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ECOBUILDING REVIEW

THE 2014 HANLEY AWARDS

Plus: Vision 2020 and the Greenbuild LivingHome

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Winter 2014

THIS YEAR'S VISION 2020 PROGRAM EXPANDS TO INCLUDE ALL BUILDING TYPES.

When we started our Vision 2020 program, we identified the year 2020 as the deadline by which our country must get solidly on track to meet Architecture 2030's carbon neutrality challenge. As we stare down that deadline, now just a few years away, we've seen progress we can take pride in. But much work still remains.

Some experts posit that our best efforts come too late—that climate change is now inexorable and irreversible. And what if this is so? Should we give up the struggle to improve how we build our new buildings and how we maintain, renovate, and occupy our existing ones? Nonsense. We are a country of visionaries and innovators. Our vision extends beyond 2020 or even 2030, for that matter. We will create new solutions to problems that now seem insurmountable. Our 10 expert advisers, in the pages that follow, help to illuminate some of the potential paths forward.

Complacency is the enemy. We must continue to fight to protect our environment like our lives and livelihoods depend on it—because they do. And this year, recognizing that we need to rally even more allies to the cause, we expanded our Vision 2020 program to encompass every building type, whether commercial or residential. Every building, every person, and every step toward sustainability counts—this we see with infinite clarity.

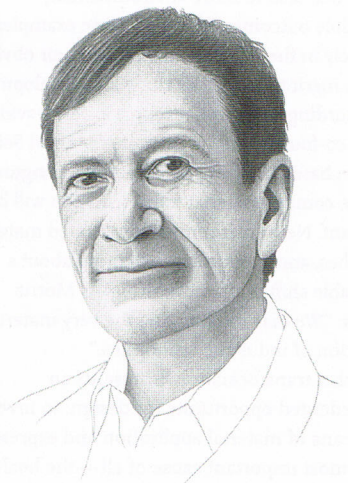
VISION 2020

Illustrations Denise Nestor

BUILDING DESIGN + PERFORMANCE

ARCHITECTURE, LIKE GRASS, COULD ALWAYS BE GREENER … LESSONS LEARNED FROM THE HUDSON PASSIVE PROJECT.

Text Dennis Wedlick, AIA



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Designing architecture that is better for the environment is an urgent but perplexing challenge. Architects have long known that it is our duty to design buildings that use less energy, because the carbon-based energy consumed by buildings is a large cause of global warming—second only to transportation but more culpable than manufacturing. Leading authorities on the impact of architecture on the environment, such as the United States Department of Energy, recommend many different energy-conservation strategies for greener architecture, including LEED, Energy Star, passive solar, Passive House, active solar, and net zero. These strategies provide guidelines for incorporating specialty technologies, techniques, and materials into the design specifications of buildings to reduce carbon-based energy use.

But truth-be-told, a healthier environment is rarely given priority over other programmatic requirements that make up the architect's commission, such as the client's aesthetics, functions, or desired completion date. So how do architects motivate their clients to invest in the time, effort, and specialties that are required of energy-conservation guidelines? We believe that finding hard evidence of efficacy is the first step, and this is the purpose of the research for our Hudson Passive Project (HPP). The HPP is an ongoing research project evaluating two highly commended energy-conservation strategies, passive solar and Passive House, to find evidence of efficacy.

When clients agree to pursue greener buildings, many small architectural practices like ours use the passive solar strategy. We find this approach to be straightforward and relatively low-cost to implement in the construction of single-family detached, low-rise multifamily, and small commercial buildings—the types of commissions our firm normally gets. Since 2007, we have been exploring a newer energy-conservation strategy called Passive House. We find this approach to be as uncomplicated as passive solar and a comparable cost to implement.

The purpose of our research is not a payback analysis of energy-conservation strategies; it is a comparison of efficacy. Given similar investments of time, effort, and money, we sought to determine which strategy will save the most energy and how they each compare to commonplace construction. Our method, then, creates two versions of a single design for an actual commission, each adhering to alternative strategies. HPP is a commission from a builder–developer for a custom-built, three-bedroom home in the Hudson Valley of New York. HPP Original is the initial version of the design, established from the client's programmatic requirements using specifications that suit passive solar guidelines. HPP Passive House, the first alternate design, modifies the original specifications to suit Passive House guidelines. These modifications are significant, but working with design software provided by the Passive House Institute US (PHIUS), we can calibrate the revisions so that there would be virtually no impact on the appearance of either the exterior or the interior of the building. A third version of the design, HPP Base Code, uses commonplace construction specifications instead of the specialties required by either energy-conservation strategy. We call it HPP Base Code because these specifications will conserve only the minimum amount of energy required by building code.

Using computer-generated energy models, we then compare the total energy use of all three versions. Once construction is complete, we also monitor the actual energy use of the building, which is built using the strategy that the energy models predict will result in the most energy conserved. For the Hudson Passive Project, this model was the HPP Passive House design.

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Our research is ongoing, but the evidence from the energy models and subsequent energy monitoring of the completed building is conclusive: HPP Passive House is far more effective in reducing energy use than HPP Original. Based on actual energy use, the alternative HPP Passive House design used 99 percent less energy for heating, 83 percent less energy for cooling, and 70 percent less energy overall than the original passive solar design would have.

This research is done in partnership with the New York State Energy Research and Development Authority (NYSERDA), a public benefit corporation with a focus on energy conservation. NYSERDA funds the important participation of the Levy Partnership, our New York–based building science team that assists with the specifications and reports on the results. With their help, we added three case studies to our research—a church for Kinderhook Seventh Day Adventists (KSDA) and two infill-housing projects for Columbia County Habitat for Humanity (CCH4H). As with HPP, these three additional case studies are built using the Passive House strategy because we were able to provide clear-cut evidence that this approach would result in the greatest reduction in energy use. HPP Passive House construction was completed in 2010 and became the first certified Passive House in New York state with an optimum air-tightness of 0.16 at 50 pascals. The KSDA Passive House church is under construction and will be completed in 2016. The first of the two CCH4H Passive House duplexes was completed in 2013; the second duplex is under construction and will be completed in 2015.

While the result of our first case study was conclusive as to the effectiveness of the Passive House strategy for our region, the second, third, and fourth case studies are revealing the importance of continuing our research. For example, energy models revealed that the Passive House specifications implemented for the church will considerably reduce its energy use; whereas, if the congregation had chosen to follow the original passive solar specifications it would have saved surprisingly little energy compared to code-minimum construction specifications. Furthermore, the figures allow us to demonstrate the dramatic reduction in CO_2 emissions for pursuing the greener architecture, figures we could not generate without this research.

In addition, consider the energy monitoring of our first CCH4H Passive House duplex. This building saved substantial heating and cooling energy in the first year, despite the fact that the project didn't qualify for Passive House certification because of a less-than-optimal air-tightness and air-exchange rate. Our research pinpointed not just the cause (i.e. good-however-not-good-enough air sealing combined with good-however-not-good-enough heat recovery ventilators) but also the effect that these shortfalls had on the actual energy performance (a 4 percent increase in heating and cooling energy use). Without this research, we couldn't have motivated the team to pursue greater efficiency with the next duplex.

In conclusion, discovering evidence of efficacy—such as a 96 percent to 99.9 percent improvement in reducing heat energy over conventional construction—certainly helps us motivate our clients to make energy conservation a priority and build greener buildings. We hope our ongoing research will encourage other architects to pursue evidence of efficacy so that our entire industry is motivated to meet the challenge of energy conservation with the greenest architecture possible.