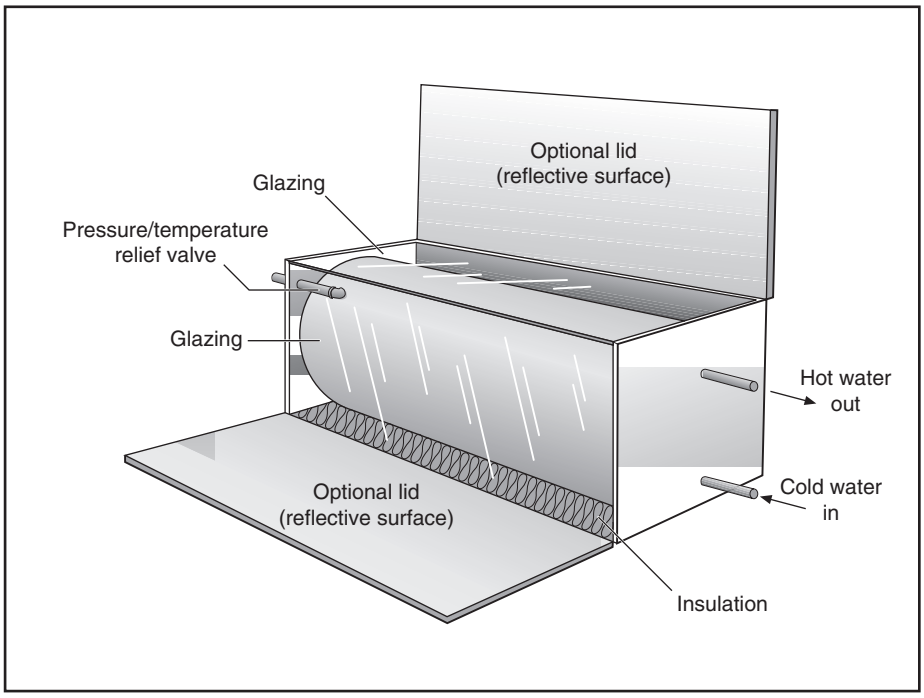
Solar Water Heaters

RENEWABLE ENERGY
THE INFINITE POWER
OF TEXAS

SECO FACT SHEET **NO. 10**

HIGHLIGHTS

- **Solar water heaters can provide half or more of the hot water needs in the average home**
- **Simple or complex, solar water heater systems save money**



Breadbox or batch heater *Allows cold water to flow in from the bottom and hot water to flow out of the top.*

SUMMARY

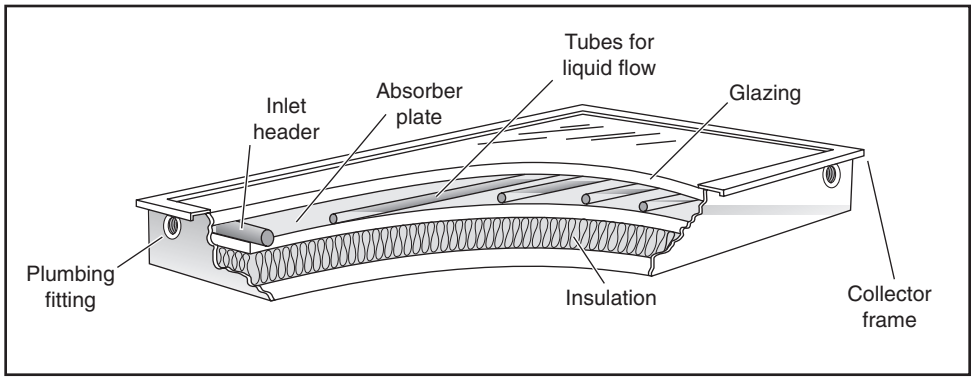
Solar water heaters can be as simple as a garden hose left in the sun or as complex as multiple glass-plated solar collectors filled with propylene glycol. Simple or complex, solar water heaters are an economical option for home and business owners wishing to reduce their water heating costs.

TYPES OF SYSTEMS

PASSIVE SOLAR SYSTEMS

Generally speaking, a passive solar system requires no moving parts and no external energy source except the sun itself.

Passive water heating systems are not much more complex than a regular garden hose that has been left in the sun. The basic passive water heater consists of one or more 40 gallon water tanks that have been painted black and placed in a well insulated box that has glass or plastic on one side to allow the sun's rays to heat the tanks. This Integral Collector Storage (ICS) system, also known as a "bread box" or batch heater, allows cold water to flow in from the bottom and hot water to flow out of the top. The system operates using only the water pressure from the city or your well. Water from the system is then routed to a standard water heater, where your thermostat determines if the water is already hot enough for use or if additional heat is necessary.



