

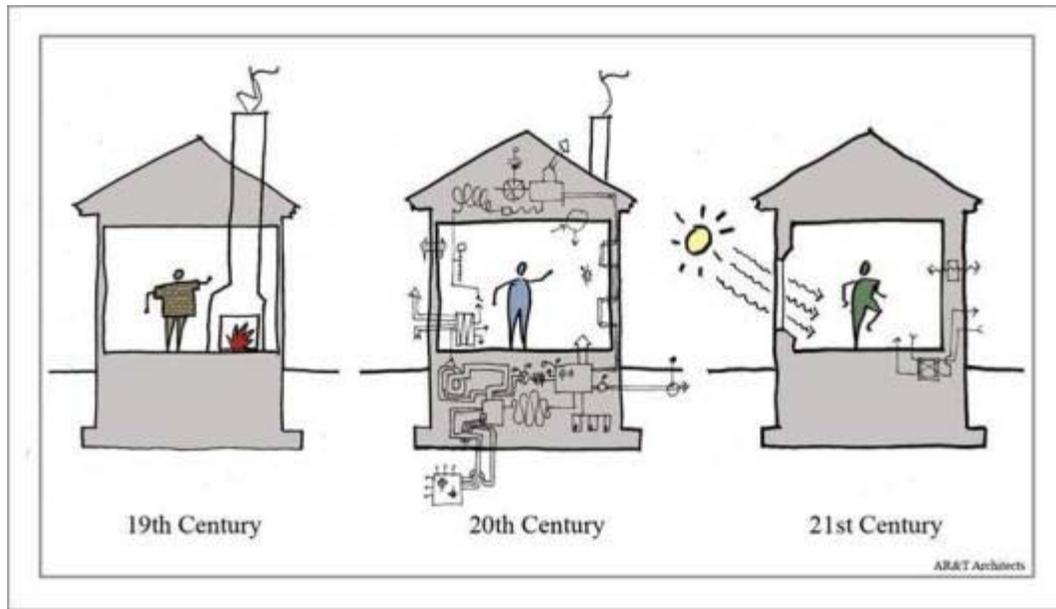
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Passivehaus to our Haus?

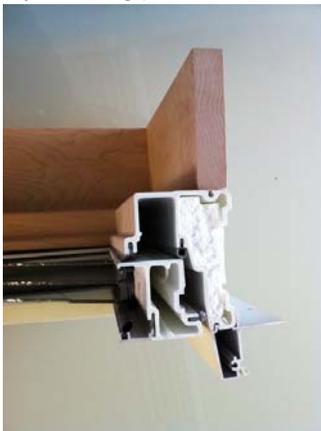
STEPHEN M. FREY



Why the funny title? Well, I went to a conference a few weeks ago in Burlington, Vermont and came away wondering if the Passiv Haus movement is really accessible to the mainstream. The phrase is a play on words from the presentation, "From Bauhaus to Passivhaus", given by Ken Levenson during the Better Building by Design Conference, hosted by Efficiency Vermont. A handful of presentations showcased Passivhaus projects and their innovative design process, as well as other super-low energy, net-zero projects. They brought together a variety of professionals and their case studies, working on opposite ends of the spectrum-- houses for the wealthy 'spare no expense group' and those working with Habitat for Humanity, 'let's figure out how to do this for everyone group'. Somewhere in the middle we will meet.



The current debate between engineers, architects, and building scientists is focused on how low is too low or over-the-top-excessive in home design and performance. And how can early adopters of Passivhaus and low-energy, net-zero home design move the residential market toward a more positive, energy-efficient and resource-conserving future? How can they replicate and expand their knowledge and experience to the community on a regional scale? That's what it's all about. How can we help soften the hard landing for coming generations forecasted by Bill McKibben in his book *Eaarth*? Well, I now have a deeper understanding of the issues at hand and passions uniting them. And, yes, there are some answers. There is hope. You can find hope in a renovation of an early modern Connecticut home designed by Ken Levenson Architects; a Habitat for Humanity home designed by J.B. Clancy of Albert, Righter & Tittmann Architects, Inc. who collaborated with Peter Schneider from VEIC (the mother company of Efficiency Vermont); and Preferred Building Systems out of Claremont, NH. This optimism extended into a presentation by Marc Rosenbaum from South Mountain Company, a noted energy design consultant here in the northeast and Building Science Corporation's Kohta Ueno. A palpable electricity of strong personalities and wonky cutting edge building science knowledge from the front lines pervaded the



room.

Starting with the bottom-line, let's look at super insulation recommendations for Passivehaus projects in our cold climate region. They range from R50-90 for roofs, R40-60 for walls and R30-50 for sub-slab insulation. Windows are R7-10. Such homes have extremely air-tight construction requirements needing to meet or be below 0.6 ACH@50CFM. High efficiency heat recovery systems need to be installed in rooms with return air back--less reliance on radiant-slab space heating and more on heating ventilation air with other delivery methods, as per the BSC Insight white paper 025. In his comparison between the Passive House Standard and other low-energy homes BSC has been involved with recently, John Straube writes in the paper that such houses "consume 40-60% more energy than Passivhaus but are more cost effective". (Cost-effective refers to first costs to build and the return on investment over the long-term.) They follow the BSC 5/10/20/40/60 building enclosure insulation recommendations: R5 for triple

