

QUESTIONS & ANSWERS

Metal-Stud Performance

Q. Commercial buildings are often required by code to use metal studs. I have been unable to find accurate thermal conduction values for these studs in exterior walls. Do you know of any test data giving effective R-values for nominal 2x4 and 2x6 metal studs on 16- and 24-inch centers with fiberglass batts in the cavities?—*Thomas Anderson, IKM SGE Inc., Architects, Engineers and Interior Designers, Pittsburgh*

A. We found what we think are the only two papers on the subject. They draw different conclusions. In the first, written in 1972, J.R. Sasaki of the National Research Council of Canada concludes that metal stud wall R-values were 9 to 13 percent less than the R-value as calculated by the ASHRAE Zone Method. The Zone Method uses a weighted average of the U-values of individual elements to calculate the thermal resistance of a multi-component system such as a stud wall. Sasaki attributed the differences to convective heat transfer in the stud space or convective air exchange through the insulation. The walls in his test, however, were unlike today's insulated walls. They had only 2 inches of fiberglass insulation in a 3½-inch stud cavity.

The second study is much more recent and uses modern materials. Donald Larson and Bakhtier Farouk at Drexel University in Philadelphia measured heat flow through a wall built of foil-faced R-11 fiberglass, ½-inch drywall, and 0.02-inch-thick steel studs at 16 inches on-center. Using a portable 4-foot-square test plate, they found the wall R-value to be 43-percent lower than that determined by a simple one-dimensional calculation.

The discrepancy, they speculate, is due to increased lateral heat flow through the flanges of the stud. Thermal short-circuiting was made worse by the foil facing on the insulation. They conclude with a note of caution, saying that the test method needs further assessment.

Standard design booklets for metal-stud buildings list R-values for the insulation only—they ignore the studs altogether.

Covering Inside Foam

Q. I am reinsulating a house that has concrete-block walls, a stucco exterior, and ¾-inch foil-backed gypsum board over furring strips on the interior. If I glued foam insulation directly over the existing plaster finish, would paneling be sufficient covering? Will the foil backing create a cold-side vapor barrier?—*Gordon Reed, Jr., Kingsford, Mich.*

A. Since most fire codes call for a minimum half-hour fire rating over foam insulations, paneling would probably not

suffice. New 1/2-inch drywall is usually called for.

The thin foil used on the back of drywall will create a moderate cold-side vapor retarder, but the exact permeance is not published. The safe tack is to use a high-grade air/vapor barrier on the inside, keeping it much less permeable than the cold-side barrier. We suggest foil-faced foam insulation with the joints sealed with foil tape. Also take measures to keep interior moisture levels to a moderate level.

Flue Damage

Q. A heating salesman mentioned that lawsuits were pending against some manufacturers of high-efficiency furnaces—that although condensation problems had been solved through the use of stainless-steel heat exchangers, there were new problems arising from the lower-temperature flue gases. Also are there any documented cases of condensation damage in older furnaces stemming from the use of duty-cyclers lowering flue-gas temperatures?—*Jeff A. Pendl, Enervison, Cincinnati*

A. Higher-efficiency units have cooler exhaust gases, which may condense in different parts of the system. If the system is not designed to handle the corrosive condensate, problems may occur.

The very high-efficiency condensing furnaces are designed to condense liquid in the heat exchanger. While some early models had troubles, we are not aware of any current problems or lawsuits. Condensing furnaces use stainless-steel heat exchangers, plastic flue pipe, and other systems that resist corrosion.

You are more likely to run into trouble when fitting a new, more efficient furnace to an old flue, or when retrofitting devices that lower flue-gas temperatures. In particular, problems are likely when the draft is already marginal due to a cold exterior chimney, extra-long flue connector, or other flue problems.

As for the particular device you mentioned, researchers at The American Gas Association Laboratory suggest they are unlikely to cause condensation problems. Nor are they likely to boost the efficiency more than 1 or 2 percent. Other energy savers such as heat reclaimers and flue vent dampers are more effective. But stick with certified devices, follow the specs, and consult with the manufacturer when in doubt.

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