

Residential Load Calculations: Manual J and more

10/27/2021



SEDAC

SMART ENERGY DESIGN ASSISTANCE CENTER

Providing effective energy strategies for buildings and communities

SEDAC is a Preferred Education Provider with the International Code Council (ICC). Credits earned on completion of this program will be reported to ICC for ICC members. Certificates of Completion will be issued to all participants.



This workshop is approved for 1 LU/HSW CES credits from the American Institute of Architects (AIA). Credits earned on completion will be reported for AIA members.



Learning Objectives

- 1. Understand when a Manual J load calculation should be performed.**
- 2. Understand how to look up information for a Manual J calculation.**
- 3. Understand common mistakes made in Manual J entries.**
- 4. Understand how to use Manual J software packages for detailed load calculations.**

Who we are

We assist buildings and communities in achieving energy efficiency, saving money, and becoming more sustainable.

We are an applied research program at University of Illinois, working in collaboration with 360 Energy Group.

Our goal: Reduce the energy footprint of Illinois and beyond.



SEDAC is the Illinois Energy Conservation Code Training Provider

This training program is sponsored by **Illinois State Energy Office**



SEDAC Resources

Technical support

- energycode@illinois.edu
- 800.214.7954

Online resources at

smartenergy.Illinois.edu/energy-code



TRAINING AND SUPPORT SERVICES



Workshops



Webinars



Online courses



Technical support

ENERGY CODE RESOURCES



What is the Illinois
Energy Conservation Code?



Frequently asked questions



Useful websites

Code Accessibility – IECC and IL Amendments

<https://codes.iccsafe.org/content/IECC2018P4>

All Codes » I-Codes

Search Code Titles

2018 INTERNATIONAL ENERGY CONSERVATION CODE

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PREFACE

EFFECTIVE USE OF THE INTERNATIONAL ENERGY CONSERVATION CODE

IECC—COMMERCIAL PROVISIONS

CHAPTER 1 [CE] SCOPE AND ADMINISTRATION

CHAPTER 2 [CE] DEFINITIONS

CHAPTER 3 [CE] GENERAL REQUIREMENTS

CHAPTER 4 [CE] COMMERCIAL ENERGY EFFICIENCY

CHAPTER 5 [CE] EXISTING BUILDINGS

CHAPTER 6 [CE] REFERENCED STANDARDS

APPENDIX CA SOLAR-READY ZONE—COMMERCIAL

INDEX

IECC—RESIDENTIAL PROVISIONS

CHAPTER 1 [RE] SCOPE AND ADMINISTRATION

CHAPTER 2 [RE] DEFINITIONS

CHAPTER 3 [RE] GENERAL REQUIREMENTS

CHAPTER 4 [RE] RESIDENTIAL

2018 International Energy Conservation Code
First Printing: Aug 2017

Legend

Use the chapter listing within the bar on the left to navigate contents

The free view provides users with read only access to the code book

The premiumACCESS view includes In premiumACCESS, code change

- Technical code changes from the previous edition of the International Energy Conservation Code
- State amendments to the International Codes are shown in red text
- Indicates deletions
- Active hyperlinks for ease of navigating across section references
- Ability to bookmark or annotate key text with your notes

- Click link sharing () for quick access to key sections
- Click Print icon () for printing section level contents

My Notes and Bookmarks

Recent annotations and bookmarks from this current title. Click here

Purchase premium to take advantage of this feature.

Associated Titles

Available versions for this title.

- 2018 International Energy Conservation Code (Third Printing: Mar 2019)
- 2018 International Energy Conservation Code (Second Printing: Aug 2018)
- 2018 International Energy Conservation Code Currently Being Viewed (First Printing: Aug 2017)

<https://www2.illinois.gov/cdb/business/codes/IllinoisAccessibilityCode/Documents/2018%20Illinois%20Specific%20Amendments%20with%20Modifications%20Shown.pdf>

CHAPTER 1 [CE] SCOPE AND ADMINISTRATION

SECTION C101 SCOPE AND GENERAL REQUIREMENTS

C101.1 Title. This code shall be known as the *International Energy Conservation Code of [NAME OF JURISDICTION]* and shall be cited as such. *Illinois Energy Conservation Code* or "this Code" and shall mean:

With respect to the State facilities covered by 71 Ill. Adm. Code 600.Subpart B:

This Part, all additional requirements incorporated within Subpart B (including the 2018 International Energy Conservation Code, including all published errata but excluding published supplements that encompass ASHRAE 90.1-2016), and any statutorily authorized adaptations to the incorporated standards adopted by CDB are effective July 1, 2019.

With respect to the privately funded commercial facilities covered by 71 Ill. Adm. Code 600.Subpart C:

This Part, all additional requirements incorporated within Subpart C (including the 2018 International Energy Conservation Code, including all published errata and excluding published supplements that encompass ASHRAE 90.1-2016), and any statutorily authorized adaptations to the incorporated standards adopted by CDB, are effective July 1, 2019.

C101.1.2 Adoption. The Board shall adopt

C101.1.3 Adaptation. The Board may appropriately adapt the *International Energy Conservation Code* to apply to the particular economy, population, distribution, geography and climate of the State and construction within the State, consistent with the public policy objectives of the EEB Act.

C101.5 Compliance. ~~Residential buildings shall meet the provisions of IECC—Residential Provisions. Commercial buildings shall meet the provisions of IECC—Commercial Provisions—the Illinois Energy Conservation Code covered by 71 Ill. Adm. Code 600.Subpart C. The local authority having jurisdiction (AHJ) shall establish its own procedures for enforcement of the Illinois Energy Conservation Code. Minimum compliance shall be demonstrated by submission of:~~

- Compliance forms published in the ASHRAE 90.1 User's Manual; or
- Compliance Certificates generated by the U.S. Department of Energy's COMcheck™ Code compliance tool; or
- Other comparable compliance materials that meet or exceed, as determined by the AHJ, the compliance forms published in the ASHRAE 90.1 User's Manual or the U.S. Department of Energy's COMcheck™ Code compliance tool; or
- The seal of the architect/engineer as required by Section 14 of the Illinois Architectural Practice Act [225 ILCS 305], Section 12 of the Structural Engineering Licensing Act [225 ILCS 340] and Section 14 of the Illinois Professional Engineering Practice Act [225 ILCS 325].

<https://codes.iccsafe.org/content/document/1491>

ARTICLE XIII. CHICAGO ENERGY CONSERVATION CODE

SECTION 1. The Municipal Code of Chicago is hereby amended by inserting a new Title 14N, as follows:

TITLE 14N ENERGY CONSERVATION CODE

PART I – COMMERCIAL PROVISIONS

CHAPTER 14N-C1 SCOPE AND PURPOSE

14N-C1-C001 Adoption of the commercial provisions of the International Energy Conservation Code by reference.

The commercial provisions of the *International Energy Conservation Code*, 2018 edition, second printing, and all erratum thereto identified by the publisher (hereinafter referred to as "IECC-CE"), except Appendix CA, are adopted by reference and shall be considered part of the requirements of this title except as modified by the specific provisions of this title.

If a conflict exists between a provision modified by this title and a provision adopted without modification, the modified provision shall control.

14N-C1-C002 Citations.

Provisions of IECC-CE which are incorporated into this title by reference may be cited as follows:

14N-C[IECC-CE chapter number]-[IECC-CE section number]

14N-C1-C003 Global modifications.

