Project:

Model: VSHPe-SE / VSHPe-HE

Vertical Stack Heat Pump w/ Integrated ERV

Standard Efficiency (SE) & High Efficiency (HE) Chassis

R-454B

Dev. H

Date:

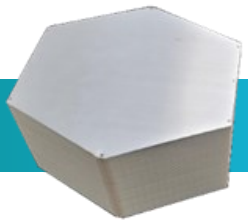
Revision: 0

OMEGA Job #:

SUBMITTAL SET

AHRI CERTIFIED® www.ahridirectory.org
Water Source HP
ANSI/AHRI/ASHRAE/ISO 13256

ETL LISTED c US
Intertek



SUMMARY PAGE

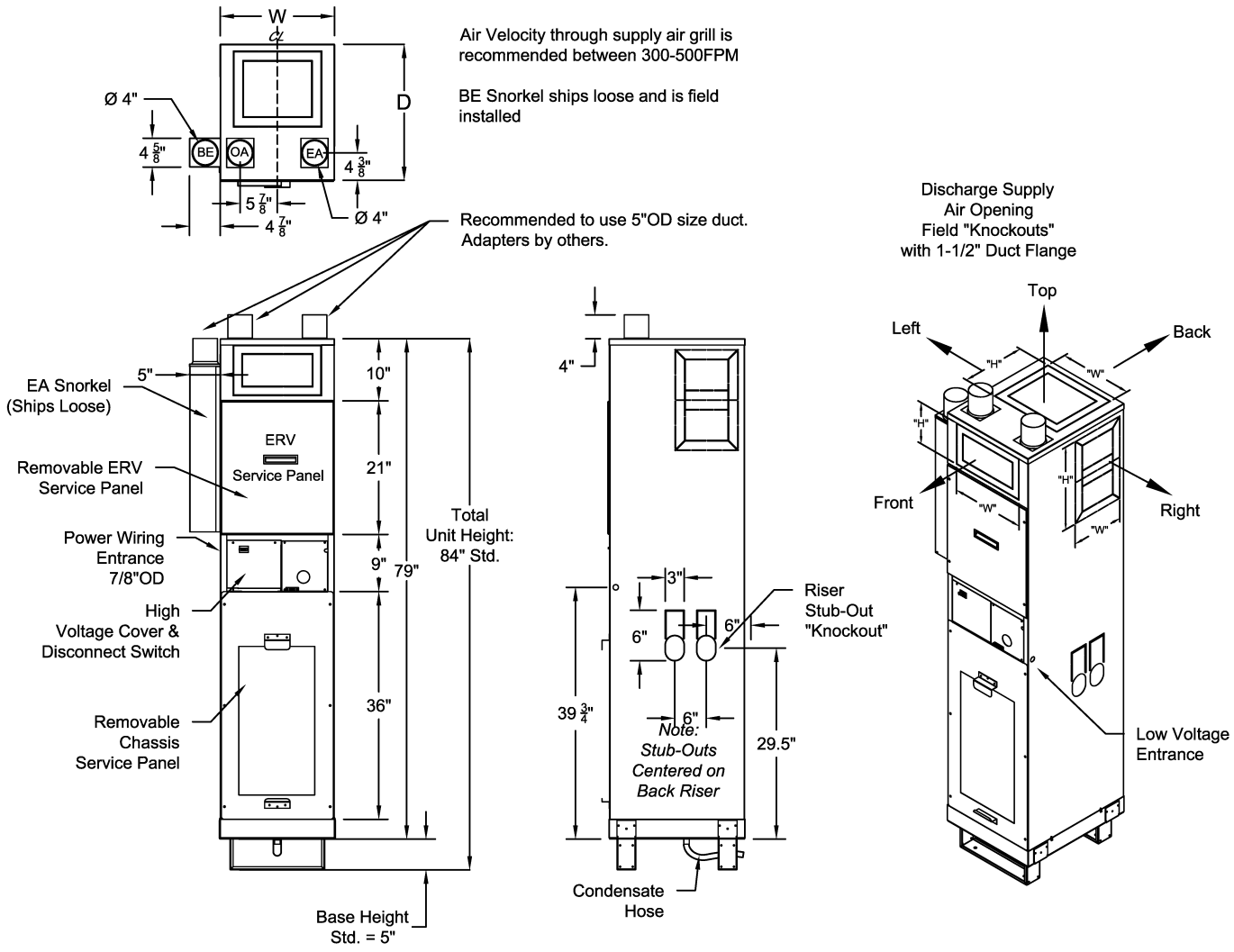
Standard Options

- □ Vertical Stack Heat Pumps with Integrated ERV w/ Standard Efficiency Chassis (SE)
- □ R-454B / UL-60335-2-40
- □ Unit Mounted Non-Fused Disconnect Switch
- □ ECM Fan with Forward Curved DWDI Blower and DC ERV Fan Motors
- □ High Efficiency Counter-Flow ERV Core, 2-Speed, Field Adjustable Speeds
- □ Fully Modulating OA Damper, Normally Closed, Spring Return
- □ "Whisper" Mode for Constant Low CFM Air Circulation
- □ Standard Basic Control Board
- □ Reversing Valve Energize to Cooling (ECOOL)

Optional

- □ Deluxe Control Board, or Deluxe Control Board with SmartOne®
- □ High Efficiency Chassis (HE)
- □ Geothermal Rated, or Low Temperature Water Rated
- □ "Whisper" Mode for Constant Low CFM Air Circulation
- □ 2-Way Motorized Zone Valve:
  - □ Standard Close-Off Pressure 40 PSI
  - □ Low Close-Off Pressure 25 PSI
- □ Reversing Valve Energize to Heating (EHEAT)
- □ Autoflow Balancing Valve
- □ Y-Strainer #20 Mesh
- □ Coated DX Evaporator Coil
- □ Cupro-Nickel Coaxial Heat Exchanger
- □ Risers (Type M, L)
- □ Hose Kits
- □ MERV 13 ERV filter, Charcoal ERV filter
- □ MERV 13 pleated 2-inch Filter
- □ Return Air Panel Type
  - □ Acoustic - Type 'A' with Baffle
  - □ 2 Panel Perimeter - Type '2P'

VSHPe - CABINET DIMENSIONS



A1 HE-ERV Configuration is shown (Refer to ERV Configuration for additional layouts)

EA - Exhaust Air to Outside
BE - Bathroom Exhaust to ERV (Snorkel Ships Loose)
OA - Outside Air Intake to ERV

