

Tech Transfer (continued from page 1)

with others in the industry who are promoting this technology.

Engineered Panelized Systems, which are constructed from a variety of materials using assembly line automation inside a factory, form a structural envelope that reduces or eliminates the need for on-site framing and can be assembled swiftly by less experienced laborers.

Engineered panelized wall systems present a potentially considerable savings for homebuyers and building owners that could easily be measured in hundreds of millions of dollars per year. The technology could also help improve the quality and durability of housing and produce new wall system technologies.

Barriers: The primary barriers to widespread use of engineered panelized systems are the lack of a performance standard for their design, fabrication, and installation incorporated into the model codes and local codes, and limited to non-existent education for local code bodies on how to apply the standards.

Approach: PATH has already developed guidelines intended for implementation as a standard. The standard would allow for innovation in fastening technologies, integration of various innovative and conventional materials (e.g., wood, steel, and plastic members in the same wall), and implementation of advanced computerized design aids. This technology may also address long-standing barriers to the acceptance and use of Optimum Value

Engineering (OVE) or advanced framing methods. PATH will focus on gaining consensus on the need for a general standard, and then publish and bring the standard to the industry.

Plumbing Manifold and Home Run Systems include a plumbing manifold and flexible piping for water distribution comprised of two PATH Technology Inventory items—Plastic Manifold Plumbing Systems and Aluminum-Plastic Composite Water Piping. When used together, the technologies conserve water, speed installation, and promote durability.

As with FPSF technology, home run systems provide lower initial costs – estimated installed plumbing costs based on the experimental plumbing design are about \$1,000, compared with about \$1,450 for a similar copper system.

The Barriers: The panel determined that acceptance of these technologies is stalled by three primary barriers – (1) negative consumer and builder perceptions of plastic piping because of past failures of polybutylene piping, (2) reluctance among some state codes to incorporate plastic piping, and (3) plumber resistance to reduced labor needs.

Approach: PATH will work with stakeholders to develop strategies for accelerating the acceptance of home run plumbing, including making consumers and builders more aware of cost savings, educating architects on building layout and utility disentanglement through use of plumbing

manifolds, and obtaining and disseminating testimonials from builders, city code officials, and homeowners who have had success with the system.

Additional information on these three technologies, as well as the other high-priority candidates, is available in the PATH Technology Inventory on the ToolBase portal – www.toolbase.org/techinventory – PATH's online technical resource. **TB**

ToolBase Site Offers Info on Natural Disaster Mitigation

In response to the natural disasters that have occurred across the country in 2003, the NAHB Research Center has posted numerous sources of information on the ToolBase website, www.toolbase.org, for the home building industry that address tornadoes, hurricanes, earthquakes, and fires. These resources include descriptions of innovative building technologies that are designed to mitigate damage to site-built and manufactured homes from wind-borne debris and high wind events; a case study of the design, fabrication, and installation of wall systems for use in high-wind and earthquake-prone regions of the United States; and listings of governmental and non-governmental organizations that are focused on addressing natural disasters, such as the Federal Emergency Management Agency, and the Earthquake Engineering Research Institute. Additionally, the site contains numerous housing damage assessment reports from past hurricanes and tornadoes, a ToolBase TechNote on hurricane preparedness for builders, and tips for fire retardant construction. For more information on how the home building industry can prepare for and respond to natural disasters, visit www.toolbase.org or call the ToolBase Hotline at (800) 898-2842. **TB**

ToolBase.org Tips

Below is the first in a series of tips that will help you navigate your way through the technical information-rich ToolBase.org website. Look for more tips in future issues of *ToolBase News*.

Navigation Bars are Your Friends

On the homepage of ToolBase.org you will see three navigation bars. These various means of navigating the site were developed to help visitors get to the information they want in the way that they want to get to it.

1. Programs and Services Bar – stretches across the top of the page; highlights documents produced for ToolBase Services and PATH, including:
 - Ask An Expert – ask ToolBase Hotline experts a technical question, or see what others have asked.
 - ToolBase E-News – bi-weekly electronic news service for the residential construction industry.
 - ToolBase News – quarterly technical newsletter articles that provide practical information for building professionals on research, trends, and events.
 - Field Results – follow projects across the country that apply and test PATH technologies.
 - Technology Inventory – get information on innovative building technologies that help with housing affordability, energy efficiency, durability, environmental performance, and safety.
 - Research – check out Roundtable Discussions, TechNotes, Technology Roadmaps, Technology Scanning, and more.
2. Issues Bar – located along the left side of the page; covers home building topics, such as Concrete Construction, Factory-Built Housing, Land Use, Seniors' Housing, Steel Framing, and more.
3. Subsystems Bar – located along the right side of the page; organizes information by the subsystem of a house.



