

PERFORMANCE CONSTRUCTION PROGRAM

PHIUS/PHI

BPI HOME Performance
index

NET ZERO

NAHB
NARI

PV- panels

USGBC - LEED GOLD, Platinum

RESNET

HERS ratings
building science

ERV or HRV

Negative Pressure and contaminant infiltration

Federal low income tax credit





HOT & HUMID

AUSTIN WEATHER BIN DATA

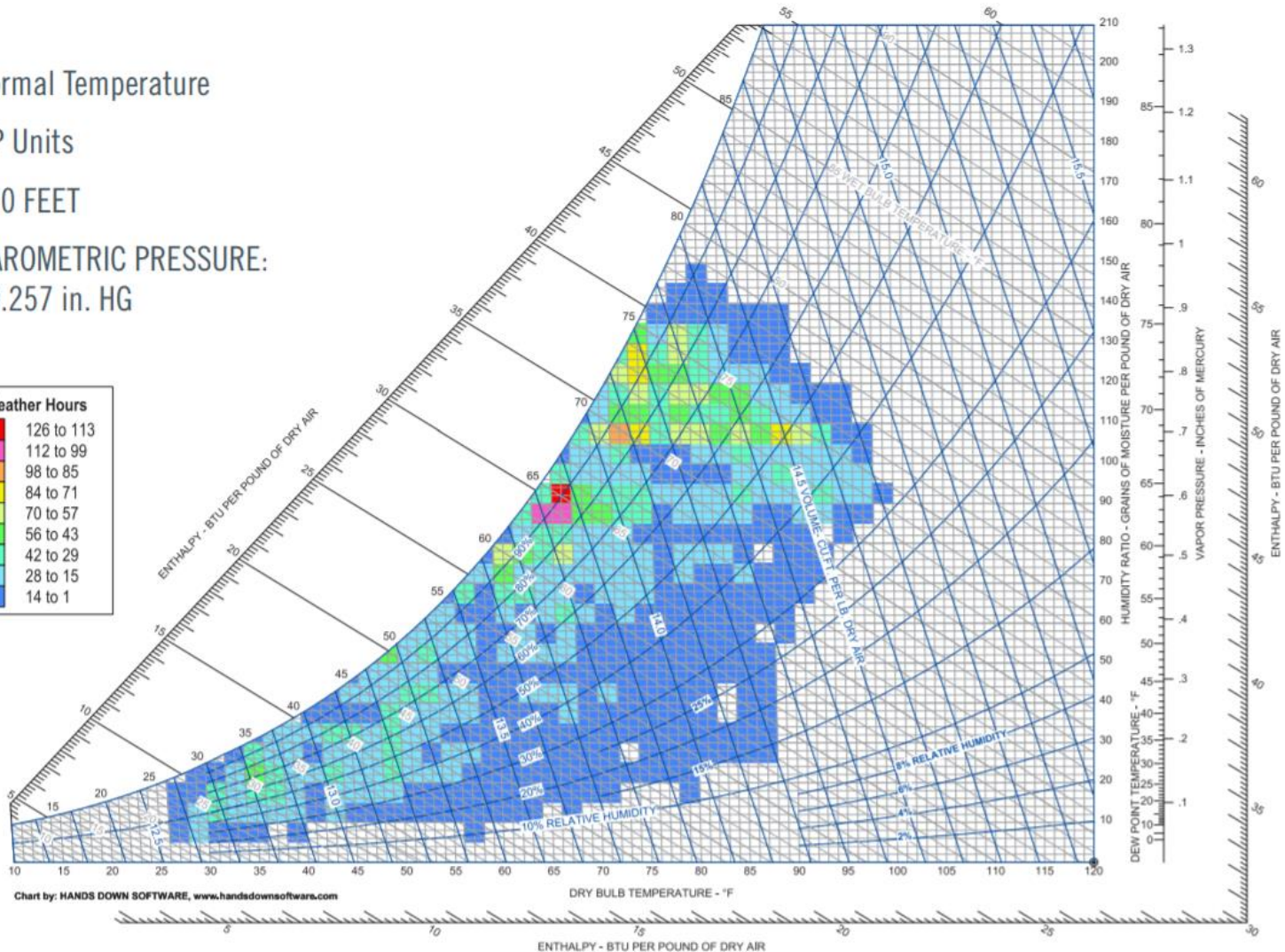
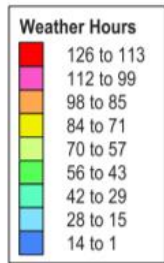
Normal Temperature

I-P Units

620 FEET

BAROMETRIC PRESSURE:

29.257 in. HG



THE VOICES IN MY HEAD (AND YOURS?)

DO I REALLY NEED
DEHUMIDIFICATION?

HOW MUCH
VENTILATION?

HOW MUCH
HUMIDITY IS IN
VENTILATION AIR?

HOW MUCH
HUMIDITY CAN MY
COOLING SYSTEM
HANDLE?

WHY DO WE HAVE TO
DEAL WITH THIS
NOW?

HOW DO I DUCT IT?

HOW MUCH
HUMIDITY WILL THE
ERV HANDLE?

IS IT JUST TX, FLA &
LA?

CHALLENGE: UNPREDICTABLE SOURCES

WEATHER &
MONKEYS



DEFINING GOALS OF THIS EXERCISE

FOR _____ DATE _____

ADDRESS _____

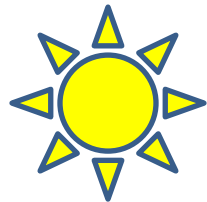
R_x REFILL _____ TIMES

WRITTEN _____ PRODUCT _____

_____ ADDRESS _____

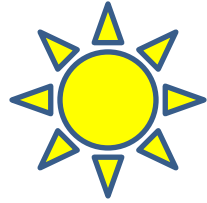
Reorder Item #6100 Total Pharmacy Supply, Inc 1-800-878-2822

PHIUS
COMPLIANT



BALANCED

COST
CONSCIOUS



CONTINUOUS

SIMPLE



CONTROLS
LATENT

1ST STEP: UNDERSTAND LATENT LOADS BETTER

CAN DO THIS..



Station	Lat	Long	Elev	Heating DB		Cooling DB/MCWB			Evaporation WB/MCDB		Dehumidification DP/HR/MCDB										
									0.4%		1%										
						99.6%	99%	DB / MCWB	DB / MCWB	DB / MCWB	WB / MCDB	WB / MCDB	DP / HR / MCDB	DP / HR / MCDB							
South Carolina																					
CHARLESTON INTL	32.899N	80.040W	40	27.5	30.9	94.3	78.0	92.2	77.5	90.3	76.9	80.7	89.1	79.8	87.9	76.6	148.8	84.4	77.6	143.7	83.5
COLUMBIA METROPOLITAN	33.842N	81.118W	225	23.4	27.0	97.1	75.4	94.6	74.8	92.5	74.5	78.5	89.7	77.6	88.5	75.8	136.2	82.3	74.9	131.7	81.4
FLORENCE REGIONAL	34.185N	79.724W	146	24.1	27.3	96.1	76.6	93.5	75.9	91.4	75.4	79.3	90.6	78.3	88.8	76.5	138.8	83.5	75.4	133.8	82.3
POLLY ISLAND	32.680N	79.890W	10	31.6	35.1	87.5	77.9	86.2	78.0	85.1	77.7	80.5	85.0	79.7	84.3	79.3	151.9	84.3	78.2	146.6	83.3
GREENVILLE-SPARTANBURG INTL	34.884N	82.221W	943	21.9	25.6	94.4	73.7	91.8	73.4	89.5	72.7	77.0	87.8	75.8	85.9	74.0	131.3	80.3	73.0	127.0	79.5
SHAW AFB	33.967N	80.467W	241	23.7	27.2	96.0	75.7	93.4	75.4	91.2	75.0	79.2	89.9	78.1	88.2	76.5	139.5	83.3	75.3	134.0	82.0
South Dakota																					
ELLSWORTH AFB	44.150N	103.100W	3278	-8.2	-2.8	95.2	66.4	91.4	65.7	88.2	65.1	71.2	85.8	69.4	83.9	66.6	110.6	77.5	64.5	102.7	75.8
RAPID CITY REGIONAL	44.843N	103.054W	3160	-8.8	-3.4	96.7	66.0	92.7	65.7	89.0	64.9	71.1	85.5	69.4	84.4	66.7	110.8	78.1	64.7	103.1	75.8
SKOIX FALLS REGIONAL	43.578N	96.754W	1428	-11.3	-6.5	91.5	73.7	88.4	72.9	85.6	71.3	77.4	86.7	75.5	84.9	74.7	137.1	83.7	72.7	127.7	81.7
Tennessee																					
CHATTANOOGA AP	35.031N	85.201W	671	19.6	23.7	95.0	74.5	92.6	74.2	90.4	73.6	77.7	88.8	76.8	87.3	74.9	133.9	81.5	73.8	129.3	80.7
MCGHEE TYSON AP	35.818N	83.986W	962	17.1	21.6	92.7	73.9	90.4	73.5	88.3	72.9	77.1	87.5	76.0	85.8	74.0	131.5	81.4	73.0	127.1	80.4
MCKELLAR-SIPES REGIONAL	35.593N	88.917W	433	15.7	19.9	95.1	76.5	92.8	76.5	90.8	76.0	79.9	90.3	78.7	88.8	77.0	142.8	85.8	75.7	136.5	84.3
MEMPHIS INTL	35.056N	89.987W	254	19.5	23.8	96.6	76.9	94.4	76.4	92.5	76.0	79.9	91.5	78.8	90.0	76.7	140.6	85.8	75.6	135.3	85.0
MILLINGTON MUNICIPAL	35.350N	89.867W	320	18.6	23.1	99.2	80.3	96.9	78.7	93.5	77.4	82.9	95.1	81.2	92.4	79.4	154.6	89.3	78.7	150.9	88.6
NASHVILLE INTL	36.119N	86.889W	600	15.4	19.9	94.6	74.8	92.3	74.6	90.2	73.9	78.1	88.9	77.0	87.7	75.1	134.5	82.9	73.9	129.3	81.8
TRI-CITIES REGIONAL	36.473N	82.404W	1500	13.5	17.9	90.2	71.8	88.0	71.3	86.0	70.8	75.0	84.9	73.9	83.6	72.1	125.5	79.0	71.0	121.0	77.9
Texas																					
ABILENE REGIONAL	32.411N	99.682W	1790	20.1	24.6	100.3	70.4	98.1	70.5	95.9	70.7	75.5	89.1	74.6	88.2	72.1	127.0	79.9	71.1	122.4	79.3
AL MANCHAM JR REGIONAL	31.578N	94.709W	355	25.0	27.6	99.1	75.7	96.8	75.8	93.2	73.6	79.0	90.1	78.3	89.5	76.5	140.1	82.3	75.2	134.1	81.7
AMARILLO RICK HUSBAND INTL	35.230N	101.704W	3604	10.1	15.8	98.6	65.4	95.8	65.8	93.2	65.8	71.2	86.4	70.1	85.6	67.2	114.3	75.2	66.0	109.6	74.3
ANGELINA COUNTY AP	31.236N	94.754W	288	26.9	29.7	99.0	76.1	96.5	76.4	94.3	76.3	79.9	90.4	79.1	89.4	77.3	143.8	82.8	76.7	140.8	82.5
AUSTIN-BERGSTROM INTL	30.183N	97.680W	480	26.7	30.2	100.2	74.1	98.2	74.4	96.2	74.5	78.5	88.9	78.0	88.3	76.4	140.0	81.1	75.5	135.9	80.5
BOYDSTOWNVILLE INTL	25.914N	97.475W	24	38.7	47.5	95.7	77.8	94.5	77.8	93.3	77.8	80.9	88.0	80.3	87.6	79.3	157.3	83.0	78.6	148.6	87.7

