



Residential Commissioning Guide Brings Home Comfort and Savings

PIER Buildings Program

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The Problem

Houses are complex systems of interacting components that don't always perform properly. Even when built or retrofitted using formal design procedures, houses often fail to meet health, safety, comfort, and energy-use expectations. A major reason for this generally poor performance is the lack of consistent procedures to ensure that a home is built and operated in the way it was intended.

The Solution

Residential commissioning combines components and system testing with changes to improve home energy efficiency and comfort. Many good commissioning elements are already practiced in some fashion, but they don't deal with the house as a system, and therefore don't fully consider parallel issues of energy consumption, peak power, thermal comfort, and pollutant control. "Guidelines for Residential Commissioning," a report prepared by Lawrence Berkeley National Laboratory for the California Energy Commission, integrates many available procedures into a comprehensive process that considers the house as a whole system. The guide also provides examples that demonstrate the benefits of whole-house commissioning.

Features and Benefits

"Guidelines for Residential Commissioning" explains the commissioning process and suggests how to structure a commissioning program. It recommends three phases of commissioning:

- *Audit.* Evaluating the current conditions and performance of the house.
- *Tuning.* Making minor adjustments and repairs to systems and materials to improve efficiency and performance.
- *Opportunity identification.* Providing information to the client about additional energy-efficiency measures, such as improved insulation, that could be installed and implemented.

Procedures that may take place during the commissioning phase include air tightening, duct sealing, refrigerant and air-handler airflow corrections, and improving insulation installation quality in new houses.

A list of 16 recommended audit procedures is included in the guide, along with references that describe how to conduct each procedure, an inventory of the equipment required, an estimate of the time required, and an indication of the energy savings potential. For example, the guide recommends testing the air-tightness of the building envelope and determining the location of leaks (**Figure 1**), and refers to American Society for Testing and Materials Standards E779-99, E1827-96, and E1186-7 for the procedures to follow. The equipment required includes a blower door and a smoke stick, the estimated time for the procedure is 30 to 60 minutes, and the energy savings potential is classified as medium.

The guide also describes the benefits of residential commissioning, which include the following.

Reduced electricity and gas consumption. As **Table 1** shows, substantial energy savings are a principal benefit of commissioning houses. Savings typically come from such measures as sealing leaky ducts or correcting a refrigerant-charge deficiency in a central air conditioner.

Improved occupant comfort and indoor air quality. The commissioning process can help to identify places where

Figure 1: Performing a blower door test

This test is performed during commissioning to determine the air-tightness of the building envelope and the location of leaks.



Table 1: Benefits of residential commissioning

Commissioning measures that can be implemented during the commissioning visit or as part of the correction of construction defects can lead to gas and electricity savings in new and existing homes. Following up on opportunities identified during commissioning can produce much larger savings.

	Expected savings (%)	
	Electricity	Gas
Existing homes		
Commissioning	14–18	18–21
Follow-up opportunity	61–74	44–54
New homes		
Commissioning	7–11	24–25
Follow-up opportunity	8–12	28–31

contractors can reduce uncontrolled air infiltration, provide appropriate ventilation capacity, and achieve more consistent surface temperatures through better-installed insulation. Commissioning can also help ensure that the HVAC systems actually deliver the expected amount of space conditioning.

Greater envelope durability and longer HVAC equipment life. Improving the building and its systems will reduce callbacks and warranty costs, which will provide the business community with increased profits.

If widely practiced, residential commissioning can also lead to significant decreases in electrical demand that will provide greater system reliability for utilities.

Cost, and an industry emphasis on reducing first costs, is a barrier to widespread use of commissioning. The guide can help overcome this barrier by providing an integrated set of simple, rapid, inexpensive, and reliable commissioning methods and by quantifying the potential benefits.

Applications

All new and existing homes are eligible for commissioning. The biggest savings potential lies with existing houses that are performing poorly. Well-engineered new houses may still benefit from commissioning, but offer the lowest potential for energy and comfort benefits.

California Codes and Standards

California's Title 24 energy code mandates that components of new houses comply with performance standards such as minimum efficiencies for space conditioning and water heating equipment. With the implementation of residential commissioning programs, code authorities and officials will see improved compliance with building codes as the commissioning process identifies and corrects elements that do not meet code requirements. Whole-house commissioning also has the potential to take houses to a level of performance beyond that resulting from Title 24.

What's Next

The Public Interest Energy Research (PIER) program is currently sponsoring a project with technical consulting firm Bevilacqua-Knight Inc. to extend this work. Researchers will analyze the barriers to the adoption of whole-house commissioning by contractors and determine which audit procedures in the guide are the most cost-effective. With this information, they will create training tools for contractors and build practical models for contractor business plans and sales of home-commissioning services. The final goal is to document the energy, comfort, durability, and indoor environmental quality benefits for homeowners by collecting performance data before and after the completion of improvements prescribed during commissioning.

Collaborators

The organization involved in this project was Lawrence Berkeley National Laboratory.

For More Information

"Guidelines for Residential Commissioning" is located at www.energy.ca.gov/reports/500-04-012/2004-04-07_500-04-012_A1.PDF.

Contacts

Lawrence Berkeley National Laboratory, Max Sherman, 510-486-4022, mhsherman@lbl.gov

California Energy Commission, Chris Scruton, cscruton@energy.state.ca.us, or visit www.energy.ca.gov/pier/buildings

About PIER

This project was conducted by the California Energy Commission's Public Interest Energy Research (PIER) program. PIER supports public-interest energy research and development that helps improve the quality of life in California by bringing environmentally safe, affordable, and reliable energy services and products to the marketplace.

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Arnold Schwarzenegger Governor

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