

174 Barberry HVAC System Overview

Energy Strategy: Electricity is far more expensive than natural gas, so minimize electricity use and defray the electricity cost with solar panels. Solar Panels are a no-brainer if you can keep the power company from cheating you. See: <https://www.otis-barn.com/solar-panel-arbitrage>

Heat, Ventilation and Air Conditioning is provided to the House by means of a 4 ton air handler with a water coil fed by a 50 gallon insulated plastic water tank.

The water tank handles hot and cold water provided by the geothermal heat pump to provide heated and cooled air to the house by means of the water coil in the air handler. The water tank also contains a heat exchanger which provides the tank with heated water fed by a 50 gallon natural gas hot water heater (HWH) which is Stage 2 heat for the building.

Stage 1 heat for the building is provided by a Vermont castings gas stove located on the ground floor which is controlled by a thermostat on the opposite wall. The room is strategically located directly below the living area and directly in the flow path of return air coming down the staircase and going toward the air handler to be circulated through the house. This is the first heat distributed to the house and normally set for 70 which is the desired temperature in the living spaces and is controlled by the thermostat in the room. Once it starts heating in the fall it stays on all winter, controlled by the thermostat in the room.

Note: The door at the bottom of the steps should never be closed as it is in the direct flow of return air for the building. An easy option is a new fully louvered door which would provide the needed air flow for the air handler.

Stage 2 heat is provided by the 50 gallon HWH located in the utility room. Hot water is circulated to the water tank (housing a heat exchanger) to maintain a 100 degree tank temperature, which provides hot water to the air handler which is controlled by the thermostat in the dining room.

Stage 3 heat would be the gas stove in the Dining/Living area. This should be used as finishing heat and not operated on a full time basis, local on/off.

Stage 4 heat would be the Geothermal heat pump running on electricity controlled by the thermostat in the Dining/Living area which was viewed as an unnecessary electrical expense to the owner.

In-Floor hydronic heating pipes are installed throughout the basement level of the house and were used from time to time to study how efficiently heat was generated into the living space from the hot water provided to the In-Floor system and the results were always the same, it took far less hot water to heat the air in the building than it did the concrete floor so it was not explored further.

Air Conditioning is handled by the Geothermal heat pump controlled by the thermostat in the Dining/Living area. In the hottest weather the 4 ton Geothermal heat pump struggles to keep the 7000 sf of conditioned floor space cool. The previously planned solution for this situation is the installation of a second air handler, a new conventional 3-4 ton heat pump in the Farmhouse Module controlled by a new thermostat installed in the Farmhouse Module. The install requires minor ductwork alterations.

Once the addition of a second air handler occurs in the Farmhouse Module, almost ½ of the required heating/cooling load is removed from the HVAC system of the One Floor Living Module.

On In-Floor Heat: The house has relatively small heating and cooling loads for such a large house and the current HVAC system is sufficient to properly heat and cool the house. However, if the new homeowner has experience with In-Floor heat, and decides to add a gas boiler to make the In-Floor system operational, it could be done at relatively low cost.