

Passive House in The Woods

Hudson, WI

Single Family Building New Build

PHI Database ID#: 1770

Certification Goal:



Status: **Certified** (PHI, PHIUS+, and GreenStar Gold)

Size: 1,940 FT² TFA with One Unit

Description: The Passive House in the Woods is the first certified Passive House project in Wisconsin. Completed in 2010, it delivers monitored net-zero performance for all energy consumed on site.

DOE Climate Zone: 6a

Team:

Architect/Designer:

Tim Delhey Eian, TE Studio
<https://www.testudio.com>

PH Consultant:

Tim Delhey Eian, TE Studio
<https://www.testudio.com>

MEP Design:

TE Studio & Lufta

Structural Engineer:

Mattson MacDonald Young

Builder:

Morr Construction

Certifier:

Katrin Klingenberg
Passive House Institute - US

(PHIUS accredited Passive House (PH) building certifier until Nov 2011. Today PHIUS' building certification differs from the International PH Standard). This project is certified according to the International PH criteria.



Located in a cold western Wisconsin climate zone, this home features a 3-bedroom, three-story design with a walk-out basement, as well as a rooftop terrace. Located on the outer edge of a residential development, Passive House in the Woods provides stunning views of the St. Croix river valley, which get better higher one climbs in the home.



The goal, set by the clients, was to design to net-zero energy with access to just under 5kWp of solar panels and one hot water solar preheater panel. The design maximizes endurance while minimizing maintenance, using resilient insulated concrete form construction in conjunction with certified wood framing with steel structure where it counts.

Stormwater is meticulously managed on site to divert water away from the building and put it to use in the on site rain gardens. Parts of the site were restored using only native plantings, while other sections are dedicated to permaculture and organic food production.

Thermal Envelope

Ground:

102 mm (4") concrete slab on top of 304 mm (12") EPS insulation (030)
U-value = 0.097 W/(m²K)

Walls:

Insulated concrete form 11":
64 mm EPS (035), 150mm concrete, 64mm EPS (035), 279 mm (11") Sto exterior (035) insulation and finish system
U-value = 0.083 W/(m²k)

Roof:

EPDM reinforced rubber membrane over 305 mm (12") to 445mm (17,5") tapered polyisocyanurate insulation boards (023)
U-value = 0.06 W/(m²k)

Windows & Doors:

Entrance door: Optiwin Frostkorken door
U d-value = 0.62 W/(m²k)
Window: Optiwin, Alu2Wood (Alu2Holz) with triple-pane windows
U w-value = 0.82 W/(m²k)

Shading Strategies:

Exterior motorized shading by Warema

Mechanical Systems:

Ventilation:

Luefta, LS 300 DC-K tied to an earth loop system (ground-source heat exchanger) that can prewarm the incoming ventilation air in the winter and precool and dehumidify it in the summer

Heating:

In-floor electric heating mats by NuHeat. The client later retrofit 2 cold climate mini splits that now heat and cool the home. The original heating mats continue to exist and can be used in individual spaces as desired.

Cooling/Dehumidification:

Electric cold-climate air-to-air heat pump system for heating and cooling with electric in-floor mat backup

Domestic Hot Water:

Solar hot water collector on the roof with a storage tank, and an on-demand electric water heater to boost it the rest of the way to use temperature

Onsite Renewable Energy:

5kWp of solar panels and one hot water solar preheater panels

PHPP Values

Climate: cool-temperate	Heating Load: 18 W/m ²
Airtightness: 0.25 ACH50	Cooling Load: 6 W/m ²
Annual Heating Demand: 12 kWh/(m ² a)	PE Demand: 66 kWh/(m ² a)



The building envelope – which consists of exterior walls, windows, doors, basement slab, and the roof – was designed according to Passive House principles to radically reduce the amount of energy used to condition the building. Highly insulating assemblies – often referred to as super-insulation – were used, ensuring an extremely airtight building. The windows and doors used come with a very high solar heat gain coefficient (64%), triple pane low-E coated glazing, as well as insulated frames.



The Earth- and people-friendly palette was co-developed with expert interior designers at inUnison and dubbed “warm modern.” It responds to the client’s priorities for natural, healthy materials that age gracefully, making use of uncured earthen plaster, milk-paint, and wood harvested on site.