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A bridge linking housing research and practice

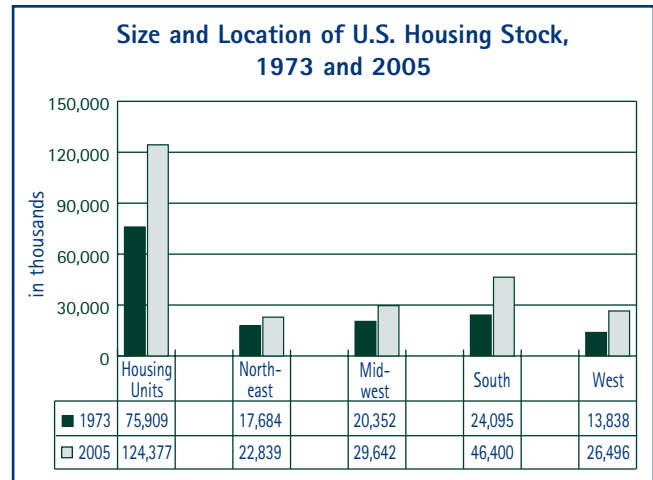
volume 5, number 1

## Three Decades of Housing Data

A recent study prepared for HUD's Office of Policy Development and Research portrays changes in American housing and households using the American Housing Surveys (AHSs) from 1973 to 2005. The report, *32 Years of Housing Data*, statistically describes developments in housing that occurred in tandem with extensive demographic shifts in a population that grew larger, older, and more diverse. Some of the most compelling findings from this study are highlighted below.

### Changes in American Housing Stock, 1973 – 2005

- The number of housing units dramatically increased. The number rose by 64 percent from around 76 million in 1973 to over 124 million in 2005.
- The distribution of housing shifted. A proportionate loss of share in the Northeast and Midwest was gained in the South and West.
- The share of housing located in metropolitan areas increased. Among the total housing stock, housing



inside metropolitan areas increased from 67 to 76 percent. Within metropolitan areas, city centers lost housing while the share of housing units in the suburbs grew larger, from 53 to 62 percent of all metropolitan units.

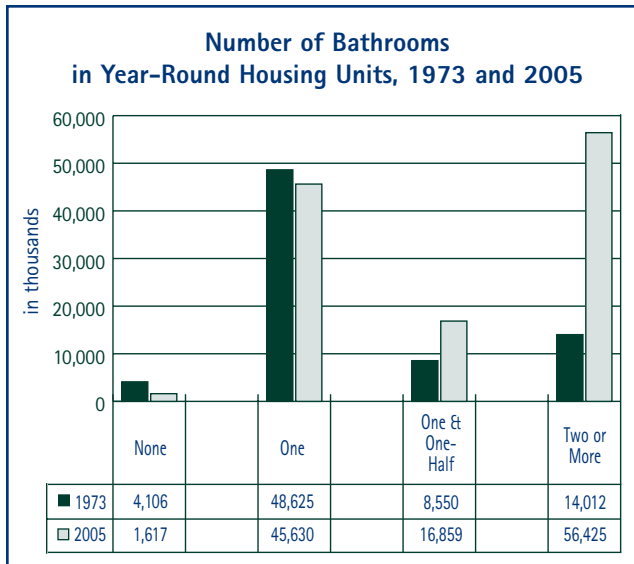
- Living space expanded. The median number of rooms in year-round housing units rose from 5.0 rooms to 5.5 rooms, while the median number of bedrooms increased from 2.5 bedrooms to 2.7 bedrooms.
- Floor plans grew larger, but lot size remained the same. The median square footage of a single-family detached or mobile home was 1,610 square feet in 1985; it increased to 1,774 square feet by 2005. The median lot size for a one-unit structure was 0.36 acre in both years.
- Overcrowding declined. In 1973, 6 percent of occupied units had more than one person per room; in 2005, the rate had dropped to 2.4 percent.

