

RRR

Newsletter From HUD USER

Introduction to Roadmapping

The Partnership for Advancing Technology in Housing (PATH) has identified research and established priorities for technology development that will help the home building industry work towards PATH's mission to improve the affordability and value of America's homes through technology. Throughout the last year, industry stakeholders—including builders, remodeling professionals, trade contractors, and public sector sponsors of research and development—have been participating in a series of meetings to set research priorities called "Roadmapping." Each Technology Roadmap identifies a set of goals within a specified topic area, outlines steps to achieve those goals, suggests timelines for research, estimates costs, and identifies possible funding sources. Highlights from the four Technology Roadmaps produced to date are described in the following articles. By addressing these issues through research, the home building industry will continue to play a key role in providing affordable, durable housing for America's families.

Putting the Pieces Together: Using Panelized Construction to Expedite Home Building

The "Advanced Panelized Construction" Technology Roadmap sets forth a vision to develop common building panels able to perform multiple tasks; deliver consistent levels of quality; are easy to order, deliver, and assemble; and easily integrate with the building process. The Roadmap suggests that such a system of panels will result in lower costs, increased energy efficiency and durability, and a safer way to construct the building envelope.

Panelized construction is a method where the building structure is subdivided into basic elements – floors, walls, and roof – that are typically constructed under some form of mass production then shipped directly to the construction site and placed in the structure dur-

ing the finishing stage.

Advantages to this type of construction include cost reductions possible through mass production, ease of assembly, lower skill sets required for field construction, improved quality control, and increased worker safety. However, the Roadmap recognizes that some disadvantages remain, such as high shipping costs, site equipment

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Panelized Construction

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requirements, and connection complexity.

Integrate Materials

The Advanced Panelized Construction working group identified the primary objective for this Roadmap as to design, engineer, and develop adaptable, standardized, multiple-use panels that achieve multiple functions for the basic planar elements of a building envelope. While this strategy will require the use and integration of multiple materials according to functional needs, it may also be possible to develop a homogeneous material usable for multiple purposes. Based on discussions to determine opportunities for further incorporation of panelized construction into the building process, the Roadmapping group identified the following possible projects:

- Roof panel systems with high insulation levels and finished exterior surfaces.
- Higher insulation wall panels that are designed to take the utility construction out of the critical path of construction.

- Floor panels that provide structure and sheathing, and possibly finished floor surface that allows utilities to easily pass through.

Establish Common Standards

Research in several areas is needed to develop the performance requirements and engineering methods used to analyze, design, and specify panel systems. The goal of the strategy is to make panel systems easier to use by making the production and delivery process more uniform. The Roadmap suggests the following steps as the basis for the development of standards:

- Define expected performance requirements.
- Perform connections testing and analysis.
- Perform panel testing and analysis.
- Develop full panelized model.
- Conduct whole system testing.

Improve Production, Delivery Systems, and Site Assembly

More efficient production, delivery, and site assembly

processes are necessary to bring advances in panel technology to building sites. Improvement in this area is based on making models and information available to people in the industry. The Roadmap suggests developing a center of excellence for showcasing breakthroughs in production, delivery, design, and site assembly as well as a demonstration project.

Supplementing these best practice examples with training and better equipment will improve the end of the house building process.

Taking it to the Next Step

Enhancing today's products is a promising opportunity for market development in the panelized sector, but it is not the only route to growth. Strategies presented in the report will be the subject of continued working sessions to further refine the Advanced Panelized Construction vision for industry and government. Future Roadmap efforts will explore technology that will lower construction costs and increase panel usage. ❖

Improving Energy Efficiency in Existing Homes Remains Priority for PATH

The "Energy Efficiency in Existing Homes" Technology Roadmap outlines research and development to make their vision that by 2010, consumers will be able to substantially improve the energy efficiency of their homes and cut their energy expenditures a reality. It describes the challenges, and outlines activities and accomplishments needed. These include promoting new technologies, evaluating products and processes for retrofit, building capabilities among trade contractors, and identifying potential consumer incentives.

