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INTERNATIONAL CODE COUNCIL 2018

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# *An Overview on ACCA's Residential HVAC System Design Process*

**John D. Sedine**
Engineered Heating & Cooling, Inc.
Cedar Springs, MI

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# Presentation Overview:
# *ACCA Manual J, Manual S, Manual D*

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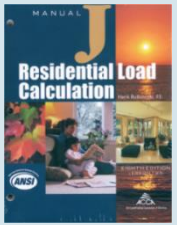
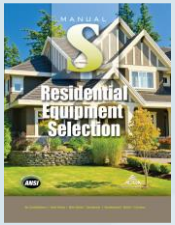
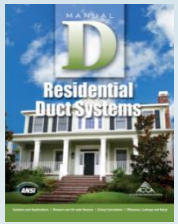
1. Provide a <u>fundamental</u> understanding on the <u>basics</u> of what it takes to do an accurate residential mechanical system design:




2. Provide verification points and caveats
   - *<u>Code officials</u>:* For the purpose of issuing a permit
   - *<u>Quality control personnel:</u>* Checking consistency/accuracy

3. Highlight relevant ACCA resources and opportunities

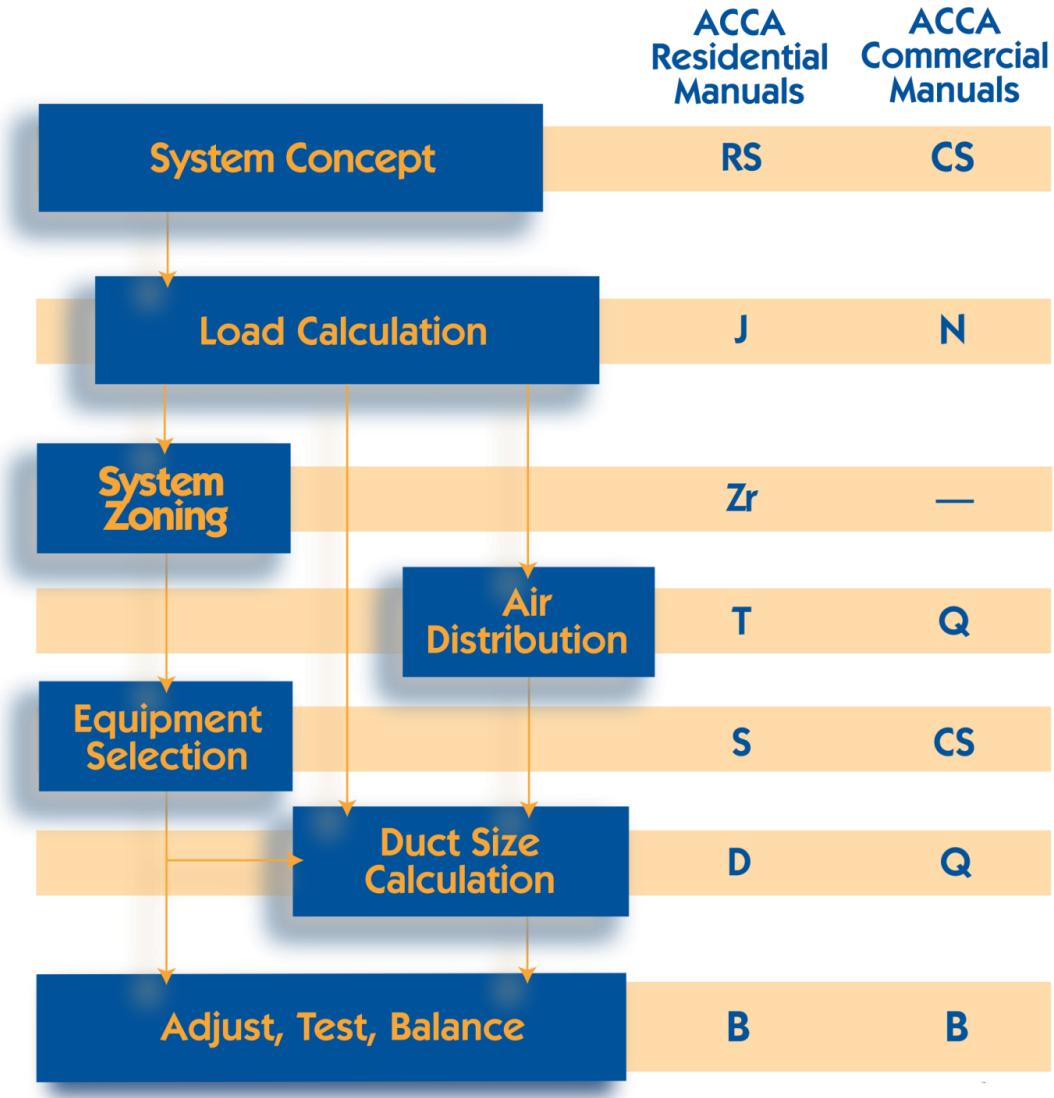
**Disclaimer:** This is NOT a design course!

# Designer's Objective

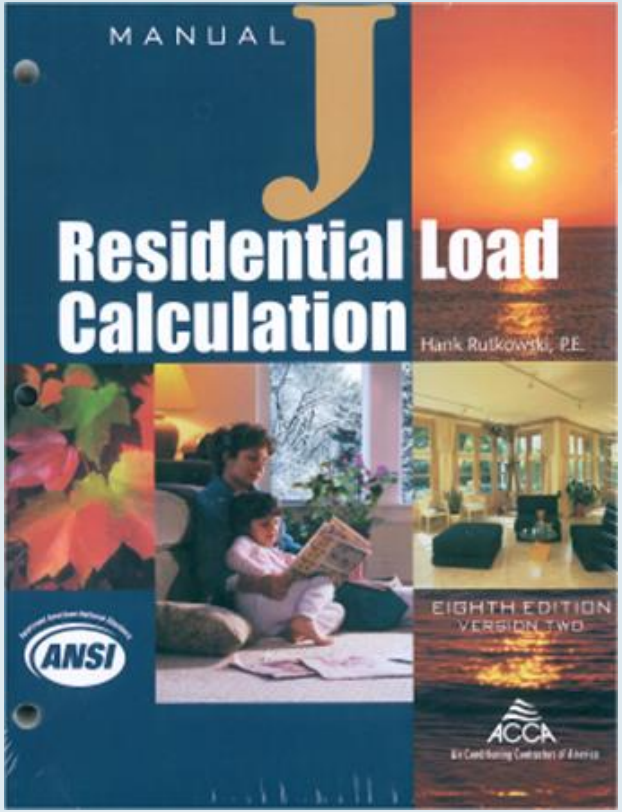
To design a mechanical system that can add (heating) or remove (cooling) heat energy at a rate (BTUs per hour) that will allow the home's indoor environment to achieve the design conditions.

This will keep occupants comfortable and safe and provide for energy-efficient operation.

# System Design Process



# Part 1 – Load Calculation

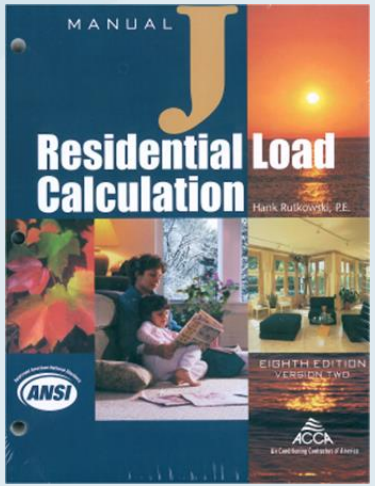


# ACCA/ANSI 2 **Manual J** - 2016

- **Standard required in:**
  - 2015 IRC §M1401.3, and
  - 2015 IECC §R403.7

- **Comprised of two sections**
  - Normative: 9 pages of text and 200 pages of tabular information that are the enforceable requirements
  - Informative: 390 pages of in depth discussion, documentation, and examples

- **Latest ANSI approval in Feb 2016**



# Load Calcs: Heat Gain / Heat Loss

## Summer

- Heat flows INTO the home
  - Sensible heat – dry heat (dry bulb; thermometer)
  - Latent heat – wet heat (wet bulb; humidity)

*Heat Gain … so we need cooling*

## Winter

- Heat flows OUT of the home
  - Sensible heat only

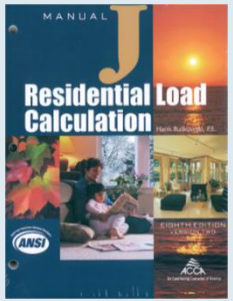
*Heat Loss … so we need heating*

Heat flow is a rate; the units are Btu/h. (Analogous to mph).

