and many swimming pools have compound curve floors.

***Conical floor:** A slightly cone-shaped slab, with concrete thickness at the low end of the traditional range promises better draining and improved strength with less material. This hasn't been done that I know of, but it is **very** close to things that have been. This shape should save considerably on concrete, add strength, and not be too hard to build. You could get this shape by pivoting a straight edge from the center along the circumference. It has the advantage over a floor sloped to one side that the walls are of uniform height. (Note that changing the floor changes the drain, too; see sidebar on page 111.)*

***Dished floor:** Or, go all the way and curve the floor like a dome roof or the bottom of a glass bottle, and make it 2-3" thick instead of 6 or 8"* (Figure 41 *).*

I've used these floors with great success in un-reinforced stucco (sand: cement) jar tanks of 160 gallons (600 L). We slope the whole bottom so that the gutter around the perimeter flows towards the drain. We also have the outlet at the high point of the island in the middle, where it is least likely to suck crud.

Domed floor in jar tank.

This should scale up fine to a large tank. Doubtless it would be more work than a flat floor, but much more economical of material and possibly less likely to leak.

I suggest you add a second layer of welded wire mesh and possibly some wire fencing with 2" squares if you do this, so it has some fine-scale reinforcing like the walls. You'll need an accurate, smooth, well-compacted excavation for a floor so thin.

This shape could be achieved by rotating a curved guide around a tilted pole in the center.

Warning: This drawings is the best composite of several designs and has not been proven in construction. If you try an innovative floor shape, please take good photos and let us know how it works out.

FIGURE 41: POSSIBLE FERROCEMENT DESIGN INNOVATIONS