Data Provides an Overview of Energy Efficiency

Relevant data from the Energy Information Administration's (EIA) Residential Energy Consumption Survey (RECS) is used in this Roadmap to show current levels of energy consumption. RECS data provides a great deal of information that can be used to estimate potential energy savings from different types of technological improvements—helpful in assessing potential energy retrofit technologies for use under PATH. According to the survey, energy use per housing unit has

declined since 1978 from 77 million housing units using 10.6 quadrillion BTUs to 101 million housing units using 10.25 quadrillion BTUs. This change has been attributed primarily to reductions of energy required for space heating due to improved insulation, windows, and heating equipment.

While homes are generally more energy efficient than they were 20 years ago, there is room for improvement using new and existing technologies. The Roadmap divides areas for improved energy efficiency into six categories, intended to encompass the whole range of approaches available for use in addressing residential energy consumption.

Improving Efficiency from the Outside In

Gaps and cracks in building exteriors contribute significantly to inefficient energy use. The first Roadmap section discusses materials that seal cracks in housing envelopes. Air leakage through the building envelope is a major contributor to heating and cooling loads in homes of all ages, but it is particularly problematic in older homes. High air leakage around win-

dow and doorframes or through holes for pipes, wiring, and fixtures results in a drafty, uncomfortable winter with noticeable cold spots around the home's perimeter. An increasing variety of caulks, foams, and other types of weather stripping are available for use in air sealing. Some products are for general use and are sold to consumers; others address special purposes. Improvements to housing insulation and windows are also discussed in-depth as a necessary step to increasing the energy efficiency of homes.

Other Areas for Improvement

The remainder of this Roadmap discusses how to increase energy efficiency in:

- HVAC systems and controls,
- Appliances and lighting, and
- Distributed generation.

All efforts to increase energy efficiency in technology must also be complemented with new outreach strategies and tools. While not technologies in themselves, the adoption of these technologies by providing the important linkages between potential end users and available technologies. ❖

Roadmap Encourages Integration of Information Technology to Manage Home Building Process

The building process involves many different players, from architects to land developers to bankers. Today's information technology could easily manage the many relationships necessary to undertake a successful building process; however, homebuilders have not taken full advantage of its possibilities. The "Information Technology to Accelerate and Streamline Home Building" Roadmap reviews the current uses of information technology

in home building, identifies gaps in usage, and develops strategies for how its use should be expanded to better facilitate the flow of information during the building process.

Why Builders Don't Use Information Technology

An overview of how information technology is currently used in home building identifies the following barriers to its wider use:

- A majority of builders are small businesses that cannot afford large, complex information systems.
- Most builders rely on small trade subcontractors who may also lack sophisticated computer equipment.
- Building sites are scattered and disconnected as the majority of homes are built on-site.
- The lack of uniformity in terminology or building codes across the country makes it

expensive to develop a standard system that can be marketed to different builders.

The remainder of the Roadmap describes four strategies for overcoming these barriers. Each solution includes a breakdown of the steps necessary for implementation, a timeline, estimated costs, and recommendations regarding funding.

Create a Common Language

A number of efforts are underway to develop a common language within the industry. Most of today's efforts focus on commercial building construction, but some of the work already completed could serve as a useful starting point for the residential construction sector. Developing common terminology involves defining the necessary protocols and interface standards to allow design, supply, construction, and sales and marketing functions to communicate seamlessly. A common

PATH Solution – Promote the Use of Electronic Permitting Systems

The first publication related to streamlining the regulatory process, "Electronic Permitting Systems and How to Implement Them" is available from HUD USER. This report will accelerate the process of adopting electronic permitting by providing information on features of such systems and the experience of other communities that have adopted such systems. This will allow communities to reach the decision point on electronic permitting systems more quickly and with more information.

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IT Roadmap

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language would span, integrate, and be embedded in each of the current major areas of home building.

