Air Conditioning Contractors of America

HVAC Quality Installation - Code Requirements, Best Practices, and Contractor Selection

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PHRC

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ACCA

The Air Conditioning Contractors of America (ACCA)

The only nationwide association representing the technical, educational, and policy interests of U.S. businesses that design, install and maintain indoor environmental systems

ACCA

ACCA History

National Warm Air Heating and Air Conditioning Association (1914)

Air Conditioning and Refrigeration Contractors of America (1946)

National Environmental Systems Contractors Association (1968)

Air Conditioning Contractors of America (1969)

ACCA

Don's History

AA General Engineering Technology
Montgomery College, MD

1st Class Stationary Engineer, MD

Licensed HVAC Contractor, FL

BS Mechanical Engineering Technology
Thomas Edison State College, NJ

ACCA

HVAC Contractor Competency Contributes to the HVAC Industries Poor Image

~10%. Do a proper job nearly all of the time.

~35%. Know what to do. But are constrained.

~25%. Think doing okay. Often fall short.

~30%. Don't know, don't care

We talk about "raising the bar" … but, we still have to "define the bar!"

ACCA

"Defining the Bar" Questions

What is a good HVAC contractor?

What is a quality HVAC installation?

What makes one HVAC contractor more competent than another?

How can HVAC contractors demonstrate superior performance?

How can a home owner/builder identify/engage the services of a quality HVACR contractor?

How can a home owner/builder be assured that the quality installation paid for was obtained?

ACCA

Version 1 2007 HVAC Quality Installation Specification

ANSI / ACCA 5 QI-2007 Was Developed Over A Three Year Period By A Diverse National Committee And Vetted Through Public Reviews

Free downloads still available at: www.acca.org/quality

Committee Represented All HVAC Industry Sectors:

HVAC Contractors
Program Administrators
Equipment Manufacturers
Educators
Code Officials
(Others EPA etc.)

Why Would ACCA Want So Many Involved?

The HVAC Quality Installation Specification was Updated in 2010

ANSI / ACCA 5 QI-2010
Once Again the Updating Committee Represented All HVAC Industry Sectors:
HVAC Contractors
Utility Program Administrators
Equipment Manufacturers
Others (Educators, EPA, Code Officials, etc.)

Why Would ACCA Want To Update Early?

ANSI / ACCA 5 QI-2010 HVAC Quality Installation Specification

Available for free at: www.acca.org/quality

QI Divided Into Six Sections

1. Purpose
2. Scope
3. Design Aspects
4. Equipment Installation Aspects
5. Distribution Aspects
6. System Documentation and Owner Education Aspects

Purpose and Scope
(Section 1 and Section 2)

ANSI / ACCA 5 QI-2010 HVAC Quality Installation Specification

Purpose (Section 1)

The *HVAC QI Specification:*
establishes minimum criteria for use by stakeholders concerned with the proper installation, maintenance, and servicing of HVAC systems to meet occupant demands for energy efficiency, comfort, and IAQ in residential and commercial applications.

Scope (Section 2)

This specification applies to HVAC equipment/components being installed in residential and commercial buildings

That's a Broad Scope Is Anything Excluded?

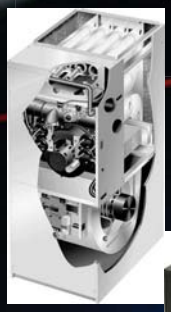
Due to differing design aspects and control/operation situations, built-up systems (i.e., chillers, custom or specialty-built penthouse units, etc.) are not included in this specification. Buildings employing built-up systems are generally designed by architects or professional engineers. Additionally, commercial buildings using built-up equipment are more likely to benefit from increased owner scrutiny via building commissioners, owner agents, etc.

QI Divides HVAC Equipment Into 3 Main Categories

1) Unitary air conditioners, air-source/water-source heat pumps and geothermal heat pumps
2) Furnaces
3) Boilers

Unitary air conditioners, air-source/water-source heat pumps, and geothermal heat pumps

Furnaces (gas-fired, oil-fired, electric, and other)



Boilers (gas-fired, oil-fired, electric, and other)




Design Aspects (Section 3)

This Section focuses on the upfront design procedures/tasks undertaken before the equipment is actually installed.