The following modifications shall apply to each provision of IECC-CE incorporated into this title:

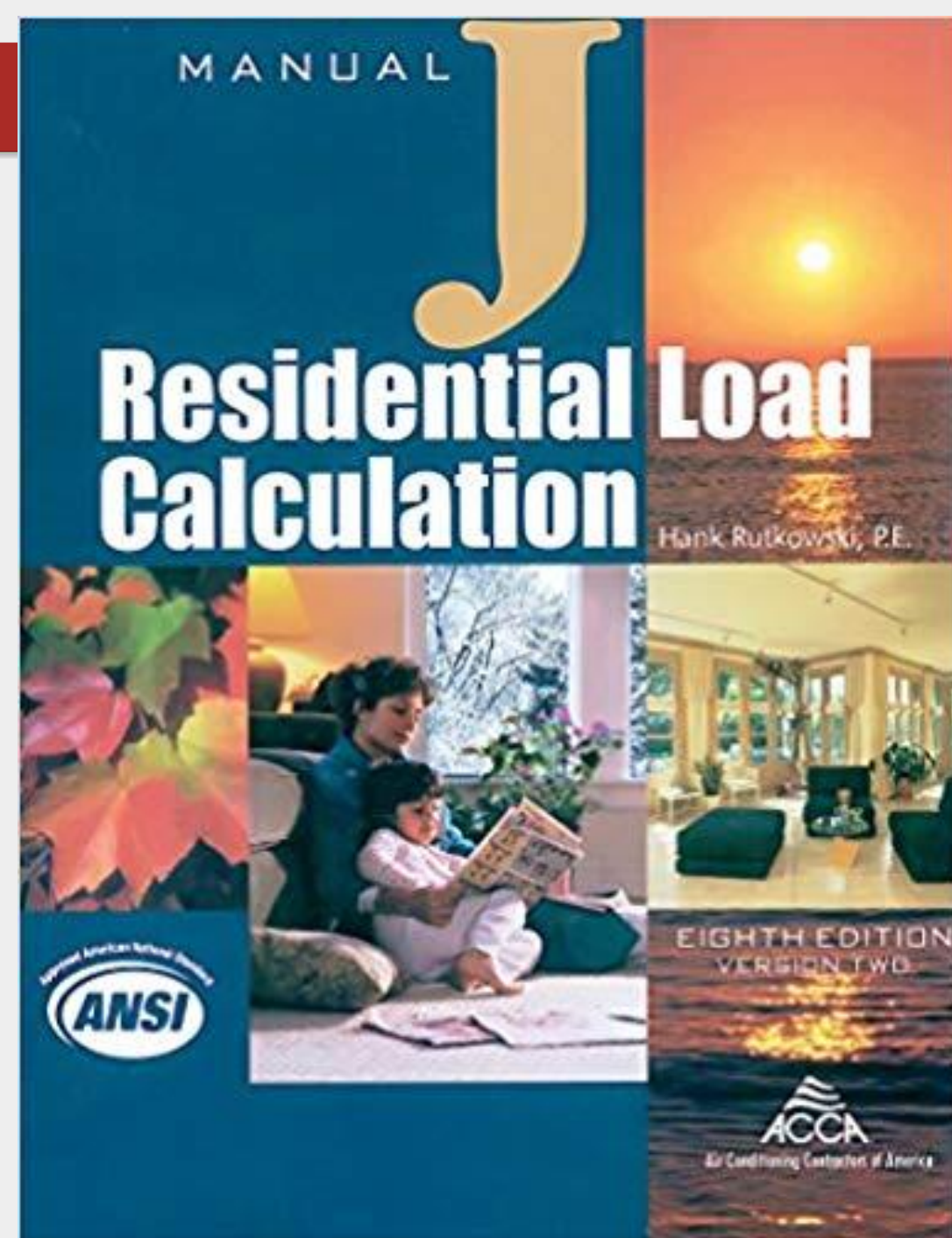
- Replace each occurrence of "International Codes" with "Chicago Construction Codes."
- Replace each occurrence of "International Building Code" with "Chicago Building Code."
- Replace each occurrence of "ASME A17.1" or "ASME A17.1/CSA B44" with "the Chicago Conveyance Device Code."
- Replace each occurrence of "NFPA 70" with "the Chicago Electrical Code."

When to Conduct a Manual J Load Calculation

Manual J

The Air Conditioning Contractors of America (ACCA) Manual J calculates heating and cooling peak loads.

- Required by the IECC and ASHRAE 90.1 for new construction.
- Replacement systems should also be selected based on Manual J load calculations.



Manual J – 2 versions

Abridged Version

- Uses spreadsheet or software for calculations
- Limited to simple default loads
 - Quick and relatively easy to complete
 - Good for early design



Complete Version

- Uses full software
- More design flexibility
 - Accounts for more assembly types and installation practices



Manual J – 2 methods

Whole House Block Method

Typically used for new construction early design to size equipment.
May also apply to simple duct-plan final models.

May also be used for existing homes that are swapping out aging HVAC equipment without modifying ductwork.

Room by Room Loads

Heating and cooling loads determined for each room.

Used for complex new construction, or remodels that include duct changes.
May also be applicable if using ductless mini-split units in smaller residences.

*Room-by-Room is required for conducting a Manual D sizing calculation to size ductwork!

Manual J speedsheet

- Free download from ACCA
- Automates load calculation for the abridged version only
- Designers can create a template house for common models, adjust for location and orientation for future models.
- Block or room-by-room load compatible.

FORM J1 _{AE} • ABRIDGED VERSION of MANUAL J, 8TH EDITION									
Project		Design State & City		Alabama	Alexander City	Block Load		ACCA	
Indoor Design Heating db		70	@ Outdoor (Winter) 99% db	22	HTD	48			
Indoor Design Cooling db		75	@ Outdoor (Summer) 1% db	93	CTD	18			
Indoor Design Cooling RH		50%	Grains Difference	46	Daily Range	Medium			
Latitude		33	Elevation	686	ACF	0.985			
	Glass Direction	Construction Detail			Heating HTM	Cooling HTM	Net Area	Heating BTUH	Cooling BTUH
6B	Skylights								
7	Wood & Metal Doors	a							
		b							
		c							
8	Above Grade Walls	a							
		b							
		c							
		d							
	e								
	Partition Walls	f							
		g							
9	Below Grade Walls	a							
		b							
10	Ceilings	a							
		b							
		c							
	Partition Ceilings	d							
		e							
11	Passive Floors	a							
		b							
	Exposed Floors	c							
		d	Slab (Perimeter Ft.)						
		e	Basement Floor						
	Partition Floors	f							
		g							
12	Infiltration	Envelope Leakage	Average	Heated & Cooled Floor Area = Sq. Ft.		Above Grade = Cu. Ft.			
		No. of Fireplaces							
13	Internal Gains	Number of Bedrooms		3	Occupants		4		#VALUE!
		Appliance - 1200 BTUH							#VALUE!
14 Sub Totals									
15	Duct Loss & Gain	7E-T&B SA in Attic, RA Riser in Floor to Ceiling Chase, Perimeter Supply Outlets							
		R-Value = 6	Leakage Class .12/.24		0.133	0.172			#VALUE!
		Installed Square Feet of Surface or Default = 1		Supply	1	Return	1		
16	Ventilation	Combustion Air From Conditioned Space <input type="checkbox"/> Furnace <input type="checkbox"/> Water Heater			None				
17	Blower Motor Gain	Manufacturer's performance data less on blower heat discount							1707

Software available for full Manual J

Find ACCA Manual J approved software:

<https://www.acca.org/standards/approved-software>

Example Software:

<http://www.adteksoft.com/SoftwareRes.htm> - checklist format

<https://www.elitesoft.com/> - checklist format

<https://www.wrightsoft.com/> - floorplan format

<http://www.energygauge.com/> - checklist format

<https://www.avenir-online.com/AvenirWeb/HeatCAD/HeatCADHome.aspx> - 3D modeling format

<https://www.coolcalc.com/> - checklist format

Free to use

Must purchase to generate reports



Approved software will generate reports with this label.