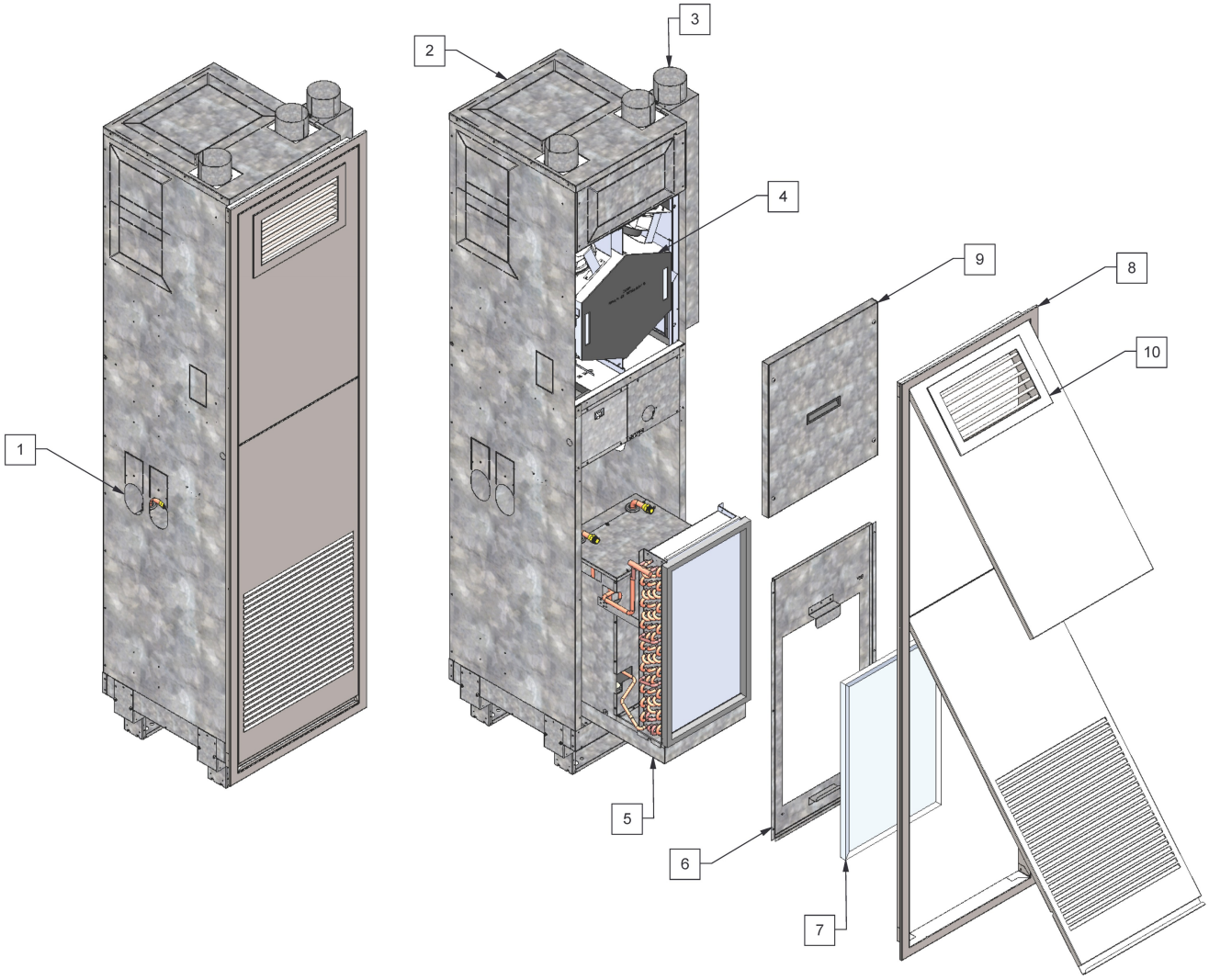
VSHPe - CABINET DIMENSIONS & SUPPLY DISCHARGE OPENING SIZES

Model	Capacity (Tons)	Cabinet Size	Dimensions (in)		VSHPe Supply Discharge Opening ("W" X "H") inches			
			W	D	Front	Back	Right/Left	Top
VSHPe 030	3/4	Y	18	20.5	14 x 8	8 x 14	10 x 12	12 x 12
VSHPe 040	1				14 x 8	8 x 14	10 x 14	12 x 12
VSHPe 050	1 1/4				14 x 8	8 x 14	10 x 16	14 x 12
VSHPe 060	1 1/2				14 x 8	8 x 14	10 x 16	14 x 12
VSHPe 080	2	Z	22	24.5	18 x 8	8 x 18	14 x 18	14 x 14
VSHPe 100	2 1/2				18 x 8	8 x 18	14 x 20	16 x 14
VSHPe 120	3				18 x 8	8 x 18	14 x 20	16 x 14

Note: Discharge opening sizes (Top, Back, Right/Left) are customer configurable. Published sizes shown are maximum factory default sizes. Customer to verify discharge opening sizes match design requirements for proper airflow and select appropriate discharge openings at time of order. **Front direct supply discharge off of unit will increase NC levels above published performance.**

EXPLODED VIEW

1. Supply, return and condensate riser field “knockouts”
2. Field “knockout” supply air openings (Front/Back/Side/Top) with 1-1/2” duct flange