Ventilation (Section 3.1)

The contractor shall ensure that ventilation calculations are performed for every HVAC system installation/replacement

Building ventilation requirements (outside air, exhaust air and building pressurization) are performed to recognized standards, codes, or requirements.

(For example: ASHRAE 62.1 or ASHRAE 62.2)

Building Heat Gain / Loss Load Calculations (Section 3.2)

The contractor shall ensure:

For NEW CONSTRUCTION, or when adding ducts to an existing structure, room-by-room heat gain/loss load calculations are completed

Or

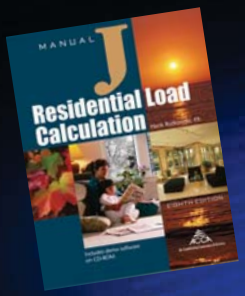
For EXISTING CONSTRUCTION, without contractor modification of the existing duct system, block load heat gain/loss load calculations are completed.

Loads Types: Heat Gain and Heat Loss Calculations (Section 3.2)

- Block Load
- Peak Block Load
- Avg. Room Load
- Peak Room Load
- **System Loads**
  - Duct Loads
  - Ventilation Load
  - Humidification Loads
  - Dehumidification Loads
  - Blower Heat Load
  - Infiltration Loads
  - Internal Loads

QI's Acceptable Procedures For Load Calculations

Manual J8 or Manual N5



QI's Additional Acceptable Procedures

ASHRAE Handbook Guidelines,
DOE Energy Plus™
Or
Other approved equivalents per the authority having jurisdiction
Or
Confirm that the calculations were performed by a qualified third party

Proper Equipment Capacity Selection (Section 3.3)

The contractor shall ensure that all equipment is properly sized and selected prior to being installed

Help, I need a Manual J for the equipment I installed so my customer will qualify for the rebate

Proper Equipment Capacity Selection (Section 3.3)

For CENTRAL AIR CONDITIONERS and HEAT PUMPS - the selected equipment will satisfy the building 's load requirement at design conditions.

Central Air Conditioner / Heat Pump Sizing Requirements

i. OEM product data demonstrates that latent requirements are addressed.
And
ii. Total equipment capacity is between: 95% and 115% of total cooling requirements (for air conditioners and heat pumps).
Or

Central Air Conditioner / Heat Pump Sizing Requirements

95% and 125% total cooling requirements (for heat pumps with heating dominated requirements).
Or
the next largest nominal piece of equipment per OEM increment that is available to satisfy the latent and sensible requirements.

Gas/Oil-Fired Warm Air Systems and Boiler Sizing Requirements

For gas-fired or oil fired WARM AIR SYSTEMS and HEATING BOILERS – the heating capacity of the selected equipment will satisfy the heating requirement at design conditions

Gas/Oil-Fired Warm Air Systems and Boiler Sizing Requirements

i. WARM AIR SYSTEMS - output capacity between 100% and 140% of calculated system load unless dictated by the cooling equipment selection.

ii. HEATING BOILERS - equipment capacity between 100% and 115% of calculated system load, OR the next largest nominal piece of equipment that is available.

Acceptable Sizing Procedures (Section 3.3.2)

Using OEM performance information and industry-approved procedures (e.g., ACCA Manual S® for residential applications, ACCA Manual CS® for commercial applications, OEM guidelines, or other approved equivalent per the authority having jurisdiction)

Geothermal Heat Pump Ground Heat Exchanger (Section 3.4)

The contractor shall observe industry design practices for the proper design of the exterior ground heat exchanger.

American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)

International Ground Source Heat Pump Association (IGSHPA)

National Ground Water Association (NGWA)

Original Equipment Manufacturer's guidance

Geothermal Heat Pump Ground Heat Exchanger (Section 3.4)

i. The ground interface heat exchanger fluid temperatures [extremes] and flow rates used as the basis for design equipment capacity are within the range specified in OEM guidelines.

And

ii. The ground heat exchange design methodology incorporates:

- Building loads and total installed equipment capacity
- Ground heat exchanger type, materials, and soil geometry
- Soil thermal characteristics
- Climatic characteristics of project location

Matched Systems (Section 3.5)

The contractor shall ensure that all evaporators, condensing units, and furnaces are properly matched systems as identified by industry-recognized certification programs.