Using the Manual J

Manual J information

Step 1. Climate

- Outdoor design conditions for heating and cooling



Step 2. Design Conditions

- Indoor design conditions
- Indoor equipment loads
- Occupant Loads



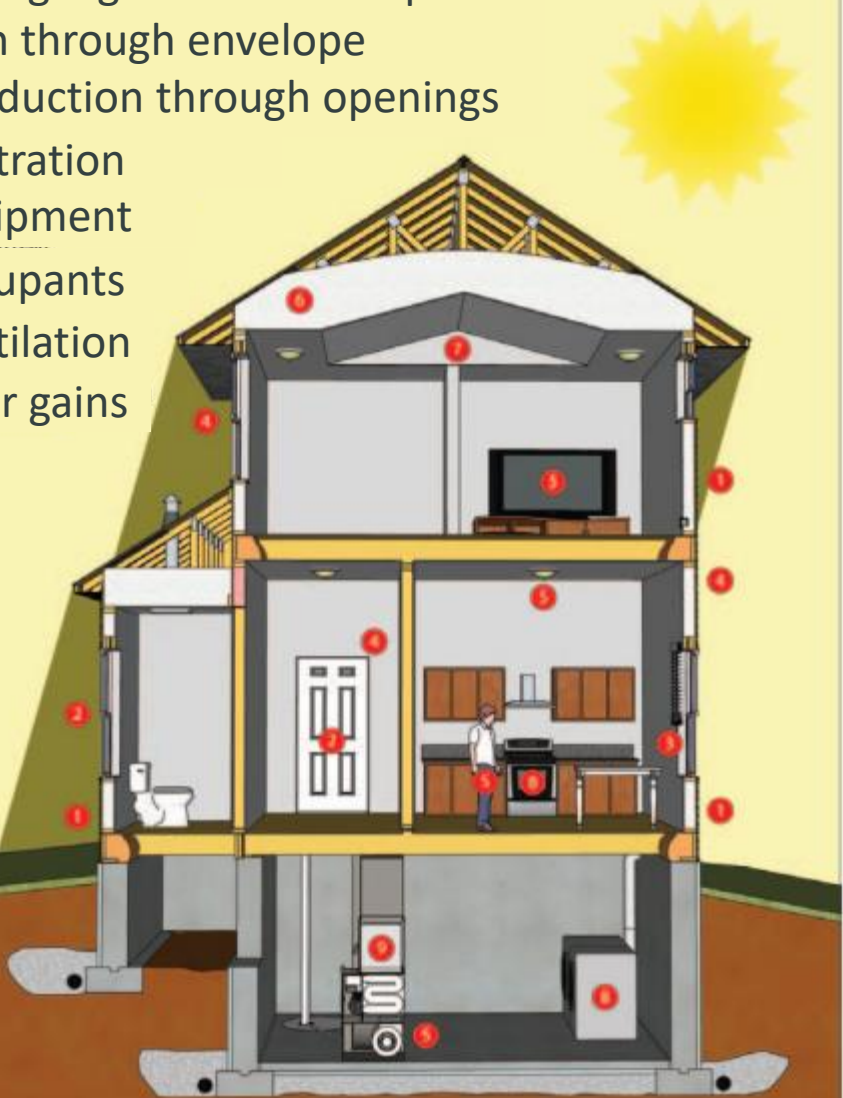
Step 3. Building Details

- Total area & orientation
- R-values for opaque materials
- U-values, SHGC and orientation for glazing
- Air infiltration rate



Manual J adds up BTUs lost and gained

During high outdoor temp:
Gain through envelope
Conduction through openings
Infiltration
Equipment
Occupants
Ventilation
Solar gains



During low outdoor temp:
Loss through envelope
No Internal loads
Infiltration
Ventilation

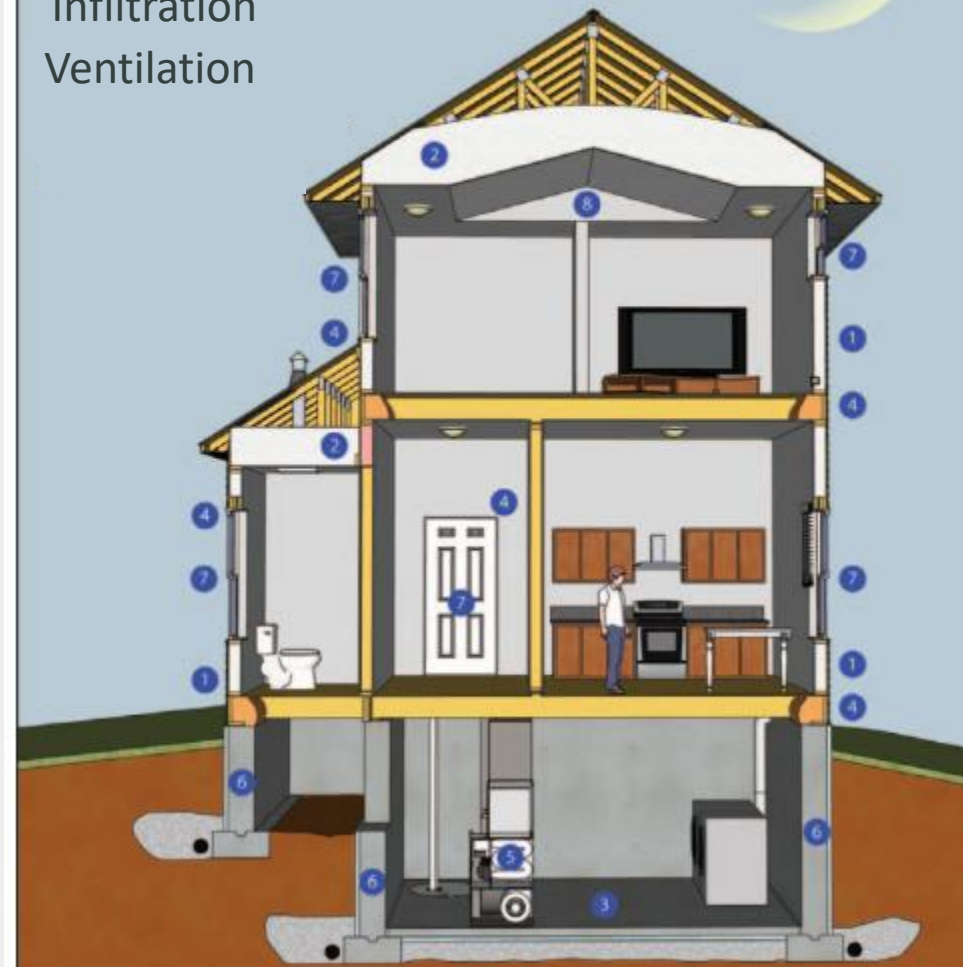


Image sources: nrel.gov

Manual J – weather data

Step 1 – Find climate data - Section 3 of the Manual J contains weather data

Available free online https://farm-energy.extension.org/wp-content/uploads/2019/04/7.-Outdoor_Design_Conditions_508.pdf

Table 1A
Outdoor Design Conditions for the United States

Location	Elevation Feet	Latitude Degrees North	Heating 99% Outdoor Dry Bulb	Cooling					HDD ₆₅ CDD ₅₀ Ratio	
				Outdoor Air		Design Grains				Daily Range (DR)
				1% Dry Bulb	Coincident Wet Bulb	55% RH Indoors	50% RH Indoors	45% RH Indoors		
Illinois										
Aurora Municipal AP	705	42	1	88	74	30	37	44	M	2.22
Belleville, Scott AFB	453	38	10	93	77	44	51	58	M	1.13
Bloomington (Peoria DD)	875	40	-2	90	74	31	38	45	M	1.80

Quick notes on terms:

Dry Bulb: Actual air temperature as measured by a thermostat

Wet Bulb: Lowest air temperature achievable from evaporation.