# Manual J Load Design Conditions

**Two design conditions … hence, two sets of peak loads.**

| | Outdoor Design Temp (Geographic-specific) | Indoor Design Temp |
|---|---|---|
| Heat Gain (summer) | 1% db condition | 75 F |
| Heat Loss (winter) | 99% db condition | 70 F |



# Loads That Must Be Accounted For
(as applicable to the specific home)

- **Fenestration** (windows, glass doors, skylights)
- **Opaque panels** (wood/metal doors, above & below grade walls, partition walls, ceilings, floors)
- **Infiltration**
- **Ventilation**
- **Internal** (number of people and appliances)
- **System** (ducts and blower)

# Basic Load Equation

**Load = U x A x ΔT**

**U** = the heat transfer performance index
(how well a material transfers heat; it's the reciprocal of R-value)

**A** = the Area of the surface (window, wall, ceiling, etc.)

**ΔT** = the temperature difference across the surface

**Load** units are Btu/h

# Designer Software Options

## Simple load calculation – $MJ8_{AE}$ (Abridged Edition)

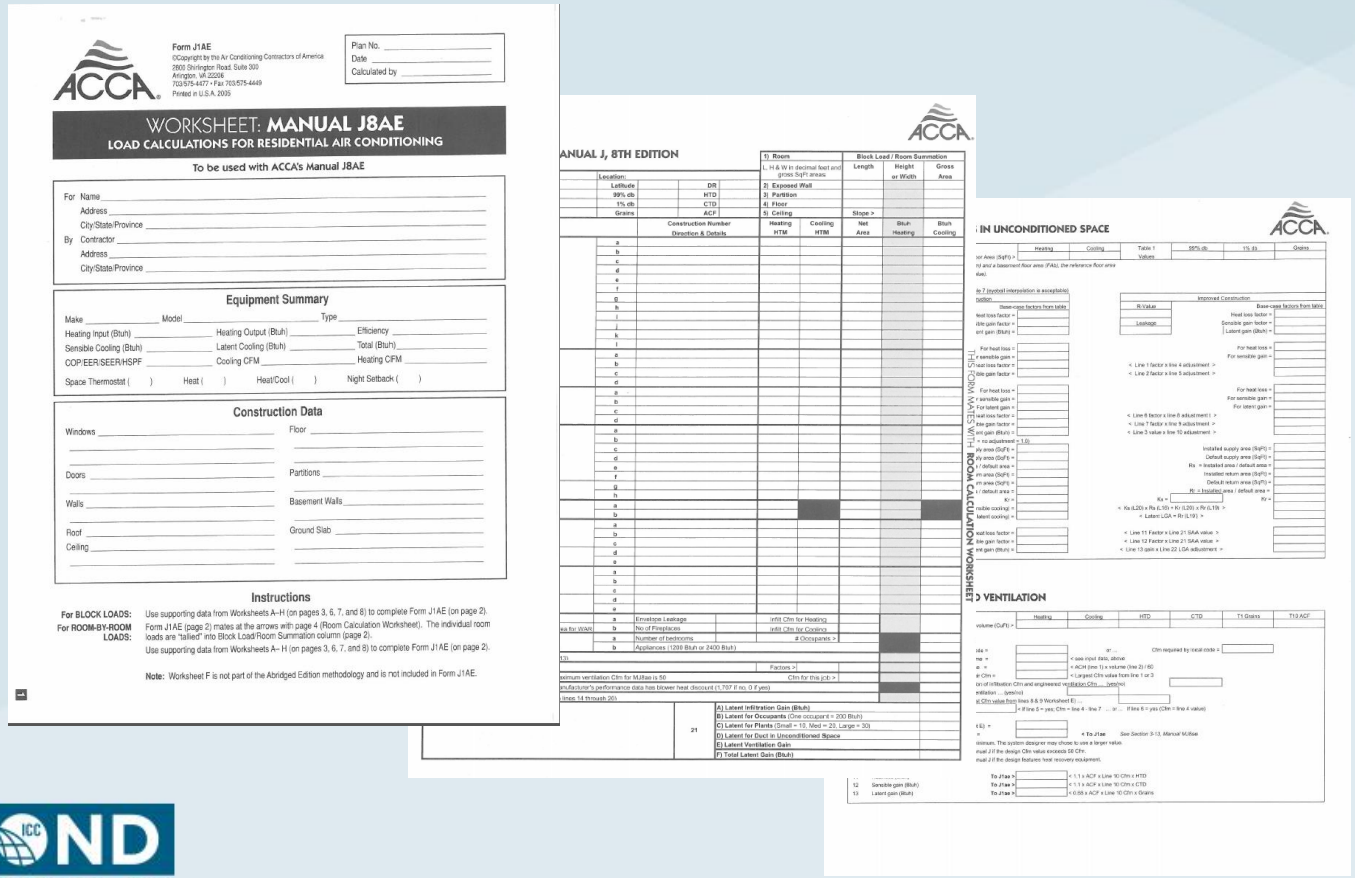
- Dwelling must be 100% compatible with AE Checklist
- Can be done by hand or using ACCA MJ8 speedsheet

## Full load calculation – Full MJ8

- Can be done by hand, but extremely time consuming
- Usually use third party software[1]

[1] ACCA vets third party software for compliance with MJ8 procedures, those that pass received “Powered by Manual J” recognition (see: http://www.acca.org/standards/approved-software)

# Manual J, Form J1$_{ae}$ (Block Load)



Form J1AE
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2800 Shirlington Road, Suite 300
Arlington, VA 22206
703/575-4477 • Fax: 703/575-4449
Printed in U.S.A. 2005

Plan No. _____
Date _____
Calculated by _____

WORKSHEET: **MANUAL J8AE**
**LOAD CALCULATIONS FOR RESIDENTIAL AIR CONDITIONING**

To be used with ACCA's Manual J8AE

For Name _____
Address _____
City/State/Province _____
By Contractor _____
Address _____
City/State/Province _____

**Equipment Summary**

Make _____ Model _____ Type _____
Heating Input (Btuh) _____ Heating Output (Btuh) _____ Efficiency _____
Sensible Cooling (Btuh) _____ Latent Cooling (Btuh) _____ Total (Btuh) _____
COP/EER/SEER/HSPF _____ Cooling CFM _____ Heating CFM _____
Space Thermostat ( ) Heat ( ) Heat/Cool ( ) Night Setback ( )

**Construction Data**

Windows _____ Floor _____
Doors _____ Partitions _____
Walls _____ Basement Walls _____
Roof _____ Ground Slab _____
Ceiling _____

**Instructions**

**For BLOCK LOADS:** Use supporting data from Worksheets A–H (on pages 3, 6, 7, and 8) to complete Form J1AE (on page 2).
**For ROOM-BY-ROOM LOADS:** Form J1AE (page 2) mates at the arrows with page 4 (Room Calculation Worksheet). The individual room loads are "tallied" into Block Load/Room Summation column (page 2).
Use supporting data from Worksheets A– H (on pages 3, 6, 7, and 8) to complete Form J1AE (on page 2).

**Note:** Worksheet F is not part of the Abridged Edition methodology and is not included in Form J1AE.

ANUAL J, 8TH EDITION

1) Room
L, H & W in decimal feet and gross SqFt areas

Block Load / Room Summation
Length | Height or Width | Gross Area

Location:
Latitude | DR
99% db | HTD
1% db | CTD
Grains | ACF

2) Exposed Wall
3) Partition
4) Floor
5) Ceiling — Slope >

Construction Number
Direction & Details

Heating HTM | Cooling HTM | Net Area | Btuh Heating | Btuh Cooling

a Envelope Leakage — Infil Cfm for Heating
b No of Fireplaces — Infil Cfm for Cooling
a Number of bedrooms — # Occupants >
b Appliances (1200 Btuh or 2400 Btuh)

Factors >

Cfm for this job >

A) Latent Infiltration Gain (Btuh)
B) Latent for Occupants (One occupant = 200 Btuh)
C) Latent for Plants (Small = 10, Med = 23, Large = 30)
D) Latent for Duct in Unconditioned Space
E) Latent Ventilation Gain
F) Total Latent Gain (Btuh)

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IN UNCONDITIONED SPACE

Heating | Cooling | Table 1 Values | 99% db | 1% db | Grains

Improved Construction
R-Value | Base-case factors from table
Leakage | Heat loss factor = | Sensible gain factor = | Latent gain (Btuh) =

