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**The Pennsylvania Housing Research Center**

# **Project Plan**

**July 2013 – June 2014**

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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, developers, remodelers, design professionals, industry associations as well as building code organizations and state agencies.

On April 11, 2013 the IAC met to identify and discuss over 26 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. The high-priority projects are included in this plan. The IAC was also presented with, and approved, a Land Development Project Plan that was based on prioritization decisions made by the IAC Land Development Subcommittee during their meeting on March 19, 2013.

Unless otherwise noted, the projects contained in this plan are anticipated to start July 1, 2013, and be completed on or before June 30, 2014.

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 Commonwealth 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 array 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 in-hand. Any remaining funds will be carried over for future projects. We will 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 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 new training programs. These programs will address issues challenging the residential construction industry (builders, developers, remodelers, building code officials, design professionals, materials suppliers, etc.). During this period the following programs will be developed:

#### **1. Basement Essentials 101**

**Description:** Basements in residential construction today are different than in the past, and in many cases they are constructed with the intentions of becoming living space. Incorporating basements into the overall building enclosure can be a difficult task. This PHRC program will address both the code requirements and recommended practices for basement construction, including structural design, moisture and heat management, ventilation design, containment of pollutants, and finish options.

**Manager/PI:** Wolfgang

**Deliverables:** The PHRC will develop the new programs and offer the ½ day training at various locations around the Commonwealth as requested.

#### **2. High-Performance, Code Compliant HVAC Systems: ACCA Training for HVAC Contractors**

**Description:** Designing and installing HVAC systems have turned from being “rules of thumb” into a very scientific calculation based on location, size and construction materials of structure, fenestration, air leakage, orientation, and equipment efficiency. The Air Conditioning Contractors of America (ACCA) is a non-profit association of HVAC contractors that write standards for the design, maintenance, installation, testing, and performance of indoor environment systems. ACCA provides training and education programs to the HVAC industry, but much of their programming is available at their headquarters in Arlington, Virginia. Through this project, the PHRC trainers will bring ACCA training to the HVAC contractors in Pennsylvania.

**Manager/PI:** Hine

**Deliverables:** The PHRC personnel will become certified ACCA trainers. The PHRC will then provide training based on ACCA programs. This program will provide HVAC sub-contractors with quality training usually only available at ACCA facilities in Virginia.

### 3. Educating the Next Generation of Tradespeople

**Description:** Educating the “next generation” residential trade contractors is essential for the future of residential construction. The construction of a residential structure has as much to do with science as it does with knowledge for construction practices. Today’s industry leaders can support secondary schools in laying a good foundation for this information. The PHRC will pursue multiple avenues to reach out and include the next generation of tradespeople in programs. Based on interest and demand, the PHRC will conduct a one- to multi-day training seminar on a condensed version of the Building Codes for Residential Building Professionals program. This program will cover the IRC Building Code, IRC Plumbing Code, IRC Electrical Code and the IRC Mechanical Code for Secondary School Instructors. This program will also include an overview of the UCC and how it relates to the IRC. This information will train the teachers about the latest cycle of building codes so they can then relay the information to their students. Training materials will also be provided to the secondary school instructors. Other outreach activities will include trying to increase participation of vocational students and instructors in the PHRC conference, PCCA symposia, and PHRC webinars. The PHRC will also pursue the accreditation through the Pennsylvania Department of Education to offer continuing education credit to secondary school instructor.

**Manager/PI:** Blansett

**Deliverables:** The PHRC will develop a one- to multi-day training for Secondary School Instructors to increase their knowledge of the current building codes and practices. This will then be relayed to the students of vocational schools. The ultimate goal is to increase the detailed knowledge of future industry tradespeople through this general outreach and draw them to future training sessions such as the PHRC Annual Conference and PCCA Symposium. This project involves longer-term relationship building between the PHRC and the vocational school instructors that will benefit both organizations well beyond the current project cycle.

