HVAC LOAD CALCULATIONS AND THE ENERGY RATER



RESNET

2009



Research Toward Zero Energy Homes



Accu-Size Heating & Cooling Hor

Cooling load (heat gain) - S	95 deg	ree day		Heating
SQUARE FOOTAGE OF WINDOWS	22.253		HEAT GAIN	SQUARE
North (single)	X 26	A		Single gla
North (double)	X 21			Double g
NE & NW (single)	_X 45	-		SOUARE
NE & NW (double)	X 35			Single gla
East & West (single)	X 60	÷		Double g
East & West (double)	X 49	-		Wood (ne
SE & SW (single)	X 50	-		Wood (w
SE & SW (double)	X 40	=		Insulated
South (single)	X 36	-		moulateu
South (double)	X 25	=		SQUARE
SQUARE FOOTAGE OF DOORS			HEAT GAIN	Frame (1)
Wood (no storm door)	X 13	-		Frame (6
Wood (w/storm door)	_X9	-		Maeonry
Insulated metal door	_X 6	-		Masonry
SQUARE FOOTAGE OF NET WALLS			HEAT GAIN	course
Wall perimeter Xheight	t	less		SQUARE No incul
glass and door area = net	wall			D 11 (2" ;
No insulation	_X 8	-		R-II (3 I D 10 (6")
R-13 (3.5" insulation)	_X3	-		R-19 (0 1
R-19 (6" insulation)	_ X 2	=		R-30 (10
SQUARE FOOTAGE OF CEILING			HEAT GAIN	SQUARE
No insulation	_ X 22	-		No insula
R-11 (3" insulation)	X 4.1	-		Carpet (r
R-19 (6" insulation)	_ X 2.6	-		K-II (3"+
R-30 (10" insulation)	_ X 1.6	=		SQUARE
SOUNDE EQUITACE DE ELOOP			HEAT CAIN	No insula
No insulation	¥ 3		ILAI GAIN	Carpet or
Parpet (no insulation)	_ X 2	2.5.7		PERIME
R-11 (3"+ insulation)	_ X 1			Slab (no
Floor on slab	XO	-	0	Slab (edg
INFILTRATION / VENTILATION			HEAT GAIN	INFILTR
Home square feet	X 3.5	=	ILAI GAIN	Home sq
INTERNAL CAINS			HEAT CAIN	Subtota
Number of people X 530	-		ILAI GAIN	LOSSES
Kitchen & bath allowance	7		1250	In crawl
Subtotal BTU/h heat gain	_	-		In attic - (
CUNS FROM DUCTION			IIIIII	Total B
n grawl epage (enhtetal DTU/h V	(00)		HEAT GAIN	000/ /
n attic - (subtotal BTU/h X .13)	.09)			80% furna 90% furna
Total BTU/h heat gain		-		Table

FOOTAGE (ss ass	Cooling load (heat gain) -	95 deg	ree da	y
FOOTAGE (ss patio ass patio	SQUARE FOOTAGE OF WINDOWS			HEAT (
storm doo	North (single)	X 26	=	
metal doo FOOTAGE C	North (double)	X 21	=	
o insulation 5" insulatio	NE & NW (single)	X 45	=	
insulation (no insulat	NE & NW (double)	X 35	=	
FOOTAGE C	East & West (single)	X 60	=	
tion isulation)	East & West (double)	X 49	=	
insulation)	SE & SW (single)	X 50	=	
tion o insulatio	SE & SW (double)	X 40	=	
insulation) FOOTAGE C	South (single)	X 36	=	
tion insulation	South (double)	X 25	=	
ER OF SLAE	X 57 =			
nsulation)	ATTION HEAT LOSS			
are feet	<u></u> OR. Just	t do t	he o	ld
I BIU/h h	eat loss =			
ROM DUCTWO pace - (subtol subtotal BTU/	HEAT LOSS HEAT LOSS al BTU/h X .10)	y!		
U/h heat		CT	DEI	DTO



TRIM OUT VERY CAREFULLY ON DASHGED LINES, THEN FOLLOW INSTRUCTIONS BELOW Stand on

curb across from the home you are performing the calculation on. Look through the sizing holes locating the best match. For larger homes and or zoning use multiple Sizing Holes.

HVAC Load Calculations.

- Why should an Energy Rater perform HVAC Load Calculations?
- What is meant by a Room x Room calculation?
- Why use ACCA Manual J Version 8?

MJ8 Sensitivities.

How can an Energy Rater benefit?

Energy Raters and Air Flow

Energy raters are already familiar with airflow.
We use air flow as a tool to do energy ratings.





Two types of Airflow.

With respect to residential and commercial construction there are two kinds of airflow.

Controlled and Uncontrolled



Energy Raters use controlled airflow to estimate the amount of uncontrolled airflow.

Uncontrolled Airflow

Pressure readings were taken across the closed entrance door of each apartment. The purpose is to see if there were any extreme pressure differences. The Florida Building Code says there cannot be no more than 2.5 Pascals pressure difference across closed doors between spaces.

Uncontrolled Airflow

The elevator lobby was found to be a -27.3 Pascals with respect to the apartments. This means air in the elevator lobby is trying to go into the apartment.



Uncontrolled Airflow

Leaky buildings Leaky Duct Systems Unbalanced building pressures.







Uncontrolled Airflow = Infiltration

Infiltration influences how the building reacts in terms of health, safety, durability, comfort, and energy efficiency.

•Can be estimated with a high degree of accuracy.

•Can be tested with a high degree of accuracy.

•Can be eliminated or controlled.







Duct Leakage

Influences how the building reacts in terms of health, safety, durability, comfort, and energy efficiency.

- •Can be estimated with a high degree of accuracy.
- •Can be tested with a high degree of accuracy.
- •Can be eliminated.







As <u>Energy Raters</u>we understand uncontrolled airflow.

So lets talk about controlled airflow.

Controlled Airflow

Open and closing windows Table fan

Air conditioning systems.







The Building is a System **Air Conditioning is a Sub System Air Conditioning Conditions Air, duh! Air Conditioning Moves Air Air Conditioning Blows and Sucks Air Conditioning Affects Building** Pressure **Air Conditioning Makes the Building Come Alive**

Room Airflow

Relating to Air Conditioning Systems

Determined by the estimated Heat Gain/Loss; Cooling or heating which ever has been chosen to dominate the system design.

HVAC Load calculations should be performed on a <u>Room x Room</u>basis. Based on the Heat Loss/Gain through the building envelope and internal gains relative to each room.

Room x Room Loads

If the HVAC system is the backbone of the house as a system. The HVAC load calculation is the backbone of the HVAC system

- Required to determine supply CFM for each room
- Required to select Supply Outlets
- Required to select Return Inlets
- Required to design a Duct System
- Required to diagnose comfort problems

303.5.1.5 Manufacturer's Equipment Performance Ratings (e.g., HSPF, SEER, AFUE) shall be corrected for local climate conditions and mis-sizing of equipment. To determine equipment mis-sizing, the capacity of heating and cooling vapor compression equipment shall be calculated in accordance with ACCA Manual J, Eighth Edition, ASHRAE 2001 Handbook of Fundamentals, or an RESNET Residential Energy Services Network equivalent computation procedure, using the following assumptions: **Recognize This?**

2006 Mortgage Industry National **Home Energy Rating Systems Standards**

and a second second land

ACCA Manual J V8



The Standard in the Industry

Why Use MJ8



The heating and cooling load estimates affect every aspect of the system design procedure

- From system selection
- To equipment selection procedures
- To placement and selection of air distribution hardware
- To duct routing and airway sizing or pipe layout and sizing
 - Because of this the load calculation must be as accurate as possible

Value of Manual J



Eliminate Under-sizing of Heating & Cooling Equipment

- Eliminate Over-sizing of Heating & Cooling Equipment
- Humidity Control During the Cooling Season
- Eliminate Comfort Problems

Relating to Cooling Under Sizing Equipment

The obvious problem with undersized equipment is that it will not maintain the desired temperature. However, slightly undersized cooling equipment (by a margin of 10% or less) may actually provide more comfort at a lower cost.