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NEWS

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Technology Transfer: Bringing Innovation to the Mainstream

Since its inception in 1998, the Partnership for Advancing Technology in Housing (PATH) has worked with the NAHB Research Center and other industry leaders to identify emerging technologies with the potential to significantly improve the quality, durability, energy efficiency, environmental performance, and affordability of America's housing. The PATH Technology Inventory now contains 162 emerging technologies – each presenting specific benefits for the home building industry, as well as encountering its own barriers to market inception.

Typical barriers – such as higher initial costs, approval delays before code recognition, and additional time and costs for training installers and inspectors – can delay full market penetration of new technologies and products for 10 to 25 years. PATH aims to accelerate the adoption of practical innovations into mainstream building practices by first identifying and then tackling the specific barriers to market penetration for each technology.

In order to focus efforts on the technologies likely to benefit the most from PATH's involvement, a panel recently identified 10 technologies from the Inventory as "high-priority" candidates for transfer into mainstream residential construction. The panel, comprised of nine industry professionals experienced with the PATH program and goals, then further analyzed the barriers to each technology and developed preliminary recommendations for overcoming them.

"Because each technology is different, we need to find which barriers each encounters, then establish ways to overcome those barriers," said Ross Heitzmann, an independent consultant who participated in the panel. "That may sound simple, but it could make a substantial difference in how quickly these technologies are accepted."

The 10 high-priority technologies identified are:

- Frost Protected Shallow Foundations
- Engineered Panelized Systems
- Home Run Plumbing Systems
- Pre-cast Concrete Panels (Walls & Foundation)
- HVAC Optimization
- Low Impact Development
- Integrated Steel/Wood Combination Framing
- Tankless Water Heaters

- Shared (Community) Wastewater Treatment
- Air Admittance Vents

Among these, the panel identified frost protected shallow foundations, engineered panelized systems, and home run plumbing systems as items that have significant and clearly-demonstrated benefits as well as apparently manageable barriers – as a result, these technologies will receive attention first.

Frost Protected Shallow Foundations (FPSFs) protect foundations against frost damage without the need for excavating below the frost line by strategically placing insulation around the outside of a foundation. Market acceptance for FPSFs is especially promising because, unlike many new technologies, they offer builders initial cost savings. FPSFs cost less than traditional foundations in both construction and excavation requirements and labor and material costs. FPSFs also provide increased energy efficiency, which can result in recurring utility savings for homeowners.

The only remaining technical concern for FPSFs is the vulnerability of the insulation required around its base. Builders need to protect the insulation from physical damage and, in areas prone to termite infestation, use termite-resistant insulation products and termite treatments.

The Barriers: Despite the clear benefits and limited obstacles to FPSF technology, the panel agreed that FPSFs are not achieving rapid acceptance because of lack of awareness and industry resistance. FPSFs do not have an active promoter within the industry, reducing market awareness. As a result, home builders, masonry contractors, and homebuyers who are unaware of FPSFs do not offer it or ask for it, and local officials who are unfamiliar with the technology may not be willing or able to approve it promptly.

Approach: PATH is seeking stakeholders to help implement several strategies for educating the public and increasing awareness of FPSF technology, including ensuring local code officials are aware of FPSFs in the model codes; providing information and training to local inspectors on how to apply the code; disseminating architectural details and specifications to designers and architects; providing demonstrations and workshops; writing articles; developing case histories and cost comparisons; and linking

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- Partnership for Advancing Technology in Housing
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- Wood Truss Council of America
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HOTLINE

ALTERNATIVES FOR UNDERLAYMENT

Q: I am looking for an alternative to luan plywood for flooring underlayment applications – perhaps something with no wood content or reduced wood content. What are the possibilities?

A: There are several choices for underlayment material, depending upon the type of floor finish (carpet, resilient vinyl, hardwood, or tile). Fiber-cement and cement board products are popular choices in kitchens, bathrooms, and foyers where the typical finish is tile. Recently, gypsum panel products have been introduced and are beginning to gain acceptance. One brand of gypsum panel works well under wet-floor applications, such as tile in kitchens or bathrooms, as well as for dry-floor applications, such as under carpets, vinyl, or hardwoods in bedrooms, hallways, dens, or living rooms. Some of the widely-available underlayment types are listed below, with their possible applications to the right.

