The Passive House Network

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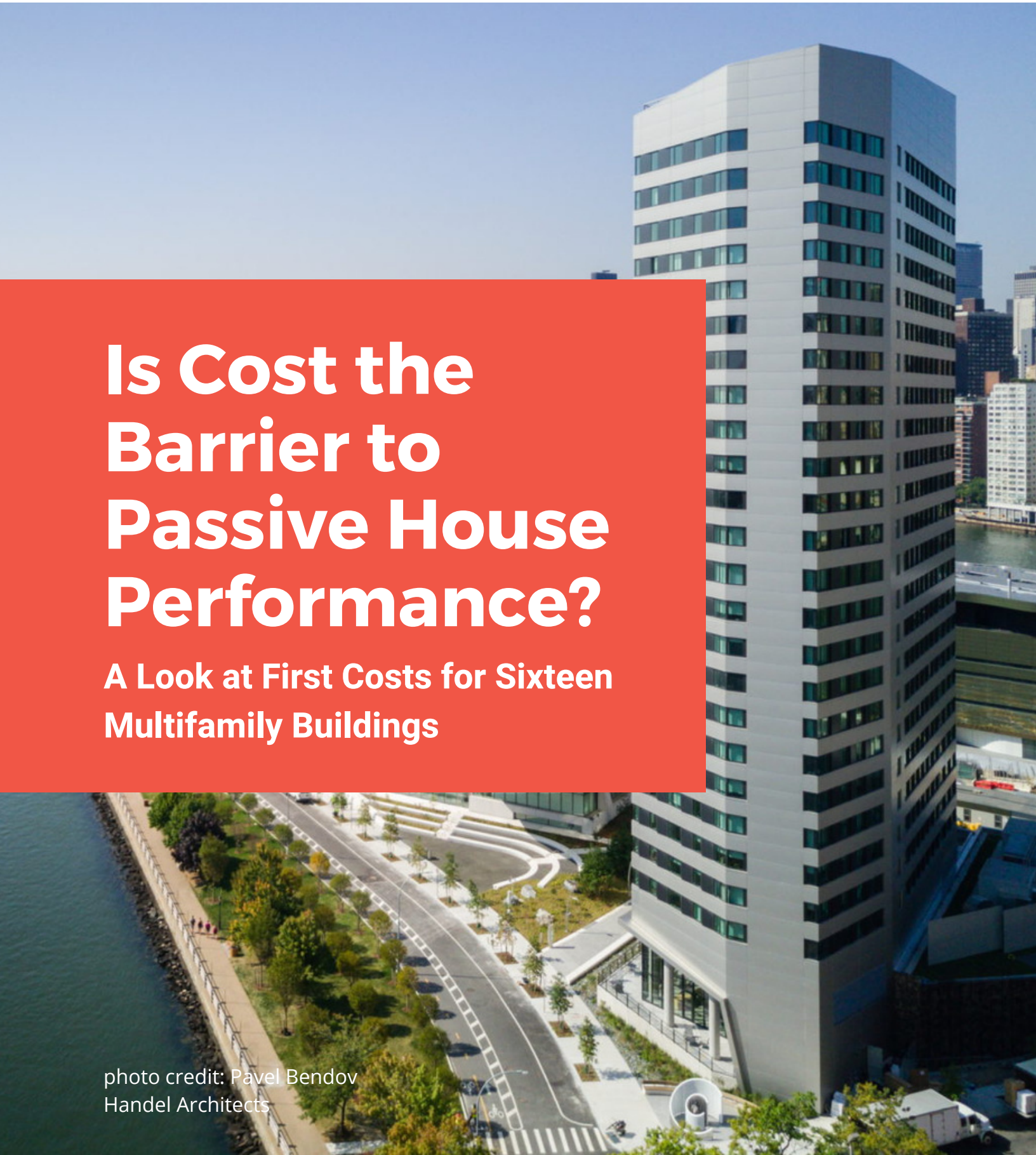
Is Cost the Barrier to Passive House Performance?