QI Approved System Matching Methods

AHRI Product Certification directory/database

CEE directory of AHRI-verified equipment

www.ahridirectory.org

www.ceedirectory.org

Equipment Installation Aspects (Section 4)

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

QI Section 4 Equipment Installation Aspects

The Contractor shall verify that the airflow through the indoor blower unit (e.g. furnace, fan coil, air handler) is within acceptable CFM ranges.

Airflow Through Indoor Heat Exchangers (Section 4.1)

The contractor shall provide evidence of the following for the measured airflow across the indoor heat exchanger for installed systems (with all accessories and system components in place):

Evidence For Cooling Coils

i. Airflow across the coil, at fan design speed and full operating load, is within 15% of the airflow required per the system design. and

ii. Airflow across the coil or fan unit is within the range recommended by the OEM product data. and

iii. Measured external static pressure (ESP) is:
   1. Within OEM specified acceptable range, and
   2. Not more than 25% or 0.10 iwc (which ever is greater) over the calculated ESP used to design the duct system [exception for existing buildings: measured ESP is not required for change-out applications if there has been no modification to the pre-existing ductwork.]

Evidence For Gas-Oil Fired Heat Exchanger Applications

i. Airflow, across the heat exchanger, at fan design speed and full operating load, is within 15% of the airflow required per the system design,

And

ii. Airflow across the indoor heat exchanger is within the range recommended by the OEM product data.

And

Evidence For Gas-Oil Fired Heat Exchanger Applications

iii. Heat exchanger airflow requirements shall be considered separately from any combined and attached cooling coils sharing the same distribution duct system design,

And

iv. Measured external static pressure (ESP) is:
   1. Within OEM specified acceptable range, and
   2. Not more than 25% or 0.10 iwc (which ever is greater) over the calculated ESP used to design the duct system [exception for existing buildings: measured ESP is not required for change-out applications if there has been no modification to the pre-existing ductwork.]

Acceptable Procedures
(Section 4.1.2)

OEM CFM / SP drop across coil table method

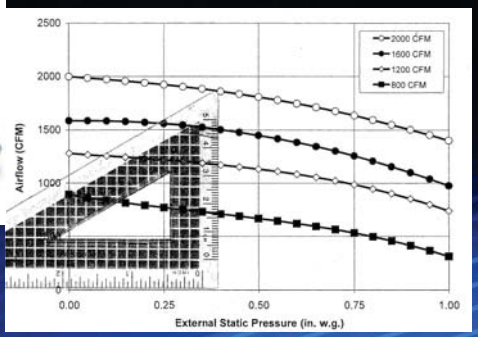
Traversing Duct

Flow Grid Method

Pressure Matching Method

Temperature Rise Across the Heat Exchanger

OEM CFM Pressure Drop Across A Clean Coil



Traversing Duct

Manometer and probe, or an anemometer (e.g., hot wired, rotary style) or other methods per ACCA, AABC, ASHRAE, ASTM, NEBB, SMACNA, or TABB procedures

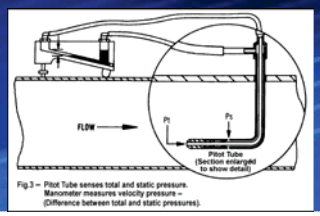


Fig.3 – Pitot Tube senses total and static pressure. Manometer measures velocity pressure – (Difference between total and static pressures).

Flow Grid Measurment Method

Pressure Matching Method

Temperature Rise Across The Heat Exchanger (heating only)

Water Flow Through Indoor Heat Exchangers (Section 4.2)

The contractor shall verify that the water flow through the refrigerant-to-water, water-to-water, or water-to-air heat exchanger are within acceptable ranges.

