

research works

A bridge linking housing research and practice

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Housing and Hurricanes



The image above shows the effects of Hurricane Charley on a manufactured home that was constructed prior to implementation of the 1994 HUD-Code and 1999 Florida installation standards, while the photo at right shows the performance of another manufactured home built after adoption of the improved standards.

With only five months until the next hurricane season (and you thought the last season just ended!), it's important to consider how both new and existing homes can be made more resistant to the threat of hurricanes.

Homeowners and communities can reduce the impact of hurricanes through a number of approaches, such as building codes, home design, materials selection, construction quality, protection systems, and retrofit.

With increasing development along the coastal areas of the Southeast, more people now face the potential risk of hurricanes. To effectively address that risk, homeowner and communities must proactively address the potential for hurricane threats.

Following the hurricanes of 2004, HUD and the Partnership for Advancing Technology in Housing (PATH) initiative sent teams of engineers to Florida to examine the performance of affected housing. The idea was to build on the work HUD's Office of Policy Development and Research (PD&R) sponsored following Hurricane Andrew in 1992 (that report is available from HUDUSER at www.huduser.org/publications/destech/hurricaneAndrew.html). The observations that follow are based on an examination of conventional and manufactured housing near the path of Hurricane Charley.

Building Codes

Though it's hard to find an upside to widespread destruction, it can be said that the hurricanes of 2004 demonstrated the effectiveness of modern building codes. Following the damage experienced by manufactured (HUD-Code) homes during Hurricane Andrew in 1992, HUD developed new construction requirements for manufactured housing in areas that are particularly at risk of hurricanes. Released in 1994, this new code includes elements intended to strengthen a home's resistance to the wind. In Florida, the state-regulated installation standards implemented in 1999 strengthened the foundations. As a result of these regulations, new manufactured housing performed much better, with most homes suffering only cosmetic damage during the hurricanes of 2004. HUD is continuing to strengthen manufactured housing through the development of new installation standards, which will build on

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Home Weatherization for Winter: It's not Just About Caulk

The season's first big spike in home heating bills often motivates homeowners to look for quick fixes in an attempt to weatherize their homes. While every effort can make a difference, comprehensive weatherization—a 'whole-house' strategy for improving energy performance—is the best approach to significantly reducing utility bills. A comprehensive weatherization program looks at the building shell (roof, walls, floors, windows, and doors), heating and cooling equipment (including control and distribution systems), ventilation systems, the hot water system, and lighting.



Keeping gutters clean and free from debris is an important step in winter weatherization.

Comprehensive weatherization not only reduces energy use and cost, but can also improve the health of occupants and indoor environmental conditions by reducing health risks from mold, radon, combustion by-products, and other contaminants. Additionally, comprehensive weath-

erization can reduce noise, eliminate entry points for insects and other pests, and improve building durability by reducing moisture-related problems. The *Basic Winter Weatherization Checklist* on page 5 demonstrates important seasonal weatherization activities.

For homeowners on a tight budget, the cost of weatherization can be daunting. However, assistance is available to those in need. With approximately \$52 million allocated in 2003–2004 to 67 community-based organizations that provide weatherization services, the U.S. Department of Energy's (DOE) Weatherization Assistance Program (WAP) is by far the largest government-supported program of its kind. Administered by the states, WAP assists income-eligible families and individuals by reducing their heating/cooling costs and improving the safety of their homes through energy efficiency measures. Program services are available to both homeowners and renters, with priority given to senior citizens, families with children, and disabled individuals.

Through the Community Development Block Grant (CDBG), Indian Community Development Block Grant

(ICDBG), and the Home Investment Partnership Program (HOME) programs, HUD is also doing its part to support weatherization programs for low-income homeowners, in that the Department looks for ways to support energy efficiency in all of its grants and programs.

The Village of Mt. Prospect, Illinois is one example of a community using its CDBG funding to underwrite a weatherization grant program. The program's goal is to reduce home utility and repair costs, and to improve energy efficiency. The program provides a matching 50 percent grant up to a maximum of \$1,500.

