

Verifying ACCA Manual J® Procedures

MANUAL J Residential Load Calculation



Includes
load
calculation
checklist



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The Air Conditioning Contractors of America (ACCA) is dedicated to excellence in the heating, ventilation, air conditioning and refrigeration (HVACR) industry. As the largest HVACR contractors organization, ACCA is committed to helping its members succeed. Some of the fundamental ways in which these efforts are seen, are in the technical resources and industry standards that guarantee quality HVACR design, installation and maintenance.

Sponsoring the ACCA Code Committee

The ACCA Code Committee was formed to address code issues and, in particular, to advise and assist ACCA in thoroughly representing the contractors in the code process for efforts HVACR industry. The information has been provided for members, seeking to verify that load calculations for an HVACR application have been correctly performed. For more information, contact:
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WHY ARE HEAT LOSS AND HEAT GAIN CALCULATIONS IMPORTANT

Achieving occupant satisfaction is the principal goal of any HVAC design. Primary factors impacting occupant satisfaction include: filtration, temperature and humidity control, air motion in the room, adequate ventilation, interior zoning needs and energy efficient operation. Occupant satisfaction is maximized when the heating and cooling system and equipment are the correct type and size and the air distribution system is properly designed and installed.

For residential applications, ACCA's Manual J, Eighth Edition (2007th) is the only procedure recognized by the American National Standards Institute (ANSI) and specifically required by residential building codes. Methods not based on actual construction details, nor founded on relevant physical laws and engineering principles, are unlikely to result in correct equipment sizing.

PROBLEMS WITH OVERSIZED EQUIPMENT

Oversized equipment results in marginal part load temperature control. While the temperature control at the thermostat may be satisfactory, equipment cycling may cause noticeable temperature swings in other rooms and larger temperature differences between rooms. Oversized equipment may cause degraded humidity control and increase the potential for mold growth, allergic reactions and respiratory problems. In these unfavorable conditions, occupants may experience additional discomfort and dissatisfaction. Other negative effects are higher installed costs, increased operating expenses, and increased maintenance costs. Furthermore, oversized equipment generally requires larger ducts, poses additional requirements on the power grid and may lead to more service calls.

REASONS FOR OVERSIZED EQUIPMENT

Three main reasons for oversized equipment are: (1) a guess is made on the load; (2) mistakes are made in the load calculation; (3) the equipment is selected for other unusual/extreme conditions such as abnormal temperatures or unusual occupancy loads (i.e. gatherings/parties). Other reasons include the use of inappropriate and inadequate "rules of thumb" such as "3000/ton", "400CFM/ton", or "total cooling capacity = 1.3 x sensible cooling capacity". Furthermore, seemingly trivial mistakes such as ignoring building efficiency upgrades and assuming that the original design and installation are correct, all contribute towards inappropriate equipment sizing.

MANUAL JO VERIFICATION

While it is not practical to verify every aspect of a submitted MJR calculation, it is a good practice to review key elements that indicate general integrity of the calculations i.e. the contractor has made a good faith effort to provide reasonably accurate loads.

ITEMS TO VERIFY

The key load elements, grouped in roughly decreasing levels of impact on the overall contribution to the loads, are:

IMPACT ON LOAD	H I G H	✓ Design Temperatures (Indoor and Outdoor) ✓ Windows, Glass Doors and Large Skylights (shading, overhangs, etc.) ✓ Ducts (location, leakage and duct wall R-values) ✓ Ceilings (under an attic (R-values, roof material, roof color))
	M E D I U M	✓ Small Skylights ✓ Infiltration ✓ Ventilation
	L O W	✓ Appropriately Insulated Floors ✓ Appropriately Insulated Walls ✓ Internal Gains

It is also worth noting some unusual items that also contribute to the load. These include:

- Hot Tubs
- Whirlpool Tubs
- Three-season Porches

A NOTE ON UNDERSTANDING THE DESIGN PROCESS

Manual J allows contractors to perform a load calculation on a residential building/home. Apart from the load calculation being performed, the ducts must be sized and the correct size equipment must be selected. ANSI-recognized ACCA Manual D® for duct sizing and ACCA Manual S® for residential equipment selection provide guidance here.

Acca Manual P7

Hussin A.Rothana



Acca Manual P7:

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