Acceptable Procedures (Section 4.2.2)

Water Pressure Drop Method

Or

Water Temperature Change Method

Or

Any method approved and specifically by the OEM that can be used to determine water flow rate

Water Pressure Drop Method

Water Pressure Drop (in feet @ 180°F)			
GPM	COIL A	COIL B	COIL C
2	0.4	0.4	0.5
4	1.4	1.6	1.7
6	3.0	3.3	3.7
8	5.2	5.7	6.3
10	7.9	8.7	9.6

Water Temperature Change Method

Table 4.4: Flow Rate and Pressure Drop for Various System Temperature Rise Values

ΔT (°F)	Flow Rate & Pressure Drop											
	PF-50		PF-80		PF-110		PF-140		PF-210		PF-399	
	GPM	FT	GPM	FT	GPM	FT	GPM	FT	GPM	FT	GPM	FT
40	1.3	2.17	3.7	3.92	5.1	3.74	6.5	2.70	9.6	6.23	18.7	4.97
35	1.6	2.72	4.2	4.95	5.8	4.75	7.4	3.51	11.0	7.69	21.3	6.38
30	1.1	3.54	4.9	6.49	6.7	6.27	8.7	4.75	12.8	9.81	24.9	8.50
25	1.7	4.83	5.8	8.95	8.1	8.70	10.4	6.80	15.4	13.09	29.8	11.93
20	1.6	7.06	7.3	13.25	10.1	12.99	13.0	10.55	19.2	18.63	37.3	18.08
15	1.1	11.52	9.7	21.97	13.5	21.78	17.3	18.58	25.6	29.35	49.7	30.90
10	1.2	22.97	14.6	44.81	20.2	45.11	26.0	41.26	38.4	55.71	74.6	65.74

Other Methods

Any method approved and specifically stated by OEM that can be used to determine the water flow rate.

Refrigerant Charge (Section 4.3)

The contractor shall ensure that the HVAC system has the proper refrigerant charge.

Acceptable Procedures:

- Superheat
- Subcooling
- OEM approved methods

Superheat Method

System refrigerant charging per OEM charging data/instructions and within ± 5°F of the OEM recommended optimal refrigerant charge.

Subcooling Method

System refrigerant charging per OEM charging data/instructions and within ± 3°F of the OEM-recommended optimal refrigerant charge.

Other OEM Approved Methods

Any method approved and specifically stated by the OEM that will ensure proper refrigerant charging of the system

Electrical Requirements (Section 4.4)

The contractor shall ensure all electrical requirements are met as related to the installed equipment.

- Line and Low Voltages
- Amperages
- Wiring Sizes
- Grounding/Bonding per NEC or Equivalent.

Line and Low Voltages

Per equipment (single and three-phase) rating plate - the percentage (or amount) below or above nameplate values are within OEM specifications and/or code requirements

Amperages

Amperages per equipment (single and three-phase) rating plate - the percentage (or amount) below or above nameplate values are within OEM specifications and/or code requirements.

Wiring Sizes

LINE and LOW-VOLTAGE wiring sizes per NEC (National Electric Code) or equivalent.

Grounding / Bonding

GROUNDING / BONDING per NEC or equivalent.

On-Rate for Fuel Fired Equipment (Section 4.5)

The contractor shall ensure the equipment "on-rate" (BTU/H input during steady-state operation) for gas-fired or oil-fired equipment is at the equipment name plate value.

Gas-Fired Equipment

Firing rate within ± 5% of nameplate input for gas equipment (or per OEM specifications).

Temperature rise per nameplate.

Acceptable Procedures for Gas-Fired Equipment

The contractor shall test using both of the following acceptable procedures for fulfilling the desired criteria:

- Clocking the meter or other fuel input measurement per OEM instructions.
- Measuring the temperature rise at steady state conditions (with airflow first verified by §4.1) – furnaces only.
- Combustion analysis for gas and oil-fired equipment if required by the OEM must be performed.

Oil-Fired Equipment

Correct nozzle flow rate and spray angle for correct firing rate per nameplate input.

Correct oil pump pressure for nozzle installed and at OEM's specified values.

Temperature rise per nameplate.

Acceptable Procedures for Oil-Fired Equipment

The contractor shall fulfill the following criteria:

- Verify nozzle or alternate input nozzle per OEM installation or oil burner instructions.
- Verify oil pump pressure with a dial or electronic gauge designed for oil pressure measurement.
- Measure the temperature rise at steady-state conditions (with airflow first verified by §4.1) –furnaces only.
- Perform a combustion analysis per OEM installation or oil burner instructions.
- Combustion analysis is necessary when setting up an oil burner. Additionally, new oil-fired equipment no longer standardizes the pump pressure at 100 psig. Hence, incorrect pump pressure may result in an incorrect input rate for the equipment.