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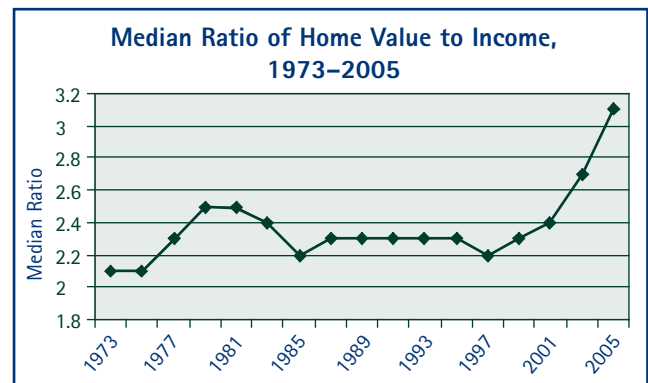
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- Bathrooms multiplied. The share of units without bathrooms dropped from 5.5 to 1.3 percent. Thirty percent of housing units had 1.5 bathrooms or more in 1973; 32 years later, this number has increased to 61 percent.
- Air conditioning became standard. The share of year-round units without air conditioning declined dramatically, from 53 percent to 13 percent.
- Overall quality of the housing stock improved. Nearly 4 percent of occupied units had a variety of moderate physical problems in 2005, compared to 6.6 percent in 1985. With regard to electrical systems, defects such as exposed wiring, inadequate outlets, and blown fuses or breakers were reported by 11 percent of households in occupied units in 2005, as opposed to 24 percent in 1973.

### Housing Costs, 1973 – 2005

- Housing costs for renters increased. In 1973, 23 percent of renters paid 35 percent or more of their income for housing costs; by 2005, 41 percent of renters did so.
- Housing costs for owners increased. In 1974, 8 percent of owners paid 35 percent or more of their income for housing costs; by 2005, 22 percent of owners did so.
- The ratio of home value to income increased in two phases. From 1973 to 1979, the ratio increased from 2.1 to 2.5. It reached a plateau at 2.3 from 1985 to 1999. Then, by 2005, the ratio rose sharply to 3.1.



### Characteristics of American Householders, 1973 – 2005

- More Americans became homeowners. The homeownership rate rose from 64.4 to 68.8 percent.
- The composition of households changed. In 1973, approximately 2 out of 3 were married-couple families; by 2005, this ratio fell to 1 out of 2.
- The median household size dropped from 2.5 persons to 2.2 persons. Large households decreased. Households with 5 or more members represented 18 percent of all households in 1973, but only 10 percent by 2005.
- Households with children decreased. From 1973 to 2005, the percentage dropped from 43 percent to 35 percent of all households.
- Elderly householders aged 65 and over accounted for 20 percent of those occupying the nation's housing stock in 1973, and that percentage remained constant in 2005. There was, however, a slight increase in the proportion of those over 75.
- Householders traveled slightly longer and further to get to work. The median commuting time increased from 19 minutes in 1974 to 22 minutes in 2005; the median commuting distance increased from 8 to 11 miles.

The data reported by the AHS are consistent with those reported by other national surveys, such as the decennial census and the American Community Survey. What makes the AHS unique is its ability to link household and housing features. Extensive analyses of the relationship between housing and household characteristics are possible using the public use files found at [www.huduser.org/datasets/ahs.html](http://www.huduser.org/datasets/ahs.html). The direct link to *32 Years of Housing Data* can be found at [www.huduser.org/datasets/ahs/AHS\\_taskC.pdf](http://www.huduser.org/datasets/ahs/AHS_taskC.pdf), and the report can be downloaded at no cost. **HUD**

## Mixed-Financing Underwrites Affordable Housing in Southwest Virginia

A former public housing site in Bristol, Virginia is being redeveloped with accessible, affordable housing, thanks to a mixed-financing package assembled by the Bristol Redevelopment and Housing Authority (BRHA). Sapling Grove Apartments, a cluster of 13 one- and two-bedroom duplexes, will provide its residents with the added environmental and operational benefits of energy-efficient housing.

A combination of federal and private subsidies is funding the \$4 million Sapling Grove project. Low-income housing tax credits provided more than \$3 million of the construction cost, with the remainder coming from HUD's Replacement Housing Factor Fund, the Capital Fund, and other unrestricted funds. With a mortgage loan from the Virginia Housing Development Authority (VHDA), BRHA's debt on the property will be only \$400,000. BRHA is even putting most of its developer's fees back into the project. "We were the first housing authority in Virginia to get a mortgage for this kind of project from VHDA," said Executive Director Dave Baldwin.