Oversized Equipment Causes

- short-cycles marginalized
- temperature control pockets of
- stagnate air degrades humidity
- control during the cooling season
- requires larger duct runs



Oversized Equipment Causes

increases the installed
cost increases the operating cost increases
the demand on our utilities adds
unnecessary stress on equipment





Humidity Control During The Cooling Season

- Sensible and latent cooling loads are imposed on buildings located in hot humid climates.
- When the summer design condition occurs, properly sized equipment will <u>operate continuously or almost</u> <u>continuously</u>, both loads will be neutralized, and the occupants will be comfortable.

BUT, Design Conditions Only Occur For A Few Dozen Hours Per Season.



Design Conditions

Table 1A

Outdoor Design Conditions For the United States and Canada

	Elevation	Latitude	Winter			Sun	imer		
Location	Feet	Degrees North	Heating 99% Dry Bulb	Cooling 1% Dry Bulb	Coincident Wet Bulb	Design Grains 55% RH	Design Grains 50% RH	Design Grains 45% RH	Daily Range (DR)
St. Augustine	10	29	35	89	78	59	66	72	М
St. Petersburg	11	28	47	93	79	59	66	72	М
Sanford	55	28	38	93	76	39	46	52	М
Sarasota/Bradenton	30	27	43	92	79	61	68	74	M
Tallahassee AP	55	30	28	93	76	39	46	52	M
Tampa AP	19	28	40	91	77	49	56	62	М
Valpariso, Eglin AFB	85	30	33	90	78	57	64	70	М
Vero Beach	13	27	43	90	78	57	64	70	M
West Palm Beach AP	15	26	47	90	78	57	64	70	М





Outdoor design conditions used to estimate heating and cooling loads do not represent the most severe weather conditions experienced at a particular location.

However, they do represent extremes that, on average, will not be exceeded for more than a few dozen hours per season.

This means that when heating and cooling loads are based on Table 1, recommended design conditions, comfort and performance are optimized for thousand of hours per season.





Load estimating and equipment sizing concepts must be explained to the builders and home owners because they do not understand that installation and operating cost increase and long term comfort decreases when load estimates are based on <u>record-setting weather conditions</u> (MJ8, A3-2)





Using Table 1 from ACCA Manual J for West Palm Beach the summer outdoor dry bulb temperature is 90°



At peak load conditions, the HVAC load calculations shows the net gain on the building is 32,000 BTUH total.





50% of the time our temperatures range is in the moderate temperature zone. The net gain could drop to 23,000 BTU/H on a 90°day if the sun is behind the clouds.



Sensible load variation shows a difference of 9000 BTUH while our latent load remains the same!



Lets say the temperature dropped to 85 when the sun went behind the clouds.

Sensible load drops to 16,500 BTU/H, a difference of 15,500 BTUH.



If your load calculation came out to 39,500 NET BTUH, what size system would you install?



39,500 BTU/H NET BTUH , 81% SHR

MJ8 Sensitivities

DesignconditionsBuildingtightnessFenestrationAirDesign & Installation



Location	Elevation Feet	Latitude Degrees North	Winter Heating 99% Dry Bulb	Summer						
				Cooling 1% Dry Bulb	Coincident Wet Bulb	Design Grains 55% RH	Design Grains 50% RH	Design Grains 45% RH	Daily Range (DR)	
St. Augustine	10	29	35	89	78	59	85	72	M	
St. Petersburg	-11	28	47	93	79	59	66	72	М	
Sanlord	55	28	38	93	76	39	45	52	М	
Sarasota Bradenton	30	27	43	92	79	61	68	74	М	
Tallahassee AP	55	30	28	93	75	39	45	52	М	
Тапра АР	19	28	40	91	77	49	56	62	М	
Valpariso, Eglin AFB	85	30	33	90	78	57	64	70	М	
Vero Beach	13	27	43	90	78	57	64	70	М	
West Palm Beach AP	15	26	47	90	78	57	64	70	М	




Guidelines

Use outdoor design conditions recommended by Table 1 Manual J.

- Use the default indoor design conditions recommended by Manual J.
- Take full credit for all internal shading devices and external overhangs.
- Use internal shading devices that are compatible with the type of room.

Guidelines

- Do not use internal shade if the room is specifically used for day lighting.
- Use the tested performance coefficients when known.
- Take full credit for all insulation & sealing efforts.
- Take full credit for insulated & sealed duct runs located in unconditioned space.

ACCA Manual J V8





A Computer Only Procedure

From "Addendum B" from ACCA Manual J®

Addendum B to

ACCA Manual J_® Residential Load Calculation Eighth Edition

ANSI/ACCA Man J 2-2004

ISBN#1-892765-27-6

This addendum updates Version 1.10 of Manual J Eighth Edition (MJ8TM) and addresses *AED Protocol Revisions* to the MJ8TM procedures.

Executive Summary

Now that the industry and software houses have had time to work with the Eighth Edition of *Manual J*_{*}, ACCA has determined that AED simplifications would ease implementation by third-party software vendors and improve the understanding and use of MJ8 by practitioners. This addendum revises the adequate exposure diversity (AED) approach on window/glass exposures in the following manners:

- a) MJ8 shall become a computer-only procedure. (Note: A shorter, abridged version of MJ8 is under development that supports a hand calculation procedure aimed at single-family, detached dwellings with single-zone, constant-volume systems).
- b) A computer-only, hourly fenestration gain (HFG) procedure shall be used for all application scenarios.
- c) Calculations shall be made for midsummer, unless southerly-facing fenestration causes a peak gain in the fall.
- d) Hand calculation procedures for applications other than single family detached dwellings served by a single zone, constant volume system shall be abandoned in favor of computerized solutions.

From Part of Section 1-16 ACCA Manual J 8thEdition

Computerized method calculates load by month of year and time of day associated with each room load and with the equipment sizing load.

Computer can generate solutions for 288 scenarios (12 month year and 24 hour day)









Notice of the software programs are recognized by ACCA as meeting the standards of Manual J residential load calculations.
Elite



Software

WrightSoft

Nitek

Right-J

HVAC

Wizard

9	 I ttp://www.acca.org/teci 	n/manual)/software/		Live Search	
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	Members Only * Click here for ACCA Member Central. Forgot username?	Remember, only these c ACCA" logo and only the load calculation. UPDATED: As of Novemb updated their software pr	ompanies are authorized to ir products meet the standa er 12, 2004, Elite Software, oducts to include all four ad	o display the "Powered by ards of Manual J residential Nitek and Wrightsoft have denda to Manual J 8th Edition.	
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	ACCA Events Technical Training Conference & Expo CC Roundtable Full Calendar	Wrightsoft Right-J8 Right-J8 Features Download Demo			
	Join ACCA Learn more about the ACCA Advantage and join online.	Purchase Right-Ji Nitek HVAC Wizard	3 & Other Wrightsoft Product	S	
	contractor	Learn More & Pure	chase HVAC Wizard		

Floor Plan Required.



Room x Room Entry

2	Running Feet	of Exposed	Vall																						
3	Ceiling Heigh	t At Walls (F	and Gross	Wall A	Area (Se	(FI)											-								
4	Room Dimen	ions LxW (F	t) and Eloor	Dian A	Irea /Se	(FI)			_																
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Room Entry Data

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Table 1A

RHVAC weather data base comes directly from ACCA Manual J version 8 Table 1A & 1B(micro climates).

Table 1A

Outdoor Design Conditions For the United States and Canada

	Elevation	Latitude	Winter			Sun	mer		
Location	Feet	Degrees North	Heating 99% Dry Bulb	Cooling 1% Dry Bulb	Coincident Wet Bulb	Design Grains 55% RH	Design Grains 50% RH	Design Grains 45% RH	Daily Range (DR)
St. Augustine	10	29	35	89	78	59	66	72	м
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Sarasota/Bradenton	30	27	43	92	79	61	68	74	м
Tallahassee AP	55	30	28	93	76	39	46	52	M
Tampa AP	19	28	40	91	77	49	56	62	м
Valpariso, Eglin AFB	85	30	33	90	78	57	64	70	м
Vero Beach	13	27	43	90	78	57	64	70	М
West Palm Beach AP	15	26	47	90	78	57	64	70	м

Outdoor Design Conditions

The Data that is automatically filled in comes from Table 1A in ACCA Manual J 8th edition.