Grains: Measure of absolute humidity. 1 lb water = 7,000 grains

Manual J – Data Inputs

Step 2. Gather interior loads information:

Information on heat gains inside the building:

- **Peak internal equipment & occupant loads.** Appliances and electronics, human body heat, and moisture addition.
- **Mechanical system loads.** Duct leakage and ventilation

Information on the desired temperature and humidity inside the building

- **Typical ACCA design values:**
 - Winter design: 70F and 30% RH
 - Summer design: 75F and 50% RH

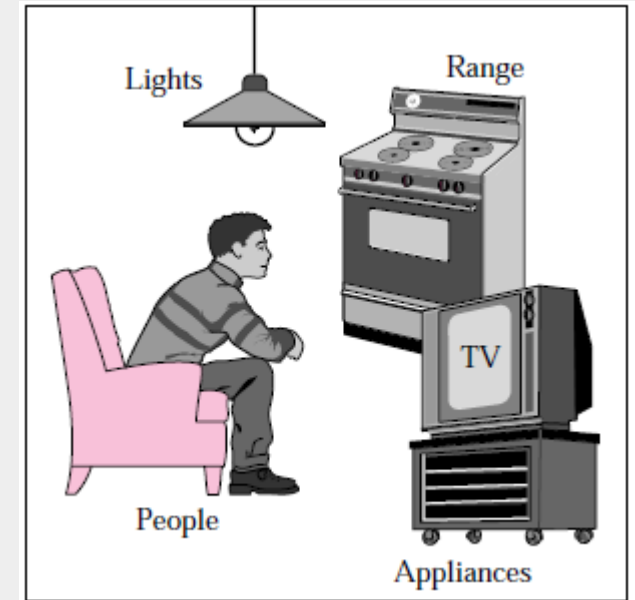


Image source: Engineer-Educators.com

Step 3. Gather envelope information:

Information on thermal envelope:

- **R-values** for wall, roof, foundation assemblies
- **SHGC and U-factor** for window and skylight assemblies
- **Air infiltration rate** from a blower door test or estimated

Information on building size and orientation

- **Areas** of assemblies
- **Orientation** of the building

Step 3. Input Overview

Above grade walls can be framed or mass walls between indoor and outdoor conditions.
Partition walls are between indoor and unconditioned spaces (i.e. - garage or attic).

Below grade walls are walls greater than 2ft below grade.

Ceilings can be below attic, below roof deck with exposed beams, or below deck with sandwiched beams.
Partition ceiling is ceiling under unconditioned space or encapsulated attic (foamed deck, unfinished attic space).

Passive floors are any floors without radiant heating.
Partition floors are above enclosed unconditioned spaces
Exposed floors apply to cantilevered floors over outdoor air, or floors over vented crawls or open-air spaces.
Basement floors have no insulation underneath, if passive.
Slab floors are on grade (<2ft below soil surface)

8	Above Grade Walls	a
		b
		c
		d
		e
	Partition Walls	f
		g
9	Below Grade Walls	a
		b
10	Ceilings	a
		b
		c
	Partition Ceilings	d
		e
11	Passive Floors	a
		b
	Exposed Floors	c
	Slab (Perimeter Ft.)	d
	Basement Floor	e
	Partition Floors	f
	g	

Step 3. Assembly look-up tables

Knowing building information, look up construction types in look-up tables in Manual J to determine correct values for Manual J entry.

Example: 2x4 wood stud wall with R-13 fiberglass, R-5 insulation board and vinyl siding
 Framed walls can be found in Table 4A, Construction #12-Frame Walls and Partitions

Construction Number 12						
Frame Walls and Partitions						
Wall or partition with brick veneer, plus interior finish (40 to 50 Lb / SqFt) Wall with siding or stucco, or light partition, plus interior finish (7 to 20 Lb / SqFt) Exterior finish code: b = brick veneer; s = stucco or siding Framing code: w = wood, m = metal (studs 16 Inches on center, 75% cavity, 25% framing) Reference Area = Gross Wall Area - Area of Window and Door Openings						
Construction Number	Insulation R-Values	Description of Construction	Exterior Finish	U-Value with Wood Studs	U-Value with Metal Studs	Group Number
12A — No Insulation In Stud Cavity						
12A-0b w/m 12A-0s w/m	Cavity: None Board: None	Frame construction, no cavity insulation, no board insulation, wood sheathing	Brick Siding	0.253 0.240	0.315 0.295	E A
12C — R-13 Insulation In 2 x 4 Stud Cavity						
12C-5b w/m 12C-5s w/m	Cavity: R-13 Board: R-5	Frame construction, R-13 cavity insulation, R-5 board insulation	Brick Siding	0.064	0.078	K F

Proper assembly code for this wall type is 12C-5s w, the U-value is 0.064

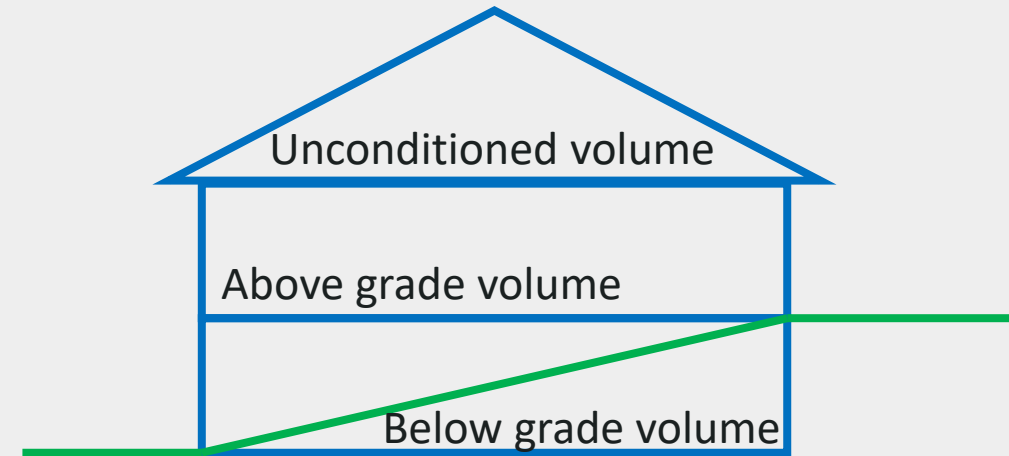
Step 3. Air leakage entry

Manual J Infiltration only considers above-grade areas and volumes

Summary table below used for abridged calculations

If actual pressure test conducted, must use full Manual J (software program)

