

TECHNOLOGIES

Comprehensive Whole-House Ventilation Strategy

Most of us are familiar with the air quality index system that predicts outdoor air quality ranging from good to hazardous. The system warns those with respiratory problems to avoid outdoor exertion on bad days.

However, the Environmental Protection Agency indicates that indoor air pollutants in office buildings, public areas and homes may be two to five times, and sometimes as much as 100 times, higher than outdoor levels. This is a special concern since most people spend 90 percent of their time indoors.

Poor indoor ventilation at home can have an adverse impact on occupant health and comfort, especially for those that have greater sensitivity, such as children, the elderly and those with respiratory problems such as asthma. Inadequate ventilation can also increase the chance of moisture problems if humidity is not expelled from within, or if humid air from outside is drawn in without adequate conditioning.

Manufactured homes are required to include ventilation systems capable of continuous operation, which is unique in the homebuilding industry. Most homes built on-site rely primarily on natural ventilation via leakage through the building envelope.

In order to develop improved ventilation strategies for manufactured homes, MHRA has undertaken a course of research that will formulate a baseline for evaluating whole house ventilation and make common-sense recommendations based on solid scientific evidence.

Needle in a Haystack

The impact of airflow on building performance has traditionally been one of the most difficult phenomena to quantify and predict.

Indoor ventilation is affected hour to hour by a myriad of complex and dynamic factors both inside and outside the home. Amongst others, these factors include wind speed, temperature, humidity levels, and homeowner activities such as bathing, cooking, and the opening and closing of doors and windows. With all of these variables, the complexity of conducting conclusive research is challenging.

It is clear that meaningful solutions do not lie in a piecemeal approach. Instead, the engineering of a whole-house ventilation system will best spur significant and cost-effective improvements.

As a first step, the MHRA Whole House Ventilation Steering Committee conducted a review of existing research to investigate existing whole-house ventilation requirements and design strategies. This review helped the committee to describe optimal design characteristics and to develop a testing protocol for further research.

Additionally, the findings of MHRA's concurrent research on manufactured homes in hot and humid climates and on attic ventilation

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Blower door test measures air infiltration.

The Route of Research: A Roadmap

As MHRA has gone through the process of building a **Technology Roadmap** that will set the direction of current and future industry research, it has become clear that the participation of key influential groups representing the industry, government and consumer is critical to its success.

In order to comprehensively determine the most valuable direction that manufactured home research must take, the ultimate goals of that research must be determined. Late last year, a committee of 25 leaders from industry, government and academia, met to discuss the roadmap and begin the vetting process to set industry goals.

"We put in one room the current and future leaders of this industry and mutually agreed on the direction we should take. It gave us a chance to initiate efforts that will yield the best possible outcome," said committee-member Mike Slifka, president of PFS Corporation.

"It became apparent that the roadmapping process goes well beyond setting a 'technical' agenda. In order

for it to be truly effective, it must address the bigger issues, and that requires a broad-based review," said committee-member Barry McCabe, president of Hometown America.

The group determined that research should center around five topics: the home, the factory, the site, the market and the consumer. They identified critical touch-points in each area and identified any obstacles that might stand in the way.

"We found that we couldn't talk about anything unless we addressed the market and consumer first," says McCabe.

The committee crafted the material that will constitute the first draft of the roadmap. They are currently reviewing the working-draft, and once a consensus is reached on many of the items, it will be released for review by the entire MHRA membership. The review should provide the broad-based input needed, since MHRA's membership includes all of the Manufactured Housing Institute's members—which represent all the segments of the manufactured housing industry.

"This process is an ideal way to search out opportunities. It also lets us see how we as an industry can participate in these innovative ideas," said committee-member Ron LaMont, director of quality assurance for Alpine Engineered Products Inc. 🏠



MANUFACTURED HOUSING
TECHNOLOGIES
 A publication of the Manufactured Housing Research Alliance

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TECHNOLOGIES (ISSN 1525-6804) is a bi-monthly publication of the Manufactured Housing Research Alliance (MHRA), the research arm of the manufactured housing industry. For subscription and editorial inquiries, contact MHRA at 2109 Broadway, Suite 203, New York, New York 10023; (212) 496-0900 (voice); (212) 496-5389 (fax); info@research-alliance.org (e-mail); www.mhrahome.org (Web site)

TECHNOLOGIES is distributed without charge to MHRA members. Subscriptions for non-members are \$95 per year (\$40 per year for retailers and community owners).