Of the 26 units, public housing subsidies will fund 10 and tax-credits will fund 16. Sapling Grove will have upper and lower income limits, with preference given to elderly and handicapped individuals. The first tenants are expected to arrive in March 2008, with completion and final occupancy planned for July 2008.



*The Sapling Grove Apartments in Bristol, Virginia, will incorporate energy-efficient appliances, low-E glass windows, energy-conserving insulation, and high-efficiency heat pumps and water heaters.*

### Using Universal Design and Energy Efficiency

All Sapling Grove units feature universal design concepts that make them accessible to all residents. To accommodate residents with walkers or wheelchairs, the apartments have wide doorways and no steps. Five fully accessible units will be set aside for handicapped residents, including one for hearing-impaired individuals that features a fire alarm with a strobe light and flashing lights for the doorbell and telephone, and another for visually impaired individuals. The remaining units can be readily converted to provide full accessibility, allowing residents to age in place. Bathroom walls contain the support structures needed to add grab bars, and sink cabinets in the kitchen and bathroom have removable fronts to provide full wheelchair access.

The excavation and groundwork for the project have followed EarthCraft Virginia principles for green building, which promote healthy, energy-efficient homes that minimize environmental impact. The apartments will feature ductwork that's sealed rather than taped, with all supply lines located in conditioned space. A vapor barrier under the floor will reduce moisture build-up and discourage mold and mildew from forming. All units will be sealed to reduce air penetration.

BRHA has also incorporated a number of energy-efficient features in Sapling Grove's design. The 13 single-story duplexes will have Energy Star®-rated refrigerators, dishwashers, washers, and dryers. All appliances will be electric, because natural gas is no longer an affordable choice for Bristol residents. Other features that will help reduce utility costs for residents and BRHA include the following:

- Energy Star low-E glass windows, which reduce heat loss and gain;
- Energy-conserving insulation (e.g., R38 in ceiling), with all joints and penetrations taped to reduce heat loss;
- High-efficiency heat pumps; and
- High-efficiency water heaters.

"The units are sustainable," said Todd Musick, BRHA's vice president for capital investment. "We're using

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## A Lean Makeover for Factory-Built Housing Production

Lean production is a manufacturing approach originally developed by Toyota that strives to eradicate waste. In this case, “waste” means expenditures of time, money, materials, and other resources that do not directly contribute to producing what buyers want. The goal of lean production is to satisfy the customer by delivering the highest quality goods at the lowest cost in the shortest time.

Lean production principles are applied to both a plant’s physical characteristics and to its production processes. The former includes designing a plant layout that speeds production; improving job station design to avoid wasted time and effort on the production line; and maintaining a clean, orderly workplace. This entails adopting standardized best-practice methods; keeping inventories low; employing just-in-time order processing driven by customer demand; ensuring quick changeovers of machines; preventing defects to avoid reworking products; and other commonsense – but often overlooked – workplace goals.

Lean production has been transforming enterprises ranging from spacecraft production to fast food, but the modular housing industry seems to have been left behind. Construction techniques typically used in HUD-code and modular homes have changed very little in the past 50 years. Does the potential exist for factory-built housing – a major contributor to the supply of affordable homes – to benefit from lean production?

A new analysis, *Pilot Study: Applying Lean to Factory Home Building*, is finding some answers. The study describes how nine housing manufacturing plants differing in size, location, and type of product tried lean production techniques on their own factory floors. HUD’s Office of Policy Development and Research sponsored the research through the Partnership for Advancing Technology in Housing and in conjunction with the Manufactured Housing Research Alliance.

### Applying Lean Tools

In taking the first steps toward testing lean production methods, top management at each factory agreed to participate in the project. The plant then identified one or more “lean advocates” – team leaders who participated in a week of intensive training and agreed to serve as liaisons with the researchers. Together they assembled “lean teams” representing a cross-section



Workers study a value stream map that will improve the flow of materials along the production line in factory-built housing.

of employees and a range of viewpoints and experiences.