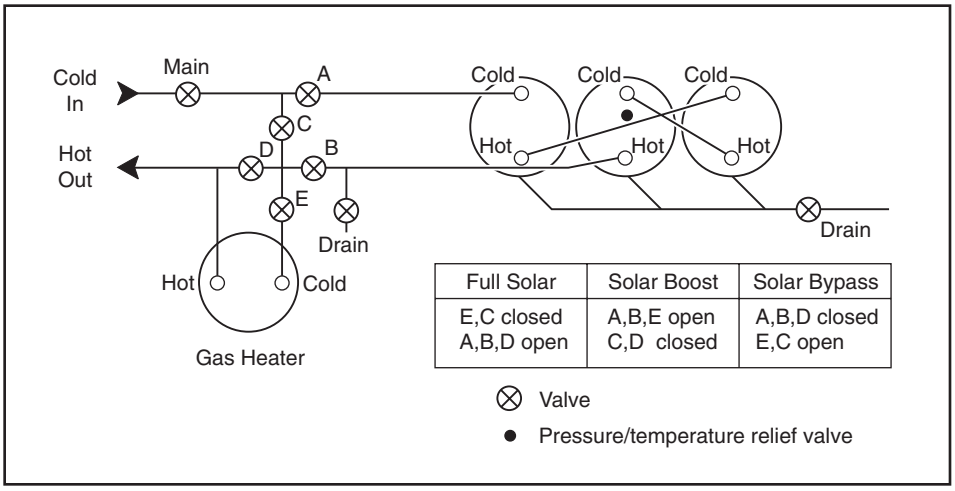
Liquid heating "flat plate" collector *It is a very simple machine.*

ACTIVE SOLAR SYSTEMS: DIRECT AND INDIRECT

Active water heaters are more efficient than their passive brethren, but they also require more equipment in the form of collectors, sensors, circulating pumps and controller mechanisms.

Active systems come in two categories: direct (sometimes known as open loop) and indirect (closed loop). Direct systems heat water in the collectors. Indirect systems do not heat the household water, but instead they employ another fluid such as freon, distilled water or propylene glycol. After the fluid is heated in the collectors, it travels through a heat exchanger, where the heat it contains is transferred to the household water.

While direct systems are more efficient than indirect ones, they require more maintenance and are prone to scaling: a build up of mineral deposits that can close the smaller pipes. In addition, the direct systems must be allowed to drain to prevent damage from freezing or overheating. This drain down design limits installation options and requires additional components.



Full solar, solar boost, and solar bypass systems *Direct systems are more efficient than indirect ones.*

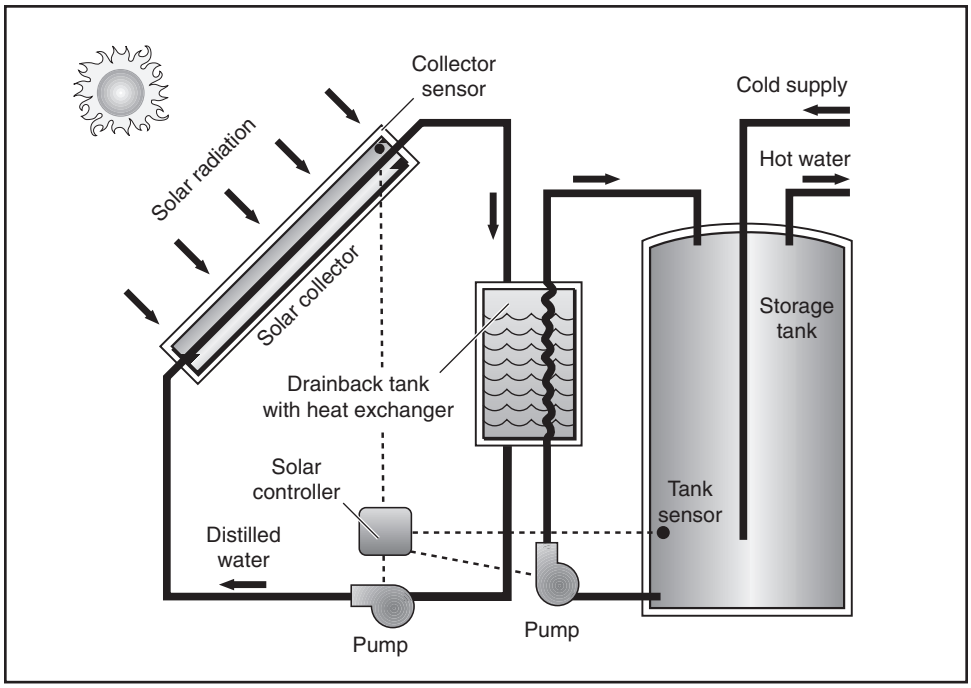
COLLECTOR SYSTEM BASICS

The flat plate solar collector is a very simple machine. An insulated rectangular box, it contains a metal plate (usually copper) that has been painted black, with headers made of 3/4 inch or 1 inch pipe at each end that are connected to small tubes called risers made from 1/4 inch pipe. Supply water flows from the header into the risers where it is heated and then returns to the storage tank. The entire box is covered with tempered glass, which is hail resistant, and then installed at an angle equal to latitude plus 10 degrees.

