



The Pennsylvania Housing Research/Resource Center

Project Plan

July 2010 – June 2011

Pennsylvania Housing Research/Resource Center
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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. Projects should:

- 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 groups and individuals. The PHRC Industry Advisory Council (IAC) and the Operations Committee, in particular, have responsibility for the final choice of activities. These housing industry-based bodies consist of manufacturers, suppliers, builders, remodelers, industry associations as well as building code organizations and state agencies. On April 15, 2010 the IAC met to identify and discuss over 50 potential projects for the PHRC to pursue. After a thorough discourse, the members of the IAC voted on projects they felt were the highest priority for the industry.

This voting resulted in a prioritization of projects into three groups. The first group was high-priority projects that are included in this plan. The second group included medium-priority projects. Many of these are included in the contingency projects that may be pursued if resources become available. The third group was low-priority projects. These projects are not included in this plan. The projects are anticipated to start July 1, 2010 and be completed on or before June 30, 2011.

The list of projects that follows identifies only those projects that are to receive funds provided to the PHRC by the Commonwealth of Pennsylvania. 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. It should also be recognized that the PHRC undertakes a wide area of additional projects that do not receive any of these funds and are therefore not listed in this plan.

Please note that with the collection of monies under Act 157 of 2006, there is not an accurate estimate of the exact amounts of funding available during this period. Because of this, this plan only considers funds on hand. Any remaining funds will be carried over for future projects. We plan to continue with our previous initiatives in the areas of training and education, modular housing, manufactured housing, and applied research.

We 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 requests for proposals.

PART 1 - 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.

A. Program Development

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

1. **Wall Bracing: Prescriptive Design and Plan Reviews** - This project will expand the existing one-day workshop on 2009 IRC wall bracing requirements to two days. The program will provide a general understanding of structural principals of wood frame buildings, as well as wind and seismic loading. The expanded program will provide additional hands-on exercises by evaluating several house designs and proposed additions.

Manager/PI: Fortney, Kasal

Deliverables: The program will be developed and ready for delivery in Fall 2010.

2. **Advanced Framing: Increasing Performance and Reducing Costs** – With increased competition between builders and a green building movement that is here to stay, advanced framing provides a means to cut costs while improving energy efficiency and reducing waste. This half-day program will provide an overview of advanced framing techniques while discussing the potential benefits to builders and homeowners, as well as things to watch out for. Relevant code issues will also be discussed.

Manager/PI: Turns

Deliverables: By the Fall of 2010 the development of this program will be completed and rolled out to builders, design professionals and code officials.

3. **Overview of the IRC's Electrical Provisions** – The PHRC will develop a program for PCCA's residential academy on the electrical provisions of the 2009 IRC. This program will be developed by PHRC staff and outside instructors and developers. The program will include numerous hands-on exercises and examples, as well as practice exams.

Manager/PI: Fortney

Deliverables: By late Fall of 2010 the development of this program will be completed and rolled out through PCCA.

4. **Residential Fire Sprinklers** – Residential fire sprinkler requirements have already gone into effect for townhouses, and will go into effect for single-family homes on January 1, 2011. This program will provide an overview of the two options for compliance with residential fire sprinkler requirements: NFPA 13D and IRC Chapter 29. General plan review and inspection issues will be discussed—including proper sprinkler head number, location and type and proper pipe sizing, as well as various water supply issues.

Manager/PI: Fortney/Buddenbohn

Deliverables: Modify NFPA program to increase coverage of IRC Chapter 29 including an example. Train PHRC instructors to teach the program and deliver programs.

B. PHRC Delivered Workshops

Description: Every year the PHRC provides workshops for builders, remodelers, design professionals, educators, trade contractors and building code officials. These programs will be administered directly by the PHRC. Some of the topics that are being considered for this year's programs include the following:

1. **Residential Deck Design Construction and Inspection** - 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.

This one-day program will provide an overview of IRC code requirements for residential decks and a detailed review of the proper installation 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 deck plan review to check for code compliance, and a virtual inspection of a residential deck.

