

Glossary

- absorption: The process by which solar radiation is converted to heat when it strikes a dark colored surface; also refers to radiation heat flow transferring to a surface.
- active: A solar heating system that uses a pump (water-heating) to transfer solar heat to storage.
- air-heating: A system using air as the heat-transfer medium in a solar heating system. Heat is usually stored in a rock-bed.
- analogy: A device or function that is somehow equivalent to another device or function; for example, a gold mine is an economic analogy to a solar collector.
- auxiliary: A furnace or other heating system used as a backup to a solar heater; for use when the solar heater can't provide all the heat required.
- awnings: shading devices made of fabric or other material that block solar radiation; used for seasonal control
- backup: An auxiliary heater used when the solar heating system can't provide all the heat required.
- baseboard heaters: Heating devices in houses using either hot water or electricity that are installed along the baseboard of a room. They heat primarily by convection heat flow.
- beadwall: A way to prevent nighttime heat-loss from a passive system by blowing styrofoam beads into the space between two glass layers on the south wall of a house. The beads are sucked out during the day.
- biomass: Using the sun to grow plants such as trees or algae which are then harvested to produce energy.
- boiling protection: Preventing damage in a solar hydronic system due to water inside boiling when the pump malfunctions.
- caulking: Putting a plaster-like material in the cracks of a house or window to prevent infiltration heat loss.

changing phase: Changing from a solid to a liquid (melting) or from a liquid to a solid (solidifying). When a material changes phase it requires or gives up latent heat.

check valve: A valve that lets water flow through it in only one direction; analogous to the controller of an active solar heating system.

collector: The part of a solar heating system that captures the sunlight. Collectors gain heat from the sun but lose some of it by radiation and convection.

collector efficiency: The fraction of incoming solar radiation or rainwater that gets stored. Efficiency is low when the collector is hot and high when it's cool.

collector temperature: The average temperature of the solar collector (it might be a little hotter near the outlet and a little cooler at the inlet); analogous to pipe depth.

condense: Changing the phase of a material from gaseous phase to the liquid phase; for example, steam condenses into water; the opposite of evaporate.

conduction: Heat flow through a material where the material itself doesn't move; a type of thermal resistance.

conductor: A material which allows heat to flow through it easily (such as a metal); the opposite of an insulator.

conservation: Using less heat in a building by reducing the building's heat losses. More insulation, weather-stripping, caulking and storm windows all conserve heat.

control function: Controlling when and where solar heat is added to the living space from storage.

controller: A device that controls when the pump or fan on a solar heating system should be turned on. It usually uses information from collector and storage temperature sensors.

convection: Heat flow from a surface into the surrounding gas or liquid (usually air or water); a type of thermal resistance.

conventional heater: A heating system other than solar; for example, gas-fired furnaces, baseboard heaters, oil furnaces.

corrosion: When metals disintegrate, usually because of chemical action by oxygen (e.g., rusting) or other substances. Usually water-heating systems have more corrosion problems than air-heating systems.

crushed rock: Heat storage material used in rock-bed air-collector systems. Rocks are usually about the size of an egg.