REALITY:

AND GET THIS

Verizon 11:14 PM 48%

UltraAire
WHOLE HOUSE VENTILATING DEHUMIDIFIERS

Inlet °F: 81 % RH: 87 Grains: 139

Outlet °F: 75 % RH: 50 Grains: 65

Flow CFM: 120 Pts Day: 146.6 Gr Dep: 75

CFM	Pints / Day
90	144
100	145
110	146
120	147
130	148
140	149
150	150

PsyCalc® Psychrometric Calculator

Edit Tools Help Exit

Entering Point **Leaving Point**

81.00 °Fdb 75 °Fdb

87.00 %RH 50.00 %RH

120 STD CFM 700.00 Alt in Ft

Leaving Properties **Process Results**

Value	Units	Label	Value	Units
75.00	°Fdb	Total	-7337	Btuh
62.43	°Fwb	Sensible	-780	Btuh
50.00	% RH	Latent	-6557	Btuh
66.61	gr/lb da	Moisture	-5.96	lb/hr
28.42	Btu/lb da			

BUT THERE'S MORE TO IT:

PsyCalc® *Hourly Data Binning and Statistics*

North America | 699 | Elevation ft
USA | 30.3 | Latitude North | Use External Data
Texas | 97.7 | Longitude West | Hide Stats
Austin Mueller Municipal Ap [ut]

Select Binning Type:
 Standard
Bin on: Dry Bulb
Bin size: 2
 Joint Frequency
Tdb size: 2
W size: 2

Select Months:
January, February, March, April, May, June, July, August, September, October, November, December
All Months | Clear Months

of Hours Selected **8760**

Weather Data Statistics for selected schedule:
Define selection criteria:
Equal or Above: Dry Bulb Temperature °F (65.00) AND Equal or Below: 90.00
Humidity Ratio gr/lb d.a. (65.00) N.A. 70.00
50.00 N.A. 70.00
50.00 N.A. 70.00

4514 HOURS/YR

Get Stats | Export Stats

Stats for the selected hours fitting the selection criteria: **Number of hours: 4514**

Description	Units	Minimum	Maximum	Wt Average	Mean
Dry bulb temperature	°F	65.30	89.96	76.72	77.63
Dew point temperature	°F	54.27	79.35	68.65	69.04
Wet bulb temperature	°F	59.21	81.34	70.80	70.27
Humidity ratio	gr/lb	65.32	153.43	107.99	109.38
Relative humidity	%	30.70	100.00	76.94	65.35
Enthalpy	Btu/lb da	26.10	45.65	35.32	35.88

ARE LATENT VENTILATION LOADS REAL?

PsyCalc® Hourly Data Binning and Statistics

North America | 699 | Elevation ft
USA | 30.3 | Latitude North | Use External Data
Save Location | 97.7 | Longitude West | Hide Stats

Weather Data Statistics for selected schedule:

Define selection criteria:

	Equal or Above	AND	Equal or Below
Dry Bulb Temperature °F	65.00	AND	85.00
Humidity Ratio gr/lb d.a.	70.00	N.A.	70.00
	50.00	N.A.	70.00
	50.00	N.A.	70.00

3842 HOURS/YR

Get Stats | Export Stats | Number of hours: 3842

Stats for the selected hours fitting the selection criteria:

Description	Units	Minimum	Maximum	Wt Average	Mean
Dry bulb temperature	°F	65.30	84.92	75.24	75.11
Dew point temperature	°F	56.16	78.60	68.83	69.16
Wet bulb temperature	°F	60.35	79.04	70.53	69.69
Humidity ratio	gr/lb	70.05	149.87	108.69	109.96
Relative humidity	%	38.71	100.00	80.77	69.35
Enthalpy	Btu/lb da	26.84	43.10	35.06	34.97

Inputs: 75.00 °Fdb, 50.00 %RH, 600 Alt in Ft

Outputs:

Value	Units
75.00	°Fdb
62.44	°Fwb
50.00	%RH
66.36	gr/lb da
28.38	Btu/lb da
55.13	°Fdp
0.0722	lb/ft ³

ARE LATENT VENTILATION LOADS REAL?

PsychCalc Hourly Data Binning and Statistics

North America | 20 | Elevation ft
USA | 42.4 | Latitude North
Massachusetts | 71.0 | Longitude West
Boston Logan Int|| Airport

Save Location | Use External Data | Hide Stats

Select Binning Type:

- Standard
 - Bin on: Dry Bulb
 - Bin size: 2
- Joint Frequency
 - Tdb size: 2
 - W size: 2

Select Months:

January	July
February	August
March	September
April	October
May	November
June	December

All Months | Clear Months

of Hours Selected **8760**

Weather Data Statistics for selected schedule:

Define selection criteria:

	Equal or Above		Equal or Below
Dry Bulb Temperature °F	65.00	AND	85.00
Humidity Ratio gr/lb d.a.	65.00	N.A.	70.00
	50.00	N.A.	70.00
	50.00	N.A.	70.00

1480 HOURS/YR

Get Stats | Export Stats

Stats for the selected hours fitting the selection criteria: Number of hours: 1480

Description	Units	Minimum	Maximum	Wt Average	Mean
Dry bulb temperature	°F	66.02	84.92	73.39	73.47
Dew point temperature	°F	54.74	74.88	64.11	66.23
Wet bulb temperature	°F	59.26	76.82	66.98	68.04
Humidity ratio	gr/lb	65.06	128.67	89.99	96.87
Relative humidity	%	37.22	100.00	73.29	68.61
Enthalpy	Btu/lb da	25.99	40.55	31.68	33.27

ARE LATENT VENTILATION LOADS REAL?



North America 1010 Elevation ft

USA Save Location Latitude North

Georgia Longitude West

Atlanta Hartsfield Intl Airport

Select Binning Type:

Standard

Bin on

Bin size

Joint Frequency

Tdb size

W size

Select Months:

January	July
February	August
March	September
April	October
May	November
June	December

of Hours Selected

Weather Data Statistics for selected schedule:

Define selection criteria:

<input type="button" value="i"/> Dry Bulb Temperature °F <input type="button" value="v"/>	<input checked="" type="radio"/> Equal or Above	<input type="text" value="65.00"/> <input type="button" value="v"/>	<input type="text" value="AND"/> <input type="button" value="v"/>	<input checked="" type="radio"/> Equal or Below	<input type="text" value="85.00"/> <input type="button" value="v"/>
<input type="button" value="i"/> Humidity Ratio gr/lb d.a. <input type="button" value="v"/>	<input checked="" type="radio"/> Equal or Above	<input type="text" value="65.00"/> <input type="button" value="v"/>	<input type="text" value="AND"/> <input type="button" value="v"/>	<input type="radio"/> Equal or Below	<input type="text" value="70.00"/> <input type="button" value="v"/>
<input type="button" value="i"/> Humidity Ratio gr/lb d.a. <input type="button" value="v"/>	<input type="radio"/> Equal or Above	<input type="text" value="50.00"/> <input type="button" value="v"/>	<input type="text" value="AND"/> <input type="button" value="v"/>	<input type="radio"/> Equal or Below	<input type="text" value="70.00"/> <input type="button" value="v"/>
<input type="button" value="i"/> Humidity Ratio gr/lb d.a. <input type="button" value="v"/>	<input type="radio"/> Equal or Above	<input type="text" value="50.00"/> <input type="button" value="v"/>	<input type="text" value="AND"/> <input type="button" value="v"/>	<input type="radio"/> Equal or Below	<input type="text" value="70.00"/> <input type="button" value="v"/>

2770 HOURS/YR

Stats for the selected hours fitting the selection criteria: Number of hours: 2770

Description	Units	Minimum	Maximum	Wt Average	Mean
Dry bulb temperature	°F	66.02	84.92	74.80	75.47
Dew point temperature	°F	54.29	75.45	66.01	66.49
Wet bulb temperature	°F	59.18	76.55	68.55	67.87
Humidity ratio	gr/lb	66.32	137.22	99.60	101.77
Relative humidity	%	36.03	100.00	74.79	68.01
Enthalpy	Btu/lb da	26.20	40.79	33.53	33.49

ARE LATENT VENTILATION LOADS REAL?