The lean advocates began with a lean tool called “value stream mapping,” a sketch using boxes and arrows to illustrate each step of the production process. These diagrams capture the flow of materials and information as value is added along the production line. Lean advocates collected information such as cycle and lead time, labor requirements, inventory levels, space requirements, and quality metrics. They then worked with project researchers to identify opportunities for improvement, targeting areas with low productivity, production defects, bottlenecks, or other problems. The lean teams also drew future value stream maps to help visualize their goals.

### RPIs Yield Results

With this analysis in hand, participating plants scheduled rapid process improvement (RPI) events – intensive workshops to develop and implement solutions to the targeted problems. As a result, plant production departments scored productivity improvements ranging from 10 to more than 100 percent. The report suggests that lean production techniques can provide housing plants with striking improvements in efficiency and quality. Here are two examples of RPI events drawn from the report.

- At Hi-Tech Housing in Bristol, Indiana, value stream mapping identified a serious problem. A partition wall was taking too long to build, causing production delays. Hi-Tech minimized disruptions by holding several RPI events over the course of one to two weeks and implementing the changes on a nonproduction day.

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## Mixed-Financing Underwrites Affordable Housing in Southwest Virginia continued from page 3

fiber cement siding, brick veneer, and sandstone—the same materials that would be found in any new housing construction. We're approaching this in terms of long-term sustainability."

### What Made It Work?

Baldwin credited some of BRHA's success to hiring an attorney with experience in mixed-financing deals. "The attorney really helped us understand what we needed to do," said Baldwin. "He got us connected to the right people at HUD and helped us determine what forms we needed to complete and what we needed to do." One challenge was combining the HUD requirements and the equity providers' requirements. "HUD was pretty accommodating as we were trying to close on the project. HUD completed its review on the day we needed it so that the project could move forward," Baldwin said.

Fast-tracking from the outset, BRHA completed the various preconstruction processes concurrently. "We began the disposition process on the public housing property well in advance," Baldwin said. "Then we applied for the low-income housing tax credits while the disposition process was underway. And we talked with our partners in the process and let them know what we planned to do." Musick advised other housing authorities contemplating this type of project to "use as many resources as you can and create partnerships to help you reach your goals."

Baldwin noted that developing affordable housing is a new step for BRHA, which has 400 public housing units and 254 residents with Section 8 vouchers. "For the past few years, we've been primarily a public housing and Section 8 management company. This



*Residents will begin moving into the Sapling Grove Apartments in March 2008, with final occupancy planned for July 2008.*

project has opened up a whole new arena for pursuing affordable housing."

### Looking to the Future

BRHA is seeking a consultant to help redevelop its public housing stock and uncover new opportunities to develop affordable housing and redevelop neighborhoods. "We're looking at how we can make our public housing units competitive in the local market," said Baldwin. "We can't rely on the Capital Fund, which doesn't provide sufficient funds each year, so we may need to do more mixed-finance projects. We're also thinking of expanding our housing services to meet other needs in the community—in particular, increasing homeownership opportunities and assisting in neighborhood revitalization in the area around the public housing complexes."

For more information about BRHA, visit [www.brha.com](http://www.brha.com) or contact Dave Baldwin, executive director, at 276.821.6255 and Todd Musick, vice president for capital investment, at 276.821.6264. To learn more about EarthCraft Virginia, visit their website at [www.earthcrafthouseva-sf.org/](http://www.earthcrafthouseva-sf.org/). ■■

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## A Lean Makeover for Factory-Built Housing Production continued from page 4

Hi-Tech took the two wall-framing tables then in use and moved them under the hoist system, welding them together as one jig. Beneath the tables they added tool storage compartments with see-through steel mesh doors. Barrels of white glue, formerly located 125 feet from point of use, were placed closer to the workstations. The drywall cart was moved closer to the assembly table and mounted on ball-bearing wheels that traversed a steel track secured to the floor. The RPI team built

new racks that neatly hold insulation bundles. They improved the placement of lumber racks, reducing physical strain on workers and rationalizing the flow of materials. The concrete floor was resealed, and everything was painted to foster a clean environment where it would be easier to spot problems.

Hi-Tech's RPI event, which entailed a one-time cost of \$8,000 for labor and materials, eliminated the need to add one worker to the department as orders increased, saving about \$35,000 annually.