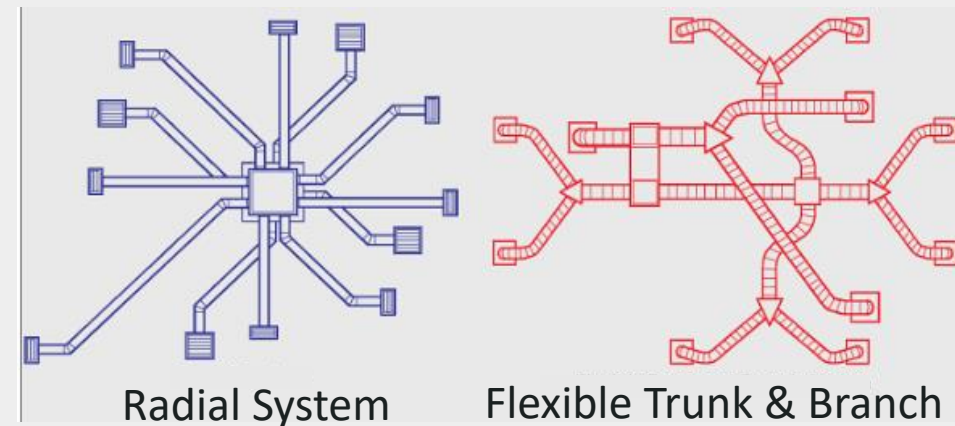
Modern homes are tight or semi-tight



Construction	Air Changes per Hour — Heating				
	Floor Area of Heated Space (SqFt)				
	900 Or Less	901 to 1500	1501 to 2000	2001 to 3000	3001 or More
Tight	0.21	0.16	0.14	0.11	0.10
Semi-Tight	0.41	0.31	0.26	0.22	0.19
Average	0.61	0.45	0.38	0.32	0.28
Semi-Loose	0.95	0.70	0.59	0.49	0.43
Loose	1.29	0.94	0.80	0.66	0.58

Step 3. Duct gains and losses

- Abridged version uses 4 default duct classes
- Full Manual J requires calculation of duct areas, leakage, and resulting heat transfer factors
- 28 tables of duct layouts – important to be familiar to select correct system!
- Each table has 4-steps
 1. Baseline heat loss/gain based on default surface area
 2. Adjustment multipliers for insulation
 3. Adjustment multipliers for duct leakage rate
 4. Adjustment multipliers for surface area variation from default



Tightness	Supply cfm/sf	Return cfm/sf
Extremely sealed	0.06	0.06
Notably sealed	0.09	0.15
Average Sealed	0.12	0.24
Partially sealed	0.24	0.47
Unsealed	0.35	0.70

Common Manual J Mistakes

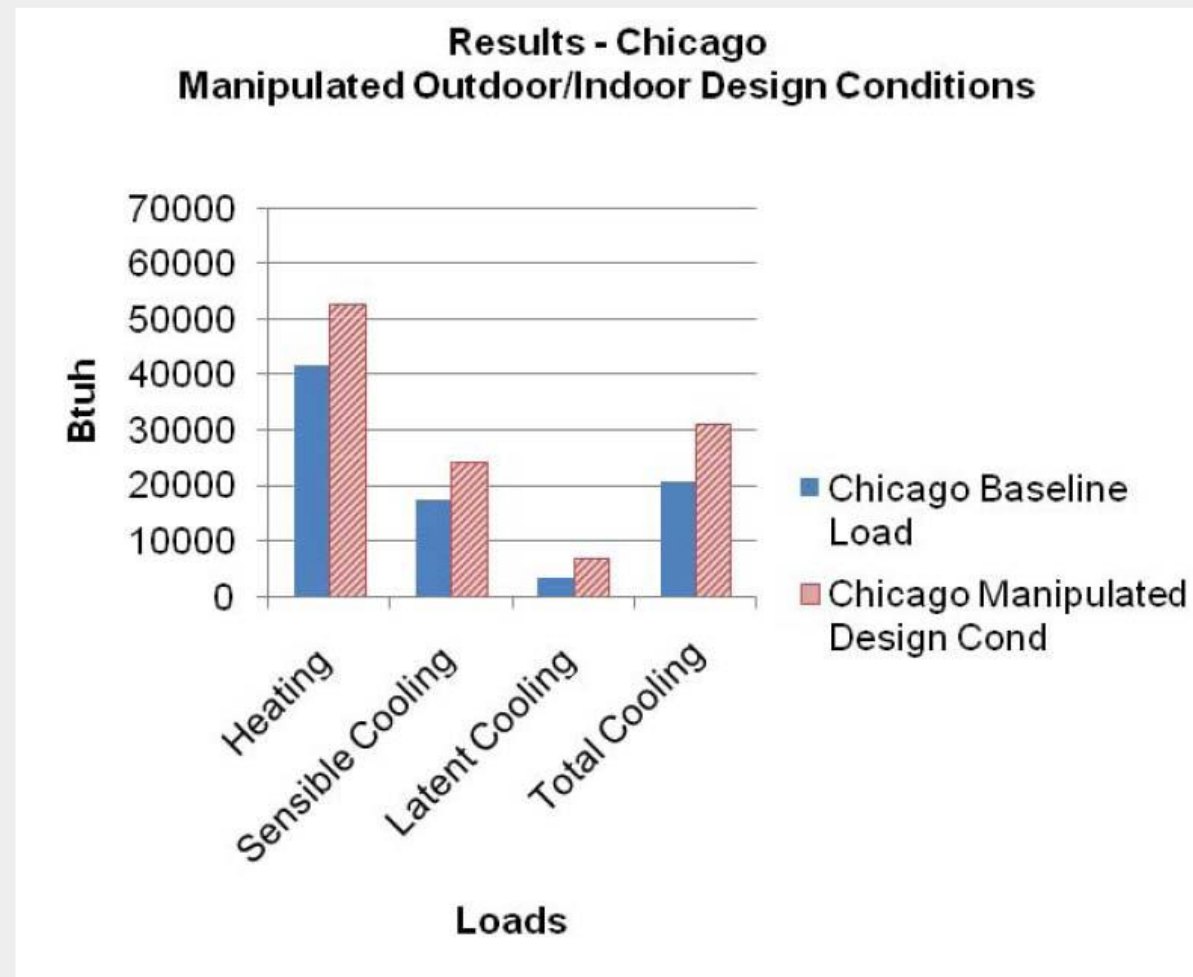
Basic Information Check!

Particularly for designers with model homes

- Check proper location/weather data
- Check proper orientation
- Check indoor design conditions

These are common errors when copying a file as a template.