This course is designed for builders, remodelers, deck contractors, building code officials (plan reviewers and inspectors), design professionals, home inspectors, and manufacturers and suppliers of deck-related construction materials.

2. **Residential Mechanical Code Compliance Program** - This program focuses on mechanical installers and job supervisors, as well as new building code officials to provide a 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. This program will provide new and experienced building code officials, mechanical installers, and job supervisors the background they need to effectively administer and enforce the mechanical requirements in the IRC.
3. **Wall Bracing: Prescriptive Design and Plan Reviews** - This one-day workshop is designed to provide an overview of the 2009 IRC wall bracing requirements. The program will provide a general understanding of structural principals of wood frame buildings and wind and seismic loading. The program will also provide an emphasis on prescriptive design using the IRC, when a building is exceeding the limits of this approach and a design professional is required, and how to conduct wall bracing plan reviews.
4. **Advanced Framing: increasing performance and reducing costs** - With increased competition between builders and a green building movement that is here to stay, advanced framing provides a means to cut costs while improving energy efficiency and reducing waste. This half-day program will provide an overview of advanced framing techniques while discussing the potential benefits to builders and homeowners, as well as things to watch out for. Relevant code issues will also be discussed.

Manager/PI: Fortney, Turns, Kasal

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

C. PHRC Training Delivered Through Industry Partnerships

Description: The PHRC has developed and maintains a wide array of training for all sectors of the construction industry with a focus on residential construction. These programs are intended to address technical issues facing the industry. Additionally, the PHRC will customize programs to better meet the needs of an industry partner. Each program is developed with a particular audience, which may include builders, remodelers, trade contractors, design professionals, teachers, building code officials, etc.

These programs are intended to be offered through our industry partners, which may include trade associations such as the Pennsylvania Builders Association or their 42 local associations, professional associations, building code associations, as well as the Pennsylvania Construction Code Academy (PCCA).

General Audience Programs

1. Comprehensive International Residential Code (IRC) Program	4 day
2. Pennsylvania's Residential Energy Code Requirements	2 day
3. Overview of the IRC's Plumbing Requirements	4 day
4. Overview of the IRC's Mechanical Requirements	4 day
5. Overview of the IRC's Electrical Provisions	4 day
6. Residential Mechanical Plan Reviews and Inspections	1 day
7. Commercial Building Provisions of the IECC	2 day
8. Performing Residential Building Inspections	2 day
9. Special Issues for 2-Family Dwellings and Townhouses	1 day
10. IRC 2009 Update Program	1 day
11. Residential Deck Design Construction and Inspection	1 day
12. Blueprint Reading	1 day
13. Wall Bracing – IRC 2009 Prescriptive Design and Plan Reviews	1 or 2 day
14. Design and Construction of Wood Frame Buildings	2 day
15. Advanced Framing – increasing performance and reducing costs.	½ day

Manager/PI: Fortney, Turns

Deliverable: The PHRC will deliver at least 15 workshops to be held through various industry partners across the Commonwealth. The PHRC will also deliver custom programs upon request.

D. 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 both live and archived for future viewing.

The following are the web-based training during this fiscal year:

July – Special Webinar: Coordination of the 2009 IRC Energy Requirements with Industrialized Housing Installation

September – Special Webinar: Building Permit Fees in PA – *Overview of Center for Rural Pa. Study*
 October - Basement Insulation
 November - Understanding Barriers – *vapor, air, water resistive, etc.*
 December – Wall Bracing Overview (2009 IRC)
 January– Performing inspections using the IECC insulation and air sealing checklist
 February – No Program – Conference
 March – Sprinkler head selection
 April – Bringing the ducts inside: unvented attics, conditioned basements and crawl spaces, and avoiding exterior walls
 May – To be determined – possibly residential lighting – new technologies and avoiding homeowner complaints

It should be noted that the programs are subject to change and additional programs may be added to address industry demands.

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 eight (8) programs. Additional programs may be added to address emerging issues as they arise.