PsyCalc® Hourly Data Binning and Statistics

North America | 1319 | Elevation ft
USA | 37.7 | Latitude North | Use External Data
Kansas | 97.4 | Longitude West | Hide Stats
Wichita Mid-Continent Airport

Select Binning Type:
 Standard
Bin on: Dry Bulb
Bin size: 2
 Joint Frequency
Tdb size: 2
W size: 2

Select Months:
January | July
February | August
March | September
April | October
May | November
June | December
All Months | Clear Months

of Hours Selected **8760**

Weather Data Statistics for selected schedule:
Define selection criteria:
Dry Bulb Temperature °F Equal or Above 65.00 AND Equal or Below 85.00
Humidity Ratio gr/lb d.a. Equal or Above 50.00 N.A. Equal or Below 70.00
N.A. Equal or Above 0.00 N.A. Equal or Below 70.00
N.A. Equal or Above 0.00 N.A. Equal or Below 70.00

2508 HOURS/YR

Get Stats | Export Stats

Stats for the selected hours fitting the selection criteria: Number of hours: 2508

Description	Units	Minimum	Maximum	Wt Average	Mean
Dry bulb temperature	°F	65.12	84.92	74.50	75.02
Dew point temperature	°F	46.47	74.28	62.73	63.24
Wet bulb temperature	°F	54.93	76.75	66.30	65.84
Humidity ratio	gr/lb	50.05	133.61	89.81	91.83
Relative humidity	%	28.44	100.00	67.31	64.22
Enthalpy	Btu/lb da	23.66	41.30	31.92	32.48

REALITY IS ALSO REAL: BUILDER X



MID-SIZED
PRODUCTION



LOW LOAD



COST
CONSCIOUS

THE CHALLENGE:

Rhvac - Residential & Light Commercial HVAC Loads
 EcoScience LLC
 Austin, TX 78704



Elite Software Development, Inc.
 PSW Homes LLC
 Page 4

Load Preview Report

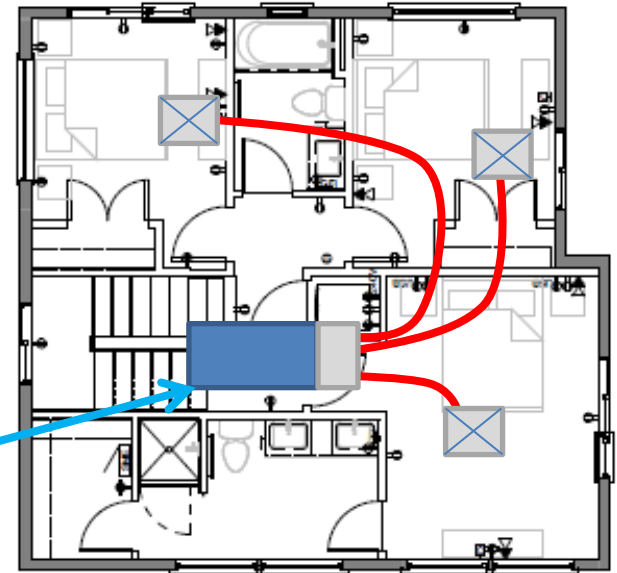
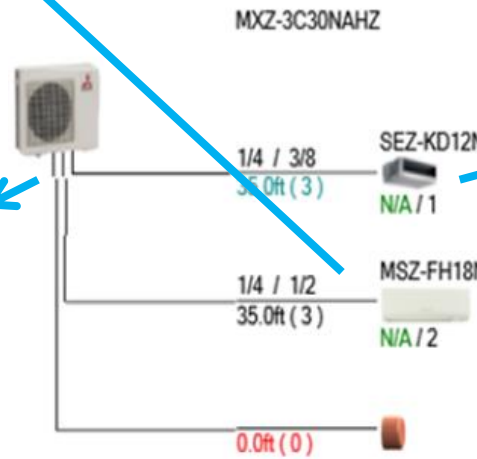
Scope	Net Ton	ft. ² /Ton	Area	Sen Gain	Lat Gain	Net Gain	Sen Loss	Sys Htg CFM	Sys Clg CFM	Sys Act CFM	Duct Size
Building	1.60	926	1478	16,640	2,517	19,157	23,938	917	917	917	
System 1	0.75	960	759	8,033	1,457	9,490	9,438	529	529	529	9x12
Zone 1			759	8,033	1,457	9,490	9,438	529	529	529	9x12
7-Master Bath			93	749	101	850	979	55	49	49	1-4
8-Master Closet			45	392	57	449	759	43	26	26	1-4
9-Stairs			73	646	30	676	724	41	43	43	1-4
10-Bedroom 2			133	1,740	297	2,037	1,874	105	115	115	2-4
11-Bath			44	288	55	343	436	24	19	19	1-4
12-Bedroom 3			140	1,689	313	2,002	1,973	111	111	111	2-4
13-Master Bedroom			170	2,412	544	2,956	2,541	142	159	159	2-5
14-Laundry			13	25	60	85	33	2	2	2	1-4
15-Corridor			49	92	0	92	119	7	6	6	1-4
System 2	0.81	893	719	8,607	1,060	9,667	14,500	388	388	388	9x9
Zone 1			719	8,607	1,060	9,667	14,500	388	388	388	9x9
1-Foyer			79	1,050	76	1,126	2,317	62	47	47	1-4
2-Stair Closet			83	393	65	458	1,659	44	18	18	1-4
3-Kitchen			156	2,685	488	3,173	2,492	67	121	121	2-4
4-Living				3,306	186	3,492	5,592	150	149	149	2-5
5-Dining				1,173	215	1,388	2,393	64	53	53	1-4
6-Powder				0	30	30	47	1	0	0	0-0

LOW LOAD

APPLICATION: COMMON LAYOUT



② T. SLAB - 1ST FLOOR - ELECTRICAL - HOME D
1/4" = 1'-0"



② T. SUBFLOOR - 2ND FLOOR - ELECTRICAL - HOME D
1/4" = 1'-0"

THE CHALLENGE: THEY'VE GOT THE RX

Equipment Sizing and Selection

in accordance with ACCA Manual S Procedures

Performed By EcoScience, LLC dba Positive Energy

Integrated Design. Measured Performance.

www.PositiveEnergy.pro - Info@PositiveEnergy.pro



Client:
Project Address:
Date:

Prepared for:
PSW Homes LLC
EM Franklin - Unit D
March 10, 2017

Regulated by the Texas Department of Licensing and Regulation PO Box 12157, Austin, TX 78711

1.800.803.9202, 1-512-463-6599, www.license.state.tx.us License # TAC14481215

Unit Quantities, Refrigerant Pipe Sizes & Accessories

Q	Model #	Description
1	stock controller	Wireless remote controller
1	MHK1-Kit	MHK1-Kit
1	MXZ-3C30NAHZ	Outdoor Unit
1	SEZ-KD15NA4R1.TH	Indoor Unit
1	MSZ-FH18NA	Indoor Unit

Pipe Dia.	Refrigerant Total Length (feet)	Components Number of Bends
1/4	70	6
1/2	70	6

Q	Model #	Brand, Description
1	70H	UltraAire, Ventilating Ducted Dehu
1	DEH3000R	UltraAire, Dehu Controller
1	FAD-6 (P/N 46590506)	Field Controls, Fresh Air Damper

Filtration Components for IAQ

Q	Model #	Brand, Description
1	TBD	TBD, Filter Grill

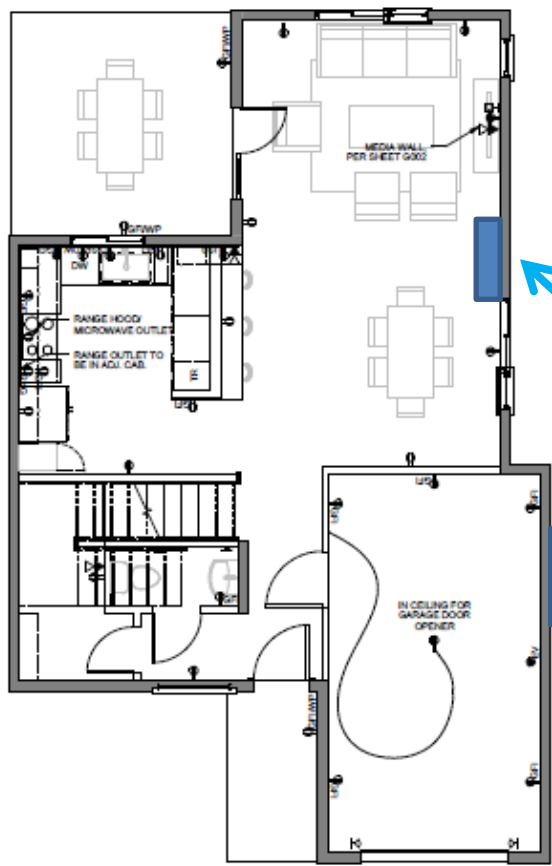
Integrated Make Up Air System for IAQ

Q	Model #	Brand, Description
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Integrated Garage Exhaust Ventilation for IAQ

Q	Model #	Brand, Description
1	FV-30NLFI	Panasonic, Inline Exhaust Fan
1	GVC-01	AirCycler, Garage Vent Controller
1	GVDK-012	AirCycler, Door Kit (+2 contacts)