### 4. Introduction to Building Science

**Description:** The study of building envelopes and building science is a rapidly evolving segment of the residential construction industry that continues to play an important role in home performance, code development, and overall best practices. The PHRC has previously developed a half day program consisting of an introduction to these concepts. This course is to be expanded into programs of varying levels of detail in order to reach a more diverse audience.

**Manager/PI:** Wolfgang

**Deliverable:** The PHRC will expand the existing half day course into a full day training program. Also, information from both courses will be used to develop a 1-2 hour focused training program.

## 5. The Land Development Process

**Deliverables:** The land development process is a long and complicated process. Many of the entities involved in the process do not know what other steps are involved in getting a project from conceptual idea to construction. The PHRC published a Land Development Brief, *Summary of the Typical Residential Land Development Process in Pennsylvania*, in 2012 to help educate those involved with the process about the many steps. This current project will expand upon that Brief to provide municipal officials, code officials, and sewage enforcement officers (SEOs) with an overview of the land development process through a focused training program. Content in the program will focus on the land development flow chart included in the Brief. The program will highlight the various approvals needed and where additional information on steps in the process can be found.

**Manager/PI:** Blansett

**Deliverable:** The PHRC will develop the new programs and offer them at various locations around the Commonwealth as requested. Proposals will be submitted to present this topic at the PSATS annual conference and the PA SEO annual conference.

## 6. Stormwater 101

**Description:** Professionals in the land development field have been dealing with the issues of stormwater management for years. Recent regulatory and policy changes have now made stormwater management an issue for some single-family homebuilders. Regulatory and permit updates and increased public awareness of flooding and water quality are bringing the issues of stormwater management to others professions, such as municipal officials and code officials who may not be well versed in the topic. A short training program will be developed to educate municipal officials, code, officials, builders, and other non-stormwater professionals on the basic issues of stormwater, the management of runoff, and the new rules that affect a larger percentage of the development community.

**Manager/PI:** Blansett

**Deliverable:** The PHRC will develop the new programs and offer them at various locations around the Commonwealth as requested. The PHRC will attempt to schedule a short presentation at the Pennsylvania Builders Association's regional meetings. A proposal will be submitted to present this topic at the PSATS annual conference. A 1-hour version of the program will be presented as a webinar.

## 7. Residential Plan Review and Inspection

**Description:** The existing PHRC program on Energy Plan Review and Inspection has been very successful in terms of the number of people attending and the feedback from participants. Based on this success of this program, a similar program will be developed focusing on the components of a residential plan review and inspection. The morning

session will consist of an overview of relevant code requirements, and then hand-on guided plan review, followed by one or two small group plan reviews that will be discussed later as a whole group. The afternoon session will be followed by video field inspections. The videos will be used in an interactive way to engage the participants in a virtual inspection within the classroom.

**Manager/PI:** Heitzmann

**Deliverable:** The PHRC will develop the new programs and offer the 1 day training at various locations around the Commonwealth as requested.

## B. PHRC Training Program Delivery

**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, and building code officials.

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 42 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) Residential Building Scholars/Code Refresher, (2) Focused Topics, and (3) Academy Programs.

(1) **Residential Building Scholars (RBS)/Residential Code Scholar (RCS)/Code Refresher** programs are intended for those wishing to attain the RBS designation or for code officials looking for a short review of the key code issues in a 1-day version as opposed to the multi-day academy version. These programs are also well-suited for anyone interested in an introduction to building codes, an update from 2006 to 2009 IRC provisions, or information to make inspections go more smoothly. The RBS program was established as part of the 2012-2013 project plan. For the 2013-2014 plan, the program will be expanded to include the Residential Code Scholar certificate for code officials who complete four out of the five programs and pass exams at the end of each program.

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

(2) **Focused Topics** programs are designed to immerse the student more deeply into a particular aspect of construction. These programs are ideal for meeting continuing education requirements for RBS designees and certified code officials.