Outdoor Design Conditions For the United States and Canada.

General Project Data		
Project <u>C</u> lient C <u>o</u> mpany	De <u>s</u> ign D <u>u</u> ct	
Reference City:	West Palm Beach, Florida	
Daily Range:	Medium 🖌	
Latitude:	26 🗸	
Elevation:	15 -	
Elev. Derating:	Sensible Total Heatin	ng -
Dry Bulb Temperature:	45 🗸 91 🗸	
Wet Bulb Temperature:	78 🗸	
People Loads:	Sensible Latent	

System Information

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esign <u>Equipment</u>							
System Design Condit	ions						
	Winter	1	Summ	er			
Indoor Temperature:	70	-	75	-	Do Winter Humid.:	No	-
Relative Humidity:	50	-	50	-	System Air Type:	Fixed	-
Lvg. Coil-Rm DT:	70	-	20	-	System CFM:	675	-
Infiltration:	0	-	0	-	Pct. Sens. Capacity:	75	-
Ventilation:	42.46	-	42.46	-	Radiator Btuh/ft.:	0	-
Exhaust:	0	-	0	-	Radiator Text Option:	Foot	-
Do Heat Recovery:	No	-	No	-	Duct Load Factors:	(None)	-
Heat Recovery SER:	60	-	60	-			
Blower Power:			0	-			
Hot Water Piping:	0	-					

 Indoor Design Conditions
 Infiltration
 Ventilation

MJ8 & Infiltration For Winter

W	inter Infiltration 3 or 4 Exposures (f Select the number of changes per hour of the appropriate firep number of fireplace: the Rhvac Help wir	ree standing stru of exposures that th ption based on the place option based s. To read descript ndow and click the	ucture) 1 is system has quality of the on the constri ions of exactly link for the "C Cor (Sou	or 2 Expo by clickin envelope uction qua y what is r onstruction ditioned are feet	Reside Calcu	ential Loa lation		Add AC Re Ca Eig ANS
	Construction	900 or Less	901 to 1500	1501 to 200		Liber 1		1.525
	Tight	0.21	○ 0.16	C 0.1	Includes sol on CD-RON	A attempt	CCA spinnesses / kernin	This
	Semi-Tight	0.41	0.31	○ 0.2			10 mg	Eight
	Average	0.61	○ 0.45	C 0.3				Gam
	Semi-Loose	C 0.95	C 0.70	C 0.59	C 0.49	0.43	C 27	
	Loose	O 1.29	· 0.94	C 0.80	0.66	0.58	C 33	
	Number of Firep	laces: 0	<u> </u>	Fireplace Infiltration	: CFM (addeo n Air Change	l to AC/hr): 0 s per Hour: 0.	▼ 94 ▼	
						01	C	ancel

Addendum D to

ACCA Manual J_® **Residential Load Calculation** Eighth Edition

ANSI/ACCA Man J 2-2004

ISBN# 1-892765-27-6

This addendum updates Version 1.10 of Manual J Eighth Edition (MJ8[™]) and addresses *Infiltration Gain / Loss Revisions* to the MJ8 procedures.

MJ8 & Infiltration For Summer Loose Construction



MJ8 & Infiltration

🍠 System Data - System 1 of 1			
No: Image: System 1 Design Equipment System Design Conditions Indoor Temperature: 70 Indicator Temperature: 70 Infiltration: 0.94 Infiltration: 0.94 Infiltration: 0 Infiltration: <th>5,739 I from a 3 built bu 1 today's</th> <th>3TUH loose uilding stan</th> <th>gain ly g by dards</th>	5,739 I from a 3 built bu 1 today's	3TUH loose uilding stan	gain ly g by dards
2: Do Heat Recovery: No No Duct Load Factors: (Data) Image: Control of Contro	5,908 0	0	0
Subtotals for structure: People: 4 Equipment: Lighting: 0 Ductwork:	17,491 0 800 800 5,660 999	11,924 920 1,600 0 5 162	11,924 1,720 2,400 0 6,161
Infiltration: Winter CFM: 190, Summer CFM: 99 Ventilation: Winter CFM: 0, Summer CFM: 0	5,222 3,998 0 0	1,741 0	5,739 0
Total Building Load Totals:	28,373 6,597	21,347	27,944
Check Figures Total Building Supply CFM: 940 CFM Square ft. of Room Area: 1,246 Squ Volume (ft³) of Cond. Space: 12,124 Air T	/ Per Square ft.: are ft. Per Ton: Furnover Rate (per hour):	0.7 5	/54 525 4.7

MJ8 & Infiltration For Summer Tight Construction



Image: System 1 Design Equipment System Design Conditions Winter Summer Indoor Temperature: 70 70 75 Do Winter Humid.: No Vinter System Design Conditions Winter Summer Indoor Temperature: 70 70 75 Do Winter Humid.: No Venturation: 0 50 Venturation: 0.16 0 Venturation: 0<	939 from built toda	BTUH a loc builc y's st	H gain osely ding b anda	y rds
Blower Power: Hot Water Piping: 0 -		0	0	
People: 4 Equipment: Lighting: 0	17,491	0 800 800	11,924 920 1,600 0	11,924 1,720 2,400 0
Ductwork. Infiltration: Winter CFM: 32, Summer CFM: 16	5,682 888	1,223 654 0	5,234 285 0	6,457 939 0
Ventilation, Winter ChW, 0, Summer ChW, 0		and the second se		



Infiltration: Winter CFM: 190, Summer CFM: 99 5,222 3,998 1,741 5,739

Tight Construction

0					
Ductivite	0,002	1,220	0,201		
Infiltration: Winter CFM: 32, Summer CFM: 16	888	654	285	939	
			· · · · · · · · · · · · · · · · · · ·		

