

Solar Thermal: The absorption of solar radiation (heat energy) into a thermal mass.

**Classification: Stationary mass;** many materials such as concrete, rocks and fluid filled manmade objects can serve as stationary solar thermal collectors. The idea is for the object to absorb the solar heat during the day and release the heat slowly through the night. Careful design and balance are necessary to make this type of solar thermal system work.

**Moveable or flowing mass;** these solar thermal systems rely on either convective forces or motor drive pumps to constantly bring unheated fluid into the thermal mass to absorb the solar radiation. The fluid is transferred to a storage tank for use when the solar radiation is no longer available.

The solar thermal systems referred to below are of the flowing fluid mass classification.

**Types: Direct (open loop):** These solar collectors directly heat the domestic potable water in the collector. **Unglazed Solar pool heaters** are of this type as well.

**Indirect (closed loop):** These solar collectors separate the domestic potable water from the heated fluid and transfer the heat through some type of heat exchanger. **Freeze protected systems are of this type.**

**Passive:** Passive systems can be direct or indirect. *Direct passive systems* use the solar collector as the tank and the water flows only when it is being used. *Indirect passive systems* use thermosiphoning with the tank and collector in close proximity to each other.

**Active:** Active systems can be direct or indirect and require a pump to move the fluid through the solar collectors. *Active direct systems* are usually used only in tropical climates outside of the US.

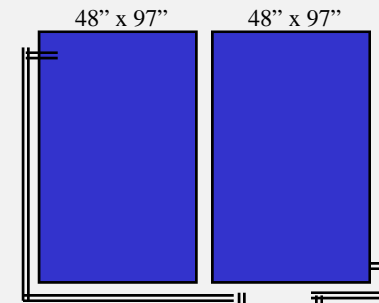
The systems referred to below are *active indirect*; using water or water/glycol mix as the solar thermal collection fluid which is separated from the potable water. **Note** – These are freeze protected in Georgia.

**Systems: Pressurized:** Pressurized systems will always have a water/glycol mix in order to be freeze protected. Pressurized systems can be used without glycol in locations that do not experience freezing temperatures. These systems will have one or two circulating pumps to move the fluid. **Note** - The pumps will either be controlled by a differential thermostat with temperature sensors located at the collector and storage tank or have a DC pump operated by a PV panel next to the collectors.

**Drainback:** Unpressurized Drainback systems can either contain water/glycol or water only. These systems use high head pumps that must lift the water from the Drainback tank to the solar collectors. If water is used in the collector loop then care must be taken to ensure all water flows out of the collectors and pipes to prevent freezing. In a water/glycol system this is also important but freezing is not an issue if some fluid remains in the collector loop.

## Solar Thermal Domestic Water Heating

- Flat plate collectors usually sized from one to four collectors. Commercial systems can go from two to a hundred depending on the use
- Evacuated Tube collectors are usually individual tubes assembled into a bank of eight or ten and then attached in series to appear continuous.
- Although the technologies differ and each has advantages the other lacks, they will both serve domestic water heating well
- Additional uses for solar thermal are radiant floor heating, space heating and pool heating. In our climate these others uses work best as supplemental and not primary as solar domestic water heating is.



## Systems and Components

- Besides collectors all systems Georgia's climate will have a heat exchanger. This is to separate the potable water from the solar water or glycol mix and protect it from freezing.
- All systems will have at least one pump on the solar loop side; some will have another pump on the potable side.
- All systems will have a solar tank that either. also serves as the backup hot water tank or as a preheat tank. Drainback systems will have another small tank for the solar loop water or glycol mix to drain back into when the system is not operating.
- All systems will either have a differential thermostat with sensors at the collectors and storage tank or they will have a PV panel operating the system
- The other components seen in these systems will be: temp. gauges, pressure gauges, flow sensors and valves.

