



The Pennsylvania Housing Research Center

Project Plan

July 2018 – June 2019

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I. 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.

The PHRC Industry Advisory Council (IAC) has the responsibility to prioritize activities and project topics. This housing industry-based body consists of builders, developers, manufacturers, suppliers, remodelers, design professionals, industry associations as well as building code organizations and state agencies.

On April 12, 2018 the IAC met to discuss potential projects for the PHRC to pursue. After a thorough discourse, the members of the IAC voted on projects that they felt were the highest priority for the industry. This voting resulted in a prioritization of projects. The high-priority projects are included in this plan.

The list of projects that follows identifies only those projects that are to receive funds provided to the PHRC by the Commonwealth of Pennsylvania through the Act 157 of 2006 permit fee (later amended by Act 36 of 2017). The PHRC attempts to use permit fee monies to leverage outside support. It should also be recognized that the PHRC undertakes 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, the current plan only considers funds in-hand (i.e. funds collected from July 2017 to March 2018 with the final quarter from April 2018-June 2018 being estimated based on historical data).

The PHRC plans projects and allocates 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.

Unless otherwise noted, the projects contained in this plan are anticipated to start July 1, 2018, and be completed on or before June 30, 2019.

II. 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 from the PHRC's Industry Advisory Council and reflect the current needs within the housing industry.

A. Program Development

The PHRC will develop or update the following training programs. These programs will address issues challenging the residential construction industry. During this period the following programs will be developed:

1. Existing Program Updates and Maintenance

Description: On May 1, 2018, the PA Uniform Construction Code (PA UCC) Review and Advisory Council (RAC) submitted their report to the Department of Labor and Industry adopting the majority of code provisions contained in the 2015 International Code Council (ICC) Model Codes. These new code provisions will take effect on October 1, 2018. Therefore, the existing PHRC workshops that will continue to be offered are in need of an update to reflect these changes. Additionally, there is a need to make minor course material updates based on instructor feedback through the use of "Program Change Forms." We will also continue work to update and improve the photos in programs, incorporate more photos or videos as appropriate, and expand active learning exercises to increase learner participation and knowledge retention.

Manager/PI: C. Hine & B. Wolfgang

2. Online Residential Deck Program

Description: The PHRC has developed a new online training strategy in the 2015-16 project year that is based on the successful webinar model. This new online strategy will allow for the delivery of longer workshops (up to 6 hours of instruction) over the course of a few weeks to a month. The Online Residential Deck Program will take the current full day deck program and place it into a 4-module online class. This online class will run once per week for a month. Each session will be 1 ½ hours and the total amount of instruction will be 6 hours. Note: This project is carried over from the 2017-18 project year due to the reallocation of staff time toward code updates beginning in spring 2018.

Manager/PI: C. Hine

B. PHRC Training Program Delivery

Description: The PHRC has developed and maintains a wide array of training for many sectors of the construction industry with a focus on residential construction. These programs are intended to address technical issues facing the industry. The intended audience for these programs includes builders, remodelers, trade contractors, design professionals, educators, and building code officials. Additionally, the PHRC can customize programs to better meet the needs of an industry partner.

The PHRC seeks to partner with relevant outside organizations whenever possible. These industry partners may include trade associations such as the Pennsylvania Builders Association or their local associations, professional associations, building code associations, as well as the Pennsylvania Construction Code Academy (PCCA).

Current PHRC training program offerings are listed below. These are broken into three categories: (1) Code Refresher, (2) Academy Programs, and (3) Focused Topics.

(1) **Code Refresher** programs are 1-day programs that offer a shorter alternative to the multi-day academies and are also well-suited for anyone interested in an introduction to building codes or information to make inspections go more smoothly.

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|----------------------------------|-------|
| a. IRC Building Code Refresher | 1 day |
| b. IRC Plumbing Code Refresher | 1 day |
| c. IRC Mechanical Code Refresher | 1 day |
| d. IRC Electrical Code Refresher | 1 day |
| e. IRC Energy Code Refresher | 1 day |

(2) **Academy Programs** are typically offered 1-2 times per year through the Pennsylvania Construction Codes Academy (PCCA). These programs are geared toward beginning code officials seeking to pass their certification exams or anyone interested in a comprehensive overview of residential building codes.

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| a. International Residential Codes Academy | 4 days |
| b. IRC Plumbing Academy | 4 days |
| c. IRC Mechanical Academy | 4 days |
| d. IRC Electrical Academy | 4 days |
| e. IRC Energy Academy | 2 days |

(3) **Focused Topics** programs are designed to immerse the attendee more deeply into a particular aspect of construction. These programs are ideal for meeting continuing education requirements for certified code officials. As appropriate, AIA Learning Units (LUs) for architects, ICC credits and ICC contact hours for code officials, NARI credits for remodelers, and Professional Development Hours (PDHs) for engineers are offered.