STORAGE TANKS

Whether the design used is direct or indirect, a large storage tank will be required. The most commonly used size is 80 gallons. Similar in shape to a water heater, solar water storage tanks must be highly insulated to preserve the heat gained by the collectors. From the storage tank, the water is usually routed to a standard water heater.

Tempering or mixing valves are recommended for residential water heating because solar systems typically heat water to 180 degrees, which can be a safety hazard especially with small children. The tempering valve can be set to 120 degrees and allows cold water to mix with the hot water before it reaches the faucet.



Drain back system *The direct systems must be allowed to drain to prevent damage.*

GETTING MORE FROM YOUR SYSTEM

Have you already installed low flow shower heads and aerators on all faucets? This is a cost effective method of not only conserving water but also reducing hot water demand as well.

The time of day when you use water can greatly affect how far you can stretch your solar heated water. For instance after normal morning water usage (when your schedule allows) wait until around noon to do laundry. This allows the solar system to heat up during the morning and to recover again in the afternoon.

DO IT YOURSELF?

Passive hot water systems, which range in price from $800 to $1,500, are among the easiest ways to incorporate solar design into the home. Because of their simplicity, many homeowners design, build and install passive hot water systems themselves for under $400. If a homeowner doesn't want to embark on a project without help, there are a myriad of instructional videos, blueprints and other materials available to the home handyman.

Of course, a competent contractor can reduce the hassle factor. If you decide to use a contractor, ask friends for recommendations and be sure to ask potential contractors about their experience with the type of system you want installed. Whether you build it yourself or purchase a passive system, all permits should be purchased and local plumbing codes followed. The installation of an active solar system, which can cost $2,000 to $3,500, is best left to a professional. The best equipment may not operate correctly or may even be ruined by a bad installation.

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ORGANIZATIONS

American Solar Energy Society
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(303) 443-3130
www.ases.org

Energy Center
University of Texas at El Paso
P. O. Box 645
El Paso, Texas 79968
(888) 879-2887
energycenter.utep.edu

Florida Solar Energy Center
1679 Clearlake Road
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www.fsec.ucf.edu

Passive Solar Industries Council
1511 K Street, Suite 600
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www.sbicouncil.org

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RESOURCES

TEXAS RENEWABLE ENERGY EDUCATION CAMPAIGN

FREE TEXAS RENEWABLE ENERGY INFORMATION

For more information on how you can put Texas' abundant renewable energy resources to use in your home or business, visit our website at **www.InifinitePower.org** or call us at 1-800-531-5441 ext 31796. Ask about our free lesson plans and videos available to teachers and home schoolers.

ON THE WORLD WIDE WEB:

Renewables, products, sustainable living. A good place to start search. **solstice.crest.org**

El Paso Solar Energy Association. Lots of good information. **www.epsea.org**

Florida Solar Energy Center. Information on solar pool heating and other information. **www.fsec.ucf.edu** You can order a manual called "Solar Water and Pool Heating Design and Installation Manual," for $25. Run by the Florida Solar Energy Center, the site contains a panoply of other documents on renewable energy. **www.fsec.ucf.edu/docsale.htm**

Fun facts on solar water heating, including this one: "Over 1.5 million Americans have invested in solar hot water systems for their homes and businesses, with over 94% of these customers considering the investment a wise decision." **www.seia.org/sf/sfsolth.htm**

City of Austin Green Builder Program's comprehensive guide covering energy, water, building materials, solid waste and other topics. A mammoth resource.
www.greenbuilder.com/sourcebook

Department of Energy offers a wealth of information on solar water heating, including tips on sizing your system, potential cost savings and other helpful info.
www.eren.doe.gov/erec/factsheets/solrwatr.html
www.eren.doe.gov/solarbuildings/hotwater.html

Software to estimate the economic benefits can be found at:
eren.doe.gov/solarbuildings/sbm.html

BOOKS:

The Passive Solar Energy Book. Edward Mazria, Rodale Press, 1979.

Solar Water Heating Systems, Active and Passive. US Department of Energy. (available by calling (800) 523-2929)

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