Combustion Venting System (Section 4.6)

The Contractor shall ensure proper sizing, design, material selection and assembly of the combustion gas venting system.

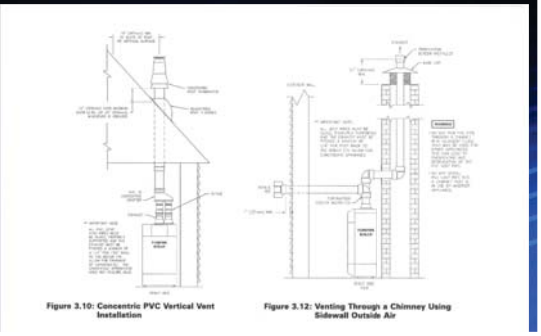
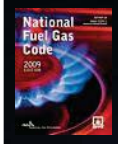


Figure 3.10: Concentric PVC Vertical Vent Installation

Figure 3.12: Venting Through a Chimney Using Sidewall Outside Air

Requirements For Combustion Venting

The contractor shall provide evidence of compliance with the following:



- CATEGORY I vent system sized per OEM instructions and the National Fuel Gas Code (NFGC, NFPA 54) *or*
- CATEGORY I vent system sized per OEM instructions and the International Fuel Gas Code (IFGC) *or*
- CATEGORY II, III and IV vent system sized per OEM instructions *and*
- CATEGORY II, III and IV vent system sized per required local code.

Acceptable Procedures

Comparison of the actual installation's venting system's performance to appropriate fuel gas venting tables for Category I vent systems.

Comparison of the actual installation's venting system's performance to appropriate OEM instructions, for Category II, III and IV vent systems.

System Controls (Section 4.7)

CONTROL REQUIREMENTS

The contractor shall ensure:

a) Operating controls and safety controls are compatible with the system type and application, and the selected controls are consistent with OEM recommendations and industry practices, and

b) Operating controls and safety controls lead to proper sequencing of equipment functions, with all controls and safeties functioning per OEM or customer design specifications

Distribution Aspects

Duct leakage

Airflow balance

Hydronic Balance

Duct leakage (Section 5.1)

NEW residential / commercial buildings:

- *Ducts located inside conditioned space:*
  ≤ 10% total leakage at 25 Pascals
- *Ducts outside thermal envelope:*
  ≤ 6% total leakage at 25 Pascals or
- per Energy Star™ guidance (new homes)

EXISTING residential / commercial buildings:

- *≤ 20% total leakage at 25 Pascals, or*
- *50% reduction of existing airflow leakage or*
- per local code requirement (if meet / exceed above)

ACCEPTABLE DUCT LEAKAGE TESTING PROCEDURES

The contractor shall test using one or more of the following acceptable procedures for fulfilling the desired criteria:

Duct pressurization test at 25 Pascals

Or

For commercial buildings: airflow comparison method

Or

Hybrid Blower door / airflow measuring device subtraction

Or

Duct pressurization test referenced pressure standard by authority having jurisdiction.

DUCT PRESSURIZATION TESTS

Differential Air Totals

Blower Door Airflow Measuring Device

Airflow balance (Section 5.2)

For NEW CONSTRUCTION or addition of new ducts to an existing structure:

Residential: ±20% or ±25 CFM of design / application requirements for supply and return ducts

Commercial: ±10% or ±25 CFM of design / application requirements for supply and return ducts

Or

Airflow balance (Section 5.2)

For EXISTING CONSTRUCTION without contractor modification of existing ductwork: No additional ACCA QI requirements apply.

Or

For NEW or EXISTING CONSTRUCTION the airflow balance is per local code or authority having jurisdiction.

ACCEPTABLE PROCEDURES FOR AIR BALANCING

a) Airflow Measuring Device (AMD) used per specifications from the AM manufacturer.
   [Commonly referred to as flow hood™, Shortridge or Balometer™ Alnor (trade marked names).]