daily control: Controlling solar heat over a day's period: not

- too much heat in late afternoon but heat stored for use at night; for example, a masonry wall.
- depth: The level of liquid in a container; analogous to temperature.
- depth difference: One level subtracted from another level; difference between two levels or depths; analogous to temperature difference.
- diode function: The method by which solar heating system allows heat to go to storage when it's available but prevents heat loss from storage at night; for example, a controller in an active system provides a diode function.
- direct-gain: A passive system where the sun heats the floor or walls of the house directly through south-facing windows.
- direct use: Using the sun's radiation directly as in heating and generating electricity.
- distribution: Getting heat to the living space. In a passive house, distribution to north-facing rooms is often difficult.
- double-glazing: Using two layers of glass on windows or solar collectors to reduce heat loss. The still air in the space between the windows acts as a good insulator.
- downhill: Direction of heat flow (from a higher temperature to a lower one); direction of volume flow (from a higher depth to a lower one).
- drain-down: Draining a solar hydronic system at night to prevent water from freezing in its collectors.
- drumwall: A passive system which uses water-filled drums for heat storage and a hinged, insulating wall to prevent nighttime heat loss.
- electric furnace: A heater where forced air is blown past electrically-heated coils. The air is heated by convection from the coils' surface.
- electromagnetic radiation: A class of radiation whose different "pitches" include solar radiation, radiation heat flow, x-rays, light, microwaves, T.V. waves and radio waves.
- evacuated tube collector: A collector with a vacuum jacket and reflectors that reduces heat losses and improves efficiency at very high temperatures.
- evaporate: Changing the phase of a material from liquid phase to gaseous phase; for example, water evaporates to form water vapor (steam); the opposite of condense
- fan: A device which blows air in an air-heating solar system or in a forced-air heating system. A fan moves heat by transport heat flow.

fiberglass batting: An insulator made from loosely-packed glass fibers, coming in thick layers which can be stapled to a wall or layed between ceiling rafters. Heat flows by conduction through batting since the fibers prevent convection.

fin: A thin sheet of metal in a heat exchanger that conducts heat to the surrounding gas or liquid.

first cost: The amount you pay for a solar heater when you first buy it; sometimes called the initial cost.

flap valve: A check valve that uses a flap to block the liquid flow in one direction, but allow flow in the other direction.

flat-plate collector: A collector which remains fixed in position; the collecting part of a flat-plate solar heating system.

fluid resistance: Impediment or resistance to fluid flow. A high fluid resistance means fluid flows with difficulty, a low fluid resistance means fluid flows easily.

forced-air: Heating a house using heated air forced into the rooms by fans.

forced convection: Convection by a gas or liquid forced over a surface; for example, a pump forcing water through a pipe or a fan blowing air over a brick-in contrast to natural convection where an object's temperature alone causes flow past its surface.

fossil fuels: Fuels derived from the fossils of plants that died millions of years ago; oil, natural gas and coal are all fossil fuels.

freeze protection: Protecting a solar hydronic system at night to prevent water from freezing in its collector.

fuel savings: The money you make each year on solar heater because it's eliminating some of the fuel costs you would otherwise have.

glazing: Transparent cover (or covers) that prevent heat losses from a solar collector. Glazing is usually made of plastic film or glass.

glycol: An antifreeze additive to water.

ground reflection: Solar radiation reflected from the ground (e.g., by snow) into a solar collector; more heat can be captured by a collector with ground reflection.

greenhouse: A passive system which separates the collector and storage from the living space by means of a greenhouse buffer.

greenhouse effect: The property of glass where solar radiation

- passes through but radiation heat flow is blocked. In greenhouses, sunlight enters but heat is trapped by the glass.
- heat: A quantity indicating how much energy a substance contains; analogous to volume.
- heat exchanger: A device which is designed to transfer heat easily. Heat transfer can be between a liquid and gas or between liquid and liquid; analogous to the tap on the rainwater collecting system.'
- heat flow: The movement of heat from one place to another due to temperature differences; analogous to volume flow.
- heat-flow path: Path which heat takes as it moves by conduction through a material from a high temperature to a lower one. Length of flow path is how far the heat travels, area of the flow path is how much material the heat flows through at each point along the path.
- heat losses: Heat flow from an object that is lost; for example, heat flowing from a house on a cold day are house heat losses.
- heat storage: Keeping heat collected at one time for use later on; analogous to volume storage. Heat is stored by materials when they get hotter or when they're melted.
- heat store: Part of a solar heating system that stores heat.
- heat transfer medium: A gas or liquid that moves heat by either convection or transport heat flow.
- high-pitched: In sound, radiation refers to high notes that come from instruments like violins and flutes. In electromagnetic radiation it refers to solar radiation (and light and x-rays, as well).
- hot-water heating: Solar energy used to heat water for showers, laundries, cooking, dishwashing and so forth.
- house heating: Solar energy used to heat a house. (See space-heating.)
- hydronic: A solar heating system that heats water in its collector and stores heat in a water tank; a water-based heating system.
- indirect use: Using the effects of the sun's radiation for energy. Fossil fuels, biomass wind power and ocean currents are examples.
- infiltration: Heat loss from a house due to cold air leaking in cracks and warm air leaking out through cracks or chimneys. Some infiltration is needed or a house feels stuffy.
- initial cost: The amount you pay for a solar heater when you

first buy it; sometimes called the first cost.

