The Pennsylvania Housing Research/Resource Center

Project Plan
January – June 2008

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Preface

Each year, the Pennsylvania Housing Research Center (PHRC) seeks to identify and prioritize a series of projects that collectively satisfy the following criteria:

- meet the residential construction industry needs and the needs of the housing consumer in Pennsylvania;
- be consistent with the mission and goals of the PHRC;
- be affordable and feasible, given the resources available and the prevailing constraints on time, expertise and facilities; and
- be a balanced program of projects that address both the long and the short-term needs of all sections of the industry.

This PHRC work plan is the result of input and assistance from numerous individuals and groups. The PHRC Industry Advisory Council and the Operations Committee, in particular, have responsibility for the final choice of topics. These housing industry-based bodies consist of manufacturers and suppliers, builders, remodelers, industry associations as well as building code organizations and state agencies.

The list of projects that follows identifies only those projects that are to receive some degree of support from funds provided to the PHRC by the Commonwealth of Pennsylvania, through the Department of Community and Economic Development. The projects are anticipated to start January 1, 2008 and be completed on or before June 30, 2008. In most cases, we have attempted to use state funding to leverage outside support; in other cases the work is considered important enough to warrant full state support. Please note that with the collection of monies under Act 157 of 2006, there is not an accurate estimate of the exact amounts of funds available during this period. Any excess funds will be carried over for future projects. If there is less funds collected than expected, the project plan will need to be abridged. We plan to continue with our previous initiatives in the areas of training and education, modular housing, manufactured housing, and applied research.

We have tried to build into the program some flexibility with regard to the number and nature of projects and their funding. We are required to plan projects and allocate funds at the start of each year. However, there is a real need for the PHRC to be able to take on special projects during the year. These projects typically fall into two categories: the first includes short term and limited scope projects that are time sensitive, while the second requires the ability to allocate some funds to leverage additional outside funds in response to request for proposals.

Training, Technical Assistance & Outreach: The PHRC has a mandate to transfer knowledge by providing the necessary training and education to the wide variety of groups that make up the housing industry. The projects that are described below are in response to the recommendations that flow out of the PHRC's Industry Advisory Council and reflect the current needs within the housing industry.

Workshops

Description: Every year the PHRC provide workshops for builders, remodelors, design professionals, educators and building code officials. These programs are held in partnership with local and regional design professional associations, building related associations or building code associations. Some of the topics that are being considered for this year's programs include the following:

- design and construction of wood frame buildings (NDS) for engineers in private practice and within the factory built housing industries;
- moisture control, energy efficiency or other building science related issues;
- green building and sustainable land development practices; and,
- residential deck design, construction & inspection.

Manager/PI: Fortney, Duran, Turns, Kasal

Deliverable: The PHRC will develop and deliver at least two technical workshops to be held at various locations across the state.

Builder Briefs

Description: Continuation of the series of short technical documents, two to four pages in length, that address specific issues that have been identified by builders or remodelers. These documents are intended to be quick to read with much information presented graphically or pictorially. Potential topics include:

1. Energy Code Enforcement – lessons from the field
2. Design pressures for windows and doors
3. Insulated Concrete Masonry Below-Grade Walls

Manager/PI: Turns, Fortney, Kasal, etc.

Deliverable: At least one builder brief will be researched, written, printed and distributed.

Building Code Training

Description: The passage of the Uniform Construction Code (Act 45 of 1999) created, for the first time, a statewide building code for Pennsylvania. This act has been implemented. It will cause the single biggest change for the construction industry in Pennsylvania. For areas of the state that have never had an enforced building code, now there is one. For areas with an enforced building code, the new code replaces the existing regulations. This will change the way we build. The PHRC will also expand its support for the Pennsylvania Construction Code Academy (PCCA) by developing programming to help building code officials prepare for residential certification examinations.