REALITY: BOTTOM LINE RULES

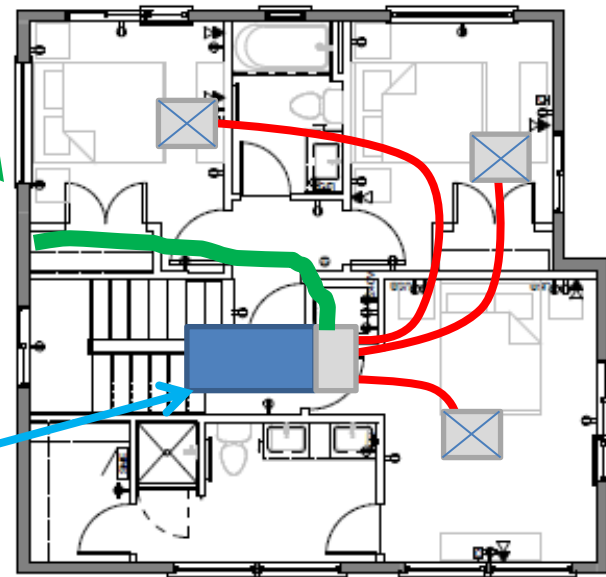


MECHANICAL DAMPER ON A TIMER

MXZ-3C30NAHZ



- 1/4 / 3/8 35.0ft (3) SEZ-KD12N N/A / 1
- 1/4 / 1/2 35.0ft (3) MSZ-FH18N N/A / 2
- 0.0ft (0)



3 T. SLAB - 1ST FLOOR - ELECTRICAL - HOME D
1/4" = 1'-0"

3 T. SUBFLOOR - 2ND FLOOR - ELECTRICAL - HOME D
1/4" = 1'-0"

THEY WON'T TAKE THEIR MEDICINE

WE END UP WITH: PLACEHOLDER



INSTEAD OF WHAT WE REALLY NEED

CONTINUOUS

BALANCED

THE MAGIC BOX

ENERGY
RECOVERY

DEHUMIDIFICATION

BUILT GREEN: LARSON RESIDENCE

Casa La Vista

20318 Haystack Cv
Spicewood, TX 78669



BUILT GREEN:

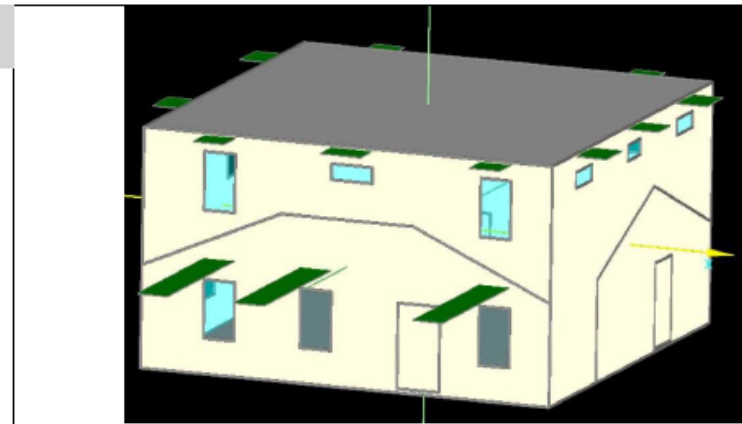


CPHC: KEITH SIMON

HVAC CONTRACTOR: ELITE HEATING AND AIR

BUILDING INFORMATION

Category:	Residential
Status:	In planning
Building type:	New construction
Year of construction:	
Units:	1
Number of occupants:	6 (Design)



Boundary conditions

Climate:	CAMP MABRY TX
Internal heat gains:	0.8 Btu/hr ft ²
Interior temperature:	68 °F
Overheat temperature:	77 °F

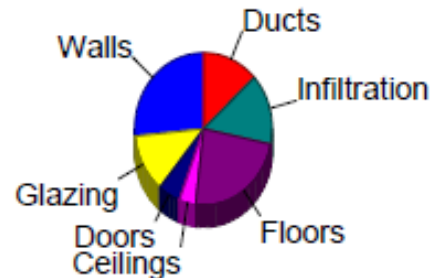
Building geometry

Enclosed volume:	36,498 ft ³
Net-volume:	27,738.5 ft ³
Total area envelope:	6,865.8 ft ²
AV ratio:	0.2 1/ft
Floor area:	3,043.6 ft ²

BUILT GREEN: LARSON RESIDENCE

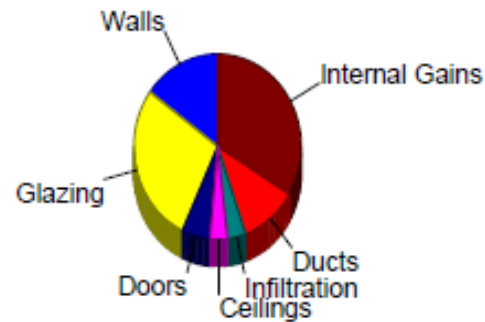
Heating

Component	Btuh/ft ²	Btuh	% of load
Walls	2.1	5851	26.5
Glazing	10.9	2755	12.5
Doors	24.2	1164	5.3
Ceilings	0.6	868	3.9
Floors	3.4	5206	23.6
Infiltration	1.2	3320	15.0
Ducts		2913	13.2
Piping		0	0
Humidification		0	0
Ventilation		0	0
Adjustments		0	0
Total		22077	100.0



Cooling

Component	Btuh/ft ²	Btuh	% of load
Walls	0.9	2604	15.0
Glazing	19.4	4891	28.1
Doors	19.8	952	5.5
Ceilings	0.4	575	3.3
Floors	0	0	0
Infiltration	0.2	624	3.6
Ducts		1896	10.9
Ventilation		0	0
Internal gains		5850	33.6
Blower		0	0
Adjustments		0	0
Total		17392	100.0



Latent Cooling Load = 1981 Btuh
 Overall U-value = 0.065 Btuh/ft²-°F

HVAC LINE-UP: 1

HIGH
EFFICIENCY
ASHP

DEHUMIDIFICATION

VENTILATION



Indoor Unit: MSZ-FH09NA



Indoor Unit: SEZ-KD09NA4**



4032240



Ultra-Aire XT105H

130ERVV

ENERGY RECOVERY VENTILATOR



Outdoor Unit: MXZ-3C24NAHZ2



HVAC LINE-UP: SPECS



Indoor Unit: MSZ-FH09NA



Outdoor Unit: MUZ-FH09NAH



Indoor Unit: SEZ-KD09NA4**



Outdoor Unit: MXZ-3C24NAHZ2

Rated Conditions (Capacity / Input)		
Cooling ¹	Btu/h / W	9,000 / 560
Heating at 47° F ²	Btu/h / W	10,900 / 710

AHRI Efficiency Ratings	
SEER / HSPF	30.5 / 13.5
COP at 47° F / 17° F	4.5 / 3.33
Energy Star®	Yes

Power factor	Cooling (208/230) %	80/81	90/90	97/97	97/97	93/93
	Heating (208/230) %	87/88	94/94	96/96	97/97	96/96

ENERGY EFFICIENCIES:

Indoor Unit Type	SEER	EER	HSPF	COP @ 47°F	COP @ 17°F
Non-ducted (09 + 09)	17.0	13.5	9.8	4.00	2.77
Ducted and Non-ducted	16.00	12.25	9.65	3.85	2.65
Ducted (09 + 12)	15.0	11.0	9.5	3.69	2.53

HVAC LINE-UP: 1 SPECS



Capacities and Performance

Part Number:	4032240	
Blower:	257 CFM @ 0.0" WG 206 CFM @ 0.2" WG 146 CFM @ 0.4" WG	
Power:	530 Watts @ 80°F and 60% RH	
Supply Voltage:	115 VAC – 1phase – 60 Hz	
Current Draw:	4.9 Amps	
Energy Factor:	4.2 L/kWh	
Operating Range:	49°F - 95°F Max (Inlet Air Temperature) 34°F - 135°F Max (Outside Cabinet)	
Sized for:	Up to 2,500 Sq. Ft. - Typical	
Minimum Performance at:	80°F and 60% RH	70°F and 60% RH
Water Removal:	105 pints/day	85 pints/day
Efficiency:	8.8 Pints/kWh	8.0 Pints/kWh
Duct Connections:	6" Round Inlet; 10" Round Inlet; 10" Oval Outlet	
Air Filter:	MERV-13, Standard Pleat	