E. 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. Deck Lateral Support
2. Basement Wall Insulation Strategies

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

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

F. 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

Deliverables: 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 18 years this conference has been the premier technical conference for housing and land development issues in Pennsylvania. This two-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. **PCCA Symposium:** The PHRC will work with the PCCA to develop and deliver a one-day program that will be drawn from the content of the Pennsylvania Housing and Land Development Conference. This annual event is intended to address technical issues being faced by building code officials.
3. **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 meetings, or state or national conferences.
4. **General 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 Web site.
5. **Fall Newsletter** – This letter will be sent to PHRC members to keep them up-to-date on recent PHRC activities, and promote upcoming events including the PA Housing and Land Development conferences.

PART 2 - 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 foster partnerships and draw on the expertise and strengths of the persons, groups and facilities available at both the Pennsylvania State University and the Pennsylvania College of Technology.

A. Engineering Based Bracing for the State of Pennsylvania

Description: The International Residential Code (IRC 2009) bracing requirements are based on tributary area approach and simplified (box-type) building models. In addition, the minimum wind speed in Pennsylvania based on IBC (2009) is 90 mph. It has been shown in the latest PHRC research project that the 50-year recurrence wind speed in PA can be reduced to 80 mph. However, unless a simplified method useable by engineers is developed, 90 mph and tributary approach will be used to design bracing and this will result in requirements exceeding the current IRC minimum bracing requirements due to the incorrect initial assumptions (tributary areas). This work will use simple building model and the fact that forces in the building are distributed according to the wall stiffness and not the areas attributed to them.

Manager/PI: Kasal

Deliverable: Step-by-step building analysis procedure that will allow designing the bracing of residential structures in an efficient and fast way and therefore significantly reducing the costs of the design and increasing the safety of the engineered bracing design.

B. Methods for Life-Cycle Cost Assessment of Building Enclosure Systems

Description: The life-cycle cost assessments are becoming crucial in the housing industry, because products will be marketed based on their energy and environmental impacts. It is important to have an overview of existing life-cycle cost assessment methods available to builders in Pennsylvania to be able to inform their customers and negotiate with suppliers. This project will overview existing methods for lifecycle assessments, from the simple ones such as “life-cycle energy efficiency” to more complex methods such as BEES (Building for Environmental and Economic Sustainability) software created by the Environmental Protection agency (EPA). We strongly believe that simpler methods will give as good results as the more complex ones, because the life-cycle assessment mythologies inherently have many assumptions with a wide range of acceptable input parameters. We will create a list of most important input parameters, as well as their range of values to be able to question any life-cycle assessment result from the perspective of its sensitivity to input parameters. Our project results will be available in the form of builder briefs published by PHRC

Manager/PI: Kasal

Deliverable: We will create a list of most important input parameters, as well as their range of values to be able to question any life-cycle assessment result from the perspective of its sensitivity to input parameters. Our project results will be available in the form of builder briefs published by PHRC.

PART 3 - Land Development: The land development process is a key component of 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. The following program and tasks have been identified by builders and the PHRC Operations Committee as a high priority project for Pennsylvania’s home building industry. It should be noted that the Land Development Specialist position at the PHRC is currently vacant. Once this position is filled, additional activities will be included as contingency projects. The following tasks will be undertaken:

A. Pennsylvania Standards for Residential Site Development

Description: The residential development standards project was 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 the adoption by municipalities within the Commonwealth.

Manager / PI: Fortney

Deliverable: 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.

PART 4 - Applied Projects: These groups of projects are application oriented and have a direct need by the residential construction industry. This includes the development and support of standards, and longer term initiatives.

A. Development of Alternative Residential Deck Lateral Load Connections

Description: Deck failures usually have tragic consequences. The 2009 International Residential Code establishes prescriptive requirements for deck lateral attachment connections that are problematic to constructs and may not meet the loads imposed. This project will identify the best practice in deck construction and develop a set of details that will result in safe deck construction. Special emphasis will be on lateral connection of decks. This will be done through structural analyses of the deck systems and testing of connection details if necessary. The project deliverable will be guidelines for deck construction including typical details.

