

by Pieter  
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COURTESY OF PORTLAND CEMENT ASSOCIATION

# Foam Forms Bring Concrete Results

*Concrete may be cold and hard, but some energy-efficient builders have been warming to insulating concrete forms (ICFs). As ICFs become more common, home performance professionals need to know how they're built and how well they work.*

**S**ales of insulating concrete forms (ICFs) are growing over 50% per year, and last year an estimated 4,000 houses were built with ICFs. In addition, a smaller number of low-rise commercial ICF buildings went up. The rapid growth in the popularity of ICFs stems in large part from their energy efficiency and interior comfort. A field study in 1997 compared the energy consumption of homes built with ICFs to

that of homes built with conventional wood frame walls. The data indicate that houses with ICF walls consume about 40% less energy for heating and 30% less energy for cooling than otherwise comparable stick-frame houses.

The field study results are good news for those concerned with energy-efficient housing. But the ICFs put new demands on the energy and HVAC professionals. Sizing heating and cooling

equipment and specifying ventilation, in particular, can be challenging. *Manual J*, the usual technique for sizing heating and cooling systems, needs to be tweaked to work with ICFs. And, ICF homes almost always need supplemental ventilation. HVAC contractors using the same techniques they use on conventional construction will tend to oversize the equipment and provide too little ventilation.

## FOAM FORMS

mium. In light of this, we might view the fuel savings as a nice side benefit.

The more dramatic cost savings come from correctly sizing the HVAC equipment (see "Efficient Cooling: Making It Happen," *HE* Mar/Apr '98, p. 35). Sizing it to match the home's lower energy consumption can save enough money to offset much of the higher cost of the walls.

One can probably install about one-third to one-half as much heating capacity in an ICF home as one would install in the same stick frame house, and about one-third as much cooling capacity. Heating energy consumption is only about 44% less, but HVAC is supposed to be sized for the peak load, not the total load. Simulations show that walls of high thermal mass, because of their damping effect, tend to have lower peak loads than their lightweight counterparts.

Thus it is not a stretch to assume that heating capacity can safely be cut by half. A few ICF builders in the North say that they routinely install half as large a furnace as they would in a similarly sized frame house, without problems.

The same reasoning seems to justify downsizing the cooling system by at least one-third. For an average-size house these equipment reductions could translate into \$2000–\$3000 in up-front savings, which can be used to help pay for the ICFs.

However, most HVAC contractors are loathe to downsize equipment, let alone to downsize it so much. They fear that

the lower load projected will not be accurate, the house will fail to maintain set temperature, and they will be blamed. They point to the uncertainty

of the exact load in any given house.

In fact, even in the study sample, there were a few cases in which ICF houses and frame houses had similar HVAC loads. Presumably, this was because of unmeasured differences among houses such as the tightness of the roof construction, extent of roof insulation, solar incidence, routing of HVAC ductwork, and the energy efficiency of windows and doors. Such variation inclines HVAC contractors to be conservative.

Proponents of ICFs argue that equipment on frame houses is usually oversized already, and that leaving the sizing the same when switching to houses as energy-efficient as ICFs can not only overcharge the customer for the initial equipment cost, but can also create other problems. Oversized equipment will tend to hit the house abruptly with a blast of hot or cold air and quickly shut off. The equipment will not have time to cycle efficiently, leading to such problems as unnecessarily high fuel consumption and failure to

### ICFs and HERS: Guaranteed Performance, Easy Financing

For the last 10 years, Reward Wall Systems, a manufacturer of insulating concrete forms (ICFs) in Omaha, Nebraska, has offered an energy guarantee: their ICFs save homeowners 70% on heating and cooling compared to the 1992 Model Energy Code (MEC), or Reward pays 110% of the difference in energy costs. Reward recently decided to promote homes built with their walls by getting them the Energy Star label. To qualify for the federal Energy Star Homes program, homes need only surpass MEC by 30%, so Reward's executives were confident their walls could pass the standard. However, Energy Star requires each home's performance to be verified by certified home energy raters.

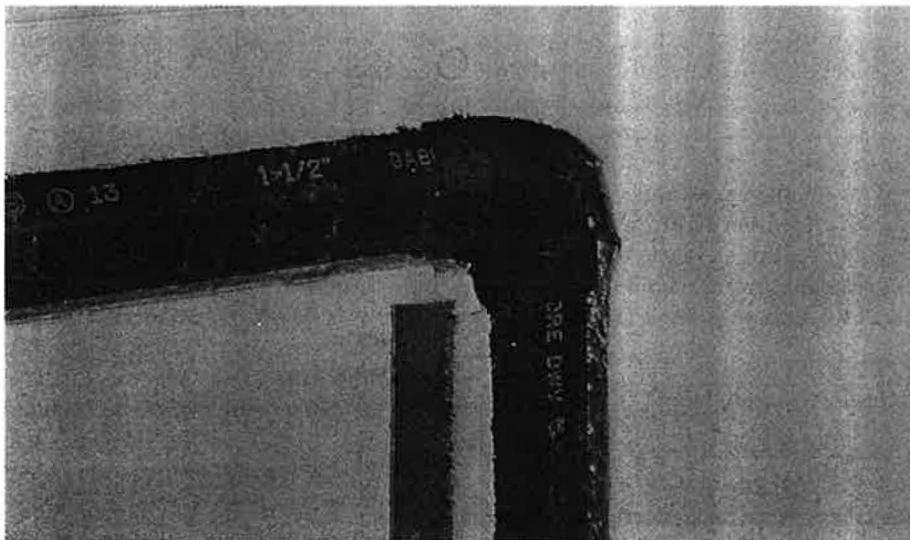
In order to get the homes verified, the company recently partnered with the National Home Energy Rating Organization (National HERO) to make many of its distributors and dealers into certified energy raters. The partnership will allow Reward to make all of its homes Energy Star-compliant, and the dealers will be able to help buyers set up energy efficiency mortgages (EEMs).

