

Commissioning Residential HVAC Systems: A Quick Guide for Contractors

PURPOSE AND DEFINITION OF COMMISSIONING

Simple mistakes like forgetting to program the thermostat or clean insulation debris out of the ducts or condensate drain can ruin a homeowner's otherwise positive opinion about the SMUD Home Performance program (HPP) and the otherwise quality work performed. To ensure jobs involving envelope, plumbing, electrical, or HVAC equipment are mistake-free, it is important that Home Performance Contractors practice commissioning.

Commissioning is the process of testing and adjusting of installed equipment to be sure that it performs in accordance with the manufacturer's specs and the designer's intent.¹

This Quick Guide addresses commissioning for newly installed HVAC systems so it operates in compliance with code, manufacturer's specifications, designer's intent and homeowner's expectations.

HOMEOWNER EXPECTATIONS

Managing the homeowners' expectation is a key initial step of the commissioning process. A good sales process will include a survey to document the homeowners' expectation for the new HVAC system prior to the job starting. Specialists commissioning large commercial buildings refer to it as the Owner's Project Requirements (OPR). A commissioning checklist can help ensure system performance meets the homeowner's expectation, while avoiding simple and common mistakes. A common complaint about newly installed HVAC systems is the smell of something burning from new furnaces due to manufacturing oil burning off. Sometimes extra dust is encountered with even small pieces of insulation blowing out a newly installed system. By mentioning this possibility in advance, a lot of concern about the quality of the installation can be alleviated. Other complaints could be due to imbalances in the supply registers (noticeably

high and low airflows that are not proportional to the size of the area being served or its load).

SUGGESTED RESIDENTIAL COMMISSIONING CHECKLIST:

- Determine Owner's Expectations or special concerns (noise/ air flow/ dust, etc.)
 - Follow proper design standards
 - Install according to design(make sure installers understand reasons for the design)
 - Make sure ducts and catch pans are clean and clear of debris
 - Test fire furnace to burn off dust and oils from heat exchanger
 - Verify duct leakage
 - Verify total airflow
 - Verify fan watt draw
 - Check for obvious supply register imbalances
 - Test static pressure
 - Across filter
 - At return plenum
 - At supply end of air handler unit
 - Across coil
 - Program thermostat and other controls (discuss customer needs and wants and specifically explain how the unit was set, and how it will respond)
 - Final safety inspection and CAZ testing
 - Provide homeowner a commissioning report

Optional:

- Final detailed register-by-register air balancing to Manual D airflows.
- Combustion efficiency testing
- Installed AC efficiency measurement
- Room pressurization when doors closed

¹ <http://www.greenbuildingadvisor.com/blogs/dept/musings/residential-commissioning>

BASIC VS. OPTIONAL COMMISSIONING

Basic commissioning ensures that the system is operating in compliance with code, manufacturer's specifications, designer's intent and homeowner's expectations. Basic commissioning should be standard practice; however, more extensive commissioning that includes detailed performance diagnostics and ratings could be offered as an optional fee-for-service.

In California, some diagnostics of new systems are deemed so important that they are mandated by code. These include:

- Refrigerant charge verification,
- Duct leakage,
- Total system airflow, and
- Fan watt draw.

Additional fee-for-service diagnostics include:

- Room-by-room air balancing,
- Furnace combustion efficiency,
- AC cooling efficiency,
- Duct static pressures, and
- Room pressurization.

A **good design** and quality installation can make diagnostics routine with superior results every time.

Code requires designing to Air Conditioning Contractors of America's (ACCA) Manual J load calculations, Manual S equipment selection and Manual D duct design (or equal). Although the code is vague about having to follow those calculations, they have been widely proven to result in superior designs when applied correctly.

The type of HVAC system installed determines the amount of commissioning required. The more "packaged" a system is, the less commissioning it will generally need. For example, ductless mini-splits require less commissioning than ground source heat pumps.

ACCA/ANSI STANDARD 5, QUALITY INSTALLATION

The ACCA/ANSI Standard 5, Quality Installation, is an excellent reference for procedures related to residential HVAC commissioning. It has detailed information on the following topics and includes information on hydronic systems including both air and ground source heat pumps:

Design Aspects:

- Ventilation
- Building heat gain/loss load calculations
- Proper equipment capacity selection
- Geothermal heat pumps ground heat exchanger
- Matched systems

Distribution Aspects:

- Duct leakage
- Airflow balance
- Hydronic balance

Equipment Installation Aspects:

- Airflow through indoor heat exchangers
- Water flow through heat exchangers
- Refrigerant charge
- Electrical requirements
- On-rate for fuel-fired equipment
- Combustion venting system
- System controls

System Documentation and Owner Education Aspects:

- Proper system documentation to the owner
- Owner/operator education

REFERENCES:

The Art of Residential HVAC Commissioning, Rob Falke and John Puryear, Contracting Business (website).

<http://contractingbusiness.com/residential-hvac/art-residential-hvac-commissioning>

Residential Commissioning – Musings of an Energy Nerd, Martin Holladay, Green Building Advisor (website).

<http://www.greenbuildingadvisor.com/blogs/dept/musings/residential-commissioning>

FOR MORE INFORMATION

Air Conditioning Contractors of America - Manual J/S/D – www.acca.org

ACCA/ANSI Standard 5, Quality Installation - <http://www.acca.org/standards/quality>

For more information about energy efficiency incentives available through SMUD, visit: <http://hpp.smud.org/> or email Jim Mills at: james.mills@smud.org