

FLORIDA SOLAR



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Solar DHW Storage Tanks and Systems

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SOLAR DHW STORAGE TANKS AND SYSTEMS

Water is by far the most common storage medium in solar domestic hot water systems. Rock storage is another method of sensible heat storage, but is not generally used in systems that are exclusively DHW. Storage of heat in solutions of phase-changing salts is extremely rare in DHW systems and therefore is not discussed.

Single-Tank vs. Two-Tank Systems

The backup conventional DHW heater can be installed as part of the solar DHW storage tank or hooked in series with it. For example, a single-tank solar DHW system can be made from an adapted electric water heater of sufficient size by disconnecting the lower of the two electrical heating elements from the power source. There are also tanks now available with one element in the middle for solar applications. In draindown and drainback systems, the collector supply line outlet is generally located in the lowest third of the storage tank to draw out the coldest water and circulate it through the collectors so they will work at highest efficiency. Combining both auxiliary and solar DHW storage in one tank does reduce the systems' storage volume. A one-tank solar DHW system will probably require a larger tank than conventional DHW systems.

In a two-tank system the solar DHW tank serves as a preheat tank and has a cold water inlet. Supplemental heating takes place in the conventional DHW tank. Two tanks require more floor space, and standby losses will be greater. But collectors often will receive lower inlet temperatures, improving their efficiency.

The source of auxiliary heat is also a consideration. Because a gas hot water heater will not stratify, two tanks may be more desirable. An electric backup with the lower element disconnected may function better in a one tank configuration.

Types of Storage Tanks

You probably will install only two types of tanks: steel or fiberglass. Steel tanks are usually lined with either glass or concrete (stone-lined). Stone-lined tanks are heavier; size and weight specifications are available from manufacturers. If the fluid in storage is pressurized, tanks larger than 120 gallons must carry an ASME label, indicating that its construction conforms to accepted standards of safety.

Fiberglass tanks are lighter than glass- or stone-lined steel tanks and are highly corrosion resistant. You should check pressure and temperature ratings of this type of tank to see if it will withstand the maximum pressures (100 psi or more) and temperatures imposed by the system you are installing. Most fiberglass tanks cannot be used to store water as high as 220 F., even if unpressurized. As pressure increases, its temperature limit decreases.

Tanks must have provisions for all supply and return lines. Tanks can have either built-in heat exchangers (if any are required) or separate units that you install.

WARNING! Temperature and pressure relief valves are mandatory for all hot water storage tanks or in at least one tank of a two-tank system.

Inspecting Storage Tanks

After the tank is delivered to the job site, check it for obvious signs of damage. You may want to pressure test it before putting it in final position, because the tank may be difficult to move once properly placed. Check the condition of the in-tank heat exchanger, if there is one. If the heat exchanger coil is suspended in the tank, bouncing around during shipment may have damaged it. Reject damaged tanks immediately.

Plug all tank openings to prevent dirt from entering. If space considerations permit, leave the tank crated until the move is completed. If the tank is to be lowered into a basement, you may need a winch, especially if it is a stone-lined tank. In most cases, at least two people and a hand truck will be necessary. Take care not to damage the tank while moving it into place.

Placing Storage Tanks

The best storage tank placement is near the existing DHW components with protection from moisture and cold, near the point of use, and in an area where drainage, leakage, or valve-venting will not cause damage. In most cases, this would probably be in a cellar or an enclosed porch.

WARNING! Storage tanks should not be installed in areas where flammable liquids are stored.

For thermosiphon systems, the storage tank must be a minimum of 18" - 24" above the top of the collector array, which may require placing the tank on an outside platform, the roof (depending on collector location), or possibly in the attic.

Tanks should be level and upright (if at all possible) to obtain the best thermal stratification of the hot water. If a tank is placed in a basement or other unfinished area, placement should be on a concrete pad to ensure that it stays level. A tank below grade should be set up on blocks to prevent corrosion in case of flooding.

In a two-tank system, the storage tank should be as close as possible to the conventional hot water and the electrical hookup, but keep enough room between them to conduct maintenance and repairs.

Installing Storage Tanks

After the tank is in place, shut off the main water supply to the existing water heater (if this is a retrofit installation) and bleed off enough water to empty the supply line. Connect to the rest of the solar DHW system. Pipe connections should be provided with the tank. When plumbing the solar storage tank in series with the conventional DHW tank, always bring the cold water supply into the solar storage tank first.

When installed, the storage tank should be leak tested before insulation is added.