Best Practices for Residential Heating & Cooling Load Calculation Requirements

2012 IECC Section 403.6 – states that heating and cooling equipment shall be sized in accordance with ACCA Manual S based on building loads in accordance with ACCA Manual J or other approved heating and cooling calculation methodologies.

Mechanical systems in residential construction are commonly oversized which increases installation costs, wastes energy, and reduces comfort and moisture control. Properly sized equipment will last longer, provide greater comfort, reduce noise, and save homeowners money. Yet builders and code officials are uncertain as to how to evaluate such calculations to make sure they meet the intent of the code and the sizing methodology approved in the Air Conditioning Contractors of America (ACCA) Manual J (or equivalent).

The ACCA sizing methodology has sufficient built-in safety factors to accommodate most conditioning needs. Therefore, it is important to follow all instructions in Manual J, use precise area measurements, and specific data. Heating and cooling loads can be determined using a whole-house approach, or by performing a room-by-room load calculation. The room-by-room approach provides the information needed to determine the number of cubic feet per minute (cfm) of conditioned air needed to satisfy the heating and cooling load for the room. This information can, then, be used to determine the duct size necessary to deliver heating and cooling for the space.

The IECC regulates the indoor design temperature for use in performing load calculations. The IECC specifies that the maximum heating indoor temperature shall be 72°F, and the minimum cooling temperature shall be 75°F.

Table IA of ACCA Manual J requires that the outdoor winter and summer design temperatures be based on the 99 percent value for winter, and 1 percent value for summer. Table is attached. To select the appropriate system, based on the heating and cooling load calculations, IRC Section M1401.3 requires that ACCA Manual S be used to size equipment. Excessively oversized equipment causes short-cycling, and creates unnecessary stress on the equipment. Also, larger systems require larger duct sizes, increasing the installation cost. In areas where humidity is an issue, an oversized system will degrade the humidity control. A properly sized system will run almost continuously at design conditions, and provide the proper level of dehumidification during the cooling season.

Plan Review:

1. Verify that the correct outdoor design temperatures are used for the heating and cooling load calculations, and that they are consistent with values in Table 1A of ACCA Manual J.
2. Verify that the correct indoor design temperatures are used based on IECC Section 302.1 of the 2012 IECC which list "The interior design temperature used for heating and cooling load calculations shall be a maximum of 72 degrees F for heating and minimum of 75 degrees f for cooling.
3. Verify that the building geometry and glass area match what is shown on the plans and compliance documentation. Glazing orientation is important to verify for cooling load calculations but has no effect on heat loss calculations.

4. Verify that the levels of efficiency shown in the load calculations are consistent with the energy code compliance documentation. Insulation R-values and glazing U-factor are important to confirm.
5. Verify that the make, model number, and equipment size is specified on the plans or compliance.

Field Inspection:

1. Verify the make and model numbers for the heating and cooling systems installed for the building, and compare that to system specified on the building plans or documentation.
2. Verify that the system has the same output capacity, and the same level of efficiency as specified in the plans (If a different system is specified).
3. Require the responsible party to verify that the systems installed comply with the IECC (If a larger system, or an additional system, is installed).
4. Verify that the efficiency levels of insulation and windows (U-factors and SHGC) meet or exceed the levels that are called out on the plans or documentation. Levels that are too low can cause the system to be undersized. If cooling is installed, verify that the glazing area and orientation is installed per the approved building plans.
5. Verify that the energy features of the house are installed by the manufacturers' installation instructions.
6. Verify that the refrigerant charge level was tested by the installer.