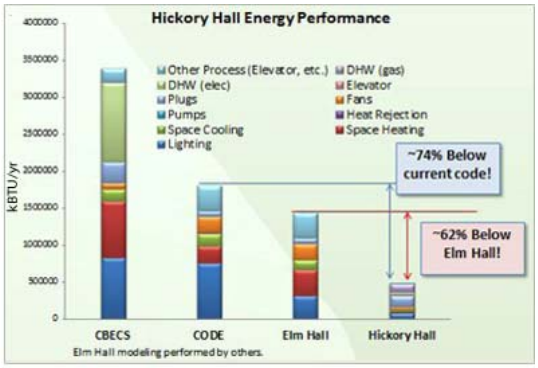
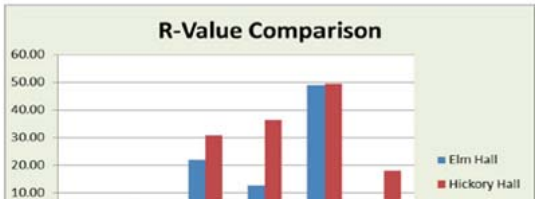
Modular Passive House Dorm Drastically Lowers Energy Consumption for University

When Emory and Henry University in Virginia wanted to save energy costs on a student dorm, they combined modular construction with a design method called passive house to construct Hickory Hall. Used widely in Europe, where it's known as "passivhaus," the method – in its simplest terms – involves making the building airtight so that energy is not wasted.

According to the Emory and Henry website, some of the factors contributing to the energy reduction in Hickory Hall include an innovative geothermal heating and cooling system that also provides domestic hot water, 90-percent efficient energy recovery ventilators, triple-pane windows, R-30 walls, R-50 roof, low-flow plumbing fixtures and high-efficiency lighting with occupancy sensors. Hickory Hall is modeled to use 74 percent less energy than code and 50 percent less than the university's Elm Hall, a modular dorm of comparable size and the second most efficient building on campus.





Shawn Torbert of Trespa, a company that supplies products used in passive house buildings, explains how the building envelope can make the difference.

"Trespa's drained and back-ventilated rainscreen cladding systems can accommodate a very robust exterior thermal envelope and continuous air barrier with minimal thermal bridging," he said. "Deep cavity systems from attachment system solution providers can accommodate a variety of continuous insulation thicknesses outboard of the structural wall. Additionally, by locating the

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insulating layer on the outside of the wall, thermal stresses on the structural element are reduced."

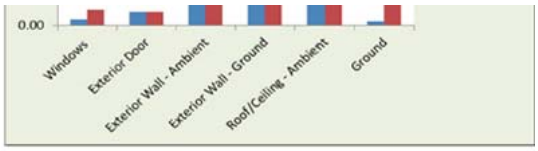


PHOTO CREDIT: PASSIV SCIENCE, LLC

According to Adam Cohen, a leading passive house expert in the US and the designer of Hickory Hall, building with passive house methods will reduce energy costs by 50 to 70 percent.

He bases these numbers on some recent passive house projects. His firm, Structures Design/Build, recently completed a dental office. An office of comparable size would expect their heating and cooling bills to run between $1200 and $1400. Instead, he said, they're operating at about $350/ month, which is on average, a 75 percent reduction. A recently built student center at Virginia Tech is producing energy bills of about $400/month as opposed to the expected $1500 – about a 75 percent reduction, he said.

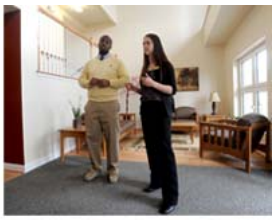
According to Adam Cohen, building with passive house methods will reduce energy costs by 50 to 70%... Facilities that are a good fit for passive house include retirement homes, dorms, office buildings and schools – any place where the owner has an investment in keeping energy costs down for the long term. However, you can apply the principles to any building.

No one can argue with the benefits of reducing energy usage for both the environment and the owner's wallet. But do the savings get negated by increased upfront costs in using this cutting edge construction method?

Cohen maintains that the method can actually save upfront costs, but says that the critical piece is that all parties be involved in the building design from the beginning and work on the project in an integrated fashion.

Modular construction helps facilitate that because most modular projects already use an integrated team. Also, with a modular process, the building is constructed offsite, under controlled conditions. "If done correctly, modular reduces the challenges of field implementation because much of the work is done in the factory. Modular is a future way to deliver passive house," Cohen said.

Another myth both Cohen and Torbert want to dispel is that a highly airtight building will result in poor air quality. "According to a USGBC white paper on national trends for high performance green buildings, indoor air can be two to five times more polluted than the air outside," Torbert said. "Since a passive house building is very airtight, it is essential to have proper ventilation for the number of people and types of activities in the facility."



Interior photos of completed Hickory Hall
CREDIT: BRISTOL HERALD COURIER

To ensure this, highly effective ventilation systems should be specified during the design phase to bring in fresh air and release polluted air. According to a passive house certifier in the United Kingdom, these Passive House Certified mechanical ventilation units are closely controlled to ensure the correct levels of ventilation. While the units are designed to garner the heat of exhaust air for use in the building, they do not directly mix the exhaust air with the fresh incoming air from the outside, helping to ensure excellent indoor air quality.

"It results in a building that's typically above ASHRAE standards," Cohen added.

While passive house building has been used far more extensively in Europe – in 2010, there were about 25,000 certified buildings there compared with 15 in the US – Cohen believes that the building method will become more popular in the US.

"It caught on in Europe as they learned that it works and reduces energy. I think we are five or six years from the inflection point in the U.S. By 2020, I think it will really start to grow," he said.

Facilities that are a good fit for passive house include retirement homes, dorms, office buildings and schools – any place where the owner has an investment in keeping energy costs down for the long term. But Cohen noted, "You can apply the principles to any building."

To learn more about how passive house concepts work, please visit the Trespa website or the Structures Design/Build website.

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