

Solar Collectors

We have installed high efficiency ETC (Evacuated Tube Collectors). They are effective even on bitterly cold winter days, as long as there is sun.

They are mounted at about 45 degrees from horizontal. The ideal angle is 53 degrees (the same as our latitude), but this is not critical. They can even be wall mounted, if you have a south-facing wall.

Evacuated Tube vs. Flat Plate Collectors

Flat plate collectors are about $\frac{1}{2}$ the cost of ETC collectors. However, in the winter they are much more efficient. For example, on a -20 C day, when water is coming down at 80 C (that's a 100 C temperature difference between the ambient air and the water), the ETC collector is still 60% efficient; the flat plate has dropped to about 15% efficiency. Basically, no matter how many flat plate collectors you have, once the temperature drops below 0 C, they cease to be able to effectively raise your tank temperature beyond 60 or 70 C, and the colder it gets the less heat they collect.

What this means, is that your maximum tank temperature is going to be much higher in the winter with an ETC collector, than with a flat plate collector. Since our goal was to supply heat for DHW (Domestic Hot Water) and hydronic heating, we wanted to maximize our tank temperatures, and ETC was the way to go.

Why are they more efficient?

Each 3" quartz glass tube is sealed, and the air is evacuated out. Since there is no air inside, no convection can occur, and there is no heat loss between the solar absorbing plate and the atmosphere. The reason they drop in efficiency is because of the heat loss through the solar collector header and piping.

A flat plate collector, on the other hand, has a huge expanse of glass with air behind it, which circulates past the solar collector plate, gets hot, rises and sheds its heat against the glass. The bigger the temperature difference, the faster this occurs, causing the net efficiency to drop sharply. The collector is collecting just as much solar heat energy as the ETC, but is losing it faster and faster as the ambient air temperature drops.