For heat loss =
For sensible gain =
For latent gain =

< Line 1 factor x line 4 adjustment >
< Line 2 factor x line 5 adjustment >
< Line 6 factor x line 8 adjustment >
< Line 7 factor x line 9 adjustment >
< Line 3 value x line 10 adjustment >

Installed supply area (SqFt) =
Default supply area (SqFt) =
Installed area / default area =
Installed return area (SqFt) =
Default return area (SqFt) =
Ri = Installed area / default area =
Ki =
< Ka (L20) x Ra (L19) + Ki (L20) x Ri (L19) >
< Latent LGA + Ri (L19) >

< Line 11 Factor x Line 21 SAA value >
< Line 12 Factor x Line 21 SAA value >
< Line 13 gain x Line 22 LGA adjustment >

HEATING WATER WITH ROOM CALCULATION WORKSHEET

VENTILATION

volume (CuFt) =

Heating | Cooling | HTD | CTD | T1 Grains | T1G ACF

Cfm required by local code =

< see input data, above >
< ACH (line 1) x volume (line 2) / 60 >
< Largest Cfm value from line 1 or 3 >

< If line 5 = yes, Cfm = line 4 - line 7 ... or ... If line 6 = yes (Cfm = line 4 value) >

< To J1ae See Section 3-13, Manual N/Bse >

To J1ae > < 1.1 x ACF x Line 10 Cfm x HTD >
To J1ae > < 1.1 x ACF x Line 10 Cfm x CTD >
To J1ae > < 0.68 x ACF x Line 10 Cfm x Grains >

12 Sensible gain (Btuh)
13 Latent gain (Btuh)

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# Load Calculation
## Min. Verification Points

- **Location** (City, State)
- **Outdoor design temperatures and grains** (Why deviating from MJ8 Tables 1A or 1B?)
- **Indoor design temperatures** (75°F db cooling, 70°F db heating unless superseded by code/regulation)
- **Orientation** matches actual home or plan
- **Occupants** = number of bedrooms + 1
- Conditioned **floor area** = home or plan
- **Eave overhang** depth and **internal shading** = home or plan / default
- Number of **skylights** = home or plan
- **Sensible + latent heat gain = total heat gain**

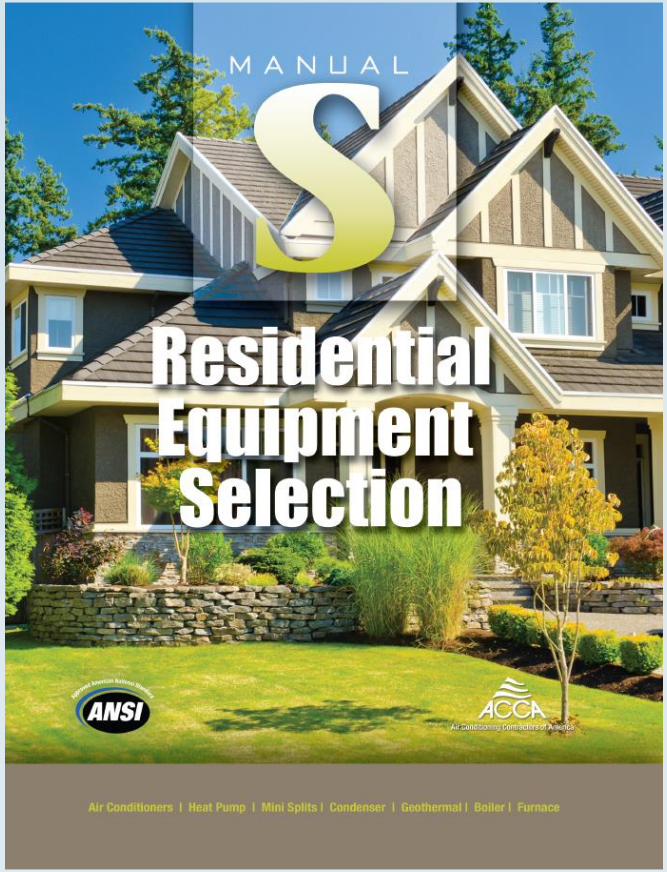
# What to Watch Out For …

**Some practitioners will try to fudge the numbers to get bigger loads:**

- Change the design temperatures (outdoor and/or indoor)
- Design to the worst case scenario (e.g., very loose house)
- Add more occupants than ‘number of bedrooms plus 1’
- Calculate duct loads even when ducts in conditioned space
- Not include window overhangs and shading
- Puff up internal loads
- Use a factor of safety

The above practices are not supported by ACCA. Manual J instructs practitioners to be thorough and reflect the ACTUAL conditions.

# Part 2 - Equipment Selection

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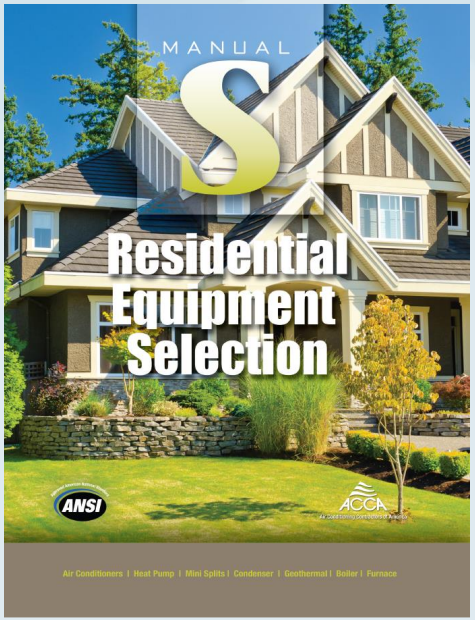
# ANSI/ACCA 3 **Manual S** - 2014

- **Standard required in:**
  - 2015 IRC §M1401.3, and
  - 2015 IECC §R403.7

- **Comprised of two sections:**
  - Normative: 22 pages of enforceable requirements
  - Informative: 270 pages of in-depth discussion, documentation, and examples

- **Latest ANSI approval in May 2014**



# Overview Equipment Selection Steps

1. **Start with sizing values**
    - MJ8 heating load:  For furnaces and boilers
    - MJ8 cooling load:  For cooling-only and heat pump units
2. **Manual S provides sizing rules**
    - Sets upper and lower limits for equipment total capacity
3. **Designer must use OEM performance data**
    - Capacity values must be for operating conditions

# Size Limits For Each Equipment Type

| Size Limits for Cooling-Only Equipment | | | |
|---|---|---|---|
| **Equipment Type** | **Single Speed** | **Two Speed** | **Variable Speed** See Note 8 |
| | **Ducted or Ductless Total Cooling Capacity** | | |
| **Air-Air** | Max = 1.15<br>Min = 0.90 | Max = 1.20<br>Min = 0.90<br>FS | Max = 1.30<br>Min = 0.90<br>RS |
| **Water-Air pipe loop system** | Max = 1.15<br>Min = 0.90 | Max = 1.20<br>Min = 0.90<br>FS | Max = 1.30<br>Min = 0.90<br>RS |
| **Water-Air open-piping system** | Max = 1.25<br>Min = 0.90 | Max = 1.30<br>Min = 0.90<br>FS | Max = 1.35<br>Min = 0.90<br>RS |
| **Zone Damper Systems** | To minimize excess air issues, zone damper systems shall have as little excess cooling capacity as possible when full-cooling capacity is compared to the ***Manual J*** block load for the space served. | | |

| Size Limits for Fossil Fuel Furnaces | | | |
|---|---|---|---|
| **Output Capacity for Heating-Only** | **Single Stage** | **Multi Stage** | **Modulate Burner** |
| | Sizing value to 1.4 x sizing value | Sizing value to 1.4 x sizing value at full capacity | Sizing value to 1.4 x sizing value at full capacity |
| **Preferred [3] Output Capacity for Heating and Cooling** | Sizing value to 1.4 x sizing value | Sizing value to 1.4 x sizing value at full capacity | Sizing value to 1.4 x sizing value at full capacity |
| **Maximum [4] Output Capacity for Heating and Cooling** | Sizing value to 2.0 x sizing value | Sizing value to 2.0 x sizing value at full capacity | Sizing value to 2.0 x sizing value at full capacity |
| **Zone Damper Systems** | Zone damper systems should have as little excess capacity as possible when full capacity is compared to the ***Manual J*** block load for the space served. | | |

