Rick's Energy Solutions

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HVAC Equipment and Duct Calculations

Project:
Mike Gasparini/Allan Henderson
Paseo Vista Townhomes
Unit B6 Rev
Santa Rosa, CA 95404

Project HVAC Design by:

Farrell Faber and Associates
1022 Mendocino Avenue
Santa Rosa, CA 95401
(707) 579-3811

Document Author:
Rick Cowperthwaite
2-25-2015

These HVAC equipment and duct sizing calculations for Paseo Vista have been prepared using Right-Suite Universal version 15.0.13 The calculations meet the requirements of ACCA Manuals J, D, S and T, 8th Edition. The author has used equipment in the calculations that meets the loads in the calculations. The author is not responsible for specifying the equipment to be installed in this home. The equipment listed herein was selected by the Contractor and satisfies the design assumptions used in these calculations. It is the responsibility of the Contractor to select and specify equipment for this project that is sized and selected according to the requirements of the most current versions of ACCA Manuals J, D, S and T. The equipment must not be oversized. The Contractor may call the author of these documents at any time with any questions.

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Project Information

For: Mike Gasparini/Allan Henderson, Paseo Vista Townhomes & Apartments
900 Quietwater Ridge, Santa Rosa, CA 95404
Phone: 707-529-7931
Email: mfg79@live.com

Cooling Equipment

Design Conditions

Outdoor design DB:	91.0°F	Sensible gain:	13646	Btuh	Entering coil DB: 76.7°F
Outdoor design WB:	66.6°F	Latent gain:	629	Btuh	Entering coil WB: 63.1°F
Indoor design DB:	75.0°F	Total gain:	14275	Btuh	
Indoor RH:	50%	Estimated airflow:	617	cfm	

Manufacturer's Performance Data at Actual Design Conditions

Equipment type: Split AC
Manufacturer: Model:

Actual airflow:	617	cfm		
Sensible capacity:	0	Btuh	0% of load	
Latent capacity:	0	Btuh	0% of load	
Total capacity:	0	Btuh	0% of load	SHR: 0%

Heating Equipment

Design Conditions

Outdoor design DB:	31.8°F	Heat loss:	16060	Btuh	Entering coil DB: 69.2°F
Indoor design DB:	70.0°F				

Manufacturer's Performance Data at Actual Design Conditions

Equipment type: Gas furnace
Manufacturer: Coleman, Unitary Pr Model: TG9S040A08MP11

Actual airflow:	713	cfm		
Output capacity:	39000	Btuh	243% of load	Temp. rise: 50 °F

The above equipment was selected in accordance with ACCA Manual S.

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Design Criteria

Occupants	
Age	Number
0-5	0
6-13	2
14-59	2
60+	0

Not occupied during the day	
Dishwasher	
Clothes washer	
Additional use (gpd)	0
Setpoint (°F)	120
Daily use (gpd)	61

Gas conventional (40 gal, 0.60 EF)

Manufacturer	
Trade name	
Model	
AHRI ref. number	

Tank size (gal)	40
Energy factor	0.60
Input (MBtuh)	0.0
1st hour (gal)	60
Recovery eff. (%)	77

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Design Conditions

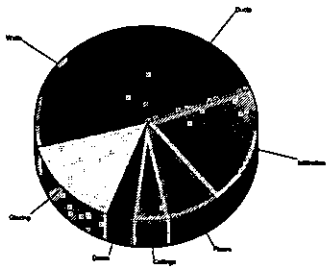
Location:
Santa Rosa (AWOS), CA, US
Elevation: 148 ft
Latitude: 39 °N

Outdoor:	**Heating**	**Cooling**
Dry bulb (°F)	32	91
Daily range (°F)	-	30 (H)
Wet bulb (°F)	-	67
Wind speed (mph)	15.0	7.5

Indoor:	**Heating**	**Cooling**
Indoor temperature (°F)	70	75
Design TD (°F)	38	16
Relative humidity (%)	50	50
Moisture difference (gr/lb)	33.9	-5.8
Infiltration:		
Method	Simplified	
Construction quality	Semi-tight	
Fireplaces	0	

