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Building an Energy-Efficient Home From the Ground Up

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Because their customers increasingly want green, contractors are increasingly building green. In response to trend-driven requests for bamboo floors, Energy Star appliances and recycled glass tiles, however, many builders have focused their efforts on green retrofits of existing homes when in fact it's often easier and more effective to green a new-construction home—especially when the goal is energy efficiency, says

green builder Walker Harris, principal of Durham, N.C.-based Sustainable Building Solutions.

“It’s much easier to be energy efficient when you’re building a new home because you’ve got a blank canvas,” he says. “You’re not dealing with pre-existing conditions or installations, and you’re not facing the unknowns and what-ifs that come with retrofitting an existing home.”

There are fewer potential roadblocks with new-home construction, but there also are more opportunities, according to Kevin Morrow, senior program manager for green building standards at the National Association of Home Builders (NAHB).

“When you’re starting from scratch, you can put all the project’s primary stakeholders on the same page by having a dialogue about energy efficiency from the very onset of the project,” he says. “What that amounts to is integrative design, which looks at the home as a system. By involving everyone who’s responsible for its various parts, you can more easily make that system as energy efficient as possible.”

To make your next new-construction home a model of energy efficiency, consider the following components of the typical energy-efficient house, built from the ground up:

1. Orientation

Builders who can choose the orientation of a home on its lot are at a huge advantage when it comes to energy efficiency, according to Morrow. “If you’re building a home in Portland, Maine,” he says, “you may want to situate the home so there are large windows with southern exposure so the sun can come in and heat the floor and the furniture, reducing the heat loads required to keep the home comfortable.”

2. The foundation

According to Morrow, builders seeking energy efficiency should insulate their foundation walls just as well as they insulate their living space walls using insulated concrete forms (ICFs) that include layers of foam insulation. To go a step further, he says, consider framing the interiors of the basement walls—whether the basement’s finished or unfinished—and insulating them as you would living-space walls.

3. Walls

Speaking of walls, consider using framing techniques that allow one to maximize energy efficiency. Optimum value engineering (OVE), for instance, leaves more room for insulation, while framing with structural insulated panels (SIPs) reduces the chance that workers will install walls without properly insulating them.

Also important to both the walls and the roof is air sealing, which alone can reduce utility costs by as much as 50 percent, according to the U.S. Department of Energy’s [National Renewable Energy Laboratory](#) (NREL). To keep a new-construction home airtight, Morrow suggests caulking and weather stripping not only windows and doors, but also seams between the foundation, floor and ceiling joists and walls, not to mention gaps around ceiling light fixtures, electrical panels, etc. Additionally, the NREL recommends the Airtight Drywall Approach, which uses gaskets and caulking along with drywall to create a continuous air retarder.

4. Windows and doors

According to the NREL, the typical home loses more than 25 percent of its heat through windows. For that reason, it recommends minimizing windows on the northern, eastern and western sides of a home in heating-dominated climates; installing sufficient roof overhangs for south-facing windows to prevent overheating in the summer; installing windows with low Solar Heat Gain Coefficients (SHGC) on the north, east and west sides of the home; installing windows with a high SHGC on the south side of the home; and purchasing Energy Star doors and windows.

5. The guts

If the roof, foundation and walls are a home’s skeleton, the appliances and products inside it are its guts, and they’re just as important as the bones to energy efficiency. The most important organ, according to Harris, is the heating, ventilation and air conditioning (HVAC) system. To find a system that’s sized appropriately for your home, he recommends using software to perform a Manual J “Residential Load Calculation,” which will help you choose an HVAC unit that uses the least amount of energy possible.

Other important components, according to Morrow, are lighting and appliances—including water heaters, washers and dryers, dishwashers, refrigerators, stoves, etc.—all of which should have an Energy Star label. After all the energy-efficient appliances are installed, builders should help homeowners understand the importance of selecting more energy-efficient products like TVs and microwaves after they move in.

Morrow adds: “The final piece of energy efficiency is educating homeowners about things they can do to operate the home in a more energy-efficient manner.”