- |   |          |
|---|----------|
| a. Advanced Framing – Increasing Performance & Reducing Costs | ½ day    |
| b. Beginner’s Blueprint Reading                               | 1 day    |
| c. Building with Exterior Rigid Foam                          | ½ day    |
| d. Exterior Plaster Finish Systems                            | ½ day    |
| e. International Residential Code Inspections                 | 2 day    |
| f. Photovoltaic Installation and Inspection                   | 1 day    |
| g. Residential Deck Design and Construction                   | 1 day    |
| h. Residential Fire Sprinklers                                | 1, 2 day |
| i. Solar Hot Water Installation and Inspection                | 1 day    |
| j. Special Issues with Two-Family Dwellings and Townhouses    | 1 day    |
| k. Stucco & Adheared Masonry Veneer                           | ½, 1 day |
| l. Energy Plan Review and Inspection                          | 1 day    |
| m. Basement Essentials 101                                    | ½ day    |
| n. High-Performance, Code Compliant HVAC Systems              | varies   |
| o. Land Development Process                                   | 2 hour   |
| p. Stormwater 101   | 2 hour   |
| q. Building Science   | ½, 1 day |
| r. Residential Plan Review and Inspection                     | 1 day    |

(3) **Academy Programs** are typically offered twice 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.

- |   |       |
|---|-------|
| a. International Residential Code – Building Essentials           | 4 day |
| b. International Residential Code – Plumbing Essentials           | 4 day |
| c. International Residential Code – Mechanical Essentials         | 4 day |
| d. International Residential Code – Electrical Essentials         | 4 day |
| e. Residential Energy Code Essentials                             | 2 day |
| f. International Energy Conservation Code Essentials – Commercial | 2 day |

For program descriptions, visit [www.engr.psu.edu/Training/ScheduleWorkshop.htm](http://www.engr.psu.edu/Training/ScheduleWorkshop.htm).

**Manager/PI:** Heitzmann, Hine

**Deliverable:** The PHRC will conduct a review of existing programs to update and revise as needed. The review will include adding more photos and videos to programs as appropriate. The PHRC instructor feedback will be included in the review process. The PHRC will deliver at least 30 workshops/training programs at locations across the Commonwealth.

## C. Web-Based Training

**Description:** In today’s economic climate, there is a need for technical programs without the added cost of hotel stays and transportation. 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 certification maintenance credit is offered for each webinar for PA code officials. As appropriate, AIA Learning Units (LUs) for architects and professional development hour (PDHs) for engineers will be offered.

Webinar Series	
Month	Proposed Title/Topic
September	Quick Guide to UCC Amendments
October	Energy Efficient Lighting and Appliances
November	OSHA Compliance Tips
December	Soil Considerations for Builders
January	NAHB Green Building Standard Update (Home Innovation)
February	No webinar – attend PA Housing and Land Development Conference
March	Renovation Requirements in Floodplains
April	Stormwater 101
May	Aging in Place

Programs are subject to change and additional programs may be added to address industry demands and emerging issues.

**Manager/PI:** Heitzmann, Hine

**Deliverable:** The PHRC will develop and deliver at least eight webinars. Additional programs may be added to address emerging issues as they arise.

## D. Builder Briefs

**Description:** The PHRC will continue its series of short technical documents 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 topics include:

- Update to existing PHRC manufactured housing briefs
- OSHA Compliance Overview and Recommendations
- Learning from the Experience of Solar Decathlon
- Resuspension and Transport of Allergen Carrier Particles in Residential HVAC
- Performance Optimization and Development of a Home Modular Delivery System

**Manager/PI:** Blansett

**Deliverable:** Builder Briefs will be researched, written, printed and distributed.

## E. Technical Assistance, Technology Transfer & Outreach

**Description:** This item is a 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:** Blansett

**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 21 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. One day of the conference focuses primarily on the house itself, while the other day 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 2 one-day programs (one in the eastern part of the Commonwealth and one in the western part) 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, 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 state or national conferences. Speaker service topics include:
  - UCC overview/update
  - Floor fire protection
  - Proper flashing
  - PA Alternative Residential Energy Provisions
  - Foundation Systems for Relocated Manufactured Housing
  - Subdivision and Land Development Guidelines
  - Intro to Stormwater Calculations
  - Intro to WQ Calculations
  - Land Development Process

- 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, articles in trade journals, phone calls, and the PHRC's Web site.

