
HRC NEWS

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COMPLETED RESEARCH PROJECTS FROM 92-93

On September 24, 1993, the HRC submitted its year end report to the Pennsylvania Builders Association (PBA) and the Ben Franklin Technology Center. Included in this submission were final reports for three research projects and three technology transfer projects that cover each of the six emphasis areas of the HRC. The diversity of topics reported with these projects is reflected in the following summaries.

1. A Review of Selected Alternative Wood Framing Systems for Residential Builders

Rising lumber costs and labor rates, along with the competitive struggle to provide higher quality and more efficient building packages, have stimulated the development of alternative framing systems for residential and light commercial construction. After surveying steel, masonry, log, and alternative stick structural framing, the HRC Advisory Council identified locally available hardwoods and structural insulated panels as the subject of a three-year research project.

The objectives of this research were: 1) to identify alternative structural building components using northeastern hardwoods; 2) to document a case study for the development of a design manual for structural insulated panels as an alternative to stick framing; and, 3) to define the state-of-the-art for the development of structural insulated panel systems as an alternative structural system.

Recent research has shown that northeastern hardwoods (esp. yellow poplar, red maple, and red oak) are nailable and treatable and have allowable design values competitive with commonly used softwoods. Designers, architects, and engineers can now specify, for the first time, hardwood materials such as solid sawn, glulam, and LVL in structural systems such as diaphragm and nail-laminated structural framing. Our research has also shown that structural insulated panels (SIPS) are emerging as an

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A NOTE ON RESEARCH FROM THE EDITOR

Our next Advisory Council meeting, which will be held on December 9, will focus on the current status and future direction of the HRC research program. The morning session will include a review of completed projects from the 92-93 cycle. The afternoon session will be devoted to developing task groups with the charge of reviewing research and technology transfer projects in progress as well as developing issues-based priorities for future work. Task groups will be formed around the present HRC areas of emphasis:

- Energy Analysis and Optimization
- Structural Systems
- Computer Aided Design
- Construction Management
- Subdivision Infrastructure Systems
- Technology Transfer

The task groups will consist of industry representatives who have special expertise in the emphasis area and who will assist each project's principal investigators. These task groups will meet for progress reports at each Advisory Council meeting and will be responsible for the presentation of the final reports at the end of the research cycle.

The groups will be challenged to plan projects that are responsive to the immediate and long-range needs of the industry. A research project model has been developed by the respective principal investigators for each task group that defines the deliverables for short- and long-term projects. Short-term projects will develop seminars, training manuals, conferences, and short courses for specific areas. Long-term projects will develop basic principles for the continuation of applied research in the emphasis areas. We will be discussing this model at the December Advisory Council meeting.

Steven Taylor
HRC Assistant Director of Operations

Completed Research Projects continued

alternative structural framing system; however, additional work is necessary to document structural performance.

The second year of this research project will focus on building code specifications and physical testing protocol issues with the goal of establishing criteria for the structural evaluation of a SIP configuration under critical loading conditions such as creep and/or combined loading. This evaluation will then be used to develop predictive models for panel structural performance in the third year of the project.

The HRC has identified this three-year effort as a pilot research project that will: 1) identify a basic problem and a course of action; 2) identify modeling techniques to predict behavior; and, 3) collect data to validate or calibrate models so industry will be in a position to develop design aids and standards. The literature review is being followed by the implementation of testing protocol and analytical work in the second year. The third year will focus on the validation and calibration of models to demonstrate the HRC's commitment to long-term research.

2. Development of a Customized CAD-Based Design Production System for Residential Builders

In May 1992, the HRC Advisory Council approved funding for a residential construction CAD application project. The purpose of this project was to enhance the manner in which small-to-medium sized residential builders utilize CAD and to provide non-CAD builders with a review of current residential CAD software systems.

The idea for this project evolved from a survey of engineers, builders, and developers that was conducted in the fall of 1993. The results of the survey indicate that low-cost microcomputer hardware and software has made computer-aided design tools readily available to residential building firms. However, for a variety of reasons, this technology has not yet been fully utilized by the average builder.

In general, it was felt that this was partly due to a lack of effective technology transfer to the industry and the fact that many of the most well-known or popular CAD systems are not addressing the specific needs of the residential builder. In other words, many CAD systems do not "speak the language" of the builder. CAD commands like "wall," "door," and "window" are much more builder-friendly.

The primary objective of this project was to develop a

technology transfer program in the area of CAD-based systems for residential builders. This technology transfer program would take the form of a CAD tutorial-workbook, an HRC customized AutoCAD menu system, and possible future CAD seminars and workshops.

The material contained in the tutorial-workbook offers valuable information to all residential builders, with sections dealing with system selection, system customization, CAD management, CAD training, and AutoLISP programming. Also included is a resource directory that contains an overview of builder software packages, publications, organizations, education, training, etc., related to residential CAD systems.

