WORK LEADING UP TO THE ARCHITECTURAL COOL CELL

October 2002

We first thought to both heat and cool buildings using the same collector on south facing walls. Years ago Shawn Buckley experimented with passive heaters where collector and inside tank were at the same level, he used a layer of oil on top of water to make a very sensitive fluidic check valve. Buckley advised us that it would be easier to use floating plastic check valves. We had made these years earlier and then benefited from the ingenious discovery of Michael Zeiler that a valve seat as good or better than one made by a lathe can be formed by simply hammering a ball bearing of the same size as the float ball into the open end of a copper pipe.

Joe Minella named these valves boogie valves because the plastic balls could be seen through the clear pipe to Boogie when open. The valves can be tuned to great sensitivity by pushing copper wire weights into pre drilled holes.

Aaron Shiver did the set up and experiments on these Di thermal walls using a stack of reject 6 string Cool Cell™ lids that George Sousea welded and which were rejected for some reason. (We never found any of them to leak.) They were 18 square feet and very heavy. Aaron was going to UNM studying Mechanical engineering. I hired him over several other candidates when I found he worked part time in a tire shop fixing tires. He was able to wrestle these enormous heavy 6 string lids wherever they needed to go.

See figure 1, side view of tank, plenum, valve and connecting hoses.

This scheme worked both for heating and cooling. The valves all leaked but, very slowly and not enough to effect the performance. One time, inexplicably, a check valve did not seat properly and lost all the heat that it had gained in the day during the night. See figures 2 and 3. This very rare event made me nervous and also the complication of reversing the valves from winter heat gain to summer heat loss promised to make the valves expensive. I decided I wanted ceiling tanks.

Bill Mingenbach suggested using 8" PVC pipes as overhead tanks and we found they worked well. We switched to this with roof top radiators rather than wall radiators in August of 1999. You can see in our tests or by reading L. Newbauer's work, such as *Diurnal Radient Exchange with the Sky Dome* by Richard D. Cramer and L.W. Newbauer Volume 9 #1 *Solar Energy Journal 1964,* that while walls radiate well and drop considerably below ambient, roofs are a lot better. We continue to experiment with wall mounted collectors. They receive more radiation at our (34° N) latitude during the coldest months than even 26° sloped roofs and one needs no pump or electricity to operate them. Of course this is nothing new. Harold Hay has made completely passive heating and cooling schemes for decades but our methods were slightly different with some advantages (and disadvantages).

Notice in Figure 2 that the plenum temperatures stay at 32° even though ambient and parallel plate temperatures drop far below freezing. It must be that ice was forming in the plenum, releasing the huge heat of fusion.