# Heat Pump Sizing Limits

| Size Limits for Condition A Heat Pumps<br>JSHR < 0.95; or HDD / CDD < 2.0 | | | | |
|---|---|---|---|---|
| **Equipment Type** | **Single Speed** | **Two Speed** | **Variable Speed** | |
| | **Ducted or Ductless** | | **Ducted** | **Ductless** |
| **Air-Air** | Max = 1.15<br>Min = 0.90 | Max = 1.20<br>Min = 0.90<br>FS | Max = 1.20<br>Min = 0.90<br>RS | Max = 1.30<br>Min = 0.90<br>RS |
| **Water-Air pipe loop system** | Max = 1.15<br>Min = 0.90 | Max = 1.20<br>Min = 0.90<br>FS | Max = 1.20<br>Min = 0.90<br>RS | |
| **Water-Air open pipe system** | Max = 1.25<br>Min = 0.90 | Max = 1.25<br>Min = 0.90<br>FS | Max = 1.25<br>Min = 0.90<br>RS | |

| Size Limits for Condition B Heat Pumps<br>JSHR = 0.95 or greater; and HDD / CDD = 2.0 or greater | | | |
|---|---|---|---|
| **Equipment Type** | **Single Speed** | **Two Speed** | **Variable Speed** |
| **Air-Air Ducted or Ductless** | Max = +15,000<br>Min = 0.90 | Max = +15,000<br>Min = 0.90<br>FS | Max = +15,000<br>Min = 0.90<br>RS |
| **Water-Air pipe loop system** | Max = +15,000<br>Min = 0.90 | Max = +15,000<br>Min = 0.90<br>FS | Max = +15,000<br>Min = 0.90<br>RS |
| **Water-Air open pipe system** | Max = +15,000<br>Min = 0.90 | Max = +15,000<br>Min = 0.90<br>FS | Max = +15,000<br>Min = 0.90<br>RS |

Designer must heed the notes for the tables.

# AHRI Ratings

A piece of equipment's AHRI rating is evaluated for air at:

80°F db / 67°F wb entering the indoor unit, and

95°F db entering the outdoor unit.

A standardized testing point for equipment capacity and efficiency, but inappropriate for use in equipment sizing and selection.

**No one wants an 80°F indoor environment in the summer!** And not every location will have a 95°F outdoor design temperature.

# Equipment Sizing / Selection
## Min. Verification Points

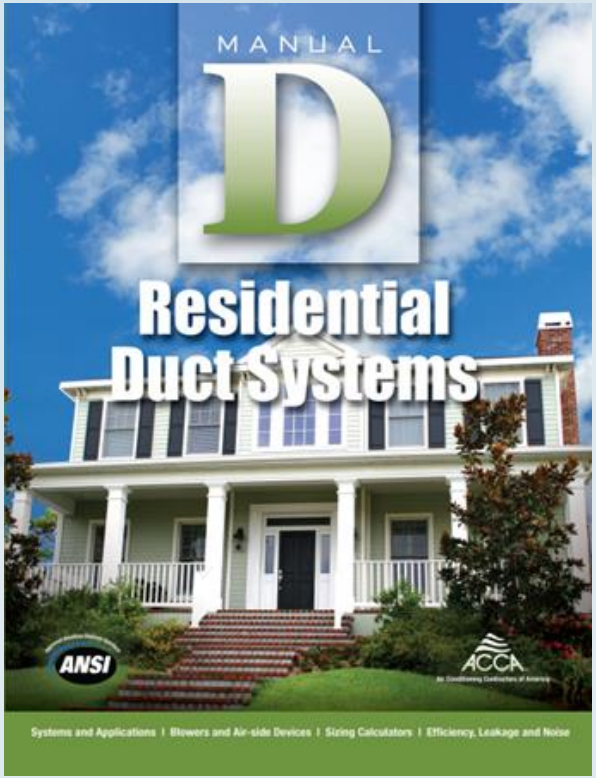
| | Cooling Equipment | Heating Equipment |
|---|---|---|
| *Equipment Information* | • Type<br>• Model | • Type<br>• Model |
| *Capacities satisfy design conditions* | • Sensible Capacity<br>• Latent Capacity<br>• Total Capacity | • Total Output Capacity<br>• Auxiliary Heating Cap. |
| *Within load sizing limits* | • To be verified | • To be verified |
| *Blower Info (at design conditions)* | • CFM<br>• ESP | • CFM<br>• ESP |

# What to Watch Out For …

## Some designers will:

- Seek (incorrectly) to use AHRI rated capacities instead of OEM engineering performance data
- Not interpolating the OEM performance data for the capacity at design conditions
- Misread / misapply OEM performance data tables
  (can be very confusing, and will come in different configurations)
- Round up to next size
- Push for equipment outside of the sizing limits

# Part 3 – Duct System Design

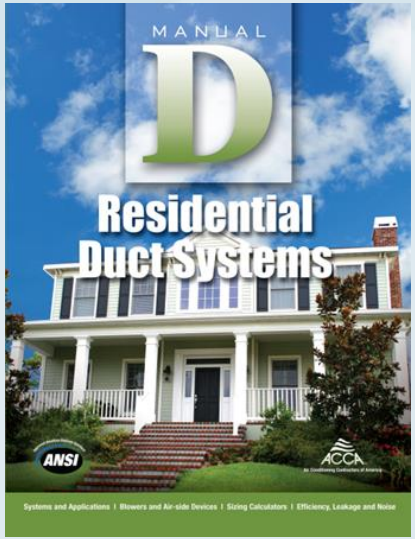


# ANSI/ACCA 1 **Manual D** - 2016

- **Standard required in:**
  - 2015 IRC §M1601.1 and §M1602.2
  - 2015 IMC §603.2

- **Comprised of two sections**
  - Normative: 43 pages of enforceable requirements
  - Informative: 213 pages of in-depth discussion, documentation, and examples

- Latest ANSI Approval in Oct 2016



# Friction Rate Worksheet

## Friction Rate Worksheet

**Step 1) Manufacturer's Blower Data**

External static pressure (ESP) = _____ IWC  Cfm = _____

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

| | |
|---|---|
| Direct expansion refrigerant coil | _____ |
| Electric resistance heating coil | _____ |
| Hot water coil | _____ |
| Heat exchanger | _____ |
| Low efficiency filter | _____ |
| High or mid-efficiency filter | _____ |
| Electronic filter | _____ |
| Other items that impede airflow | _____ |
| Supply outlet | _____ |
| Return grille | _____ |
| Balancing damper | _____ |
| Zone damper (full open) | _____ |
| Total component losses (CPL) | _____ IWC |

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

ASP = (ESP – CPL) = ( _____ – _____ ) = _____ IWC

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

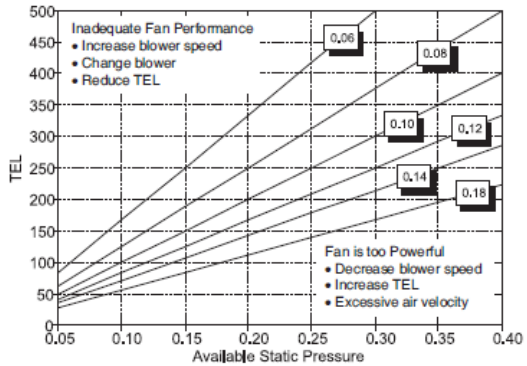
Supply-side TEL + Return-side TEL = ( _____ + _____ ) = _____ Feet

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

FR value from friction rate chart = _____ IWC/100 Ft

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

Friction Rate Chart



## Step 1) Manufacturer's Blower Data

External static pressure (ESP) = 0.67 IWC  Cfm = 1,000

## Step 2) Component Pressure Losses (CPL)

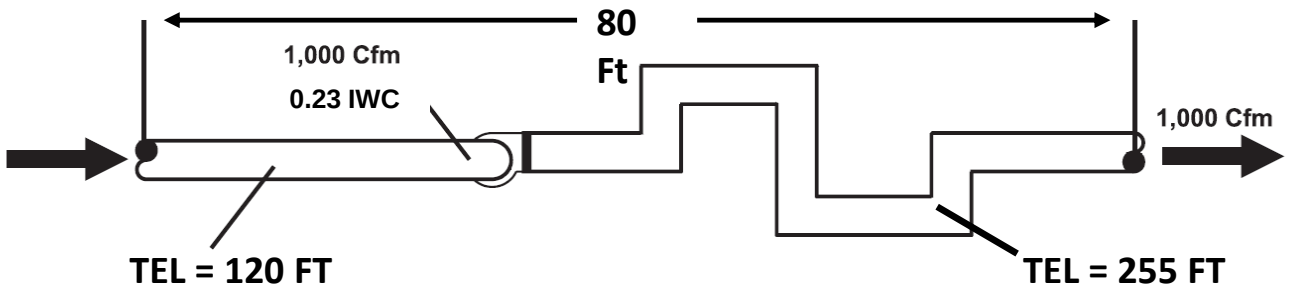
| | |
|---|---|
| Direct expansion refrigerant coil | 0.25 |
| Electric resistance heating coil | |
| Hot water coil | |
| Heat exchanger | |
| Low efficiency filter | |
| High or mid-efficiency filter | |
| Electronic filter | 0.10 |
| Other items that impede airflow | |
| Supply outlet | 0.03 |
| Return grille | 0.03 |
| Balancing damper | 0.03 |
| Zone damper (full open) | |
| Total component losses (CPL) | 0.44 IWC |

