



hot water system

The UT SolarD SNAP House's highly efficient solar heat collection system maximizes the use of thermal energy for domestic hot water and space heating, using solar electric collection as an auxiliary energy source. The system consists of 32 vertically-mounted evacuated tubes, a 105-gallon twin coil hot water storage tank, a backup instantaneous electric water heater, a hydronic fan coil unit for space heating, and an efficient plumbing manifold for domestic hot water distribution.

Evacuated Tubes

We have chosen to use evacuated tubes rather than flat plate collectors primarily because of their remarkable efficiency and capability of producing the higher water temperatures (120-180° F) desired for space heating. The evacuated tubes are mounted along the south side of the deck, serving as a dramatic shading device and giving the public maximum exposure to this innovative technology. By orienting the evacuated tubes vertically, we have allowed them to capture as much heat as possible from the low-angled winter sun, providing more hot water for winter space-heating needs. This same orientation minimizes the risk of overheating from the high-angled sun in the summer, when less hot water is needed.

In year-round simulations for Austin, Texas, the solar collectors produce an average of 75% of the house's required hot water supply (80 gallons per day at 120° F). In simulations for Austin for November through February Austin simulations, the system provides at least 92% of domestic-use and space-heating hot water needs. Additionally, October simulations for Washington, D.C. show that 87% of required hot water needs will be met by our solar collectors.

During the competition, the tubes will be protected from damage by a shatterproof transparent covering on the north side, and roped off and attended by a team member on the south side. All exposed solar loop piping will be covered with a safe-to-touch layer of insulation.



Twin Coil System

The solar collector closed loop transfers the collected thermal energy from the evacuated tubes to one of the two heat exchangers in the storage tank. The hydronic fan coil loop, also a closed loop, is connected to the other heat exchanger in the tank. Stored hot water, up to 180° F, is carried to the fan coil, where a centrifugal fan moves air over the heated coil, providing comfort heat for the house.

From the storage tank, a thermostatic mixing valve and the electric instantaneous hot water heater work to balance domestic hot water to 120° F, assuring availability of safely heated water at all times. The hot water travels through a plumbing manifold with dedicated 3/8" PEX lines to appliances and faucets. Additionally, the house design minimizes plumbing runs, with all plumbing fixtures adjacently situated along the west walls. Together these design choices decrease heat loss, boost the overall system's efficiency and save water due to the short hot water "wait times" at the faucet.

If the hot water tank temperature reaches above 180° F, an automatic diverter valve directs the solar collector loop to a secondary closed-loop heat dump – a long copper coil running through a tertiary tank beneath the house. In the house's permanent installation, this loop may be buried or run through a pool or pond.

