

# PASSIVE HOUSE DESIGN: AN ARCHITECT'S PERSPECTIVE

Too often we equate energy efficiency with sustainability, overlooking considerations of form and design. I was interested to explore how a structure designed to meet the rigorous standards of PH modelling might differ from any other.

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The answer becomes clearer as one closely models a building for passive solar gain, ventilation, area/volume ratio, and thermal bridging. These considerations become the drivers of building orientation, massing, fenestration and envelope design.

As an architect who has always had a deep interest in elegant contextually-appropriate design combined with energy efficiency and ethical building practices, I wanted to answer this question as definitively as possible.

Casa Luca was my first attempt at not just speculating about the relationship between energy efficiency and context, but actually calculating it scientifically. Herein lies the major difference between the PH approach and most other sustainability models. PH modelling requires rigorous and exact dimensioning of all relevant details, components, and systems within a building. These aspects are then scientifically combined and calculated to show actual performance based on your design, precise geographic location and orientation.

Some constraints on design are generic for all PH projects. Working through the PH methodology, it quickly becomes apparent how adding a certain window here, or there, affects all aspects of performance. Similarly, we soon see how it may be difficult to provide overhangs and at the same time reduce thermal bridging.

Other factors may be site specific. Casa Luca sits on the south side of an east-west street in a part of Vancouver that enjoys mountain views to the north. To achieve PH performance, one must limit glazing on north facades and give priority to solar gain from the south. A roof deck overcomes this conflict by providing those views, and at the same time, a private outdoor space away from the street.

Also, we wanted to install a 3kw solar system [that is currently producing more energy than is normally required for a house this size in Vancouver]. The panels were easily added to a metal standing seam roof, but the roof itself was a challenge. In Vancouver, designing a south-facing roof on lots zoned RS-1 is problematic, because the angle of daylight setback generally supports gables that slope east-west. We had to get relaxation to make it work.



There are also programmatic questions to be answered. In our case, what is the optimal location for a child's bedroom? The kitchen? The Laundry room? Can I hang my clothes to dry in this location or do I always have to use the dryer? These are now questions that have environmental implications and for which the answers are quantifiable. Architectural excesses can clearly be seen as such.

Of course, there will always be trade-offs in design but striving for good architecture and real energy efficiency can truly make a building comprehensible. By achieving this level of understanding, design decisions can then be made in pursuit of that combination of beauty, quality and efficiency that every good architect strives for.

Casa Luca was a project borne out of the necessity for a bigger space for a growing family. In short, we needed more bedrooms! The process may have started as such, but it quickly evolved into a broader challenge of creating a housing prototype for young urban families. Could we produce an easily replicable typology for Vancouver's RS-1 zone that was beautiful, a source of inspiration and learning, yet also achievable in today's market? By employing commonly used details, materials, and components that met the PH standard we were able to do so with only a small cost premium over standard construction techniques.

Further to standard PH requirements, we installed analytical sensors to test the performance of all walls and roofs for moisture content and temperature gradient. As well, the power produced by the solar panels is logged and compared to actual usage.

Based on our experience with Casa Luca, we believe that it is possible to produce a custom-designed building that is truly energy and cost efficient while satisfying all the needs of the client. ♦

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