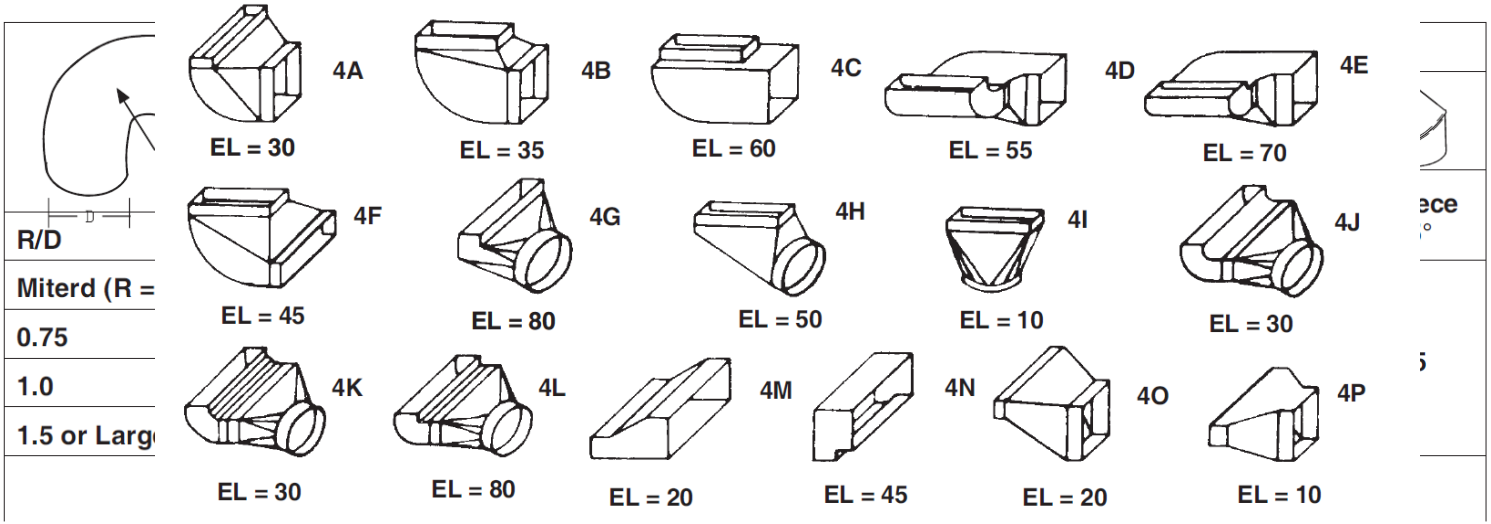
## Step 3) Available Static Pressure (ASP)

ASP = (ESP – CPL) = ( 0.67 – 0.44 ) = 0.23 IWC

## Step 4) Total Effective Length (TEL)

Supply-Side TEL + Return-Side TEL = ( 255 + 120 ) = 375 Feet



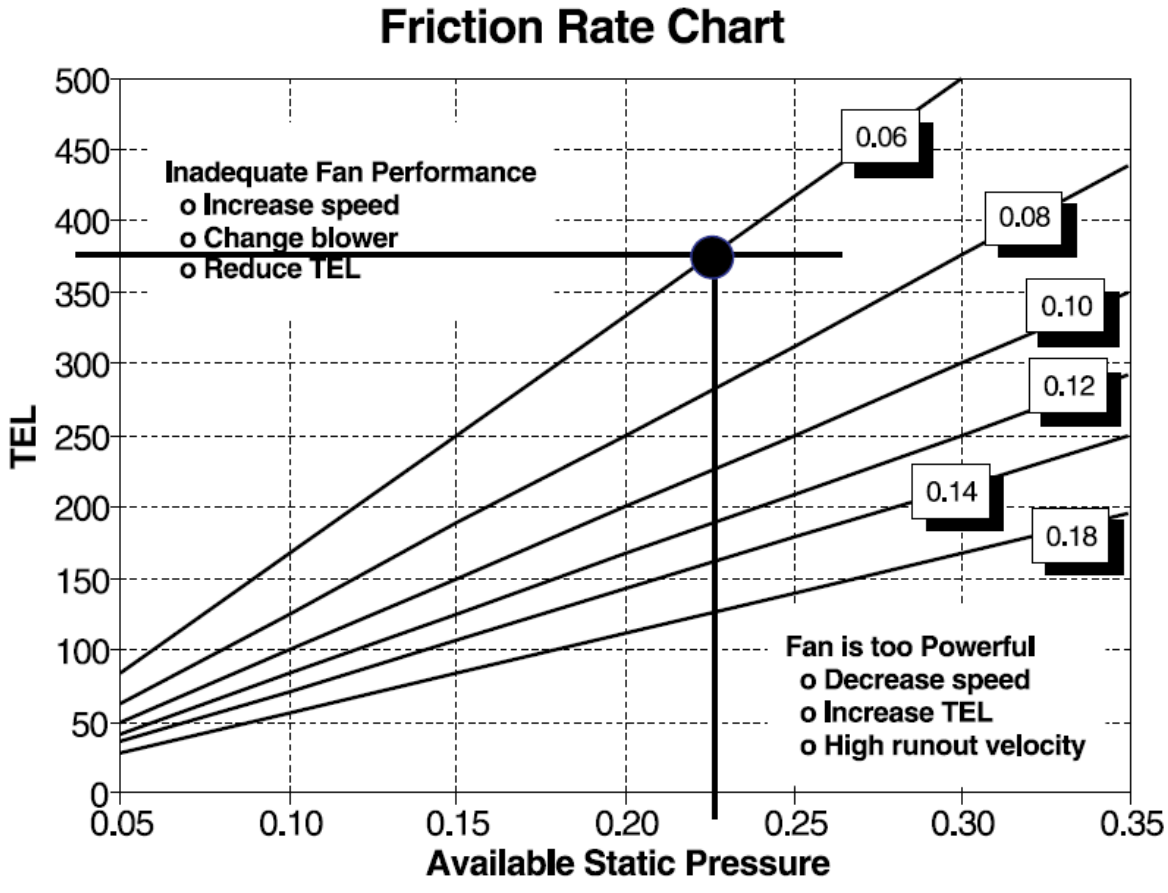
## Step 5) Friction Rate Design Value (FR)