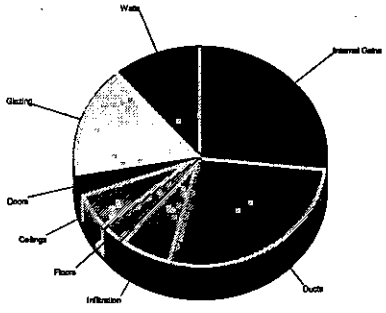
Heating

Component	Btuh/ft²	Btuh	% of load
Walls	2.6	4702	29.3
Glazing	13.0	2403	15.0
Doors	14.9	624	3.9
Ceilings	1.0	833	5.2
Floors	1.4	1201	7.5
Infiltration	1.7	3195	19.9
Ducts		3102	19.3
Piping		0	0
Humidification		0	0
Ventilation		0	0
Adjustments		0	
Total		**16060**	**100.0**



Cooling

Component	Btuh/ft²	Btuh	% of load
Walls	0.8	1523	11.2
Glazing	12.3	2278	16.7
Doors	8.7	365	2.7
Ceilings	0.9	782	5.7
Floors	0.4	375	2.8
Infiltration	0.5	966	7.1
Ducts		3711	27.2
Ventilation		0	0
Internal gains		3620	26.6
Blower		0	0
Adjustments		0	
Total		**13619**	**100.0**



Latent Cooling Load = 629 Btuh
Overall U-value = 0.070 Btuh/ft²-°F

Data entries checked.

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Santa Rosa (AWOS), CA, US
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Latitude: 39°N

Outdoor:	Heating	Cooling
Dry bulb (°F)	32	91
Daily range (°F)	-	30 (H)
Wet bulb (°F)	-	67
Wind speed (mph)	15.0	7.5

Indoor:	Heating	Cooling
Indoor temperature (°F)	70	75
Design TD (°F)	38	16
Relative humidity (%)	50	50
Moisture difference (gr/lb)	33.9	-5.8

Infiltration:

Method	Simplified
Construction quality	Semi-tight
Fireplaces	0

Construction descriptions	Or	Area ft²	U-value Btuh/ft²-°F	Insul R ft²-°F/Btuh	Htg HTM Btuh/ft²	Loss Btuh	Clg HTM Btuh/ft²	Gain Btuh
Walls								
12E-0sw: Frm wall, wd ext, 1/2" wood shth, r-19 cav ins, 1/2" gypsum board int fnsh, 2"x6" wood frm, 16" o.c. stud	n	305	0.068	19.0	2.60	791	0.90	274
	e	411	0.068	19.0	2.60	1068	0.90	370
	s	275	0.068	19.0	2.60	715	0.90	248
	w	630	0.068	19.0	2.60	1636	0.90	568
	all	1621	0.068	19.0	2.60	4211	0.90	1461
Partitions								
12E-0sw: Frm wall, wd ext, 1/2" wood shth, r-19 cav ins, 1/2" gypsum board int fnsh, 2"x6" wood frm, 16" o.c. stud		189	0.068	19.0	2.60	491	0.33	62
Windows								
4A4-2ovd: 2 glazing, clr outr, air gas, vnl frm mat, clr low-e innr, 1/2" gap, 1/8" thk; NFRC rated (SHGC=0.25); 50% blinds 45°, light; 50% outdoor insect screen; 6.67 ft head ht	n	48	0.340	0	13.0	623	8.03	386
	n	36	0.340	0	13.0	468	8.03	289
	e	12	0.340	0	13.0	154	22.3	264
	s	89	0.340	0	13.0	1158	11.7	1047
	all	185	0.340	0	13.0	2403	10.7	1986
Doors								
11D0: Door, wd sc type	s	24	0.390	0	14.9	358	8.72	209
	n	18	0.390	0	14.9	266	8.72	156
	all	42	0.390	0	14.9	624	8.72	365
Ceilings								
16CR-38ad: Attic ceiling, asphalt shingles roof mat, r-38 ceil ins, 5/8" gypsum board int fnsh		839	0.026	38.0	0.99	833	0.93	782
Floors								
19A-19cvhp: Flr floor, frm flr, 8" thkns, hrd wd flr fnsh, r-19 cav ins, leaky crwl ovr		490	0.049	19.0	1.47	718	0.61	301
19C-19cscp: 19C-19cscp		97	0	0	0	0	0	0
20P-19c: Flr floor, frm flr, 10" thkns, carpet flr fnsh, r-19 cav ins, amb ovr		53	0.050	19.0	1.91	101	0.29	15
		200	0.050	19.0	1.91	382	0.29	59
	all	253	0.050	19.0	1.91	483	0.29	74

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Notes:

