Manual J Do's and Don'ts

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The following guidelines are from Addendum A to ACCA Manual J® Residential Load Calculation Eighth Edition. You can read the full text of Addendum A by going to:
http://www.acca.org/tech/manualj/addenda/

Guidance for Undertaking MJ8 Calculations
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 increased first costs and unacceptable performance, especially at part load. The following items, noted in *Manual J*, are highlighted for use by
all practitioners.

MJ8 Do's (Mandatory Requirements)

- *Construction details*: Verify all construction details prior to performing *Manual J* calculations.
  - Consider orientation of the structure on the site.
    - Use the actual orientation whenever possible.
    - Use "best case - worst case" load estimates for cookie-cutter designs that may have varying
      site-orientations when built.
    - Orientation has impact on system zoning. Taking orientation into consideration ensures that the correct conditioned airflow will be delivered to each room.
  - Take full credit for insulation R-values:
    - As specified for new construction.
    - As installed (verify the installation conforms to methods and materials protocols).
    - As tested (see quality control programs for new construction, investigate existing construction)
  - Take full credit for tightness of the envelope construction.
    - As specified by builder or code.
    - As installed (verify the installation conforms to methods and materials protocols).
    - As tested (see quality control programs for new construction, investigate existing construction).
  - Follow the Manual J procedures for infiltration and ventilation
    - Use the Table 8 procedure to evaluate the fresh air requirement.
    - 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).
    - Use Worksheet E procedures to evaluate the infiltration load (based on a truthful estimate
      of the tightness of the dwelling and adjusted for pressurization or depressurization by an engineered ventilatio n system (when applicable).
    - Use Worksheet H procedures to evaluate the loads produced by the engineered ventilation
      system (when applicable).
- *Design Conditions*: Use appropriate indoor and outdoor conditions for the application.
  - Use the outdoor design conditions recommended by Table 1 of MJ8, unless superceded by

local code.

- Use indoor conditions that are compatible with the ASHRAE comfort chart (i.e., the default conditions recommended by *Manual J*), unless superceded by local code:
    - The recommended indoor dry bulb temperatures are 70°F for heating and 75°F for cooling.
    - For wet-coil climates (positive values for Table 1 Grains), the recommended indoor relative humidity (RH) is 50% for cooling.
    - For dry-coil climates (zero or negative values for Table 1 Grains), the recommended indoor RH is 45% for cooling.

• *Duct considerations*: Many items factor into accurately estimating duct gain and loss.

- Take full credit for duct system sealing and insulation when such efforts are confidently anticipated or certifiable.
    - Use the "sealed" scenario for ducts that are reasonably sealed.
    - If the duct sealing work is not so great - seal the ducts, and then use the sealed table (use the unsealed table to show why the sealing work is required). [This is a great selling tool for fixing the ducts. Putting in the properly sized (smaller) equipment will generally leave more than enough money to seal the ducts ... and still leave you looking more price competitive.]
- Match location as close as possible when selecting a duct load table.
    - For attic systems, the table -choice depends on factors related to venting, roofing material, roof color and presence of a radiant barrier.
    - For closed crawlspaces, the table -choice depends on the crawlspace wall insulation. (See MJ8, page T7-1 for a list of choices.)
- Match duct system geometry:
    - Radial and spider systems have less surface area than extended plenum and trunk and branch systems.
    - Be sure to use the adjustment factor (see MJ8, Worksheet G) for the exposed duct surface area when the actual duct system has less exposed area than the Table 7 scenario used for the duct load estimate. [Table 7 duct systems have multiple returns that do not flow more than 400 CFM of air per return. The surface area correction for a system that has one large return right at the air-handler is approximately 0.50. Such adjustment multipliers range between 0.50 and 0.90 and must be defensible. See MJ8, Page A7-5 and A7-6.]
- Use the appropriate duct wall insulation correction if the R-value of the insulation is not R-6.

• *Window considerations*: In general, take full credit for the rated (or tested) performance of glazing assemblies, construction materials, and construction features.

