The PERLITA Passive House

—An Affordable Path to Meeting CALIFORNIA'S NZE GOAL

Photo courtesy of Xavier Gaucher

When I moved from France to Los Angeles in 2015, I was surprised to find no Passive House construction completed or even under way in Southern California. The climate is similar to that found in the Mediterranean countries, where there are already many Passive House buildings.

Did people think it was not worth it because of the mild climate? Did they think it was too expensive? Neither conjecture makes sense to me. If the climate is mild most of the time, then when the weather changes and it becomes cold or hot outside, poorly constructed buildings become very uncomfortable. And the number of days above 95°F in Los Angeles have been projected to triple in the next 30 years. The energy bills here can get quite high, especially in summer. On top of that, Los Angeles has many iconic architects' houses, which are often used as a reference for designing new houses. However, these houses are designed with no comfort criteria, making them very unpleasant to live in—which must be very upsetting considering the price of real estate!

On top of all those motivations, California has set a very aggressive goal for all new residential construction—single-family and multifamily buildings up to four stories—to be net zero energy (NZE) starting in 2020, with a start date of 2030 for the other types of building. Because Passive House construction simplifies meeting the NZE requirement, I was astonished not to see a surge in these types of building.

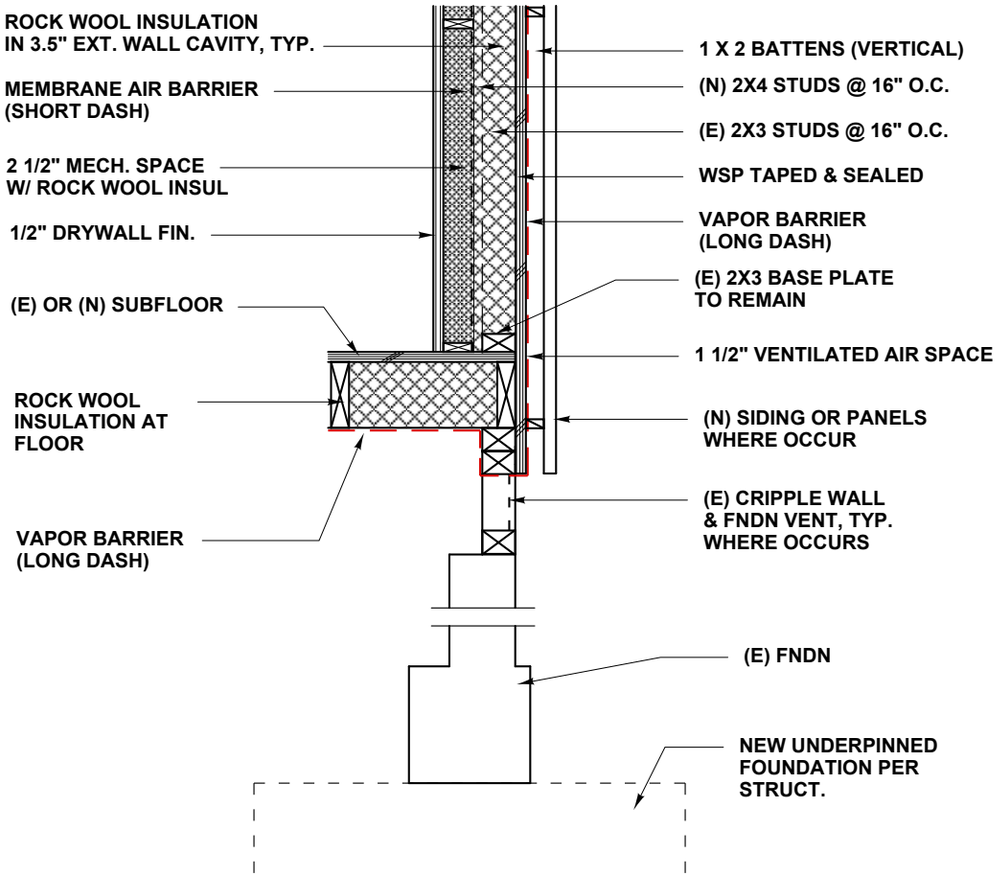
So when we found a house to buy that needed serious renovations, we decided to make it a Passive House. Starting with what had been done in southern Europe and in the first Passive House in Mexico, I searched for the required solutions to meet the Passive House standard in Los Angeles. My goal was to demonstrate a path to creating high-efficiency buildings, in general— not only for single-family homes—so finding appropriate local solutions that were also cost-effective was a priority.

Running the first PHPP models, we realized that double-pane windows and continuous ventilation without heat recovery were perfectly suitable for us and would save money. That seemed to simplify the way forward, but that wasn't entirely the case. If only double-pane windows with the proper efficiency had been easy to find! We needed a Passive House window manufacturer who could guarantee the airtightness not only of the windows, but also of the doors, including sliding glass doors. After much searching, I found a reasonably priced double-pane wooden window with a Passive House-quality frame and a National Fenestration Rating Council rating from Zola Windows; the window's U-value is 0.26, and its solar heat gain coefficient is 0.39.

Regarding the ventilation, we went with two fans, one to bring in fresh air and one to extract the exhaust air, both operated with the same variable-speed controller. We designed our HVAC ductwork to carry both the fresh air and the conditioned air, to avoid having two separate duct circuits. The HVAC unit is a new 1-ton air-handling unit capable of operating at high static pressures, which the manufacturer launched with our project. After a few weeks living in the place, I can attest that everything is working great.

Concerning the building envelope, we didn't have to change much from what was required to meet California's Title 24 building standard—although we did have to almost double the insulation in the 2 x 4 walls from the R-13 requirement. Regarding the airtightness, the crew's inexperience in that domain, the material we used, and the fact that this was my first Passive House meant that we were not able to reach the 0.6 ACH_{50} standard for new construction. But we reached the retrofit target of 1 ACH_{50}, which allows us to qualify for EnerPHit certification. In retrospect, framing could have been improved to minimize thermal bridges, but seismic requirements were often an excuse not to do so. However, the mild climate helped us get by even with this less than optimal wood framing.

Version 9 of PHPP, which had just come out when we started our energy modeling, arrived at the perfect time. With the new primary energy renewable factor we were able to calculate within the PHPP the kWh requirement—6,000—and the number of solar panels needed to meet the NZE goal: 12 panels for this 2,000-ft^2 all-electric house. With the addition of just 4 more panels, we are able to power an electric car and achieve a Net



Zero Lifestyle goal. If the house had been designed just to meet California's Title 24 building efficiency standard rather than the more-stringent Passive House standard, the roof would have been too small to fit all the necessary solar panels.

In conclusion, the extra cost to build this Passive House was less than 5%, and I am confident that premium can be reduced. With two completed Passive Houses in Los Angeles by early 2018, our Passive House California Los Angeles Chapter intends to use these examples to inspire local policy makers, developers, architects, contractors, and customers to build many more such projects.

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Passive House Metrics

Heating energy	Cooling energy	Total source energy	Total renewable source energy	Air leakage
2.2 kBtu/ft²/yr	3.2	23.5	10.5	
0.7 kWh/ft²/yr	0.9	6.9	3.1	0.9 ACH_{50}
7 kWh/m²a	10.0	74.0	33.0	

Products

Windows and Exterior Doors
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