

Bozeman Passive House

Bozeman, MT

Single Family Building

New Build

PHI Database ID#: Pending

Certification Goal:



Status: **Pending**

Size: 3,200 FT² TFA with One Unit

Description: Bozeman Passive House is the highest-performing single-family home in Montana's Gallatin Valley, setting a new standard for single-family homes in the region.

DOE Climate Zone: 6b

Team:

Owner:

Alison Graham

Architect/Designer:

Love Schack Architecture
<https://www.loveschackarchitecture.com>

PH Consultant:

Lindsay Schack, CPHC, Love Schack Architecture
<https://www.loveschackarchitecture.com>

Builder:

CWJ Construction
<https://www.cjwconstruction.com>

Certifier:

Marco Filippi, Energy Plus Project
<https://www.epplus.it>

Thermal Modeling Consultant:

Emu Building Science
<https://emupassive.com>



Located in Montana, Bozeman Passive House is driven by the client's commitment to sustainability, which is integrated into every aspect of the home's design and function. The goal was to create an exceptionally efficient and resilient home by employing Passive House principles. As experts in Passive House design, Love Schack Architecture designed a sustainable oasis in the harsh rural Montana winters. This approach resulted in a highly insulated and airtight building envelope, which ensures stable indoor temperatures and significantly reduces the load on mechanical systems. The Bozeman Passive House maintained comfortable indoor conditions even during extreme -30-degree temperatures, despite the mechanical systems being turned off.



The airtight construction minimizes noise levels and enhances indoor air quality, particularly during Montana's wildfire season, when outdoor air quality can be compromised. The home's superior thermal comfort and air quality create a serene and healthy living environment year-round.

Comfort was also prioritized in the design. From the entryway, guests are greeted with an open-concept living, kitchen, and dining room, all engulfed by the wrap-around patio with views of the surrounding landscape. The completion of this project was a huge step forward in building science and trade skills in the rural Gallatin Valley, demonstrating that improved building methods and aesthetics can exist in the same home.

Thermal Envelope

Ground:

Slab on Grade: R49.2
Sealed 4" Concrete Slab per Structural: R0.07/in
Radon/Moisture Barrier Per Code
12" Rigid EPS Insulation: R4/in
Fill per Structural w/ Radon Piping System per Code

Walls:

Wood Lap Siding
7/16" Cor-A-Vent Rainscreen
4" Graphite Embedded EPS SIP Nailbase: R4.30/in (w/1 layer 7/16" OSB: R1.10/in)
6" Graphite Embedded EPS SIP Nailbase: R4.30/in (w/2 layers 7/16" OSB: R1.10/in)
1" Airspace filled w/ Dense Pack Fiberglass Insulation: R4.1/in
2x4 Framing Chase @ 24" O.C. w/3.5" Dense Pack Fiberglass Insulation: R4.1
5/8 Gyp Board: R0.9/in

Roof:

Standing Seam Metal Roofing
Underlayment per Roofing Mfr
3/4" Sheathing per Structural
Pre-Engineered Truss w/24" Heel Height & 24" Blown-in Insulation: R2.9/in (w/16" O.C. 2x4 Bottom)
Smart Membrane
5/8" Gyp Board: R0.9/in

Windows & Doors:

Optiwin Windows
Enersign Doors

Shading Strategies:

Interior Hunger-Douglas Shades
Exterior Wood Pergola on South and West elevations

Mechanical Systems:

Ventilation:

Zehnder ComfoAir 550

Heating:

Mitsubishi Electric Mini Split,
Baseboard Electric Heat back up

Domestic Hot Water:

Domestic Hot Water tanks in mechanical room,
instant hot water in kitchen and primary bath

Onsite Renewable Energy:

(30) REC Alpha Series 365-Watt Modules, Roof Mounted, 10.95 kW

PHPP Values

Climate: Cool-temperate	Cooling & Dehumidification Demand: 1.5 kBtu/(ft2yr)
Airtightness: 0.6 ACH	Cooling Load: 3.68 kBtu/(hr.ft2)
Annual Heating Demand: 3.56 kBtu/(ft2yr)	PE Demand: 25.67 kBtu/(ft2yr)
Heating Load: 5.10 BTU (hr.ft2)	PER Demand: 12.00 kBtu/(ft2yr)



The project exemplified the five key principles of Passive House building: solar orientation, high insulation, high-performance windows, air-tight enclosure, and balanced ventilation with heat recovery. This construction concept, which can be applied to any building, ensures up to 90% energy savings in heating and cooling while maintaining healthy air quality. Passive Houses are not just low-energy buildings. They also prioritize comfort, affordability, and ecological sustainability.



The building utilizes internal energy sources like body heat from residents and solar heat to achieve significant energy savings of up to 90% compared with typical building stock and over 75% compared with average new builds. The Bozeman Passive House's key features include structural integrated panels (SIP), fossil-free energy with all-electric appliances, and on-site solar energy production, an integrated design and construction process, and permaculture landscape design. The building achieves an outstanding level of energy efficiency, comfort, and health through its constant supply of fresh air and meticulous attention to air-sealing and insulation, keeping the heat inside during the winter and outside during the summer.