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The relevant federal agencies define a chronically homeless person as an unaccompanied individual who is disabled and continuously homeless for at least one year, or who has had four homeless episodes within the past three years. The Substance Abuse and Mental Health Services Administration estimates that 39 percent of the chronically homeless suffer from mental illness, a disability often aggravated by substance abuse and HIV or AIDS.<sup>1</sup>

Evidence suggests that an approach called Housing First can make a positive difference in this hard-to-serve population, as can other forms of permanent supportive housing. Although some chronically homeless people with mental illness and co-occurring substance-related disorders are willing and able to commit to treatment, they may either be unable to keep such a commitment or may simply reject a conditional offer of housing. The theory behind Housing First is that street life is so demanding that people are unable to concentrate on recovery. Once the hardships of street life are left behind and they have condition-free stable housing, chronically homeless mentally ill persons are better equipped to address their illnesses.

## Pathways to Housing

Perhaps the most well-known application of this model is Pathways to Housing in New York City. Established in 1993, this program finds affordable apartments for homeless individuals with psychiatric or substance-related disorders. Pathways to Housing relies on a network of landlords, brokers, and property managers who identify privately owned housing units in low-income neighborhoods in Queens, Harlem,



Credit: Courtesy of DESC.

*The Downtown Emergency Service Center provides Housing First services to chronically homeless people in Seattle.*

1. *The Applicability of Housing First Models to Homeless Persons with Serious Mental Illness*, U.S. Department of Housing and Urban Development, Office of Policy Development and Research (2007), p. 2.

Brooklyn, and Westchester County. Clients and Pathways personnel work together to find an acceptable apartment, and clients may select from up to three choices. The agency holds the lease and sublets the apartment to the client, who pays 30 percent of his or her income (usually from Supplemental Security Income) for rent. Pathways to Housing provides the furnishings and equipment necessary for setting up housekeeping.

Neither psychiatric treatment nor sobriety is required, but clients must participate in two case manager visits each month. Once the participant has moved into an apartment, an interdisciplinary Assertive Community Treatment (ACT) team is available around the clock to provide needed clinical, rehabilitative, and support services. Pathways' ACT teams are composed of a nurse practitioner; part-time psychiatrist; social worker; administrative assistant; and specialists in substance abuse, wellness, family systems, and employment. Clients choose the support services and the sequencing they need. The program assumes that the client's housing tenure will be permanent. If the client requires inpatient treatment, the apartment is held for 90 days; if the absence is longer, the client is guaranteed a new apartment when returning to the program.

## Wider Use of Housing First

To learn how extensively the Housing First model is used and to explore its benefits, a study team canvassed the nation for programs that met the model's criteria. The team found nine programs that shared the following essential features, although varying considerably in the ways they are combined and implemented:

- Direct and permanent placement in housing;
- Readily available, but not mandatory, supportive services;
- Assertive outreach to recruit potential clients and a low-demand approach that accommodates client alcohol and substance use; and
- Case management services and housing holds for clients, even if they leave the program for a short time.

In addition to New York City, the programs canvassed were in Seattle, Washington; San Diego, California; Columbus, Ohio (which has two programs); Long

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## A Lean Makeover for Factory-Built Housing Production continued from page 5

■ The plant at Palm Harbor Homes in Albemarle, North Carolina, was small, congested, and obsolete. Damaged or excess materials and unneeded equipment were scattered throughout the plant, and necessary materials were often poorly organized. As its first lean production initiative, the plant launched a "red tag" system. A special team of managers and supervisors with the necessary decision-making authority set aside a high-visibility location marked by red flags. They asked each department to put together a list of obsolete, damaged, excess, or otherwise unneeded materials and to submit a materials return request. The lean team prioritized the list and relocated the selected materials to the "red tag" area. The team then inspected that area each Friday morning to decide whether to return these

materials to the vendor, use them in another application, cut them down, scrap them, or sell them. By reselling obsolete ceramic tile and light fixtures, reshaping obsolete molding into window jambs, and other "red tag" activities, the team saved \$21,282 in 6 months. Palm Harbor Homes went on to implement a second RPI in its shingle area.

