Passive Without Compromise

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1 Introduction

Passive Without Compromise explores the impact that pursuing Passive House standards had on a mid-size architectural practice, their staff, and their consultants. Within the architectural community, there is a question as to whether or not pursuing Passive House standards will force the client, design team, or consultants to compromise the client's desired results or their preferred business practices. The paper will describe how and why Passive House is more than just an energy-conservation standard. It is an approach to design that has the potential for improving the services and results of an architectural practice while simultaneously allowing the nature of the business to remain the same, specifically with regard to the architect/client, architect/consultant, and firm/staff interactions.

BarlisWedlick (BW), a leading New York-based architectural/passive house design firm, and The Levy Partnership (TLP), a building science consulting firm, have been working together since 2009 pursuing Passive House (PH) standards on residential, commercial, and institutional projects throughout New York State. Early pioneers of PH, BW and TLP joined forces on one of the first PH case studies in the Northeast, later called the Hudson Passive Project (HPP). The project was awarded funding from New York State Energy Research and Development Authority (NYSERDA) for research, development, and performance verification. HPP ultimately became the first building to achieve PH certification in New York State and the 11th in the nation. Pursuing PH standards proved to be a transformative experience for both companies due to the valuable lessons it provided for the architectural and engineering professions.

Since its inception in 1992, BW has based their design aesthetics on their client's predilections, working in a wide range of styles. BW has always made it a point to work with their consultants during the earliest stages in order to assure the desired energy-performance. Often, BW would tap private commissions as case studies for new methods and means of engineering and building technologies such as pre-fab systems, active solar, and passive solar. Since 2009, BW has produced seven unique PH case studies --from affordable housing to high-end residential design to commercial and institutional buildings. For each case study, BW had the benefit of TLP consulting on high-performance technology, PH methods and means, and verification of energy-conservation results. Together, they sought ways of pursuing PH standards without compromising the client's stylistic preferences or their preferred business practices.

For BW, pursuing PH standards broadened the dialogue between the client and the architectural team as well as between the architectural team and their consultants because of the specificity of the PH guidelines and the strict quantifiable energy targets required for certification. This paper and the accompanying presentation will explore the resultant impact — what, if anything needed to be compromised — through a discussion of three Passive House-certified case studies in New York: a speculative home, a private home, and a church/community center. For each, the authors will discuss the

measured performance, the costs, the client's perceptions, productivity, quality of services, and good will. It will do so by focusing on three overarching questions as described below.

2 How did pursuing PH impact the architect/client relationship?

To answer this question, BW compares the impact of pursuing PH on three projects — a spec house by a developer (completed by subsequent homeowner); a private home by a homeowner, and an institutional building by a church congregation. The response and the satisfaction with the results varied significantly for each type of client. This is related to their original program goals and their energy-conservation expectations as follows:

- HPP — The initial developer undertook the project as a spec house. They did not aspire to achieve superior energy performance and assumed the cost would be higher, which to them was unacceptable. They abandoned the project. A subsequent developer built and personally occupied the home. They had low expectations for substantial energy reduction but were in the end extremely satisfied with the home. Initial Developer
- Fox Hall — This project was constructed as a custom home for the homeowner The homeowner aspired to achieve superior energy performance; assumed the cost would be higher, which was acceptable to him. He expected dramatic reduction in *total* energy use and was very satisfied with the result.
- Seventh Day Adventist Kinderhook (SDAK) Church — The congregation aspired to achieve superior energy performance; assumed the cost would be higher, which was acceptable. They had reasonable expectations for reduction in *total* energy use and were extremely satisfied by the result.

3 How did (a) using PH consultant as the Lead and (b) training staff in PH impact architect/consultant and firm/staff relationship?

To answer this question, we have compared the experience of the architectural team working on projects that pursued PH standards with projects that did not.

a. Efficiency and quality of service from consultants is improved with PH. Because pursuing PH holistically considers thermal, comfort and durability impacts, the interactions between the architect and PH consultant are much more intense and frequent. This is in contrast to a project seeking LEED or ENERGY STAR certification where the consultant may conduct an initial review of the specifications, make one set of recommendations and then conduct limited, focused field inspections. PH construction verification, being more comprehensive offers the team an added opportunity during the construction to make improvements when needed.
b. Efficiency, quality of service, job satisfaction, and good will for both PH and non-PH clients is enhanced by training staff in high-performance techniques, budgeting, and construction administration. With PH, BW learned that training, R&D, and architect/consultant collaboration at the earliest conceptual design stage is essential. Massing, orientation, and distribution of fenestration matter considerably. Preliminary thermal models provide actionable feedback to

planned construction specifications and proposed design changes without taking an undue amount of time and money to create. Furthermore, the team must explore construction specifications with a cost/benefit analysis such as minimizing thermal bridges and increasing R-values without spending excessive money to do so.