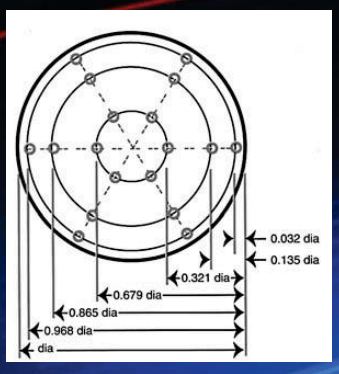
b) Duct Traverse with Pitot tube and manometer per procedures specified by ACCA, AABC, ASHRAE, NEBB, SMACNA, or TABB.

c) Measure average flow using an anemometer (hot wire, rotary) per specifications from the test equipment manufacturer.

Airflow Measuring Device AMD used per specifications from the AMD manufacturer.

Traverse with a Manometer

Traverse with Anemometer



Hydronic Balance (Section 5.3)

a) For NEW CONSTRUCTION, or addition of new piping to an existing HVAC system, the water flow to individual room or zone heat exchangers are within ± 10% of the design/application GPM requirements,

Or

b) For EXISTING CONSTRUCTION without contractor modification of existing piping: No additional ACCA QI requirements apply.

Or

c) For NEW OR EXISTING CONSTRUCTION the room/zone hydronic balance is per local code or authority having jurisdiction.

Acceptable Procedures for Hydronic balancing

a) Manometer and probe used per instructions from the instrument manufacturer

Or

b) Ultrasonic/Doppler flow meter used per instructions from the instrument manufacturer

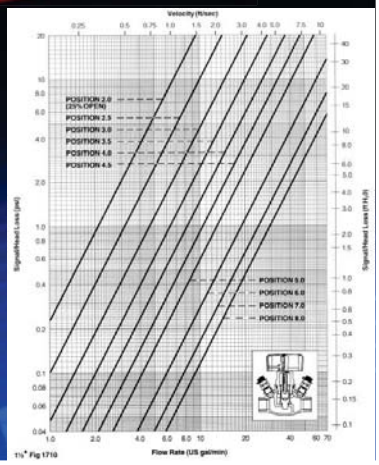
Or

c) Pressure gage used per instructions from the instrument manufacturer

Or

d) Procedures specified by OEM

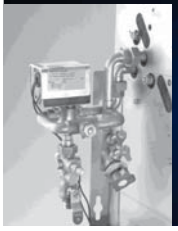
Manometer and Probe



Ultrasonic/Doppler Meter Per OEM Instructions

Pressure Gauge Used Per Instructions

Water Pressure Drop (in feet @ 180°F)			
GPM	COIL A	COIL B	COIL C
2	0.4	0.4	0.5
4	1.4	1.6	1.7
6	3.0	3.3	3.7
8	5.2	5.7	6.3
10	7.9	8.7	9.6



Procedures Specified by OEM

This leaves options open for innovation and built in water flow diagnostic tools

SYSTEM DOCUMENTATION and OWNER EDUCATION ASPECTS
(Section 6)

6.1: Proper System Documentation to the owner

The contractor shall document the HVAC installation as well as the operation and maintenance to be preformed.

SYSTEM DOCUMENTATION and OWNER EDUCATION ASPECTS
(Section 6)

6.2: Owner/Operator Education

The contractor shall inform the customer on how to both operate and maintain the installed equipment and will promote system maintenance to aid in the continuing performance of installed equipment.

System Documentation & Owner Education Elements

- Placing copies of pertinent system documentation with the customer:
  - Installation
  - Operation
  - Maintenance
  - Warranties, guarantees, etc.
  - As relevant to the HVAC activity undertaken
- Owner / operator education on pertinent operation and maintenance issues.

