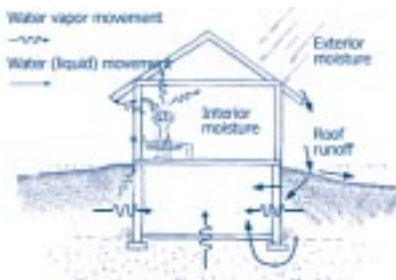


Increasing Energy Value through Moisture Control

Designing and building energy efficient homes that also minimize moisture intrusion is a goal for builders who participate in the EnergyValue Housing Award (EVHA) program. By following a few simple steps to managing moisture and mold growth, all builders and homeowners can all breathe a little easier while creating homes that are both comfortable and energy efficient.

- When it comes to site drainage and foundations, builders must be familiar with local hydrology and soil types to know the best type of foundation for that area. Inadequate site preparations can cause foundation cracking and aggravate moisture problems. Make sure gutters and downspouts work properly and divert water away from the house.




Typical pathways for water entering a home.

- A good design is the first line of defense in helping to keep wall cavities dry from the outside. Properly flash all openings in exterior walls and roof penetrations; do not rely on caulk or other sealants as a moisture barrier. Install windows according to manufacturer guidelines. When used, vapor retarders must be located on the warm-in-winter side of the wall (inside) in all climates except

hot/humid climates, where it should be placed on the warm-in-summer side (outside). Overhangs are an effective design tool to keep water away from walls as well.



Longer roof overhangs mean fewer moisture issues in walls.

- Proper HVAC system sizing is key to ensuring adequate dehumidification, which helps maintain proper moisture levels. Oversized air conditioners can contribute to damp indoor conditions because they cool air too quickly and don't run long enough to dehumidify. Automated controls on cooling systems and dehumidifiers can also help reduce moisture levels.
 - Minimize sources of moisture by venting combustion appliances and clothes dryers to the outside and not into attics, crawlspaces, or garages. Install ventilation fans in bathrooms, laundry rooms, and kitchens, to remove interior moisture. Automation control such as humidistats and occupancy sensors help ensure fans are used.
- To learn more on award-winning energy-efficient design, visit the EVHA website at www.toolbase.org/evha. 

ToolBase.org Reaches Out

To better serve the thousands of visitors who use the ToolBase Internet Portal (www.toolbase.org), the NAHB Research Center has made some changes you may want to check out.

- The Information Technology section of the site now includes research on computer programs created especially for builders, as well as research reports focusing on how Information Technology can accelerate and streamline home building processes.
- The Seniors' Housing section was reorganized to enhance ease of access to critical information for users.
- And, the site's Spanish-speaking audience now has the option to access even more articles that have been either created in Spanish or translated from English. At least 12 articles have been added to this section so far this year.


Let us know what you think of the changes made to ToolBase.org—send comments and suggestions to toolbase@nahbrc.org.

SIGN UP FOR THE
FREE TOOLBASE/PATH
E-NEWS BY VISITING
WWW.TOOLBASE.ORG

Guide on FPSF Updated

The NAHB Research Center is completing an updated version of its Frost Protected Shallow Foundations (FPSF) Guide. The new document will feature design procedures for FPSF, including applications/limitations, insulation selection, and FPSF design methods. The updated version will also include new information on recommended construction methods and details. For example, the FPSF technique can be applied to home additions with existing conventional foundations, and even walk-out basements. Each of these options is explained in the guide. Satisfactory practices of the design are included, proving the incorporation of polystyrene foam insulation to prevent frost heave in cold climates. Several typical approaches, such as brick veneer, independent slab, and stem wall are also explained.

The new version of the guide shows detailed drawings and updated graphics of the prescribed methods of using insulation board in the construction of shallow slab-on-grade foundations in cold climates with seasonal ground freezing. Because the International Residential Code (IRC) now includes prescriptive methods for building FPSF, this guide focuses on FPSF in heated and attached unheated buildings. Tables include a simplified comparison of the FPSF design requirement and energy code design requirement, and present actual examples of calculating the design of an FPSF in different climates.

A draft of the updated FPSF Guide is available now on www.toolbase.org/fpsf—the final document will be online in September. 



400 Prince George's Boulevard
Upper Marlboro, MD 20774-8731

Phone: (800) 638-8556
(301) 249-4000

Fax: (301) 430-6180

Internet: www.nahbrc.org

TOOLBASESM

NEWS

SUMMER 2004

Volume 9, Issue 3

Framing the Future: Engineered Panelized Systems Gain Market Acceptance

Engineered panelized systems consist of prefabricated panels that form a structural envelope, eliminating the need for conventional framing. As one of the Top 10 Technologies for 2004 identified by the Partnership for Advancing Technology in Housing (PATH), panelized systems are quickly gaining market share among builders in the United States for their energy- and labor-saving benefits.

