

# MOTHER EARTH NEWS – ENERGY MATTERS

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## What is (a) Passive House?

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By David White

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Passive House is a specific approach to energy efficient homes, originating in Germany (*Passivhaus*). It has led to far more units of housing, at lower energy consumption (verified by measurement), than for any other design movement in recent history. Estimates range from 6,000 to over 15,000 units built worldwide, with a handful completed in the United States so far, under the guidance of the [Passive House Institute](#). The approach combines the Passive House Standard, which is the most stringent residential energy efficiency standard in the world, with the Passive House Planning Package, calculation software that accurately predicts the energy use of the proposed design while greatly simplifying the process.

### Passive House Design Principles

Although the Passive House standard addresses a home's total energy consumption, the core focus of its approach is to greatly reduce energy demand for heating. In Germany, heating is the bulk of the problem (as it is in most of the United States), and it's the issue that building design can do the most about (as opposed to electricity consumption by appliances).

Passive House is not limited to one climate type, and recent efforts are expanding its application to cooling climates. Heating energy savings are achieved using simple passive solar design principles (in fact, much of the research behind Passive House was conducted on passive solar work in the United States). The basic measures are:

- Super insulation, with careful attention to eliminating weak spots (thermal bridges)
- Extreme airtightness, at about one-third the air leakage of current U.S. best practice
- High-performance windows, with selection and orientation for passive solar heating in winter
- Mechanical ventilation, with highly effective heat recovery

The use of these simple, passive measures means that a Passive House is quite affordable compared to its peers. It also means that it won't "break." In the event of an extended fuel outage, it will maintain survivable — if not downright comfortable — temperatures.

## **The Passive House Standard**

The heating energy aspect of the Passive House standard is that the building shall demand no more than 15 kWh per square meter of heating energy annually (4.8 kbtu per square foot). Compared to existing housing in the Northeast, this is a savings of around 90 percent.

Why this metric? A common approach to making energy-efficient building more economical is to reduce heating needs to the point that some of the heating equipment can be eliminated, winning back some of the extra costs for insulating, air tightening, etc. This approach takes many forms, but the specific target for the original Passivhaus concept was to reduce the worst-case heating load to the point that it could be met simply by putting a small heater in the main supply duct of the fresh air ventilation system (not all Passive Houses are heated this way today). The outcome of meeting this target was that the annual heating energy demand of the house would end up around the 15 kWh mark. The resulting heating system is, in a typical German home or mid-20th century American home, equivalent in power to a small hair drier (or two small hair driers in a contemporary American home, ahem...)