glazed low-e windows, R10 sub slab insulation with R20 in conditioned spaces in basements, R40 above-grade walls and R60 for roofs. For BSC buildings insulation is installed on the outside of the framing. Like Passivhaus, air-sealing is fairly stringent at 3 ACH@50 Pa with some homes able to come in at half of that with additional detailing care. One challenge, when adopting either of these approaches to designing homes, is the very low air-sealing requirements that lead to towards simplifying building shapes and overall building form. More expressive building shapes and variations in form, such as extra dormers and protrusions complicate air-sealing detailing and construction and increase costs. This pushes designers to be more creative while working with simpler building forms. Another challenge is the need to limit window area in ratio to wall area. For Passivhaus it's not uncommon to have 9% on south facade and 1-3% window to wall ratios on other facades, thus dramatically limiting views and day light into spaces. The low-energy homes designed from the BSC perspective allow for a bit more flexibility in the window to wall ratios. Andy Shapiro of Energy Balance, Inc., a Vermont based energy consultant who has helped engineer and design many low energy homes, recommends that you plan for 10-15% window to wall area on the south, while keeping other facades as minimal as possible to function-specific glazing.



This controversy is

healthy for our industry and helps liven up the discussion about the need for the kind of design that appeals to consumers while protecting the planet. What everyone disagrees on is the degrees of difference in levels of insulation and how far to wean homeowners from fossil fuel-driven energy sources. Marc Rosenbaum, who wears many hats as an energy consultant, is a certified Passivhaus trainer. In his "How Low Can You Go" presentation he praised the system as a means to the end of getting architects, engineers, and builders as a way to learn how to design better, high performing, sustainable homes. He emphasized the power of the excitement and learning he's watched transform professionals and the communities when working with the Passivhaus standard. "It's important to consider that what is cost effective changes when you consider the big picture. It's not all about economics, but can be about our (shared) humanity," Marc added, quoting David Ward, who said, "Focusing on energy and climate change is a moral issue not only an economic issue today." Marc applauded Joe Listiburek, the founder of Building Science Corporation, who has had a profound impact on building design and engineering. For the last 20 years Joe has helped frame the discussion about building science and energy efficiency, bringing the topic to a wider audience. We're all grateful to him. As Marc noted, Building Science Corporation has recently updated and increased the stringency of its insulation recommendations for building enclosures, especially in the northeastern cold climate zones. And that the presence of the Passivehaus standard has helped push BSC to adopt the heavier insulation levels, tighter air-sealing standards, and

extremely low U-factors for windows. BSC and its Build America program is closer to the mass marketplace for housing. As far as he's concerned, upping insulation standards, doing better air-sealing, and using better windows is a great thing! There are degrees of payback and return on investment though. Kohta reframed the question, "How Low Can You Go," by asking "What is the best choice of use of resources on a global scale?" adding that at some point "those last few inches of added insulation levels and low-air sealing rates reach a place of diminishing return and a much longer payback". He asked some great questions such as "... is it helpful to ship super-high-performing R9-12 windows from Europe with all of the embodied shipping energy when you can install R5-7 windows made in North America?" Is the performance difference really worth it? Do you really need 16 inches of foam below your floor slab for insulation? Is this too much? Is this affordable and will it pay back over time? After seeing the PHPP (Passivehouse Planning Package) spreadsheets on multiple Powerpoint images, and hearing the passion of those in the audience about the Passivhaus process, I had to wonder if all that excruciating detail and input time is worth it and accessible to help mainstream this productive concept? To really drive the software and learn how to design with the system, you buy PHPP software for \$225 from passivehouse.us, then you need to attend one of their 9-day training seminars where you pay \$2,100 for full training, then you sit for a certification exam so when you pass it you can call yourself a certified consultant? Rather exclusive, don't you think?



As an architect

and business person I have seen the proliferation of new design approaches and standards requiring expensive specialized training, continuing education requirements, and project certification costs. I see shades of the USGBC, which is now a rather large and wonderful non-profit Green Gorilla, with its multi-billion dollar sub-industries. I'd like to see Passivhaus become more open source with free ware, free online training you can take via YouTube or other social networking sources. Rather than make it a profit and knowledge center for the few, what if it was freely shared and could really impact many? Give away Passivhaus to widely disseminate its great system for the greater good. That way, as Bill Reed so eloquently said in his keynote the day before, the system can "self-evolve". In recent conversations with J.B. Clancy, the architect involved with the Habitat modular house in Charlotte, Vermont, he mentioned some freely available resources such as the iPHA created passipedia, the PHIUS and the Passive House Alliance (USA). Perhaps the system is self-evolving after all. If you want to build a super-energy-efficient home with more window area to frame beautiful views and bring natural daylight inside, you can set a more reasonable building enclosure performance standard and invest a little more in heating equipment and possibly additional renewable energy sources to achieve zero energy use. It's all about finding balance and seeding hope for the future through dedicated action today, showing what is possible meeting budget and performance levels. As energy consultant Peter Schneider from VEIC a partner on the Habitat House said, "Their goal is to see the Passivhaus concept applied on a community scale." He noted that you can buy a Passive House Modular home design right now from Preferred Building Systems in New Hampshire. That's truly

remarkable! Stephen M. Frey, AIA, LEED AP, is owner and chief design catalyst at **arocordisdesign** in Montpelier, VT. He practices high performance workplace and residential design, while engaging greater community and sustainability concerns. He blogs regularly at www.designcultivation.blogspot.com and www.UpWorld.com about design innovation and many things green. Contact steve@arocordisdesign.com with any questions or comments. He's always looking for innovative ideas and great stories to tell which will help shape our world for the better.