A Look at First Costs for Sixteen Multifamily Buildings



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Handel Architects

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By Bronwyn Barry, RA

Most non-profit developers we work with are passionately seeking ways to build better for less. In our advocacy work at NAPHN, we've found that these developers are mostly concerned with two things: first cost to build, and operating costs for their occupants. Of these two, the first cost - or construction cost - usually presents the biggest barrier. When we broach the topic of implementing Passive House, they typically have one of three reactions: the default reaction is "Well we can't do that because it's too hard and not cost-effective." The second most common reaction is "Oh, that sounds interesting - tell me more" but the third reaction is our favorite: these folks tell us, "We've just tried that and it's working fantastically."

This is the story of a cohort of developers who fall into the third category, looking specifically at the costs they've incurred and sharing their experiences on how to build to Passive House standards. Our goal is to help remove perceived barriers and enable others to overcome their fear of first costs, in order for everyone to access the benefits of implementing this high-performance, high-quality, high-comfort approach to building design. Let's start by digging into the data from a collection shared by Steven Winter Associates, documenting the percentage increase to the builders' typical baseline costs required to reach Passive House performance.

Certification Program	Project	Size [# of units]	Floors	Ave Increase	Notes
PHI	Bld 6	Large	25	1%	Two or more team members experienced w/PH
PHIUS	Bld 1	Medium	6	2%	Two or more team members experienced w/PH
PHIUS	Bld 2	Large	9	2%	Two or more team members experienced w/PH
PHIUS	Bld 8	Large	11	2%	Two or more team members experienced w/PH
PHI	Bld 13	xt Large	9	3%	High base cost/ft2 already
PHI	Bld 4	Large	20	3%	Two or more team members experienced w/PH
PHIUS	Bld 11	xt Large	26	3%	Two or more team members experienced w/PH
PHIUS	Bld 10	Large	12	4%	Two or more team members experienced w/PH
PHI	Bld 9	xt Large	13	4%	Two or more team members experienced w/PH
PHI	Bld 12	xt Large	18	4%	Two or more team members experienced w/PH
PHI	Bld 15	xt Large	8	5%	High base cost/ft2 already
PHI	Bld 16	Large	21	5%	Two or more team members experienced w/PH
PHI	Bld 7	Large	8	5%	Two or more team members experienced w/PH
PHI	Bld 14	xt Large	37	7%	Inexp Builder wrt PH
PHI	Bld 5	xt Large	13	8%	Complex façade & volume to surface
PHIUS	Bld 3	Large	7	8%	Inexp team wrt PH

Figure 1: Cost data for sixteen projects currently under consultation for design or construction by Steven Winter Associates, 2020-2021. Source: Lois Arena, SWA.

Where are these projects and how was this data compiled?

The projects included in this spreadsheet represent sixteen current (2020-2021) projects in the design or construction stage, all using the consulting services of Steven Winter Associates, Inc. The data set was shared by Lois Arena, Director of Passive House Services at PH2020, in a presentation titled "Keeping Your Students

Healthy & Funders Happy: Passive House Matriculates" The projects are all mixed-use multifamily buildings, with the exception of two university dormitory buildings, highlighted in blue. Costs include hard and soft costs, contingencies, permitting, insurance, etc. but not land costs. Medium size buildings range from 25-50K SF (with the average at 33,000 SF.) Large buildings range between 50-150K SF (104,000 SF) and the extra-large buildings are over 150K SF (269,000 SF.)

What can we reliably extrapolate from this data?

