

Passive House Design and the Building Code – Where Do They Meet?

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During the next eight years, building and energy codes will be transformed to achieve legislative goals established by several enacted bills:

- **AB 758**, established energy objectives for existing buildings.
- **AB 32**, codified the 2020 GHG emission reductions targeted into law.
- **AB 1109**, established minimum energy efficiency standards for all general purpose lighting.
- **AB 1560**, requires the CEC to provide regulation for water efficiency in new residential and commercial buildings, and the 2007 Integrated Energy Policy Report (IEPR) established the goal that new building standards achieve “net zero energy” levels by 2020 for residences and by 2030 for commercial buildings.

The State has established a code development schedule that will culminate with building and energy codes mandating constructed homes built after January 1, 2020 to be NZE.

At the center of this convergence is the building official who enforces building codes in Title 24. The building official must understand the goals and objectives established by the various

stakeholders in his community, serve as the liaison between his community and the building industry, and provide policies and procedures that allow the construction industry the ability to achieve a level of profitability.

Lastly, but perhaps most importantly, the building official has to ensure that the residential homes and commercial buildings our families, friends, and businesses occupy are safe and conform to well-vetted standards.

AB 758 directs the Energy Commission to achieve greater energy efficiency for existing residential and non-residential buildings. The strategy to accomplish this goal is a 7-point plan that includes:

1. Energy assessments
2. Building benchmarking
3. Building energy use ratings and labels
4. Cost-effective energy efficiency improvements
5. Public and private sector energy efficiency financing
6. Public outreach and education

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7. Green workforce training.

The CEC is currently upgrading the 2008 Energy Standards to align with the 2013 triennial code adoption process. The 2013 Energy Standards will be 30% from the NZE goal. In the 2010 issue of the California Green Building Standards (CALGreen), local jurisdictions have the ability to adopt a “reach code,” more commonly known as TIER 1 and TIER 2.

If adopted, the TIER 1 energy level requirement is 15% more efficient than the 2008 Energy Standard. If TIER 2 is adopted, that requirement is 30% more efficient than the 2008 Energy Standard.

The State is pleased with this format because it allows the State to establish various types of energy standards and then review these higher energy standards for applicability in the field prior to being codified in the next code adoption process.

You can see with the adoption of the 2013 CALGreen, TIER 2 level are 30% from NZE, adoption of the 2016 CALGreen, TIER 1 is only 15% from NZE and with the adoption of the 2019 CALGreen and Energy Codes that State will achieve its goal of NZE for residential buildings

The design and construction of “passive houses” is not new to many European countries. In the next eight years, the construction industry will review and adopt the European ideas and techniques that provide the best

answers to the developing challenges.

To most of us, the phrase “passive house design” is new, and we will need to learn the new methods of home construction. First, we need to understand the working definition of a “passive house,” which is generally a home whose energy usage is reduced by 90% of that of code built homes.

Another definition of “passive house” is a house that can provide thermal comfort using post-heating or post-cooling of a fresh air mass sufficient for indoor conditions and not using re-circulated air.

In simple terms, we need to build homes that comply with the State building codes and use as little energy as possible. And what energy is used will be generated on the site. This is “Net Zero Energy.”

In the next eight years, design teams must develop an integrated design process so that all the systems and components of a house will be modified to meet State goals. These modifications can be divided into multiple sections:

1. Super insulate:

- a. Wall insulation may have to be increased from R-19 to R-40.
- b. Framing will be increased to 2x6 or 2x8.

2. Make it airtight:

- a. Install; a vapor retarder to minimize

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air infiltration and exfiltration.

b. Comply with the requirements for whole house venting.

3. Specify energy or heat recovery ventilation:

a. Use of none energy systems to provide heating or cooling.

4. Specify high-performance windows and doors:

a. U-factor and solar heat gain coefficient values of windows will need to increase.

b. The production methods of high efficient windows will need to improve so the retail window cost is reduced.

5. Optimize passive-solar and internal heat gains:

a. Incorporate passive-solar methods, such as thermal mass, to achieve necessary heat gains.

b. Additional floor and roof loads may be required.

6. Model energy gains and losses:

a. Use energy modeling to determine if net zero energy is achievable.

b. Develop different types of energy modeling software to address the different elements of a passive house.

One of the more challenging factors in meeting State goals is “plug loads.” We can construct net zero homes, but the occupants’ habits are another

challenge. Homeowners will need to re-educate themselves on how to use their homes. Manufacturers of appliances, TVs, electronic entertainment devices, and other electrical consuming items will need to develop products that will minimize plug loads.

The State goal for all homes built after January 1, 2020 is to be “net zero energy.” This goal will be challenging to construction and design professionals as well as homeowners. ■

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