In response, the PHRC has developed a series of building code training programs intended for builders, remodelers, building code officials, design professionals, and others involved in residential construction. These programs were developed with the support of the Pennsylvania Builders Association (PBA) and DCED, the U.S. Department of Energy. The following are the programs to be offered during this program period:

General Audience Programs

1. Comprehensive International Residential Code Program 2 day
2. Pennsylvania's New Energy Code Requirements 2 day
3. Overview of the IRC's Plumbing Requirements 2 day
4. Overview of the IRC's Mechanical Requirements 2 day
5. Commercial Building Provisions of the IECC 2 day
6. Performing Residential Building Inspections 2 day
7. 2003 to 2006 IRC 2003 Update Program 1 day

Manager/PI: Fortney

Deliverable: The PHRC will deliver at least 5 workshops to be held at various locations across the state. The PHRC will also deliver custom programs upon request.

New Program Development

Description: The PHRC will develop three new training programs. These programs will address issues challenging the residential construction industry (builders, remodelors, building code officials, materials suppliers, etc.) During this period the following programs will be developed:

1. **Deck Design Construction and Inspection Program:** Decks are considered simple structures. Yet deck related failures are responsible for a substantial number of injuries and deaths each year. This program will discuss the root causes of these problems and offer real world solutions. The program will be developed to provide an overview of IRC code requirement for residential decks and a detailed review of the use of commonly used connectors, fasteners and some commonly used proprietary products. The afternoon will focus on hands on examples including designing a simple residential deck, performing a detailed review deck plan to check for code compliance and a virtual inspection of a residential deck. This course is designed for builders, remodelers, deck contractors, building officials (plan reviewers and inspectors), design professionals, home inspectors, and manufacturers and suppliers of deck related construction materials.

Deliverable: A new program will be developed in cooperation with Virginia Tech, instructors will be trained, a pilot will be held and the program will retooled based on the industry input received. The final program will be deployed next fiscal year through PHRC sponsored programs and programs offered through the PCCA and local builders associations.

2. Residential Mechanical Plan Reviews and Inspections – The need for this program is two fold. The first is the need of new building code officials to have more in-depth knowledge of mechanical systems since many of them come into code enforcement from other areas of the construction industry and are not familiar with mechanical requirements and proper installation issues. Additionally, a recent DOE funded study conducted by the PHRC found generally poor performing HVAC systems across the Commonwealth. This was attributed to poorly constructed ducts. This 2-day program will provide new and experienced building code officials the background they need to effectively administer and enforce the mechanical requirements in the IRC.

3. Multi-Family Program – There are specific requirements for multi-family structures built under the IRC that require special attention by the building code officials. The program will highlight such issues as fire separation requirements and accessibility. This program will focus on effective plan review and inspection practices and provide an understanding of fire rated assemblies.

Manager/PI: Fortney/Turns

Deliverable: A new program on multi-family structures will be developed, pilot programs will be held, instructors will be trained, and the programs will be made ready for deployment. The PHRC will include PCCA and other interested parties in the development process to assure the finished product meets the needs of the building code officials and the construction industry.

A program on Residential Mechanical Inspections will start to be developed based on establishing industry partnerships with HVAC associations and equipment suppliers.

Web Based Training

Description: The PHRC's Industry Advisory Council has requested the development and deployment of web-based training. There is a need for technical programs with a lower cost delivery mechanism than a formal classroom setting. This initiative will seek to develop interactive web-based training that can be available live and archived for future viewing.

Manager/PI: Fortney/Turns

Deliverable: The PHRC will work with the PBA, PMHA PCCA and other industry and trade organizations to identify the most relevant topic(s) and develop and deliver at least one program.

Technology Transfer & Outreach

Description: Continuation or expansion of activities to get information and publications to builders, remodelers, design professionals, building code officials and others involved in the residential construction industry.

Manager/PI: Fortney

Deliverable: The PHRC will work with the PBA and other industry and trade organizations by means of the following activities:

1. **Annual Pennsylvania Housing and Land Development Conference:** For over 15 years this conference has been the premier technical conference for housing and land development issues in Pennsylvania. This 2-day conference provides the latest information on emerging technologies and how to resolve problems facing the housing industry. The conference is intended for all sections of the housing industry including builders, remodelers, code officials, educators, design professionals and modular and HUD code builders. The second day of the conference serves as an annual forum that addresses emerging planning, design, and regulatory issues affecting the land development industry in Pennsylvania. This day is intended for anyone involved in land development activities including builders, developers, design professionals, planners and regulatory officials.