Design Information

Weather: Santa Rosa (AWOS), CA, US

Winter Design Conditions

Outside db	32	°F
Inside db	70	°F
Design TD	38	°F

Summer Design Conditions

Outside db	91	°F
Inside db	75	°F
Design TD	16	°F
Daily range	H	
Relative humidity	50	%
Moisture difference	-6	gr/lb

Heating Summary

Structure	12958	Btuh
Ducts	3102	Btuh
Central vent (0 cfm)	0	Btuh
Humidification	0	Btuh
Piping	0	Btuh
Equipment load	16060	Btuh

Sensible Cooling Equipment Load Sizing

Structure	9909	Btuh
Ducts	3711	Btuh
Central vent (0 cfm)	0	Btuh
Blower	0	Btuh
Use manufacturer's data	n	
Rate/swing multiplier	0.96	
Equipment sensible load	13075	Btuh

Infiltration

Method	Simplified
Construction quality	Semi-tight
Fireplaces	0

	Heating	Cooling
Area (ft²)	1329	1329
Volume (ft³)	11958	11958
Air changes/hour	0.31	0.16
Equiv. AVF (cfm)	76	55

Latent Cooling Equipment Load Sizing

Structure	584	Btuh
Ducts	45	Btuh
Central vent (0 cfm)	0	Btuh
Equipment latent load	629	Btuh
Equipment total load	13703	Btuh
Req. total capacity at 0.90 SHR	1.2	ton

Heating Equipment Summary

Make	Coleman, Unitary Products Group
Trade	COLEMAN
Model	TG9S040A08MP11
AHRI ref	2016962

Efficiency	95.5	AFUE
Heating input	40000	Btuh
Heating output	39000	Btuh
Temperature rise	50	°F
Actual air flow	713	cfm
Air flow factor	0.044	cfm/Btuh
Static pressure	0.60	in H2O
Space thermostat		

Cooling Equipment Summary

Make		
Trade		
Cond		
Coil		
AHRI ref		
Efficiency	0	SEER
Sensible cooling	0	Btuh
Latent cooling	0	Btuh
Total cooling	0	Btuh
Actual air flow	617	cfm
Air flow factor	0.045	cfm/Btuh
Static pressure	0.60	in H2O
Load sensible heat ratio	0.96	

Calculations approved by ACCA to meet all requirements of Manual J 8th Ed.

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Design Conditions

Location:
Santa Rosa (AWOS), CA, US
Elevation: 148 ft
Latitude: 39 °N

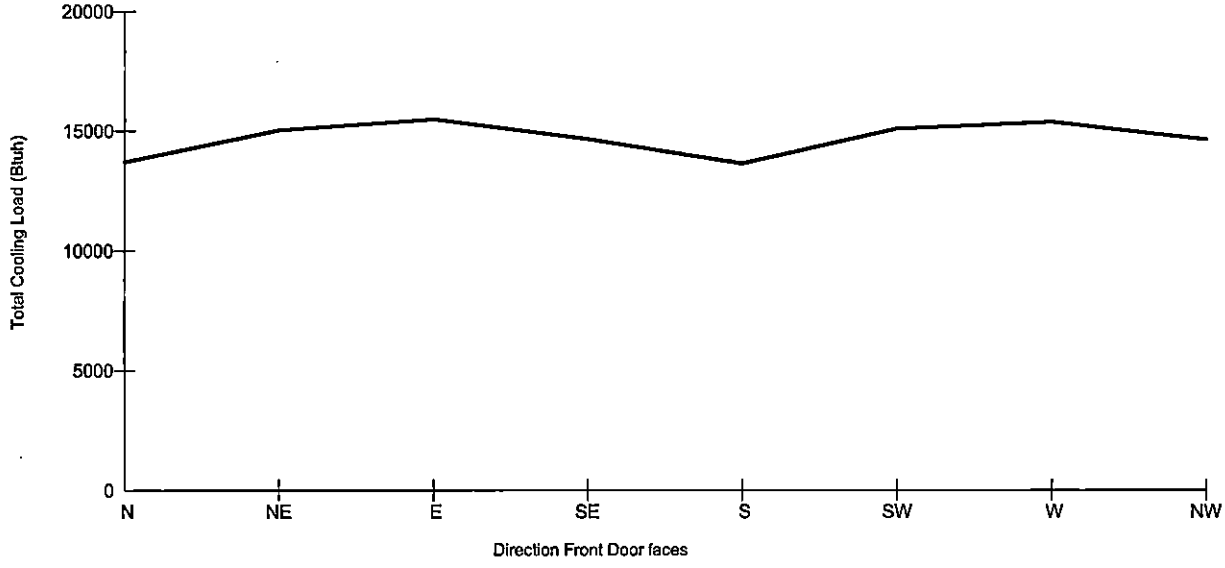
Outdoor:	Heating	Cooling
Dry bulb (°F)	32	91
Daily range (°F)	-	30 (H)
Wet bulb (°F)	-	67
Wind speed (mph)	15.0	7.5