This also involves attending relevant industry meetings, such as the Pennsylvania Department of Environmental Protection (DEP) meetings (Water Resources Advisory Council, Sewage Advisory Council); participating in technical committees such as the Pennsylvania Stormwater Technical Workgroup and Chesapeake Bay TMDL Urban Stormwater Workgroup; and serving as a technical resource to legislative committees as needed

**Pennsylvania Stormwater Technical Workgroup.** As part of outreach activities, Dr. Blansett will continue to serve on the Executive Board of the Pennsylvania Stormwater Technical Workgroup (PaSTW). She serves as the chair of the Low Impact Development Committee (Chapter 5) and as a member of the Land Development Process Committee (Chapter 4). PaSTW is working to revise the DEP PA Stormwater BMP Manual.

- 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, and processes. These efforts may have a longer-term 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 the Pennsylvania State University.

### 1. Learning from the Experience of Solar Decathlon

**Description:** The Solar Decathlon program is a very successful Department of Energy (DOE) sponsored competition that challenges colleges to design, construct and operate solar powered homes for energy efficiency, cost-effectiveness and various other criteria such as renewable energy, clean energy, and advanced building technologies. The program started in 2002 and has so far been held during 2002, 2005, 2007, 2009, and 2011. Teams from universities in the U.S. and other countries participate at the competition. Although the competition will result in one team winning first place, each team uses different features from which much can be learned. In particular, if the target audience will be the builders and developers, there are many useful features that this audience may benefit from for different applications. The goal of this project is to develop a collection of learning materials from the significant investment and effort that has so far gone into the Solar Decathlon program. In particular, the detailed designs of all the past solar decathlon homes will be reviewed to identify special features that were used for each home. These features

will then be categorized and tabulated with their attributes. Then the features and their impact considering various performance criteria will be compared taking into account the analyses results generated by each team in their projects.

**Manager/PI:** Memari

**Deliverables:** The study will develop an array of suggested features for different performance expectations by the homeowners or developers. The project will suggest guidelines for appropriate use of various features in NE climates. The project will deliver a final report, a paper for the Residential Building Design and Construction Conference, a Builder Brief, and likely a journal paper.

## 2. Resuspension and Transport of Allergen Carrier Particles in Residential HVAC Systems

**Description:** HVAC systems play an important role in transporting allergen carrier particles that trigger asthma episodes in residential indoor environments. Unfiltered particles deposited on interior duct surfaces resuspend and transport when disturbed under mechanical vibration and varying air flow conditions in the system. However, experimental data is needed to characterize the behaviors of individual allergen-carrier particles in response to HVAC system disturbances and to inform modeling work that will lead to better design and performance guidance for builders seeking to improve indoor air quality in residential settings. A combination of experimental work in residential settings and in a more controlled laboratory resuspension chamber setup is proposed to characterize the resuspension of allergen-carrier particles deposited in residential HVAC ductwork and to obtain resuspension rate data for individual allergen-carrier particles in various HVAC system environments. The results of this research investigation are expected to provide a better understanding of the behavior of allergen sources in residential homes that would benefit the Pennsylvania housing industry and its residents.

**Manager/PI:** Dr. James Freihaut (Penn State Department of Architectural Engineering)

**Deliverables:** The project will result in the following deliverables: (1) a final research report to be published by PHRC, (2) a paper to be presented at PHRC's annual Residential Building Design and Construction Conference, and (3) a Builder Brief.