3. ERV Ports—Bathroom Exhaust, Exhaust Air, Outside Air
4. Removable Counterflow ERV core
5. Heat pump chassis
6. Chassis service cover panel
7. 1-inch Air Filter
8. Acoustic return air (R/A) panel for chassis, blower and electrical compartments
9. ERV service panel
10. (Optional) Front supply discharge grille



STANDARD EFFICIENCY CHASSIS

VSHPe (SE) PERFORMANCE TABLE - STANDARD EFFICIENCY CHASSIS - ISO WATER

Unit Model	Refrig.	Air Flow (SCFM)		Water Flow (GPM)	WLHP Cooling[1]		WLHP Heating[1]		GLHP Cooling[2]		GLHP Heating[2]	
		Cooling	Heating		Capacity (BTUH)	EER	Capacity (BTUH)	COP	Capacity (BTUH)	EER	Capacity (BTUH)	COP
VSHPe 030SE	R-454B	350	390	2.3	8,900	13.2	11,000	4.8	9,100	14.5	6,200	3.3
VSHPe 040SE	R-454B	400	450	3.0	11,600	14.0	14,400	4.7	12,000	15.3	8,900	3.2
VSHPe 050SE	R-454B	550	600	3.7	14,200	15.0	16,600	5.3	14,900	16.5	10,400	3.3
VSHPe 060SE	R-454B	630	700	4.4	17,300	14.1	20,500	4.9	18,000	15.7	12,800	3.2
VSHPe 080SE	R-454B	870	930	6.0	23,300	14.9	26,600	4.9	24,300	16.1	16,600	3.4
VSHPe 100SE	R-454B	1100	1150	7.5	29,500	14.8	33,700	4.8	30,300	16.0	21,000	3.3
VSHPe 120SE	R-454B	1200	1260	9.0	35,500	14.4	41,300	4.6	36,300	15.4	24,700	3.3