The panels themselves come in a variety of forms. Structural Insulated Panels (SIPs), the most widely-used system, consist of an expanded polystyrene (EPS) core that is adhered to oriented strand board (OSB) or plywood skins, enabling it to act as a bridge that increases structural capacity and resists buckling. Other panelized systems include light gauge steel, aluminum, concrete, and fiberglass components.

Panels are usually manufactured in modules of 4' x 8' or greater, depending upon the home's design.

Although installation techniques differ by manufacturer, they typically include connections along the top and bottom of the panel and at panel abutment edges. In general, manufacturers must obtain individual code approval. The systems can reduce labor costs by eliminating the need for on-site framing, and allowing quick on-site assembly by less skilled laborers.

Another key advantage is improved insulation. Unlike conventional wood framing, which allows minor thermal breaks at each vertical stud and gaps between insulation batts and stud surfaces, panelized systems offer a dense, uniform and continuous air barrier. Improved insulation helps homeowners reduce energy costs, and provides builders with an additional selling point.

Many panels can also be designed to resist earthquakes, high winds, debris impact, moisture, and insect infestation. Additionally, the prefabrication process ensures precise, quality-controlled panels.


However, this preciseness limits the flexibility of the systems. Once panels have

been manufactured, making changes to the home's design becomes either very expensive or impossible. Also, because panels are manufactured within 1/1000 of an inch of specifications, the foundation must be poured precisely. If it is not, the foundation will have to be redone or gaps will have to be patched in the panels. Using pre-panelized foundations can prevent this, but may be cost prohibitive for smaller builders.

Higher material cost is also a drawback. Panelized systems are proprietary, and subsequently, cost more than commodities. Yet according to the Structural Insulated Panel Association (SIPA), building with SIPs generally costs about the same as building with wood frame construction, when labor savings are taken into account. According to ThermaSteel Corp., the total installed cost of its steel and EPS product is \$4.53 per square foot, compared with \$4.21 for a 2 x 6 stick frame. Harold Bader, president of Dynabilt, states that their EnergyStar-rated steel and structural polymeric insulated core product can save builders 30 to 40 percent of labor costs on the shell alone.

Panelized systems have gained the notice of production builders across the United States. After implementing panelized steel frames with pre-punched holes,

several divisions of Lennar Corp. found significant reductions in framing errors and much improved schedules. Pulte Home Sciences (PHS), the research and development group of Pulte Homes, has begun using a panelized system for all of their wood-built homes, including floors, walls, roofs, and foundations. According to the Pulte website, the custom component systems can "improve the stability, strength, environmental friendliness, and aesthetics of a new home."

More information on engineered panelized systems is available in the PATH Technology Inventory on the ToolBase Portal—www.toolbase.org/techinventory. To learn more about SIPs, visit the SIPA website at www.sips.org. 



Engineered panels, such as SIPs, can help reduce energy and labor costs, but may cost more up front.

Summer is here, and most homeowners are turning on their air conditioners. This is prime time for moisture issues to develop in homes. This issue of ToolBase News details some best practices for builders in design and product selection to help minimize moisture problems.

Inside

- Ask an Expert: Mold-proof Drywall Concrete Alternatives
- Keeping Humidity Outdoors
- PATH: Concept Home
- Quality: Grayson Homes
- Energy Value and Moisture Control
- ToolBase.org Update
- Updated Guide on FPSF

Services of the NAHB Research Center's ToolBase Program are delivered to you at no cost thanks to the generous support of our sponsors:

- National Association of Home Builders
www.nahb.org
- Partnership for Advancing Technology in Housing
www.pathnet.org
- U.S. Department of Housing and Urban Development
www.huduser.org



www.nahbrc.org

in partnership with

PATH

PARTNERSHIP FOR ADVANCING TECHNOLOGY IN HOUSING

www.pathnet.org

ASK AN EXPERT

Mold-proof Drywall

Q: I am looking for drywall that is as "mold-proof" as possible for the homes I build. What products are available?

A: Drywall manufacturers have been keenly attuned to the mold issue in the home building industry. Mold in new residential construction is an issue for builders due to the additional cost of remediation, not to mention visibility with homebuyers. For solid materials such as framing members, mold remediation revolves around cleaning and treating. However, for drywall, cleaning may not suffice, leaving a more expensive effort that requires removal and replacement.