The results of this project produced a residential software package that "speaks the language" of residential builders (i.e., walls and doors instead of lines and arcs). This package, or portions of it, could be added to a residential builder's AutoCAD menu system. The results demonstrate to software developers and vendors that a market exists for this type of software. The tutorial-workbook serves as a reference manual for builders, regardless of their CAD experience level. This manual will be the course text for future CAD workshops and seminars.

3. An Optimization of Residential Energy Systems

Life-cycle cost optimization of residential heating and cooling systems is dependent on local fuel and electricity prices. This means that the analysis must be repeated for each region with a particular natural gas utility and a particular electrical utility. It must also take into consideration the design of the particular house being examined as well as local weather conditions. This makes it very difficult for a builder to perform an analysis to ensure that the buyer is getting the most economical energy system. The objective of this project was to solve that problem.

The energy systems for two case study houses were analyzed for Pennsylvania's 44 energy cost regions, and the most economical heating and cooling systems were determined. In all regions a high-efficiency air source heat pump or a high-efficiency gas furnace with a high efficiency air conditioner were determined to be the optimum selections. This report will enable a builder to choose the most cost-effective heating and cooling system for each house design and location.

4. Builders' Perceived Need for Continuing Education

In order for PBA to offer educational programs that are relevant to the present and future needs of its membership, the HRC was asked to conduct a series of

focus group sessions in the northeast, northwest, south-central, and southeast regions of the Commonwealth. The objective was to survey builders regarding their: (1) perceived need for continuing education; (2) views of the educational opportunities currently offered through PBA; (3) list of priority topics for future educational offerings; (4) ways to make educational program opportunities more appealing to builders; and (5) effective marketing techniques for educational offerings.

Participants strongly recommended that PBA continue to offer educational seminars for both the new and the experienced builder and that a basic knowledge of construction techniques continues to be necessary. However, in order for today's builders to succeed, they must be competent in business management practices and keep abreast of the most current financial, legal, and governmental regulations. Participants also recommended that PBA investigate licensing or certification programs for active builders.

The results of this research project were discussed by

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Contributions and news items are
welcome. The deadline for spring issue
submissions is February 1, 1994.

the Education Committee of PBA and incorporated into their long-range educational plans. Findings were also shared with NAHB and Home Builders Institute personnel. As a result of this project, new topics will be

added to the menu of seminars already being offered through PBA.

5. Technology Transfer Manual for Computer-Based Cost Estimating (CBCE)

An NAHB study conducted in 1992 indicates that only two out of five builders who have personal computers are using them for cost estimating. Many builders are hesitant to use CBCE because of the perceived costs and complexity involved in purchasing and operating the hardware and software necessary for successful utilization of a computerized cost-estimating system.

This report provides an introduction to the theory and application of CBCE and presents guidelines for evaluating and purchasing cost estimating software. The steps necessary to create a computer estimate are illustrated by providing a demonstration that produces an estimate for an actual house.

This report includes an introduction to CBCE terminology and the elementary steps needed to construct the database and work packages for use in taking off and costing an estimate. This report also provides excerpts from an NAHB compiled cost estimating software directory and software reviews. An outline for a one-day CBCE course is also included.

6. Technology Transfer Program for PaDER Approved Spray Irrigation Systems

On-site treatment and disposal of domestic wastewater is a topic of major concern for the residential building industry. Existing DER-approved alternatives to sand mound systems include spray irrigation, stream discharge, and dry-stream discharge systems. PBA, in conjunction with the PaDER, encouraged the HRC to develop the technology transfer material necessary to support an educational program related to spray irrigation systems.

Spray irrigation systems provide a viable alternative to marginal residential lots that may contain poor soils, a high water table, or steep slopes. The application and approval process is considerable and the costs are relatively expensive; however, a spray irrigation system may allow the development of a particular site that was previously unbuildable.

The project has produced a two-part package consisting of a brochure about spray irrigation systems and a detailed HRC Research Report that includes material that can be used for a seminar series explaining the application/permitting process, treatment and disposal

systems, and the design of on-site spray irrigation systems.

IMPORTANT

National Builders St
Las Vegas, Nevada

Ben Franklin Propo

PBA Sponsored HF

Spring Advisory Cou
and Reception Dinn

Fall Advisory Counc

NAHB Student Cha
Banquet

UP-COMING FUNDRAISER

HRC

PBA has announced that the HRC fundraising event will be held in conjunction with the next PBA Board Meeting, which will be held in State College in March 1994. Mark your calendars for the big event.

HRC REPORTS

The six new research projects described in this HRC News issue can be obtained by contacting Steven Taylor at the HRC, 212 Sackett Building University Park, PA 16802, and requesting an order form. Reports can be obtained by submitting the order form, along with a check made payable to The Pennsylvania State University, for \$75 (Non-members), \$50 (Patron Members), or \$25 (Contributing Members) for each report requested. Leadership and Supporting Members will receive free copies of each research report at the end of the HRC operating cycle.

The HRC has also published the second edition of the Housing Research Fact Sheets that describe the HRC Research Report Series to date. For a free copy please contact the HRC at the above address.

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