HVAC LINE-UP: 1 SPECS

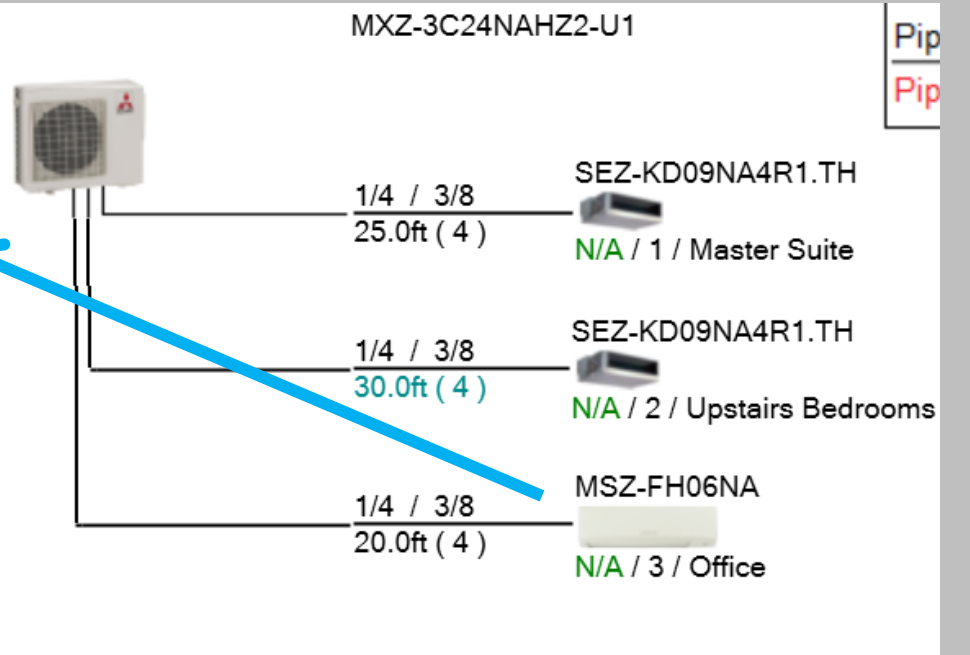
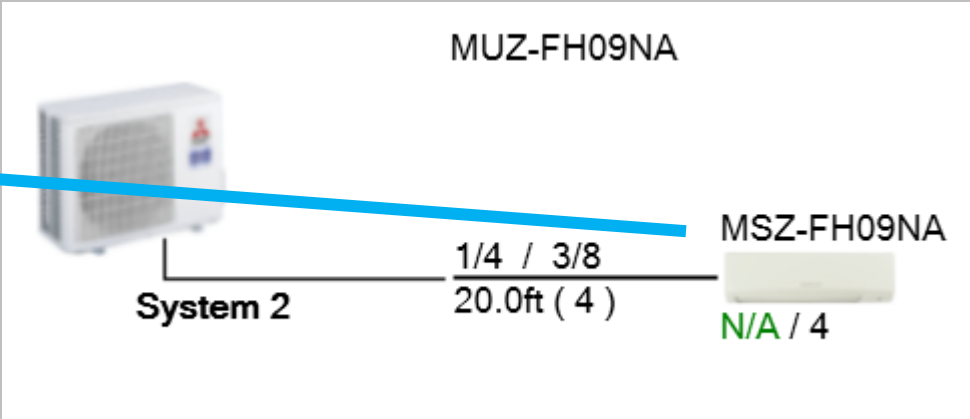
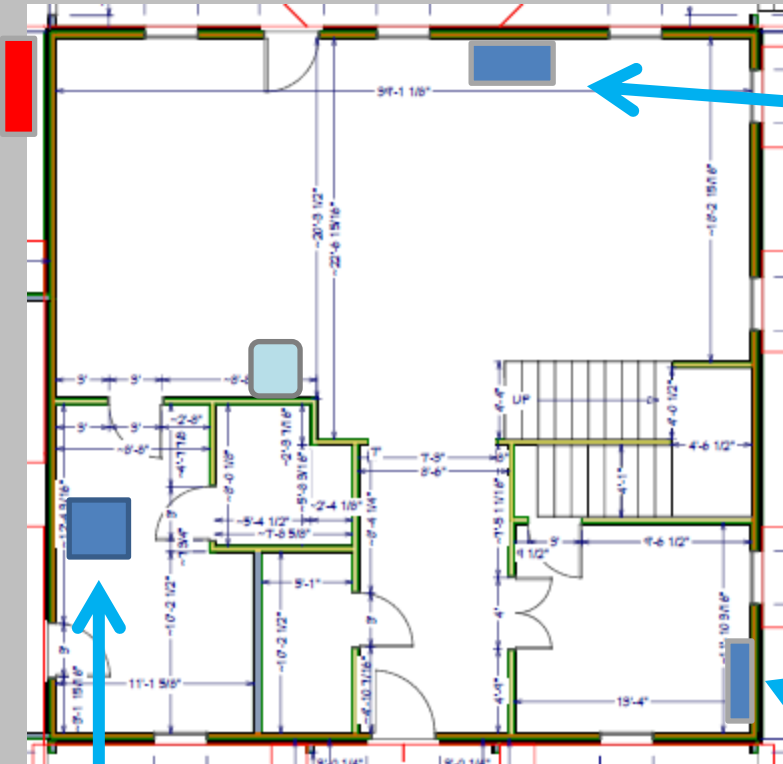


130ERV

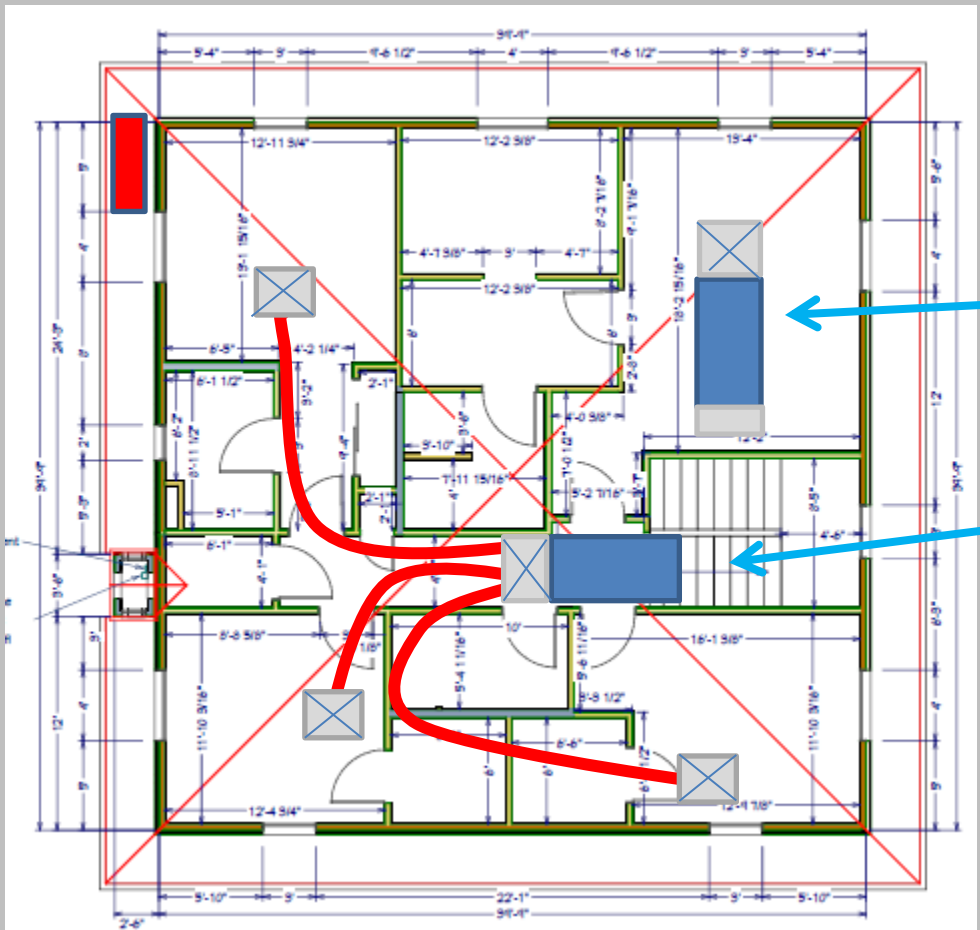
ENERGY RECOVERY VENTILATOR

Performance (HVI certified)		
Net supply airflow in cfm (L/s) against external static pressure		
External Static Pressure	Airflow	
@ 0.1 in (25 Pa)	153 cfm (72 L/s)	
@ 0.2 in (50 Pa)	140 cfm (66 L/s)	
@ 0.3 in (75 Pa)	127 cfm (60 L/s)	
@ 0.4 in (100 Pa)	115 cfm (54 L/s)	
@ 0.5 in (125 Pa)	102 cfm (48 L/s)	
@ 0.6 in (150 Pa)	90 cfm (42 L/s)	
@ 0.7 in (175 Pa)	77 cfm (36 L/s)	
@ 0.8 in (200 Pa)	64 cfm (30 L/s)	
@ 0.9 in (225 Pa)	50 cfm (24 L/s)	
Max. Temperature Recovery	87%	
Sensible Effectiveness		
@ 64 cfm (30 L/s) 32°F (0°C)	87%	
Sensible Efficiency		
@ 66 cfm (31 L/s) 32°F (0°C)	75%	
Total Efficiency		
@ 64 cfm (30 L/s) 95°F (35°C)	53%	
VAC @ 60Hz	120	
Watts / Low speed	76	
Watts / High speed	132	
Amp rating	1.4	

LARSON RESIDENCE: 1ST FLOOR



LARSON RESIDENCE: 2ND FLOOR



MXZ-3C24NAHZ2-U1

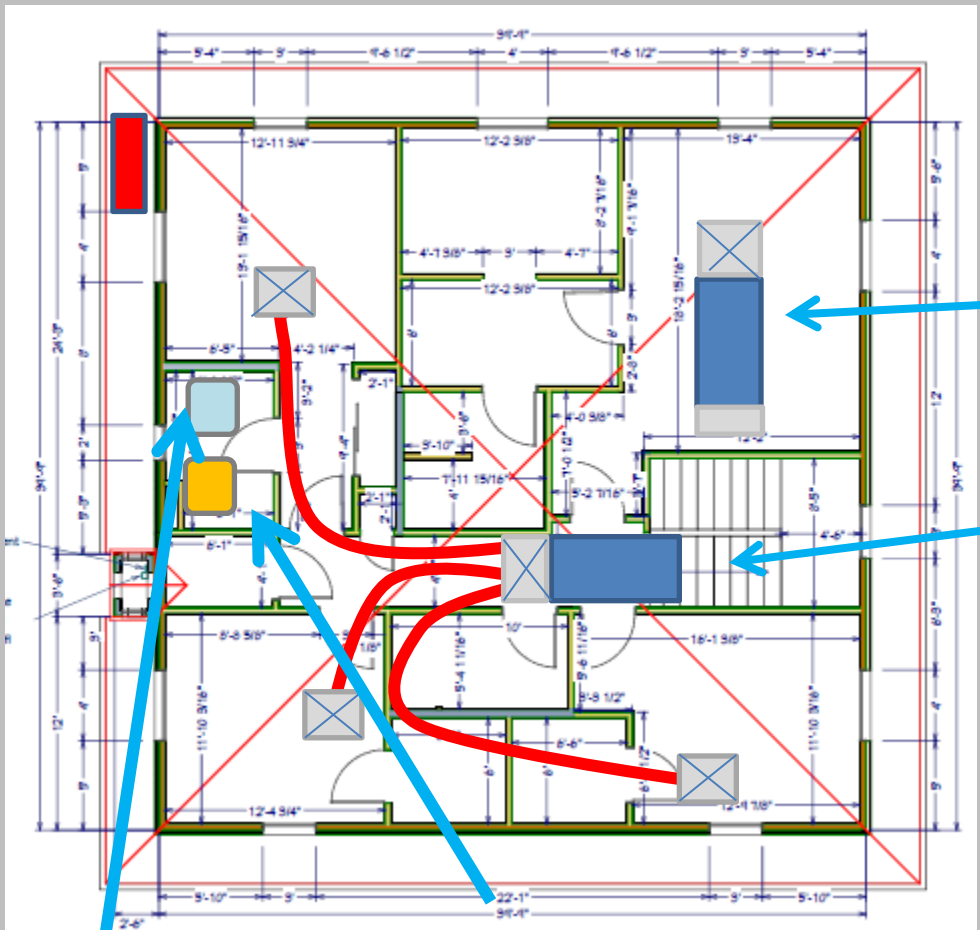
1/4 / 3/8
25.0ft (4) → **SEZ-KD09NA4R1.TH**
N/A / 1 / Master Suite

