

# ICF House

## Featured on Extreme Makeover: Home Edition



The ABC television program, *Extreme Makeover: Home Edition*, the show that radically rebuilds homes for families in need, featured its first “green” home built for the Vitale Family of Athens, Vermont last fall. This highly energy-efficient and handicapped accessible home was built in just days using expanded polystyrene insulating concrete forms (ICFs).

As in all episodes of *Extreme Makeover: Home Edition*, the rebuilding is completed in four days, including interior design and landscaping. A team of contractors, designers and several hundred workers and volunteers swarmed the site to complete the spacious 2,900 sq. ft. home in under a week.

ICFs are lightweight, hollow EPS foam blocks connected by plastic or steel ties and held in place with concrete that’s poured into the space between the foam panels to form a thermally insulated wall. The EPS panels remain in place to provide permanent, highly insulated walls which contributes to the home’s comfort and energy efficiency. The ICF installation process saves manpower time and costs and reduces worker injuries. In addition to superior insulation, ICF walls provide

safety, strength and significant noise reduction. Expanded polystyrene ICFs contain no CFCs, formaldehyde, asbestos or fiberglass, nor is there any degree of “off-gassing” or the accompanying loss of R-value. Their design flexibility allows contractors to build curved walls and custom angles without worrying about structural load considerations.

The first job was demolishing the existing hunting shack, clearing the debris and digging the hole for the frost wall. A high-performance, under-slab vapor barrier provided protection against water-vapor migration from the soil into the concrete slab and crawlspaces. As soon as the slab and footer forms were in place, crews poured the concrete mixture into the forms. The building team used an accelerator to ensure the concrete would cure in four hours.

One side of the slab was still being poured as the ICF crew set the vertical rebar for the wall. Volunteers handed rebar and ICFs forms down to ICF installers. As the ICF installers worked, framers were on the slab erecting floor supports. The ICF crew started building exterior walls while framers worked on first floor interior walls, HVAC crews and plumbers installed ducts, the mechanicals and under-floor plumbing.

Although the ICFs are a “behind the scenes” element of the Vitale Home, they are an integral part of the energy efficient, healthy home. The use of ICFs on both foundation and walls was



The Vitale family had been living in a dilapidated hunting shack, not a good environment for their two children especially their two-year-old son who suffers from ongoing health issues. Their new home will provide years of worry-free comfort allowing them to provide the care needed by their young family. EPSMA congratulates *Extreme Makeover: Home Edition* for another outstanding job.



# Below Grade In-Situ Research

## Proven Performance Under Tough Conditions

A joint research project on exterior insulation basement systems (EIBS) conducted by the National Research Council of Canada/Institute for Research in Construction (NRC-IRC) and the Expanded Polystyrene Association of Canada (EPAC) in 1995 uncovered new information on how to test key performance characteristics of foam insulation in below grade applications.

The joint NRC and EPAC research project evaluated the performance of EPS insulation in an exterior below-grade application. Measurements of moisture content after long-term exposure in below-grade applications confirms the thermal performance of EPS exterior foundation insulation. EPS insulation was attached to the foundation wall exterior that was exposed to soil backfill for 30 months. The moisture content of the EPS insulation samples removed after this length of exposure was in the range of 0.01 percent to 0.96 percent by volume. The project also instrumented and monitored specimen thermal performance, site weather conditions and soil moisture content.

Thorough analysis detected water at the form's outer surface during periods of heavy rain and major thaws, however, the concrete basement wall surface showed no evidence of water penetration through most of its height. The thermal performance of EPS was found to remain stable and was largely unaffected by water movement.

EPS durability was also measured as part of the research project. The in-situ thermal performance of the insulation was monitored continuously over the 30-month exposure period and found to be constant. Thermal and mechanical properties of material samples tested after removal were also unchanged.

### Test Parameters & Results

1. The EPS insulation was directly exposed to high moisture content soil conditions, yet the moisture content in the foam insulation after the two-year exposure period was found to be less than 0.5 percent by volume on average.

2. The in-situ thermal performance of the EPS insulation was monitored over the two-year exposure period and found to remain constant (i.e. there was no loss in thermal resistance).
3. Samples taken from the field exposure underwent laboratory testing to confirm thermal performance and durability. Test results indicated there was no change in material properties after the two-year period.
4. The research project included development of a durability test protocol to provide a means of assessing performance of all insulation types subjected to extreme thermal gradient and environmental cycling.

Testing conducted as part of the NRC/EPAC project confirmed the method provided valid comparative ratings for the products tested versus field performance. The draft protocol served as the basis of a formal test protocol developed within ASTM International. C1512-07, Standard Test Method for Characterizing the

Effect of Exposure to Environmental Cycling on Thermal Performance of Insulation Products is now recognized as an effective means to evaluate the ability of insulation products to maintain its thermal performance and other critical physical properties.

Measurements of moisture content after long-term exposure in below-grade applications confirm the performance of EPS insulation. Numerous published reports demonstrate water absorption by EPS insulation exposed in actual applications over extended periods of time is much less than values indicated by short term, exaggerated laboratory tests.

The EPS Molders Association has released two new technical bulletins, *EPS Insulation: Freeze-Thaw Cycling Tests Show No Loss of R-Value or Strength* and *EPS Insulation: Below Grade Testing Confirms R-Value Retention*. Contact our office to request copies.

estimated to reduce heating costs by 30 percent, a significant consideration for a New England home. The Vitale Home was Energy Star rated, it surpassed the builders expectations by achieving the highest available rating. The U.S. Department of Housing and Urban Development and the Partnership for Advancing Technology in Housing (PATH—[www.pathnet.org](http://www.pathnet.org)) recognized ICFs as one of the Top Ten building technologies in 2006. The PATH toolbase website contains a section on ICFs. Not only does an ICF home help reduce the utility costs, but it may actually help generate some income. The Gainesville-based International Carbon Bank and Exchange calculated the amount of carbon emissions saved by a project home of the University of Florida, and paid \$86 for 8.6 metric tons of carbon emission credits to the homeowner.

In addition to the ICF walls and foundations, the "green" Vitale home has state-of-the-art windows, low-flow toilets, sinks and showers, Vermont lumber, green-certified hardwood floors,

Vermont slate, passive-solar heating, solar hot water and energy efficient appliances. EPS foam insulation can contribute toward green building recognition in a variety of point or credit categories including energy efficiency, recycled content, localized distribution, indoor air quality, sustainable sites and innovation.

EPSMA member Concrete Block Insulating Systems Inc. (CBIS Inc.) of West Brookfield, Massachusetts provided the ICFs for BuildBlock Building Systems LLC of Oklahoma City, who donated and oversaw the installation of the ICFs for the Vermont project. Jeff Nickerson, president of CBIS traveled to the remote job site and volunteered as part of the construction crew.

For more information, go to ABC's site: <http://abc.go.com/primetime/xtremehome>.