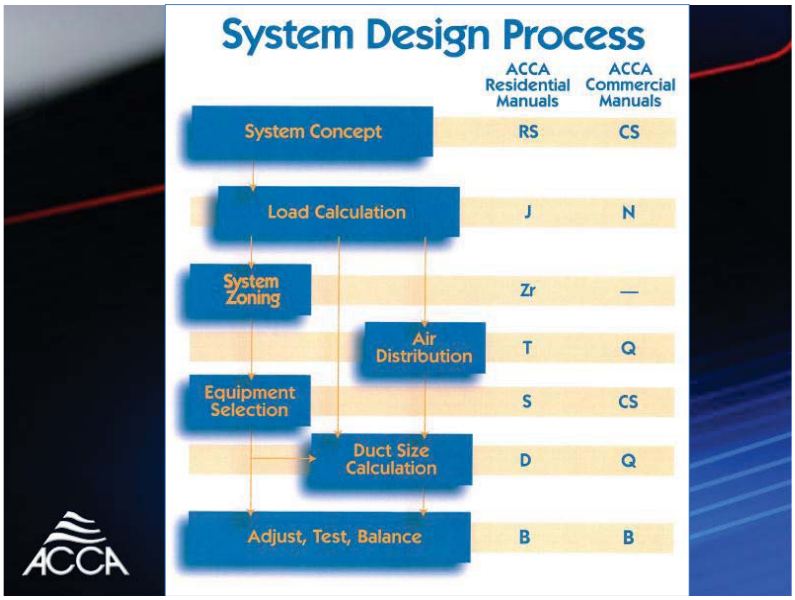
Other QI Related Stuff

ACCA Design Process Overview

Code Requirements Related to ACCA's Standards and Manuals

Supporting Guidelines and Manuals

Supporting Efforts



OVERVIEW OF CODE REFERENCES TO ACCA MANUALS

	CODES	CODE BOOKS			
		Current Edition	Publishing Cycle	ACCA Library	2012 Edition Contains Reference(s) to ACCA Manual(s)
IAPMO	Uniform Mechanical Code (UMC)	2012	every 3 years	2000 2003 2006 2009 2012	YES [J, D, N, Q, B, 4 QM]
ICC	Int'l Energy Conservation Code (IECC)	2012	every 3 years	2000 2003 2006 2012	YES [J, S – RE: IRC §M1401.3]
ICC	Int'l Fuel Gas Code (IFGC)	2012	every 3 years	2000 2006 2012	NONE
ICC	Int'l Mechanical Code (IMC)	2012	every 3 years	2000 2006 2009 2012	YES [Manual D]
ICC	Int'l Residential Code (IRC)	2012	every 3 years	2000 2003 2006 2009 2012	YES [J, S, D]
ICC	Int'l Building Code (IBC)	2012	every 3 years	No 2012	YES [Manual D, RE: IBC §M2801]

DETAILED CODE REFERENCES TO ACCA MANUALS

Code Body	Code	Edition	ACCA Reference	Code Statement
International Association of Plumbing and Mechanical Officials	Uniform Mechanical Code	2012	2012 UMC §1106.1 [Manual J8 Residential Load Calculation-8th Ed.] 2012 UMC §1106.1 [Manual N Commercial Load Calculations] 2012 UMC §601.2 [Manual D Residential Duct Systems] 2012 UMC §601.2 [Manual Q Low Pressure Low Velocity Duct Systems Design]	1106.1 Human Comfort (GENERAL REQUIREMENTS): Cooling equipment used for human comfort in *dwelling units* shall be sized to satisfy the calculated loads determined in accordance with the reference standards in Chapter 17, or other approved methods. 601.2 Sizing Requirements (DUCT SYSTEMS): Duct systems used with blower-type equipment that are portions of a heating, cooling, absorption, evaporative cooling, or outdoor-air ventilation system shall be sized in accordance with Chapter 17, or by other approved methods". **Chapter 17 Standards | Table 17-1 Standards for Equipment and Materials** - RESIDENTIAL LOAD CALCULATION, ACCA MANUAL J 2006 - RESIDENTIAL DUCT SYSTEMS, ACCA MANUAL D 2009 - COMMERCIAL LOAD CALCULATION, ACCA MANUAL N 2008 - LOW PRESSURE LOW VELOCITY DUCT SYSTEM DESIGN, ACCA MANUAL Q 2003 - BALANCING AND TESTING AIR AND HYDRONIC SYSTEMS, ACCA MANUAL B 2009 - MAINTENANCE OF RESIDENTIAL HVAC SYSTEMS, ACCA 4 QM-2007

