HOUSE IN LOW

OFF GRID, PASSIVELY-HEATED HOME ACHIEVES LEED GOLD

When you’re a long way from the amenities of civilization, employing both active and passive solar strategies can provide security, independence and just good living in general.

By Hillary Hosta
With their house near Low, Quebec, about three kilometers from the nearest paved road and hydro pole, Craig Anderson and France-Pascale Ménard had no option but to go for extreme efficiency in design, product selection and construction if they wanted to achieve LEED Gold. Built by Bala Structures of Wakefield, Quebec, and designed by Anthony Mach of Mach Design, Craig and France-Pascale went after that LEED Gold certification and got it.

The LEED system generously awards points for the type of transportation and service connectivity found in urban cores, so if getting yourself home requires the opening and closing of cattle gates, you’re not likely going to pick up points for being close to public transport. If despite your remote location, you still end up with a LEED Gold plaque on your wall, you’ve definitely gone the extra mile in designing your home for healthy, sustainable, efficient living.

The design for the house began with the basic principles of passive heating and cooling – invest in quality windows, face as many of them south as you can to maximize heat gain and utilize heavy duty insulation to capture that heat in the winter months.

Without blocking the low winter sun from entering, a large overhang and sun shades keep the high summer sun out to prevent overheating. This family also enjoys the comfort of supplementary heat from the wood stove and radiant floors, warmed by a propane boiler.

A double exterior wall system helps to reduce heat loss to a fraction of that being lost by most other new homes being built today.

**EXTERIOR WALL COMPOSITION - FROM INSIDE TO OUT:**
- Gypsum board with zero VOC paint;
- 2x4 stud wall at 24" centers as wiring chase, with R14 mineral wool batts;
- polyethylene air/vapour barrier;
- 2x8 stud wall at 24" centers with R28 mineral wool batts;
- 1-1/4" exterior mineral wool board, R5;
- plywood sheathing;
- house wrap;
- strapping;
- cement board siding.

**Building section:** double wall construction and highly-insulated roof
The benefits of a double exterior wall are plenty. This type of building envelope eliminates thermal bridging through studs, provides a lot of room for insulation, and the air/vapour barrier is sandwiched between walls where it won’t need to be punctured for electrical work, as all wiring is done on the interior 2x4 wall.

Not punching a ton of holes in your air barrier allows it to do what it is intended to do - stop air leakage - which commonly accounts for about a third of the heat loss of a home and creates significant risk of moisture damage inside walls.

The ceiling is a mix of mineral wool batts and cellulose, totalling R80. The basement is a mix of EPS foam and mineral wool batts totalling R28.

The insulating value of the wall adds up to R48.8 in total, which is about twice that of most provincial building codes. With framing materials factored in, energy modelling shows the effective or ‘true’ R value of the wall is 36.3. With heat gain from the sun and an airtight building envelope, the energy required to keep this house warm will be a fraction of what most houses use.

Within the circle of high-performance home construction, an effective R36 wall falls pretty much into what is known as the ‘sweet spot’ of design, meaning the optimum balance of energy efficiency and cost effectiveness, by investing in insulation instead of heat generation.

**ACTIVE SOLAR AND ENERGY EFFICIENCY**

The house is also powered by solar panels. When you rely on an array of photovoltaic [PV] panels to power your home there is an even stronger motivation to design that home with optimal efficiency in mind. Energy-efficient appliances and low-flow faucets reduce hot water requirements. With an emphasis on natural lighting, augmented by strategically placed LED bulbs, the house is kept bright with very little energy use.

After living in the house for some time, Craig Anderson said - "It feels different to live in a house that is both actively and passively solar powered; the path of the sun and the weather are central to our experience of living in this home. With the house situated perfectly on a solar east/west axis, we get the rising and setting sun shining through the length of the house on the spring and fall equinox. I know exactly when noon is without referring to a clock, as the sun is shining straight in from the south windows."

They also report needing to open windows as early as March when the days are warmer and brighter but the sun is still low in the sky and describe this as a “nice problem to have”.

Having lived in the house for a while, the owners are planning some upgrades:

- A small portable backup generator
- Additional PV modules to augment power supply. Changing the angle of the PV modules from 45 degrees to 65 or 70 degrees to eliminate the need for snow removal and accommodate more of the low-angle winter sun.
- Remote monitoring by using a cellular modem they connect to the internet while off-grid, enabling them to monitor their house from afar. Battery levels, generator stops/starts, pauses, even the temperature of their home is available to them wherever they are. Alerts for any kind of mechanical failure can also be set.

It’s easy to see how this beautiful home, with its high-performance and passive design scored LEED Gold despite its remote location.

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