Underlayment Type	Applications
Cement-board (e.g., Durock®)	Wet-floor
Fiber-cement (e.g., CertainTeed FiberCement Underlayment®; Hardibacker®)	Wet-floor; Dry-floor
Gypsum-panel (e.g., Dens-Shield®; Fiberock®)	Wet-floor; Dry-floor

It is important to review product installation instructions. Pay careful attention to specifications such as subfloor deflection limits, approved floor finishes, panel spacing, and fastener schedule. In addition, follow the manufacturer's installation instructions for finish floor products because they specify which underlayment is approved for use with their product for warranty coverage. Be sure to review the product with your trades, as they may be willing to try different products that have good track records.

Most of the non-wood underlayments are available in building supply centers nationwide. If your local supplier does not stock a particular product, they can order the product for you.

For answers to other questions on products and technologies, contact the ToolBase Hotline.

(800) 898-2842

More Insight from Energy Expert:
Energy Efficiency and HVAC

Following is part two of a discussion with Joe Wiehagen, senior energy engineer at the NAHB Research Center. This discussion focuses on the latest developments in HVAC products and practices that builders and remodelers can adopt to attract customers, and to address the nation's pressing energy crunch as heating season kicks into high gear.

TBN: Thanks for catching up with us again. The heating season has begun for most of the United States—how can building professionals act to impact the efficient operation of an HVAC system during this season?

JW: There are many things that builders and remodelers can do to make an HVAC system more energy-efficient. For example, they can ensure that systems are properly sized according to the home's location, window area orientation, and wall construction. Builders and remodelers should place as much of the ductwork as possible in conditioned space, and seal the ducts against air leakage using mastic or foil tape. Ducts located outside of conditioned space should be insulated. And the entire HVAC system should be pressure balanced to ensure that all rooms get adequate air supply.

A thermostatic expansion valve (TXV), which regulates the pressure of refrigerant in an air conditioning system, can be used to maximize efficiency. As a cooling unit ages, a TXV keeps the system operating close to peak efficiency. Shea Homes' San Diego division offers TXVs as a regular part of the energy-efficiency package in their High Performance Homes. Many equipment manufacturers also are incorporating TXVs into the design of their high-efficiency equipment.

Another way to make an HVAC system more energy-efficient is to choose the highest efficiency equipment that is affordable. The efficiency of an air conditioner is measured by its seasonal energy efficiency ratio (SEER), which represents the ratio of cooling energy provided (in BTUs) per watt-hour of electrical input energy. Federal minimum SEER requirements are in the process of being raised to 12, and the highest SEER equipment on the market today is over 19. High SEER equipment should be considered, since it often does not cost much more. Both the Henderson, Nev., PATH field evaluation and the Tucson Zero Energy Home feature very high-efficiency HVAC systems. (More information on these and other PATH field evaluations is available at www.toolbase.org/fieldeval.)

The highest-efficiency gas furnaces on the market, condensing furnaces, can be over 96 percent efficient and do not use

indoor air for combustion. By using outdoor air for combustion, condensing furnaces don't run the risk of backdrafting (a situation in which flue gases are drawn into a home) and do not require expensive chimneys.

TBN: Are there any alternatives to traditional HVAC systems on the market?

JW: Yes. One alternative to a standard furnace and air conditioner is a ground source heat pump. This equipment uses the

earth's stable temperature to provide heating and cooling throughout the year, either through a hydronic or forced air delivery system. In some moderate and northern climates, a well designed home can be comfortable without mechanical cooling – through the use of clerestories, ventilation fans, and window shades.

For more information on HVAC system efficiency, condensing furnaces, ground source heat pumps, and other related technologies and practices, visit the ToolBase Services technical website,

www.toolbase.org. The PATH Technology Inventory and Field Evaluation write-ups are also available on the ToolBase site. If you have other specific questions about maximizing energy efficiency in the homes you build, contact the energy experts at the ToolBase Hotline—call (800) 898-2842 or email toolbase@nahbrc.org. **TE**



Very high-efficiency central air-conditioners (16 SEER and higher) are available from many manufacturers.

Hot Off the Presses!



The *2004 Directory of Accessible Building Products* will soon be available. If you are attending the International Builders' Show in Las Vegas in January, be sure to get

your free copy at the NAHB Research Center booth in the NAHB On-Site area (near the NAHB bookstore). After the show, the *Directory* will be available online at www.nahbrc.org/bookstore – you pay just the cost of shipping.

