

Full Plane Passive House Achieves Energy Reduction with Ductless System

When Lisa Whitridge was planning her new home, she aimed high on the sustainability scale. Whitridge wanted the two-story, 1,950-square-foot house to comply with the Passive House standard, which focuses on an airtight building envelope, an approximate 90 percent reduction on space heating and an overall 60-70 percent energy reduction. The house also had to meet the more rigorous Living Building Challenge by achieving net zero energy, waste and water.

► Challenge

Finding an HVAC system that didn't require ductwork and would run efficiently at very low loads.

Builder James Ray Arnold, JRA Green Building, Portland, called this a "dream Passive House project" because of its ideal siting on a south-facing slope. In the winter, the concrete-slab first floor collects and slowly releases warmth from the sun streaming through three 8-foot-by-8-foot glass sliders. The building is constructed with thermally broken double walls creating a 12-inch-deep

Full Plane Passive House

Project Location:
Portland, Ore.

Completion Date:
August 2012

Project Team

Owner:
Lisa Whitridge, Portland, Ore.

Architect:
Departure, Portland, Ore.

Builder:
JRA Green Building, Portland, Ore.

Mechanical Engineer:
Imagine Energy, Portland, Ore.

HVAC Contractor:
Gensco, Portland, Ore.

Mitsubishi Electric Equipment Installed

(1) MXZ-2B20A M-Series Outdoor Unit

(2) MSZ-FE09NA Wall-mounted Indoor Units



cavity packed with cellulose insulation, resulting in R-values in the mid 40s, Arnold said.

This meticulously constructed dwelling has a low cooling and heating load—about 11,000 Btu/h. It required an HVAC system that could run efficiently at very low speeds, ruling out conventional forced-air systems. In addition, creating ductwork space within the walls would have been difficult given the complicated framing. Whitridge heard from a realtor, David Todd, who lived in Japan, that Mitsubishi Electric US Cooling & Heating Division (Mitsubishi Electric) ductless systems are widely used in Japanese homes, and that they rarely break down. "But I said I'll trust my contractor to hire the top HVAC people in Portland," she said.

JRA Green Building worked with Imagine Energy, Portland, to specify and install a Mitsubishi Electric ductless system with an INVERTER-driven compressor and two 9,000-Btu ductless indoor units—one on each floor. David Landau, project manager at Imagine Energy, said the Mitsubishi Electric ductless systems are the company's go-to choice for Passive Houses. "You get very high efficiencies for low loads and the units adapt well to the environment," he said. "The SEER ratings are as good as or better than the other products with INVERTER® technology. And the ductless system is nice because we need only a small amount of space to move the energy from the outdoor unit to the wall-mounted heads."

Another important factor led to the HVAC decision. In addition to energy-efficiency requirements for cooling and heating equipment, Passive Houses have source energy efficiency standards. For example,

► Solution

A Mitsubishi Electric ductless system helped the home achieve the heating reduction needed to achieve Passive House certification.

approximately one-third of the electricity a coal plant produces reaches the end user, Arnold said, and the Mitsubishi Electric system has a Coefficient of Performance (COP) between 250 and 300 percent. "The fact that it's almost three times as efficient as your typical 95-percent-efficient furnace helps offset the coal plant's inefficiency as well as transmission and grid losses," he said. "Thinking about the true calculation from power plant to house, we're hoping to achieve a 1-to-1 relationship, if not better."

Engineer Jonathan Cohen, who owns Imagine Energy, added that these indoor units have an infrared i-see Sensor™ that reads a variety of different surfaces to continually monitor room temperature and adjust it accordingly. "While other systems measure the air temperature coming into the unit, this one takes the average assessment of surface temperatures and knows what is needed to cool or heat the space," he said. Whitridge uses the equipment mostly for heating, as Portland summers are mild. "The units are mounted on the upper wall and are very quiet, and the temperatures feel even, not like a dry heat blowing around," she said.

The entire team was pleased that their goals for comfort, energy efficiency and quiet operation had been achieved. Landau also commented that Mitsubishi Electric and its local distributors are easy to work with in terms of quality, warranty and tech support. Cohen thinks so, too. "These systems offer great performance and reliability," he said. "It's pretty much the best equipment out there." ■