FR value from friction rate chart = 0.06 IWC/100 Ft

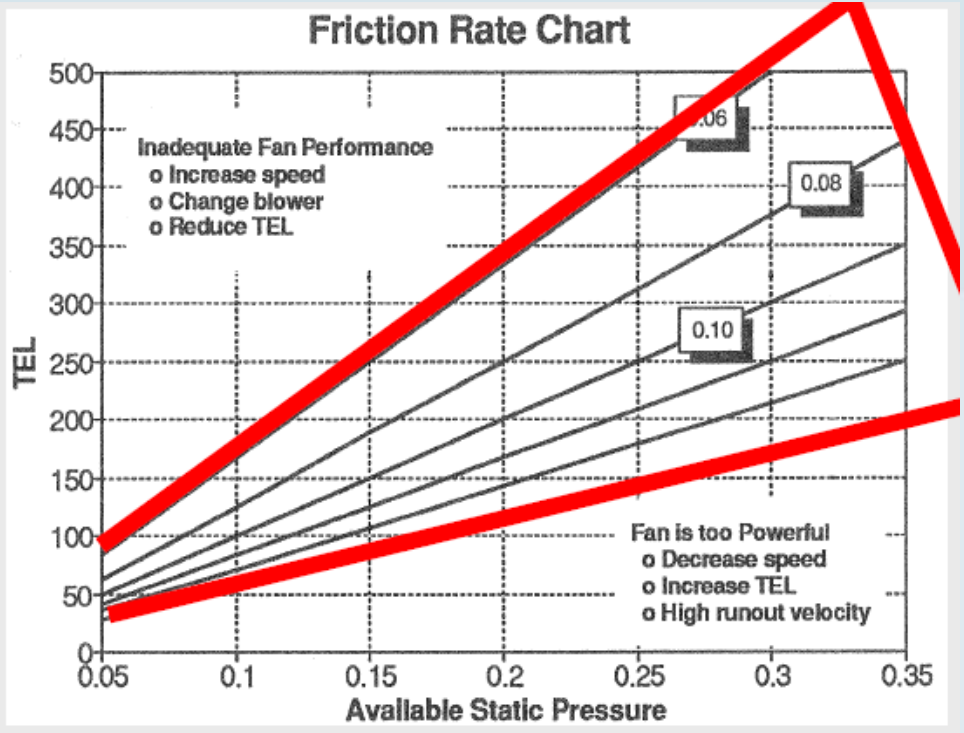
$$FR = \frac{ASP \times 100}{TEL}$$

$$FR = \frac{.23 * 100}{375}$$

*FR = 0.061 IWC / 100 Ft*



# Friction Rate Chart




*Outside of the "wedge" may lead to velocity problems*

# Finding Each Room Cfm

$$Room\ CFM = Blower\ CFM * \frac{MJ\ Room\ Load}{MJ\ Total\ Load\ (htg\ or\ clg)}$$

- One value for cooling and one value for heating
- The designer must use the larger of the two cfm values for sizing the duct runs

Reminder: Loads are in Btu/hr

# Example

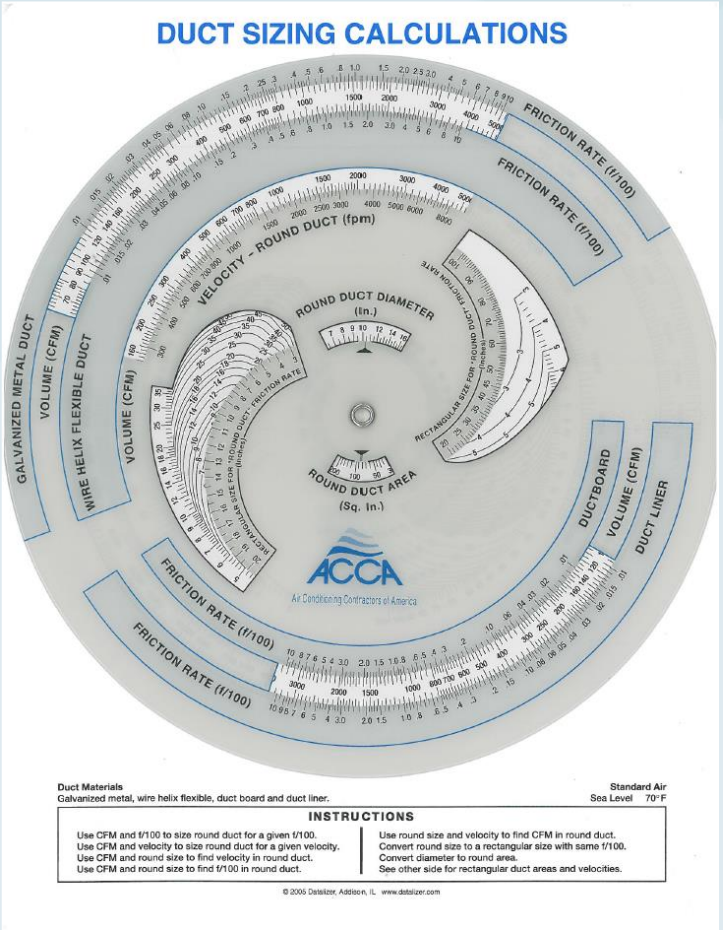
- Air handler delivers 1000 Cfm at 0.23 IWC (net)
- Total heating load: 60,000 Btu/h
- Total cooling load: 48,000 Btu/h

$$Room\ CFM = \frac{Blower\ CFM\ x\ MJ\ Room\ Load}{MJ\ Total\ Load\ (htg\ or\ clg)}$$

| Blower Cfm = 1000 | | | | | |
|---|---|---|---|---|---|
| Total heating load = 60,000 Btu/h | | | | | |
| Total cooling load = 48,000 Btu/h | | | | | |
| | C - Btu/h | H - Btu/h | C - Cfm | H - Cfm | Design Cfm |
| Room 1 | 4800 | 5800 | 100 | 97 | 100 |
| Room 2 | 19200 | 25200 | 400 | 420 | 420 |
| Room 3 | 24000 | 29000 | 500 | 483 | 500 |

# FR & Cfm → Duct Size & Velocity

- Using a duct slide rule, the Cfm and calculated FR will:
  - Provide values for sizing the ducts
    - Round
    - Rectangular
  - Provide an associated velocity in feet per minute (fpm)

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# Velocity Limit

- Compare the velocity (feet per minute, fpm) at the design cfm with the limits for turbulence / noise control
- If the velocity exceeds the limits, then use the cfm for the limit velocity – resulting in bigger diameter ducts

| Air Velocity for Noise Control Subject to Notes 1, 2 and 8 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Component | Supply Side (Fpm) | | | | Return Side (Fpm) | | | |
| | Conservative | | Maximum | | Conservative | | Maximum | |
| | Rigid | Flex | Rigid | Flex | Rigid | Flex | Rigid | Flex |
| Trunk Ducts | 700 | 700 | 900 | 900 | 600 | 600 | 700 | 700 |
| Branch Ducts | 600 | 700 | 900 | 900 | 500 | 600 | 700 | 700 |
| Supply Outlet Face Velocity | Size for Throw | | 700 Note 7 | | — | | — | |
| Return Grille Face Velocity | — | | — | | — | | 500 | |
| Filter Grille Face Velocity | — | | — | | — | | 300 | |

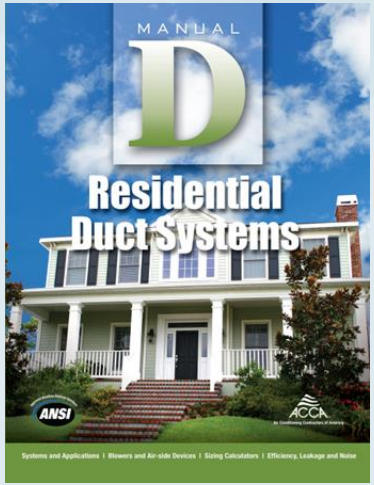
# Manual D
# Min. Verification Points

**ACCA recommended minimum:**

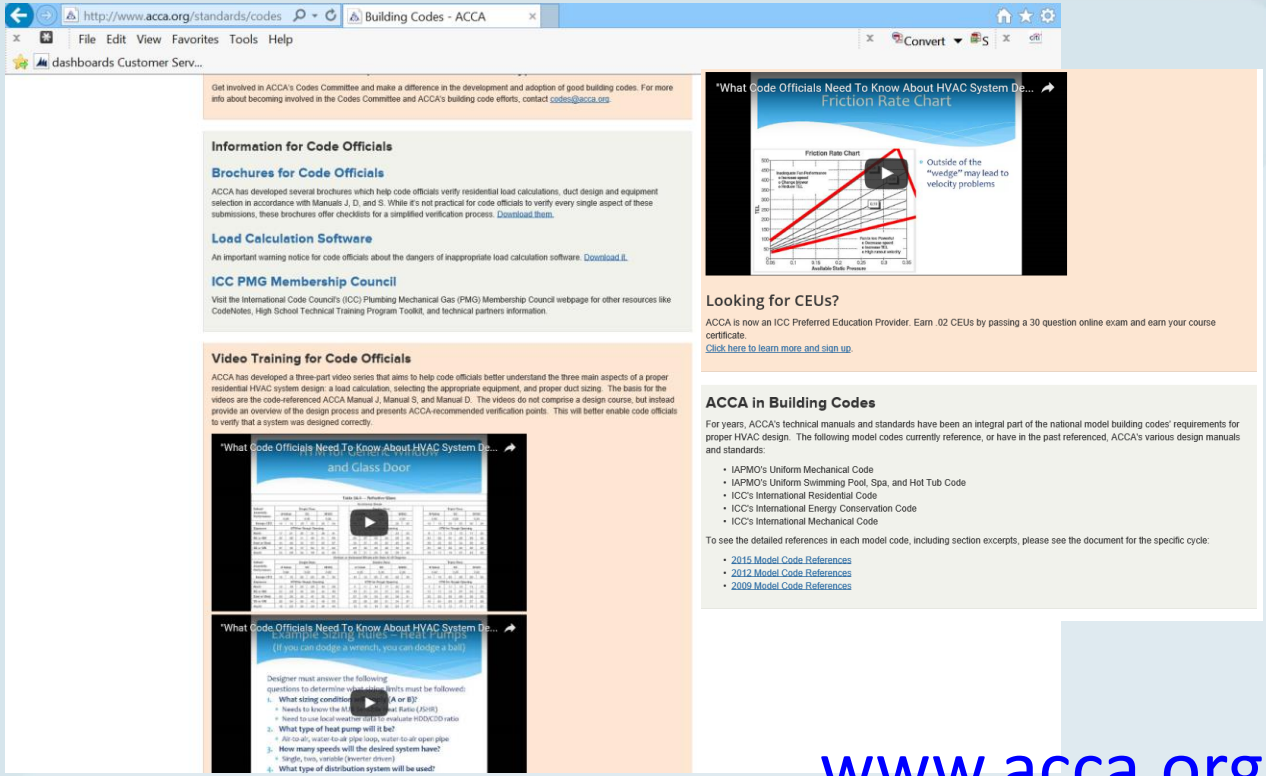
- ESP from blower table at Design Airflow (CFM)
- Total Component Pressure Losses (CPL)
- Available static pressure (ASP = ESP – CPL)
- Lengths: longest supply duct, longest return duct, TEL
- Determined Friction Rate
- Used Manual J room loads to determine Heating/Cooling CFMs
- Ensure maximum airflow velocity limits are not exceeded