Also, common to tweak indoor conditions to get outputs in-line with rules-of-thumb

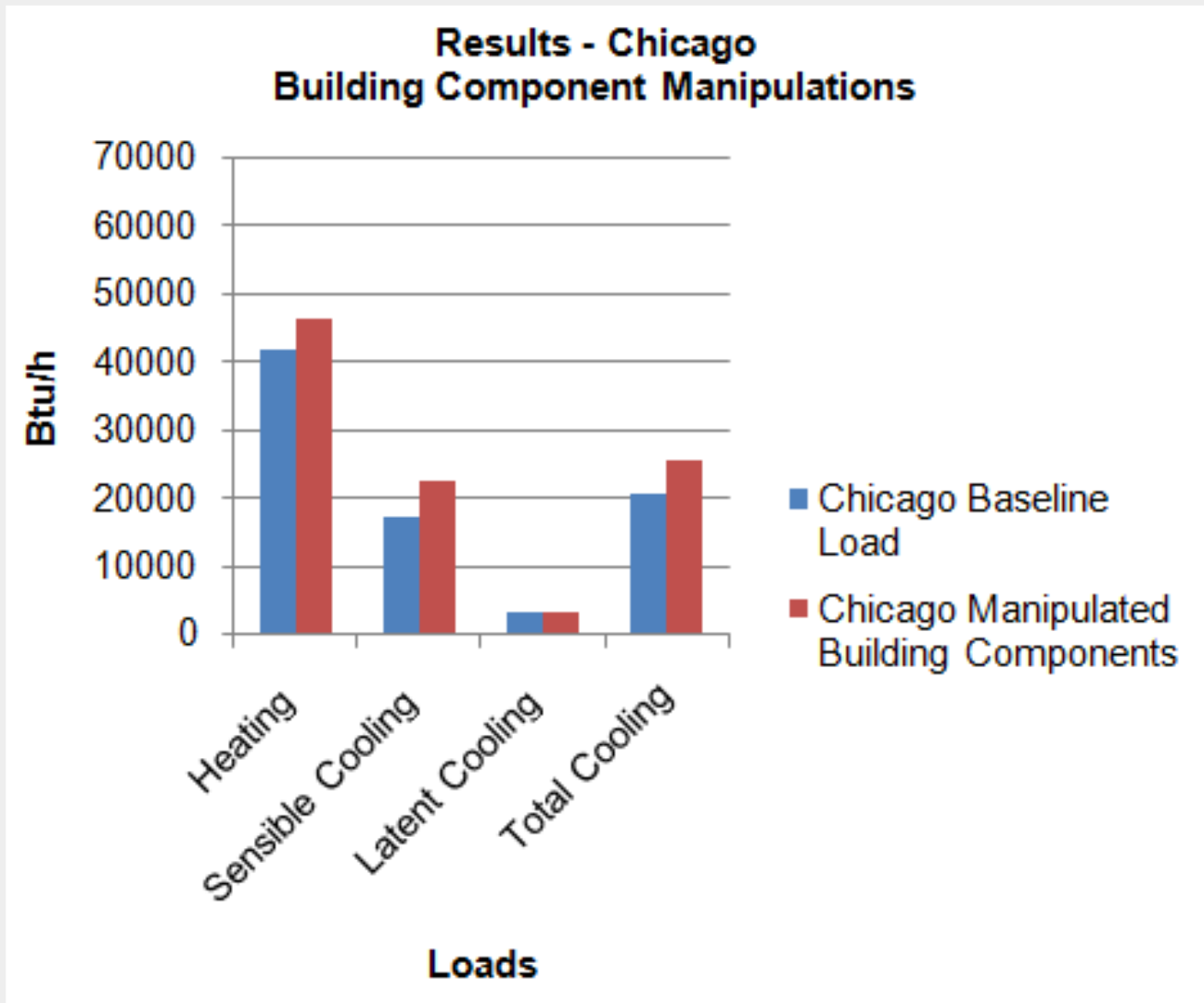


Source: DOE Building America Program

Don't forget window shading!

Blinds, curtains, and overhangs reduce window loads. Be sure to account for them in load calculations!

Chicago example left off bug screens, eave overhangs, and blinds.



Source: DOE Building America Program

Get Areas Right!

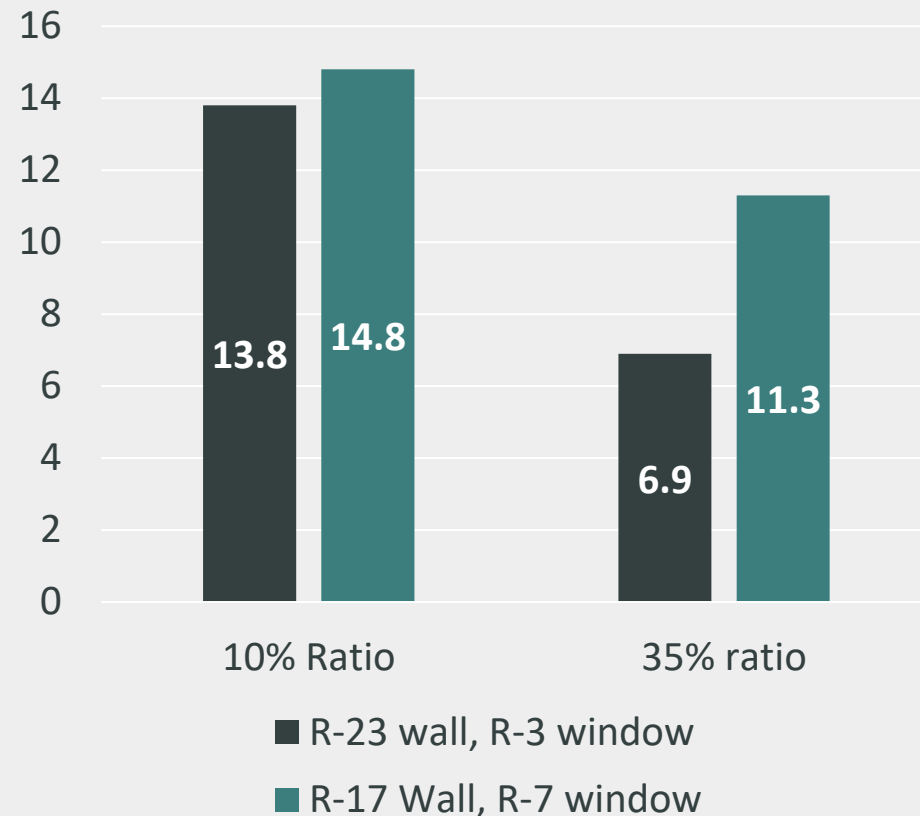
Pay particular attention to low R-value areas

- Windows are R-3 compared to R-13 to R-20 for walls
 - Common to use default windows with R-1 to R-2 to increase loads
 - Check orientation of each window set!

Foundation insulation, particularly slab-on-grade, entry errors

- Enter slab-on-grade perimeter, not floor areas!
- Check U-values for misplaced decimals
- Duct areas also have significant impact.

Assembly R-value Comparisons



Data courtesy <https://www.zolawindows.com/>

Manual J Duct leakage manipulation

Properly documenting the duct locations and leakage rates can also have a big impact on building loads

Duct Sealing Benefit										
Atlanta, Georgia	Manual J Loads		Seasonal Performance Summary						Annual Energy Cost	
\$ 0.08 / Kwh \$ 0.58 / Thrm Scale cost estimates for other rates.	Heating	Cooling Sensible Latent	Fossil Fuel Heating		Air Source Heat pump Heating		Electric Cooling		Gas Heat Electric Cooling	Air Source Heat Pump
	Btuh	Btuh	Therms	Cost	KWH	Cost	KWH	Cost	Cost	Cost
Attic 15% Leak	43,108	32,865 6,257	830	\$ 543	9,834	\$ 790	5,675	\$ 469	\$ 1,012	\$ 1,333
Attic 5% Leak	34,988	25,161 3,827	656	\$ 426	7,662	\$ 616	4,430	\$ 369	\$ 795	\$ 1,042
Crawl Space 15% Leak	49,175	33,327 6,542	971	\$ 636	11,580	\$ 929	5,737	\$ 473	\$ 1,109	\$ 1,565
Crawl Space 5% Leak	38,829	26,419 3,975	742	\$ 495	8,753	\$ 703	4,545	\$ 378	\$ 873	\$ 1,198