MJ8 & Duct Leakage



MJ8 & Duct Design

Toad Preview													
	A 4	A ×											
AED	Net.Ton	Rec.Ton	ft²/Ton	Area	S.Gain	L.Gain	Net.Gain	S.Loss	W.CFM	S.CFM	Sys.CFM	[].Size	
	2.11	2.28	546	1,246	20,534	4,794	25,327	24,566	227	900	940		
Yes	2.11	2.28	546	1,246	20,534	4,794	25,327	24,566	227	900	940	0*	
					747	1,715	2,462	1,167					
					5,343	1,479	6,822	5,908					
				1,246	14,444	1,600	16,044	17,491	227	900	940	1 1 1 1	
				155	1,392	0	1,392	2,414	31	87	91	1-6	
				155	1,392	0	1,392	2,414	31	87	91	1-6	
				120	783	0	783	1,213	16	49	51	1-4	
				48	121	0	121	59	1	8	8	1-4	
				43	378	0	378	702	9	24	25	1-4	
				329	4,838	400	5,238	4,196	55	301	315	1-10	
				276	3,240	1,200	4,440	3,462	45	202	211	1-9	
				120	2,300	0	2,300	3,031	39	143	150	1-7	
	AED	AED Net.Ton 2.11 Yes 2.11	A A × AED Net.Ton Rec.Ton 2.11 2.28 Yes 2.11 2.28 Yes 2.11 2.28 Yes 2.11 2.28 Yes 2.11 2.28	Image: A transmission of the stress of th	Image: A Image: A <th< td=""><td>A A × AED Net.Ton Rec.Ton ft²/Ton Area S.Gain 2.11 2.28 546 1.246 20,534 Yes 2.11 2.28 546 1.246 20,534 Yes 2.11 2.28 546 1.246 20,534 Yes 2.11 2.28 546 1,246 20,534 Yes 2.11 2.28 546 1,246 20,534 Yes 2.11 2.28 546 1,246 14,444 Yes Yes Yes 1.246 14,444 Yes Yes Yes 1.20 783 Yes Yes Yes 1.20 783 Yes Yes Yes 1.20 783 Yes Yes Yes Yes 1.20 378 Yes Yes Yes Yes 1.20 3.240 Yes Yes Yes Yes 1.20</td><td>▲ ▲ ★ AED Net.Ton Rec.Ton ft®/Ton Area S.Gain L.Gain 2.11 2.28 546 1.246 20.534 4.794 Yes 2.11 2.28 546 1.246 10.444 1.600 Yes Yes Yes Yes 1.55 1.392 0 Yes Yes Yes Yes 120 783 0 Yes Yes Yes Yes 120 783 0 Yes Yes Yes Yes 120 783 0 Yes Yes Yes Yes</td><td>AED Net.Ton Rec.Ton ft²/Ton Area S.Gain L.Gain Net.Gain 2.11 2.28 546 1,246 20,534 4,794 25,327 Yes 2.11 2.28 546 1,246 14,444 1,600 16,044 Yes Yes Yes 1.21 155 1,392 0 1,392 Yes Yes Yes 120 783 0 783 Yes Yes Yes 329 4,</td><td>AED Net.Ton Rec.Ton ft²/Ton Area S.Gain L.Gain Net.Gain S.Loss 2.11 2.28 546 1,246 20,534 4,794 25,327 24,566 Yes 2.11 2.28 546 1,246 20,534 4,794 25,327 24,566 Yes 2.11 2.28 546 1,246 20,534 4,794 25,327 24,566 Yes 2.11 2.28 546 1,246 20,534 4,794 25,327 24,566 Yes 2.11 2.28 546 1,246 14,444 1,600 16,044 17,491 I I 1.55 1,392 0 1,392 2,414 I I I 120 783 0 783 1,213 I I I I I I 120 783 0 378 702 I I I I I I</td><td>A A × AED Net.Ton Rec.Ton ft²/Ton Area S.Gain L.Gain Net.Gain S.Loss W.CFM 2.11 2.28 546 1.246 20,534 4,794 25,327 24,566 227 Yes 2.11 2.28 546 1,246 20,534 4,794 25,327 24,566 227 Yes 2.11 2.28 546 1,246 20,534 4,794 25,327 24,566 227 Yes 2.11 2.28 546 1,246 20,534 4,794 25,327 24,566 227 Yes 2.11 2.28 546 1,246 14,444 1,600 16,044 17,491 227 Yes Yes Yes Yes 155 1,392 0 1,392 2,414 31 Yes Yes Yes Yes 120 783 0 783 1,213 16 Yes Yes</td><td>A A × AED Net.Ton Rec.Ton f%/Ton Area S.Gain L.Gain Net.Gain S.Loss W.CFM S.CFM 2.11 2.28 546 1.246 20,534 4,794 25,327 24,566 227 900 Yes 2.11 2.28 546 1,246 20,534 4,794 25,327 24,566 227 900 Yes 2.11 2.28 546 1,246 20,534 4,794 25,327 24,566 227 900 Yes 2.11 2.28 546 1,246 20,534 4,794 25,327 24,566 227 900 Yes 2.11 2.28 546 1,246 14,444 1,600 16,044 17,491 227 900 Yes 1.246 14,444 1,600 16,044 17,491 227 900 Yes 1.246 14,444 1,600 1,392 2,414 31 87<td>A A × AED Net.Ton Rec.Ton ff*/Ton Area S.Gain L.Gain Net.Gain S.Loss W.CFM S.CFM Sysc.FM 2.11 2.28 546 1.246 20,534 4,794 25,327 24,566 227 900 940 Yes 2.11 2.28 546 1,246 20,534 4,794 25,327 24,566 227 900 940 Yes 2.11 2.28 546 1,246 20,534 4,794 25,327 24,566 227 900 940 Yes 2.11 2.28 546 1,246 14,444 1,600 16,044 17,491 227 900 940 Yes 1.246 14,444 1,600 16,044 17,491 227 900 940 Yes 1.246 14,444 1,600 16,044 17,491 227 900 910 91 91 91 91 91</td></td></th<>	A A × AED Net.Ton Rec.Ton ft²/Ton Area S.Gain 2.11 2.28 546 1.246 20,534 Yes 2.11 2.28 546 1.246 20,534 Yes 2.11 2.28 546 1.246 20,534 Yes 2.11 2.28 546 1,246 20,534 Yes 2.11 2.28 546 1,246 20,534 Yes 2.11 2.28 546 1,246 14,444 Yes Yes Yes 1.246 14,444 Yes Yes Yes 1.20 783 Yes Yes Yes 1.20 783 Yes Yes Yes 1.20 783 Yes Yes Yes Yes 1.20 378 Yes Yes Yes Yes 1.20 3.240 Yes Yes Yes Yes 1.20	▲ ▲ ★ AED Net.Ton Rec.Ton ft®/Ton Area S.Gain L.Gain 2.11 2.28 546 1.246 20.534 4.794 Yes 2.11 2.28 546 1.246 10.444 1.600 Yes Yes Yes Yes 1.55 1.392 0 Yes Yes Yes Yes 120 783 0 Yes Yes Yes Yes 120 783 0 Yes Yes Yes Yes 120 783 0 Yes Yes Yes Yes	AED Net.Ton Rec.Ton ft²/Ton Area S.Gain L.Gain Net.Gain 2.11 2.28 546 1,246 20,534 4,794 25,327 Yes 2.11 2.28 546 1,246 14,444 1,600 16,044 Yes Yes Yes 1.21 155 1,392 0 1,392 Yes Yes Yes 120 783 0 783 Yes Yes Yes 329 4,	AED Net.Ton Rec.Ton ft ² /Ton Area S.Gain L.Gain Net.Gain S.Loss 2.11 2.28 546 1,246 20,534 4,794 25,327 24,566 Yes 2.11 2.28 546 1,246 20,534 4,794 25,327 24,566 Yes 2.11 2.28 546 1,246 20,534 4,794 25,327 24,566 Yes 2.11 2.28 546 1,246 20,534 4,794 25,327 24,566 Yes 2.11 2.28 546 1,246 14,444 1,600 16,044 17,491 I I 1.55 1,392 0 1,392 2,414 I I I 120 783 0 783 1,213 I I I I I I 120 783 0 378 702 I I I I I I	A A × AED Net.Ton Rec.Ton ft²/Ton Area S.Gain L.Gain Net.Gain S.Loss W.CFM 2.11 2.28 546 1.246 20,534 4,794 25,327 24,566 227 Yes 2.11 2.28 546 1,246 20,534 4,794 25,327 24,566 227 Yes 2.11 2.28 546 1,246 20,534 4,794 25,327 24,566 227 Yes 2.11 2.28 546 1,246 20,534 4,794 25,327 24,566 227 Yes 2.11 2.28 546 1,246 14,444 1,600 16,044 17,491 227 Yes Yes Yes Yes 155 1,392 0 1,392 2,414 31 Yes Yes Yes Yes 120 783 0 783 1,213 16 Yes Yes	A A × AED Net.Ton Rec.Ton f%/Ton Area S.Gain L.Gain Net.Gain S.Loss W.CFM S.CFM 2.11 2.28 546 1.246 20,534 4,794 25,327 24,566 227 900 Yes 2.11 2.28 546 1,246 20,534 4,794 25,327 24,566 227 900 Yes 2.11 2.28 546 1,246 20,534 4,794 25,327 24,566 227 900 Yes 2.11 2.28 546 1,246 20,534 4,794 25,327 24,566 227 900 Yes 2.11 2.28 546 1,246 14,444 1,600 16,044 17,491 227 900 Yes 1.246 14,444 1,600 16,044 17,491 227 900 Yes 1.246 14,444 1,600 1,392 2,414 31 87 <td>A A × AED Net.Ton Rec.Ton ff*/Ton Area S.Gain L.Gain Net.Gain S.Loss W.CFM S.CFM Sysc.FM 2.11 2.28 546 1.246 20,534 4,794 25,327 24,566 227 900 940 Yes 2.11 2.28 546 1,246 20,534 4,794 25,327 24,566 227 900 940 Yes 2.11 2.28 546 1,246 20,534 4,794 25,327 24,566 227 900 940 Yes 2.11 2.28 546 1,246 14,444 1,600 16,044 17,491 227 900 940 Yes 1.246 14,444 1,600 16,044 17,491 227 900 940 Yes 1.246 14,444 1,600 16,044 17,491 227 900 910 91 91 91 91 91</td>	A A × AED Net.Ton Rec.Ton ff*/Ton Area S.Gain L.Gain Net.Gain S.Loss W.CFM S.CFM Sysc.FM 2.11 2.28 546 1.246 20,534 4,794 25,327 24,566 227 900 940 Yes 2.11 2.28 546 1,246 20,534 4,794 25,327 24,566 227 900 940 Yes 2.11 2.28 546 1,246 20,534 4,794 25,327 24,566 227 900 940 Yes 2.11 2.28 546 1,246 14,444 1,600 16,044 17,491 227 900 940 Yes 1.246 14,444 1,600 16,044 17,491 227 900 940 Yes 1.246 14,444 1,600 16,044 17,491 227 900 910 91 91 91 91 91	

Design room CFM (airflow)

Duct Loads

Addendum C to

ACCA Manual J_® **Residential Load Calculation** Eighth Edition

ANSI/ACCA Man J 2-2004

ISBN#1-892765-27-6

This addendum updates Version 1.10 of Manual J Eighth Edition (MJ8TM) and addresses *Duct Gain / Loss Revisions* to the MJ8 procedures.

