

BLOG

Maxing out on comfort in Passive Houses

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Now that he's no longer "breaking bad," actor Bryan Cranston is reveling in the good green features of his beachside Passive House. He's just one star making room for Passive Housing. This isn't a celebrity-exclusive bandwagon, though. (It turns out that there are ways to add Passive House features to your own home, though they do require attention to detail.) We hopped aboard for our own tour of Passive Houses. Consider the following an open house to understanding the basics.



Credit: Fips via Wikimedia Commons

The Passive House approach

A Passive House is a building that meets a very particular energy efficient design standard. Developed by the [Passive House Institute](#), the Passive House standard is inclusive of all types of residential buildings and is based on the idea of using less energy to achieve a comfortable indoor environment all year. The Institute certifies Passive Houses in Europe and suggests that buildings that meet the Passive House standard use up to 60%- 70% less energy than those built to traditional building codes. In fact, a Passive House isn't certified until the owner submits one year of utility bills to confirm the building meets very low energy consumption standards.

The term passive refers to the absence of large, active heating systems and technologies in favor of maximizing passive solar gain (heat gained from the sunlight) and minimizing heating losses with an almost airtight design. While many details can work together to achieve that level of efficiency, a few key strategies stand out as the hallmarks of the Passive House:

A well-insulated and airtight building envelope - Ensuring a constant, comfortable indoor air temperature and humidity level with as little energy as possible requires decoupling indoor air from outdoor air. That separation is accomplished by meticulously insulating and sealing the building. Walls in Passive Houses are typically twice as thick as other buildings and are constructed to be almost completely airtight. The thick wall insulation prevents heat from escaping and cold from getting in. Air sealing and moisture management construction best practices, combined with controlled ventilation, help minimize indoor humidity levels. Exhaustive leak tests ensure an almost completely airtight seal.

Energy-recovery ventilators (ERVs) and heat-recovery ventilators (HRVs) - Controlling the airflow in and out of the building is also essential to maintaining a consistent, comfortable environment. Passive Houses always include ERVs and HRVs to provide fresh air from outside and exhaust stale air from inside. The Passive House Institute US, the Chicago-based nonprofit organization that offers certification in North America, says, "Basically, these systems remove the heating or cooling energy from tempered air inside and transfer that energy to the incoming air." The downside is that these systems can consume a significant amount of electricity and don't remove and transfer all that energy or heat from the inside air.

Heavy-duty, triple-paned windows - While Passive House certified windows are not mandatory for U.S. certification (they're more readily available in Europe), the Passive House standard recommends installing heavy duty triple-paned windows. These high performance windows are insulated (even the frames are insulated) and airtight. They offer much better insulation, air tightness, and durability than windows constructed to minimum code standards.

A focus on solar - Passive Houses are constructed to reap the benefits of solar energy – hence the name passive. The south side of the building is used to take advantage of passive solar gain. This side is often where you'll find the most windows, ideally within 5 degrees of true south. In addition, Passive Houses manage the solar gain with tiles and concrete floors that soak up all of this warmth and help distribute it. The windows on this south-facing side also provide the benefit of natural light during the day and reduced electricity costs.

House versus Haus

The Passive House standard, or *passivhaus*, has its origins with Dr. Wolfgang Feist, who was at the forefront of implementing the Passive House standard in Germany in the early 1990s.

The first [Passive House in the U.S.](#) (PDF) was built in 2003, and by many accounts, Passive House in the U.S. is completely separate from the standard in Europe. The Passive House Institute US (PHIUS) and the Passive House Institute (PHI) in Germany function independently, have different criteria, and offer their own certification. While they were once affiliated, as of 2011 that relationship ended; recognition of projects and professionals is completely independent to the certifying organization.

One source of the division is the difference in climate and resources between Europe and the U.S. Central Europe does not face the challenges of humidity like some regions of the U.S. Humidity is a significant factor that is preventing the standard from gaining much momentum. Building Passive Houses in the humid climate of the southeastern United States would require much more consideration toward adapting the standard. The Passive House standard is easiest to apply in the Pacific Northwest where conditions are most similar to those in Europe. (To view a list of certified PHIUS projects in North America, [click here](#).)

More importantly, however, is the hefty price tag. The Passive House standard in Europe is marketed as affordable by the PHI, whereas the PHIUS advises expecting to add an additional 10% to construction costs up front. *Some caution* against the standardization of the Passive House in the U.S. precisely because of the cost, saying it's a payback not worth waiting for. Others emphatically counter that notion. There are also others that champion the possibility of affordable housing being built to Passive Housing standards in the U.S.

Resources

A number of organizations and resources are out there actively discussing Passive Housing. Here's a small sample of them if you're interested in reading more.

Organizations

- [Passive House Institute US](#) is the site of the non-profit organization that offers certification in the U.S.
- [The Passive House](#) (PDF) is a primer on the standard from the Passive House Institute US.
- [Passive House Alliance United States](#) is a site launched by the Passive House Institute US to provide a community and network for resources on local chapters, certification, and case studies.
- [Passive House Institute](#) is the home of the independent research institute based in Germany.
- [Passipedia](#) is a wiki from the Passive House Institute.

Passive Houses in the U.S.

- [Chicagoland's First Passive House](#) is an article on the first Passive House in the Chicago area.
- [Have You Seen NYC's Very First Passive House?](#) is a look at a beautiful Passive House in Park Slope.
- [The Klinenblog](#) is a blog from the architect of North America's first Passive House.

Both sides of the Atlantic

- [No Furnaces but Heat Aplenty in 'Passive Houses'](#) is an article on Passive Houses in Germany.
- [The Passive House: Sealed for Freshness](#) provides a contrasting look at Passive Houses in the U.S.

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