Solar Space Heating

There are three basic techniques to provide space heating in northern climates using solar water heating collectors:

Direct Solar Heating

With direct solar heating there is no storage medium for the collected solar energy other than the thermal mass that already exists in the house. On sunny days during the winter, heat can be directly transferred either to a floor area through radiant heating tubes, to a heat exchanger in the return side of a furnace, or to a radiator in a cold area of the home. Direct Solar Heating systems can provide about 25% of a home’s heating requirements in southern Wisconsin by using one square foot of solar collector for every ten square feet of floor area in the basement or on the first floor. For each additional floor level 10-15% more collector area is added. An example of a good application would be a house with an addition on the north side that is under-heated. On a cold sunny day, the house warms up and the thermostat turns the furnace off, but the north side addition is still cold. In this case, a Direct Solar Heating system could provide heat to the addition when it is needed most – on cold sunny days.

Solar Heating with Water Storage

When a Water Storage system collects solar energy, it is stored in a large water tank. This heat is then directed into the house through a radiant floor or forced-air heating system. Like the Direct Solar Heating system, these systems can provide heat to a radiant floor, to a return furnace duct or to a radiator unit. A Water Storage system will supply about 50% of a home’s heating requirements for a home in southern Wisconsin by using one square foot of solar collector for every four square feet of floor area in the basement or on the first floor. For each additional floor level 10-15% more collector area is added. As opposed to a Direct system, the heat from a Water Storage system can be controlled, drawing heat from the solar water storage tank when you need it.

High Mass Solar Heating

The High Mass Solar Heating concept was developed and popularized by Robert Ramlow of Artha Renewable Energy. Instead of storing heat from the solar collectors in a water storage tank, the solar energy is stored in a 2'-deep insulated sand bed located directly under the entire basement or first floor of a building. This technique is limited to new homes or home additions. The insulated sand bed is inexpensive to build because it is buried underground and sand is inexpensive in Wisconsin. Collected heat is delivered to and stored in the sand bed using a gridwork of radiant tubing. Homeowners with high mass solar heating typically begin storing solar heat in their sand beds during late summer or early fall. When the sand bed becomes warm, and outside temperatures drop, the stored heat will slowly rise up into the building, warming the floors and the whole building (provisions for air movement between the floors must be provided). These systems can provide about 75% of a home’s heating requirements for southern Wisconsin by using one square foot of solar collector for every four square feet of floor area in the basement or on the first floor. For each additional floor level, 10-15% more collector area is added. Due to the enormous thermal mass of the sand bed, this system provides 25% more space heating with the same collector area as a standard water storage system.