# What to Watch Out For …

- **Designers that ALWAYS use a FR of 0.10**
  - It needs to be calculated every time for the specific duct system details
- **Check the math**
  - ASP = ESP – CPL
  - FR = (ASP x 100) / TEL
  - Spot check a few register CFMs
- **Not using balancing hand dampers in the runout branches**
- **Not altering the design for a house plan that is rotated to the opposite street side**



# Part 4: ACCA-Available Resources




www.acca.org/codes

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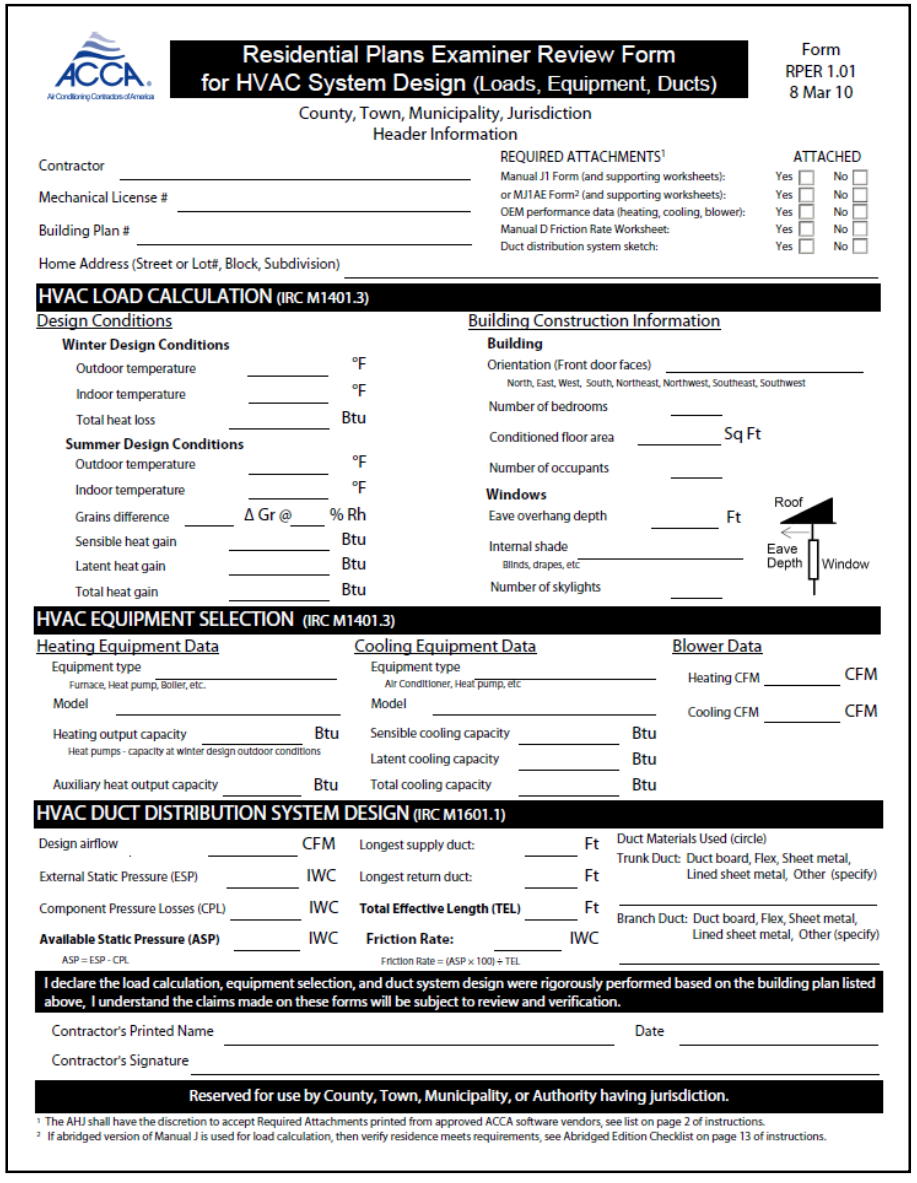


# Residential Plans Examiner Review Form for HVAC System Design (Loads, Equipment, Ducts)

Form RPER 1.01 8 Mar 10

County, Town, Municipality, Jurisdiction Header Information

Contractor

Mechanical License #

Building Plan #

Home Address (Street or Lot#, Block, Subdivision)

| REQUIRED ATTACHMENTS[1] | ATTACHED |
|---|---|
| Manual J1 Form (and supporting worksheets): | Yes ☐ No ☐ |
| or MJ1AE Form[2] (and supporting worksheets): | Yes ☐ No ☐ |
| OEM performance data (heating, cooling, blower): | Yes ☐ No ☐ |
| Manual D Friction Rate Worksheet: | Yes ☐ No ☐ |
| Duct distribution system sketch: | Yes ☐ No ☐ |

## HVAC LOAD CALCULATION (IRC M1401.3)

### Design Conditions

**Winter Design Conditions**

Outdoor temperature ____ °F

Indoor temperature ____ °F

Total heat loss ____ Btu

**Summer Design Conditions**

Outdoor temperature ____ °F

Indoor temperature ____ °F

Grains difference ____ Δ Gr @ ____ % Rh

Sensible heat gain ____ Btu

Latent heat gain ____ Btu

Total heat gain ____ Btu

### Building Construction Information

**Building**

Orientation (Front door faces) ____
North, East, West, South, Northeast, Northwest, Southeast, Southwest

Number of bedrooms ____

Conditioned floor area ____ Sq Ft

Number of occupants ____

**Windows**

Eave overhang depth ____ Ft

Internal shade ____
Blinds, drapes, etc.

Number of skylights ____

Roof / Eave Depth / Window

## HVAC EQUIPMENT SELECTION (IRC M1401.3)

### Heating Equipment Data

Equipment type ____
Furnace, Heat pump, Boiler, etc.

Model ____

Heating output capacity ____ Btu
Heat pumps - capacity at winter design outdoor conditions

Auxiliary heat output capacity ____ Btu

### Cooling Equipment Data

Equipment type ____
Air Conditioner, Heat pump, etc

Model ____

Sensible cooling capacity ____ Btu

Latent cooling capacity ____ Btu

Total cooling capacity ____ Btu

### Blower Data

Heating CFM ____ CFM

Cooling CFM ____ CFM

## HVAC DUCT DISTRIBUTION SYSTEM DESIGN (IRC M1601.1)

Design airflow ____ CFM

External Static Pressure (ESP) ____ IWC

Component Pressure Losses (CPL) ____ IWC

**Available Static Pressure (ASP)** ____ IWC
ASP = ESP - CPL

Longest supply duct: ____ Ft

Longest return duct: ____ Ft

**Total Effective Length (TEL)** ____ Ft

**Friction Rate:** ____ IWC
Friction Rate = (ASP × 100) ÷ TEL

Duct Materials Used (circle)

Trunk Duct: Duct board, Flex, Sheet metal, Lined sheet metal, Other (specify) ____

Branch Duct: Duct board, Flex, Sheet metal, Lined sheet metal, Other (specify) ____

**I declare the load calculation, equipment selection, and duct system design were rigorously performed based on the building plan listed above, I understand the claims made on these forms will be subject to review and verification.**

Contractor's Printed Name ____ Date ____

Contractor's Signature ____

**Reserved for use by County, Town, Municipality, or Authority having jurisdiction.**

[1] The AHJ shall have the discretion to accept Required Attachments printed from approved ACCA software vendors, see list on page 2 of instructions.