8,000 Btu/h htg
10,000Btu/h clg

8,000 Btu/h htg
10,000Btu/h clg

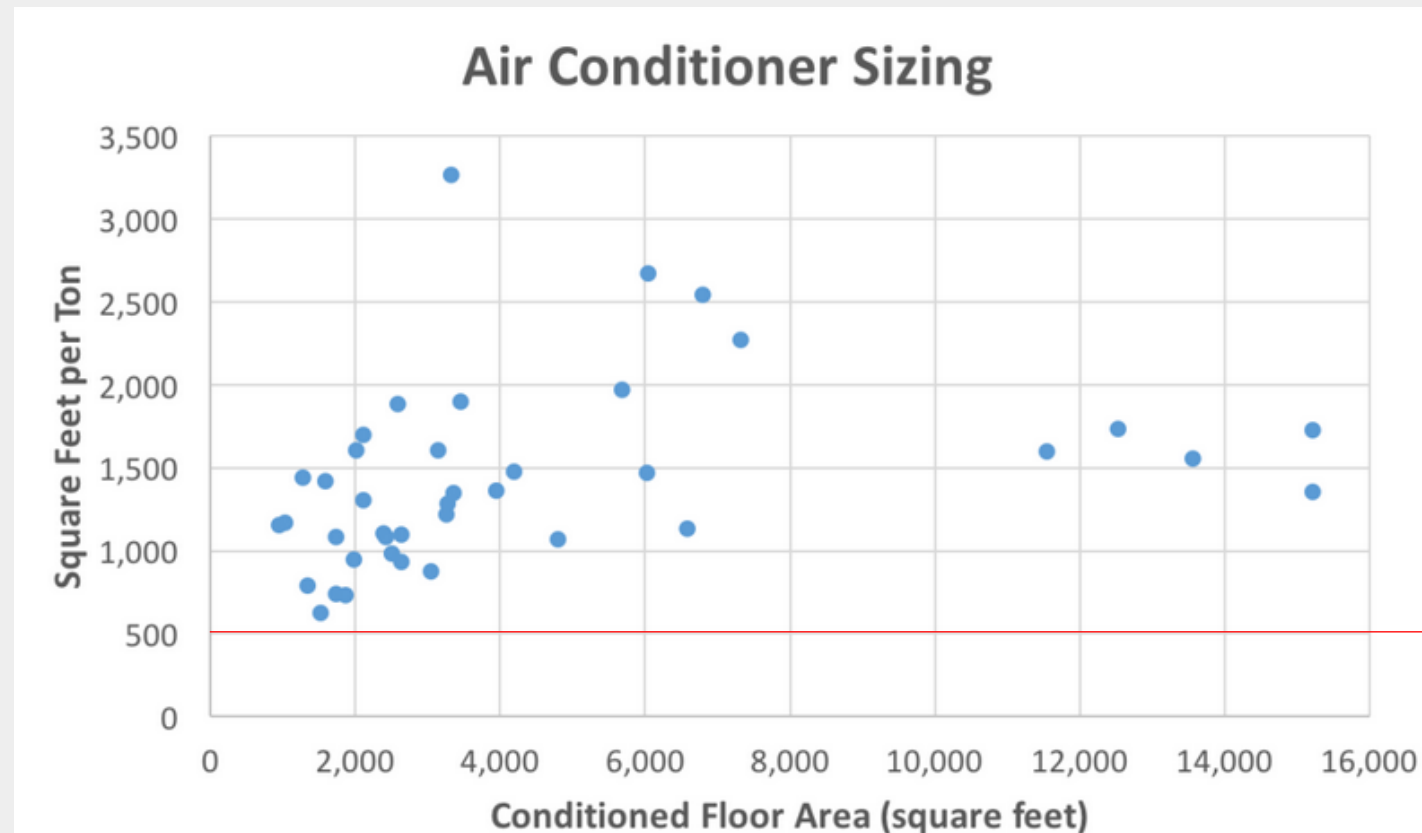
Manual J Manipulation

Many contractors comfortable with rules-of-thumb

May make multiple minor adjustments to Manual J to stretch results to match expected rule-of-thumb

As shown,
common rule is
~500 sf/ton

Average of 40
homes from
energy
vanguard study
showed 1,431
sf/ton



Manual J Software Options

List of Available Software

Find ACCA Manual J approved software:

<https://www.acca.org/standards/approved-software>

Example Software:

<http://www.adteksoft.com/SoftwareRes.htm> -

checklist format

<https://www.elitesoft.com/> - checklist format

<https://www.wrightsoft.com/> - floorplan format

<http://www.energygauge.com/> - checklist format

<https://www.avenir->

[online.com/AvenirWeb/HeatCAD/HeatCADHome.aspx](https://www.avenir-online.com/AvenirWeb/HeatCAD/HeatCADHome.aspx)

- 3D modeling format

<https://www.coolcalc.com/> - checklist format – free to

use but can't print reports without purchase.



Approved software will generate reports with this label.

CoolCalc Example Screens

Pay careful attention to input values

Example of infiltration:

Some programs want ACH, some CFM50, some ELA.

Enter correct value!

This example from

CoolCalc, infiltration is ELA in square inches.

CoolCalc MJ8

Infiltration - Manual J

https://www.coolcalc.com/coolcalc/ui/mj8/v-unkuna/current/restui.php

cool calc Manual J

MJ8 Projects / 1406 East Michigan Avenue / Construction Details / Infiltration

DWELLING INFO ✓
1 Story home. Built or last renovated to 2015 building codes.

INFILTRATION ✓
Blower door test performed, ELA = 40

CONSTRUCTION PROFILE ✓
Frame Wall, Ceiling under attic, Slab on grade floor.

CONSTRUCTION FEATURE GROUPS ✓
5 construction feature groups.

Infiltration

Was a blower door test performed?
 Yes
 No

Blower door ELA:
40

Shielding class:
Typical suburban shi

Wind velocity winter (MPH)
15

Wind velocity summer (MPH)