In its 14th year, the *Directory* contains useful information about products that facilitate accessibility, including appliances, fixtures, windows, and doors, climate control products, ramps, stair lifts, and elevators. In addition, national and federal accessibility requirements, specific product dimensions, model numbers, descriptions, and contact information are all included.

Get your copy today!



Promoting Building Innovations through NextGen Demonstration Home

Over the last 20 twenty years, energy efficiency, affordability, safety, and durability, have become increasingly important watchwords in the housing industry. At the International Builders' Show (IBS), attendees will have an opportunity to tour a demonstration home that marks the evolution of these values. The Partnership for Advancing Technology in Housing (PATH) is the driving force behind the building science in the 2004 NextGen Demonstration Home. NextGen will reflect how technological advances and marketplace demands have changed the standards for American home building.

Designed by All American Homes, the home demonstrates what can be achieved when a whole-house approach to building is coupled with high standards for building quality, comfort, and a commitment to affordability. In addition to the wide range of advanced technologies it demonstrates, the home will be a first introduction for many to modular building, or "stick building in a factory."

A 2,300 square foot modular home, built in a factory and assembled on site at the Las Vegas Convention Center, the home will be virtually indistinguishable from a

site-built home. Some of the innovations featured in NextGen include:

- **Tankless Water Heaters**, which provide hot water on demand without storage, and greatly reduce or eliminate standby losses, meaning the energy lost from



Artist's rendering of 2004 NextGen Demonstration Home

heated water sitting in the tank waiting to be used.

- **Spray Foam Insulation**, a two-part liquid containing a polymer (such as polyurethane or modified urethane) and a foaming agent. By acting as a wind and air barrier, this type of insulation often eliminates the need for separate

air-tightness detailing. This increases energy efficiency and allows downsizing of the heating and cooling system equipment.

- A **Greywater Reuse System**, which recycles wastewater from baths, sinks, washing machines, and dishwashers for use in irrigation, toilets, and exterior washing.

NextGen also demonstrates other practical and resource-conserving water conservation techniques and environmental performance. Indoor air quality and the use of recycled materials are themes throughout the house.

Through NextGen 2004, PATH will provide builders with a real world example of how advanced technologies can improve both quality and marketability in home building.

The NextGen Home will be open in the parking lot of the Las Vegas Convention Center during the 2004 IBS and Consumer Electronics Show. PATH will host a "Breakfast of Innovators" at the home on Wednesday, January 21, at 8:30 a.m. To reserve a spot at the breakfast, please email info@pathnet.org. For a complete list of PATH-profiled technologies at NextGen, visit www.pathnet.org. 

QUALITY MATTERS



Builders' Show Quality Events and Education

Looking to find out more about building quality into your business? The NAHB Research Center's National Housing Quality (NHQ) Program is offering several quality-oriented educational opportunities for attendees at the 2004 International Builders' Show (IBS). On January 19th, the 11th Annual NHQ Award Ceremony will be held at the Las Vegas Hilton. Patterned after the Malcolm Baldrige National Quality Award, the NHQ Award represents the highest recognition by the housing industry for quality achievement. Entries are judged by panels of experts who evaluate the role that customer-focused quality plays in construction, business management, sales, design, and warranty service. The NHQ Awards are jointly sponsored by the NAHB Research Center and Reed Business Group, publisher of *Professional Builder* and *Professional Remodeler* magazines.

Dean Potter, NAHB Research Center director of Quality Programs, will also lead three quality-related educational sessions at the 2004 IBS. The first session features a discussion of quality building practices with the winners of the 2004 NHQ Award. The second offering is a discussion of the NHQ Program's impact on the insurance industry. This session is a continuance of last year's insurance roundtable, which was organized by the NAHB Research Center with funding from the U.S. Department of Housing and Urban Development. The third session addresses the benefits of the NHQ Certified Trade Contractor Program, including the successes that builders and trade contractors have realized through its implementation.

For information on the National Housing Quality Program, visit www.nahbrc.org/quality or email quality@nahbrc.org. For more information on the NAHB Research Center's educational sessions, visit www.nahbrc.org/2004IBS.

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EDITORIAL CORRECTION

We would like to make our readers aware of an error in the fall 2003 issue of *ToolBase News*. The caption under the photo on the front page, which accompanies the article "Energy Expert Plugs-in to Latest Industry Developments," exaggerates the effect of radiant barriers on homeowner costs as determined by industry research. To be more accurate, the caption should have read, "The installation of radiant barriers can reduce cooling costs."