The complete report, *Pilot Study: Applying Lean to Factory Home Building*, is available at no cost at [www.huduser.org/publications/destech/pilotstudy.html](http://www.huduser.org/publications/destech/pilotstudy.html). Readers may also be interested in an earlier report, *Getting Lean: Assessing the Benefits of Lean Production in Factory Built Housing*, available at [www.huduser.org/publications/manufhsg/leanprod.html](http://www.huduser.org/publications/manufhsg/leanprod.html). **HJ**

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## Housing First for the Chronically Homeless Mentally III continued from page 6

Beach, California; San Francisco, California; Philadelphia, Pennsylvania; and Los Angeles, California. The study was designed to be exploratory. There was no attempt made to compare Housing First to other models designed to promote housing stability among chronically homeless people.

### Housing First Outcomes

Along with Pathways to Housing, two other programs were selected for further study and comparison: Reaching Out and Engaging to Achieve Consumer Health (REACH) in San Diego and the Downtown Emergency Service Center (DESC) in Seattle. The research team visited the three sites, interviewing program administrators and staff to derive closely observed descriptions of what Housing First looked like at each of the sites. In addition, researchers drew a sample of 80 clients from across the three programs and followed these participants for 12 months. Outcomes were modest but encouraging for clients with a history of being difficult to house.

Eighty-four percent of the sample participants were in their Housing First unit on the first and last days of the 12-month period; a very positive outcome. However, this indicator of housing stability masks other patterns of housing instability evinced by many of those participants. Forty-three percent of the sample spent the entire 12-month period in their selected apartments. Another 41 percent had at least one temporary absence during that time. Sixteen percent left the program voluntarily (3), left involuntarily (6), or died during the year (4).

Although the three Housing First programs approached the problem differently, all achieved some success in securing safe and healthy housing for chronically homeless individuals with mental illness and co-occurring substance-related disorders. No clear patterns of change in severity of illness or substance use emerged; assessments of the clients' levels of impairment varied from month to month. Researchers concluded that achieving housing stability is, in itself, significant, and it's reasonable to expect that a substantial improvement in impairment would require more than 12 months to accomplish.

### Program and Policy Implications

*The Applicability of Housing First Models to Homeless Persons with Serious Mental Illness* describes the Housing First study and explores its policy and program implications. The report discusses features of Housing First that may help promote higher levels of housing stability for the target population, as well as differences between the tenets of the Housing First concept and federal priorities regarding substance abuse treatment. This investigation into the Housing First model provides a foundation for further research and informed discussion about how to serve a challenging client group.

The report can be downloaded at no cost from [www.huduser.org/publications/homeless/hsgfirst.html](http://www.huduser.org/publications/homeless/hsgfirst.html) and is available in print for a nominal fee from HUD USER by calling 800.245.2691, option 1. **HJ**

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In the Next Issue of... <sup>research</sup> **works**

- At our headquarters in the nation's capital, HUD's Office of PD&R recently assembled a panel of experts in international housing finance. Moderated by Britt Gwinner, Lead Housing Finance Specialist for the World Bank, discussants provided a global perspective on the current and future prospects of the mortgage market and rising foreclosure rates in the U.S. We'll review the roundtable discussion highlights and provide links to additional information.
- *Mortgage Securitization—Lessons for Emerging Markets*, recently released by HUD's Office of International Affairs and intended for international audiences, identifies the components of a successful secondary mortgage market (SMM). SMMs enhance the primary mortgage market by separating mortgage origination and mortgage investment, thereby increasing both the number of mortgage investors and the availability of capital. This article will examine the U.S. secondary mortgage market, with case studies of SMMs in Taiwan, Guatemala, and Romania.
- A symposium of housing industry, government, and academic experts met in February 2006 to explore the status of new housing technologies. An objective of the meeting was to pinpoint factors that slow the spread of new technology to residential construction and to determine what might speed its adoption. Sound market research that recognizes the needs of manufacturers, builders, and consumers formed the basis for the priorities and action strategies recommended by symposium participants. We'll explore these expert suggestions for expediting the adoption of innovative housing technologies.
- Surveyors recently approached American homebuyers to learn how they regard site-built, modular, manufactured, and panelized housing. Homebuyers were questioned about their attitudes toward, familiarity with, and willingness to purchase each of these different types of housing. We'll discuss homebuyer perceptions of housing types, and explore the implications for builders and marketers.

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