Ducts located in the unconditioned space also have a heat gain that adds to the cooling load of the building.

Duct Load Factors - Locat	ion Scenario	1 of 5		×
Duct Properties	Supply		Retur	n
Duct Location:	Attic	-	Attic	-
Attic Ceiling Type:	16B	-	16B	-
Duct Leakage Rate:	0.12	-	0.24	
Duct Insulation R-Value:	6	-	6	-
Duct Surface Area:	0	<u> </u>	0	_
Sensible I Sensible (Latent Ga	Loss:	1		0%
If the ducts in this system are properties that differ, you can below and enter "Duct Prope 5 total). Duct Scenario No.: 1	e in more than n change the erties" data fo • Desc.:	n one loca Duct Sco or addtion Main	ation or ha enario Nurr al scenario	ive other iber os (up to
≪ ≫ 🖻 🖻 Total Duct Surface Area for Scenario 1 Percentage:	System 1:	Supply O O%	Re ▼ 0 ▼ 0%	turn V
		1		Cancel

Calculate Duct Loads

	Supply	Ret	urn
Duct Location:	Attic	▼ Attic	
Attic Ceiling Type:	16B	▼ 16B	
Duct Leakage Rate:	0.06	• 0.06	
Duct Insulation R-Valu	e: 6	- 6	
Duct Surface Area:	336	▼ 249	
Results			
Calculate	Sy Du	stem 1 Pe ct Load To	rcent of tal Load
Sen	sible Loss:	4,350	18%
Sens	sible Gain:	4,700	24%
Late	ent Gain:	629	18%
Multiple Duct Scenario	s (Optional) —		
If the ducts in this syste	em are in more that	n one location or	have oth
properties that differ, yo	ou can change the Properties" data fo	Duct Scenario No	umber rios (up.)
below and enter "Duct	rioponios udia iu		nos (up i
below and enter "Duct 5 total).			
below and enter "Duct 5 total). Duct Scenario No.: 1	▼ Desc.:	Main	
below and enter "Duct 5 total). Duct Scenario No.: 1 « » 🗈 💼	Desc.:	Main Supply F	Return
below and enter "Duct 5 total). Duct Scenario No.: 1 « » 🖻 🖻	Desc.:	Main Supply F 336 V 24	Return 19
below and enter "Duct 5 total). Duct Scenario No.: 1 & >> 1 Total Duct Surface Are	▼ Desc.: ea for System 1:	Main Supply F 336 ▼ 24	Return 9

The Sensible Loss, Sensible Gain, and the Latent Gain are calculated for the duct system.



What If?

👃 Duct Load Factors - Location Scenario 1 of 5 🛛 🛛 🔀									
Duct Properties									
.	Supply	Heturn	- 1						
Duct Location:	Attic	✓ Attic	<u> </u>						
Attic Ceiling Type:	100	100							
Duct Leakage Rate:	0.06	▼ 0.06	-						
Duct Insulation R-Value:	6	▼ 6	•						
Duct Surface Area:	336	✓ 249	-						
□ Results									
	System	n 1 Percent o	E -						
Sensible Loss: 4,350 18%									
Sensible Gain: 4,700 24%									
Latent Gai	in:	629 18%							
Multiple Duct Scenarios (Optional)									
Extre	melv se	aled (seal							
shall be verifi	ed by lea	akage tes [.]	t)						
Duct Scenario No	Desc. Jacob	"							
« » 🖻 🔒	c.	upplu Doturn							
Total Duct Surface Area for	Sustan 1: 336								
Total Duct Sullace Alea Iol	Jystem 1. 550	· [245							
Scenario 1 Percentage:	100	% <u>-</u> 100%	-						
		<u>O</u> K Car	ncel						

Duct Load Fac	tors - Locatio	on Scena	rio 1 of 5			×
-Duct Properties		Supp	oly	Retu	m	
Duct Location:		Attic 🗸		Attic		
Attic Coiling Typ		168		160		
Duct Leakage F	late:	0.12	<u> </u>	0.06		J
Duct Insulation	R-Value:	6		6		Γ
Duct Surface A	rea:	336	•	249	-	J
- Results	Sensible Lo Sensible G Latent Gair	oss: ain: n:	System 1 Juct Load 5,62 5,19 1,11	Pero Tota 24 7 7 7	cent of al Load 23% 26% 28%	
properties that below and ento 5 total).	Ave	rage (MJ	seale 8 def	ed sys ault)	stem)
≪ ≫ Pa Pa Total Duct Surfa Scenario 1 Percenti	ace Area for S entage:	System 1:	Supply 336 100%		eturn))%]
				<u>o</u> k	Cance	







Rhvac - Residential & Light Commercia Colcs-Plus Venice: PL 34293-6060	al HVAC Loads	1	\$		Elite S	oftware Develo	pment, Inc. 5 Mrs Smith Page 14
Detailed Room Loads -	Room 6	- Great Ro	om (Avera	ge Load	Procedur	e)	
General							
Calculation Mode:	Htg. & clg.		Occurrences	63		1	
Room Length:	14.0	π.	System Num	ber:		1	
Room Width:	26.3	π.	Zone Numbe	r:		1	
Area:	368.0	SQ.II.	Supply Air:			298 CFN	1
Ceiling Height:	10.5	π.	Supply Air Cl	hanges:		4.6 AC/	hr
Volume:	3,866.0	cu.fl.	Required Ver	nt.:		0 CFN	1
Number of Registers:	1		Actual Winte	r Vent.:		0 CFN	1
Runout Air:	298	CFM	Percent of St	upply.:		0 %	
Runout Duct Size:	Runout Air.	298	CFM			in. Actu Surr	ial Imer
Ruppet Air Velochr	647	et imin	Dercent of St	innhr		Ven %	L:
Design Loss:	0 100	io wa /100 ft	Actual Winter	r Infil -		11 CEN	
Actual Loss:	0.095	in.wg/100 ft.	Actual Summ	ver Infil.;		6 CFN	i
Item	Ar	ea -U-	Htg	Sen	Cig	Lat	Sen
Description	Quant	thy Value	HTM	Loss	HTM	Gain	Gain
V -Wall-13A-50cs 23.5 X 9	131	0.125	3.1	410	2.0	0	267
4 -Part-15*/20*-12B-0sw 6.4 X 10.5	67	.2 0.097	1.9	130	1.5	0	98
V -GIS-1A-cb-d shgc-0.75 100% (4)	S 80	1.080	27.0	2,172	26.5	0	2,132
JP-Ceil-168-19 14 X 26.3	368	3.2 0.049	1.2	451	2.5	0	920
3 -Cell-16B-15 30.6 X 1	30	0.061	1.5	47	3.1	0	95
4 -Ceil-16B-15 20.5 X 1	20	0.5 0.061	1.5	31	3.1	0	64
loor-22A-ph 30 ft. Per.		30 1.358	34.0	1,019	0.0	0	0
subtotals for Structure:				4,260		0	3,576
nfil.: Win.: 11.1, Sum.: 5.7	2	12	1.442	305	0.478	231	101
Juchwork:				1,064			1,241
VED Excursion:							782
People: 200 lat/per, 230 sen/per.		2				400	460
Equipment						0	400
Room Totals:				5,629		631	6,560



Envelope materials	Enve	lope	Mate	rials
--------------------	------	------	------	-------