In general, there are two kinds of mold-resistant drywall products currently in the market. They have either treated paper or treated paper plus a treated core. Manufacturers encourage use of drywall with just treated paper for finished basement wall application; they suggest use of the drywall with both treated paper and core material in bathrooms. Certain varieties of mold resistant drywall are sold as substrate for EIFS and gypsum party walls in residential buildings such as townhouses.

The current standard for drywall's mold resistant characteristics is ASTM D3273 ("Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber"). This standard measures the ability of the drywall product to resist mold and mildew growth under certain prescribed moisture conditions. However, this standard does not include longevity of the mold resistance treatment.

It's important to remember, there is no "silver bullet" when it comes to selecting materials for new homes. While technology is advancing to help builders deliver homes that are more able to resist mold growth, mold will always be an issue in home construction. The best tip to remember is that mold develops due to moisture—control the moisture, and you can control mold growth.


Alternative Methods May Offer Relief during Concrete Shortage

Recent cement shortages and price fluctuations have had a severe impact on the U.S. housing industry and on home builders. Alternative methods exist that may offer solutions for builders when concrete is either unavailable or cost prohibitive. Four methods are summarized below.

- **Wood Foundations.** Wood foundations consist of pressure-treated wood studs and plywood. They are easy to construct, can provide more spacious below-grade living areas, allow for easier modifications, and simplify installation of wiring, plumbing, ductwork, and insulation. Wood foundations are codified by the International Residential Code (IRC), and their long-term durability has been verified by 40 years of use and accelerated aging tests.
- **Cold-Formed Steel Foundations.** Cold-formed or light-gauge steel foundations are impervious to insect and fire damage and, despite recent increases in steel prices, can still be used economically. Similar to wood foundations, steel foundations are easy to install, can provide larger below-grade living areas, simplify trade installations, and can be constructed in inclement weather. Although the IRC does not provide prescriptive

tables for steel foundations, they can be used effectively; below-grade steel studs are subjected to lateral soil loads, just as above-grade studs are subjected to lateral wind loads.

- **Frost Protected Shallow Foundations (FPSF).** FPSF systems can save energy and reduce construction costs. They use insulation and drainage techniques to raise the frost level, permitting footing depths as shallow as 12 inches, even in the coldest climates. Shallow foundation ditches are easier to work around and use less concrete than a traditional 4-foot deep stem wall.
- **Panelized Steel Foundations.** Panelized steel systems are fabricated from extruded or expanded foam either sandwiched between steel sheets or with steel studs embedded in it. Panels are interlocked with each other, and can be used as basement or foundations walls. They provide easy installation by framing crews, eliminating the need for a concrete contractor.

These and other alternative methods are detailed in a new ToolBase TechNote—visit www.toolbase.org/technotes for the complete write-up. 

Keeping Hazy, Hot, Humid Conditions Outdoors


Experts agree that abnormally high indoor humidity conditions contribute to poor air quality and can create conditions for mold growth. Often problems relating to indoor humidity are also caused by the occupants, such as a homeowner who opens windows at night, then decides only during the heat of the day to close the windows and turn on the air conditioner. However, other factors relating to the design and selection of air conditioners may contribute to indoor humidity problems as well.

Each new generation of homes made a significant impact on HVAC design requirements and to such an extent that traditional estimating practices used for equipment selection are harmful to comfort and humidity control if used as a guide in today's generation of homes. Proper HVAC design is essential for a home built to today's energy code requirements.

The first step in humidity control is for a mechanical designer to calculate the heating and cooling loads for each room of the house using an approved method, such as the Air Conditioning Contractors of

America's (ACCA) Manual J. The calculated loads are used to select correctly sized HVAC equipment for the home. A good design may also need to incorporate dehumidifiers installed as part of the entire system, or if needed, energy recovery ventilators (ERVs) as well as sealed ducts to reduce air leakage. Optimal duct design involves installing the duct within the conditioned envelope of the home.

Homeowner education is part of the humidity control process too, and should include information on the need to have the equipment serviced and cleaned on a regular basis. Cleaning is especially important for high SEER equipment because the fins are more tightly spaced than standard equipment and can attract airborne dust.

More information on dehumidification and moisture control is available in a new ToolBase TechNote—visit www.toolbase.org/technotes to access this and other helpful TechNotes. If you have a specific question related to this topic, contact the technical housing experts at toolbase@nahbrc.org. 