## 3. Performance Optimization and Development of a Home Modular Delivery System

**Description:** The objective of this research is to expand affordable home energy performance by developing an optimized modular delivery system, a Kit-of-Parts (KoP), applicable for infill development of new homes and for retrofitting existing homes. This innovative system of components will result in homes that surpass Energy-Star performance for energy-efficiency, have improved indoor air quality, and provide realistic options for aging-in-place. Most notably it will provide a way to deliver high quality, well-designed, small affordable housing projects on a broad scale.

**Manager/PI:** Prof. Lisa Iulo (Penn State Department of Architecture)

**Deliverables:** The project will result in the following deliverables: (1) a final research report to be published by PHRC, (2) a paper to be presented at PHRC's annual Residential Building Design and Construction Conference, and (3) a Builder Brief.

#### 4. Stormwater BMP Effectiveness in Real Residential Developments

Description: This is a multi-year project that involves the selection of an appropriate site, installation of equipment, continued maintenance of equipment, and the collection of both flow and water quality data during multiple precipitation events over several years. The duration of the project is dependent on annual climate conditions and the continued interest and funding in the research.

The project involves the installation of flow monitoring and water sample collection equipment in residential developments to collect long-term data on the characteristics of stormwater runoff from these sites and the effectiveness of Best Management Practices (BMPs) in a typical residential development. Nitrogen (N), phosphorus (P) and sediment (TSS) are the water quality parameters of interest for this study. N, P, and TSS must be considered in the design of stormwater BMPs and water quality controls for NPDES permits. These parameters are also the targets of the EPA TMDL (Total Maximum Daily Load), or pollutant diet, for the Chesapeake Bay. Flow data along with the constituent concentrations can be used to determine the total load (g) and event mean concentration (EMC, mg/L), or a flow weighted average, which is a parameter commonly used to model water quality. Data will be collected from different types of events (for example, spring rains versus summer thunderstorms versus winter rain on snow) over several years.

The long-term goals of this project are to:

- Define the pollutant load from residential developments,
- Define the effectiveness of different BMPs and treatment trains (BMPs in series)

Over time as the project expands different types of development can be compared.

**Manager/PI:** Blansett

**Deliverables:**

**Short-term:** During the 2013-2014 project year, flow and water quality data will be collected and analyzed from multiple events throughout different seasons. If funding and staffing allow, equipment will be installed at additional locations.

**Long-term:** Flow and water quality data will continue to be collected and analyzed. The effectiveness of the stormwater BMPs instrumented will be evaluated based on the influent and effluent pollutant concentrations. These data will be submitted to the International Stormwater BMP database. The median

event mean concentration (EMC) for the land use category of residential housing will be calculated and compared to typical reference values.

The long-term outcomes of this project would include peer-reviewed journal publications and technical conference presentations of the study findings and a public summary report of the data. Webinars and other presentations can be developed to disseminate the findings.

**Optional Long-Term Data Collection:** While field data is being collected at development sites, some other information could be collected from the same sites to expand the impact of this study. These additional projects could include:

**a. Long-term operation and maintenance issues for stormwater BMPs**

This part of the project would include a literature review of existing data sources on long-term operation and maintenance (O&M) needs of stormwater BMPs. While flow & water quality data are being collected at different developments, site inspections will be conducted to determine the type and frequency of maintenance needed. The literature material will be combined with site observations to develop recommendations that can be used address O&M needs of new and existing stormwater BMPs.

**b. Homeowner acceptance of on-lot stormwater BMPs**

Stormwater regulations are pushing more BMPs to be located on individual properties rather than a single basin for a whole development. At the development sites where BMPs are being monitored, homeowners can be periodically surveyed to find out information such as what they know about their on-lot BMP, how they feel about them, have they been provided with maintenance information and what are they doing to maintain the BMP. This information can be used to provide information about the long-term operations and maintenance of BMPs and the likeliness of them being maintained by homeowners. The data collected could lead to the development of homeowner training programs and provide local governments and the Pennsylvania DEP information about the effectiveness of regulations putting responsibility of stormwater management on to the homeowner.