Grants can be used to install:

- Wall, floor, and attic insulation;
- Storm windows and doors;
- Energy-efficient windows;
- Roofing;
- Caulking;
- Weatherstripping;
- Energy-efficient furnaces and water heaters;
- Plumbing;
- Insulation for water heaters and piping;
- Insulated siding;
- Home storm water improvements; and
- Other items that can save on the cost of home utilities.

Another example is the Spokane Neighborhood Action Program (SNAP), which combined funding from Washington Water Power (a local utility), DOE, U.S. Department of Health and Human Services, HUD, and the Farmer's Home Administration. Undertaken by DOE Seattle Support Office, this project was designed to show CDBG and Residential Retrofit Program officials that program efficiency and energy savings could be achieved by scheduling housing rehabilitation and energy-efficient improvements at the same time. The goal of this effort was to leverage federal, state, and local funding to weatherize, rehabilitate, and provide conservation education to 80 low-income, single-family households in Spokane County, Washington.

Each participating dwelling was audited for both weatherization and rehabilitation improvements, and work orders for both aspects of the job were prepared simultaneously. Typical weatherization measures included insulation, furnace repair and replacement, and infiltration improvements. Typical rehabilitation

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Affordable Housing Meets ENERGY STAR®: New Partnership Brings ENERGY STAR Qualified Products and Practices to HUD-Assisted Programs

In September of 2002, the Department of Housing and Urban Development (HUD) joined with the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE) to spread the use of ENERGY STAR qualified products in public and assisted housing. One of the main reasons is that more than 10 percent of HUD's annual budget—an estimated \$4 billion—is spent on energy. HUD estimates that installing basic efficiency measures in public housing can save taxpayers at least \$800 million over the next 10 years, resulting in significant savings for property owners and residents. The new partnership encourages programs such as the Home Investment Partnership Program (HOME), Community Development Block Grants (CDBG), HOPE VI, and Public and Indian Housing Authorities to incorporate ENERGY STAR qualified products and practices when building and rehabilitating homes. This simple step can lower utility bills, improve comfort for residents, increase project value, and reduce air pollution.

ENERGY STAR is a government-backed program that helps businesses and individuals protect the environment through applied energy efficiency. The ENERGY STAR mark is found on more than 40 categories of products and appliances, including clothes washers, dryers, refrigerators, dishwashers, room air conditioners, home electronics, lighting, and windows. To qualify, products must meet stringent performance criteria set by EPA or DOE. ENERGY STAR qualified products use less energy, which helps consumers save money on utilities while protecting the environment.

HUD promotes the installation of ENERGY STAR qualified products in HUD-financed and HUD-assisted



ENERGY STAR new homes are estimated to save up to \$400 a year on heating and cooling bills.

housing to improve energy efficiency, which in turn yields significant cost savings. Renters are estimated to save up to 20 percent on energy bills by installing qualified products. Programs assisted by HUD can incorporate ENERGY STAR qualified products in their new or existing homes by using the HUD and

ENERGY STAR websites to obtain information on specific products, use energy-savings calculators, locate rebates, and develop a clear procurement policy. These programs are also encouraged to use ENERGY STAR's *A Guide to Energy Efficient Cooling and Heating* (www.energystar.gov/ia/products/heat_cool/GUIDE_2COLOR.pdf) to ensure correct sizing and installation of the HVAC system. This is especially important in multifamily buildings where space heating accounts for 33 percent of total energy usage.



The ENERGY STAR certification mark.

HUD-funded programs (especially HOME, CDBG, and HOPE VI) which build new homes are encouraged to have the homes qualified as ENERGY STAR. To receive the mark, new homes must be independently verified to be either at least 30 percent more energy efficient than homes built to the 1993 national Model Energy Code standards, or 15 percent more efficient than the state's energy code. Building envelope upgrades, high performance windows, controlled air infiltration, upgraded heating and air conditioning systems, tight duct systems, and upgraded water-heating equipment all contribute to the homes' energy performance and the resulting operating cost savings. ENERGY STAR and its partners also encourage builders to use energy-efficient lighting and appliances. ENERGY STAR qualified houses can be single-family or multi-family residential homes that are three stories or less in height. They can also be traditional site-constructed homes, as well as modular, systems-built, and HUD-Code manufactured homes.

