

**Passive House Buildings**  
*NEW ENGLAND  
FORGES AHEAD*

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Cover: Friends School of Portland, Photo by © David Kurtis [WWW.DAVIDKURTIS.COM](http://WWW.DAVIDKURTIS.COM)

# Maine Passive House

The custom homes that Jesper Kruse of Maine Passive House builds are almost all Passive Houses, ever since he first heard of this approach during a year-long sojourn in Denmark in 2007.

“Once I heard 80-90 percent reduction in heating energy consumption,” says Kruse, “What is there to talk about after that? It is so obvious that’s where we need to be headed. I have children. I know about climate change.”

He returned to Maine, took the first PHIUS training in Urbana, Illinois in 2008, and then the market crashed. In a way that was a benefit, as the relatively slower work pace gave him plenty of time to research how best to design and build Passive Houses in his extremely cold climate.

Today, in initial meetings with clients, Kruse may not necessarily lead with Passive House. Instead, he stresses that his buildings are simply superior products—more comfortable, healthier buildings with lower energy costs—a difficult proposition to turn down. Yes, his way of building will cost a little more, but that increase will be made up by energy cost savings. “I don’t have to make a big deal out of it,” says Kruse. “It’s a no-brainer once I talk to them.”

In this climate, the guaranteed comfort is a strong selling point, as is a Passive House’s resiliency. Knowing that the pipes won’t burst even when the power goes down in the middle of winter provides an invaluable level of security, especially for homeowners who might be in sunnier climes when the storm hits. For some of his clients, especially those nearing retirement, lower energy costs—and particularly their predictability—are a huge incentive.

To be accurate, not every custom home he builds meets all the Passive House criteria. Six out of the last nine he has built did, and the other three were close; he always accommodates his clients’ preferences.

In previous years most of his clients were the homeowners. Today, as his firm and the high quality of its work have become better known, roughly 50 percent of his work comes from architects who have learned that this five-person firm will deliver the high-quality homes they envisioned.

With two Passive House consultants on staff, Maine Passive House also does consulting for other builders, working out tricky Passive House details. Although Kruse spends more of his time in the office, he’s not always indoors. “I’m still out there cracking the hammer,” he says, laughing.





## Rowe Hill ENERPHIT Greenwood, Maine

### TEAM

**Builder, Designer, and  
Certified Passive House  
Consultant**  
**MAINE PASSIVE HOUSE**

There's an old saying that "the cobbler's children have no shoes." A variation that applies to the construction industry might be "a builder's house is never finished." That adage fits Jesper Kruse of Maine Passive House, for the moment anyway. He and his wife built their 2,000-ft<sup>2</sup> house around the turn of the century before he switched to building Passive Houses. Now, between client projects, they are renovating it to meet the international Passive House retrofit standard, EnerPHit, applying all of the experience he's gained from his new construction projects to meeting this ambitious goal.

Having built the home himself, Kruse already ensured that there is ample natural light in all spaces. A large deck off the living room allows him and his family to fully enjoy their views of the nearby mountains. In addition to the living room, dining room and kitchen, the first floor contains a large entry with a porch, a half bath, and a utility room. The second floor has three bedrooms and an office plus a full bath.

The original house was built with 2x6 walls sitting on a slab insulated with two inches of EPS, on top of uninsulated frost walls. They are slowly going around the house, one side at a time, upgrading each assembly. At the bottom, they are excavating around the foundation and insulating the footers. Although the frost walls and slab are not thermally broken, the difference in comfort from that one small upgrade is significant.

They are removing the existing cladding and windows, adding an air barrier over the existing sheathing, then bolting TJI's to the existing framing.

The walls go from 5 1/2 to 16 inches of dense-pack cellulose. The existing eaves are being removed, and the new air barrier is being wrapped up over the existing roof framing. New overhangs and eaves are bolted on and steel roof extensions are then added, allowing Kruse to reuse the existing metal roofing. There are plans for a new standing seam roof to be installed, when appropriate.