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| a. Blueprint Reading Program | 1 day |
| b. Residential Sprinkler Inspection/Installation | 1 day |
| c. Fundamentals of Exterior Plaster and Thin Stone Veneer Assemblies | 1 day |

d. Building Envelope Design and IECC Code Compliance	1 day
e. Building Code Plan Review and Inspection	1 day
f. Residential Deck Design and Construction	1 day
g. Building with Exterior Rigid Foam	1 day
h. Residential Moisture Management: The 4D's	online
i. IRC Framing Design & Code Compliance	1 day
j. Commercial Energy	2 days
k. HVAC Design & Installation	1 day
l. IRC Multifamily	1 day

Manager/PI: B. Wolfgang

C. Web-Based Training

Description: The PHRC will continue its successful monthly webinar series. Webinars are delivered live, and are also archived for on-demand viewing. Proposed topics are listed below. One PA Labor & Industry contact hour is offered for each webinar for PA code officials. As appropriate, AIA Learning Units (LUs) for architects, ICC credits and ICC contact hours for code officials, NARI credits for remodelers, and Professional Development Hours (PDHs) for engineers are offered. Note: Due to the high demand for code update training, the PHRC webinar series for 2018-2019 will begin a month early (August 2018) and will offer two webinars per month in August and September, 2018.

The webinar topics for the 2018-2019 series are:

- Residential Code Updates in PA
- Energy Code Updates
- Introduction to Mechanical Ventilation
- Blower Doors for Builders
- PA Alternative Residential Energy Provisions
- Air Sealing Basics
- HERS and the ERI Path
- Introduction to Passive House
- HVAC Basics: Forced Air Delivery
- Manufactured Stone Veneer
- What's New in Photovoltaics

Manager/PI: B. Wolfgang

Deliverable: The PHRC will develop and deliver at least eight webinars. Additional programs may be added to address emerging issues as they arise, including programs addressing significant changes to the PA UCC.

D. Builder Briefs & Other Publications

Description: The PHRC will produce publications as appropriate, including its series of short technical documents called Builder Briefs that address specific issues that have been identified by builders or remodelers. These documents are intended to be quick to read with a lot of the information presented graphically or pictorially. Potential publication topics include:

- Summary of Changes to the PA UCC
- Code Update Marketing Pieces

Manager/PI: B. Wolfgang

Deliverable: Builder Briefs and other publications will be researched, written, printed (as appropriate), and distributed.

E. Technical Assistance, Technology Transfer, & Outreach

Description: This initiative is a continuation or expansion of activities to get technical information, resources, and publications to builders, remodelers, design professionals, building code officials and others involved in the residential construction industry.

Manager/PI: B. Wolfgang

Deliverables: The PHRC will continue to offer the following activities:

- 1. Annual PHRC Housing Conference:** The PHRC will continue to organize, promote and hold the annual conference. This conference has been held since 1992 and has established a reputation of being the premier program focusing on technical issues of housing and land development in PA. The conference brings together the building community (builders, remodelers, design professionals, educators) with regulators (planners, building code officials, township engineers, DEP and conservation district staff, etc.) and others involved in the residential construction industry.
- 2. Residential Building Design & Construction Conference:** The PHRC will organize, promote, and hold the Residential Building Design and Construction Conference (RBDCC), to be held in even numbered years. The RBDCC provides a unique forum for researchers, design professionals, manufacturers, and builders to keep up-to-date on the latest advancements and discuss their own findings, innovations, and projects related to residential buildings. RBDCC sessions will consist of technical paper presentations on recent research and innovations related to residential buildings. RBDCC is focused on various types of residential buildings including single- and multi-family dwellings, mid-rise and high-rise structures, factory-built housing, dormitories, and hotels/motels. Full papers be published in the conference proceedings.