## **PART 3 - 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.

## 1. Moisture Management in Homes

**Description:** Moisture damage to home incurs unwanted repair costs to homeowners and potential health hazards if left untreated. Although there is a considerable amount of information about waterproofing and use of vapor barriers and flashings, water damage to basement walls due to rain on basement windows (without proper and reliable well cover protection), water damage to above grade walls due to window failure/malfunction, water damage to floors and ceiling drywall due to overflow of bathroom toilet or tub are common occurrences. In this study, sources of water damage will be identified and, where needed, new concepts such as basement window solutions or bathroom waterproofing ideas will be developed. In particular, the existing monitoring and sensor technologies will be reviewed and potential applications for homes to detect intruding moisture and alarming the homeowner of potential problems will be explored.

**Manager/PI:** Memari

**Deliverables:** The project will result in a report and a Builder Brief, as well as a webinar.

## 2. Details that Work

**Description:** New construction practices create a need for new and innovative details for contractors and sub-contractors to ensure proper installation. These necessary details encompass a wide range of scenarios starting from the footing level through shingles. This project will review critical details, which include controlling bulk water through proper flashing, moisture control, proper insulation, and controlling air infiltration, particularly at problem areas like penetrations. These details will help ensure code compliance as well as increase the durability and sustainability of the structure.

**Manager/PI:** Hine

**Deliverables:** This will be an ongoing project to develop details for programs such as speaker services and other training programs. The PHRC will also compile all details into one PHRC detail book. This detail book will be available in PDF form on the PHRC website. During the 2013-2014 project year details will focus on the topics of bulk water, moisture and air management. This scope will include flashing details, ventilation solution details, wall assembly details and air sealing details.

## 3. Support of the UCC RAC

**Description:** The International Code Council's (ICC) code development process will finish in October of 2013, and the 2015 I-codes will be published during 2014. Pennsylvania's Uniform Construction Code (UCC) Review and Advisory Council (RAC) will most likely begin their task of reviewing new code provisions and voting for or against their adoption in PA in 2014. Once the results of the final ICC hearings are published, the PHRC will begin to review the documentation and summarize new code provisions and highlight the ones deemed to be most significant. The PHRC will continue to support the

RAC through comprehensive analysis of proposed code changes, as well as serving as a general technical resource upon request.

**Manager/PI:** Wolfgang, Blansett

**Deliverables:** The PHRC will develop and publish a summary of new code provisions as well as provide education to the RAC and the public regarding proposed code updates. The PHRC will also serve as a general technical resource to the RAC.

#### 4. Update of Manufactured Housing Briefs

**Description:** The manufactured housing industry provides installation manuals with every house it produces. Those manuals provide instructions for the onsite completion of the home, including acceptable foundation design and construction practices. Two previously published PHRC Technical Briefs (TB0101 and TB0201) were developed to provide supplementary guidance to the manufactured housing industry regarding various site design considerations relevant to PA. The PHRC will review current manufactured housing industry practices and technology in order to update the previously published briefs to current state of the art.

**Manager/PI:** Wolfgang

**Deliverables:** The PHRC will develop and publish updated versions of Technical Briefs 0101 and 0201.

#### 5. Location and Land Areas for Buffers on High Quality and Exceptional Value Streams

**Description:** Recent and proposed regulation and policy updates are relying heavily on stream buffers as a major tool in protecting water quality, particularly in High Quality (HQ) and Exceptional Value (EV) watersheds. Some areas of the Commonwealth have a much higher density of HQ and EV streams than other areas. In addition to affecting many traditional land development projects, the new regulations and policies can affect single-lot home builders. Single-lot builders have not traditionally needed to be concerned with knowing in which watershed they are building, obtaining stormwater permits, or designating and planting stream buffers. This project will use GIS data to map the location of HQ and EV streams in Pennsylvania to assist in determining if a location is within an HQ or EV watershed. The location and amount of area needed for a 150 foot stream buffer will also be determined for all HQ and EV streams.

