

**Pennsylvania Housing Research Center
The Pennsylvania State University**

1995 Annual Report

CENTER OVERVIEW

The Pennsylvania Housing Research Center (PHRC) formerly the Housing Research Center (HRC) at Penn State, has been active since July 1988 in providing education, research, and technology transfer services to the residential building industry. Within the Commonwealth of Pennsylvania, most of the PHRC's activities have been carried out in conjunction with the Pennsylvania Builders Association (PBA). Additional joint programs have also been developed with the Pennsylvania Electric Association, the Pennsylvania Energy Office, and the member firms within the Mid-Atlantic Building Systems Council. The PHRC was also an active member of the Pennsylvania Advanced Technology Housing Consortium (PATHC), which was funded by the PA Department of Commerce through the Ben Franklin Partnership Program between 1989 and 1991.

The PHRC is situated in the College of Engineering but faculty members from other colleges in the University also participate. Major focus areas include: (1) Energy Analysis and Optimization, (2) Characterization, Testing and Modeling of Structural Systems, (3) Computer Aided Design, (4) Construction Management, (5) Subdivision Infrastructure Systems, (6) Enclosure Performance, and (7) Technology Transfer.

1995 PROGRAM (9/1/94-8/31/95)

1. Personnel

Dr. Eric F. P. Burnett - Director, Departments of Civil and Environmental Engineering and Architectural Engineering
Dr. Harvey Manbeck - Professor, Department of Agricultural and Biological Engineering
Ms. Michelle McMullen- Administrative Assistant, Department of Civil and Environmental Engineering
Dr. Kevin Parfitt - Professor, Department of Architectural Engr.
Mr. Stacy Worley -Assistant Director, Department of Civil and Environmental Engineering
Dr. Gren Yuill - Professor, Department of Architectural Engr.

2. Funding

In addition to considerable support from Penn State and the College of Engineering, in the 1995/96 the PHRC received the following:

- Ben Franklin Partnership Grant - \$25,000
- Residential Industry Support - \$82,000
This support consists of separate donations from individual businesses combined with a grant from the Pennsylvania Builders Association

3. The Fourth Annual Housing Conference

The Fourth Annual Housing Conference was held on March 27-28, 1996, at the Penn State Scanticon Conference Center Hotel in State College, PA. The conference was co-sponsored by the PHRC, Pennsylvania Builders Association (PBA), and Pennsylvania Electric Association (PEA). The conference was attended by approximately 125 representatives of the residential construction industry from Pennsylvania and beyond. There were three keynote sessions, seven topic oriented sessions, three workshops, and a dinner program.

The workshops included one on *Hands-On CAD for the Residential Builder, Engineered Wood Products*, and another on *Computer-Based Cost Estimating*. The topic-oriented and plenary sessions addressed subjects including current and future challenges for the PA builder, legislation and regulatory issues affecting PA builders, planned communities, a Canadian perspective on home building, and several energy-efficiency issues (NAHB's Volunteer Energy Efficiency Initiative, marketing with E-Seal Volunteer Energy Program, energy efficient heating systems and comfort extenders, energy efficiency with steel, concrete and masonry, and structural insulated panel construction).

In addition, twelve representatives from material manufacturers demonstrated their products and answered questions for the attendees.

4. Publications: Research Series Report E Technical Support Series Documents

- No. A39: A Progress Report on HRC Activities Related to the Modular Manufacturing Industry. August 1995. J. Julo, P. Gowda, and J.H. Willenbrock.
- No. A40: Evaluation of Duct Sealing Effectiveness. July 1995. G. Yuill and A. Musser.
- No. A41: Creep Behavior of Composite Structural Insulated Panels. September 1995. S.B. Taylor and H.B. Manbeck.
- No. A42: The Framework for an Integrated CAD-Based Information Management System for the Residential

- Land Development Industry. September 1995. C. McIntyre and M.K. Parfitt.
- No. A43: The Energy Cost Optimized Modular House. August 1995. G. Yuill and J. Rioux.
- No. 6: Site Selection and Evaluation Techniques Concerning a Proposed Residential Subdivision Within the Centre Region. C. McIntyre and J.H. Willenbrock. (this report is contained in Report No. A42)
- No. 7: Test Item Development for the PBA Certified Residential Contractor Program. July 1995. J. Julo and J.H. Willenbrock.

5. Research Projects

Two 1994-95 PHRC projects were expanded with the award of competitive research grants from the U.S. Departments of Agriculture and Energy. *The Analysis of Time Dependent Behavior of Structural Insulated Panels* was selected for support by USDA. This project involves the study of the creep performance of SIPs. An understanding of time-dependent behavior is necessary to ensure that serviceability requirements are met in residential applications of SIPs. One of the objectives is the development of a model of time-dependent panel behavior that can be applied to a broad range of materials and techniques common to SIP manufacture. *The Design, Construction, and Testing of a Super-Insulated Modular Home Without an HVAC System* was selected for funding by the DOE. The experimental design of a modular home that is sufficiently insulated to maintain a comfortable environment without an HVAC system has been completed and construction of the modules is scheduled for June 1995. Construction is complete, the home will be occupied later in the year and energy consumption will be monitored to provide data for a life-cycle cost analysis.

6. Current Research Projects (1995-96) are:

1. The Framework for an Integrated CAD-Based Information Management System for the Residential Building Industry
2. Modeling and Optimization of Floor Systems Utilizing Alternative Materials
3. A Builder's Guide to Modular Housing (Completed January 1996)
4. Ground Source Heat Pumps