Note: We have provided our staff with a survey to substantiate the impact of PH on their work experiences. We will summarize our findings as part of our presentation.

4 Does pursuing PH force the client to compromise on the desired results? Does pursuing PH significantly improve energy-efficiency compared to BW non-PH designs?

Pursuing PH standards had minimal impact on the desired aesthetics of the three projects. Note that for all three projects, the desirable views were to the South, SE, and/or SW, which helped to alleviate any impact on the desired aesthetics when applying Passive House techniques. HPP and Fox Hall (Figures 1-5) achieved the style, layout, and fenestration as the program originally called for. Figures 6 and 7 illustrate the changes to the SDAK Church as redesigned to meet PH standards five years after the original design was approved and priced. There was no noticeable difference in the appearance and less than a 3% increase in cost. Both HPP and SDAK provided for a case study comparing projected energy consumption of the original designs, which were based on Passive Solar approaches, with the redesign to meet PH standards (Figures1 and 2).

5 Conclusions

In conclusion, pursuing PH standards did not force the client, design team, or the consultants to compromise on the client's desired results. Following is a summary of the impact of PH standards for HPP, Fox Hall, and SDAK Church:

- Overall Aesthetic: No impact
- Program (arrangement and size of rooms): No impact
- Fenestration: (style and location of windows and doors): Minor (the passive solar fenestration in the baseline design already incorporated glazing favorable to PH techniques)
- Budget (hard and soft): Minor (< 3%)
- Energy Savings: High for heat/cooling energy; moderate for total energy
- Building Performance: Improved (air-quality, durability, construction details)
- Comfort: Varied (Excellent for sound, warmth, and light levels; fair for cooling) Cooling was challenging because of limited air distribution from point-source cooling, .

Pursuing PH standards, training staff in PH techniques, and using the building science team as the lead consultant enhanced the preferred business practices in the following ways:

- PH training improves architect's staff's construction knowledge and job satisfaction
- PH certification adds minimally to architect's staff R&D, design, and documentation time.

The architect and building science team collaborate on siting, building form, fenestration design and material selection; they also work together to coordinate structural and mechanical input and oversee construction work related to building performance. In using this approach we have found that PH adds minimally to structural design time, mechanical design time and documentation.

6 References

1. Measured Performance of Four Passive Houses on Three Sites in New York State, Report Number 14-44, New York State Energy Research and Development Authority, November 2014
2. High Performance Residential Design Challenge: Case Studies 5-11, Report Number 14-47, New York State Energy Research and Development Authority, October 2014

7 Images, Graphs, Photographs

Table 1 Project data

Project	HPP	Fox Hall	SDAK
Treated floor area (TFA) (sqft)	1,568	1,599	6,538
Envelope area	5,817	12,664	29,924
Ratio TFA to Envelope area	27%	13%	22%
Window area as % of wall area total	15%	16%	14%
North (% window area)	1%	7%	10%
South (% window area)	77%	62%	31%
East (% window area)	3%	7%	9%
West (% window area)	19%	24%	50%

