Comparing CA & International Residential HVAC Installation Codes to ACCA Standard 5

Summary

There are critical differences between California mechanical and energy code and other guiding residential installation standards, including international standards and ACCA Standard 5. This document by HVAC subject matter experts is the first step in providing a clear, comprehensive overview comparison between various codes and standards for residential quality installation.

Finalized: January 18th, 2017

Use of this document

This document offers a comparison of California and international residential mechanical codes to ACCA Standard 5 for residential quality installation.

It is based on an official WHPA Work Product of January 18th, 2017 titled "RQI Committee Residential Installation Comparison: California and International Codes to ACCA National Standards." This Work Product was developed by the WHPA Residential Quality Installation (RQI) I Committee.

This document, and also the WHPA Work Product, may be used in part or whole at no charge. Attribution to the Western HVAC Performance Alliance is requested.

We would also ask that you inform the WHPA through info@performancealliance.org if you have made use of either document, so that we can inform and encourage the hundreds of volunteers who donate their time to providing expert HVAC advice in order to support energy efficiency objectives.

Preface

California regulators as well as IOU/utility staff are often unaware of the critical differences between CA code and other guiding installation standards. Until those differences are pointed out and those staff are truly aware of the deficit that current code requirements mandate, there cannot be meaningful movement toward "quality" standards based installations

Provide a clear, comprehensive overview comparison between the requirements of CA mechanical and energy codes to that of national and international standards. Currently, CA code supersedes national and international standards which have defined a "quality installation." Until CA code includes requirements of these other standards/codes or moves to make these standards the primary installation requirements, as stated in its own long term strategic plan, critical elements of a "quality installation" will not be expected, required, rewarded or enforced as the norm.

California has expressed the desire to move towards a "Standards" based code regarding mechanical system installation as part of its overall long-term energy goals. California currently utilizes its own state codes which establish the use of custom protocols which supersede any contained or referenced national standards. In most other states, the jurisdiction adopts a national code and then produces an addendum or supplement of changes.

However, in California the state publishes its own super-code and references other national codes or standards as subjects to the code. One compelling reason why California has embodied its codes this way is it allows the state to prescriptively promote certain measures which have been deemed to provide energy-savings through past utility programs or studies.

Background

The following background refers to the relationships between California's residential mechanical codes and ACCA Standard 5.

As both California and national code standards have evolved, the need for contractors and other market-actors to improve their engineering and installation practices has grown progressively. Additionally, as original equipment manufacturers (OEM) product lines incorporate more sensors and digital interfaces, the way systems are installed and commissioned has changed. This artifact of product evolution sometimes creates gaps or friction between current market approaches and codes and standards.

As the OEM industry continues to evolve and rely on more controls and interfaces, contractors will need to be much more capable in their understanding of how systems actually operate as they will now have to deal with interfaces that tell the customer there is something potentially wrong even if cold air is blowing from the supply registers.

Contractors who don't understand the design and/or commissioning process will likely have great difficulty dealing with performance issues in the future. Furthermore, although current codes reference national design standards, there is no mechanism for codes to evaluate the competence of any engineering process applied or the lack of any engineering process. The prescriptive nature of California codes cannot capture or prevent poor design.

The Western HVAC Performance Alliance (WHPA) Residential Quality Installation (RQI) Committee has been working with the California investor owned utilities (IOUs) for over 6 years on the implementation of a performance-based approach to residential HVAC design and commissioning utilizing ACCA Standard 5 (Standard 5) as the governing design process and ACCA Standard 9 as the quality control (enforcement) mechanism.

CODES-Related Issues: Inconsistent and/or lack of enforcement, permit rates, and HERs (parties who are responsible for conducting field testing and installation verification).

In California, as in many states, contractors are required to file some basic engineering documents as part of the permitting requirements for each job. These documents are difficult to review. A large majority of installation jobs are believed to be completed without any permit being filed for or record or any installation engineering having taken place.

Purpose

To help parties who are involved in discussions about residential mechanical codes understand the differences between current codes and ACCA Standard 5 as well as the nuances involved in the design process, the RQI Committee sets forth the following table and charts to show where current codes, national codes, and ACCA Standards align as well as where gaps exist. Since ACCA Standard 5 and national/international codes are subservient to CA codes, those additional requirements are not currently evaluated or enforced.

The work product and accompanying tables highlight key code to standards differences. It is the committee's intention to expand this work in the future to include a more detailed discussion of each critical differing element and the probable impact of the current CA code based approach. What energy savings elements are being overlooked or ignored.