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Industry leaders and government meet in Washington, D.C. to set a research course for the industry.



reinforced the need for development of a comprehensive whole-house ventilation strategy. As a result, these three research projects have been brought together under a single umbrella.

New Technology, New Techniques

In the past, infiltration, or the leakage of air in and out of the house through unintended gaps, has provided a large portion of the ventilation. However, with the advent of energy-efficient building technologies and materials, homes now have a tighter envelope that limits natural ventilation. Additionally, research has shown that under certain conditions, a home can experience air pressures that increase filtration of hot and moist air into a home's wall, attic and roof cavities.

In order to maintain acceptable air quality, modern ventilation systems must be designed to supply fresh air and exhaust stale air, either by natural or mechanical means. Additionally, other activities and materials that add to indoor air pollution or excessive water vapor must also be considered in determining an acceptable whole-house ventilation solution. For example, even normal activities such as cooking, bathing, breathing and maintaining house plants can introduce excessive levels of water vapor into the home.

Practical Research

Future research will seek to establish whole-house ventilation strategies, home designs, and construction and operational parameters that result in homes that reliably maintain internally balanced air pressures, a healthy air quality and that include a mechanism to dehumidify and condition fresh air.

Out of this research, a best practice manual for whole house ventilation will be created. This manual will recommend designs for several ventilation systems that meet the performance targets established by the Department of Housing and Urban Development (HUD). The report will also include climate-specific instructions.

Additionally, consumer-oriented educational materials will be created to describe the purpose and need for whole house ventilation systems and give homeowner operation tips. The research on the performance of manufactured home ventilation systems will enable manufacturers to make better informed decisions on design and give consumers more satisfaction with their home.

For more information about this project, please contact Jordan Dentz at (212) 496-0900, ext. 13 or jdentz@research-alliance.org. 🏠

Legislative Progress Sets Tone for 2003

Due to the Republican victory in the midterm elections and other mitigating factors, the 107th Congress adjourned in December 2002, without passing even its appropriations bills, which fund the government. As a result, many of the items on the industry's legislative agenda were left undone.

However, several areas of importance to the industry were advanced during the past legislative session and should serve as a platform from which to launch the agenda in 2003 with the 108th Congress. The following initiatives were undertaken in 2002:

Energy-Efficiency

Tremendous strides were made in 2002 towards gaining the most optimal language for the manufactured housing industry in the energy-efficient home tax credit legislation.



Additionally, language was added to a Senate bill that would have allowed for builders to qualify for a \$1,250 tax credit for manufactured homes that met the 2001 ENERGY STAR Labeled Home Program standards.

President Bush lists energy legislation as one of his top priorities, and MHRA and MHI will continue to work with the leadership of the 108th Congress to assure that the issues of importance to the manufactured housing industry are considered.

ENERGY STAR Appropriations

Manufactured housing ENERGY STAR Program report language was included in the VA-HUD Appropriations bill urging the EPA to cooperate with the manufactured housing industry and MHRA to facilitate industry participation and research planning for the ENERGY STAR Labeled Homes Program. The language makes it easier for the staff of the ENERGY STAR Labeled Homes Program to coordinate with MHRA.

PATH Funding

The mark-up of the budget for the Department of Housing and Urban Development by the House Appropriations Committee included \$7 million in funding for the Partnership for Advancing Technologies in Housing (PATH) program for 2003. The Senate version funded PATH at \$8.75 million, which is consistent with the current spending level. Spending bills that weren't passed in the 107th Congress have been combined into a large omnibus bill slated for passage by the 108th Congress sometime in early 2003. 🏠

Steel in Paradise

After overcoming some technical difficulties concerning the installation of homes in Hawaii's extreme Wind Zone III environment, the nation's first steel-construction, HUD-Code manufactured housing plant, located in Honolulu, Hawaii, is now in full production. By the end of January, Quality Homes of the Pacific (QHP) anticipates that it will deliver over 30 homes.

Robert (Pat) Patterson, the general manager of QHP, says that he ultimately expects the plant to produce over 150 homes per year.

The frame of each multi-section, HUD-Code home produced by QHP, including the walls, roof trusses and floor joists, is made of steel. QHP utilized research conducted by the Manufactured Housing Research Alliance in 2001 to draft its initial DAPIA-approved designs.