3. **PCCA Symposium:** The PHRC will work with the PCCA to develop and deliver 3 one-day programs (one in the central region of the Commonwealth in conjunction with the annual PHRC Housing Conference, one in the eastern part of the Commonwealth, and one in the western part). This annual event is intended to address technical issues being faced by building code officials.
4. **Speaking Engagements:** The PHRC will hold and/or participate in talks, seminars, and conferences directed at the housing and land development industries. This may include trade and professional association functions and regional meetings, local association meetings, or regional, state, or national conferences. Speaking engagement topics include:
 - Residential Code Updates
 - Fire Protection of Lightweight Floor Systems
 - Exterior Water Management
 - PA Alternative Residential Energy Provisions
 - Foundation Systems for Relocated Manufactured Housing
 - Insulation: Is this “stuff” right?
 - Code Compliant Air Barriers: It’s All About Continuity
 - Why Decks Fail – Design and New PA UCC Requirements to Improve Safety
 - Fundamentals of Exterior Plaster and Manufactured Stone Veneer
 - Between a Rock and a Hard Place: Manufactured Stone Veneer
 - Energy Auditing 101
 - HERS Ratings in Pennsylvania
5. **General Outreach Activities:** Through our general outreach initiative, the PHRC pursues activities to keep industry professionals up-to-date on technical issues, as well as informed on the services and publications the PHRC provides. These activities may include the PHRC newsletter, mailings, email and social media campaigns, articles in trade journals, phone calls, and the PHRC’s website.

Our general outreach also involves attending relevant industry meetings and serving as a technical resource to legislative committees as needed.
6. **Annual Magazine:** The PHRC annual magazine will be sent electronically to PHRC members and stakeholders to keep them up-to-date on recent PHRC activities and to promote upcoming events. For the 2018-2019 project year, the PHRC intends to continue to have it delivered in the late summer or early fall to provide timely updating of the audience with the outcome of the previous year’s projects and with what to expect in the coming year.
7. **Educating the Next Generation of Tradespeople:** Educating the “next generation” of residential trade contractors is essential for the future of residential construction. With the support of the IAC, the PHRC will consider the education of the next generation of tradespeople as an ongoing project. The ultimate goal is to increase the detailed knowledge of future industry tradespeople through this general outreach and

provide students with professional development opportunities within the residential construction industry. This project includes relationship building, sharing of resources, speaking at school events, leveraging resources and contacts to bring opportunities to students, and soliciting feedback from instructors and administrators to better address their needs. Other outreach activities includes trying to increase participation of vocational students and instructors in the PHRC conference, PCCA Symposia, and PHRC webinars. A scholarship program was established for the 2015 Annual PHRC Housing and Land Development Conference and this program will continue to provide an opportunity for students to attend the conference at no charge.

8. **Support of the UCC RAC:** The PHRC will continue to support the RAC and the public by serving as a general technical resource upon request.
9. **Support of Standards:** The PHRC has developed standards to respond to industry demand. Each of these standards requires training and timely technical assistance for local governments, builders/developers, design professionals, and contractors. All of these standards are available electronically for free. Education on these standards will continue to be provided through various training programs as requested and technical assistance will be provided through telephone and email support by the PHRC. The PHRC standards include:
 - Pennsylvania’s Alternative Residential Energy Provisions – 2018 Update
 - Foundation Systems for Relocated Manufactured Housing

III. Applied Research

A very important function of the PHRC is to undertake or stimulate research and development on materials, products, procedures, and processes. These efforts may have a longer-term or a more fundamental focus than other projects. Projects in this category foster partnerships and draw on the expertise and strengths of the people and facilities available at Penn State University.

Retrofit of Existing Homes for Energy Efficiency according to the Passive House Standard

Description: The Passive House standard for home design is considered more stringent than other standards such as LEED and ENERGY STAR. Meeting passive house performance goals are particularly challenging when retrofitting existing construction. Examples of such challenges include hidden thermal bridges; building orientation and position and size of window openings, which affect solar heat gain; limited thickness of existing walls or floors or ceiling spaces to add insulation; and inaccessible areas with air leakage, which may yield a less than ideal airtightness. Individual home-specific challenges may also be generalizable characteristics of a given region's housing stock (e.g., common wall types or construction techniques), depending on the building history of the area. Recognizing the numerous complicating factors around retrofit building design, the international PHI standard has a designated retrofit performance path (EnerPHit) allowing for slightly relaxed performance targets relative to the new construction path (e.g., 1.0 ACH50 instead of 0.6 ACH50 envelope air leakage values). However, currently PHIUS+ 2018 requires retrofits to meet the same performance metrics as new construction (e.g., requiring 0.05 CFM50/ft² air leakage in the building envelope for both new and retrofit construction).

This project will provide a thorough review of passive house design and construction techniques when retrofitting existing construction. In particular, several case studies will be reviewed to illustrate examples of design and detailing that can be used for residential retrofit.

Manager/PI: Dr. Ali Memari

Deliverables: The result will be a complete research report, a conference paper, and a journal paper.

IV. Applied Projects

The Applied Project category refers to projects that are application-oriented and have a direct need by the residential construction industry. This may also include longer term initiatives.