The windows are being replaced with high-performance triple-pane units that Kruse imported directly from Denmark. The couple's children are quite comfortable sitting in the new, deep window sills, even when the outdoor temperature drops to -10 °F. The home's mechanical equipment includes a mini-split for heating and cooling, an ERV for fresh-air delivery, and a solar thermal system for hot water.

In addition to improving the quality of their indoor environment, this project provides Kruse with other benefits. He can experience first-hand the Passive House benefits that his clients do. He has a demonstration house he can show to new clients, especially now when the differences between the old structures and the new are clearly noticeable. And, finally, he's walking the walk, not just talking the talk.

Rowe Hill EnerPHit, Photos by Naomi Beal Photography

## PRODUCTS

**Air/Moisture Control**  
**PRO CLIMA FROM 475**

**Ventilation**  
**LUNOS FROM 475**

**Insulation**  
**ROXUL**

**Heating & Cooling**  
**MITSUBISHI ELECTRIC US**

## PASSIVE HOUSE METRICS

<b>Heating energy</b>	9.3 kBtu/ft <sup>2</sup> /yr	2.7 kWh/ft <sup>2</sup> /yr	29.3 kWh/m <sup>2</sup> a
<b>Cooling energy</b>	1.0	0.3	3.2
<b>Total source energy</b>	24	7.0	75.7
<b>Air leakage</b>	1.0 ACH <sub>50</sub>		



# Hidden Lake

## PASSIVE HOUSE

### Otisfield, Maine

#### TEAM

**Builder and Certified  
Passive House Consultant**  
**MAINE PASSIVE HOUSE**

**Solar**  
**REVISION ENERGY**

This fairly rectangular, 2,200-ft<sup>2</sup> house near Hidden Lake was designed as a Passive House from conception. The occupants, a young family with children, moved to the town to be close to friends and foster a real sense of community. It seems to be working; their next-door neighbor and good friend ended up doing the house's timber framing. Along with pine board siding and extensive use of local wood, the overall aesthetic is comfortable and very compatible with the local architecture both inside and out.

The open floor plan includes all the expected common areas plus a full bath and a room that can be used as an office or bedroom. There is also a massage room for the wife's home-based business, which is flooded with daylight from a large window and sliding door. The second floor houses three bedrooms—two for the children and a master suite—and laundry facilities. There is an outside screened porch and a large, combined barn and garage with easy access from the house.

This was the third Passive House built by Maine Passive House. Based on their experiences with their first two, they had developed a reliable wall assembly: 2x6 stick framed walls with plywood sheathing and TJI rafters, stuffed with dense-packed cellulose, bolted on the outside. For this project they switched from a fiberboard weather resistant barrier on the outside to wrapping the whole house, including the roof, in an intelligent membrane with a high perm rating. This approach reduced construction time—and costs. The





foundation is a floating mat slab insulated with 10 inches of EPS rigid foam, another assembly that has become typical for them whenever the site allows it.

A solar thermal system reduces the energy they require for water heating. Jesper Kruse, principal of Maine Passive House, says that it's unlikely he will be installing another such system in a future project, because of the continuing downward trend in PV prices. Plus, solar thermal requires some amount of maintenance. The house includes the builder's typical Passive House mechanical details: mini-split heat pump, with upstairs and downstairs heads, for heating and cooling and a heat-recovery ventilator (HRV). If a system works, why change it? At presstime a 6.75-kW PV system was being added to the house—calculated to make the house net zero or net positive.

The occupants decided early on that they didn't want any exterior shading, despite being encouraged by Kruse to include it; their budget just didn't allow for shading at this time. After move-in Kruse wasn't surprised to find that they were experiencing some overheating problems, even though they strategically deploy nighttime ventilation as recommended. Since then, Kruse has helped the owners experiment with sun-blocking screens on the west-facing windows. This simple, inexpensive approach has helped tame their overheating issue.