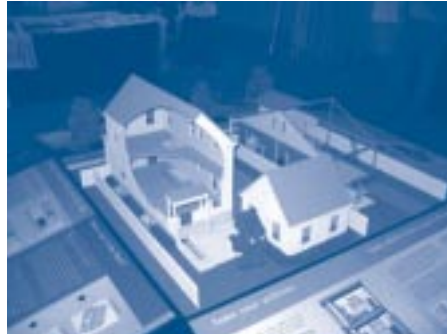
Concept Home Offers Flexibility, Affordability

What happens when housing industry leaders put their heads together to design the ideal home of the future? A select audience of housing industry and policy officials got a sneak peek at the answer on June 23, when the PATH Industry Committee unveiled the first architectural model of the PATH Concept Home at Union Station in Washington, D.C.

The Concept Home demonstrates advanced technologies and building practices that hold enormous potential for improving American housing. The home proposes changes in the home building industry that will make home design and construction more efficient, predictable, and controllable with a median cycle time of 20 working days from groundbreaking to occupancy. PATH estimates that these methods will result in cost savings that will make homeownership available to 90 percent of the population by 2010.

"Working with builders and manufacturers we will, over the next year, develop detailed plans and specifications for this home and ... work with the housing industry to build this home," said Darlene Williams, HUD General Deputy Assistant Secretary, who addressed those assembled at the unveiling. "The future is exciting, and we invite you all to join us as we work to improve the affordability, durability, and quality of tomorrow's homes."

The Concept Home represents one vision for the future of housing, with an emphasis on flexibility of systems to meet the specific needs of the homeowner. Innovations in the Concept Home include flexible interior walls that can accommodate family changes, customizable designs that will give the home the quality and curb appeal of a custom-built house without the high cost, and improved production methods that speed construction and improve durability.




Architectural model of the PATH Concept Home, unveiled in June.

As the Concept Home exhibit explains, the utilities—electrical, plumbing, HVAC, and communication—are tangled together and buried behind finished interior walls in the typical American home, which makes

home upgrades difficult and costly. A more efficient approach might be to separate the three major home systems: the structure, the utilities, and the floor plan.

Disentangling the systems opens up new possibilities for the floor plan, and for the maintenance and upgrade of utilities. The Concept Home is designed to make it easy to move walls and to access utilities. While the structure is built for long-term durability, utilities and interior walls are configured to allow for the inevitable changes in the lives of all homeowners—especially as we try to keep up with advances in technology.

The Concept Home also champions the idea of standardized measurements for building components, as well as increased use of factory-built components, which offer greater precision and better quality control. These improvements could make building easier, faster, and more efficient. Homebuyers would enjoy a bigger selection of home products at lower cost, and more moderate home prices. And everyone would benefit from less construction waste going to landfills.

The Concept Home model went on display at the U.S. Department of Housing and Urban Development on June 24 and will be displayed at several venues throughout the year. To learn more about the project, visit www.pathnet.org. 

QUALITY MATTERS

2004 NHQ Silver Award Winner—A Pioneer in Quality

Grayson Homes of Ellicott City, Md. (www.graysonhomes.com) takes pride in delivering great results to its customers. In the past two years, the company's quality initiatives have themselves yielded great results and recognition in the industry.

Let's set the stage. It's January 2003, and Grayson Homes receives the National Housing Quality (NHQ) Award's Honorable Mention. While an excellent accomplishment, that's not good enough for Cindy McAuliffe, president of Grayson Homes, or the rest of the company. Now it's 2004, and the company is awarded the NHQ Silver Award at the International Builders' Show in Las Vegas. With this silver award, the company had achieved an even higher honor, but they weren't willing to stop there. Grayson is "going for gold" in 2005, and letting everyone know. And in June 2004, as part of their business process improvement efforts which began in 1997, Grayson Homes is now among the first home builders in the nation to become certified as part of the NHQ pilot Certified Builder program.

The quality culture at Grayson Homes begins at the top. McAuliffe explained, "Our quality culture begins with the positive reinforcement the staff receives from Mr. Grayson himself." Managers at Grayson Homes work hard to hire the right kind of

people to work for the company, which McAuliffe defines as "self-initiated, motivated individuals who are always looking for continuous improvement."

Though managers lead the quality charge at Grayson, employees are fully empowered to invest themselves in the company's quality system. For example, managers email key success drivers to employees monthly, and post minimum performance standards for production supervisors in their offices. Grayson Homes uses an extensive survey for buyers during construction and after closing, and links employees' compensation to customer satisfaction.

This dedication to quality at all levels of the business has resulted in a 96 percent rate of zero defects at closing. In addition, Grayson Homes is enjoying greater customer loyalty as a result of its dedication to quality. Recent feedback indicates that 95 percent of Grayson Home's customers would either refer the builder to a friend or will choose Grayson again when buying another home.

For information on the NAHB Research Center's NHQ Program and NHQ Award winners, visit www.nahbr.org/quality or email quality@nahbr.org.