

CASE STUDY:

Passive House and High-Performance New Construction

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A high-performance home provides year-round comfort, a constant supply of fresh air and a significant reduction in energy costs. Developed over the past 40 years, the Passive House standard offers a rigorous approach to building a high-performance home.

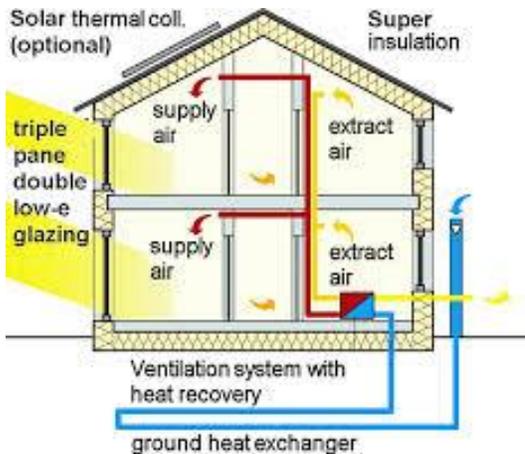
Passive House structures share three core elements:

1. A super-insulated, air-tight thermal envelope.
2. Highly efficient windows.
3. Mechanical ventilation with heat recovery.

Achieving the Passive House standard requires careful attention to detail and the latest building science advances. As insulation and air-sealing specialists, Snug Planet's building analysts and installers have worked with local builders on several Passive Houses in the Ithaca/Tompkins area.

The following stories highlight Snug Planet's role as installer, advisor and collaborator on construction projects that far surpass conventional energy standards.

What is a Passive House?



According to Passive House Institute US, “a Passive House is a very well-insulated, virtually air-tight building that is primarily heated by passive solar gain and by internal gains from people, electrical equipment, etc. Energy losses are minimized. Any remaining heat demand is provided by an extremely small source. An energy recovery ventilator provides a constant, balanced fresh air supply. The result is an impressive system that not only saves up to 90% of space heating costs, but also provides a uniquely terrific indoor air quality.”

www.passivehouse.us



TREE Neighborhood at EcoVillage

The new homes in EcoVillage's third residential neighborhood (TREE) are shaping up to be some of the most comfortable and energy-efficient buildings in Tompkins County. Several homeowners have opted to build their homes to the Passive House standard. Snug Planet's building science team helped the designers develop construction details to achieve extreme air-tightness and high insulation levels while keeping within a budget.

The Snug crew insulated new TREE homes with a combination of cellulose insulation and spray foam. Residents can expect to see at least a 60-70% reduction in overall energy use compared to homes built to current codes. The Department of Energy plans to track energy consumption in the TREE houses to better document the environmental and economic benefits of this cutting-edge approach.

Downtown Ithaca Home

With a background in natural building and energy efficiency (including time as a Snug Planet installer), Craig Modisher founded Ironwood Builders to guide clients through the homebuilding process from concept to completion. His passion for ultra-efficient homes has led his company to specialize in Passive House design and construction. A recent downtown Ithaca project (photo, right) highlights Ironwood's meticulous approach.

Recognizing Snug Planet's experience, craftsmanship and professionalism, Ironwood contracted Snug to install densely-packed cellulose in the walls and loose cellulose on the ceiling. The building shell is super-insulated and carefully air-sealed to achieve excellent R-values (R-30 slab, R-55 walls and R-90 ceilings).

The results are impressive. Environmentally-friendly cellulose, recycled foam insulation, and extreme airtightness keep the house comfortable year-round. Fresh air and exhaust are provided by an energy recovery ventilator (ERV) that captures heat and regulates humidity. The house has no central heating system or gas meter. Instead, heating and cooling demands are met by a ductless electric heat pump system. Triple-paned windows optimize passive solar gains and provide abundant natural light. Locally grown and milled hemlock siding complements the classic design.

After careful attention to detail during design and construction, this house is poised to meet all of its energy demands with the solar panels on its roof.



What is ACH50?

ACH50 provides a measure of building air tightness. It stands for "Air Changes per Hour at 50 pascals," and refers to the number of times per hour that all of the air within the house is exchanged with outside air during a blower door test.

You might expect a typical existing home to leak at a rate of 15 ACH50. New York State code requires new homes to be built to 7 ACH50. The Passive House standard requires an air tightness of 0.6 ACH50 or less—more than 10 times tighter than code! Snug Planet's team has extensive experience meeting this standard with a variety of techniques and materials.

Craft Studio and Retail Space

Across from EcoVillage's new TREE neighborhood, another low-energy building is under construction. Local carpenter Otto Ottoson is working on a workshop and retail space for his wife Graham O and other local artists (see rendering, lower right).

Ottoson originally contacted Snug Planet with a tricky building science problem: how to block air and control moisture movement through the walls. Sheetrock typically serves as an air barrier in new construction, but Ottoson chose to forgo interior sheetrock in favor of custom wood paneling.

Snug Planet recommended and ultimately installed an "intelligent" membrane that blocks air leaks, controls vapor movement, and holds cellulose in the 12" walls. Ottoson was pleased with the multiple functions of this product, which allowed him to move forward with his custom interior finishes.

After attaching and sealing the membrane, Snug's crew installed dense pack cellulose insulation in the walls and attic.

While Ottoson was not originally aiming for the Passive House standard, his structure will achieve a similar level of performance. Instead of a central heating system, a ductless heat pump will provide year-round comfort. With no on-site fossil-fuel use, it will be possible to meet the building's energy needs with renewably-generated electricity.

