



Austin Energy Green Building Manual J Inputs

For Single-Family Homes in Austin, TX

greenbuilding@austinenergy.com

The International Energy Conservation Code and Mechanical Code require that cooling equipment be sized by a Manual J or other approved calculation.

Manual J is the sizing methodology developed by the Air Conditioning Contractors of America (ACCA).

Manual J Reports must be submitted to Austin Energy Green Building before the start of construction to ensure that equipment will meet Program requirements. All detailed loads must be submitted, including the brand, model name and number of selected equipment. Summary reports will not be accepted since they cannot be reviewed for accuracy.

The sizing calculation must be based on actual design, specifications and orientation of a project, appropriate climate data, and other correct inputs.

The following items address common input questions.

The information herein is based on ACCA's Manual J and ASHRAE *Handbook of Fundamentals*.

- **Orientation**

Use the actual orientation of the structure, for which loads are being calculated, not worst case. (Depending on the design, a change in orientation can increase cooling loads by a ton or more.)

- **Design temperatures**

- Indoor design temperature: 72^o for heating; 75^o for cooling (IECC)
- Outdoor dry bulb design temperatures: 28^o winter; 99^o summer (ASHRAE .4 method)

- **Construction quality**

Measure of the air infiltration rate through the thermal envelope (not a measure of ventilation)

- New conventional construction: "semi-tight" or "average"
- New alternative construction (e.g. SIPs, ICFs): "tight" or "best"
- Older conventional construction: actual infiltration rate as determined by blower door test, or estimated, based on age and condition

- **Sensible Heat Ratio (SHR)**

Appropriate for Austin conditions: 0.75 (Note: software may have default SHR of 0.70.)

- **Mechanical ventilation and occupant loads**

Manual J calculates a mechanical ventilation rate based on the size of the house, the infiltration rate, and number of occupants.

- **If no mechanical ventilation system is installed**, this number should be "0". (Intermittent operation of exhaust fans is accounted for in the air-infiltration rate and is not to be counted toward the ventilation load unless fans are components of a dedicated mechanical ventilation system.)
- **Total occupants**: the number of bedrooms plus one (If more occupants are anticipated, use the formula in ASHRAE 62.2-2004 to establish the appropriate ventilation rate. Do not use the Manual J software to calculate it.)
- **Total infiltration and ventilation should not exceed 0.35 ACH** (cooling air changes per hour) for new construction.

- **Duct leakage calculation**

Select "extremely" or "notably" sealed. Since duct leakage is tested and may not exceed 10% for any rated home, you can have confidence in the selection.

- **Duct gains and losses**

- **Ductwork located within the thermal envelope** (e.g. in sealed attics, insulated furred-downs, in conditioned space) should *not* have any heat gain or loss entered in the load calculations.
- **Ductwork located outside the thermal envelope** (e.g. in a vented attic) should show a heat gain or loss associated with the ductwork.
 - For 13 SEER equipment, code requires R-8 ducts, plenums and boots outside of the thermal envelope. For 14 SEER or higher equipment, R-6 plenums and boots may be used. Ducts and plenums located in the trusses between conditioned spaces may be R-4.2.
- **Location of the supply registers:** Duct gains and losses are influenced by the length/surface area of the ducts. Make sure that the Manual J inputs match the actual location of supply registers. Registers located on a wall or in the ceiling near interior walls generally require shorter ducts, resulting in smaller losses/gains for ducts outside the thermal envelope.

- **Glazing**

- Use actual **SHGC** (solar heat gain coefficient) and **U-value** for specified windows. As per code, average SHGC of all glazing shall not exceed 0.40. (Software default may be higher.)
- Include both **overhang size (projection) and separation** for all windows and doors with glazing. If gutters are specified, include them in the overhang calculation.
- Include **insect screens** for the operable portions of windows
- Include **interior shading** as appropriate. Most homeowners install and use interior window shading on most windows. The Green Building Program recommends calculating loads with 50% interior shading on all windows. Interior shading can be excluded from windows that are specifically designed to provide daylighting.

- **Calculating the effect of walls, floors and ceilings**

Use all relevant specified materials in calculating loads – e.g., color of roofing; wall structure (frame or mass); kind, thickness and location of insulation. Code requires a roof radiant barrier unless the roof is reflective metal or tile, or unless the ducts and mechanical equipment are within the thermal envelope.

The *type* of wall, ceiling, or floor has a big influence on heat gains/losses. Walls adjacent to garages or other unconditioned spaces (partition walls) will have smaller loads than exterior walls—the same is true for living space above a garage. In homes with a sealed attic containing the HVAC system, ceiling loads will be comparable to those in a home with a conditioned attic.

- **Internal loads (other than occupants)**

Internal loads depend on the size of the home and the appliances, equipment and lighting within it. A reasonable range for an average home is 1600 to 3000 sensible Btu/h. Building Science Corporation (www.buildingscience.com) recommends one appliance (600 Btu/h) in the laundry and two (for a total of 1200 Btu/h) in the kitchen. If there is a family activity or theater room, add one appliance (600 Btu/h). If one bedroom is to be used primarily as an office, add another 600 Btu/h, but consider reducing the number of occupants by one.

- **Equipment selection and sizing**

It can be difficult to closely match equipment to loads, especially in smaller structures. ACCA Quality Installation Guidelines require the following:

- Total equipment capacity between 95% and 115% of the calculated system load
- Both sensible and latent loads met

Some manufacturers' equipment can be more closely matched to the calculated loads than others.

- **Recommendations**

- Variable speed air handlers and variable-capacity compressors: lower speed for high efficiency in most cooling conditions (below 99°) and higher speed to handle temporary conditions—temperatures over 99° or high occupant loads
- Ceiling registers with curved blades for better air-distribution

Submittals

Please submit Manual J reports showing all inputs and outputs. The reports required for the two primary Manual J software programs in use are listed below.

Elite RHVAC

The figure below shows the report selection screen in RHVAC with the required reports indicated with checks in the check boxes.

Select Reports

Reports | General | Title Page | Fonts & Colors

General

Title Page

Project

Miscellaneous

Load Preview

Custom Report

AED Report

Psych. Chart

Room

Detailed Loads

Load Summary

Bar Graph

Radiant Floor

Building

Report

Pie

Bar

System

Report

Pie

Bar

Zone

Report

Pie

Bar

The RHVAC printouts will have the report titles listed below.

- Project Report
- Miscellaneous Report
- Adequate Exposure Diversity Test
- Detailed Room Loads
- System Summary Loads

Wrightsoft Right-J

The figure below shows the report selection screen in Right-J with the required reports shaded on the list.

Choose Reports

Choose one or more reports and click OK.

- Cost: Equipment Performance Bins
- Cost: Equipment Summary
- Cost: Investment Comparison Report
- Cost: Operating Cost Summary
- Cost: Sales Report
- Duct: System Summary
- Loads: AED Assessment
- Loads: Building Analysis
- Loads: Component Constructions
- Loads: Project Summary
- Loads: Short Room Summary
- Loads: Worksheet
- Loop: Circulating Pump
- Loop: Details
- Loop: Field Installation
- Loop: Summary
- Quote: Parts Order
- Quote: Parts Pull Order
- Quote: Quotation
- Radiant Heating: Design Summary

The Right-J printouts will have the report titles listed below.

- AED Assessment
- Building Analysis
- Component Constructions
- Project Summary
- Right-J8 Worksheet