inlet: Where the air or water enters a solar collector or other device.

installation: The cost of getting a solar system from the crates its delivered in to a working solar heater. Installation costs are a part of the first cost.

insulated-plate collector: An unglazed solar collector with an insulated metal plate but no means for extracting solar heat.

insulation: General measure of thermal resistance. Insulation resists the flow of heat.

insulator: A material that prevents heat from flowing easily by conduction. High insulation corresponds to high thermal resistance; opposite to a conductor.

interest:, ' Interest is the cost of money.

latent heat: Heat stored by melting and solidifying a substance, such as wax. Phase change materials store heat latently.

latitude: How far a point on the earth's surface is from the equator. A solar collector near the equator (low latitude) usually has a smaller tilt angle than one nearer to the poles (high latitude).

leafy plants: Deciduous plants which block the sun in summer but allow solar heating in winter; used for seasonal control of solar radiation.

living space: The space in a house that people live in.

liquid-to-air heat exchanger: A device that transfers heat from liquid to a gas; for example, a car radiator or a baseboard heater.

liquid-to-liquid heat exchanger: A device that transfers heat from a liquid to another liquid; for example, a coil in a heat storage tank.


low-pitched: In sound radiation it refers to low notes that come from instruments like basses and tubas. In electromagnetic radiation it refers to radiation heat flow (and radio, T.V. and microwaves as well).

maintenance: Keeping your solar heater working will cost you either time or money. Maintenance costs reduce the income you get each year from your solar heater.

masonry wall: A passive solar house that lets solar radiation heat a glass-covered masonry wall. Heat is conducted into the house through the wall.

mass-production: Making products in a factory where less human labor is needed. The result is that most things can be produced cheaper in a factory.

melting: Changing phase from a solid to a liquid. Most phase



change materials (like wax) require extra (or latent) heat melt.

modular: A solar system that's made in individual units or modules, each module having the capability of an entire system; for example, a thermic diode is a modular solar heating system.

movable insulation: Moving insulation on a passive solar heating system in a way to prevent heat loss at night; for example, "Drum-wall" and "Skytherm".

natural convection: Convection caused solely by an object's temperature. Gas or liquid near a hot surface rises, near a cold surface falls; differs from forced convection where the gas or liquid is forced over the surface.

new income: The income you actually get from a solar heater each year-annual fuel savings less maintenance and interest.

nighttime loss: Heat loss from a solar collector at night. A controller of an active system turns off the pump or fan at night to prevent nighttime heat loss. Passive systems use movable insulation and other means.

oil valve: A check valve in a thermic diode uses oil in a chamber to block flow in one direction but allow flow in the other direction.

outlet: Where the air or water leaves a solar collector or other device.

overcast day: A day when solar radiation is blocked by clouds or haze. A cloudy day may have only a fifth the solar radiation of a clear day.

over-heat: The tendency for some passive solar heating systems to get too hot in the late afternoon.

parallel configuration: Where a solar heater and auxiliary heater combine to heat a house; in contrast to a series or preheater arrangement.

passive: A solar heating system that doesn't use fans or pumps to transfer solar heat to storage.

phase-change materials: Materials that store heat latently by melting and solidifying, that is, by changing phase.

photovoltaic: Devices which convert sunlight directly to electricity.

pre-heater: A way to use a solar heating system where solar heat warms the air or water and then an auxiliary heater or furnace finishes the heating by adding additional heat to the air or water.