1/4 / 3/8
30.0ft (4) → **SEZ-KD09NA4R1.TH**
N/A / 2 / Upstairs Bedrooms

1/4 / 3/8
20.0ft (4) → **MSZ-FH06NA**
N/A / 3 / Office

Pip
Pip

LARSON RESIDENCE: 2ND FLOOR



MXZ-3C24NAHZ2-U1

SEZ-KD09NA4R1.TH
 1/4 / 3/8
 25.0ft (4)
 N/A / 1 / Master Suite

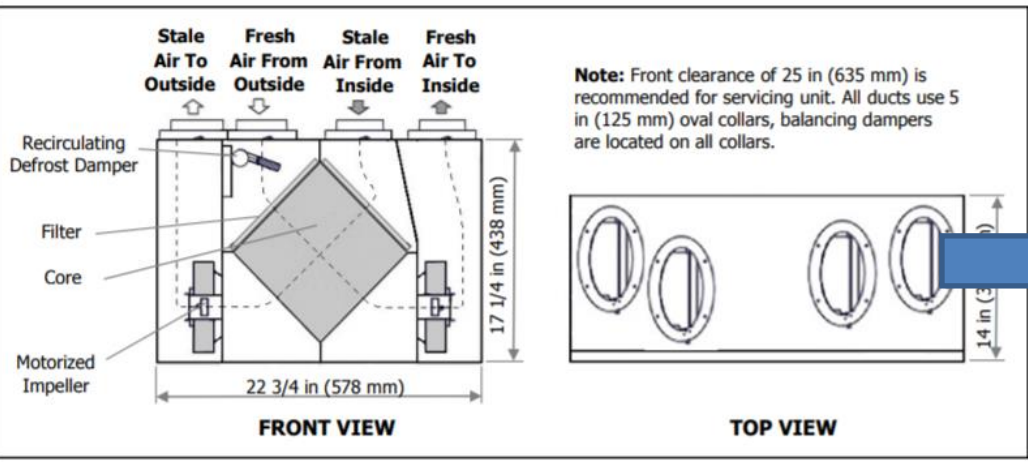
SEZ-KD09NA4R1.TH
 1/4 / 3/8
 30.0ft (4)
 N/A / 2 / Upstairs Bedrooms

MSZ-FH06NA
 1/4 / 3/8
 20.0ft (4)
 N/A / 3 / Office



ERV & DEHU INTEGRATION

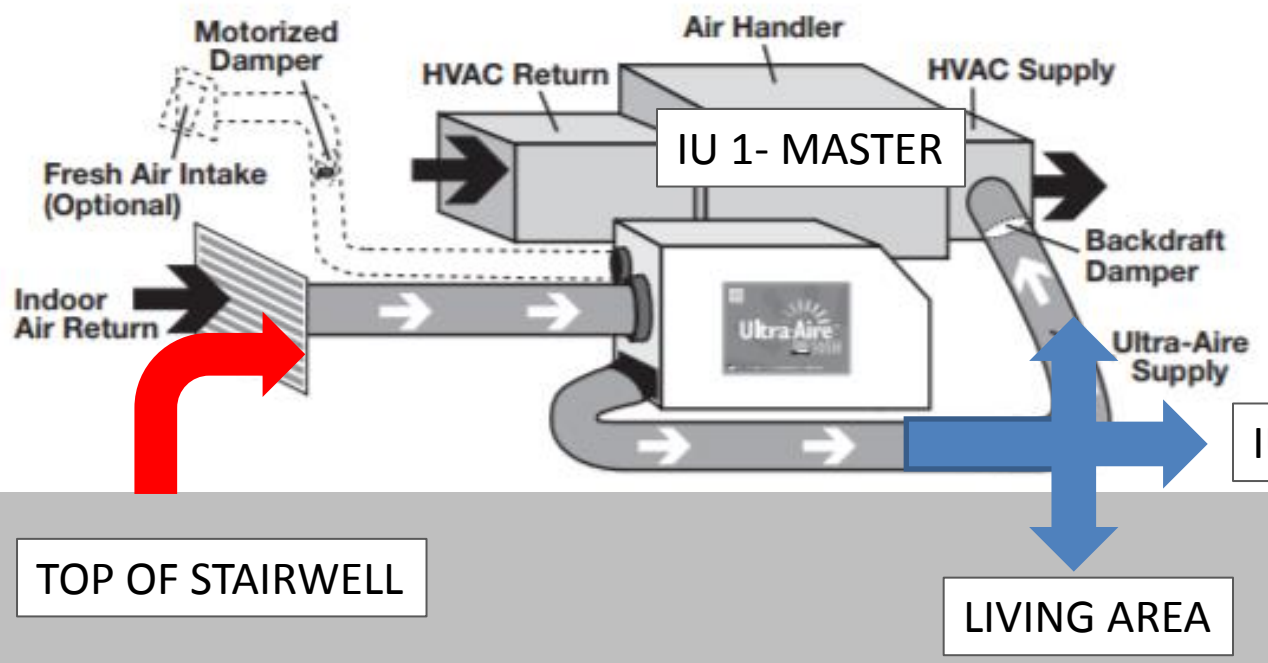
DIMENSIONS 130ERV-R



IU 1- MASTER

IU 2- BEDROOMS

LIVING AREA



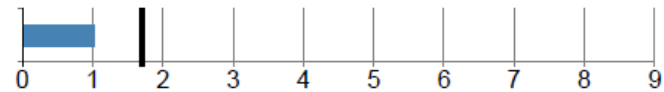
BUILT GREEN: WUFI+ RESULTS

Certificate criteria:

PHIUS+ 2015 Standard

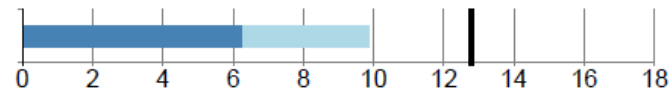
Heating demand

specific: **1.01** kBtu/ft²yr
target: **1.7** kBtu/ft²yr
total: 3,080.64 kBtu/yr



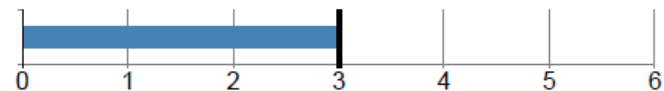
Cooling demand

sensible: **6.28** kBtu/ft²yr
latent: **3.61** kBtu/ft²yr
specific: **9.88** kBtu/ft²yr
target: **12.8** kBtu/ft²yr
total: 30,075.12 kBtu/yr



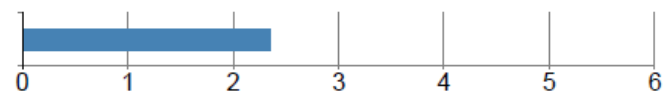
Heating load

specific: **2.99** Btu/hr ft²
target: **3** Btu/hr ft²
total: 9,085.56 Btu/hr



Cooling load

specific: **2.35** Btu/hr ft²
target: **6.2** Btu/hr ft²
total: 7,143.51 Btu/hr

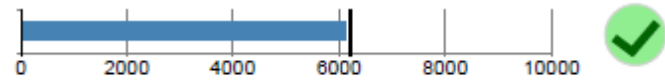


BUILT GREEN: WUFI+ RESULTS

Source energy

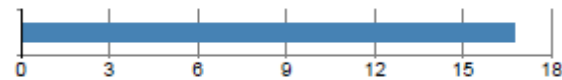
PHIUS+ Source Zero: NO

total: **36,811.93** kWh/yr
specific: **6,135** kWh/Person yr
target: **6,200** kWh/Person yr
total: **125,595.12** kBtu/yr
specific: **41.27** kBtu/ft²yr



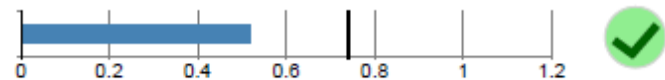
Site energy

total: 51,017.55 kBtu/yr
specific: 16.76 kBtu/ft²yr
total: 14,953.24 kWh/yr
specific: 4.91 kWh/ft²



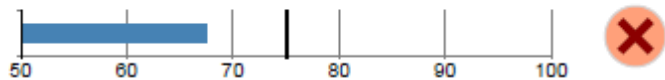
Air tightness

ACH50: **0.52** 1/hr
CFM50 per envelope area: **0.04** cfm/ft²
target: **0.74** 1/hr
target CFM50: **0.05** cfm/ft²

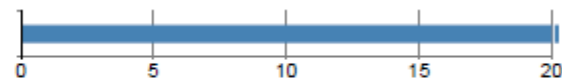


PASSIVEHOUSE RECOMMENDATIONS

HRV efficiency: **67.4** %



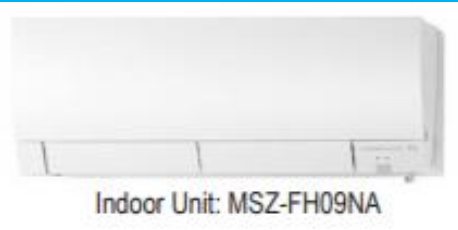
Frequency of overheating: **43.3** %
Cooling system is required



Frequency of overheating only applies if there is not a [properly sized] cooling system installed.

