Making an Accurate Load Estimate

Survey

The accuracy of the load estimating procedure is only as good as the input, and the input is only as good as the survey. Protocols and guidance for making a survey are provided by Air Design Check List, in general, the effort expended on data gathering should be proportional to the effect on the bottom line of Form J1. One may not know what kind of insulation is in a metal door, but a guess is acceptable because the door is a small part of the total load. On the other hand, glass details (type of glass, number of panes, overhang, internal shade, etc.) are very important because the glass load is normally a large percentage of the total load.

Be honest and aggressive. Manual J is an engineering tool that has an inherent and appropriate factor of safety. Any attempt to add other safety factors or to manipulate the procedure may result in unacceptable performance.

Manual J Do's (Mandatory Requirements)

- Use the outdoor design conditions recommended by Manual J (unless superseded by local code).
- Use indoor conditions that are compatible with the comfort chart in Manual J (unless superseded by local code).
- Consider orientation of the structure on the site, use the actual orientation.
- Verify all construction details prior to calculating loads.
- Take full credit for documented window, glass door and skylight U-values and SHGC values.
- Take credit for overhangs (overhang adjustments shall be applied to all windows and glass doors, including purpose-built day-lighting windows).
- Take credit for internal shade (the default is a medium color blind with slats at 45 degrees or use the actual device—this applies to all vertical glass.
- Take credit for insect screens when such devices are installed or specified.
- In general, take full credit for the rated (or tested) performance of construction materials, insulation materials and construction features.
  a) As specified for new construction.
  b) As installed (verify the installation conforms to methods and materials protocols).
  c) As tested (see quality control programs for new construction, investigate existing construction)
- Take full credit for the tightness of the envelope construction.
  a) As specified by builder or code
  b) As installed (verify the installation conforms to methods and materials protocols).
  c) As tested (see quality control programs for new construction, investigate existing construction).
- Follow Manual J procedures for infiltration and ventilation procedure to evaluate the fresh air requirement.
  a) To estimate infiltration rates for heating and cooling (ignore intermittent exhaust fans).
  b) Decide on the installation of an engineered ventilation system (mandatory if the code fresh air requirement is larger than an honest estimate of the Manual J infiltration rate)
  c) Intermittent bathroom and kitchen exhaust fans are not "ventilation devices" or "ventilation systems."
- Take full credit for duct system sealing and duct insulation when such efforts are Confidently anticipated or certifiable.
  a) Use the default scenario for (untested) ducts that are reasonably sealed.
  b) Take full credit for sealing efforts that are certifiably tighter than the default scenario for sealed ducts.
  c) If the duct sealing work is deficient – seal the ducts and take credit for sealed ducts (use unsealed options to show why the sealing work is required).
- Match location as close as possible when selecting a duct load
  a) For attic locations, match roof material, roof color, use of radiant barrier and attic ventilation.
  b) For closed crawl space locations, match crawl space tightness, crawl space wall insulation and crawl space ceiling insulation.
- Match duct system geometry (radial and spider systems tend to have less surface area than extended plenum and trunk and branch systems).
- Match return system geometry (use advanced Manual J procedures when the system has more than one or two large returns or when the returns are not located close to the air handler)

Manual J Don’ts (Mandatory Requirements)

- Do not use Manual J (any version) for:
  a) Any type of commercial application (even if located in a residential structure).
  b) Large multi-family buildings or residential high rise structures.
  c) A room or space containing an indoor swimming pool or hot tub.
  d) Solar homes that have passive features.
- Do not design for record breaking (or news making) weather conditions.
- Do not add a “safety factor” to the design conditions.
- Do not design for abnormally low or high indoor temperatures or humidity conditions (unless there is a certified medical reason for doing so).
- Do not assume that there will be no internal shade on ordinary windows and glass doors (bare glass is an acceptable assumption for glass specifically installed for “day-lighting”).
- Do not fail to take credit for overhangs.
- Do not assume that the load for the worst case site orientation can be used for other orientations. (Rotating the dwelling on a site can change the cooling load by a half ton or more. Room air flow requirements change as the orientation changes. If the same design is used for any orientation, some rooms may have too much supply air and other rooms will not have enough supply air for temperature control and comfort.)
- Do not reduce known ceiling, wall or floor R-values “just to be safe.”
- Do not fail to give full credit for the builder’s effort to produce a tight envelope.
- If a local code specifies a fresh air requirement (typically an air change per hour value), do not assume the infiltration rate will satisfy this requirement and do not use the code ventilation requirement as the input value for the infiltration rate.
- Do not assume that windows and doors will be open when making the infiltration estimate
- Do not make worst case “everything is going full blast” assumptions about internal loads (all assumptions must be defensible).
- Do not add extra occupancy loads for “entertaining groups of people.”
- Do not add internal loads for special events.
- Do not arbitrarily assume that ducts are unsealed (i.e., do not assume that they are leaky).
- Do not fail to give full credit for efforts to provide tight, properly insulated ducts
- Do not apply “safety factors” during any stage of the load calculation process.
- Do not apply a safety factor to the final answer or to the equipment selection procedure.

Improper Practices

Do not use "rules-of-thumb". The idea that the required equipment capacity equals the floor area multiplied by some magic number has resulted in many customer complaints and legal actions. Heating and cooling loads depend on individual circumstances.