



# Residential Quality HVAC Installation

*You Should Get What You Paid For*

The checklist below will assist you in evaluating the capabilities of different HVAC companies and the proposals they submit. The questions on the checklist will help you understand the requirements contained within a nationally-recognized HVAC quality installation standard, and the explanations detail “what’s in it for you.” If you seek value, rate your contractor – before you rate the price. For a free PDF copy of the ACCA *HVAC Quality Installation Specification*, visit [www.acca.org/tech](http://www.acca.org/tech).

### SUGGESTED RATING PROCEDURE

Use this checklist to rate your contractor, or to select between two or more contractors. **Each question is worth one point** unless the “*Explanation*” column recommends an additional point. After evaluating the contractors, add the contractor’s points, and then divide their total points into their total price. As an example for three bids:

1. Contractor A received 6 points and had the lowest total price – \$6,000 to replace the equipment.
2. Contractor B received 20 points, with the most expensive price – \$15,000 to replace the equipment, replace some under-sized ducts, and seal the leaky ducts.
3. Contractor C received 15 points, and had a high price – \$12,500 to replace the equipment and seal the leaky ducts.

This analysis method portrays the relative cost for each point of quality:

- Contractor A is \$1,000 per point ( $\$6,000 \div 6 \text{ pts} = \$1,000$ ),
- Contractor B is \$750 per point ( $\$15,000 \div 20 \text{ pts} = \$750$ ), and
- Contractor C is \$833 per point ( $\$12,500 \div 15 \text{ pts} = \$833$ ).

Based on point totals, Contractor B most closely follows the QI elements and uses business practices which meet your needs and offers the most value for your money (e.g., lowest \$ per point). The price difference between Contractors B and C is \$2,500. This is a lot of money, but for new equipment and repairs that could last for decades, the expense may be justified.

QUALITY INSTALLATION CHECKLIST			Contractor QI Score Card		
	QI Elements Question	Explanation	Contractor 1	Contractor 2	Contractor 3
Before Installation	Did the contractor review the load calculation for your home with you?	To install the right size unit, contractors need to know the home’s heating and cooling requirements, based on a variety of factors (e.g., size of the home, type of windows, insulation amounts, etc.). Determining heating/ cooling loads based on the building’s square footage is inaccurate and inadequate. Also, basing replacement equipment on the size of the original system could lead to problems since the original equipment size may have been incorrect. <i>(Two points for a room-by-room *load calculation.)</i>			
	Did the contractor review the manufacturers’ performance data with you to demonstrate why the unit you’re buying is the right size?	The load calculation (from Question 1) guides proper equipment selection. A unit that is too big (oversized) may have a higher upfront cost, raise your utility costs, remove less humidity, and fail more quickly. <i>(Two points for providing the *Manufacturers’ performance data.)</i>			
	Did the contractor present proof that the system will deliver the specified efficiency based on AHRI certification?	Equipment which has not been tested by an independent organization or is not designed to work together (see <i>*Certified match system</i> ) may not deliver the promised high efficiency performance.			

\*Underlined text has more explanation under *Key Terms* on page 4.