HUD supports the ENERGY STAR Qualified New Homes program because of its numerous benefits to homeowners, communities, and the environment.

ENERGY STAR Qualified New Homes benefit the environment by reducing air pollution and resource consumption. According to the ENERGY STAR website, the average home pollutes even more than the average car. The energy used in homes accounts for more than 20 percent of all U.S. greenhouse gas emissions. ENERGY STAR hopes to reduce annual carbon emissions by more than 3.5 metric tons by 2012.

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A student comes up with an idea to change the world. The plan is to do good deeds for three people, who in turn do good deeds for three others, and so on. If this sounds familiar, you may have seen the Kevin Spacey film, *Pay It Forward*. When John Beranek of Sioux Falls, SD saw the film, he thought it was more than a nice idea; he found in it a call to action.

Last year, Beranek began the community-based non-profit *Pay It Forward*. Its mission is simply to perform random acts of kindness. Beranek is the 'face' of the organization, because volunteers operate under strict anonymity, using their own funds and time. *Pay It Forward* focuses on serving the children and homeless of Sioux Falls. Here's how it all started.

In the spring of 2003, Beranek returned home after spending a week living and working in a Washington, DC homeless shelter. Upon his return, Beranek was surprised to learn the harsh facts about homelessness in Sioux Falls.

With a population under 173,000, there are approximately 800 homeless people in Sioux Falls, SD. Of those:

- More than one-third are children;
- Most are using transitional housing until they can find a permanent residence;
- 98 adults and 13 children are reported to be living outdoors;
- 40% report as being unable to afford housing; and
- 29% reported working and still unable to cover the cost of housing.

Pay It Forward recently partnered with the Sioux Empire Homeless Coalition (SEHC) to undertake its first major initiative, The Human Like You campaign. *Pay It Forward* and SEHC worked with local advertising agencies to raise both funds and awareness to support this at-risk group. With momentum beginning to build, the Human Like You campaign soon launched a website, produced a local television commercial, printed posters, and conducted a one-of-a-kind outreach exercise.

For the outreach activity, in Beranek's own words, "They took it to the streets." One frigid February morning, Beranek and a group of approximately 90 volunteers participated in the Homeless Outreach Morning Exercise (HOME). During the morning rush

hour, volunteers stood at busy intersections and in front of popular morning destinations with signs proclaiming the hard facts about Sioux Falls' homeless population. Participants agreed that they received cold stares and puzzled looks, as though they themselves were the homeless... and that was exactly the point.

The day of the event, the partners held a press conference for local media. One advocate noted that, "They [the homeless] are so used to being shunned. They aren't used to goodness. Don't feel guilty; the problem exists, accept it. Understand and appreciate the circumstances people are faced with." The Human Like You campaign continues to raise public awareness, as well as much-needed funds and supplies for the areas homeless.



Homeless advocates brave a Sioux Falls winter morning to raise community awareness about the conditions homeless people face daily.

Since the initial success of The Human Like You campaign, *Pay It Forward* continues to use innovative approaches to help Sioux Falls' needy. *Pay It Forward* is not quite ready to divulge plans for their next project, but they want the public to know that they've been very busy. True to its origins, *Pay It Forward* members prefer to keep their profile low and their giving anonymous.

In Sioux Falls and in the state as a whole, *Pay It Forward's* partner, SEHC, plays an important role in the distribution of HUD Homeless Assistance funds. SEHC regulates the prioritization of Continuum of Care applications, and is also responsible for the rank order of homeless shelters that receive state allocations of HUD's Emergency Shelter Grant funds in southeast South Dakota.