1. The obvious one is: first costs range between 1-8% over baseline. This shouldn't be too surprising, given that we know *any* higher quality, higher performance building will always cost more. (This aligns well with a similar study of the cost premium to meet various LEED certifications, which ranged from 2.5% to 8.5%.[1]) What's important to connect to this first cost is the outcome: Is it worth it? Can developers justify spending more upfront cost for reliable outcomes? A recent study conducted by a team from New York City Department of Housing Preservation and Development (NYC HPD), Bright Power, The Community Preservation Corporation (CPC), Steven Winter Associates (SWA), and Building Energy Exchange (BE-Ex), titled 'Multifamily Passive House: Connecting Performance to Financing'[2] concluded that:

   > *"Findings show that the Passive House buildings use far less energy than typical multifamily buildings. These results translate into operational cost savings that can increase access to private debt and may also decrease reliance on public subsidies for certain types of affordable housing."*

   The findings in this report indicate that there is considerable evidence that meeting Passive House standards does produce reliable results. NAPHN has already identified a growing number of financing mechanisms to help cover these increased costs[3], so we know this hurdle is not insurmountable and - perhaps more importantly - that the outcomes DO justify the investment.

2. There is no clear cost difference between using either the PHI or PHIUS certification pathway. Both certifications have projects on either end of the cost spectrum, which means claims that one certification is cheaper than another should be dismissed. This is good news. We like options and more pathways.

3. The most obvious determinant of increased cost appears to be the experience of the project design team, and not the size of the building. What Steven Winter Associates found is that teams with greater Passive House

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[1] https://www.facilitiesnet.com/green/article/Measuring-The-Cost-To-Become-LEED-Certified--10057

[2] https://be-exchange.org/report/multifamily-passive-house-connecting-performance-to-financing/

[3] https://naphnetwork.org/resources/building-financial-incentives/

experience and more certified PH consultants on board, allowed teams to deliver greater cost savings. This finding aligns with Zack Semke's three-year overview of the Pennsylvania Housing Finance Authority tax credit allocation for Passive House projects, which stated:

> *"Notably, the Passive House projects don't seem to be more expensive to build than conventional buildings, likely thanks to the early integrated design process that development teams are compelled to engage in so that their LIHTC proposals can be competitive. According to PHFA data, the construction cost premium for Passive House versus conventional projects was 5.8% in the first year, 1.6% in the second, and minus 3.3% in the third year, suggesting that learning and innovation by project teams may be driving down costs over time."* [4]

What can we conclude from this data set?
First costs for Passive House projects align well with other green building certification programs like LEED. There is no obvious cost benefit to using one certification pathway over another. Training and experience of project teams appears to be a higher determinant of cost premium than any other factor.

What does this mean for moving forward?
At NAPHN we've understood that the challenges for meeting high-performance delivery are simply based on education and training. It's why we've focused our efforts on developing and delivering a robust platform catering specifically to U.S. building industry professionals to scale online and in-person training. We understood early that the barriers to high performance delivery are not cost, but they do require skill and experience. We're now seeing the results of this training transforming how professionals practice, not just on Passive House buildings, but on every project they work on and the growth of this sector is astounding. In Q1 of 2021, we've seen a 141% increase in the number of students taking our CPHD online training over the same time period in 2020. Given this peer-reviewed study, published in March of 2020[5], which looked at verified performance outcomes of over 2000 certified Passive House buildings. The authors' findings confirmed:

> *"With over 2000 PH dwellings averaging a space heating energy consumption of 14.6 kWh/(m2a), [= 4.5 kBTU/ft2a] the in situ performance is close to the original design intent and extraordinarily low compared to the consumption in ordinary buildings. The results suggest the PH standard is capable of producing dwellings in a verifiable manner. This means, on average, the in situ thermal performance of the building fabric and the energy consumption for space heating match the design intent, i.e. there is no significant 'performance gap'."*

[4] https://drive.google.com/file/d/1x49Xmey6qaqfG-XDhzvq4TfbdTqhvi0a/view (Pg. 23)
[5] https://link.springer.com/article/10.1007/s12053-020-09855-7

With the sharp uptick in training, and these results, this bodes very well for the future U.S. building performance outcomes.

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