2. **Speaker Service:** The PHRC will hold and/or participate in talks and seminars directed at the housing industry. This may include trade and professional association functions and regional meetings, local association dinner or breakfast meetings, or state or national conferences.

3. **Outreach Activities:** This includes activities to let builders know about the PHRC and the services and publications it provides. These activities may include the PHRC newsletters, mailings, promotional pamphlets, advertisements in trade journals, phone calls, and the PHRC's website.

Applied Research: A very important function of the PHRC is to undertake or stimulate research and development on materials, products, procedures, etc. These efforts may have a longer-term and/or a more fundamental focus than other projects. The projects that are listed below make use of, foster partnerships, and draw on the expertise and strengths of the persons, the groups, and the facilities available at both the Pennsylvania State University and Pennsylvania College of Technology.

Insulated Concrete Masonry Below-grade Walls

Description: This project addresses the issues related to the insulated concrete masonry below-grade walls. The objective of this project is to develop and document a better understanding of the hygrothermal performance of these wall systems below grade.

Manager/PI: Kasal

Deliverable: Potentially new, effective methods of insulating basement walls that will permit the control of potential water intrusion while minimizing the health hazard resulting from an environment favorable to mold growth. A better understanding of mass movement through the CMU basement walls will permit us to develop effective design strategies to minimize water intrusion and subsequent health hazard.

Comparison of the Performance of Wood-frame Construction and other Alternatives in Different Environmental Hazard Conditions

Description: In light of the extensive damage to single family dwellings during Hurricane Katrina and the flood as a result of levy failure in New Orleans, it is expected that some of the lessons learned will eventually be incorporated into new construction for similar areas. The industry has also learned many lessons from failure of wood-frame construction in earthquakes and tornados.

Each of these environmental hazards demands certain characteristics of the building for acceptable performance. Considering such multi-hazard dimensions that conventional wood-frame construction has to face in addition to regular environmental design conditions (snow load, rain, wind, etc.) on top of waterproofing and energy conservation demand for heating and cooling, design professionals ponder the question of whether conventional wood-frame construction is still the best answer. In particular, given the desirable sustainability design criteria that are being highly promoted today, architects and builders are paying more attention to alternative construction systems, including different masonry types and panelized systems.

In this research, the load resistance and building science performance of residential buildings of various construction types in different natural hazards and normal environmental conditions will be studied and compared. The R&D challenges, particularly the full-scale experimental research needs for alternative wall systems and/or construction types suitable for different natural hazards will be identified and discussed. The research will generate information to be used in a comprehensive proposal to submit for funding to NSF, HUD, or NAHB with industry support.

Manager/PI: Memari/Kasal

Deliverable: Performance matrix of light frame wood and alternative construction systems in normal environmental conditions and under natural hazard loads.

Land Development: The land development process is the key component to providing affordable homes. However, there is no single group looking at land development practices in Pennsylvania. These initiatives are part of the PHRC's long-term effort to provide technical input and guidance and leadership to these issues.

Pennsylvania Standards for Residential Site Development

Description: The residential development standards project, were finalized in April 2007. These are a set of consensus standards that allow for the most up-to-date design innovations and provide flexibility needed for sustainable land development. The initiatives that will be undertaken will increase the awareness of the standards and encourage there adoption by municipalities within the Commonwealth.

Manager / PI: Duran

Deliverable:

1. At least 5 presentations will be made to land development design professionals and local government groups. These efforts will be coordinated with PSATS, Local Chapters of ASCE, PBA's Developers Council and other professional associations.

2. The PHRC will conduct a review of barriers to adoption of the standards from a municipal perspective. This will review the interrelationship between existing zoning and subdivision and land use ordinances to determine the types and breadth of amendments that would be required of local zoning to allow the use of the Pennsylvania Standards. A report will describe the findings and will present recommendations to local municipalities and the PHRC for future initiatives.

