



"Musings of an Energy Nerd" showcases the best of Martin Holladay's weekly blog at GreenBuildingAdvisor.com, where he provides common-sense advice about energy issues to residential designers and builders. His conclusions usually fall between minimum code compliance and the Passive House standard, which often makes them controversial to both building-science geeks and everyday builders.

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Brick chimneys are incompatible with airtight homes



Masons finish up a repair on a three-flue chimney. In airtight houses, chimney flues often offer the path of least resistance for makeup air for combustion appliances and range hoods, leading to a sooty smell inside the home.

One of my first construction jobs in Vermont, back in the late 1970s, was at an architect-designed home with a massive brick chimney with four flues: one flue for the oil-fired boiler, and three flues for the home's three woodstoves. The chimney worked fine—mostly because the house had so many air leaks that the woodstoves were never starved for combustion air.

Massive chimneys like the one I remember from that job are expensive to build, but they are often a source of pride for the owner. They provide interior thermal mass; they're durable; and they're handsome to behold.

Older cold-climate homes often include similar large brick chimneys with multiple flues. This type of chimney is usually located near the center of the house, so that the

bricks and the flues stay as warm as possible.

These days, however, this type of chimney is responsible for a variety of problems. It turns out that massive brick chimneys perform poorly in a modern airtight house.

I recently had a conversation with a builder about problems in a new home with a three-flue brick chimney. Each flue served a separate wood-burning appliance, and when



Beautiful problem. Chimneys in the middle of a home provide thermal mass and are often handsome focal points for families and friends to gather around. But in airtight homes, chimneys can struggle for makeup air—or become the source of makeup air for other appliances.

ating system that works better for fireplace flues than for woodstove flues. The disadvantage of this solution (besides the obvious point that these dampers are made for fireplaces, not stoves) is that the homeowner has to remember to open and close the damper each time the flue is used.

Still another option is to install a powered makeup-air unit controlled by a wall switch. To prevent makeup air from entering the house through the unused chimney flues, the homeowner could turn on the powered makeup-air unit before lighting any of the woodstoves. For more information on powered makeup-air units, see the article “Makeup Air for Range Hoods” on GreenBuildingAdvisor.com.

one was being used, makeup air entered the house through one of the unused flues, bringing a sooty smell on the backdrafting air. The builder realized that the problem was due to the fact that the house is relatively airtight. What, he wondered, is the solution?

It’s a tough situation. If a house has a single wood-burning flue, you can install a duct that brings outdoor air to the room with the wood-burning appliance. But in a house with three wood-burning flues, it’s hard to compete with those three flues. The flues are big holes in the home’s thermal envelope, and are likely to be the easiest way for makeup air to enter the house. Even when the flues have some type of damper, the dampers are unlikely to be tight enough to prevent downward airflow.

These holes in the home’s thermal envelope are the likely path for many types of makeup air—not just the combustion air required for the woodstoves. The three flues will also be the path of choice for any makeup air entering the house when the kitchen’s range-hood fan is operating. Of

course, the makeup air is likely to pick up a sooty smell on the way into the house.

Possible remedies are all imperfect

All solutions are imperfect, and all solutions include the risk of homeowner complaints. One option is to open a window before lighting a wood-fired appliance.

Another option is to install a 6-in.-round outdoor air duct to each room that includes a wood-fired appliance. This type of duct requires some type of relatively tight damper—possibilities include a motorized damper, a large ball valve usually used for plumbing pipes, or the type of blast gate usually installed in dust-collection systems—and should terminate in a wall-mounted register. (Note that some homeowners complain that this type of makeup-air system can cause cold drafts when open.)

Another option worth considering is to install three chimney-top dampers (one for each flue). Note that most chimney-top dampers are controlled by stainless-steel cables that dangle down the flue—an oper-

What if the customer insists on this type of chimney?

Building codes require that new homes pass a blower-door test. Yet some owners who are planning a new custom home still insist on a massive brick chimney with multiple flues for wood-burning appliances. What should builders tell these customers?

The best approach is to explain that wood-burning appliances are incompatible with a modern airtight home. The second-best approach is to explain that there may be a way to include a single wood-burning flue for one woodstove—as long as the homeowner accepts certain conditions that must be thoroughly explained and understood before proceeding—but that multiple wood-burning flues are impossible. Whenever a tight house includes a woodstove, a signed legal waiver would be a good idea.

If an owner insists on including features that are highly likely to cause problems, the best way to proceed is to say, “I’m sorry, but I can’t build that. Good luck finding another builder.”