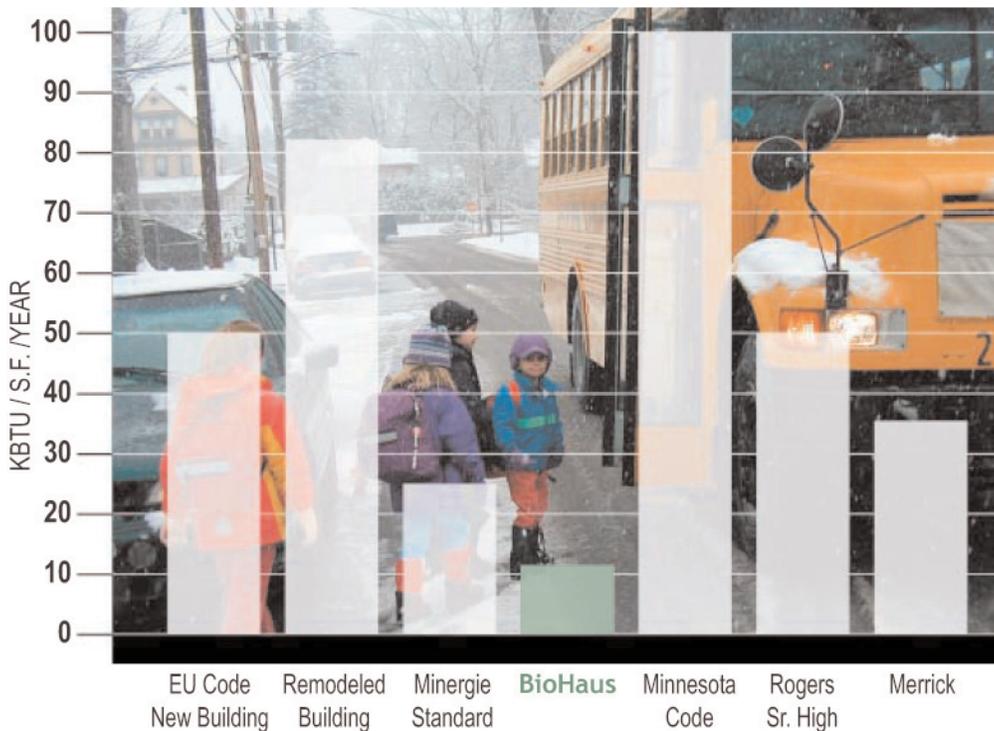


## PASSIVHAUS STANDARD VS. U.S. STANDARD COMPARISONS

A Passive house is a building that achieves high thermal comfort without installing an active HVAC-system for heating during the winter and cooling during the summer, according to the Passivhaus-Institut in Darmstadt, Germany ([www.passiv.de](http://www.passiv.de)).

Under the guidance of architect Stephan Tanner of INTEP, LLC, a Minneapolis- and Munich-based consulting company for high performance and sustainable construction, Waldsee BioHaus is modeled on Germany's Passivhaus standard: a highly-efficient building design (beyond that of the U.S. LEED standard) which improves quality of life inside the building while using 85% less energy than comparable U.S. structures.



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Passive building designs strive to minimize heat losses while optimizing passive solar gains. Application of this standard results in a building that requires space-heating energy of one BTU (see definitions) per square foot per heating degree day compared with about five to 15 BTUs per square foot per heating degree day for a similar structure built to meet the 2003 Model Energy Efficiency Code.

To achieve a Passivhaus certification three areas are tested and must be proven and maintained:

Specific space heating < 15 kWh/m<sup>2</sup>a = <4,760 BTU/ft<sup>2</sup> yr

Air tightness test result n<sub>50</sub> (Blower Door Test) <0.06h<sup>-1</sup> (The BioHaus required <0.46h<sup>-1</sup>)

Specific primary energy requirements <120 kWh/m<sup>2</sup>a = <38,000 BTU/ft<sup>2</sup>yr

The Passivhaus standard building-performance goals for Waldsee BioHaus were achieved through the use of primarily local building contractors and at least 85% of commonly available U.S. building components. A few German building components were imported to meet some of the very specific requirements of the Passivhaus standard and partially because sponsors made them available. These components primarily included vacuum-insulated panels, windows and a ground-to-air heat exchanger. Other than that, Waldsee BioHaus is an example of a highly energy-efficient building that can be constructed with domestic components.

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