

A Small Addition Faces A Tougher Energy Code

In early 2012, the owners of a small Cape-style home in Silver Spring, Md., contacted me about enlarging their kitchen, adding a screened-in porch, and creating a home office. The project was not particularly daunting in its design or details, but it was my first project under the 2012 International Residential Code (IRC), which made me a little nervous. Maryland, where I live and work, was the first state to adopt the 2012 version of the IRC, which includes all the provisions of the 2012 International Energy Conservation Code (IECC).

The IECC provisions, which are intended to improve the energy performance of new and remodeled homes, are the most dramatic code changes I've seen in the 20 years I've been a contractor. So far, seven additional states have adopted the 2012 IRC, and more are expected to sign on within a year or two.

So what's new?

Increased insulation, greater attention to air-sealing, and better-performing windows are all part of the new IECC requirements. There's also a more stringent process for reviewing plans, which is meant to ensure that heating and air-conditioning systems are sized correctly and that ductwork is sealed and insulated. Taken together, the new provisions can cut a new home's energy use by more than half.

Energy regs on airtightness, insulation, and mechanical systems mean big changes—even for small buildings



BY JAMES DOMAN

roof deck was insulated and unvented, making the attic part of the conditioned space, he agreed that this satisfied the code provision.

There is more paperwork

After our meeting, which lasted about 30 minutes, I took an application for a permit. The application includes a prescriptive-requirements worksheet that asks for R-values of floor, roof, and wall assemblies, and U-values and solar heat-gain coefficients (SHGC) for doors, windows, and skylights.

The new code tries to address the common practice of specifying oversize heating and cooling equipment

Wanting to make sure that I had interpreted the new provisions correctly, I decided to meet with the Montgomery County Department of Permitting Services (DPS) as soon as I had a contract with the client.

In my first meeting with the code-enforcement official, I described the project and showed detail drawings of wall and roof assemblies insulated with foam sheathing. Exterior foam insulation is one of the new code's most notable provisions (see "Satisfying the new IRC," facing page).

The only potential problem that the official identified was the ductwork in the attic above the kitchen addition. The 2012 code requires airtightness testing for ducts located outside the home's conditioned space.

When I pointed out that the





Satisfying the new IRC

Unlike the 2009 version, the 2012 IRC requires more insulation, better windows, and an air-sealed building envelope. To meet code requirements on this house, the author specified the following:

- R-20 wall insulation (1-in. rigid insulation plus 6-in. batts)
- Windows with a U-factor of 0.35 and an SHGC of 0.4
- Advanced framing to minimize thermal bridging
- A $\frac{3}{8}$ -in. vented rain screen behind the siding for drainage and paint durability
- 2 in. of rigid insulation over the roof sheathing, plus 12 in. of batt insulation to meet the R-49 roof requirement
- Careful attention to air-sealing all windows, doors, and gaps between sheathing panels to minimize air infiltration
- Zip System sheathing for air-sealing and as a weather-resistive barrier (WRB)



Air-sealing and ACH. The 2012 IRC includes air-sealing requirements and maximum air changes per hour (ACH). Climate zones 1 and 2 are limited to 5 ACH50. Zones 3 through 8 are limited to 3 ACH50.

by requiring heating- and cooling-load calculations for equipment sizing. (Rule-of-thumb sizing for heating and cooling equipment is no longer permitted.) In addition to square footage, these calculations take into account size, number, and location of windows and insulation amounts to get a more accurate estimate of how much heating and cooling a home really needs. These “Manual J” calculations must be done by a qualified HVAC system designer and submitted as part of the permit process.

Because higher standards for airtightness can impact indoor-air quality, new homes built under the 2012 IRC must have a whole-house ventilation system, and this system must include automatic dampers to prevent outside air from entering when it’s not running.

The application also requires the signature of the contractor, attesting that the building design satisfies all the requirements of the 2012 IECC.

Construction details need to be worked out

In order to achieve the higher R-values for walls and roof, I elected to use exterior foam on top of the roof and wall sheathing. You also can choose to build thicker walls and to install greater amounts of cavity insulation. We opted for the foam layer because it reduces thermal bridging through the framing, even though it makes installing trim and siding a little more difficult. I also wanted to

install the fiber-cement siding over an airspace to make the paint job last longer and to prevent water intrusion.

The foam and rain-screen installation procedures were largely unfamiliar to my regular framing subcontractors, so I mocked up wall and roof sections ahead of time. This helped my framing subs to understand the construction methods and also helped us to determine the width of overhangs and fascia.

To stop air movement through the walls, I used Zip System wall sheathing (huberwood.com). This OSB sheathing has a weather-resistive barrier (WRB) applied to the surface, and the seams are covered with Zip System tape. Used together, the products are very effective at reducing air infiltration. On the inside, we air-sealed all the framing cavities with spray foam.

Mechanicals must be planned for efficiency

The heat-load calculation indicated that the existing boiler was sufficient and did not need to be upgraded. The modified heating system now consists of one zone for the unaltered part of the house; another zone for the new addition, dining room, and new office (old kitchen); and another zone for the basement. Independent control of these zones is important because the new parts of the home need less heat than the older parts.

Prior to the remodeling, the homeowners relied on several window units for room cooling in summer. The new central air-conditioning system uses a high-efficiency SEER-15 unit hidden within an insulated eave on the second floor. Cool air is distributed throughout the house via a high-pressure, small-duct system. All joints, transitions, and takeoffs for the system were sealed with mastic, and all ductwork is within the home’s thermal envelope. □

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Sealed ductwork. The 2012 IRC requires sealed ductwork. If the ducts are outside the conditioned space, they also must be insulated and tested for airtightness. Generally, it’s easier to seal and insulate the ducts before they’re installed.

COMFORTABLE LIVING IS THE RESULT

The new kitchen provides the workspace needed to prepare meals for a growing family, and the island provides a central gathering space with room to sit. The remodel included new cabinets, a new built-in oven and microwave, and a new sink with black synthetic-stone countertops. One unique feature is the vintage 1940s gas stove (right) meant to add a classic element to the kitchen.

The sitting area is enclosed by six large double-hung windows that allow a clear view into the backyard. A screened-in porch adjacent to the sitting area allows for insect-free outdoor meals during the summer. On the exterior, synthetic tongue-and-groove porch flooring looks traditional, but it won't rot. The HardiePlank fiber-cement siding has a factory finish warranted to last 15 years.



6 tips for complying with the new code

Here's what the author learned from his first project under the 2012 IRC.

1. Meet with a code-enforcement official after the preliminary design is finished to see if the details are workable under the new rules.
2. Hire good insulation and HVAC subcontractors, as the requirements for air-sealing and HVAC design will overwhelm lesser subs.
3. Mock up wall and roof sections so that framing subs and others can learn the details.
4. Make every effort to keep HVAC ductwork within the conditioned envelope to eliminate the need for duct-airtightness testing.
5. If the renovation involves new HVAC equipment, look into utility-sponsored rebate programs. The homeowners received a 50% rebate for insulation and air-sealing work on the existing part of their house and a \$750 rebate on new equipment.
6. Contractors should learn the new requirements and then use this knowledge to sell their services to potential clients. Homeowners should pick contractors who know the rules well so that there are no surprises later.