1. Summary of Changes to the PA Uniform Construction Code

Description: The Uniform Construction Code in PA has been in place for over a decade. During that time, it has been altered numerous times through various legislative actions. Similar to the UCC Quick Guide, this project would focus on summarizing the basics of the UCC, including common exemptions, significant amendments, and a summary of the original Act 45 requirements. Most recently, Act 36 of 2017 significantly altered the code review and adoption process. The result of this project would be a short publication in the form of a Builder Brief so that it could be tucked into a code book or similar reference.

Manager/PI: B. Wolfgang

Deliverables: This project will result in a Builder Brief.

2. Exterior Plaster Mockup Construction

Description: The exterior plaster workshop has been very popular recently due to the need for additional education on the principles of stucco and manufactured stone installation and overall moisture management. To enhance this workshop, the PHRC will work with PHRC instructors to construct mockups of exterior plaster assemblies and flashing details to better demonstrate the challenges of exterior plaster design and installation.

Manager/PI: B. Wolfgang

Deliverables: This project will result in the construction of portable mockups for use in the exterior plaster workshop.

3. PA Community Land Trusts (CLT): Quality and Energy Affordability of Homes in Non-Profit Affordable Housing Models

Description: From Community-Wealth.org, Community Land Trusts (CLTs) are nonprofit, community-based organizations designed to ensure community stewardship of land. Community land trusts can be used for many types of development (including commercial and retail) but are primarily used to ensure long-term housing affordability. As of 2017 there are seven housing-based CLTs in the state of Pennsylvania and 316 total CLTs in the United States. This applied project to document PA-based housing CLTs will be a continuation from the 2017–2018 fiscal year.

Manager/PI: S. Klinetob Lowe

Deliverables: This project will result in a future webinar and white paper.

4. PA Residential Code Update Marketing & Communication

Description: On May 1, 2018, the PA Uniform Construction Code (PA UCC) Review and Advisory Council (RAC) submitted their report to the Department of Labor and Industry adopting the majority of code provisions contained in the 2015 International Code Council (ICC) Model Codes. These new code provisions will take effect on October 1, 2018. This project will focus on getting the word out regarding these updates to builders, contractors, and design professionals across the Commonwealth. This effort would include electronic communication, development of flyers, and other initiatives.

Manager/PI: C. Hine

Deliverables: This project will result in a variety of marketing pieces related to PA code updates.

5. PA Alternative Residential Energy Provisions Update and Publication

Description: The Pennsylvania Alternative Residential Energy Provisions were developed with the intent of being: simpler to build and easier to enforce; more rational and flexible; focused on Pennsylvania in terms of climatic and other conditions; and, equivalent to the provisions of the International Energy Conservation Code (IECC) in terms of energy efficiency. Based on the outcome of the PA Uniform Construction Code (UCC) Review & Advisory Council (RAC) review process of the 2015 codes, the PA Alternative Residential Energy Provisions will need to be updated to reflect the changes to the UCC that will become effective on October 1, 2018.

Manager/PI: B. Wolfgang

Deliverables: This project will result in an updated version of the PA Alternative Residential Energy Provisions.

V. Projected Budget

The budget for 2018-2019 project year is based on the Act 157 Funds collected during the 2017-2018 fiscal year. Table 1 shows the quarterly check values. Due to DCED collection system transition and permit fee adjustments, the third quarter value is unusually low. It is anticipated that the fourth quarter check will make up for this lower amount, but it will not be received until late July 2018. The Act 157 Funds available for the 2018-2019 year are estimated to be approximately \$446,709.99 (assuming the 2018 Q4 check matches 2017 Q4). Located in the Department of Civil and Environmental Engineering at Penn State, the PHRC receives the added benefit of Penn State waiving their F&A (facilities & administrative) rate for this research contract. As a result, this means that PHRC retains approximately \$261,772.05 more than it normally would for a research contract. This allows PHRC to maximize any received monies in service of its mission to serve the home building industry and the residents of Pennsylvania by improving the quality and affordability of housing.

Table 1. Quarterly check values from the 2016-2017 FY (2017-2018 Project Year)

Quarter	Check Value
Q1: July 2017-Sept 2017	\$100,836.10
Q2: Oct 2017-Dec 2017	\$159,267.93
Q3: Jan 2018-Mar 2018	\$53,002.66
Q4: Assumed April 2018-June 2018	\$133,603.30*
Total	\$446,709.99**

*The 2016-2017 fourth quarter value is assumed for the final check that will not be received until late July 2018.

**Estimated total based upon estimated fourth quarter check.