HVAC LINE-UP: 2

HIGH
EFFICIENCY
ASHP



Indoor Unit: MSZ-FH09NA



Indoor Unit: SEZ-KD09NA4**

DEHU &
VENTILATION
SUPPLY



VENTILATION
EXHAUST



Outdoor Unit: MXZ-3C24NAHZ2



Outdoor Unit: MUZ-FH09NAH

LINE UP 2: SD 12 SPECS



Blower:	406 CFM @ 0.0" WG 374 CFM @ 0.2" WG 348 CFM @ 0.4" WG
Power:	160 Watts @ 80°F and 60% RH
Supply Voltage:	115 VAC – 1 Phase – 60 Hz.
Current Draw:	1.4 Amps
Energy Factor:	3.1 L/kWh
Operating Range:	49°F Min, 95°F Max (Inlet Air Temperature)
Sized for:	4,000 Sq. Ft. Typical
Minimum Performance at 80°F and 60% RH	
Water Removal:	184 Pints/Day
Sensible Cooling:	4,300 BTUs/Hour
Efficiency:	6.6 Pints/kWh

LINE UP 1: VENTILATION FANS SPECS



WhisperGreen Select™
Multi-Speed with Time Delay
Plug 'N Play Module |
FV-VS15VK1

Power Consumption (Watts)

50 CFM = 3.2W, 80 CFM = 5.4W, 110 CFM = 9.8W,

Energy Efficiency (CFM/Watt)

50 CFM = 15.1CFM/W, 80 CFM = 15.3CFM/W, 110 CFM = 11.5CFM/W,

Current (Amps)

50 CFM = .04A, 80 CFM = .06A, 110 CFM = .10A,

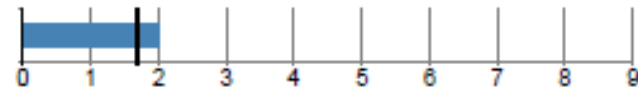
WUFI MODEL: LINE UP 1

Certificate criteria:

PHIUS+ 2015 Standard

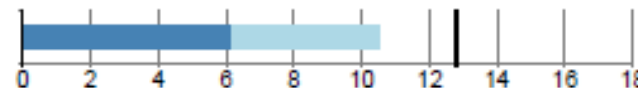
Heating demand

specific: 2 kBtu/ft²yr
target: 1.7 kBtu/ft²yr
total: 6,085.86 kBtu/yr



Cooling demand

sensible: 6.19 kBtu/ft²yr
latent: 4.3 kBtu/ft²yr
specific: 10.49 kBtu/ft²yr
target: 12.8 kBtu/ft²yr
total: 31,923.96 kBtu/yr



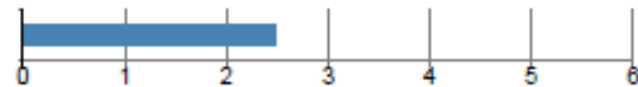
Heating load

specific: 4.03 Btu/hr ft²
target: 3 Btu/hr ft²
total: 12,264.39 Btu/hr



Cooling load

specific: 2.48 Btu/hr ft²
target: 6.2 Btu/hr ft²
total: 7,537.73 Btu/hr

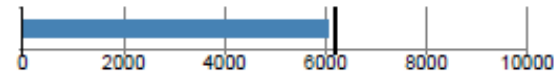


WUFI MODEL: LINE UP 2

Source energy

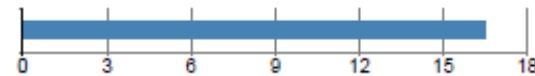
PHIUS+ Source Zero: NO

total: 36,260.29 kWh/yr
specific: 6,043 kWh/Person yr
target: 6,200 kWh/Person yr
total: 123,713.04 kBtu/yr
specific: 40.65 kBtu/ft²yr



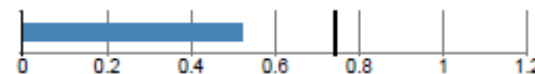
Site energy

total: 50,280.61 kBtu/yr
specific: 16.52 kBtu/ft²yr
total: 14,737.25 kWh/yr
specific: 4.84 kWh/ft²



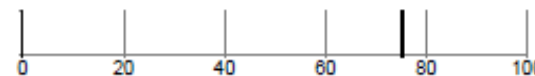
Air tightness

ACH50: 0.52 1/hr
CFM50 per envelope area: 0.04 cfm/ft²
target: 0.74 1/hr
target CFM50: 0.05 cfm/ft²

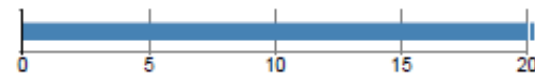


PASSIVEHOUSE RECOMMENDATIONS

HRV efficiency: 0 %

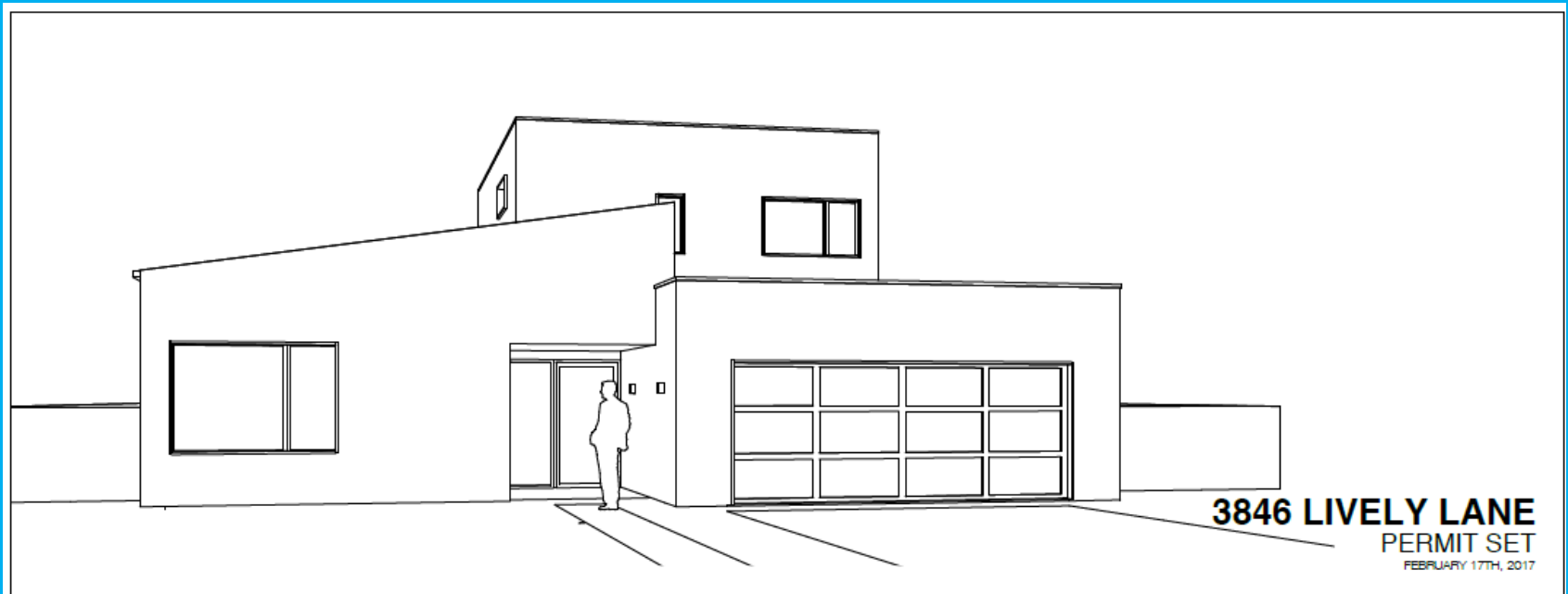


Frequency of overheating:
Cooling system is required 39.8 %



Frequency of overheating only applies if there is not a [properly sized] cooling system installed.

FAGIN BUILDERS, DALLAS:



PASSIVE HOUSE DALLAS: MANUAL J

Design Information

Weather: Dallas Love Field, TX, US

Winter Design Conditions

Outside db	27 °F
Inside db	68 °F
Design TD	41 °F

Summer Design Conditions

Outside db	104 °F
Inside db	74 °F
Design TD	30 °F
Daily range	M
Relative humidity	50 %
Moisture difference	44 gr/lb

Heating Summary

Structure	30253 Btuh
Ducts	5981 Btuh
Central vent (0 cfm)	0 Btuh
Humidification	0 Btuh
Piping	0 Btuh
Equipment load	36234 Btuh

Sensible Cooling Equipment Load Sizing

Structure	29889 Btuh
Ducts	4198 Btuh
Central vent (0 cfm)	0 Btuh
Blower	0 Btuh
Use manufacturer's data	n
Rate/swing multiplier	1.09
Equipment sensible load	37189 Btuh

Infiltration

Method	Simplified
Construction quality	Tight
Fireplaces	0

Latent Cooling Equipment Load Sizing

Structure	1908 Btuh
Ducts	1973 Btuh
Central vent (0 cfm)	0 Btuh

	Heating	Cooling
Area (ft ²)	3329	3329
Volume (ft ³)	32059	32059
Air changes/hour	0.13	0.07
Equiv. AVF (cfm)	69	37

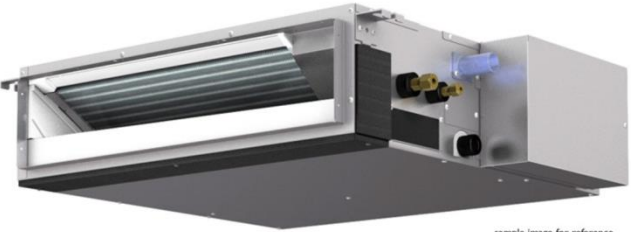
Equipment latent load	3881 Btuh
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Equipment Total Load (Sen+Lat)	41070 Btuh
Req. total capacity at 0.70 SHR	4.4 ton