[1]Performance based on ARI/ISO 13256-1 Water Loop conditions at 86F EWT Cooling, 68F EWT Heating.
[2]Performance based on ARI/ISO 13256-1 Ground Loop conditions at 77F EWT Cooling, 32F EWT Heating.
Cooling performance shown based on 80.6F DB and 66.2F WB entering air. Heating performance shown based on 68F entering air.

VSHPe (SE) - ELECTRICAL DATA (ECM)

Model	Supply Voltage	Compressor			Blower		ERV FLA	Total Unit FLA	MCA	MaxFuse/ Circuit Breaker
		Qty	RLA	LRA	HP	FLA				
VSHPe 030SE	208-230/1/60	1 @	3.7	22.0	1/4	1.2	1.0	5.9	6.8	15
VSHPe 040SE	208-230/1/60	1 @	4.7	25.0	1/4	1.3	1.0	7.0	8.2	15
VSHPe 050SE	208-230/1/60	1 @	5.6	29.0	1/3	2.2	1.0	8.8	10.2	15
VSHPe 060SE	208-230/1/60	1 @	7.4	33.0	1/3	2.3	1.0	10.7	12.6	15
VSHPe 080SE	208-230/1/60	1 @	10.9	62.9	1/2	4.2	1.0	16.1	18.8	25
VSHPe 100SE	208-230/1/60	1 @	13.5	72.5	1/2	4.2	1.0	18.7	22.1	35
VSHPe 120SE	208-230/1/60	1 @	15.4	83.9	1/2	4.2	1.0	20.6	24.5	35

Minimum voltage 200 V. Operating voltage 208-230 V, single phase. SCCR RATING: 5kA RMS, SYMMETRICAL, 300V MAX

VSHPe (SE) - PHYSICAL DATA

Model Series	VSHPe 030SE	VSHPe 040SE	VSHPe 050SE	VSHPe 060SE	VSHPe 080SE	VSHPe 100SE	VSHPe 120SE
Nominal Cooling (Ton)[1]	0.75	1.0	1.25	1.50	2.0	2.5	3.0
Compressor-Type	High Efficiency Rotary				High Efficiency Scroll		

Water Coil-Type	High Efficiency Co-Axial						
Hose Size (in)	1/2"				3/4"		
Water Connections	1/2" NPSM				3/4" NPSM		
Total Chassis Fluid Volume (US gallons)[2]	0.13	0.15	0.22		0.58	0.61	0.63
Drain Connection Size	7/8" ID (Standard)						

Standard Blower / Motor	DWDI Forward-Curved Centrifugal / Direct-Drive						
Motor Type	ECM	ECM	ECM	ECM	ECM	ECM	ECM
Motor HP/Speeds	0.25/4	0.25/4	0.33/4	0.33/4	0.50/4	0.50/4	0.50/4

Standard 1" Filter MERV8	1-14x25x1		1-16x25x1		1-20x25x1		
Optional 2" Filter MERV13	1-14x25x2		1-16x25x2		1-20x25x2		

VSHPe SE Chassis Weight (lb)	72	77	105	110	150	165	175
VSHPe SE Cabinet Weight (lb)	175	175	178	178	243	243	243