For more information regarding *Pay It Forward*, please visit www.humanlikeyou.com or contact John Beranek at 605.310.3226 or e-mail johnspeak@sio.midco.net

Home Weatherization for Winter: It's not Just About Caulk cont. from page 2

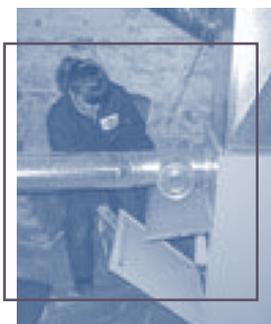
measures included new roofs, septic and drain field-work, sheetrock installation on interior walls, and sheeting on exterior walls.

In addition to the Partnership for Advancing Technology in Housing (PATH), HUD initiatives that promote energy efficiency in HUD Homes include:

Healthy Homes Initiative (HHI). HUD has identified several housing-associated health and injury hazards considered key targets for intervention, such as lead, mold and moisture, pesticides, and radon. HHI is designed to build on the Department's existing activities related to health and safety issues in housing, including lead hazard control, building structural safety, weatherization and energy conservation, electrical safety, and fire protection in order to address multiple housing-related childhood diseases and injuries in a more coordinated fashion. Several HHI projects have integrated healthy homes practices into weatherization efforts by educating weatherization contractors about lead-safe and healthy homes work practices, and on preventing mold and moisture problems.

Energy Efficiency In Public Housing. As part of HUD's overall Energy Action Plan, HUD's Office of Public and Indian Housing has been working with local public housing authorities (PHAs) to reduce utility costs. These efforts include creating a Public Housing Energy Conservation Clearinghouse and launching an initiative with DOE and EPA to study PHAs' energy consumption.

Weatherization is an important part of responsible and cost-effective homeownership. Thanks to programs and grants like WAP and CDBG, along with HUD energy initiatives such as HHI and PATH, weatherization assistance is available to those who need it.



Good weatherization practices include having the furnace checked annually and changing the filter often.

Basic Winter Weatherization Checklist

Roof

- Check for broken, damaged or loose shingles; small holes; and loose nails.
- Check flashing around all dormers, vent pipes, chimneys, and any other projections where the roof covering meets an adjoining surface.

Gutters and Downspouts

- Clean out leaves, dirt, and debris.
- Check supports.

Exterior

- Repair cracks in stucco or masonry walls.
- Spot-repair and paint any defective areas to prevent damage from freezing and thawing.
- Clean leaves, dirt, and debris out of window wells.

Interior

- Remove or winterize air conditioners.
- Check the hot water heater for leaks.
- Install insulating kits behind electrical plugs that are on exterior-facing walls.
- Have chimney inspected and cleaned.
- Close the fireplace damper when not in use.

Windows and Doors

- Check weatherstripping around windows, doors, and between foundation and siding; replace where needed.
- Check metal weatherstripping for dents, bends, breaks, loss of tension, or other damage that could make it less effective; repair or replace where needed.
- Repair and paint storm windows if necessary.
- Replace worn doorstops at bottom of doors.
- Install storm doors and windows.

Heating System

- Have a qualified service technician clean and check the home heating system.
- Vacuum vents, registers, and other heating components.
- Install a setback thermostat that automatically regulates the temperature throughout the day.

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the experience gained through evaluation of hurricane-impacted dwellings. Today, PD&R is supporting research aimed at identifying how manufactured homes can more effectively resist wind loads.

The building code for site-built housing in Florida has been changed to require greater protection for the building envelope from flying debris, as well as to promote greater roof strength. These improvements will help homes better withstand the wind pressures

This photo (post Hurricane Charley) clearly illustrates the benefits of the PATH-recommended standing-seam hipped metal roof and corrugated metal shutters. While new building technologies and design strategies cannot cure all weather-driven construction ills, they can go a long way toward minimizing damage, reducing insurance losses, and protecting home investments.



and impacts seen in hurricanes. Many technologies identified and demonstrated by PATH satisfy the requirements of the new building code. Technologies such as Insulating Concrete Forms provide homeowners with an energy-efficient and impact-resistant wall. In Port Charlotte, Florida, a home built with Structural Insulated Panels made with fiber cement panels (instead of wood), saw only modest, cosmetic damage from Hurricane Charley.

