SANSONE SOLAR HOME

LOCATION – The Sansone home is in Shady Side, MD, about 20 miles south of Annapolis, MD, and 50 miles east of Washington, D.C. There are 4000 degree days here. The winters are mild and the summers reasonable. Our biggest problem is humidity inside the house; it is too high in the summer and too low in the winter.

DESCRIPTION -- This Shady Side home built in 1993 is an ongoing experiment in living lightly or sustainably on the earth. It is intended to have no negative impact on the earth, making it possible for us to live close to--and learn--from nature. The main features of the house are lots of insulation, low emissivity windows, a wood pellet stove, a solar cooker, nesting osprey, passive solar heating and cooling, photovoltaic power, a wood cooking stove and lots of fans. But more important than these parts is the way these parts are integrated into a whole, and the management practices which make it all work to create significant energy savings.

FIRST FLOOR
ENERGY -- Probably the first thing you learn when you become interested in using energy wisely is not to throw away or waste energy you already have. This can mean super
insulating walls or roofs, and recovering energy lost out of windows or down the drains. This house uses Structural Insulated Panels (SIP), the most energy efficient wall system available. It has R 30 in the walls and R 36 in the roof. The windows are double-glazed with a low emissivity film, making the windows equivalent to triple glazing. There is also a way of recycling the heat in the attic down one of the flues in the chimney to the first floor. The next thing one can learn is to be aware of different kinds of energy. Very low temperatures from indirect sunlight can be used most effectively for passive heating. Higher temperatures from direct sunlight are needed to produce electricity. And even higher temperatures of 200°F+ from concentrating collectors can be used to heat water.

ZONING – Almost every room in the house is isolated from the rest of the house so that any space can be heated or not heated to any temperature desired. The living room, located on the waterside of the house, is a passive heated solar sunspace that is used as a heat source for the rest of the house.

HEATING SYSTEM – The living room, which we call the Miami room (the building department calls it an enclosed porch so we don’t have to heat it), is not only the center of family life but is also the center of the heating system. It acts as a plenum, collecting and distributing a low-grade heat from the sun to the surrounding spaces. It has a thermostatically controlled propane stove that never lets the temperature in this space go below 58°F. When the propane stove is shut off, this space will drift down to 54°F in very cold weather and is difficult to heat up again during a series of cloudy days. When this occurs, the spaces around the living room can be shut off to make the back of the house super insulated. The main alternative heating system for the house is a pellet stove located in the bedroom on the second floor. This stove can run for 8 hours on a single load of pellets and has the ability to keep the bedroom at 68°F and the rest of the house at 60°F on the coldest overclouded days. The pellet stove generates about four gallons of ash per year.

CUPOLA – At the top of the house is a cupola with awning windows that can be operated from the first floor. These windows draw the air through the house using the chimney effect to create a cool summer breeze for Passive Solar Cooling. They are often left open all summer, even when it is raining.

PLANTER IN LIVING ROOM – There is a large planter that goes through the floor in the living room into the ground below. When I designed the house, I envisioned a Ruby Red grapefruit tree growing up in the middle of the living room. I tried a Ruby Red at first but found that it bloomed early in the spring before it was warm enough to open the house to the outside and it made the whole house smell sickeningly sweet. The next tree we tried was a Buddhist Pine. It died and we were not sure why, but we did discover that the soil was always wet and had a salt content of 1700 ppm (1500 ppm is considered high). Now I have replaced all of the soil and have sealed off the bottom of the planter from the ground below with concrete and planted a bougainvillea vine that fills the space like a tree.

WOOD COOKING STOVE – In the kitchen, there is a woodburning-stove for cooking in the winter and outside is a barbecue for cooking in the summer. Wood is probably the only environmentally friendly way of achieving temperatures high enough for cooking.