Indoor:	Heating	Cooling
Indoor temperature (°F)	70	75
Design TD (°F)	38	16
Relative humidity (%)	50	50
Moisture difference (gr/lb)	33.9	-5.8

Infiltration:

Front Door	North	Northeast	East	Southeast	South	Southwest	West	Northwest
Sensible Load (Btuh)	13075	14403	14864	14036	13014	14464	14746	14017
Latent Load (Btuh)	629	629	629	629	629	629	629	629
Total Load (Btuh)	13703	15032	15493	14665	13643	15093	15375	14646
Heating AVF (cfm)	713	713	713	713	713	713	713	713
Cooling AVF (cfm)	617	675	695	658	614	677	690	658

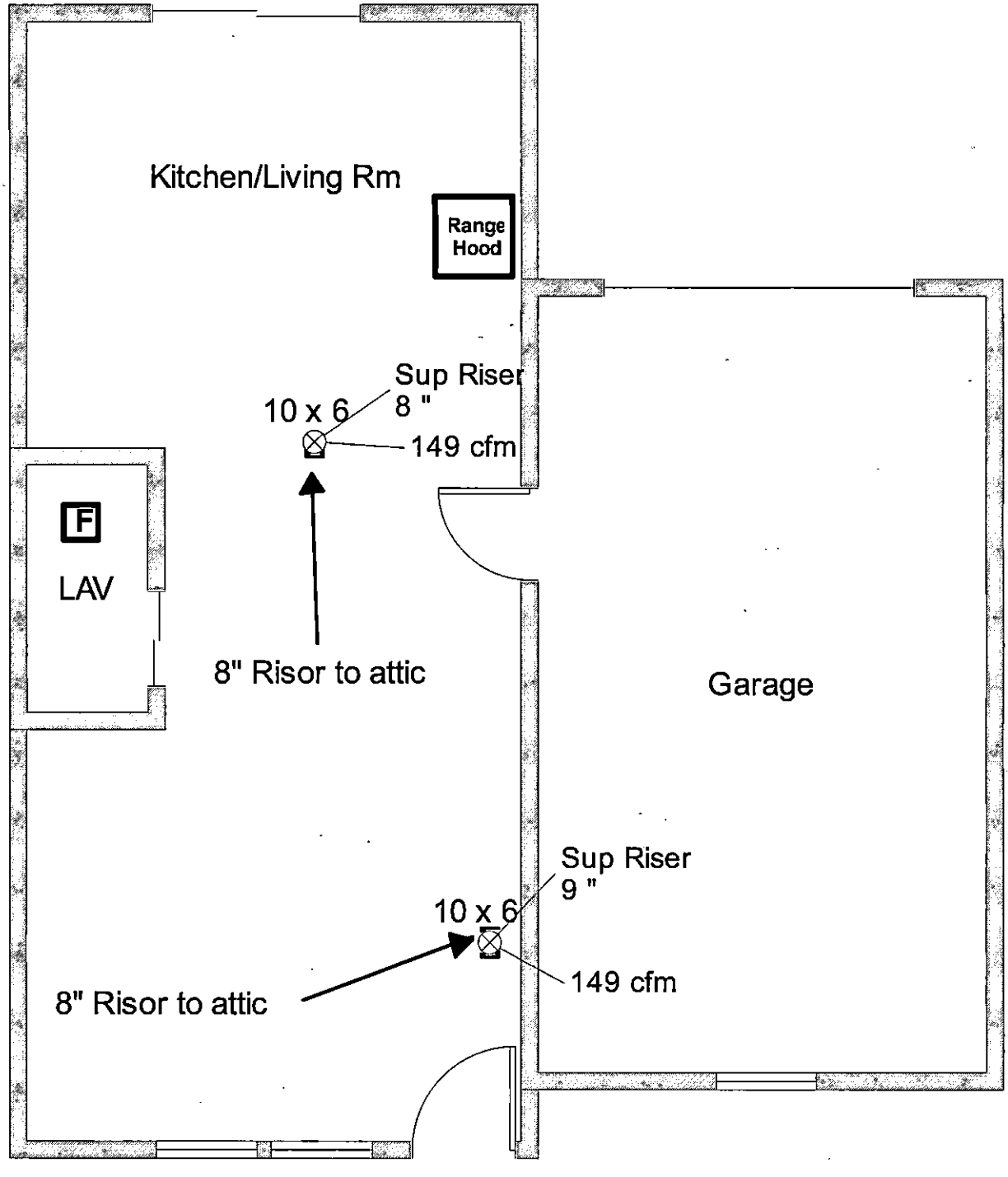
Building Orientation Cooling Load



Current Orientation: Front Door faces North
Highest Cooling Load: Front Door faces East

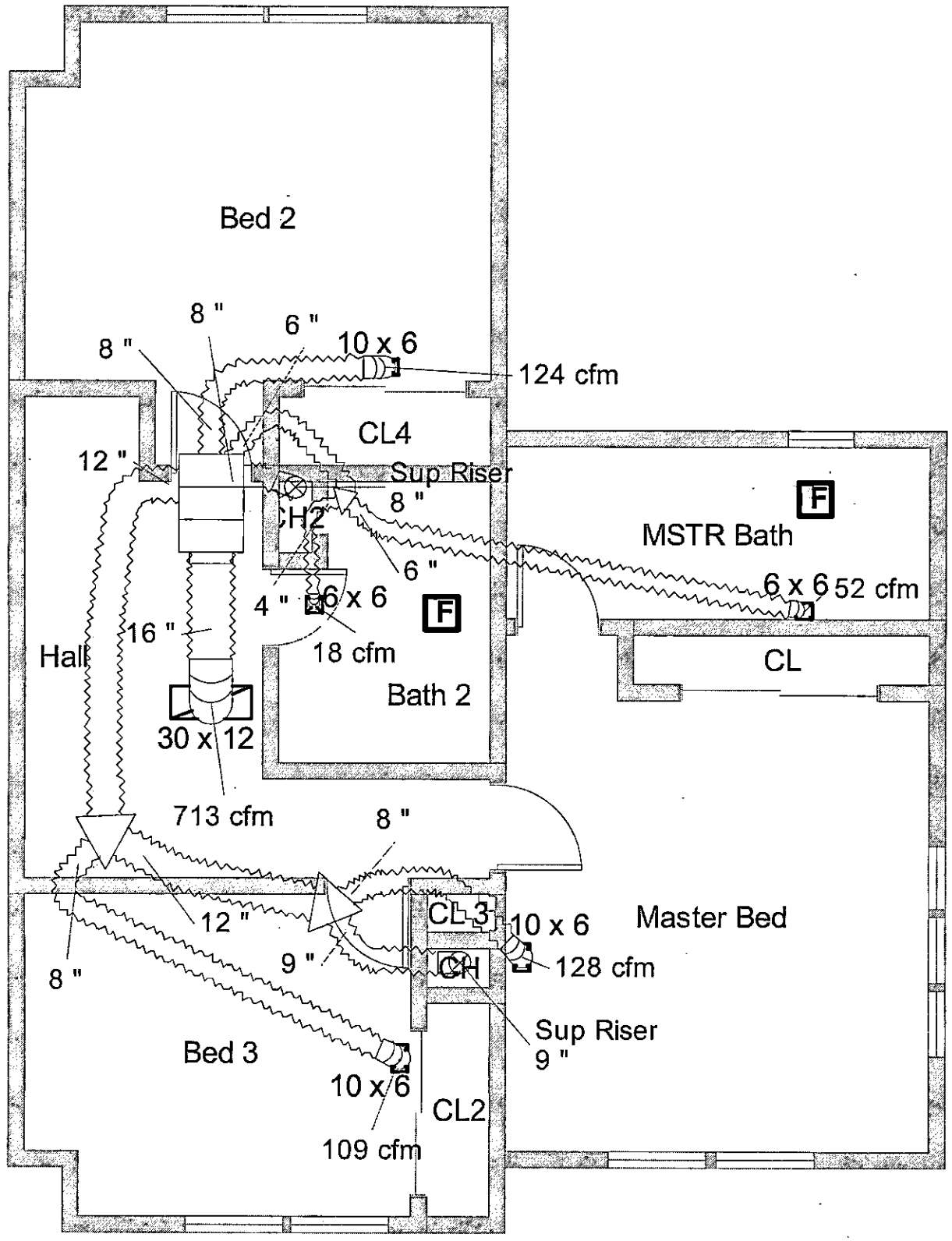
Calculations approved by ACCA to meet all requirements of Manual J 8th Ed.

