PLASTICS Takes Improvement to the Wall

NEW NAHB RESEARCH CENTER WALL STUDY ABOUT HEAT FLOW—R-VALUE NOT THE WHOLE STORY

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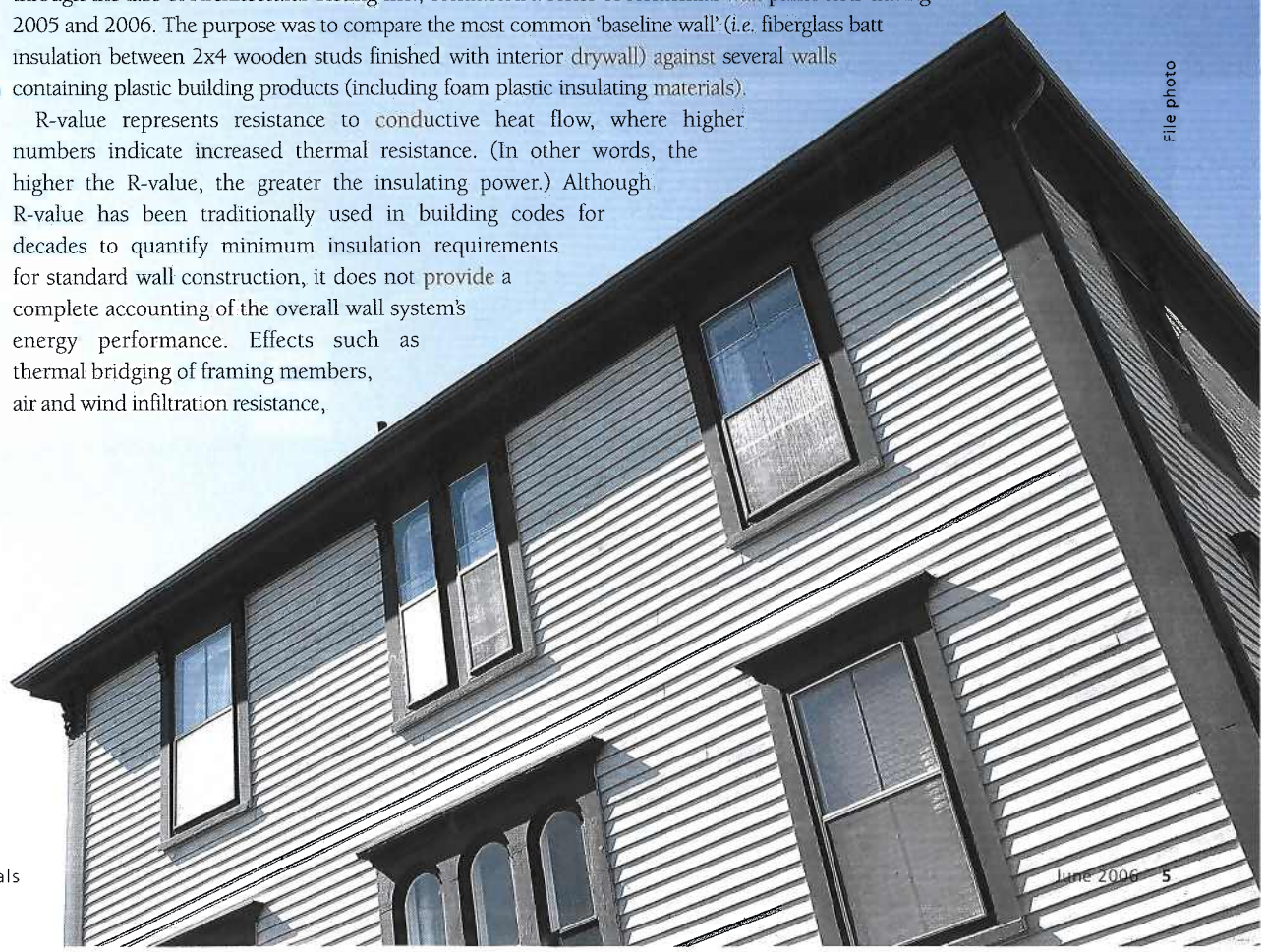
> "Plastic building products can reduce heat flow an average of 18 to 25 percent over baseline wall under windy conditions."

In an effort to more realistically quantify the energy performance of a variety of wall system alternatives under simulated 'real-world' conditions, the National Association of Home Builders (NAHB) Research Center, through the labs of Architectural Testing Inc., conducted a series of residential wall panel tests during 2005 and 2006. The purpose was to compare the most common 'baseline wall' (*i.e.* fiberglass batt insulation between 2x4 wooden studs finished with interior drywall) against several walls containing plastic building products (including foam plastic insulating materials).

R-value represents resistance to conductive heat flow, where higher numbers indicate increased thermal resistance. (In other words, the higher the R-value, the greater the insulating power.) Although R-value has been traditionally used in building codes for decades to quantify minimum insulation requirements for standard wall construction, it does not provide a complete accounting of the overall wall system's energy performance. Effects such as thermal bridging of framing members, air and wind infiltration resistance,



File photo

Photo courtesy NAHB Research Center

Prior to the National Association of Home Builders (NAHB) Research Center insulation study, wall samples, similarly aged, are readied for their hot box testing.

and stack effect on the building shell under normal, 'real-world' operating conditions are not considered in the R-value.

This study is unique in its evaluation of overall wall system performance. It was designed to characterize the energy consequences of wall construction and insulation material choices under simulated wind pressure conditions. To more accurately represent various climates and 'real-world' conditions, each wall system was tested under two conditions:

- in a 'static state' condition with no additional atmospheric wind pressures at one outdoor temperature; and
- with a 24-km/h (15-mph) 'wind loading' at three different outdoor temperatures.

Testing showed all the wall systems performed similarly (within the statistical accuracy of the testing apparatus) under no-wind conditions. Of course, all walls under wind conditions performed less well than with no wind. Nonetheless, once simulated 'real-world' wind loading was applied, the wall systems with plastic building products performed between 14 and 29 percent better, with performance, relative to the baseline wall, increasing as the outside temperature rose. This indicates air infiltration plays an important role in the

Table 1
Panel Study Parameters

Interior finish	Insulation*	Sheathing	Weather barrier
12.7-mm ($^1/_2$-in.) gypsum	R-13 KFB (88.9 mm [3.5 in.])	11-mm ($^7/_{16}$-in.) OSB	None
$^1/_2$-in. gypsum	R-13 KFB (3.5 in.)	$^7/_{16}$-in. OSB	House wrap
$^1/_2$-in. gypsum	54 mm (2.1 in.) of spray foam insulation R-13	$^7/_{16}$-in. OSB	None
$^1/_2$-in. gypsum and OSB	Net R-15 SIP (92 mm [3 $^5/_8$ in.])	$^7/_{16}$-in. OSB	None
$^1/_2$-in. gypsum	R-13 KFB (3.5 in.)	$^1/_2$-in. rigid foam board ~R-3 3	Tape

* Nominal R-values • OSB = oriented strand board • KFB = kraft-faced fiberglass batt • SIP = structural insulated panel