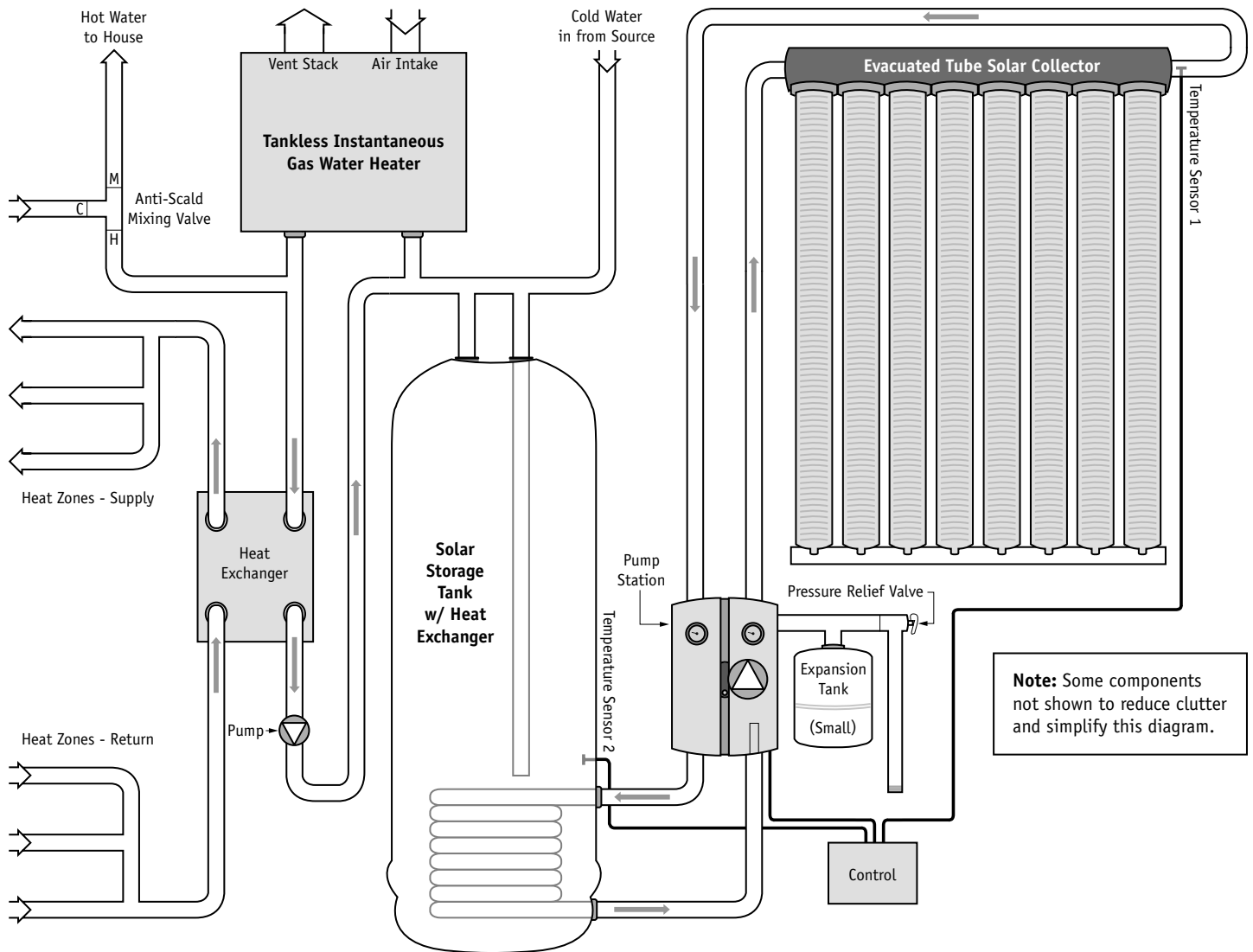


# Eco-Home at Hawk Ridge

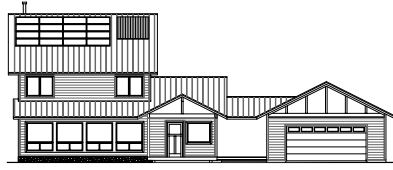


A solar model demonstrating energy efficiency, renewable energy and green building

## Schematic Diagram : Solar Hot Water System



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## Solar and Hybrid Mechanical Systems

The high-performance envelope design and detailing (including extensive energy calculation and analysis) resulted in a home with extremely low heating requirements. The estimated annual heating consumption of 25.4 million Btus is about a third of the energy that would be used in a house built to standard MN energy code. Typical residential heating systems are built to a peak design heating load of about 25-30 Btu/sf; the Eco-Home has a design heating load of 8 Btu/sf. This very low heating requirement led to an innovative heating system design responding to the conservation goals of the home.

The Eco-Home has a “hybrid” mechanical design, where an integrated system provides both heat and domestic hot water. It is a combination of very current technologies, high energy efficiencies, and renewable energy. It is a reliable whole house system; unusual in that it operates without a conventional boiler or furnace, but it uses technologies and operations that are easily understood.

### The Domestic Hot Water / Heating Plant

A roof-mounted solar thermal array heats water in an 80-gallon storage tank by circulating a heat transfer fluid through a double walled heat exchanger in the bottom of the tank. As hot water is drawn from a faucet or shower the water temperature is boosted as needed by a natural gas on-demand water heater. The on-demand water heater thermostat is set to approx. 120 degrees F. When there is a need for hot water the water leaves the storage tank and runs through the on-demand heater. If the water is not as hot as the set temperature, the heater fires to “boost” the outgoing water to the required temperature. If the water in the tank is hot enough, the water heater shuts down and the water flows on through the distribution system. If the water in the tank is hotter than desired an anti-scald valve mixes in cold water to maintain a safe and comfortable temperature.

### The Heat Distribution System

There are two heating zones in the home, each with a different distribution system. When heat is needed in one of the zones, a pump circulates water through the on demand heater and a double walled flat plate heat exchanger that transfers energy to the distribution system.

- **Zone 1** - In-floor hydronic radiant heat runs throughout the first floor slab, and also in the second floor bathroom.
- **Zone 2** - Warm air is heated with a water-to-air heat exchanger and circulated to the second floor bedrooms and study through the heat recovery ventilation system.

### Local Renewable Stored Energy

A small wood stove in the living room provides additional space heating for the open areas of the first floor. The addition of space heat on the first floor provides a “quick heat” option when occupants want a faster response time than radiant floor heat typically provides. The wood stove alone is capable of heating the entire house.