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Sleek and modern, this energy-efficient kitchen takes center stage in Chicago's first LEED Platinum-certified prefabricated home. For more information on prefab and modular construction, check out the full story on page 62.

PHOTO BY MIKE SCHWARTZ, *PREFABULOUS + Almost Off the Grid* (Abrams, October 2012)

Elegant Efficiency

Thoughtful design decisions turn a Montana stunner into an energy-efficient dream home. **PHOTOS BY HEIDI LONG**

above left: "Most homeowners that build homes of this size and caliber are mostly interested in the fit and finish of the house, not the performance, so it was surprising and refreshing to meet the Olsens," says Andy Fischer, production manager at Bigfork Builders.

above right: The home's timber frame allows for plenty of natural light to shine through the interior spaces. This is particularly helpful since no recessed lights were installed in any of the ceilings to prevent potential air leakage.

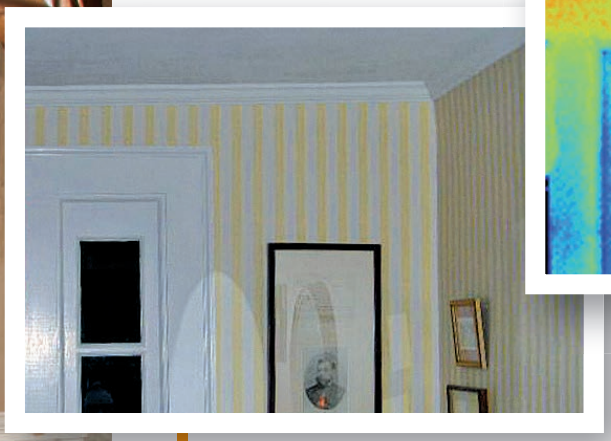
When Tom and Helen Olsen first met with the team at Bigfork Builders in Bigfork, Montana, they knew they were interested in building a smart, green-minded home, but no one knew just how energy efficient — and beautiful — the final product would become.

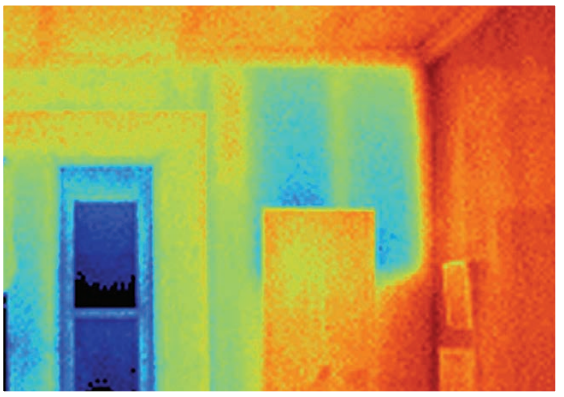
"When we first started talking with the Olsens about their goals and objectives, some of the first questions we asked were about the energy issues they wanted to address in their home," says Brad Reedstrom, operations manager at Bigfork Builders, one of the first builders in Montana to achieve the title of Certified Green Professional (CGP). "They made it clear that they wanted to build a

opposite: At 7,000 square feet, the Olsens' house reached LEED Silver standards thanks to design choices like the reclaimed wood that was used for the flooring and overhead beams.

above, left: Smaller high-performance windows or "sun tunnels," as architect Richard Smith refers to them, were incorporated into every little space in the house — even around the door frame and in hallways. The homeowners almost never have to use their indoor lights during the daytime hours.

Energy Star appliances and reclaimed overhead beams take center stage in the impressive kitchen, which features an ecclectic mix of materials and finishes.





Energy audits use infrared cameras to look for heat loss and heat gain.

WHAT TO EXPECT FROM YOUR ENERGY AUDIT

Whether you're building a brand new home like the Olsens or renovating an old house, look into getting an energy audit to assess the energy consumption in the structure. Professional auditors use a variety of techniques and specialized equipment to evaluate a building's energy efficiency, like blower doors, which measure the extent of leaks in the building envelope, and infrared cameras to pinpoint air infiltration. Audits also can determine the efficiency of your home's heating and cooling systems, show you ways to conserve hot water and electricity, and leave you with a to-do list of practical improvements you can tackle. Look for an auditor who is licensed or certified, and expect to pay between $250 and $450, depending on the service and the size of your home. Some utility companies also provide auditing services.

green timber-home product with a very tight shell."

To say that the Olsens, along with Bigfork Builders and their Whitefish, Montana-based architect Richard Smith, accomplished their goal would be an understatement. The proof of the finished 7,000-square-foot home's stellar performance came when the team had the home energy tested after the construction was complete.