Home Design

Homes can easily be designed to be more resistant to hurricanes and other severe weather. Selection of design approaches such as hip roofs provides protection for the roof structure, as hip roofs are less likely to be damaged by high winds. The flat gable end walls on gable roofs are frequently blown down during high winds. Because the wind striking a hip roof is never perpendicular to the roof trusses, the roof structure is better protected. As high winds blow over a roof, significant pressures develop. Roofs that are unusually complex appeared to experience greater damage than those with simpler rooflines. In addition, complex roof designs often increase construction cost.

To help designers better understand the structural aspects of the home, PATH published the Residential Structural Design Guide—A State-of-the-Art Review and Application of Engineering Information for Light-Frame Homes, Apartments, and Townhouses. This publication is available from HUD USER at www.huduser.org/publications/pdf/residential.pdf

Materials Selection

During the design and construction phases, the builder and homeowner can make many decisions that will affect a home's durability and storm resistance during hurricanes. In 2004, the most common visible damage to homes was to the roofing. Selection and installation of high-quality roofing products will help protect the home from wind and water damage. PATH evaluators saw standing seam metal roofing yield the best performance. Other roofing systems (such as composition shingles and concrete tiles) also performed well in many instances.

Construction Quality

Many of the failures observed were the result of a piece of roof sheathing (typically a 4x8 foot sheet of plywood) blown from the roof, allowing water to enter the home. Inspection of some of these pieces of sheathing showed that they were not fastened to the roof trusses effectively (this is also being addressed in revisions to the Florida building code). In some cases, the nails or fasteners were spaced too far apart, while in other instances, the fasteners missed the truss completely. PATH has helped develop a highly effective



Roofing ties extending from the walls of a home under construction. These ties are embedded into the walls and will be wrapped over the roof trusses (when installed). This reinforcement prevents high winds from lifting the roof off of the house.

Bob Fuller of the NAHB Research Center (a PATH Partner) examines a piece of roof sheathing which was blown off a home. The fasteners that attached the sheathing to the roof frame pulled out, exposing the home to the weather and leading to significant damage. These problems can be reduced by selecting appropriate fasteners (ring-shank nails or screws) and spacing them correctly.



construction quality program, which applies industrial quality control concepts to residential construction. Working with the National Association of Home Builders Research Center, PATH is discussing how this quality program can be applied to improve the disaster resistance of housing. Such quality strategies may help builders to not only improve the homes they build, but also to differentiate their homes from the competition.

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Affordable Housing Meets ENERGY STAR® cont. from page 3

ENERGY STAR Qualified New Homes have been found to achieve higher resale values and lower utility bills. With lower operating costs in comparison to homes of similar size, location, and configuration, homebuyers may find that it is often cheaper to own an ENERGY STAR qualified home. The energy-efficient features and components tend to be more durable and carry better warranties than those found in standard homes. Homebuyers benefit not only from these savings, but may also receive incentives for purchasing ENERGY STAR Qualified New Homes. Special financing opportunities, including Energy Efficient and ENERGY STAR Mortgages, give qualified homebuyers more options at their present income level. Lending institutions incorporate the projected energy savings into the maximum allowable housing expense when determining the homebuyer's mortgage. ENERGY STAR Financing Partners are also required to offer homebuyers incentives, such as cash back at closing, interest rate discounts, or waiving certain fees. Special utility promotions, including product rebates on ENERGY STAR qualified home products and reimbursement for the

Former HUD Secretary Martinez, former DOE Assistant Secretary David Garman, and former EPA Administrator Christie Whitman create an ENERGY STAR partnership.



cost of the home energy rating, encourage investment in energy efficiency.