HIGH-EFFICIENCY CHASSIS

(OPTIONAL) VSHPe (HE) - HIGH EFFICIENCY PERFORMANCE TABLE - ISO WATER

Unit Model	Refrig.	Air Flow (SCFM)		Water Flow (GPM)	WLHP Cooling[1]		WLHP Heating[1]		GLHP Cooling[2]		GLHP Heating[2]	
		Cooling	Heating		Capacity (BTUH)	EER	Capacity (BTUH)	COP	Capacity (BTUH)	EER	Capacity (BTUH)	COP
VSHPe 030HE	R-454B	340	380	2.3	9,300	15.1	11,500	5.4	9,600	16.7	6,800	3.5
VSHPe 040HE	R-454B	400	450	3.2	12,000	15.5	14,500	5.3	12,300	17.2	9,000	3.5
VSHPe 050HE	R-454B	550	600	3.9	15,200	17.4	16,900	6.0	15,900	19.7	10,300	3.8
VSHPe 060HE	R-454B	630	700	4.7	17,900	15.5	20,600	5.7	18,500	17.7	13,300	3.7
VSHPe 080HE	R-454B	870	930	6.0	23,400	15.5	28,000	5.6	24,100	17.2	16,600	3.6
VSHPe 100HE	R-454B	1100	1150	7.5	29,700	15.4	34,200	5.5	30,200	17.1	20,900	3.6
VSHPe 120HE	R-454B	1200	1260	8.5	35,700	14.6	40,800	5.2	36,000	16.3	24,200	3.4

[1]Performance based on ARI/ISO 13256-1 Water Loop conditions at 86F EWT Cooling, 68F EWT Heating.
[2]Performance based on ARI/ISO 13256-1 Ground Loop conditions at 77F EWT Cooling, 32F EWT Heating.
Cooling performance shown based on 80.6F DB and 66.2F WB entering air. Heating performance shown based on 68F entering air.

(OPTIONAL) VSHPe (HE) - ELECTRICAL DATA (ECM)

Model	Supply Voltage	Compressor			Blower		ERV FLA	Total Unit FLA	MCA	MaxFuse/ Circuit Breaker
		Qty	RLA	LRA	HP	FLA				
VSHPe 030HE	208-230/1/60	1 @	3.7	22.0	1/4	1.2	1.0	5.9	6.8	15
VSHPe 040HE	208-230/1/60	1 @	4.7	26.0	1/4	1.3	1.0	7.0	8.2	15
VSHPe 050HE	208-230/1/60	1 @	5.5	26.0	1/3	2.2	1.0	8.7	10.1	15
VSHPe 060HE	208-230/1/60	1 @	7.0	38.0	1/3	3.0	1.0	11.0	12.8	15
VSHPe 080HE	208-230/1/60	1 @	10.9	62.9	1/2	4.2	1.0	16.1	18.8	25
VSHPe 100HE	208-230/1/60	1 @	13.5	72.5	1/2	4.2	1.0	18.7	22.1	35
VSHPe 120HE	208-230/1/60	1 @	15.4	83.9	1/2	4.2	1.0	20.6	24.5	35

Minimum voltage 200 V. Operating voltage 208-230 V, single phase. SCCR RATING: 5kA RMS, SYMMETRICAL, 300V MAX

(OPTIONAL) VSHPe (HE) - PHYSICAL DATA

Model Series	VSHPe 030HE	VSHPe 040HE	VSHPe 050HE	VSHPe 060HE	VSHPe 080HE	VSHPe 100HE	VSHPe 120HE
Nominal Cooling (Ton)[1]	0.75	1.0	1.25	1.50	2.0	2.5	3.0
Compressor-Type	High Efficiency Rotary				High Efficiency Scroll		

Water Coil-Type	High Efficiency Co-Axial						
Hose Size (in)	1/2"				3/4"		
Water Connections	1/2" NPSM				3/4" NPSM		
Total Chassis Fluid Volume (US gallons)[2]	0.15	0.22	0.25	0.27	0.58	0.61	0.63
Drain Connection Size	7/8" ID (Standard)						

Standard Blower / Motor	DWDI Forward-Curved Centrifugal / Direct-Drive						
Motor Type	ECM	ECM	ECM	ECM	ECM	ECM	ECM
Motor HP/Speeds	0.25/4	0.25/4	0.33/4	0.33/4	0.50/4	0.50/4	0.50/4

Standard 1" Filter MERV8	1-14x25x1		1-16x30x1		1-20x30x1		
Optional 2" Filter MERV13	1-14x25x2		1-16x30x2		1-20x30x2		

VSHPe HE Chassis Weight (lb)	75	80	108	113	155	170	180
VSHPe HE Cabinet Weight (lb)	175	175	178	178	243	243	243