Manager/PI: Fortney, Kasal

Deliverable: A public report discussing proper design approaches and the development of prescriptive alternatives to the 2009 IRC requirements.

B. MHTI & MHRC Support

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 employment of a full-time Director of MHTI and MHRC.

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, etc.

C. 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 and hard copies are available for a fee.

Manager/PI: Fortney, Turns

Deliverable:

1. Pennsylvania's Alternative Residential Energy Provisions - 2009: 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 provide technical assistance through telephone and email support.

D. Support of the UCC Review and Advisory Council (RAC) – During the RAC review of the 2009 ICC codes, the PHRC made itself available as a resource to RAC members for questions on technical issues related to code requirements being considered. The PHRC will continue this roll upon request from RAC members.

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

1. **Structural Performance of Residential Buildings: A Primer for Builders, Remodelers and Code Officials** – This program will attendees better understand how various building components act to resist the loads that are imposed upon them, and what leads to building failures. There will be a focus on building assemblies and proper attachment details. It is anticipated that this will be a one-day training program.
2. **Adapting to a Changing Market** – After 40 years of consistently increasing house sizes in the U.S., house sizes were flat in 2008 and down in 2009. With tighter lending practices and an aging baby boomer generation, the PHRC expects this downward trend to continue in the foreseeable future. Meeting the demand for smaller houses presents builders with several challenges, including creating efficient floor plans that meet consumer expectations for useful space, and meeting energy code requirements while maintaining acceptable indoor air quality and moisture levels. Space and cost-effective remodeling strategies will also be considered. This project may come in the form of special webinars, speaker series or short articles.
3. **Renewable Energy Training Infrastructure Development** – State and federal incentives are making the economics of solar photovoltaic, solar thermal, and small-scale wind projects more appealing than ever. This is creating an unprecedented demand for renewable energy installations in Pennsylvania. With this increase in demand, many code officials are charged with regulating systems with which they have little or no experience. The lack of familiarity with renewable energy systems, on the part of code officials is causing reluctance to provide code approvals, which results in long delays in the permitting process, and may also reduce the overall number of systems installed in Pennsylvania. With adequate training, code officials can also significantly reduce various life-health-safety risks associated with renewable energy systems. Properly educating the code enforcement community will improve the safety, durability, and performance of renewable energy systems, and minimize a major barrier to the installation of those systems. This project will consist of identify training program curricula regarding plan review and inspection issues for solar PV, solar thermal and small-scale wind installations.

4. **Electric Utility Energy Efficiency Program Training** – Act 129 requires each of the seven major Electric Distribution Companies (EDCs) in Pennsylvania to adopt a plan to reduce energy demand and consumption within its service territory. The Act requires a 1% reduction in consumption by May 31, 2011, a total of 3% reduction in consumption and a 4.5% reduction in peak demand by May 31, 2013.

The PHRC would develop a training program geared toward residential builders and design professionals that provides an overview of electric distribution company Act 129 plans, the First Energy new residential construction program, the Home Energy Rating System (HERS), ENERGY STAR Qualified New Homes, and the design and technical requirements of homes intended to qualify for First Energy financial incentives. This program will also include a brief discussion of how recent changes to the building code could make participation in an above code program a more attractive option for builders than in previous years. Secondary audiences would include framers, insulation installers, drywallers, HVAC installers and other subcontractors.

5. **Flood Preparedness of Pennsylvania's Housing Stock:** 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.

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

Projected Budget by Project Categories

Project	Act 157 Funds	Outside ^{1,2}	PSU Support	Total
Training, Technical Assistance and Outreach	\$249,368	\$224,372	\$112,215	\$585,955
Applied Research	\$67,018	\$58,751	\$14,685	\$140,454
Land Development	\$29,506	--	\$13,278	\$42,784
Applied Projects	\$54,926	--	\$24,717	\$79,643
	\$400,818	\$283,123	\$164,895	\$848,836

Notes:

- 1 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.