UNDERSTANDING AND USING THE HVAC DESIGN REVIEW FORM

**Load Calculation:** Manual J Abridged Edition

**Equipment Selection:** Heat Pump

The form below illustrates the Manual J Abridged Edition (AE) forms and the equipment selection process for a heat pump. The Manual JAE condenses the basic elements of the load calculation into a functional procedure to promote comprehension in students. Manual J1AE load calculations are valid however; they must meet all of the requirements on the Alternative Abridged Edition Check List (page 6).


**Figure 1:** Sample Completed HVAC System Design Review Form – Manual J Abridged Edition (AE)
Figure 2: Manual J1AE Form
Figure 3: Portion of Manual J1 AE : Worksheet B
Figure 4: Sample Heat Pump Cooling Performance Data

75°F at 50% Rh ~ 63°F Wet bulb

Figure 5: Sample Heat Pump Heating Performance Data

Correction Factors for Other Airflows

<table>
<thead>
<tr>
<th>Airflow</th>
<th>Total Capacity</th>
<th>Sensible Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>875</td>
<td>0.98</td>
</tr>
<tr>
<td>High</td>
<td>1125</td>
<td>1.02</td>
</tr>
</tbody>
</table>

Multiply rated capacity data by factor.
## Friction Rate Worksheet

### Step 1) Manufacturer’s Blower Data

External static pressure (ESP) = $0.75 \text{ IWC}$

Cfm = $1,000$

### Step 2) Component Pressure Losses (CPL)

<table>
<thead>
<tr>
<th>Component</th>
<th>Losses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct expansion refrigerant coil</td>
<td>0.18</td>
</tr>
<tr>
<td>Electric resistance heating coil</td>
<td></td>
</tr>
<tr>
<td>Hot water coil</td>
<td></td>
</tr>
<tr>
<td>Heat exchanger</td>
<td></td>
</tr>
<tr>
<td>Low efficiency filter</td>
<td></td>
</tr>
<tr>
<td>High or mid-efficiency filter</td>
<td>0.13</td>
</tr>
<tr>
<td>Electronic filter</td>
<td></td>
</tr>
<tr>
<td>Humidifier</td>
<td></td>
</tr>
<tr>
<td>Supply outlet</td>
<td>0.03</td>
</tr>
<tr>
<td>Return grille</td>
<td>0.03</td>
</tr>
<tr>
<td>Balancing damper</td>
<td>0.03</td>
</tr>
<tr>
<td>UV lights or other device</td>
<td></td>
</tr>
</tbody>
</table>

Total component losses (CPL) = 0.40 IWC

### Step 3) Available Static Pressure (ASP)

ASP = (ESP - CPL) = (0.75 - 0.40) = 0.35 IWC

### Step 4) Total Effective Length (TEL)

Supply-side TEL + Return-side TEL = (288 + 150) = 438 Feet

### Step 5) Friction Rate Design Value (FR)

FR value from friction rate chart = 0.08 IWC/100

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**Friction Rate Chart**

$FR = \frac{ASP \times 100}{TEL}$

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Figure 6: Manual D Friction Rate Worksheet
### Alternative Abridged Edition Check List

The abridged procedure was used, I have initialed next to each block to indicate this dwelling meets each criteria.

- ONLY a single family detached dwelling.
- HVAC system is a central, single-zone, constant volume system.
- NO radiant heating system.
- NO ventilation heat exchanger (ERV or HRV) or a ventilating dehumidifier.
- ONLY engineered ventilation allowed is provided by piping outdoor air to the return side of the duct system (pressurization effect on infiltration is ignored).
- The indoor design conditions are: Heating 70 °F; Cooling 75 db °F and 45%, 50% or 55% RH.
- ONLY outdoor design conditions equal to the values in Table 1A were used.
- TOTAL window area (including glass doors and skylight area) does not exceed 15 percent of the associated floor area.
- The windows are equitably distributed around all sides of the dwelling — the dwelling has sufficient exposure diversity.
- NO Low-e, tinted, reflective, or special glass (All windows, skylights, and glass doors must be clear 1-pane, 2-pane or 3-pane glass)
- ALL skylights are flat. NO skylight light shafts or internal shade.
- ALL windows’ internal shade factor is a medium-color blind with slats at 45 degrees.
- ALL U-values and SHGC values for all windows, skylights, and glass doors are from Table 3A and 3C.
- ALL purpose-built daylight windows and skylights have no internal shade.
- ALL windows and glass doors are calculated with applicable bug screen, French door, and projection adjustments.
- NO glass external sun screens.
- ALL windows and glass doors are calculated with applicable overhang adjustments.
- ALL above grade walls are wood frame walls or empty-core block walls (no metal framing, no filled core block).
- ALL exterior finish is brick, stucco, or siding.
- ONLY gypsum board was used for the interior finish.
- ALL below grade walls are empty-core block walls (board insulation; framing and blanket insulation).
- ALL framing is wood (not metal).
- ONLY a dark shingle roof over an attic, a beam ceiling or a roof-joist ceiling.
- ONLY attic or attic knee wall space (when applicable) vented to FHA standards, with no radiant barrier.
- ONLY slab floors with no edge insulation (or 3 feet of vertical insulation that covers the edge). NO insulation below basement floors slab, no sensitivity to width.
- NO insulation under floors over a closed space or on the walls of the closed space.
- Floors over a closed space are insensitive to the tightness of the closed space.
- ONLY infiltration load estimates based on Table 5A (three or four exposures, class 4 wind shielding, no blower door
- ONLY a sensible appliance load of 1,200 or 2,400 Btuh
- ONLY number of occupants is the number of bedrooms plus one.
- ONLY allowed duct systems (when applicable) are: a. installed in one horizontal plane; b. entirely in a conditioned
- ONLY one of the following duct runs were used:
  a. An attic installed radial or spider pattern supply system (supplies in room centers) and returns (large return close to air handler or return in closet door); OR
  b. A trunk and branch supply system in the attic (supplies near inside walls; return riser in floor to ceiling chase); OR
  c. A trunk and branch supply system in a closed crawl space or unconditioned basement.
- ONLY the duct leakage rate of \( R/A = 0.12 \) S.A. = 0.24 was used, unless proven by a leakage test.
- ONLY the following duct insulation: R-2, R-4, R-6, or R-8.
- ONLY blower heat adjustment is 500 Watts, if manufacturer’s performance data is not discounted for blower heat.

**Note:** The abridged edition of *Manual J* (MJ8ae) shall ONLY be used to estimate heating and cooling loads for dwellings which are totally compatible (100 percent) with this checklist and the descriptions and caveats provided by Appendix 2 and 3. The full version of *Manual J* will be used for all other scenarios.

Figure 7: Manual J Abridged Edition Checklist