

# EARTH TUBES



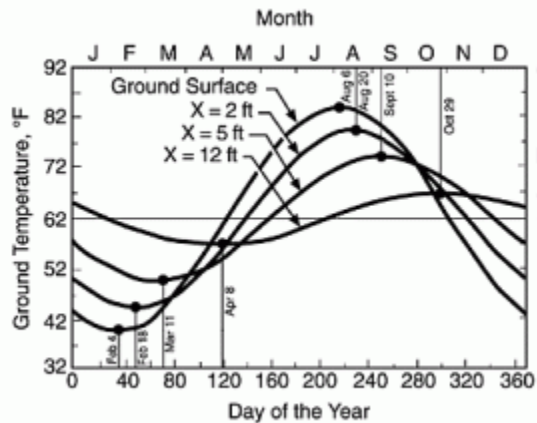
As the foundation perimeter gets finalized, and the rebar from the perimeter footings to the slab is placed, the “earth tubes” get installed.

The house is designed to have as much passive thermal management as possible. The massive slab you see about to be poured will be a heat sink that will minimize the temperature swings inside the house (more about that later). The main air inlets will be through earth tubes.



The earth tube plenum above, and tubes passing around the perimeter to be buried in the foundation footing

In the heat of the summer, when we come home, rather than turning on air conditioning (we won't have any), we will instead turn on a "whole house" fan. These fans are designed to pull the heated air in the house out through the roof and draw (hopefully cooler) outside air in. In a leaky house with poor insulation, this air generally comes in from cracks and gaps all over, but in a very well insulated ("tight") house, you need to provide an air inlet for the fan to draw air in, or you will just suck a vacuum on your house, and not move any air. To provide air, we have an air inlet plenum in the center of the house fed by earth tubes. The earth tubes are long, large diameter tubes which run all around the foundation from air inlets on the (cooler) shaded North side of the house to the central plenum. In the San Francisco Bay area the average ground temperature is around 60F. You can see from this pinched-from-the-web graph (thank you UVM), soil temperatures swing only by about 15 degrees F a couple of feet down.



By drawing your inlet air through the ground in the summer, you can cool it down to between 60 to 75 degrees (if your tubes are long enough). Of course, once the outside temperature drops to below the inside temperature, you can open up the windows and doors, and let the breeze blow through as it does on most summer nights in Mountain View, and let the whole slab cool down. Because municipal water runs deeper in the ground, it comes into a house at average ground temperature with even less variation around the mean – a fact we will be exploiting for keeping the "wine cellar" cool year round without any active cooling (also more on that later).



As you can see, Natalie is impatient to move in. We've assured her she will still be six years old when we move into the house (she turns six next week!)

So what about when it is cold outside? If used in the winter for ventilation, a whole house fan would dump lots of warmed air outside and would make all that insulation a wasted investment. Instead, we will be using a heat recovery ventilation unit to scavenge heat back out of the air during ventilation of the house (more on that later too!), so most of the air movement will not be through the earth tubes in the winter. The main exception to this will be when using the kitchen stove. As the kitchen range top hood has no heat recovery unit on it, using the vent above the cooktop during the winter, when the doors and windows are shut tight, will end up drawing air in through the earth tubes. In the winter, however, this air will be warmed up by its passage through the earth, and therefore will put less of a heating burden on the house than just drawing it in through leaky cracks in the insulation would do.

Source :<http://www.301monroe.com/?p=462>