

## Building a Better Box by Thinking Outside of It

### *Green Building, Biophilic Design, Passive House Technology and the Environmental Impact*



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*Gould & Ratner presents the next installment of our Construction Interview Series. As a continued effort to keep our clients informed of new building techniques and processes, we will continue to periodically sit down with leaders at some of the most influential companies in the construction industry to discuss their insights on relevant and pressing topics of interest in the industry.*

*Rich Reizen, chair of the firm's Construction Practice, recently discussed green building and energy efficient design methodologies with Tom Bassett-Dilley, Founder of Tom Bassett-Dilley Architects (TBDArchitects), including the state of the architectural industry and design focused on sustainability and net zero energy consumption. TBDArchitects is one of Chicago's leading architectural firms, completing nearly 200 projects since its inception in 2006, ranging from new buildings, to renovations, with the focus on sustainable contemporary designs and an eye toward a project's region, climate and general use. Notably, TBDArchitects designed the first passive house projects in the Chicagoland area and completed numerous LEED, Green Star and Energy Star/Zero Energy Ready certified projects.*

**Rich:** Tom, thank you for virtually sitting down with me to discuss design methodologies and their relationship to important climate issues. I see you are doing some really innovative things in design. Before we jump into green design, I'm curious to learn, in your opinion, how the architectural industry has been impacted by the COVID-19 pandemic in general?

**Tom:** As a small firm doing a lot of residential work, my view is that when people got stuck at home, they realized it was time to update! Also, I think a lot of people are realizing they may never go back to an office, or will do so less, so they're moving out to the country. We've seen a surprising amount of renovation and new house projects come our way in the last year. Conversely, our park districts haven't been getting revenue, so institutional projects have slowed down.

**Rich:** Have you seen any specific trends arise since the pandemic began (i.e. increased demand for new builds, single vs multi-family residences, retrofit projects?). Do you see these trends continuing into the future?

**Tom:** Boy, I wish I had a crystal ball on that one. I will say that the pandemic has raised people's awareness of ventilation and indoor air quality in general, so our Passive House and PH-like projects resonate with people, and I think that awareness of good ventilation will continue. Just look at how schools are tackling this now. The trick, though, is that while you could open all the windows and crank up the boiler or furnace, that's an energy waste—so energy-recovery ventilators (like we use in PH projects) are definitely the way to go.



**“THE OTHER BIG EMERGING THING ISN'T SO MUCH ABOUT THE PANDEMIC, BUT AS PEOPLE LOOK AT AVERTING CLIMATE CHANGE, WE REALIZE THAT THE EMBODIED ENERGY OF MATERIALS—THE ENERGY IT TAKES TO PRODUCE AND DELIVER TO THE JOBSITE—IS CRITICALLY IMPORTANT.”**

**Rich:** Tom, can you give us a brief overview of TBDA's design approach?

**Tom:** Sure—we're a small firm, 6 people, and our projects focus on sustainability: nature-inspired design, energy efficiency, healthy interiors—we like to call it marrying performance and aesthetics. Our design process shares a lot with most architects—starting with research, originating the concept, and executing detailed design—but in each of those phases, we bring this Passive House and biophilic design knowledge. We incorporate energy modeling, which we do in-house, very early in the design process, so we're cognizant of the energy ramifications of design decisions. This is not typical for architecture firms, especially small firms, unless they specialize in this as we do. This is especially interesting on renovation projects where clients can see before-and-after energy consumption through mostly low-tech means like insulation and air tightness—it's just great to have real-time data to build confidence in the design approach.

**Rich:** I have heard the term “biophilic design”. Can you explain what this is and how you incorporate it into your practice?

**Tom:** It's a fascinating emerging field: the basic idea is that as humans, most of our history is pre-civilization, so our genes are wired for the inputs nature has provided for most of the past million or so years of evolution. The problem is, we've created environments that keep us from those inputs, so the question now is, how do we build nature back into our environment? There are lots of scientific studies backing this up, like the ones where they note how much faster people recover from surgery when their hospital room has a view to a park instead of, say, a brick wall. Probably the best primer on this is a paper by a firm called Terrapin Bright Green called “14 Patterns of Biophilia,” which begins to codify a design approach. The question we're asking at TBDA is, what is the minimum effective dose?

**Rich:** Material selection is an important part of any “green” design. What types of changes have you seen relating to material selections for “green” designs as a result of the pandemic?

**Tom:** Probably higher awareness of indoor pollutants. Unfortunately the construction industry is full of toxic substances, but they can be avoided with better selections. The other big emerging thing isn't so much about the pandemic, but as people look at averting climate change, we realize that the embodied energy of materials—the energy it takes to produce and deliver to the jobsite—is critically important. So if you can use cellulose or wood for insulation, that's less embodied energy than petroleum-based foams, for instance, even though there are still very good reasons to use foam. The bigger issue is that we can't tear down our old buildings to build efficient ones—we have to make our old buildings efficient. Give them the right kind of love!

**Rich:** As we know, there are numerous “green” building designations: LEED, Green Star, Energy Star to name a few. How do these design methodologies compare to one another?

**Tom:** I like to categorize into two big groups: comprehensive certifications like LEED, Green Star, and Living Building Challenge; and specific certifications like Passive House, Well, and Energy Star. The comprehensives look at everything—site, materials, energy, water, etc.—while Passive House and Energy Star look primarily at energy, and Well looks at human wellness. They all have their place, and we've participated in all of them listed here except Well.

