CLEARING THE AIR: THREE THINGS TO KNOW ABOUT PASSIVE HOUSE IN NORTH AMERICA

By Doug Steege (2015)

Introduction

At RenewAire, we've received many calls about Passive House for both commercial and residential buildings in North America. The certification is relatively new and is evolving, so it's no surprise that questions exist. In order to help clear the air on the topic, in particular regarding the certification process and ERVs, I've compiled below the three things you need to know about Passive House in North America.

Passive House Overview

Passive House is one of the highest standards for energy efficiency in commercial and residential buildings worldwide. With roots in Germany, the movement has been in the U.S. for many years and officially established a presence in 2007 with the founding of Passive House Institute US (PHIUS). Today, the German organization, Passivhaus Institute (PHI), and PHIUS are two separate entities.

PHIUS seeks to make high-performance passive building principles the mainstream best practice, and is the primary passive certification program in North America. A passive certification is unique from others, such as LEED and Green Globes, in that the focus is primarily on energy use, which means Passive House plays a complementary role to the other programs.

Three Things to Know about Passive House in North America

Although PHIUS's mission is clear, many misconceptions exist as to how passive standards can be applied in commercial and residential buildings alike. With that, below are the three things you need to know about Passive House in North America.

1. PHIUS+ 2015 Project Certification Requirements

The PHIUS+ Certification Program is the benchmark of passive building in North America since it combines a passive house design verification protocol with Quality Assurance and Quality Control (QA/QC). In 2015, PHIUS worked with the Building Science Corporation under a U.S. Department of Energy (DOE) grant to develop new standards reflecting different climate and market conditions in North America.

Below is a summary of the updated requirements:

1. **Criteria:** The PHIUS+ 2015 criteria include:
    1. Annual Heating Demand: ≤ A (kBTU/ft2.yr)
    2. Annual Cooling Demand: ≤ B (kBTU/ft2.yr)
    3. Peak Heating Load: ≤ C (BTU/ft2.hr)
    4. Peak Cooling Load: ≤ D (BTU/ft2.hr)
    5. Air-Tightness: ≤ 0.05 cfm/sf envelope @50Pa
    6. Primary Energy Demand: ≤ 6200kWh/yr/person
2. **Climate map:** All criteria are unique for different regions in North America, and the below overview and map show the cost-optimized performance formula targets for each region: PHIUS+ 2015: Passive Building Standard—North America
3. **Timeframe:** The "PHIUS+ 2015: Passive Building Standard—North America" was implemented for PHIUS+ project certification on March 16, 2015. For applications to the old standard, PHIUS will offer both certification paths until September 15, 2015
4. **Net Zero, Net Positive, U.S. DOE:** PHIUS+ 2015 enables buildings to attain Net Zero, Net Positive and U.S. DOE Zero Energy Ready status
5. **Future updates:** The PHIUS Technical Committee will update the formula every three to five years
6. **Pillar adaptations:** the three main pillars of the passive building approach underwent adaptations, including:
    1. The air-tightness requirement was reconsidered based on avoiding moisture and mold risk
    2. The The source energy limit was reconsidered based on the global CO_2 emission budget
    3. The space conditioning criteria were reconsidered based on economic feasibility

For more information, you can view the certification packet here: PHIUS+ 2015 Certification Packet.

2. ERV/HRV Modeling Protocols & HVI/AHRI Certifications

While there is no ERV/HRV certification program in North America (the only PHIUS product certifications are for windows), incorporating an ERV/HRV into a passive project is almost a de facto prerequisite in order to meet the program's high energy-efficiency standards. Therefore, the PHIUS Technical Committee recently released a white paper with updated ERV/HRV modeling protocols: PHIUS Technical Committee's white paper on ERV/HRV modeling protocols.

Essentially, the paper states that PHI heat-transfer efficiency ratings may be used, but that ERV/HRV certificate ratings from the Home Ventilating Institute (HVI) and the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) may also be incorporated. Each rating system has its strengths and weaknesses, but with proper energy impact analysis, any of the three rating programs may be used to achieve Passive House compliance and building certification.

Below is a summary of the updated PHIUS Technical Committee ERV/HRV modeling protocols:

1. **HVI Winter:** For units with HVI certification, use an adjusted SRE for winter performance by adding back the fan power to the SRE equation (add supply fan energy to the numerator, deduct exhaust fan energy from the denominator)
2. **HVI Summer:** For units with HVI certification, summertime performance shall be used for projects in climate zones 1A, 2A, 2B and 3B
3. **PHI:** For units with only PHI certification, use the PHI efficiency for winter performance, as long as the design airflow is within the range listed on the PHI certificate (summertime performance TBD)
4. **Manufacturer-only:** For units without HVI or PHI certification, use the status quo—"manufacturer's stated for efficiency (which is typically ASE), less 12 percentage points"
5. **AHRI:** For commercial units with AHRI certification, use the "Net Sensible" and "Net Latent" efficiencies from the AHRI-certified rating

For more information, you can view the PHIUS Technical Committee's white paper that's hyperlinked above.

3. DOE Zero Energy Ready Home Program & Energy Star for Residential Projects

DOE Zero Energy Ready Home Program Guidelines—formerly the DOE Challenge Home—has been recognizing residential buildings for their high levels of energy efficiency since 2008. A home of this type maximizes

energy efficiency to the point that a renewable energy system can offset all or most of the annual energy consumption.

Now, through a partnership between the DOE and PHIUS, when a residential home receives PHIUS+ certification, it simultaneously becomes a DOE Zero Energy Ready Home and obtains the Energy Star label as well.

Passive House and RenewAire

RenewAire ERVs are among the most efficient on the market today, and their application can be extremely effective in helping to meet strict Passive House energy-efficiency standards. The HVI Certified Products Directory is a valuable resource to select the most efficient models, and at equal airflow, RenewAire models are in the top group for both heat recovery and electrical efficiency.

In fact, out of the 380 ERV/HRV models in the HVI Directory, seven out of eight RenewAire ERVs rank in the top 20 if you take into account airflow rate by calculating the amount of energy each model recovers in one hour. Heat recovered per hour equates to energy savings, which equates to dollars saved. RenewAire's higher efficiency at higher airflow rates not only helps achieve Passive House certification, but also ensures the ventilation system is practical and will pay for itself in the shortest time possible.

A strong example of the application of a RenewAire ERV in a passive building is the Scranton Passive House in Pennsylvania. The 2,150-square-foot house uses a RenewAire EV200 ERV, which plays a key role in realizing the house's low energy bills of $200-$300 per year. The ERV is able to reduce energy use and costs by keeping airstreams physically separate while heat and humidity pass efficiently from one airstream to the other.

In Sum

Passive House energy-efficiency standards are some of the most stringent when it comes to maximizing energy use in commercial and residential buildings in North America. The certification program is evolving, and it's worth taking the time to understand how your project can qualify – and I hope this article has helped to clear the air. If questions still persist, in particular about ERVs, please contact RenewAire at 800.627.4499 or renewairesupport@renewaire.com.

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