Figure 1 HPP Original Passive Solar Design

Figure 2 HPP As-Built Passive House Design

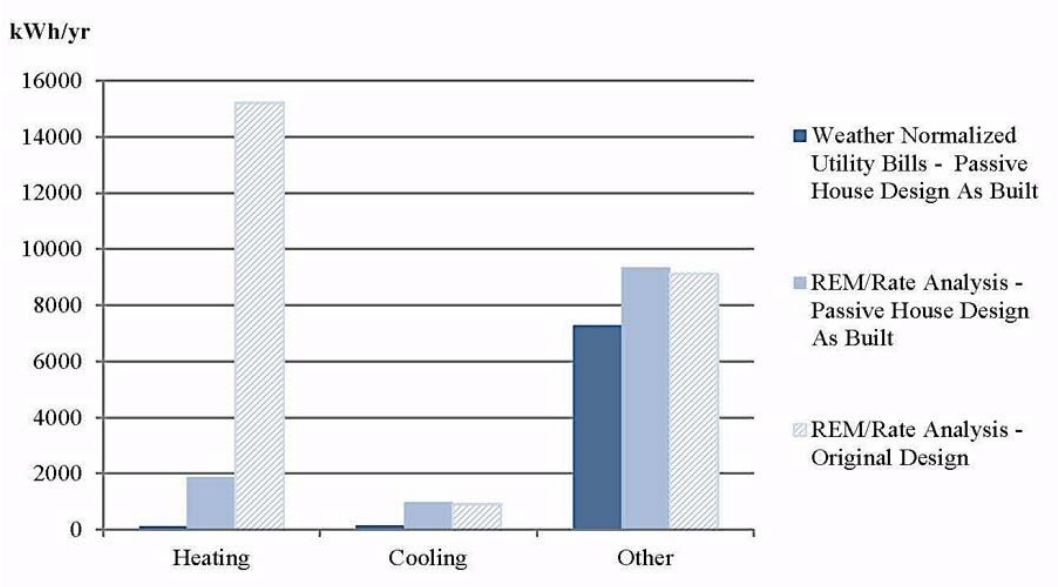

Figure 3 HPP

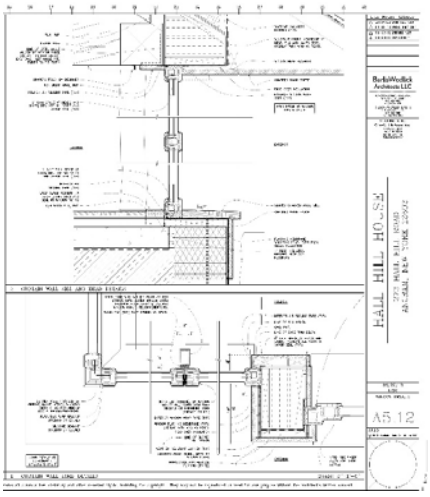

Figure 4 Fox Hill

Figure 5 Fox Hill

Figure 6 SDAK Church

Figure 7 SDAK Church

(No change to façade/interior from Original BWA Passive Solar to As-Built Passive House)

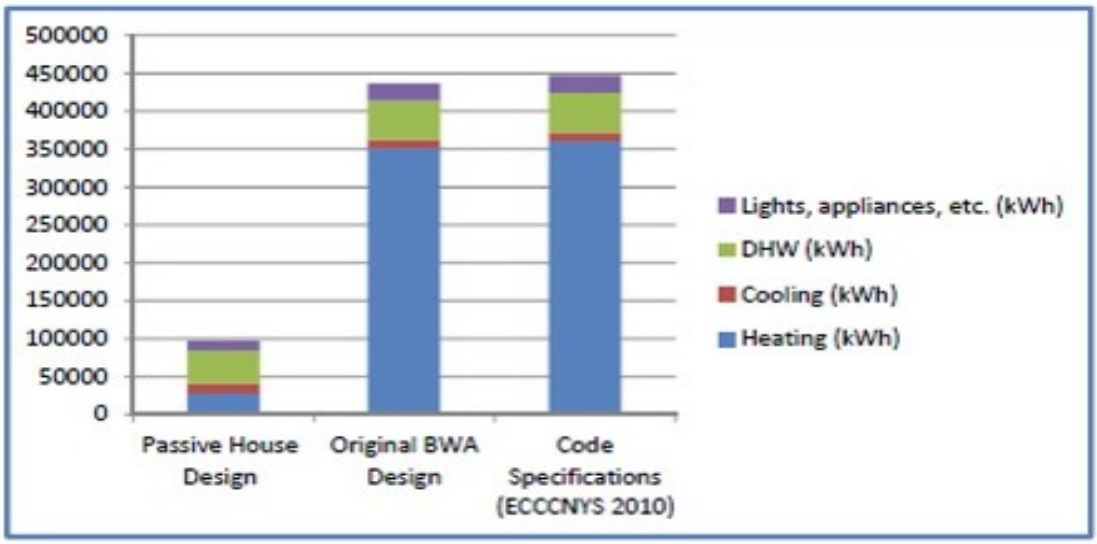

Figure 8 SDAK Church