Level 1



Job #: 13036 **Performed by Rick's Energy Solutions for:** Mike Gasparini/Allan Henderson 900 Quietwater Ridge Santa Rosa, CA 95404 Phone: 707-529-7931 mfg79@live.com	**Farrell Faber & Associates Inc.** 1022 Mendocino Ave Santa Rosa, CA 95401 Phone: 707-579-3811 Fax: 707-579-2646 www.farrellfaber.com	Scale: 1 : 55 Page 1 Right-Suite® Universal 2015 15.0.13 RSU10261 2015-Feb-25 16:21:14 ...AC Sizing\B Unit\Unit B6 Rev.rup

Level 2



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wrightsoft® Duct System Summary
Unit B6 Rev
Farrell Faber & Associates Inc.

Job: 13036
Date: Feb 25, 2015
By: Rick's Energy Solutions

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	Heating	Cooling
External static pressure	***0.60*** in H2O	***0.60*** in H2O
Pressure losses	0.43 in H2O	0.43 in H2O
Available static pressure	0.17 in H2O	0.17 in H2O
Supply / return available pressure	0.143 / 0.027 in H2O	0.143 / 0.027 in H2O
Lowest friction rate	0.077 in/100ft	0.077 in/100ft
Actual air flow	713 cfm	617 cfm
Total effective length (TEL)	219 ft	

Supply Branch Detail Table

Name	Design (Btuh)	Htg (cfm)	Clg (cfm)	Design FR	Diam (in)	H x W (in)	Duct Matl	Actual Ln (ft)	Ftg.Eqv Ln (ft)	Trunk
Bath 2	h 414	18	11	0.123	4.0	0x0	VlFx	11.1	105.0	st2
Bed 2	h 2792	124	106	0.171	8.0	0x0	VlFx	8.8	75.0	
Bed 3	c 2414	94	109	0.108	8.0	0x0	VlFx	27.8	105.0	st1
Kitchen/Living Rm	h 3355	149	119	0.134	8.0	0x0	VlFx	11.7	95.0	
Kitchen/Living Rm-A	h 3355	149	119	0.077	9.0	0x0	VlFx	34.8	150.0	st3
MSTR Bath	h 1166	52	24	0.113	6.0	0x0	VlFx	21.8	105.0	st2
Master Bed	c 2822	127	128	0.088	8.0	0x0	VlFx	27.9	135.0	st3

Supply Trunk Detail Table

Name	Trunk Type	Htg (cfm)	Clg (cfm)	Design FR	Veloc (fpm)	Diam (in)	H x W (in)	Duct Material	Trunk
st1	Peak AVF	370	356	0.077	471	12.0	0 x 0	VinlFlx	
st3	Peak AVF	276	247	0.077	351	12.0	0 x 0	VinlFlx	st1
st2	Peak AVF	70	35	0.113	357	6.0	0 x 0	VinlFlx	

Return Branch Detail Table

Name	Grill Size (in)	Htg (cfm)	Clg (cfm)	TEL (ft)	Design FR	Veloc (fpm)	Diam (in)	H x W (in)	Stud/Joist Opening (in)	Duct Matl	Trunk
rb1	0x0	713	617	34.6	0.077	511	16.0	0x 0		VlFx	

Bold/italic values have been manually overridden

Mechanical Systems Installation Notes:

1. The HVAC system shall be installed per the requirements of these notes as well as the provisions of the 2013 California Mechanical Code and the 2013 California Energy Efficiency Standards.
2. All ducts shall be sealed using water based, low VOC mastic with fiberglass mesh tape, and draw bands. Ducts shall pass a HERS duct leakage test with no more than 6% leakage.
3. All ducts, boots, and plenums shall be fully wrapped with R-6 insulation having an approved air and vapor barrier.
4. Site installed ducting shall be installed as low as possible to the attic floor and covered with as much blown-in insulation as possible. Do not hang ducts from rafters, truss chords or webs.
5. Factory Installed Ducting shall be installed as low as possible to the ceiling and covered with as much blown-in insulation as possible.
6. The return boot and return register shall be factory installed. The 16" return duct and elbow shall be site installed.
7. The supply boots shall be 4-AD square or rectangular box with a round transition to 90 degrees.
8. The return boot shall be a 6M rectangular to round transition with a site installed 90 degree elbow.
9. Install as much of the core branch ducts as possible in the factory. Where a branch duct cannot be completely installed in the factory install as much as possible plus 3 feet then compress the excess down into the ceiling framing cavity.
10. The factory shall supply and deliver with the core all of the ducting, and fittings shown on the plans that are not installed by the factory.
11. The factory and or the contractor shall cover and protect all duct openings and equipment from construction dust and debris during construction.
12. The HVAC Contractor shall test and verify that the temperature rise of the furnace is within the manufacturers specifications for the system installed.
13. Each return duct shall be equipped with a 30" X 12" Shoemaker model 920 FG2 return air filter grill. The return filter grill shall be supplied with a 2" thick MERV 8 filter having a static pressure drop at installation of no more than 0.05 inches of water column at 713 CFM. The return shall be labeled to require only 2 inch MERV 8 filters to be used in the grill with a static pressure drop of 0.05" w.c. at 713 CFM of air flow.
14. The contractor shall provide a one year supply of 2" x 30" x 12" MERV-8 filters to the building owners at the time of the final inspection. The owner's manual shall instruct the owner to only use MERV 8 filters. The manual shall advise the owners that using higher MERV rating or more restrictive filters will reduce the operating efficiency of the HVAC equipment and that using lower MERV or less restrictive filters will reduce the indoor air quality.
15. The contractor shall install the furnace as a "two pipe" "Direct Vent" "Gas Furnace" as specified in the manufacturer's installation manual.
16. The bathroom exhaust fans shall be Panasonic Model FV-08VKM3 or equal installed with minimum 4 inch or larger R-8 insulated flex duct terminated outside of the building. The fans shall be wired so that a humidistat controller runs the fans at 50 CFM when the Relative Humidity is 50% or higher. When the wall switch is turned on the fans shall be set to exhaust at full speed.
17. The downstairs Lavatory exhaust fan shall be a Panasonic Model FV-08VKM3 or equal installed with minimum 4 inch or larger R-8 insulated flex duct terminated to the outside of the building. The fan shall be wired to run continuous at 43 CFM and to increase to full speed when the wall switch is turned on.
18. Since the Laundry Room fan is the whole house mechanical ventilation fan there shall be a transfer grill installed in the wall or door between the laundry room and the Hall Way to provide the continuous ventilation to the whole house.
19. The Laundry Room exhaust fan shall pass the HERS IAQ mechanical ventilation fan flow and fan efficacy test at final inspection. The fan flow shall not be less than 43 CFM and the fan power shall not be more than 0.25 Watts per measured CFM of fan flow.
20. The HVAC ducts shall pass a HERS duct leakage test at final inspection with no more than 6% leakage.

AHRI CERTIFIED®
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This furnace qualifies for AFUE Federal Energy Efficiency Tax Credit when placed in service between February 17 2009 and December 31 2013

Certificate of Product Ratings

AHRI Certified Reference Number: 2016962 Date: 4/9/2014

Product: Residential Furnace Heating Equipment
Model Number: TG9S040A08MP11
Manufacturer: COLEMAN BY JOHNSON CONTROLS
Trade/Brand name: COLEMAN

Rated as follows in accordance with Department of Energy (DOE) furnace test procedures as published in the latest edition of the Code of Federal Regulations, 10 CFR Part 430 and subject to verification of rating accuracy by AHRI-sponsored, independent, third party testing:

AFUE:	95.5%
Output Heating Capacity:	39 MBTUH

The following data is for reference only and is not certified by AHRI:

Input:	40 MBTUH
Ef:	31.9 MMBTU/yr
Eae:	524 kWh/yr
PE:	100 Watts
Furnace Type:	Non-Weatherized
Config:	Upflow,Downflow,Horizontal
Fuel Type:	Natural Gas,Propane Gas

FootNote 208 - Direct Vent or Non-Direct Vent.
FootNote 239 - Model number may have suffix letter (A-Z) or up to three suffix numbers and/or letters

* Ratings followed by an asterisk (*) indicate a voluntary rerate of previously published data, unless accompanied with a WAS, which indicates an involuntary rerate.

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CERTIFICATE NO.: 130415424365759034