

**BUILDING AMERICA TOP INNOVATIONS
2013 PROFILE**

INNOVATIONS CATEGORY:

- 3. Effective Guidance and Tools
- 3.1 High-Performance Home Solutions

TOP INNOVATOR:

PHI, IBACOS,
BSC

**Quality Management
System Guidelines**



Businesses that apply quality management systems as part of an overall quality management program can see net profits increase over 10%, reductions in cycle time, and better communications from design through construction.

Quality management system tools customized for residential construction are ready for use by builders, trades, and designers to help eliminate mistakes that would require high-cost rework.

Unlike many manufacturing industries, home construction is usually accomplished through the cooperation of several businesses, including the designer; the architect; the builder; site supervisors; HVAC, plumbing, electrical, framing, roofing, insulation and other contractors; manufacturers and suppliers of materials and components, code inspectors, Home Energy Rating System (HERS) raters, and mortgage lenders. Historically, relationships in the residential construction industry are adversarial, with multiple disconnects and conflicts among the builder, subcontractors, material and product suppliers, and manufacturers.

High-performance homes require a high degree of coordination and significant interdependencies among various systems in order to perform properly, meet customer expectations, and minimize risks for the builder. New materials and new systems for high-performance homes require greater coordination and communication between stakeholders because the home must work as a system to achieve the desired energy performance and avoid problems with durability, moisture, indoor air quality, and comfort.

Building America’s research partners IBACOS, Inc., Building Science Corporation (BSC), and the Partnership for Home Innovation (PHI) led by Home Innovation Research Labs (formerly the NAHB Research Center) have produced quality management system (QMS) guidelines customized for the residential construction industry to support this coordination. The guidelines, which follow best practices from the quality industry, are intended for use by all parties associated with the design and construction of high-performance homes.

QMS provides a delivery framework and the infrastructure necessary to ensure continual improvement of processes, increased customer satisfaction, and lower warranty costs. According to IBACOS, partnering enables all team members to achieve high-performance-home goals consistently and cost effectively. It provides builders and home-performance contractors with a framework to consider their internal and external team when adopting high-performance construction as

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Recognizing Top Innovations in Building Science – The U.S. Department of Energy’s Building America program was started in 1995 to provide research and development to the residential new construction and remodeling industry. As a national center for world-class research, Building America funds integrated research in market-ready technology solutions through collaborative partnerships between building and remodeling industry leaders, nationally recognized building scientists, and the national laboratories. Building America Top Innovation Awards recognize those projects that have had a profound or transforming impact on the new and retrofit housing industries on the road to high-performance homes.



(Top left) As the pyramid shows, strategic, tactical, and operational steps are all part of the total quality management system that results in a high-performance home.

part of the mission, vision, and values of the company. Partnering enables integrated thinking, design, and feedback on systems and solutions the builder can implement.

A builder can use partnering to identify and work with all players in the value chain, integrating them to satisfy the end customer in a way that mutually benefits all parties involved. Responsibility for the key performance attributes is shared across the project team and must be well coordinated. Critical success factors for partnering include support from top management, mutual trust, effective and open communication, effective coordination around common goals, team building, appropriate use of an outside facilitator, a partnership charter or agreement, adequate resources, progress toward common goals, an effective problem-solving process, long-term commitment, and continuous improvement.

Through the Building America program, PHI produced a set of practical quality management resource documents and tools focused on facilitating the transition to high-performance homes, dramatically minimizing builder risks and ensuring consistent delivery on the high-performance-home value proposition.

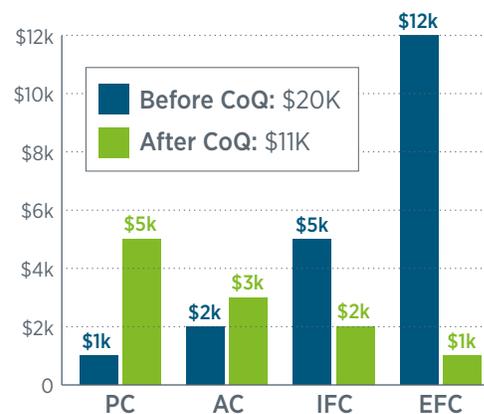
PHI's *The Economics of Quality* provides a QMS business case for builders striving to improve their construction practices, enhance product offerings, and increase customer satisfaction. It suggests that the Cost of Quality = Prevention Costs + Costs of Appraisal, whereas the Cost of Poor Quality = Cost of Internal Failure + Cost of External Failure. Tracking the costs of implementing QMS versus the costs for repairs and warranty callbacks provides a measure of the innovation's success as a net zero energy home tool.

PHI's *Quality Management Primer for High-Performing Homes* provides the QMS framework customized for a residential construction business focusing on delivering high-performing new and existing homes. Traditional QMS processes were developed for a manufacturing-type environment and often don't lend themselves directly to residential construction; also, the ISO QMS standards are generic and broad so that they can cover businesses of any type and size. The QMS tools developed in this effort are customized to residential construction and ready for use by builders, trades, and designers.

PHI's *Hotspot Implementation Guide and Tools* – The hotspot process is a quality management tool to identify, prioritize, and greatly reduce recurring problems and emerging issues.

BSC has made many contributions to this effort including the *Strategy Guideline: Advanced Construction Documentation for High-Performance Homes*, which identifies differences between the requirements for construction documents for high-performance housing and the documents that are typically produced for conventional housing.

IBACOS prepared the report, *Quality Management Tools for Each Step in Six Sigma's DMAIC*, a snapshot of easy, intermediate, and advanced approaches for implementing six sigma DMAIC – the define, measure, analyze, improve and control cycle.



Quality management (CoQ) adds to the cost of prevention (PC) and appraisal (AC), but reduces costs from internal failure (IFC) and external failure (EFC).

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