From May 2 through 5, Steven Lowrie of National HERO was in Omaha, training 13 Reward dealers and distributors in energy ratings. Now, before a home is built, the dealers can collect data about the proposed floor plan, roof system, and mechanical systems, and send the information to Lowrie's office. National HERO will then run the computer simulations to provide an energy rating. Once the home is built, the rating will be confirmed with home diagnostics equipment.

The dealers will then be able to help buyers apply for an EEM. They will have a one-page form that buyers can fill out to see if they qualify for the basic requirements of the EEM. Because most EEMs only require that homes comply with the Energy Star standard of a 30% savings over MEC, Reward is confident that homes built with their wall systems will have no problem qualifying.

For more information, or to get involved with National HERO, contact Christine K. Lowrie, 804 Morrefield Park Drive, Suite 101, Richmond, VA 23235. Tel: (800) 373-2416; Fax: (804) 560-9139; E-mail: n-hero@ix.netcom.com; Web site: www.national-hero.com. For more information about Reward, call Carl Martens, Director of Educational Services, 4115 S 87th St., Omaha, NB 68127. Tel: (800) 468-6344; Web site: www.rwsinc.com.

—Steven Bodzin



Grooves for plumbing and electrical lines are carved out of the foam with a hot knife or router.

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dehumidify when air conditioning.

Regardless, without hard numbers HVAC contractors tend to keep the equipment large. Those few who use load simulation packages, such as BLAST and HOT2000, calculate lower loads and install smaller equipment. But most contractors remain conservative.

The issue of ventilation to the outdoors arises because ICF homes tend to have much lower natural air infiltration. In practice, the builders of about half of all ICF homes install no supplementary ventilation, and say they've seen no problems. However, many experts recommend designing in some air exchange when the unassisted air change rate would be below 0.35 ACH. And according to some studies, most ICF homes are below that.

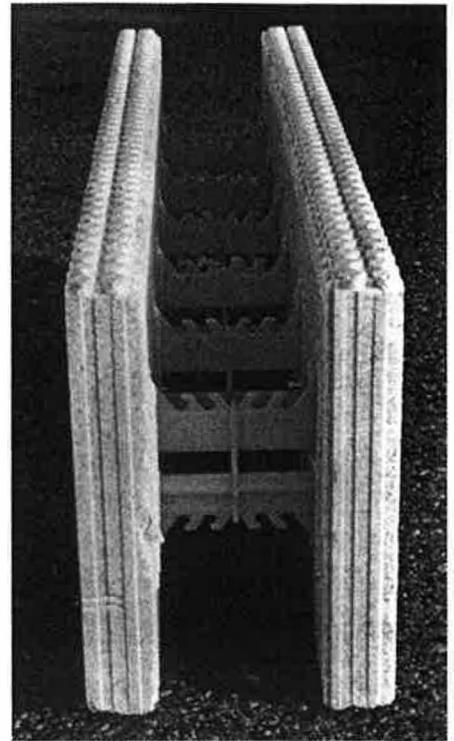
Some builders who install an air exchange use a simple intake pipe. This adds only a couple of hundred dollars to the initial cost, but it makes the house less energy-efficient. Others use a complete air-to-air heat exchanger. This has much less of a detrimental effect on energy efficiency, but it costs \$1,000-\$2,000.

## A Future of Foam

The Portland Cement Association is currently preparing sizing guidelines for HVAC contractors. These guidelines will show how to simply and accurately modify standard equipment sizing procedures laid out in *Manual J* for buildings with ICF walls.

Proper ventilation is more problematic. There are few standards for any form of construction. In both of these areas, further studies will provide more information. At that point, it will be possible to specify the HVAC sizing and ventilation procedures that maintain a comfortable, healthful environment yet take advantage of the savings permitted by ICF construction. In the meantime, the home performance professional can best serve the customer by basing decisions on a more detailed knowledge of ICF houses and how they work. 🏠

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AMERICAN POLYSTEEL

A block ready to be lifted into place. Different systems have different methods of attaching the two sides of the form, and of attaching one form to the next.

## Makers of ICFs

- AAB Building System ..... (800)293-3210
- American Polysteel ..... (800)977-3676
- Amhome USA, Inc ..... (800)393-3626
- Diamond Snap-Form ..... (800)255-0176
- Ener-Grid ..... (602)386-2232
- Energy Lock, Inc ..... (801)288-1199
- Featherlite, Inc ..... (561)575-1193
- Foam Form Systems ..... (800)858-1390
- Foam Wonder Wall ..... (813)258-5500
- Greenblock ..... (719)687-0645
- ICE Block ..... (800)ICE-BLKS
- Insul Holz-Beton ..... (803)642-9346
- Insulform ..... (206)242-9424
- ISOMAX ..... (314)677-8433
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- KEEVA ..... (602)827-9894
- Lite-form ..... (800)551-3313

- New Energy Wall Systems ..... (810)435-6056
- Perma-Form Components ..... (800)318-1750
- Poly-Form ..... (800)537-3676
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- Structura Technologies ..... (816)483-7688
- Tech Systems ..... (614)781-0655
- Therm-O-Wall ..... (800)424-WALL
- ThermoBlock ..... (520)779-1683
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