**Manager/PI:** Blansett

**Deliverables:** This project will result in a short summary of the regulations and policies that require a stream buffer, mapping of stream buffers on HQ and EV streams, calculation for the Commonwealth and each county of the amount of land that could be designated as stream buffers.

## 6. OSHA Residential Construction Compliance Recommendations

**Description:** Various levels of government oversight have taken a more predominant role in the current residential construction industry with differing levels of compliance on the part of builders and contractors across the state. The PHRC will investigate the most effective means of communicating OSHA compliance strategies to builders and contractors. Based on the results of this research, the PHRC will use various forms of media to delivery this material both online and in-person to increase awareness of OSHA regulations and compliance procedures.

**Manager/PI:** Hine, Heitzmann

**Deliverables:** The PHRC will develop strategies for increasing awareness of OSHA regulations and compliance procedures among builders and contractors in PA.

## 7. 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, and contractors. All of these standards are available electronically for free and hard copies are available for a fee.

**Manager/PI:** Blansett, Wolfgang

**Deliverable:**

- 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.
- Guidelines for Subdivision and Land Development in Pennsylvania (formerly the Pennsylvania Standards for Residential Site Development Standards): Webinars will be developed and delivered on the revised content and presentations will be made at appropriate venues to publicize the updated version. Technical assistance will be provided through telephone and email support.
- Foundation Systems for Relocated Manufactured Housing: The PHRC will provide technical assistance through telephone and email support.

## PART 4 - Contingency Projects

The PHRC may take on high priority, short-term projects mid-cycle as opportunities arise. Some issues and project ideas arise after the spring Industry Advisory Council (IAC) planning meeting, yet are important topics to address. Other project ideas were brought to the IAC, but lacked sufficient outside financial support or staffing at the time this plan was issued. Below are several projects that may be undertaken contingent upon the response to an existing online program and the availability of data.

### 1. Self-Paced Online Training

**Description:** With the success of the webinar series, the PHRC is investing other forms of outreach via the web. Expansion of the PHRC's online training resources is contingent on the success of the pilot program, which is rolling out during the summer of 2013. If that program is well-utilized, other PHRC training materials will be converted into the online format.

**Manager/PI:** Blansett

**Deliverables:** At least one additional self-paced, online training program will be developed and advertised (contingent on a successful pilot program).

### 2. Determination of Unspecified Snow Loads

**Description:** The ASCE-7 ground snow load table shows a significant portion of Pennsylvania shown as "CS", indicating that a case study is required to determine the snow loads in that area. Over 60% of all PA municipalities have at least some of their land area in a CS zone. In such areas the selection of an appropriate snow load is left to the authority having jurisdiction. In most cases such authorities know little about snow loads.

This project will consist of two phases. Phase 1 - Obtain the Army Cold Regions lab snow database and calculation spreadsheet, and beta test it with AE faculty and/or AE 537 students using PA sites. Phase 2 - Perform a comprehensive analysis of PA snow loads using an MS student to determine the procedure and coordinate with PA structural engineers and builders. This project was planned for the 2012-2013 project year but data was not available from the Army Cold Regions lab. If the data becomes available the project will be pursued.

**Manager/PI:** Blansett

**Deliverable:** This project will result in a research report, and a revised snow loads map with more comprehensive coverage of Pennsylvania municipalities (contingent on receiving the necessary data from the Army Cold Regions lab).

## Projected Budget by Project Categories

Project	Act 157 Funds	Outside <sup>1,2</sup>	PSU Support	Total
Training, Technical Assistance and Outreach	\$378,367	\$222,901	\$185,400	<b>\$786,668</b>
Applied Research	\$121,999	\$16,565	\$59,780	<b>\$198,344</b>
Applied Projects	\$41,729	\$50,490	\$20,447	<b>\$112,666</b>
Total	<b>\$542,096</b>	<b>\$289,955</b>	<b>\$265,627</b>	<b>\$1,097,678</b>

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.