	Did the contractor review the condition of your duct system with you? (Does not apply to boilers)	Leaky ducts can cause health problems and waste energy. Also, if the ducts are too small they will cause the HVAC system to use more energy and/or deliver less comfort. Small ducts may also lead to early equipment failure.			
	Did the contractor review the condition of your current furnace's or boiler's venting system with you? (Does not apply to A/C or heat pumps)	When fossil fuel is consumed, combustion gases are produced. If these silent threats are not removed by the vent system, you could suffer grave health problems. Note: Other gas appliances (e.g., clothes dryer, water heater, etc.) also need proper venting.			
<b>During Installation</b>	Will the contractor measure and document the airflow? (Does not apply to boilers)	Air is the first word in "air conditioning" – for heating or cooling. If the furnace, air conditioner, or heat pump does not have the proper amount of airflow, the unit will waste energy, may create health and safety problems, fail to keep you comfortable, and may cause the unit to fail more quickly.			
	Will the contractor measure the refrigerant charge? (Does not apply to furnaces or boilers)	If the refrigerant charge is not within the tolerance of the QI standard, then the unit cannot deliver the full energy savings and system performance.			
	Will the contractor ensure the unit is safe electrically?	The fuses and circuit breakers must be correct for the unit being installed. Sometimes new equipment has different requirements than the system being replaced.			
	Will the contractor test the firing rate of the new furnace or boiler? (Does not apply to A/C or heat pumps)	The contractor needs to measure, and possibly adjust, the firing rate to ensure proper operation. ( <i>Two points for performing a <u>Combustion analysis</u>.</i> )			
	Will the contractor test the venting system for the new furnace or boiler? (Does not apply to A/C or heat pumps)	The contractor needs to verify that all of the combustion gases are vented outside your home. ( <i>Two points for providing a carbon monoxide test- see <u>Vent system</u>.</i> )			
	Will the contractor test the thermostat?	The contractor needs to ensure that the unit operates properly in all modes and that the thermostat is fully compatible with the new equipment.			
	If ducts are to be repaired, did the contractor state how they will measure the duct leakage after the repairs?	The contractor needs to test to be sure the warm and cool air you are paying for is staying in your home and not escaping into unconditioned spaces. This is especially important when ducts are located in the attic or crawlspace.			
	Will the contractor test the amount of air going into each room?	The contractor needs to measure the conditioned air flowing into each room to ensure that each room receives the appropriate amount.			
	<b>After Installation</b>	Will the contractor provide a copy of the installation checklist with a record of all measurements taken during installation?	These benchmark measurements will be used by future technicians to ensure that the equipment continues to perform as it should.		
Will the contractor provide a copy of the owner's manuals, manufacturer's warranty, and their warranty?		These documents provide valuable information for warranties, future maintenance, or repairs. You should know what the manufacturer and the installing company will do in the event of a problem.			
Will the contractor provide a copy of the recommended maintenance requirements for the new equipment?		If a maintenance program is offered, it should inform you of the components inspected, time frames for inspection, and other factors involved. These requirements are explained in the national standard for residential HVAC maintenance ( <i>ANSI/ACCA 4 Maintenance of Residential HVAC Systems</i> ).			
<b>Contractor's QI Score</b>					

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Other Variables to Consider When Purchasing an HVAC System			Contractor 1	Contractor 2	Contractor 3
Contractor Qualities and Considerations	References?	Contractors who enjoy a good reputation have worked very hard to earn it and keep it. References from friends, neighbors, and the Better Business Bureau are indicators that the contractor will say what he does, and does what he says. A list of references is a good sign. Call them!			
	Technician skill level?	Contractors who employ NATE™ certified technicians are providing you with the highest level of recognized talent.			
	Is Energy Star® equipment offered?	High efficiency equipment will lower your utility costs if the system is installed correctly. Consider equipment which meets EnergyStar® minimum requirements.			
	Maintenance program offered?	Routine maintenance ensures that the HVAC system continues to work properly, and it can identify some problems before the system fails.			
	Professional business?	Contractors should provide proof of applicable business documents: mechanical license, business license, insurance, and bonding.			
	Professional memberships and continuing education?	Good contractors make a concerted effort to continue the learning process. They join professional associations, read professional journals, and enroll in industry-oriented training.			
	Proper permits?	Legal installations provide the homeowner with recourse and may potentially reduce headaches upon future sale of the property.			
<b>Contractor's Other Qualities and Considerations Score</b>					

Contractor's Price			Contractor 1	Contractor 2	Contractor 3
Value	Installation replacement costs	Total price to have the new system designed, installed, and tested in accordance with the Quality Installation Specification.			
	Point Score	The contractors' price divided by their total number of points earned.			

### USING THE CHECKLIST

Installation cost is usually the primary factor for many consumers when replacing their HVAC system. However, how can you best assess the benefits of your new heating and cooling system – when installation costs are but one variable in the total value equation? Will problem areas (rooms too hot or cold) be addressed? Will the equipment operate in an energy-efficient manner? There are many considerations to be addressed when discerning a contractor's skills, evaluating their proposals, and ensuring you get the value you pay for.

The “*QI Elements Questions*” provide guidance that will help you differentiate the capabilities and services of each contractor. Each “*Explanation*” portion conveys the benefit you will receive from the element and identifies the typical tasks the contractor will perform. The columns to the right of the explanation are for recording your score. Following the list of QI elements are some business related variables which may affect your selection of a contractor. This secondary list is not meant to be exhaustive, but to suggest other items for consideration.