- Take full credit for documented window, glass door and skylight U-values and SHGC values
    - For generic fenestration, use the Appendix 10 data provided by MJ8.
    - For NFRC fenestration, use the Table 3D-1 procedures provided by MJ8.
- Take credit for bug screens when such devices are installed or specified.
- Take credit for internal shade (per MJ8 defaults and protocols, and Table 3D-4). Windows and glass doors shall be shaded by a medium blind. However, internal shades are not applicable for purpose-built day-lighting windows.
- Take credit for overhangs (per MJ8 defaults and protocols, and Table 3E-1). The overhang

adjustment shall be applied to all windows and glass doors, including purpose-built daylighting windows.

- *Other considerations (Internal loads and outdoor air loads)*
  - Use a plausible estimate for the internal gain.
    - Base such decisions on normal day-to-day and time of-day occupancies, activities and events.
    - The number of occupants should be assumed as the number of bedrooms plus one.
    - The list of household equipment (washers, dryers, etc.) and electronics (TVs, computers, etc.) shall be limited to items that are normally in use at the time of day used for the load estimate (around dinner time for the block load).
    - Use the MJ8 Table 6B diversity factors when evaluating appliance loads. (Most electrical and gas appliances do not operate continuously and when running, they rarely operate at their rated capacity.
    - If unknown, assume 500 watts for the indoor blower motor.
  - If a code or regulation does not mandate a fresh air requirement, use MJ8, Table 8 procedures to determine the outdoor air requirement for the dwelling.
  - Exclude all bath and kitchen fans from the calculation. Only engineered ventilation CFMs are to be used in the load calculation.
  - Use MJ8 procedures to evaluate the
    - Infiltration load
    - Ventilation load
- *Educate consumers*: Sit down with your customers or clients and educate them on these issues.

MJ8 Don’ts (Mandatory Requirements)

- Do not use *Manual J* for:
  - Any type of commercial application,
  - Large multi-family buildings or residential high-rise structures,
  - A room or space containing an indoor swimming pool or hot tub,
  - Earth-berm or earth-covered dwellings,
  - Solar homes that have passive features.
- Do not design for record-breaking weather conditions.
- Do not add a "safety factor" to the Table 1 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 arbitrarily assume that ducts are unsealed (i.e., do not assume that they are leaky).
- Do not assume that there will be no internal shades on ordinary windows and glass doors (bare glass is only 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. The room airflow requirements change as the orientation changes and you may not have sufficient airflow to condition the room.
- 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 use the code ventilation requirement as the infiltration rate.
- 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/or 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 use internal load assumptions that cannot be defended.
  - Do not add extra occupancy loads for "entertaining groups of people."
  - Do not add extra internal loads for special events.
  - Do not make worst case "everything is going full blast" assumptions about internal loads.
- 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.

Prohibited Practices

Do not use "rules-of-thumb." The idea that the required equipment capacity equals the floor area divided
by some magic number is absurd. Heat loss and heat gain depends on individual circumstances. Floor area to tonnage ratios for the U.S. housing stock can range from less than 500 ft_2/ton to more than 1,200
ft_2/ton. Efficient single family detached homes with a normal amount of well-distributed glass typically fall in the 700 to 1,200 ft_2/ton range. Limited exposure dwellings with concentrated glass (that produces a
time-of-day peak) may fall in the 500 to 800 ft_2/ton range. Homes with exceptional features can be all over the map in this regard. Just rotating a home and changing its' orientation exposure on the site can change the ratio by 100 to 400 ft_2/ton.

Comfort system performance is only as good as the accuracy of the heat-loss/heat-gain estimate. Efforts
to "adjust the load" to provide a "safety factor" or to produce a solution that is compatible with the ... "I have been doing it this way for 30 years"... syndrome are forbidden.

When replacing equipment, do not use the existing equipment size as the criteria for the size of the replacement equipment. (There is a high probability that the existing equipment is oversized.)