Applied Projects: This group of projects focuses on the application need for the residential construction industry. This includes development and support of standards, and longer term initiatives.

MHTI & MHRC

Description: Two programs focusing on training for the factory built housing industries have been developed. The first is the Modular Housing Training Institute (MHTI) and the second is the Manufactured Housing Resource Center (MHRC). The MHTI program currently provides a two-day training program that focuses on the on-site completion of modular houses. The program is intended for builders, installation crews, code officials as well as industry representatives. The MHRC currently provides training for the on-site completion of manufactured or HUD Code housing. The program is intended for retailers, installers, manufacturers as well as building code officials. In recognition of the importance of factory built housing to PA, a Ben Franklin award has been made to enable a full-time Director of MHTI and MHRC to be employed.

Manager/PI: Pennsylvania College of Technology

Deliverable: Promotion of the programs by providing presentations at trade association meetings, direct marketing to manufacturers, community owners, and retailers.

Support of Standards

Description: The PHRC has developed three standards to respond to industry demand. These include Pennsylvania's Alternative Residential Energy Provisions, Pennsylvania Standards for Residential Site Development Standards, and Foundation Systems for Relocated Manufactured Housing. Each of these standards requires training and timely technical assistance for local governments, builders/developers, design professionals, contractors, etc. All of these standards are available electronically for free or hard copies are available for a fee.

Manager/PI: Fortney, Duran, Turns

Deliverable:

1. Pennsylvania's Alternative Residential Energy Provisions: Education will be provided through various building code training programs and technical assistance will be provided through telephone and email support by the PHRC.

2. Pennsylvania Standards for Residential Site Development Standards: Please see the Land Development section.

3. Foundation Systems for Relocated Manufactured Housing: The PHRC will develop a one-hour training program for building code officials and contractors. This will be held at least three times and will be posted to the PHRC's website for open viewing.

Flood Preparedness of Pennsylvania's Housing Stack

Description: Pennsylvania has more miles of waterways than any other state and is one of the most flood prone states. This project will review the current state of the art for flood resistive construction and proper procedures for flood recovery. This project will also identify key areas for future efforts to help Pennsylvania prepare for the recovery of future floods. This project will include involvement from FEMA, PEMA, and others involved in emergency response in the Commonwealth.

Manager/PI: Fortney, Kasal

Deliverable: The PHRC will deliver a brief report highlighting the existing resources available within the Commonwealth and suggestions for improvements in the recovery .

Wall Bracing Standards for Pennsylvania

Description: The residential structures all over the United States are exposed to high winds year round. We propose to look at the historic wind data for Pennsylvania available through the National Weather Service, and establish critical regions/counties. The assessment of wind loading with these local wind data is possible by using the existing design guidelines.

This is an initial feasibility phase of this ambitious multi-year project.

Phase 1: Feasibility Study
Phase 2: Regional Wind Mapping
Phase 3: Developing of Bracing Standards

Manager/PI: Kasal

Deliverable: Complete Phase 1, feasibility study, which will include the analysis of historical wind data in PA and determining if the development of a wind load map for sub-regions of the state is warranted. Determination of the impact of reduced wind speeds on bracing requirements for a typical residential structure. Provide a report to the IAC on the potential for developing wall bracing standards for PA with recommendations.

Contingency Projects: This group of projects are projects that have a high level of interest, but because of limited resources, (financial/ staff/ etc.) are not able to be completed during this period or project in which the PHRC has solicited financial support, but are awaiting response from funding agencies. Additionally, the PHRC may take on high priority short-time frame projects mid-cycle at the request of the Industry Advisory Council or the Operation Committee.

Budget by Project Categories

Project	State	Outside[1,2]	Total
Training Technical Assistance	123,400	105,530	228,930
Applied Research	15,000	36,750	51,750
Land Development	2,000	900	2,900
Factory Built Housing	24,355	10,960	35,315
Contingency Projects	5,000	0	5,000
	169,755	154,140	323,895

Notes:

1 Direct outside funding is received from a variety of sources including fees for services, in-kind contributions, industry contributions, grants and contracts.

2 These funds are contingent upon industry commitments.