OUTSIDE
FORM – One of the interesting features of this house is that variation is created inside of
the house, while the outside remains a simple box. A simple exterior form reduces the cost of construction and the number of places where energy can be lost through cracks at joints in exterior walls. Also the house is tall, rather than spread out like most of the houses in our neighborhood, I designed it this way in order to increase the height of the south facing glass and to reduce the roof area. The increased height allows direct sunlight to penetrate deep into the house and reach more of the mass, while the smaller roof area reduces the amount of runoff and decreases heat loss through the roof which is exposed to extreme temperatures.

SOUTHERN OVERHANGS and DECIDUOUS VINES – The overhangs with deciduous grape vines on the south and west are designed to block the sun-- which is high in the southern sky during the summer—and to let the sun in when it is low during the winter and leaves on the grape vines are gone.

EAST & WEST OVERHANGS – Heat gains are reduced in the summer by dropping the roof down as far as possible on the east and west sides of the house without blocking the view for people seated on the second floor.

SOLAR COOKER – Just outside of the porch door is a solar cooker that uses mirrors to reflect sunlight onto a pot in the middle. The bad news is that it usually takes an entire sunny day to cook a stew, but the good news is that it never burns. I use it occasionally on my boat, while I am at anchor. The stew is prepared early in the day and then allowed to sit all day on the front of the boat. When it's time for dinner, I go up front, pick up my dinner, and eat!

VEGETABLE GARDEN- On the south side of the house is a vegetable garden. The garden is covered with cedar chips to prevent weeds from growing during the fall and winter, and to act as mulch during the growing season.

PHOTOVOLTAICS – Also on the south side of the house, near the garden on the waterside, is an array of photovoltaics. This array generates about 2000 watts. Then there is another array up on the roof which generates another 2200 watts giving us a total of 4.2 KW. This is enough power to run everything in the house except the air conditioner, but includes the SunFrost refrigerator, indefinitely when we are off line. When we are on line, the array to runs the electric meter backwards and reduces our electric bill. A 1760 Amp Hour battery bank is under the first floor in the office wing for storing electricity.

SECOND FLOOR
LIGHTING – All lighting is fluorescent. This cannot be dimmed inexpensively so multiple switches are provided. There is a switch to one set of bulbs for low light and a second switch to another set of bulbs for more light.

TWO-COMPARTMENT BATHROOM – The bathroom on the second floor is divided into two compartments so that two people can use it privately at the same time. One compartment contains a sink and a toilet, and the other contains a sink and a tub.

INTERIOR WINDOWS – There are many interior windows on the second floor. Interior windows usually open onto the Florida room and allow a view to the outside without the heat loss associated with standard exterior windows.
CRAWL SPACE AND MECHANICAL SPACES

PUMP ROOM – An unheated space that never freezes is created in the crawl space by using insulation and ground heat. This space is used to keep paints, glues, and caulk warm during the winter and to provide a transition space for pipes that are leaving frost protected ground and entering the house.

PLUMBING – All plumbing is insulated and located within heated spaces of the house for easy repair and to prevent freezing, rather than outside or in exterior walls. The owner can turn off the heat and walk away from the house in the middle of winter and never worry about pipes freezing.

ELECTRICAL – A 96-volt system is used to transport electricity from the photovoltaic panels to the house; then a 110-volt system is used to transport energy within the house. This makes it possible to transport energy long distances and to use off-the-shelf 110-volt appliances. There are no electrical boxes in exterior walls, where they can compromise the insulation or cause air leakage.

GRAY WATER SYSTEM – The house has two waste piping systems. One carries the wastewater from the toilets to the sewer and the other carries all other wastewater to a settlement pond, and then to a 700-gallon storage tank located under the wing to supply water for the lawn and flowers. This system is installed but turned off until the settlement pond is built.

FANS AND PUMPS – In a solar house, it is essential to realize the importance of pumps and fans (well pump, sump pump, composting toilet pump, and pellet-stove fan). In a way, they are the house’s heart, serving as the circulatory system; without them, the house is lethargic. All of the pumps and fans can be kept running by solar when the house goes off line.

AIR CONDITIONING
Recently we have installed two ½ ton split unit air conditioners that we can use to cool the whole house by opening the windows to the Miami room or to air-condition just the bedroom and music room when the windows are closed.