The plant currently employs 25 local workers, with

numbers expected to swell to 200 says Patterson. Each worker is cross-trained to perform five job functions.

Patti Tancayo, housing programs senior specialist for The Office of Hawaiian Affairs (OHA), which holds a 55 percent stake in the company, says of the partnership, "This is an exciting new venture for OHA and our community. [It] truly breaks new ground toward making affordable housing accessible to Hawaiians." 



Rubber mallets and welding torches are standard equipment at QHP.

TOOLS OF THE TRADE

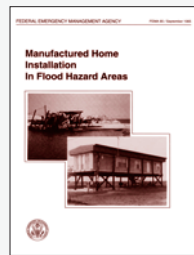
Foundation Guidelines Coming Soon

In early 2003, the Federal Insurance and Mitigation Administration (FIMA), which manages the National Flood Insurance Program and oversees the Federal Emergency Management Agency's (FEMA) mitigation programs, plans to release the **Multi-Hazard Foundations Guide for Manufactured Homes Located in Special Flood Hazard Areas**.

This publication will replace **FEMA 85: Manufactured Home Installation in Flood Hazard Areas**, guidelines that were published in 1985.

The new guidelines will include pre-engineered, generic installation solutions for manufactured homes in floodplain areas that are designed to meet the performance criteria set forth in the National Flood Insurance Program (NFIP). The designs and performance criteria were reviewed by a steering committee that included significant industry input.

Once published, local municipalities that participate in the NFIP, in order to qualify for federally-backed flood insurance, can consider incorporating the new designs into their floodplain management ordinances




as examples of compliant foundations. According to FIMA, nearly 20,000 communities voluntarily participate in the NFIP.

"We are trying to address the most commonly encountered floodplain conditions," said John Ingargiola, a civil engineer at FIMA. "Our generic designs do have some limitations and qualifications. For instance, they aren't designed for use in high velocity wind zones, such as those along the coast," he adds.

Ingargiola says that FIMA hopes the industry will use the performance requirements set forth in the new guidelines as a starting point to develop an expanded number of foundation solutions that will meet the needs of homeowners in floodplain areas.

In a parallel effort, HUD has funded the Manufactured Housing Research Alliance (MHRA) to review and test the FIMA foundation designs and prepare a follow-on manufactured home foundation guide for flood hazard areas. Once finished, these two documents will work in concert to provide practical installation solutions that meet federal guidelines for homes installed in the floodplain.

For more information contact Jordan Dentz at (212) 496-0900, ext. 13. 

Zero Energy Manufactured Home

In an effort to take manufactured homes to the next level in energy-efficiency and to demonstrate innovative energy saving technologies, the Bonneville Power Association, the Department of Energy's Building America Industrialized Housing Program (BAIHP), the Nez Perce tribe, Clearwater Homes and KIT Manufacturing have built the "Zero Energy Manufactured Home."

The 1,600 square-foot, HUD-Code home was displayed at the 2002 Spokane County Interstate Fair last September in Spokane, Wash. Over 220,000 people attended the fair with an estimated 500 people touring the Zero Energy Manufactured Home. Additionally, the home received significant radio, television and newspaper coverage.

The purpose of creating the demonstration home was threefold: to spark interest by the general public in currently available energy-efficient technologies, to provide an opportunity for a prospective homebuyer to see these technologies first-hand, and to demonstrate the feasibility, outline the benefits and calculate the cost of incorporating zero energy features in a manufactured home.

After the fair, the home was installed at its permanent site and serves as tribal housing for operations staff at the Nez Perce Hatchery (near Lewiston, Idaho).

Energy Saving Techniques

Just a few of the innovative and energy saving technologies incorporated into the Zero Energy Manufactured Home included solar panels to generate power and heat water; ENERGY STAR rated windows, appliances and lighting; an Insider Heat Pump, eliminating the need for an outside unit and HVAC contractors; and a radiant wall heater in the kitchen.

Another energy-saving material was the Icynene insulation used in the home. Icynene is a lightweight, semi-liquid foam that is blown into wall cavities and roofs where it expands to fill any voids completely and becomes rigid.

"The material can help to build higher walls and thinner floors at superior R-values," said Mike Klingner, general sales manager of KIT Manufacturing Homes Division. Klingner believes integrating the foam insulation into the plant process would

make it more attractive and lower the cost.