pump: A device which forces water through an active solar heating system; analogous to the siphon-connecting tube on a rainwater collector system.

pyramidal optical condenser: A solar heating system that has reflectors mounted in the roof peak of the house.

radiation: Heat flow from a surface by electromagnetic waves; no surrounding liquid or gas is necessary (can occur in a vacuum); a type of thermal resistance.

radiator: A device in a home or car to let heat flow easily from heated water into the air. In a car it cools the car's engine, in a home it warms a room. Radiators usually transfer more heat by convection than by radiation heat flow.

rainwater collector: A tray used to catch rain waater; analogous to a solar collector.

rainwater equivalent: A part of or function on a rainwater collector system that is analogous to a solar collector system.

reflection: The process by which solar radiation, on striking a light-colored surface, is not absorbed-it reflects away; also refers to radiation heat flow on striking a shiny surface.

reflector: A shiny surface that reflects sunlight into a collector to increase the solar radiation it absorbs.

regulated hot water: Hot water whose temperature is held more or less fixed.

reliable: A solar heating system that's rugged and simple and expected to operate a long time without need of repair.

retrofit: Installing a solar system on an existing house rather than on one that's just being built.

return hose: A hose in a thermic diode that lets cool storage water return to the collector.

reverse thermosyphon: A way in which a passive thermosyphon system can lose heat at night by the air or water circulating in the reverse direction.

rock-bed: The storage medium for an active air-heating collector system. Rocks are crushed and held in an air tight container with appropriate ducts.

seasonal control: Controlling solar heat through dthe various seasons; for example, awnings block the summer sun but allow solar heat in wirYter.

selective coating: A coating on the absorber plate of a solar collector that absorbs solar radiation but prevents radiation heat flow.

selective surface: A solar collector absorbing surface with a selective coating. Radiation heat loss from the surface is reduced.

series configuration: A solar heater used as a pre-heater to an auxiliary heater.

set temperature: The temperature a thermostat is set to.

silicon: A material that's used to make photovoltaic solar cells that convert sunlight to electricity.

silvered surfaces: Shiny, mirror-like surfaces which reflect both radiation heat flow and solar radiation.

sky temperature: The temperature of the sky. Usually it's cooler than the outdoor temperature, especially when there are no clouds and where it's very dry (as the desert).

Skytherm: A passive system with rooftop water bags storing heat and insulating slabs that slide over the water bags at night to prevent heat loss.

solar air-conditioning: Using solar heat to cool a building. Often evacuated tube collectors with low heat loss must be used.

solar cells: Photovoltaic devices which convert solar radiation directly to electricity; used in space satellites, watches and calculators.

solar radiation: A type of electromagnetic radiation coming from the sun that heats objects when it's absorbed. Solar radiation is reflected by light-colored surfaces and absorbed by dark-colored ones. It goes through transparent materials like glass and plastic.

solidifying: Changing phase from a liquid to a solid. Most phase-change materials (like wax) give up extra or latent heat on solidifying.

sound radiation: A class of radiation that lets us hear. Sound radiation is divided into high pitches (violin and flute sounds) and low pitches (bass and tuba sounds).

south-facing: Toward the equator; the best direction to point a solar collector in the northern hemisphere. In the southern hemisphere, for example, Australia, the best collector orientation is north-facing.

space heating: Heating of a house's living space; In contrast to hot water heating and swimming pool heating.

stagnation depth: The depth a rainwater collector gets when no rain water is being saved. The stagnation depth is higher when more rain is caught; analogous to stagnation temperature.

stagnation temperature: The temperature a solar collector gets when no heat is being saved. It's higher when more sunlight is falling on the collector, and when the collector is glazed; analogous to stagnation depth.

still air: Air which isn't moving. Heat loss from a surface in still air is by natural convection and is much less than if the air is moving.

storage material: Material that stores heat in a solar heating

system. Storage materials are rock-beds, water tanks, concrete walls and water-filled drums.

storage temperature: The average temperature of the heat stored (it might be a little hotter at the top and a little cooler at the bottom because of stratification); analogous to tank depth.