DETAILED CODE REFERENCES TO ACCA MANUALS

Code Body	Code	Edition	ACCA Reference	Code Statement
International Code Council	International Residential Code	2009	{2012 IRC §M1401.3} [Manual J Residential Load Calculation – 8th Ed.] {2012 IRC §M1401.3} {Manual S Residential Equipment Selection} {2012 IRC §M1601.1} [Manual D Residential Duct Systems]	**M1401.3** – Sizing: Heating and cooling equipment shall be sized in accordance with **ACCA Manual S** based on building loads calculated in accordance with **ACCA Manual J** or other approved heating and *cooling calculation methodologies*. **M1601.1** – Duct Design: Duct systems serving heating, cooling and ventilation equipment shall be fabricated in accordance with the provisions of this section and **ACCA Manual D** or other approved methods. **M1602.2** – Prohibited Sources: Outside or return air for a forced-air heating or cooling system shall not be taken from the following locations: … 3. A room or space, the volume of which is less than 25 percent … Where connected by a permanent opening having an area sized in accordance with **ACCA Manual D**, adjoining rooms…
	International Energy Conservation Code	2009	2012 IECC §*403.6 and §404.6.1.2* [Manual J8 Residential Load Calculation-8th Ed.] {2012 IRC §M1401.3} [Manual S Residential Equipment Selection]	**403.6** Equipment sizing: Heating and cooling equipment shall be sized in accordance with Section 1401.3 of the *International Residential Code*. **(Manual J and S)** **404.6.1.2** Calculation software tools: Calculation of whole-building (as a single) sizing for the heating and cooling equipment in the standard reference design residence in accordance with Section 1401.3 of the *International Residential Code*. **(Manual J and S)**
	International Mechanical Code	2009	2012 IMC §603.2 [Manual D Residential Duct Systems]	**603.2** Duct Sizing Ducts installed within a single dwelling unit shall be sized in accordance with **ACCA Manual D** or other approved methods.
	International Building Code	2009	2012 IBC §2801.1 [Manual J8 Residential Load Calculation-8th Ed.] 2012 IBC §2801.1 [Manual D Residential Duct Systems] 2012 IBC §2801.1 [Manual S Residential Equipment Selection]	**2801.1** Scope. Mechanical appliances, equipment and systems shall be constructed, installed and maintained in accordance with the International Mechanical Code and the International Fuel Gas Code.

Technician's Guide

- Tool Guide
- Explains procedures
- Offers sample forms

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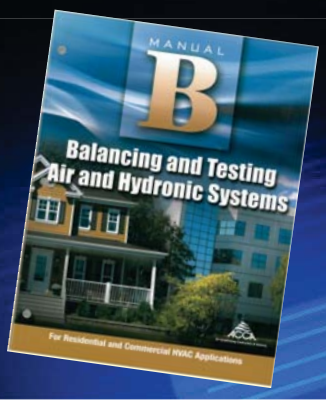
Manual B Balancing and Testing Air and Hydronic Systems



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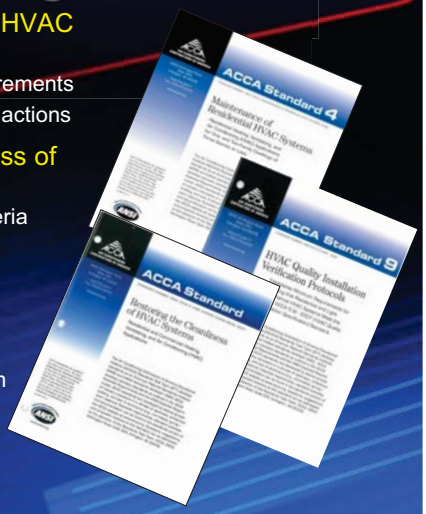
Other Supporting Efforts …

Maintenance of Residential HVAC Systems
- Minimum inspection requirements
- Recommended corrective actions

Restoring System Cleanliness of HVAC Systems
- Establishes Cleaning Criteria
- Restoration Protocols
- Post Cleaning Verification

HVAC Quality Installation Verification Protocols
- Instructions for QI program implementers



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Related ACCA Programs…

ACCA's Quality Assured Programs Based on:

ANSI/ACCA 12 QH -2011

Existing Home Evaluation and Performance Improvement

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Questions

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Answers