

Eco-Home at Hawk Ridge



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

Calculated and Planned Energy Performance

The Eco Home's energy efficiency and operating performance wasn't left to chance. Instead of choosing wall systems, windows, insulation types and other items based on currently popular products and marketing promotions, these systems, components and air tightness goals were all chosen as part of a planned and modeled approach to select, predict and quantify the end results.

The process was part of a larger effort that started by trying to identify and quantify several things:

- What problems needed to be solved
- What level of performance would be required to address those needs
- What other concerns came into play
- What products, systems and techniques were available to satisfy the items above and how much of them were needed.

The environmental impact and ongoing costs related to buildings in our climate are dominated by energy consumption. This includes the energy and other resources embodied in the materials and site work needed to construct the building, as well as the operating energy consumed during its useful life. While we kept an eye on the embodied energy piece we carefully modeled and quantified the operating energy loads using a computer based energy modeling program. All surface areas of the exterior building envelope, the layer that separates conditioned space from the outdoors, were calculated and entered into the program along with the corresponding R-values and U-values of the assemblies of materials used.

This modeling process produces a number of results. Most used in this case were the reports that calculated peak heating load of the home as well as the predicted annual heating energy consumption. Each of these results was given as a total as well as broken down by major building envelope area. These areas and components included:

- Ceilings / roof
- Rim / band joists
- Above grade walls
- Foundation walls
- Doors
- Windows / skylights
- Slab floors
- Infiltration
- Mechanical ventilation
- Internal gains (negative number)
- Total peak load / annual consumption

The results of the peak load modeling help us to predict the amount of heat needed in the home and in individual areas. By breaking the load down to various components we are able to enhance the design process by focusing our efforts to increase performance levels to those areas that represent the largest heat loss and most room for improvement. In most new homes air leakage, heat loss through exterior walls and window losses represent the largest loads and so the most room for improvement. Once the computer model is developed it is fairly easy to try changing various insulation and other performance levels to see what impact that has on the results. This is a very powerful tool to help us make decisions about various choices in walls systems, insulation, windows and other components.

The annual consumption results help us to quantify operating costs, environmental emissions from heating energy consumption and payback on various measures. As we change systems in the model we can immediately see the impact on annual energy consumption, environmental impact, operating costs and payback of various approaches.



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Calculated and Planned Energy Performance (Cont.)

The modeling and quantification process on this project resulted in the following performance levels:

Feature	Code Built	Eco-Home
Foundation	R-10	R-20
Walls	R-19	R-36
Rim	R-19	R-31
Attic	R-38	R-60
Windows	U=0.35	U=0.18-0.21
Air infiltration	0.6 cfm/sf	0.12 cfm/sf
HRV efficiency	70%	90%
Peak heating load	36,600 Btu/hr	17,200 Btu/hr

Goal 1 - Energy Efficiency Defined at the Eco-Home

Code house needs 73.1 MMBtu annually, or 18 Btu/hr/square foot

- At \$1.30/Therm= \$950/year

Eco-Home needs 25.4 MMBtu annually, or 8 Btu/hr/square foot

- At \$1.30/Therm = \$330.00/year
- About 1/3 the cost of the code house

We will be carefully monitoring the actual performance of the finished home to compare those real world results with our modeled performance predictions.