stratification: The tendency for heated air or water to stay at the top of a storage container.

sun louvers: A passive solar space-heating system where sunlight is reflected by louvers into ceiling-mounted phase-change material. The phase-change material provides nighttime heat as it solidifies.

sun window: A system which uses a dark fluid to block solar radiation when it's not needed. The dark fluid is pumped through passages within the collector.

surface area: The outside surface of an object that loses heat by convection or radiation. The bigger the surface area, the more heat lost.

swimming pool heating: Solar energy used to heat swimming pool water. The pool itself stores the heat.

tap: An outlet on the side of a rainwater storage tank from which to draw stored water; analogous to the heat exchanger of a solar heating system.

tax credits: Many states and the Federal government give tax relief to people who use solar equipment. Tax credits reduce the solar heater's first cost.

temperature: The hotness of an object measured with a thermometer; analogous to depth.

temperature difference: One temperature subtracted from another temperature; analogous to depth difference.

temperature rise: The temperature difference between inlet and outlet of a solar collector; the temperature of a heat storage tank above the temperature to which it delivers heat.

temperature sensor: An electronic device that measures the temperature of collector or storage; used to signal a controller when to turn on a pump or fan.

temperature swing: The typical change in temperature between early morning and late afternoon in a passive solar heating system.

thermal contact: Two objects that can transfer heat easily from one to the other, usually by conduction.

thermal resistance: Resistance or impediment to heat flow. A high thermal resistance means heat flows with difficulty,

- a low thermal resistance means heat flows easily; measure of how well-insulated something is.
- thermic diode: A passive solar heating module that works on the thermosyphon principle. It has an inherent diode function to prevent heat loss at night.
- thermodynamic cycle: A method of using heat to give a cooling effect by evaporating (boiling) a liquid and then condensing (liquefying) it again.
- thermostat: A device used to control when a furnace turns on and off depending on the temperature of the room it's in. A thermostat tries to hold the room's temperature at a fixed point.
- thermosyphon: Heat transferred by a circulation process where heated water or air rises and is replaced by cooler water or air. Trombe walls and thermic diodes use thermosyphon action.
- tilt angle: The angle a solar collector makes with the horizontal. Besides facing south, collectors have a high angle for house heating, medium for hot water heating, and low for swimming pool heating.
- tracking system: Solar collectors which follow the sun. Also tracking mirrors follow the sun, keeping the sun's reflection focused on a stationary point.
- transmission: The process by which solar radiation goes right through transparent materials such as glass, plastic and air.
- transparent: A material through which light can pass such as glass or plastic film.
- transport: Heat flow by transporting or moving a substance which is hot. Often the substance moved is A gas or liquid (air or water); a type of thermal resistance#
- trombe wall: A passive solar house using a glass-covered masonry wall with air holes at top and bottom of the wall. Heat is transferred to the house by conduction through the wall and thermosyphon through the air holes.
- unglazed: A collector with no glazing; convection heat losses are high without glazing since the absorbing surface is exposed to the wind.
- useful heat: The heat stored above room temperature in a house heating application. Heat stored below room temperature isn't useful because it can't warm the room (except as a pre-heat for a furnace); analogous to useful volume.
- useful volume: The volume stored in a tank above the outlet

tap; analogous to useful heat.

vacuum jacket: A vacuum around an evacuated tube collector that prevents convection heat loss.

vapor: The gaseous phase of a material; for example, steam is the gaseous phase of water.

volume: The amount of space that a liquid occupies; analogous to heat.

volume flow: The movement of volume from one place to another; analogous to heat flow.

water-heating: Using water as the heat transfer medium in a solar heating system; a hydronic system.

water main: The pipe that brings cold water into a house from a residential water system.

weatherstripping: Putting felt or foam rubber around doors and windows to prevent heat loss by infiltration.

wind power: Using the wind to produce power such as to pump water, grind grain or generate electricity. The wind is indirectly caused by solar energy.