"We hired a company out of Missoula, Montana, called Energetechs to come in and test the home," says Reedstrom. "They used infrared cameras to look for heat loss and heat gain, and also performed a blower-door test. At the conclusion, the auditor reported that it was one of the tightest homes he'd ever encountered. Considering the complex architecture and size of the home, it was really a remarkable feat."

To achieve the level of efficiency accomplished in the Olsen house, a geothermal heating and cooling ground with ten, 200-feet-deep vertical wells was installed on the property. All of the wood flooring and interior beams also were reclaimed from old, dilapidated buildings that the Olsens tore down themselves. Other major energy-efficient elements include:

Tight Envelope

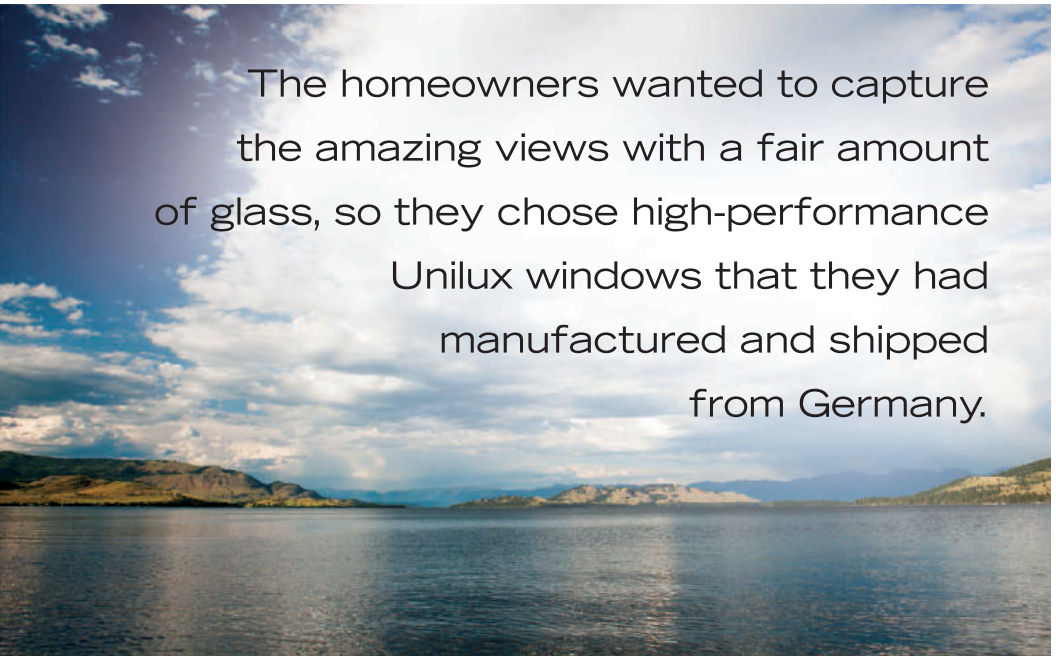
To achieve the Olsens' primary goal of a tight building envelope, the home's difficult site actually wound up helping quite a bit. "The house sits on a slope, so the lower main level of the home is partially positioned into the earth, providing natural insulation from the start," explains architect Richard Smith.

In addition, the building team paid careful attention to the home's insulation needs, says Andy Fischer, production manager at Bigfork Builders. Two inches of foam board were installed under the home's foundation slab and on the outside of the foundation walls, while three inches of hard-spray foam was added to the inside of the foundation walls. The above-grade walls have 1.5 inches of foam board on the outside and 2 inches of hard-spray foam on the inside cavities. The other cavities, as well as the roof, were filled with blown-in fiberglass bibs before the entire house was covered with two inches of insulated sheathing to eliminate thermal breaks. They also decided to not include any recessed can lights in the roof system, since those could be spots for potential air leakage.

Solar Gain

"When the Olsens first came to me, we assessed the property to see how we could site the home for maximum passive solar gain," says Smith, "but it was difficult because the site was facing north, which sloped down to Flathead Lake, so there was really only one way you could situate the home on the land."

To overcome this initial challenge, the team incorporated lots of windows where they could, including smaller windows (or "sun tunnels," as Smith refers to them) in the upper corners of the rooms to try to bring in lots of natural light so the homeowners wouldn't have to turn on lights often during the daytime hours. They also wanted to capture the amazing views with a fair amount of glass, so they chose high-performance Unilux windows that they had manufactured and shipped from Germany. Solar panels also were installed on the roof of the home, as well as on the site. EEH



top row, from left: The challenging lakeside site made it difficult to orient the house for optimum solar gain, but high-performance windows and a tight building envelope still made the home incredibly efficient.

"The house sits on a slope, so the lower main level of the home is partially posititioned into the earth, providing natural insulation from the start," explains the arhitect.

Beneath the home's stunning landscaping lies a geothermal heating and cooling source made from ten, 200-feet-deep vertical wells.