Rhvac - Residential & Light Commercial HVAC Loads			Elite	oftware Develo	opment. Inc.
Calcs-Plus	3			٨r	& Mrs Smith
Venice, FL 34293-6060	P				Page 6
Total Building Summary Loads			- <u> </u>	·	
Component	Area	Sen	Lat	Sen	Total
Description	Quan	Loss	Gain	Gain	Gain
1A-cb-o: Glazing-Single pane, operable window, clear, metal frame with break, outdoor insect screen with 50% coverage, white or reflective color drapes with tight weave with 50% coverage, u-value 1.08	115.4	3,114	0	2,466	2,466
1A-cb-d: Glazing-Single pane, sliding glass door, clear, metal frame with break, outdoor insect screen with 100% coverage, u-value 1.08	80.4	2,172	0	2,132	2,132
10A-b: Glazing-French door, single pane clear glass, metal frame with break, u-value 0.97	20.1	487	0	537	537
11J: Door-Metal - Fiberglass Core	20.1	302	0	326	326
11D: Door-Wood - Solid Core	20.1	157	0	118	118
13A-5ocs: Wall-Block, board insulation only, R-5 board insulation, open core, siding finish	999.7	3,124	0	2,039	2,039
12B-0sw: Part-Frame, R-11 insulation in 2 x 4 stud cavity, no board insulation, siding finish, wood studs	308.1	597	0	448	448
16B-19: Roof/Ceiling-Under attic or knee wall, Vented Attic, No Radiant Barrier, Dark Asphalt Shingles or Dark Metal, Tar and Gravel or Membrane, R-19 insulation	1285.6	1,575	0	3,213	3,213
16B-15: Roof/Ceiling-Under attic or knee wall, Vented Attic, No Radiant Barrier, Dark Asphalt Shingles or Dark Metal, Tar and Gravel or Membrane, R-15 insulation	84.8	130	0	264	264
22A-ph-c: Floor-Slab on grade, No edge insulation, no insulation below floor, carpet covering, passive, heavy moist soil	174	5,908	0	0	0
Subtotale for etructure:		17 566	0	11 5/3	11 5/3

Internal and Other Gains Check Figures Net Results

				Capa	acity)		
	,		2.12	Tons	(Based On	75% Sensib	le
Total Cooling Required With Outside Air	23.06	6 Btuh	1.92	Tons	(Based On	Sensible + I	atent)
Total Latent Gain:	3.99	7 Btuh	17	%			
Total Sensible Gain:	19.06	9 Btuh	83	%			
Building Loads Total Heating Required With Outside Air:	23.85	6 Btuh	23.856	MBH			
volume (π ^a) of Cond. Space: 12,5	35		Air Turnove	r Rate	(per nour):		4.2
Square ft. of Room Area: 1,2	85		Square ft. F	er Tor	l:		606
Total Building Supply CFM: 8	67		CFM Per S	quare f	t.:	0	.675
Check Figures							
Total Building Load Totals:			23	3,856	3,997	19,069	23,0
Ventilation: Winter CFM: 0, Summer CFM: 0			1994) 1994	0	0	0	1000000
Infiltration: Winter CFM: 65, Summer CFM: 3	3		1	,780	1,350	588	1,9
Ductwork:			4	,510	647	4,818	5,4
Lighting:			0			0	
Equipment:					1,200	1,200	2,4
People:			4		800	920	1,7
Subtotals for structure:			17	7,566	0	11,543	11,5

Calculations are based on 8th edition of ACCA Manual J.

All computed results are estimates as building use and weather may vary.

Be sure to select a unit that meets both sensible and latent loads.

Room Loads

1

Rhvac - Residential & Light Com Elite Software Development, In College Station, TX 77845-4491	mercial HVAC L	oads		1					Elite	Softwar	e Devel Mr	opment & Mrs : P:	t , Inc. Smith age 4
Load Preview Repor	t				20002								
Scope	Has AED	Net Ton	Rec Ton	ft² /Ton	Area	Sen Gain	Lat Gain	Net Gain	Sen Loss	Sys Htg CFM	Sys Clg CFM	Sys Act CFM	Duc Size
Buildin g		1.92	2.12	607	1,285	19,057	3,997	23,054	23,839	1,000	1,000	1,000	
System 1	Yes	1.92	2.12	607	1,285	19,057	3,997	23,054	23,839	1,000	1,000	1,000	0
Duct Latent							647	647					
Zone 1					9 17	14,414	2,719	17,133	18,231	765	676	676	
1-Bedroom 1					155	2,343	246	2,589	3,377	142	110	1 10	1-6
2-Bedroom 2					155	2,343	246	2,589	3,377	142	110	1 10	1-6
3-Bedroom 3					120	1,278	113	1,391	1,680	70	60	60	1-4
4-Bathroom Powder Area					48	156	0	156	73	3	7	7	1-4
5-Bathroom Tub Area					43	627	77	704	990	42	29	29	1-4
7-Kitchen / Dining					276	4,944	1,406	6,350	4,619	194	232	232	1-9
8-Laundry					120	2,724	631	3,355	4,115	173	128	128	1-7
Zone 2					368	6,904	631	7,535	5,608	235	324	324	
6-Great Room					368	6,904	631	7,535	5,608	235	324	324	1-10
Sum of room airflows may be greater th	an system airflow	becaus	e										
system has multiple zones.													

Building Rotation Report

Rhvac - Residential & Light Commercial HVAC Loads Calcs-Plus Venice, FL 34293-6060



Elite Software Development, Inc. Mr & Mrs Smith Page 8

Building Rotation Report

All rotation degree values in this report are clockwise with respect to the project's original orientation. Building orientation as entered (zero degrees rotation): Front door faces South

Indivi	dual Rooms										
		0°	45°	90°	135°	180°	225°	270°	315°	High	
Rm.	Room	Rot.	Rot.	Rot.	Rot.	Rot.	Rot.	Rot.	Rot.	Duct	
No.	Name	CFM	CFM	CFM	CFM	CFM	CFM	CFM	CFM	Size	
Syste	em 1:										
Zon	e 1:	502439	100000		2007030	12-12	12/27/20	520000	NUMBER OF	1.535745	
1	Bedroom 1	91	104	*144	130	91	123	133	102	1-7	
2	Bedroom 2	91	134	*144	100	91	95	133	132	1-7	
3 Bedroom 3		51	72	*78	55	51	52	71	71	1-5	
4	Bathroom Powder Area	7	8	*8	8	7	7	7	8	1-4	
5	Bathroom Tub Area	25	27	*36	34	25	32	34	26	1-4	
6	Great Room	276	296	298	*435	276	411	274	292	1-12	
7	Kitchen / Dining	204	290	*315	236	204	223	289	286	1-10	
8	Laundry	122	133	*147	138	122	131	135	131	1-7	
* Indio	* Indicates highest CFM of all rotations.										
Whole	e Building										
Rotat	ion Front door		Supply	Ser	nsible	Late	ent	Net	Recom	mended	
Degre	ees Faces		CFM		Gain	Ga	ain	Tons		Tons	
0°	South		867	19	9,069	3,9	97	1.92		2.12	
45°	Southwest		1,064	23	3,403	3,9	97	2.28		2.60	
90°	West		*1,171	*2	5,742	3,9	97	*2.48		*2.86	
135°	Northwest		1,136	24	4,981	3,9	97	2.41		2.78	
180°	North		867	19	9,069	3,9	97	1.92		2.12	
225°	Northeast		1,075	23	3,629	3,9	95	2.30		2.63	
270°	East		1,075	23	3,631	3,9	95	2.30		2.63	
315°	Southeast		1,050	23	3,081	*3,9	98	2.26		2.56	
* Indie	cates highest value of a	II rotation:	S.								



AED for – Worse Case Orientation Front Facing West

Building **Rotation** Report

The Building Rotation Report calculates required cooling load for each of eight directions along with the required room CFM for each room. This is very useful if the home does not have AED and it will be located in a subdivision and orientation is not known yet (worst- case direction).