**Rich:** Not too long ago, you became a certified passive house consultant (CPHC). What does that mean and why did you decide to pursue this specialty? Why is it important to architectural design?

**Tom:** I knew that energy design was a critical component of sustainability, and becoming a CPHC gave me the tools to bring that into my practice; it was also a great crash course in building science, which is still pretty lacking in the architecture profession. As I touched on before, one of the great benefits of having this training is that we can do energy design in parallel with architectural design, as it should be.



**“A PH PROJECT STARTS WITH THE LOCAL CLIMATE FILE, AND ENERGY METRICS BASED ON COST-OPTIMIZED SOLUTIONS: IN COLD CLIMATES, YOU’LL SEE A LOT OF INSULATION, IN HOT CLIMATES, LESS INSULATION AND MORE SHADING. OLD-FASHIONED IDEAS, REALLY, JUST REIMAGINED WITH CONTEMPORARY MATERIALS AND TECHNOLOGY.”**

**Rich:** What makes passive house design different from other design methodologies? What is involved with this process? Aside from the environmental benefits, are there any other cost saving aspects that may be important to potential clients?

**Tom:** Passive House concentrates first on conservation. Most buildings waste most the energy that comes their way through poor design and construction. A PH has rigorous energy design and third-party verification in construction, so quality control is very high. That means that comfort, air quality, and energy efficiency are assured. As far as cost, you get a certain trade-off between more expensive windows and insulation for a smaller HVAC system; in our experience, it’s a wash when you compare the slightly increased mortgage to the greatly decreased energy bills. The thing is, it’s a way healthier environment due to the ventilation strategy, so that plus a truly sustainable level of energy consumption makes it a no-brainer.

**Rich:** TBDArchitects is known for having designed the first certified Passive House Project in the Chicago region. Can you tell us more about this project and any challenges you faced?

**Tom:** That first one was in 2013, and since then we’ve done 6 more certified, 4 in review or construction, and a handful of PH-like projects, some net-zero energy. From these we’ve learned the most about HVAC systems: these are extremely low-load buildings, and they operate differently from the typical building that blows a lot of energy through the walls and roof. PH training gave us good guidance in handling the ventilation air, but distribution of the conditioned air is more nuanced, and it really needs to be particular to climate, building layout, amount of windows, and the like. The other big challenge we deal with is getting builders to embrace different ways of doing things. This has mostly been a success, in that it calls for craftsmanship in all aspects of the build, but it needs to be discussed at the outset of the project, and preferably the builder is part of the team during the design phase.

**Rich:** We have clients with projects all across the United States. Is this sort of design methodology more applicable to any specific geographical region or climate zone? Can it be transferred to commercial projects as well?

**Tom:** Great question—what PHIUS, the Passive House Institute US has done is remarkable: they took the standard that originated in Germany in the 90’s (which in turn was based in US and Canadian roots from the 70’s), and reworked the standard to adapt to the huge range of climates we have in the US—from Key West to Fairbanks is quite a spread, and each climate should be handled uniquely. So a PH project starts with the local climate file, and energy metrics based on cost-optimized solutions: in cold climates, you’ll see a lot of insulation, in hot climates, less insulation and more shading. Old-fashioned ideas, really, just re-imagined with contemporary materials and technology. And yes, we recently completed a PH Source Zero project for the Park District of Oak Park, and there are many commercial examples, notably schools, as well as a lot of multifamily, which is arguably the sweet spot for PH.

**Rich:** Can you briefly describe some of the specific design modifications that can help create a more climate friendly and climate resilient residence? Disease resilient?

**Tom:** A really robust, airtight thermal envelope means a house needs little heating and cooling energy, and can be survivable through a winter power outage, so resilience is an important part of the PH idea. A good balanced ventilation system manages indoor pollutants, provides filtration, and keeps CO2 and VOCs low, so that’s a deterrent to airborne pathogens.

**Rich:** It seems as though this type of design would be easier to incorporate into new builds. Is that true or can it be utilized on retrofit projects as well? If so, what are the challenges associated with an existing structure?

**Tom:** It is easier on new builds for sure, but it can be done on retrofits. The main challenges on retrofits are avoiding thermal bridges, like when floor joists tooth into the brick wall—if you insulate on the inside, those joists are thermal bridges. Airtightness can also be challenging on new builds, but new techniques like AeroBarrier are giving us more options. The best case scenario is to get a new air barrier and insulation on the exterior when siding needs to be replaced, or you have masonry that’s OK to cover up, in other words, not a nice façade; that way you can basically give the building a new base layer and jacket, to put it in clothing terms.



But I would never suggest covering up a beautiful façade, or even just a nice façade, like the many Chicago 2-flats; in those cases, I'd say it's fine to cover up the Chicago Common brick on the sidewalls, since those are a sponge anyway, but then flip the insulation to the interior for the front façade. And, once you have all the insulation, a good ventilation system, and efficient conditioning and appliances, put on some solar—voilà.

**Rich:** Tom, thank you again for sharing your knowledge and experience, especially as it relates to “green” building and passive house design. As demand for more sustainable structures increases, we think it is important to stay on top of new design techniques. We believe these techniques will only become increasingly more relevant as time goes forward. We would enjoy speaking again soon to see how this design methodology is progressing in the industry.

**Tom:** My pleasure, thanks for having me, Rich!