Streamline the Regulatory Process

Builders must navigate a frequently confusing path through various governmental agencies to gain approval for their building projects. Better use of information technology systems could streamline and ease the burden on the approval process. For example, builders typically obtain multiple permits from one or more agencies by standing in line to submit basic project information and complete forms. However, some jurisdictions have increased efficiency and streamlined the process utilizing electronic permitting. Better, more accessible software systems could also expedite the review, site visit, and product approval processes.

Develop a Non-commercial Information Portal

While there is a bounty of commercial information on the Internet about building prod-

ucts and processes, builders, and trade contractors, homeowners need objective information about materials, new products and process technologies, and directions to apply them. A non-commercial building information portal would provide objective information about subjects important to builders and consumers and allow them to compare products and processes to find the ones best suited for their needs.

Create Production Management Systems from Concept to Closure

The greatest challenges faced by most homebuilders revolve around execution of a production process that is complex, unpredictable, and always subject to change. Information technology cannot only make today's management approaches work more smoothly and accurately, but it can also lay the foundation for basic changes in the conduct of business that will improve productivity. ❖

PATH Solution – Use the Internet To Inform

To ensure that homeowners, homebuilders, and developers have the information they need to apply new technologies and practices, PATH sponsors the ToolBase Web site as a non-commercial information portal. From installation instructions to building code restrictions, and from cost benefit studies to construction alternatives, PATH wants builders to have fast access to hard facts. Developed in conjunction with the NAHB Research Center, ToolBase is the housing industry's resource for technical information on building products, materials, new technologies, business management, and housing systems. The ToolBase Web site is available at www.toolbase.org.

From Foundation to Rooftop, Whole Housing Building Roadmap Generates Ways to Streamline the Building Process

The construction of large products such as cars and houses requires the navigation of complex processes from start to finish. But while industrialization and the invention of the assembly line revolutionized the automobile industry, those same gains have not yet been fully realized in the housing industry. Home building is still mostly done by a myriad of small, locally based developers who rely on

an extensive network of subcontract laborers and suppliers.

The "Whole House and Building Process Redesign" Technology Roadmap brainstorms ways that such a dispersed housing industry can implement standardization mechanisms to expedite the building process and reduce costs. The Roadmap states as its goal that by 2010, home design and construction should be effi-

cient, predictable, and controllable with a median time cycle of 20 working days from groundbreaking to occupancy with resulting cost savings that make homeownership available to 90 percent of the population.

Barriers to Industrialization

The Roadmap identifies several challenges that must be overcome before systems can be implemented to improve the whole house building process.

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WE'VE MOVED

HUD USER has moved.
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Rooftop

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- Industrialized homebuilding has the potential to reduce consumer choice in a market where consumers expect more choices and customization.
- The regulatory process can impose significant cost penalties and stall the construction process.
- Builders are resistant to use new technology due to the high risks associated with implementation.

To address these barriers, the Roadmap presents a series of issues for further research. These issues are outlined in the following sections.

The Need for Change Management and Systems Thinking

Improvements to the whole house building and design process must first address the slowness in adopting new technologies and the absence of systems science and engineering in building products manufacturing. These issues are well known and frequently lamented in the building industry. The Roadmap suggests that a framework to manage the introduction of technology and to create an environment that facilitates systems solutions must be developed before other PATH research and development prior-

ities in whole housing building can be addressed.

The Advantages of Industrialization

The Roadmap also suggests that additional research should be done to consider the application of industrialized processes to the home building industry to achieve higher levels of production efficiency. Substituting capital for labor will make the building process more like manufacturing and increase efficiency while improving quality and safety. The Roadmap also states that industrialized home building in the future must remain flexible and easily customized to meet consumer preferences—advantages currently available with onsite builders.

Completing the Process

The final section of the Roadmap contains proposals to improve home construction. Building time and costs could be reduced if more pieces could be manufactured off-site and delivered to the construction site intact. In addition, integrating mechanical systems, such as flooring modules that incorporate HVAC ducting or radiant heat, could reduce costs, decrease labor requirements, and improve energy efficiency. ❖



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