The ventilation system utilized screwed-in, metal risers to hold ducts in place and reduce the number of branch and trunk registers needed. Additionally, crossover ducts with strong inner liners and plastic elbows that eliminate crimping were used to ensure proper long-term airflow performance. Ducts were then sealed with mastic to reduce leakage.

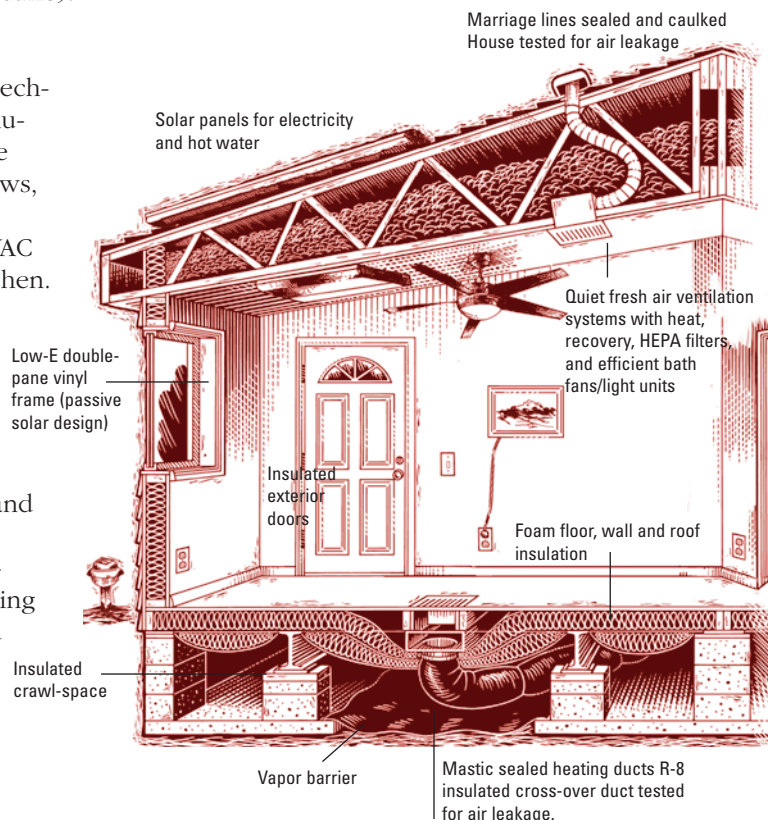
Klingner felt the project was enlightening in many ways. While KIT Manufacturing has considerable experience building energy-efficient homes through the Super Good Cents program and more recently through the Manufactured Housing ENERGY STAR Program, the Zero Energy project took these programs to the next level.

"Participating in the [Zero Energy] program brought us an even greater awareness of energy-efficient building techniques," said Klingner.

The Cost

The solar panel technology, which impressively makes the electric meter run backwards and powers the hot

Zero Energy continued on page 6



water heater, runs at about \$30,000. In remote areas, where electric service is unavailable or prohibitively expensive, solar power provides an attractive alternative. The home would come from the factory "solar-ready" and the panels would be installed without roof penetrations as an aftermarket product.

The other energy-efficient upgrades added about \$4 per square foot, approximately \$6,400 or about \$47 per month, to the cost of the house. Much of this initial cost to homebuyers could be offset in lower electric bills, higher resale value, government and utility energy incentives and an improved indoor environment.

It is expected that costs will come down as these technologies become standard or frequently ordered options.

Next Steps


According to the retailer who delivered the home, Christy Skinner, co-owner of Clearwater Homes, in Orofino, Idaho, the home wasn't difficult to install.

"There were a few minor differences in the insulation that was required between the sections, but it wasn't more involved than the average installation."

Skinner also installed a second home for the tribe.

This home was built to Super Good Cents standards, but didn't include many technologies used in the Zero Energy Manufactured Home.

Both homes have been outfitted with meters and will be monitored for energy performance. Since both homes will experience almost exactly the same climate, they will provide a good comparison of energy costs. This information will help industry and homebuyers to determine the cost-effectiveness and viability of these energy-saving measures.

The results of the study and updates on the project can be found online at www.bpa.gov/Energy/N/energy_tips/zemh, or by contacting Michael Lubliner of the Washington State University Cooperative Extension Energy Program at 306-956-2082 or lubliner@energy.wsu.edu. 

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