Rhvac - Residential & Light Commercial HVAC Loads	Elite Software Development, Inc
Venice, FL 34293-6060	Page 8

Building Rotation Report

All rotation degree values in this report are clockwise with respect to the project's original orientation. Building orientation as entered (zero degrees rotation): Front door faces South

ndiv	dual Rooms									
de sent		0°	45°	90°	135°	180°	225°	270°	315°	High
Rm.	Room	Rot.	Duct							
No.	Name	CFM	Size							
Syst	em 1:									
Zon	e 1:									
1	Bedroom 1	91	104	*144	130	91	123	133	102	1-7
2	Bedroom 2	91	134	*144	100	91	95	133	132	1-7
3	Bedroom 3	51	72	*78	55	51	52	71	71	1-5
4	Bathroom Powder Area	7	8	*8	8	7	7	7	8	1-4
5	Bathroom Tub Area	25	27	*36	34	25	32	34	26	1-4
6	Great Room	276	296	298	*435	276	411	274	292	1-12
7	Kitchen / Dining	204	290	*315	236	204	223	289	286	1-10
8	Laundry	122	133	*147	138	122	131	135	131	1-7

* Indicates highest CFM of all rotations.

Rotation	Front door	Supply	Sensible	Latent	Net	Recommended
Degrees	Faces	CFM	Gain	Gain	Tons	Tons
0°	South	867	19,069	3,997	1.92	2.12
45°	Southwest	1,064	23,403	3,997	2.28	2.60
90°	West	*1,171	*25,742	3,997	*2.48	*2.86
135°	Northwest	1,136	24,981	3,997	2.41	2.78
180°	North	867	19,069	3,997	1.92	2.12
225°	Northeast	1.075	23,629	3,995	2.30	2.63
270°	East	1,075	23,631	3,995	2.30	2.63
315°	Southeast	1.050	23,081	*3,998	2.26	2.56

* Indicates highest value of all rotations



Building Recommended Tonnage **Building Net Tonnage**

Our home has AED so the load does not change much from when rotated.



Whole Buil	lding			d an	n 9 ann 10 ann 11 ann 12 pon 1 pon 2 pon 3 pon 4 pon	6 Spm 6 pm 7 pm
Rotation	Front door	Supply	Sensible	Latent	Net	Recommended
Degrees	Faces	CFM	Gain	Gain	Tons	Tons
0°	South	867	19,069	3,997	1.92	2.12
45°	Southwest	1,064	23,403	3,997	2.28	2.60
90°	West	*1,171	*25,742	3,997	*2.48	*2.86
135°	Northwest	1,136	24,981	3,997	2.41	2.78
180°	North	867	19,069	3,997	1.92	2.12
225°	Northeast	1,075	23,629	3,995	2.30	2.63
270°	East	1,075	23,631	3,995	2.30	2.63
315°	Southeast	1,050	23,081	*3,998	2.26	2.56

* Indicates highest value of all rotations.

If the home does not have AED!



Whole Buil	ding				inn tim tim tim tim zim zim	bin tin tin tin Tin
Rotation	Front door	Supply	Sensible	Latent	Net	Recommended
Degrees	Faces	CFM	Gain	Gain	Tons	Tons
0°	West	612	14,225	*3,014	1.44	1.58
45°	Northwest	677	15,658	3,014	1.56	1.74
90°	North	518	12,168	3,014	1.27	1.35
135°	Northeast	708	16,338	3,014	1.61	1.82
180°	East	812	18,623	3,014	1.80	2.07
225°	Southeast	*819	*18,782	3,014	*1.82	*2.09
270°	South	527	12,358	3,014	1.28	1.37
315°	Southwest	735	16,939	3,014	1.66	1.88

* Indicates highest value of all rotations.

	-	_	•	_		
Rhvac - Residential & Light Commercial HVAC Loads Calos-Plus Venice, FL 34293-0080		qı	11	on	ne	ent Selection
Total Building Summary Loads						
Component	Area	Sen	Lat	Sen	Total	
Description	Quan	Loss	Gain	Gain	Gain	
1A-cb-o: Glazing-Single pane, operable window, clear, metal frame with break, outdoor insect screen with 50% coverage, white or reflective color drapes with tight weave with 50% coverage. u-value 1.08	115.4	3,114	0	2,466	2,466	TRANE RS PERFORMANCE DATA COOLING February 10, 2007
IA-cb-d: Glazing-Single pane, sliding glass door, clear, metal frame with break, outdoor insect screen with	80.4	2,172	0	2,132	2,132	(Capacities are net in btuh/1000 - indoor fan heat deducted)
100% coverage, u-value 1.08 10A-b: Glazing-French door, single pane clear glass.	20.1	487	0	537	537	Outdoor Model Indoor Model
metal frame with break, u-value 0.97 11J: Door-Metal - Fiberglass Core 11D: Door-Wood - Solid Core 13A-Socs: Wall-Block, board insulation only, insulation, once a ciding finish	Mat	chi	ng	the	MJ	J8 Results to
12B-05w: Part-Frame, R-11 insulation in 2 x no board insulation, siding finish, wood s	nufa	acti	ure	r's	Per	rformance Data
Attic, No Radiant Barrier, Dark Asphalt S						E Capacity 0.94 1.06 Indoor Fan Power = 236 watts Compressor Kw 0.99 1.01 Outdoor Fan Power = 150 watts
insulation 16B-15: Roof/Ceiling-Under attic or knee wall, Vented Attic, No Radiant Barrier, Dark Asphalt Shingles or Dark Metal, Tar and Gravel or Membrane, R-15	84.8	130	0	264	264	S.E.E.R = 14.00
Insulation 22A-ph-c: Floor-Slab on grade, No edge insulation, no insulation below floor, carpet covering, passive, heavy moist soil	174	5,908	0	0	0	Rated with 25 feet of 3/4 suction and 5/10 liquid lines.
Subtotals for structure:		17,566	0	11,543	11,543	O.D. I.D. TOTALSENSIBLE CAPACITY SYSTEM
People:	4		800	920	1,720	<u>D.B. W.B. CAP 72 75 78 80 KW</u>
Equipment:			1,200	1,200	2,400	85 59 20.0 21.3 23.9 20.0 20.0 2.11 85 52 27.1 17.3 20.0 22.6 24.3 2.12
Lighting:	0			0	0	85 67 292 154 154 189 207 216
Ductwork:		4,510	647	4,818	5,465	95 59 247 207 234 247 247 230
Ventilation: Winter CFM: 65, Summer CFM: 33		1,780	1,350	586	1,938	95 63 25.7 16.7 19.4 22.0 23.8 2.31
Vendadon, Winter CFM, 0, Summer CFM, 0		0	0 007	0	0	95 67 27.7 13.1 15.8 18.4 20.1 2.35
i otal Building Load I otals:		23,856	3,997	19,069	23,066	105 63 24.3 16.2 18.8 21.4 23.2 2.51
Check Figures						105 67 26.2 12.6 15.2 17.8 19.6 2.55
Total Building Supply CFM: 867	CFM P	er Square ft.		0	0.675	105 71 28.3 8.9 11.6 14.2 15.9 2.57
Square ft. of Room Area: 1,285	Square	ft. Per Ton:			606	113 63 23.0 15.7 18.3 20.9 22.7 2.70
Volume (ft ^a) of Cond. Space: 12,535	Air Turr	nover Rate (per hour):		4.2	115 0/ 24./ 12.0 14./ 17.5 19.0 2.75
Building Loads						112 11 2011 0.1 11.0 10.1 2.11
Total Heating Required With Outside Air: 23.856 E	Stuh 23	.856 MBH				** 95 63 25.7 ID.D.B = 75 19.4 2.31
Total Sensible Gain: 19,069 E Total Latent Gain: 3,997 E Total Cooling Required With Outside Air: 23,066 E	3tuh 3tuh 3tuh	83 % 17 % 1.92 Tons (2.12 Tons (Capad	Based On Based On tty)	Sensible + l 75% Sensib	_atent)	
Calculations are based on 8th edition of ACCA Manual J						nance at selected design conditions
All computed results are estimates as building use and wea Be sure to select a unit that meets both sensible and latent	ather may van loads.	y.				* Dry coil condition (Tohl Capacity = Sensible Capacity)
						a oran capacity, compressor K w vand only for wellon
						All temperatures in Degree °F