Save

CoolCalc Example R-Value

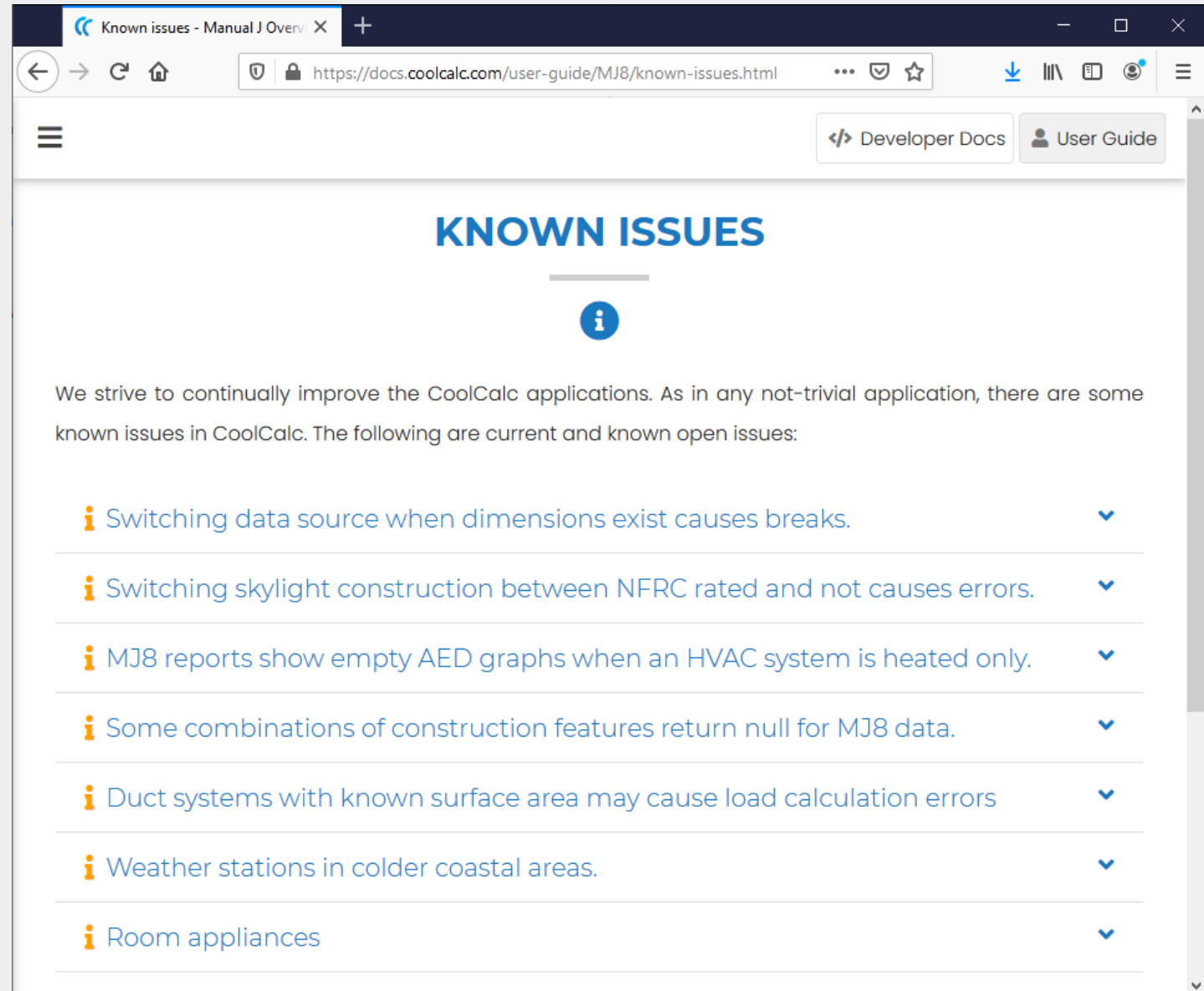
- Be careful of default values.
- Enter data as close as possible to actual conditions.
- Understand base assumptions and limitations.

The screenshot displays the CoolCalc web application interface. The browser address bar shows the URL: <https://www.coolcalc.com/coolcalc/ui/mj8/v-unkuna/current/restui.php#>. The application has a dark blue sidebar with navigation options: Project, Construction Details, Dimensions, and HVAC Systems. The main content area is titled 'Manual J' and contains sections for 'DWELLING INFO', 'INFILTRATION', 'CONSTRUCTION PROFILE', and 'CONSTRUCTION FEATURE GROUPS'. A modal dialog box titled 'Construction Feature Group' is open, showing a list of R-values: None, R-7, R-11, R-13, R-15, R-19, R-21, R-25, R-28, R-30, R-38 (highlighted), R-44, R-50, and R-56. A dropdown menu at the bottom of the list shows 'R-38'. A 'Save' button is located at the bottom right of the dialog box.

Know your Software Limitations

Most software providers keep records of limitations and known issues.

Be familiar with these limitations so your models can be as accurate as possible!



Known issues - Manual J Overview

https://docs.coolcalc.com/user-guide/MJ8/known-issues.html

Developer Docs User Guide

KNOWN ISSUES

i

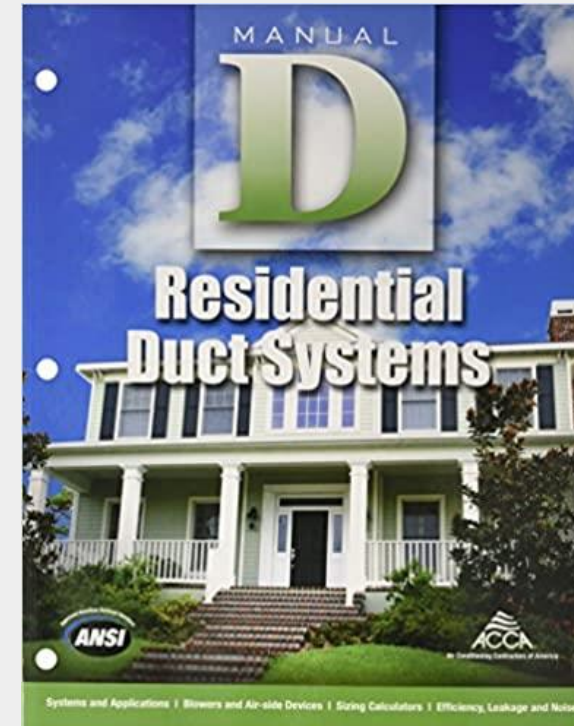
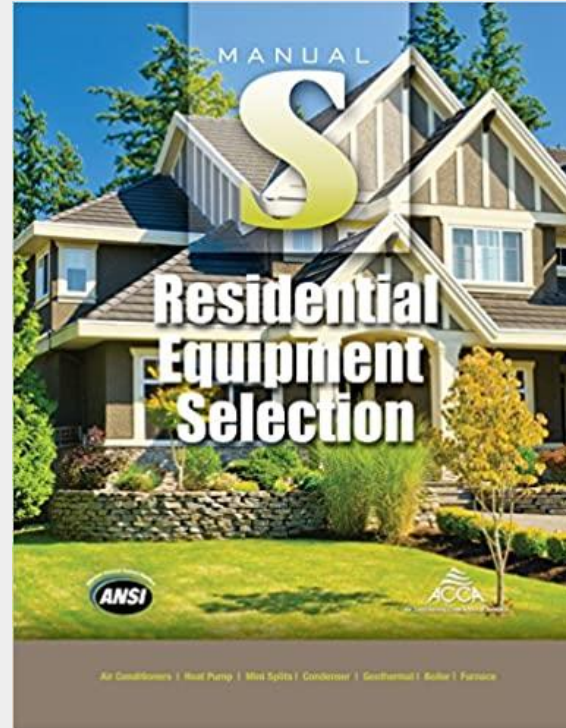
We strive to continually improve the CoolCalc applications. As in any not-trivial application, there are some known issues in CoolCalc. The following are current and known open issues:

- i* Switching data source when dimensions exist causes breaks.
- i* Switching skylight construction between NFRC rated and not causes errors.
- i* MJ8 reports show empty AED graphs when an HVAC system is heated only.
- i* Some combinations of construction features return null for MJ8 data.
- i* Duct systems with known surface area may cause load calculation errors
- i* Weather stations in colder coastal areas.
- i* Room appliances

Beyond Manual J

Completing Residential Calculations

- Manual S and Manual D are needed to complete a residential load analysis and properly size the HVAC equipment.
 - Manual S adjusts equipment from manufacturer default test conditions to the air conditions assumed in the load calculation.
 - Manual D sizes ducts to properly move air, ensure even conditioning of whole home



Beyond the ACCA Manuals

- There are hourly energy simulation programs, like DOE's Energy+ for commercial buildings, that can analyze annual loads for residential
 - ACCA manuals only calculate peak loads
- EnergyGauge, REM/Rate, BeOpt, and others provide annual energy consumption
 - Can be used for Net-Zero planning, energy code ERI calculations, and load sizing.
 - Usually do not include duct sizing, though!

List of software can be found here:

<https://www.buildingenergysoftwaretools.com/>



Questions?

energycode@illinois.edu

800-214-7954