ENERGY STAR has also developed innovative and cost-effective solutions to common home problems, while helping to make new and existing houses more affordable and efficient. The ENERGY STAR website (www.energystar.gov) gives specific advice for home improvements, including how to solve common home problems and improve energy efficiency when remodeling. Detailed information on incorporating ENERGY STAR qualified products and practices into HOME, CDBG, HOPE VI, and Public and Indian Housing Authorities can be found on the HUD website at www.hud.gov/energystar/index.cfm.

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Protection Systems

During the 2004 hurricane season, the effectiveness of retrofit hurricane shutters and impact-resistant windows was demonstrated time and time again. At one home visited by the evaluation team, the homeowner complained that one set of shutters was very difficult to install for the second hurricane because it

was slightly bent protecting the home during the first storm. While the homeowner experienced some inconvenience in installing the shutter, it protected the home much as an airbag protects a driver. Replacing a damaged shutter is far less expensive than the wind and water damage that results from a broken window.

Retrofit

Many organizations dedicated to improving the disaster resistance of homes and businesses have described retrofit strategies for existing homes. Many of these techniques are not invasive and do not require extensive (or expensive) effort. The Institute for Business & Home Safety (www.ibhs.org) has a number of guides for homeowners interested in strengthening their homes to better resist hurricanes.

The evaluation efforts in Florida demonstrated that both manufactured and site-built homes effectively resisted the severe weather of the 2004 hurricane season. As with many other issues in construction, the factors affecting housing performance included effective design, selection of appropriate materials, quality installation, and timely use of the protections. Like the links in a chain, each component is critical to maintaining the integrity of the whole.



Here we see insulated concrete forms (ICFs)—another PATH-evaluated technology—being used for the exterior walls of a new home, and very minor post-storm damage; mostly to the roof area. This home was under construction at the time the storm hit.

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In the Next Issue of... ^{research} **works**

- Many of the impediments to increasing the supply of affordable housing are institutionalized at the state and local level in the form of regulatory barriers. As visitors to our Regulatory Barriers Clearinghouse (www.regbarriers.org) well know, HUD is committed to working with communities to break down the regulatory barriers that stand in the way of affordable housing development. This article will highlight a new PD&R publication "*Why Not In Our Community?*" *Removing Barriers to Affordable Housing*, which discusses the trends in regulatory barriers, efforts by states and local communities to reduce these barriers, and the actions being implemented by HUD to reduce regulatory barriers.
- Each February, HUD's Birmingham Field Office recognizes African-American History Month through a celebratory program which highlights that year's national theme. This year's theme, "The Niagara Movement: Black Protest Reborn 1905 - 2005", an early forerunner of the NAACP is a tribute to leader W.E.B. DuBois and others within the African-American community who waged a lifelong battle against injustice and set the stage for African-American social advancement over the next 100 years. Birmingham is a city rich in civil rights history, both good and bad. This article will serve to illuminate this year's theme, and will look at the work of some of the honored speakers scheduled for Birmingham's unique celebration.
- Historically Black Colleges and Universities (HBCUs) have been important housing and community development partners with HUD since 1980, when President Carter signed the first Executive Order bringing the HBCU program into being. HUD's HBCU Program is designed to assist HBCUs in addressing community development needs in their localities, including neighborhood revitalization, housing, and economic development. This article will discuss HBCU program requirements, eligible activities, and recent research, and will highlight some existing partnerships between universities and their surrounding communities.
- With an abundance of inexpensive infill rental housing available in Springfield, Missouri, a number of community members have questioned whether the city's low-income housing policy was really benefiting the community as a whole. The residents' perception was that these projects are reducing property values, causing an increase in renter population, a reduction in owner occupied units, and overall neighborhood devaluation. In responding to these concerns, the Springfield City Council authorized the use of basic design guidelines – the *Residential Infill and Rehabilitation Guidelines (For Single-Family and Duplex Development)*. This article will discuss these *Guidelines*, including their use and the overall effects on the community.

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