1,321 sqft/Ton

ALL STAR HVAC LINE-UP

SEZ-KD12NA



sample image for reference



ComfoAir 350



Front Cover



Outdoor Unit: MXZ-2C20NAHZ2



PEAD-A24AA7



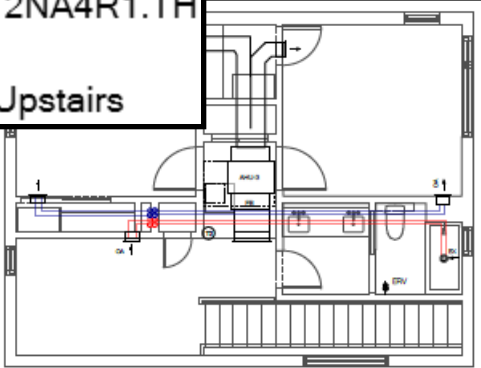
Ultra-Aire MD33

PASSIVE HOUSE DALLAS: LAYOUT

SEZ-KD12NA4R1.TH
N/A / 6 / Upstairs



Ultra-Aire MD33



2 UPPER FLOOR MECHANICAL PLAN
10/10/17

MECHANICAL EQUIPMENT SPECIFICATIONS

- HEAT PUMP: Mitsubishi PUMY - Model TED (18 SEER 2 ton unit) w/ 1 branch box
- AHU-1: Mitsubishi PEY - Model TED
- AHU-2: Mitsubishi PEY - Model TED
- AHU-3: Mitsubishi PEY - Model TED
- THERMOSTATS: Mitsubishi MR-K1 (3 total). Leave set for space temperature setting or not use heat pump.
- ACCESS PANELS: Translucent frosted concealed hardware gypsum panel coated per unit manufacturer's specification at AHU's with GFI'd calling.
- ERV: Zehnder ComfoAir ERV model TED
- WATER HEATER 1: Heat Pump Water Heater model TED
- KITCHEN EXHAUST HOOD: TED - 400 CFM maximum.
- MAKE-UP DAMPER: Model TED operation installed by mechanical.

Zehnder ComfoAir 350

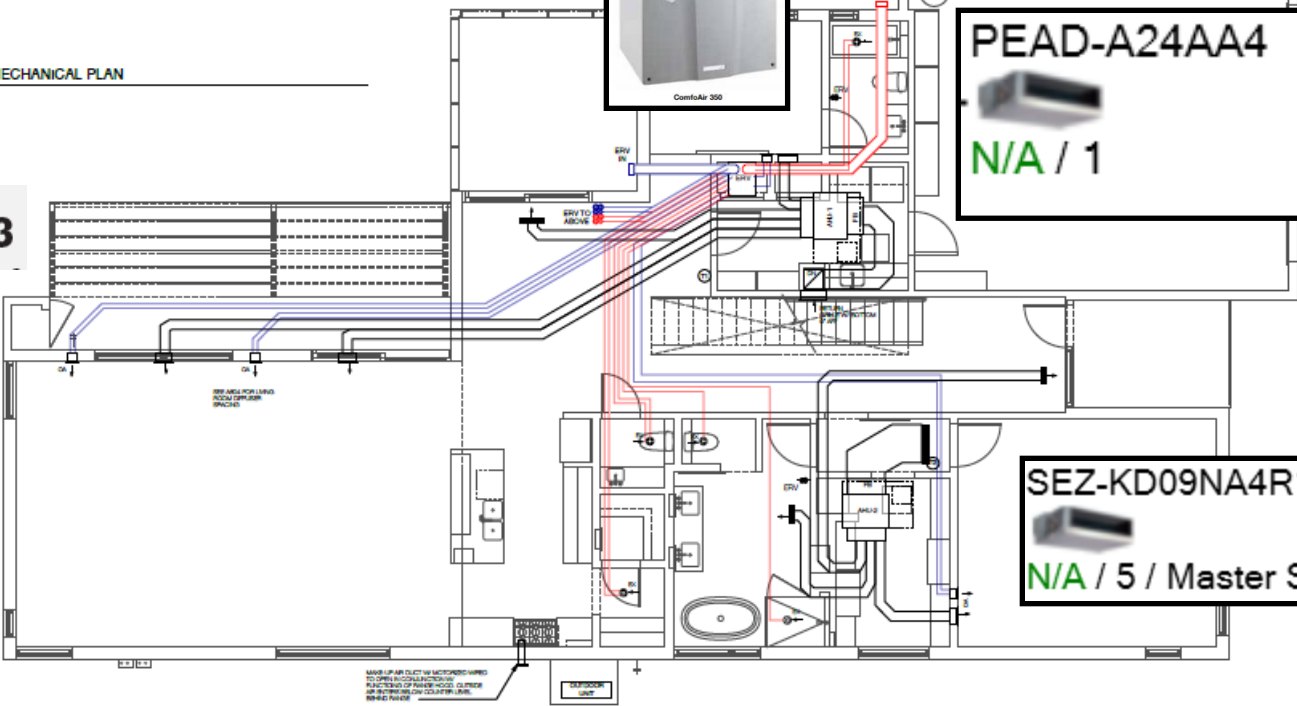


- SYMBOLS**
- Thermostat location and AHU
 - ERV brand location switch

MECHANICAL NOTES

- Mechanical contractor to provide system design based on Architect's layout & Manual S, D calculations. Design to be coordinated w/ Architect prior to installation.
- SCOPE:
3,200 sq. area of conditioned space to be serviced by a Mitsubishi system heat pump with three zones. Indoor units to be ducted, no cooktop/broiler units. ERV ventilation to be Zehnder or approved equal.
- REQUIREMENTS:
- All Indoor Mechanical Equipment & Ducts to be within the insulated building envelope. Ductwork does not require thermal insulation.
 - Air Filter to be MERV 8 or greater.
 - Air handles must be sized to maintain air pressure & air flow.
 - All filter housing must be airtight.
 - Copper refrigerant piping to be flushed with nitrogen during brazing.
 - Submit grille schedule for Architect's review.

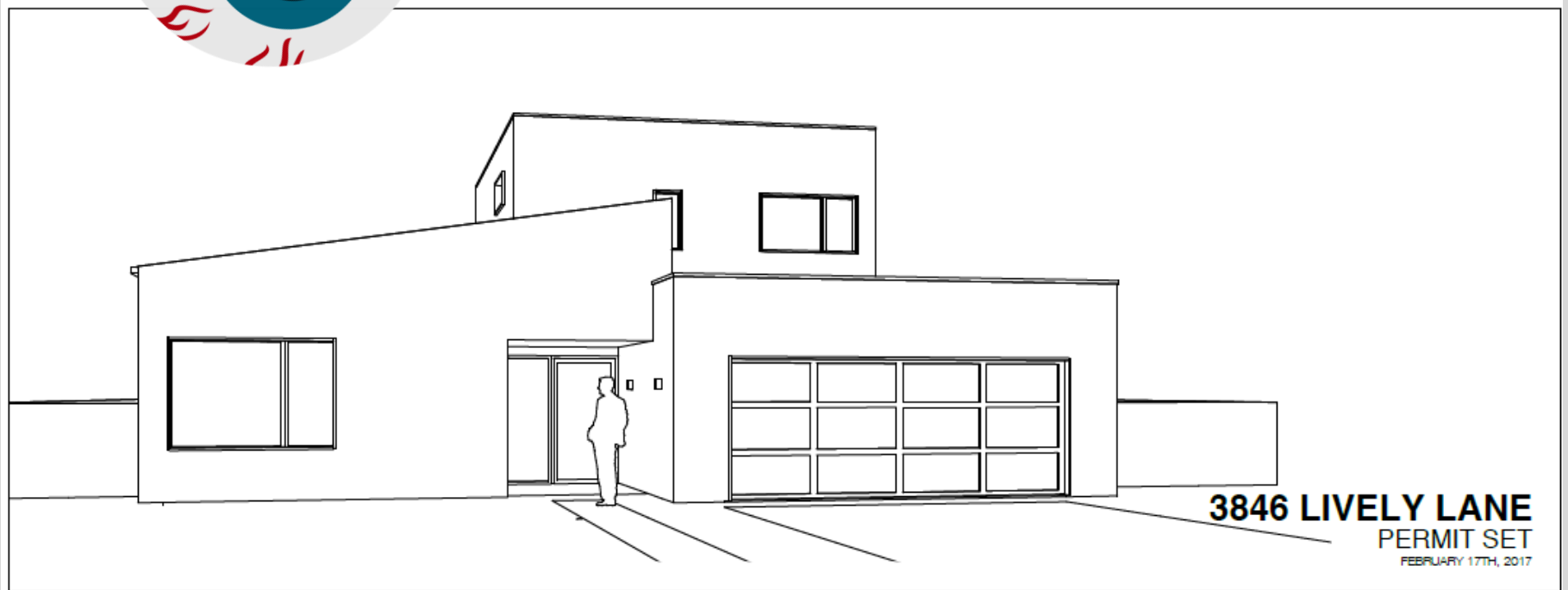
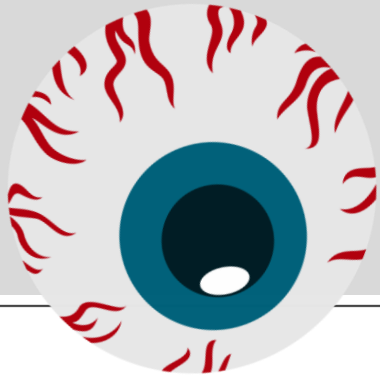
PEAD-A24AA4
N/A / 1



SEZ-KD09NA4R1.TH
N/A / 5 / Master Suite

1 GROUND FLOOR MECHANICAL PLAN
10/10/17

FAGIN BUILDERS, DALLAS: STAY TUNED...



3846 LIVELY LANE
PERMIT SET
FEBRUARY 17TH, 2017

THANK YOU!



CONTACT:
Kllewellyn@hvac.me.com

BUILT GREEN: LARSON RESIDENCE