## PRODUCTS

**Air/Moisture Control**  
**PRO CLIMA FROM 475**

**Ventilation**  
**ZEHNDER AMERICA**

Hidden Lake Passive House, Photos by Naomi Beal Photography

## PASSIVE HOUSE METRICS

<b>Heating energy</b>	3.9 kBtu/ft <sup>2</sup> /yr	1.1 kWh/ft <sup>2</sup> /yr	12.3 kWh/m <sup>2</sup> a
<b>Cooling energy</b>	1.2 kBtu/ft <sup>2</sup> /yr	0.4	3.8
<b>Total source energy</b>	19 kBtu/ft <sup>2</sup> /yr	5.6	60
<b>Air leakage</b>	0.34 ACH <sub>50</sub>		





# Newry PASSIVE HOUSE Newry, Maine

Passive House builders have a tendency to say that the first project is always the hardest. Once you're over that hump, you never turn back. Jesper Kruse of Maine Passive House fits that profile. His first Passive House taught him quite a bit, and he has never looked back.

His clients were "tree huggers in the best sense of the word," says Kruse. They embraced the Passive House concept and also asked for an adaptable, low-maintenance building that would support their active lifestyle. They got it all. In addition to their 2,200-ft<sup>2</sup> house, their property includes an attached barn large enough to park their vehicles and store skis, kayaks, and canoes.

## TEAM

**Builder, Designer, and  
Certified Passive House  
Consultant**  
**MAINE PASSIVE HOUSE**

**Designer**  
**GARLAND MILL  
TIMBERFRAMES**

**Solar**  
**REVISION ENERGY**

Their home's floor plan is designed for the future. The first floor is mostly open, except for utility and laundry rooms. Anticipating the day when the homeowners might not be quite so mobile, the master suite and bathroom are also located on the first floor. The second floor contains additional bedrooms and an office.

The foundation is a load-bearing frost wall with a thermally separated slab inside the perimeter. Not a big fan of foam insulation, Kruse uses as little as possible. The slab has 12 inches; the frost wall 6 inches. For subsequent projects, Kruse has migrated to simple slab foundations. They're easier to do, less expensive, and use less concrete.

The exterior walls are a double assembly: a 2x6 plus an interior 2x4 with taped OSB on the inside as an air barrier. The cavity was filled with blown-in cellulose. The under-slab vapor barrier was wrapped up and around and taped to the OSB to complete the air barrier. Two-inch horizontal furring strips were added inside the wall to create a wiring chase. The roof is a combination of trusses and TJIs, also insulated with blown-in cellulose.

The all-electric house has a 6.1-kW PV system and a solar thermal system with electric backup for domestic hot water. Unlike many Passive Houses that use mini-splits for heating and cooling, the primary heat source is a wood stove, supplemented with electric baseboards on the north side of the building. This approach lets the occupants adjust the temperature levels in individual rooms as needed.

A heat-recovery ventilator (HRV) brings in a steady stream of fresh air. The HRV has a ground loop pre-heater running 300 feet out to the well, buried six feet down, below the frost line.

## PRODUCTS

**Air/Moisture Control**  
**PRO CLIMA FROM 475**

**Ventilation**  
**ZEHNDER AMERICA**

Newry Passive House, Photo by  
Carol Savage Photography

## PASSIVE HOUSE METRICS

<b>Heating energy</b>	4.75 kBtu/ft <sup>2</sup> /yr	1.4 kWh/ft <sup>2</sup> /yr	15 kWh/m <sup>2</sup> a
<b>Cooling energy</b>	1	0.3	3.2
<b>Total source energy</b>	24	7.0	75.7
<b>Air leakage</b>	0.53 ACH <sub>50</sub>		

“Once I heard 80 – 90 percent reduction in heating energy consumption, what is there to talk about after that? It is so obvious Passive House is where we need to be headed. I have children. I know about climate change.”

—Jesper Kruse, Maine Passive House

**The reasons for designing, building, buying, or renting Passive House buildings can vary: predictably low energy bills, superior comfort, outstanding indoor air quality, or reduced carbon emissions. For all these reasons the Passive House market in New England is surging.**