	16B-15: Roof/Ceilir Attic, No Radia Dark Metal, Tar insulation 22A-ph-c: Floor-Sla	ng-Under attic or nt Barrier, Dark / r and Gravel or M ab on grade, No (knee wall, Vent Asphalt Shingles //embrane, R-15 edge insulation,	ed s or 5	84.8	130 5,908	0	264 0	264
1.92 Tons	insulation below heavy moist so	w floor, carpet co il	vering, passive,			21			
(Based On	Subtotals for struc People:	ture:			4	17,566	0 800	11,543 920	11,543 1,720
Sonsible +	Equipment: Lighting:				0		1,200	1,200 0	2,400 0
Latent	Ductwork: Infiltration: Winter Ventilation: Winter	CFM: 65, Summ CFM: 0, Summe	er CFM: 33 er CFM: 0			4,510 1,780 0	647 1,350 0	4,818 588 0	5,465 1,938 0
	Total Building Loa	d Totals:				23,856	3,997	19,069	23,066
	Check Figures Total Building Sup Square ft. of Room	ply CFM: n Area:	867 1,285		CFM F Square	Per Square ft.: e ft. Per Ton:		0	675 606
	Volume (ft ^s) of Cor	nd. Space:	12,535		Air Tur	nover Rate (p	per hour):		4.2
	Total Heating Req Total Sensible Gai	uired With Outsi in:	de Air: 2 1	3,856 Btuh 9,069 Btuh	23	3.856 MBH 83 %			
System Data - System 1 of 1 W ≪ ≫ 1 to the second secon	Total Cooling Req	uired With Outsid	de Air: 2	3,066 Btuh	➔	1.92 Tons (2.12 Tons (Capac	Based On S Based On 7	Sensible + L 75% Sensibl	atent) e
No: 1 Vame: System 1	Notes					Capac	ity)		
Design Equipment	Calculations are ba	ased on 8th editi	on of ACCA Ma	nual J.					
System Design Conditions	Be sure to select a	its are estimates a unit that meets	both sensible a	and weather nd latent load	may var s.	у.			
Indoor Temperature: 70 + 75 + Do Winter Humid	.: No +						_	_	
Relative Humidity: 50 - 50 - System Air Type:	Auto -			2.	12	Tons	(Ba	sed	
Lvg. Coil-Rm DT: 70 - 20 - System CFM:				0 r	· 76	0/ Ca	, ncihl	•	
Infiltration: 0.31 v 0.16 v Pct. Sens. Capac	sity: 75 🗸			U	1/5	70 50	12100	E	
Ventilation: 0 v 0 v Radiator Btuh/ft.:	0 -				C	anar	i+\/)		
Exhaust: 0 v Radiator Text Op	tion: Foot				U	apac	ity)		
Do Heat Recovery: No Vo Duct Load Factor	rs: (Data) -					•			
Reverse Deversion Planet Recovery SER: 00 Planet Recov						•			
Hot Water Piping:						·			
							F	Page	
							5	71	

Total Building Load Totals:				23	,856 3,997
Check Figures					
Total Building Supply CFM:	867			CFM Per Sq	uare ft.:
Square ft. of Room Area:	1,285			Square ft. Pe	er Ton:
Volume (ft ^a) of Cond. Space:	12,535			Air Turnover	Rate (per hour):
Building Loads					
Total Heating Required With Outsi	de Air:	23,856	Btuh	23.856	MBH
Total Sensible Gain:		19,069	Btuh	83	%
Total Latent Gain:		3,997	Btuh	17	%
Total Cooling Required With Outsi	de Air:	23,066	Btuh	1.92	Tons (Based On Se
•				2.12	Tons (Based On 75 Capacity)

Calculations are based on 8th edition of ACCA Manual J.

All computed results are estimates as building use and weather may vary.

Be sure to select a unit that meets both sensible and latent loads.

Manufacturers performance cooling data (like the one at the right) will give system performance at conditions other than ARI

For the area of the country this home is going to be located we will be interested in how the system will perform at or near MJ8 design conditions of 91°F outdoor and 75°F @ 50% RH.

O.D.	I.D.	TOTAL	SENS	IBLE	CAPAC	CITY	SYSTEM
D.B	<u>W.B.</u>	CAP	72	75	78	80	KW
85	59	26.0	21.3	23.9	26.0	26.0	2.11
85	63	27.1	17.3	20.0	22.6	24.3	2.12
85	67	29.2	15.4	15.4	18.9	20.7	2.16
95	59	24.7	20.7	23.4	24.7	24.7	2.30
95	63	25.7	16.7	19.4	22.0	23.8	2.31
95	67	27.7	13.1	15.8	18.4	20.1	2.35
105	63	24.3	16.2	18.8	21.4	23.2	2.51
105	67	26.2	12.6	15.2	17.8	19.6	2.55
105	71	28.3	8.9	11.6	14.2	15.9	2.57
115	63	23.0	15.7	18.3	20.9	22.7	2.70
115	67	24.7	12.0	14.7	17.3	19.0	2.75
115	71	26.7	8.4	11.0	13.6	15.4	2.77
 95	63	25.7	IDDB=	75		194	2 31

*** Performance at selected design conditions

* Dry coil condition (Total Capacity = Sensible Capacity)

Total capacity, compressor KW valid only for wetcoil

All temperatures in Degree °F

Indoor Model TWE031E13

PERFORMANCE DATA COOLING

-- U.S. (ENGLISH) --(Capacities are net in btuh/1000 - indoor fan heat deducted)

2TTR3030A1

TRANE RS

Outdoor Model

Airflow = 1000

Values At ARI H	Ratin	g Cond	itions
Total Net Capacity	-	27800	Btuh
Airflow	=	1020	CFM
Compressor Power	-	1970	watts
Indoor Fan Power	=	236	watts
Outdoor Fan Power	-	150	watts
SEER	-	14.00	

Airflow	875	<u>1125</u>
Total Capacity	0.98	1.02
Sensible Capacity	0.94	1.06
Compressor Kw	0.99	1.01

Rated with 25 feet of 3/4 suction and 5/16 liquid lines.

February 10, 2007

TRANE
Values At ARI Rating Conditions

Total Net Capacity Airflow Compressor Power Indoor Fan Power Outdoor Fan Power S.E.E.R		= = = =	27800 1020 1970 236 150 14.00	Btuh CFM watts watts watts				
	O.D.	I.D.	TOTAL	SEN	SIBLE	CAPAC	CITY	SYSTEM
	D.B	W.B.	CAP	72	75	78	80	KW
	85	59	26.0	21.3	23.9	26.0	26.0	2.11
	85	63	27.1	17.3	20.0	22.6	24.3	2.12
	85	67	29.2	15.4	15.4	18.9	20.7	2.16
	95	59	2.4.7	20.7	23.4	24.7	24.7	2.30
	95	63	25.7	16.7	19.4	22.0	23.8	2.31
	95	67	21.1	13.1	15.8	18.4	20.1	2.35
	105	63	24.3	16.2	18.8	21.4	23.2	2.51
	105	67	26.2	12.6	15.2	17.8	19.6	2.55
	105	71	28.3	8.9	11.6	14.2	15.9	2.57
	115	63	23.0	15.7	18.3	20.9	22.7	2.70
	115	67	24.7	12.0	14.7	17.3	19.0	2.75
	<u>115</u>	71	26.7	<u>8.4</u>	<u>11.0</u>	<u>13.6</u>	<u>15.4</u>	2.77
ķ	95	63	25.7	I.D.D.B	= 75		19.4	2.31

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MJ8 & the Energy Rater

The information you gather to do a energy rating is the same as required for an HVAC Load Calculation.

Do it to set yourself apart from your competition.

Do it to become a better Energy Rater.

Do it to provide another avenue for income.

Larger Customer Base

AC Contractors know or at least had to have learned load calculations if they carry a licenses or certification.

AC contractors are busy running a company and don't have time to do room x room calculations.

If they were provided room x room calculations they would use them as a design tool.

Diagnostic Tool

Start every diagnostic investigation with a room x room HVAC load calculation.

You will understand the construction of the building much better.

You will have a better understanding of the results of all the data gathered.

A Plug for MJ8

The possibility for experiencing comfort problems at part load conditions can be minimized by observing the guidelines set forth in Manual J.

The Manual J calculation should take full advantage of legitimate opportunities to minimize the size of the estimated loads.