Overview Code to ACCA Standard 5 Comparison

California Code Comparison Table			
Measure	California Mechanical Code	California Energy Code	ACCA Standard 5 Quality Installation
Permit	X	X	X
Design conditions		X	X
Minimum Efficiency Equip		X	
SetBack Thermostat		X	
Load Calculation (Man J)		X	X
Equip Selection (Man S)			X
Duct Sizing (Man D)	X	X	X
AC Clearances	X	X	
Fau Termperature Rise		X	X
Duct R Value		X	
Duct Leakage Testing		X	X
Air Filtration		X	X
Minimum Air Flow		X	X
Fan Efficancy		X	
Ventilation	X	X	X
Return Duct Sizing Min		X	X
Refrigerant Charge		X	X
Equipment Sizing Limits			X
Equipment Perfomance Min/ Max			X
System Testing & Commissioning			X

Please note the highlighted rows where CA Mechanical and Energy Codes do not address critical elements of a "quality installation" addressed by ACCA Standard 5.

More Detailed Code to ACCA Standard 5 Comparison

Please note the highlighted rows (in yellow) where CA Mechanical and Energy Codes do not address critical elements of a “quality installation” addressed by ACCA Standard 5.

California, "I-Code", ACCA Standard 5, Cross Reference Table

Measure	California Code	2015 I-Code	ACCA Standard 5	Design Process	Design Impact / Comment
Design Conditions	Title 24		Table 1A & 1B, Code/AHJ	Manual J	Affects: Δ-T, Δ-Grains, infiltration, ventilation, duct loads
Equipment Efficiency Standards	Title 24	IECC R403.7	Code/AHJ	Manual S	Affects: Equipment SHR and dehumidification
Setback Thermostat	Title 24	IECC R403.1.1	Code/AHJ	Controls	N/A
Thermostat Balance Point (Heat Pumps)		IECC R403.1.2	Code/AHJ	Manual S / Controls	Affects supplemental heating selection & operation
Duct R-Value	R-8	IECC R403.3.1 R-8 / R-6	Code/AHJ - Existing Actual	Manual J / S	Affects: duct loads
Duct Leakage	Title 24	IECC R403.3.4 - 4 cfm/100 sf cond. Space	Sect 5.1 - 10% inside / 6% outside or 50% redux	Manual J / S	Affects: duct loads
Building Cavities		IECC R403.3.5)/IRC N1103.3.5 Prohibited	Code/AHJ	Manual D	Affects: duct loads (duct leakage), potential for mold and fire
Air Filtration			Appendix A	Manual D	Affects: Available Static Pressure (fan power, duct sizing and system airflow)
Airflow - Equipment	Min 350cfm/ton		Sect 4.1: CFM = BTUH / (1.09 x ACF x TD) where TD dependent on SHR	Manual S / D	Affects: Operating SHR, runtime cycling, fan power, duct sizing, duct loads
Airflow - Registers			Sect 5.2 (+/- 20% or 25 cfm)	Manual T	Affects: Register placement, throw, selection
External Static Pressure		IRC M1411.2 (min 0.5 i.w.c. or rated w/coil)	Sect 4.1.1	Manual D	Affects: Fan power, duct sizing
System Fan/Duct Efficacy		N/A	N/A	Manual S / D	Calculated result
Ventilation		IRC M1507	Sect 3.1, Code/AHJ	Manual J / S	Affects: Design ventilation loads
Ventilation Fan Efficiency		IECC R403.6.1	Code/AHJ		N/A
Boiler Temperature Setback		IECC R403.2	Code/AHJ		Affects: may affect flue placement
Pipe Insulation		IECC R403.4 - R3	Code/AHJ	Manual J	Affects: distribution loads (similar to duct loads)
Building Leakage		IECC R402.4.1.2 (New)	Manual J	Manual J	Affects: infiltration loads, moisture gains/losses, design SHR
Equipment Clearances		IRC M1305.1 (extensive)	OEM, Code/AHJ		Affects: available equipment configuration solutions
Return Air		IRC M1602.2	Sect 4.1.1	Manual D	Affects: SHR, capacity
Refrigerant Metering Device		N/A	N/A		N/A: May be small changes in operating SHR
Refrigerant Charge		N/A	Sect 4.3		N/A: May affect capacity
Matched (Rated) Components			Sect 3.5		Affects: Provides OEM capacity and SHR values needed for sizing and airflow
System Documentation			Sect 6.1		N/A: Copies of all system design engineering and OEM installation and operation
Design:					
Load Calculation		IECC R403.7 - Manual S/J	Sect 3.2	Manual J	
Equipment Sizing/Selection		IECC R403.7 - Manual S/J	Sect 3.3	Manual S	
Duct Design		IRC M1601.1 - Manual D and M1601		Manual D	
System Commissioning:					
Combustion Capacity			Sect 4.5		
Airflow - Equipment	Min 350cfm/ton		Sect 4.1 (+/- 15% of design)		
Airflow - Registers			Sect 5.2 (+/- 20% or 25 cfm)		