Some of the steps in the Checklist apply to all installations, while others are specific to certain appliances:

- Questions that exclude air conditioners or heat pumps will state, “Does not apply to A/C or heat pumps”.
- Questions that exclude fossil fuel appliances like furnaces and boilers will state, “Does not apply to furnaces or boilers”.
- Questions that exclude boilers will state, “Does not apply to boilers”.

The shaded column to the left of the checklist indicates approximately when each task should be performed. Because some tasks must be evaluated before they occur, you should have the contractor's intent to perform these functions in writing. Most contractors want to do quality work, but contractors who document their intent generally fulfill it as well.

### THE QI SPECIFICATION

Experts from across the HVAC industry identified and refined the core elements required for a quality HVAC installation. The result is a nationally-recognized, industry-approved standard (ANSI/ACCA *HVAC Quality Installation Specification*) that documents these industry requirements. The QI standard focuses on the actual installation (e.g., how well the equipment is selected and installed) and can be used by consumers to select a contractor. For a free PDF copy of the QI standard visit [www.acca.org/quality](http://www.acca.org/quality).

## KEY TERMS

Load calculation: Building load calculations consider a variety of issues: location (Boston's weather is different than that of Los Angeles), orientation (southwest glass gets much more sun than north glass), construction materials (R-value of insulation, brick or siding, etc.), building size, etc. Heating and cooling needs are expressed in British Thermal Units per hour or Btu/h. A "block load" looks at the whole building's requirements as one large room. A "room-by-room" load calculation refines the calculation to determine individual room's or zone's requirements.

Ton (of air conditioning): A "ton" of air conditioning refers to capacity in relation to melting one ton of ice in 24 hours. The capacity is measured in British Thermal Units (Btu); 288,000 Btu are required to melt one ton of ice in 24-hours (or 12,000 Btu/hr). A 2-ton air conditioner has a nominal capacity of about 24,000 Btu/h.

Manufacturer's performance data: This is information provided by the manufacturer to specify the capacity for a particular model. You may hear cooling terms like 2-ton or 3.5-ton. These are nominal capacities at standard rating points. For heating systems, the Btu/h are expressed by how much heating capacity goes *into* the furnace (i.e., an 80% efficient, 80,000 Btu/h furnace receives enough fuel to create 64,000 Btu/h of output heat).

Equipment selection: Equipment is manufactured to meet standardized performance requirements. Manufacturers publish *expanded* performance data that details how the equipment performs at actual operating conditions. Applying the manufacturer's performance data to your home's load is essential to saving energy with the right unit.

Efficiency: Performance descriptors for cooling are Seasonal Energy Efficiency Ratio (SEER) and Energy Efficiency Ratio (EER). Heating application descriptors are Coefficient of Performance (COP) and Heating Seasonal Performance Factor (HSPF). These are determined under laboratory conditions.

Certified matched system: The Air Conditioning, Heating, and Refrigeration Institute (AHRI; [www.ahrinet.org](http://www.ahrinet.org)) puts heating and cooling equipment through rigorous certification processes to ensure systems deliver the promised performance at certain test conditions.

Combustion analysis: When fossil fuels are used to heat a home, furnaces and boilers should be adjusted to ensure that they are efficiently consuming fuel and that they have sufficient oxygen to properly combust the fuel. A combustion analysis test, with a properly calibrated meter, is an optimal approach to verify the combustion rate.

Vent system: When fossil fuels are used to heat a home they produce carbon monoxide (CO). Your contractor will verify that the vent piping is the correct size and properly installed. A CO test is supplemental to ensure that the furnace or boiler is venting properly, exhausting all of the harmful gases away from the occupants.

## HELP FINDING ACCA CONTRACTORS

If you are in need of a contractor, ACCA has a contractor locator on its web site [www.acca.org](http://www.acca.org). You simply enter your zip code and the locator will list all the ACCA member contractors in your area. You can specify the type of work you want done and the level of expertise: residential, commercial, etc. You can expand your search from 10 to 100 miles of the zip code you entered. You may see these identifying symbols associated with the contractor's name:



NATE: The North American Technician Excellence patch signifies that the contractor employs technicians, some or all of whom have passed this national certification. NATE is recognized and endorsed by ACCA, equipment manufacturers, and other industry organizations. Technicians who wear the NATE patch, or present a NATE card, have passed a rigorous written test for technical knowledge.



Energy Star: Installed per the QI standard, these high-efficiency heating and cooling units save additional heating and cooling costs over the baseline equipment sold today.