[2] If abridged version of Manual J is used for load calculation, then verify residence meets requirements, see Abridged Edition Checklist on page 13 of instructions.

## ACCA Design Review Form

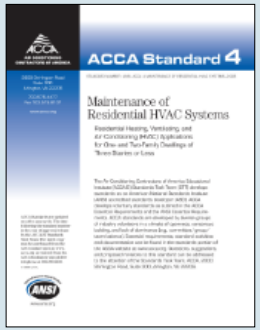
Everything you need to check on one form.

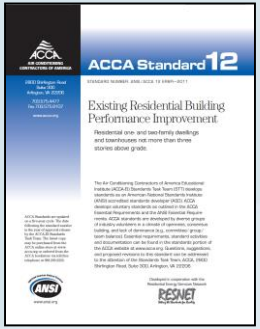
- Load calculation
- Equipment selection
- Duct system design

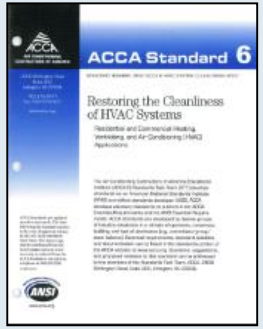
Free to download at [www.acca.org/codes](http://www.acca.org/codes)

# Free Standards






**Free PDF Downloads on HVAC**

- Quality Installation (ACCA 5 QI)
- QI Verification (ACCA 9 QIvp)
- Quality Maintenance (ACCA 4 QM)
- Quality Restoration (ACCA 6 QR)
- Whole House Evaluation (ACCA 12 QH)
- and more

Free to download at www.acca.org/quality

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# Free Training for Code Officials
(and Others!)

## Three-part video training on Manuals J / D / S

- Approximately 45 minutes for each segment
- A bit more detailed than this presentation
- Free! … www.ACCA.org/codes

## CEUs available from ICC

- ACCA is an ICC Preferred Education Provider
- See: http://www.acca.org/certification/code-essentials
- 0.2 CEU; Cost for the J / D / S test = $60

CEUs have associated costs.

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# ACCA Technical Reference Note

*"Computing Manual J Infiltration Load Based Upon a Target Envelop Leakage Requirement"*

Shows how to convert a maximum code allowable leakage limit (say, 3 or 5 ACH 50 per the ICC IECC) to:

1. Manual J infiltration CFM value, and then to

2. infiltration load contributions (Btuh) of:
   - sensible heating,
   - sensible cooling, and
   - latent cooling.

# Free ACCA Membership for ICC Code Offices

**To obtain ACCA member benefits for free, contact:**

Karla Price Higgs
Vice President, Member Services
International Code Council
KHiggs@iccsafe.org

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# Educational Offerings

**QI Design … [Load Calcs, Equipment Selection, Duct Design, etc.]**



## Offered via:

- In-person training
  (3-day class)
- Online training
  (18 hours of videos, plus assessments)
- Offline DVDs

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5-year certificates provided for successful passage of final exam

These each have associated costs.

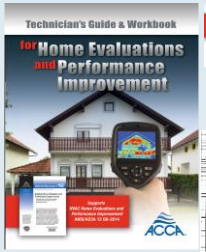
# Educational: Technician Training & Certification

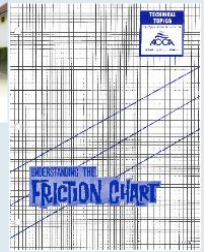
ICC INTERNATIONAL CODE COUNCIL®

qtech

## On-line learning

- *Technician Field Practices for Quality Installation*
- *Home Evaluation and Performance Improvement*
- *Friction Rate Primer and Duct Design Fundamentals*
- *Duct Diagnostics & Repair*
- *Etc.*


Convenient … affordable … on-demand training focused on quality HVACR installation, maintenance, home performance, and more.

These each have associated costs.

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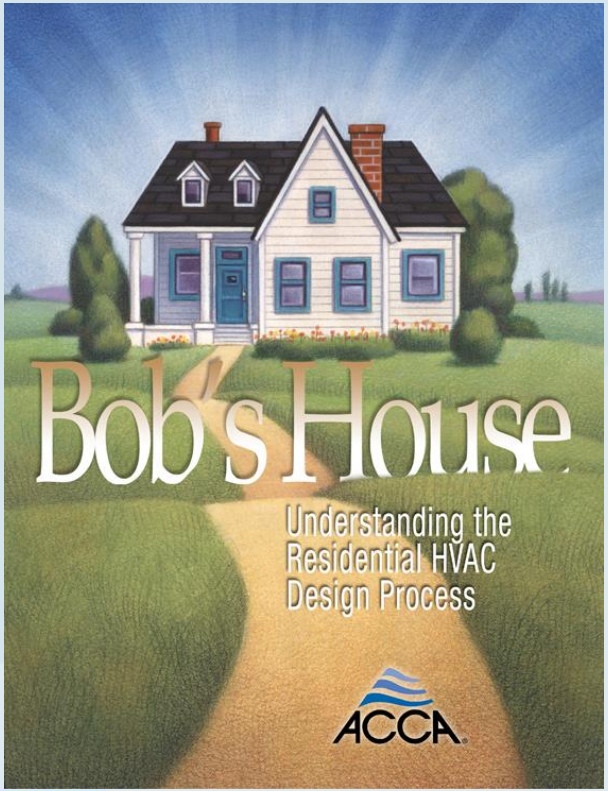
# HVAC Primer, residential



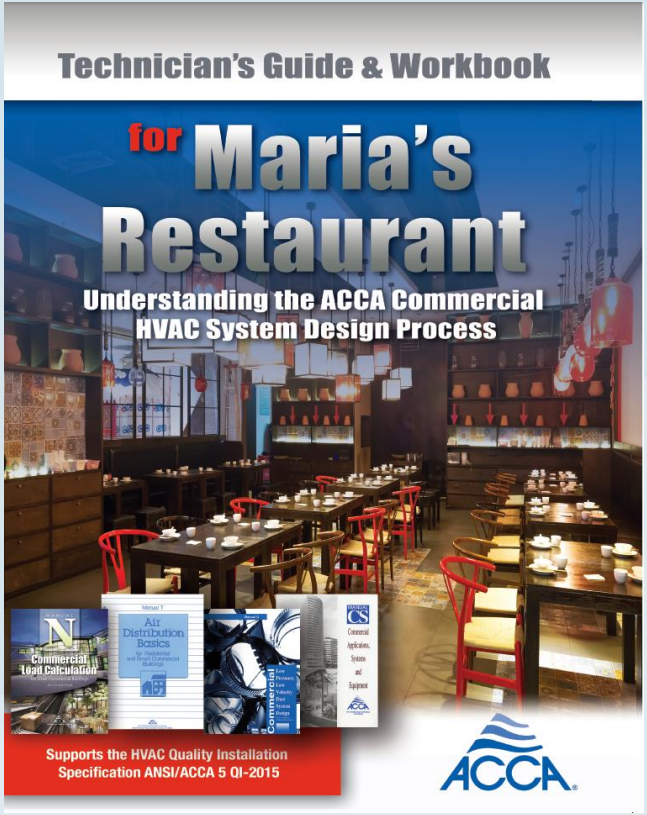

## Bob's House

A case study for understanding the residential HVAC design process as described in the ACCA residential design manuals.

May be purchased at

www.acca.org/store/

# HVAC Primer, commercial




## Maria's Restaurant

A case study for understanding the commercial HVAC design process as described in the ACCA commercial design manuals.

May be purchased at

www.acca.org/store/

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# Questions ???

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Contact Information:
John D. Sedine, President
Engineered Htg & Clg
1321 17 Mile Rd NE
Cedar Springs, MI 49319
johns@engineeredhvac.com
616.439.3311

ACCA Contact:
Glenn C. Hourahan, P.E.
Sr. Vice President
ACCA
2800 S. Shirlington Road; Suite 300
Arlington, VA 22206
glenn.hourahan@acca.org

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