ECM FAN DATA

Unit Size	EC Motor Speed	Min. SCFM	Rated SCFM	External Static Pressure (in w.g.)												
				0	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.55	0.6
				SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM
030	WHISPER*	N/A	N/A	170	160	145	130	120	110	100	85	75	65	55	-	-
	LOW	220	350	315	305	295	285	275	265	250	240	225	-	-	-	-
	MED			350	340	335	325	315	305	295	285	275	265	255	245	235
	HIGH			-	-	365	355	350	340	330	320	310	305	295	285	275
040	WHISPER*	N/A	N/A	190	175	170	155	135	120	110	95	85	70	75	-	-
	LOW	300	460	410	400	390	380	370	365	350	340	330	325	310	300	-
	MED			460	450	445	440	430	425	415	405	395	385	375	365	355
	HIGH			-	-	-	-	470	465	455	445	435	430	420	410	400
050	WHISPER*	N/A	N/A	340	325	310	295	280	265	240	225	205	190	165	-	-
	LOW	375	530	520	510	490	470	450	430	410	390	375	-	-	-	-
	MED			-	-	550	540	520	505	485	470	450	430	410	390	375
	HIGH			-	-	-	-	-	-	555	540	525	510	490	475	460
060	WHISPER*	N/A	N/A	340	325	310	295	280	265	240	225	205	190	165	-	-
	LOW	450	630	580	565	550	540	520	505	485	470	450	-	-	-	-
	MED			640	620	610	595	580	565	555	540	525	510	490	475	460
	HIGH			-	-	675	670	655	650	640	620	610	595	580	565	550
080	WHISPER*	N/A	N/A	465	435	420	390	360	330	310	285	255	225	195	-	-
	LOW	600	820	800	760	740	720	695	660	640	620	-	-	-	-	-
	MED			880	860	840	820	800	780	750	720	700	670	650	625	600
	HIGH			-	-	-	-	895	880	860	820	805	795	780	770	760
100	WHISPER*	N/A	N/A	465	435	420	390	360	330	310	285	255	225	195	-	-
	LOW	750	1010	960	940	920	890	860	840	820	800	775	750	-	-	-
	MED			1080	1060	1040	1010	990	970	950	930	900	880	860	840	820
	HIGH			-	-	-	-	1110	1090	1070	1060	1040	1020	990	980	960
120	WHISPER*	N/A	N/A	465	435	420	390	360	330	310	285	255	225	195	-	-
	LOW	900	1200	1120	1100	1090	1070	1050	1025	1010	990	970	940	920	-	-
	MED			1230	1200	1185	1170	1150	1130	1110	1095	1080	1055	1040	1020	1000
	HIGH			1320	1290	1275	1260	1240	1225	1205	1190	1175	1160	1140	1120	1100

Note: All airflow ratings are taken at lowest voltage rating of dual rating (ie. 208 volt).
Airflow ratings include resistance of dry coil, Return Air panel and clean MERV10 air filters.
*Standard “Whisper” mode is Fan On, Compressor Off mode for constant fresh air circulation.

ERV FAN DATA

% Torque	Potentiometer Dial Setting	CFM								
		ESP (External Static) inwg								
		0.05	0.075	0.10	0.15	0.20	0.25	0.30	0.40	0.50
25%	10 O'clock	42	20	31	22	-	-	-	-	-
37%	11 O'clock	59	35	38	27	19	-	-	-	-
45%	12 O'clock	71	45	52	40	32	-	-	-	-
57%	1 O'clock	90	75	78	64	53	46	40	35	30
69%	2 O'clock	122	105	115	105	95	86	75	65	57
82%	3 O'clock	144	140	140	135	130	125	118	109	98
95%	4 O'clock	160	155	153	150	148	145	142	136	129

Notes:
- All airflow ratings are taken at lowest voltage rating of dual rating (ie. 208 volt).
- ERV external static setting is based on longest run: Exhaust duct run.
- ESP capability shown per fan.
- Recommend field sets ERV fan speeds to meet design CFM requirements based on ERV duct static. Default factory settings may not match site conditions and requirements.

DESIGN AND OPERATIONAL LIMITS

Air Limits	Cooling		Heating
	DB	WB	DB
Std. Entering Air Temperature (EAT)	75°F	63°F	68°F
Min. Entering Air Temperature (EAT)	65°F	55°F	50°F
Max. Entering Air Temperature (EAT)	85°F	71°F	80°F

Fluid Limits	Standard Range		Low Temp Water Range		Geothermal Range	
	Cooling	Heating	Cooling	Heating	Cooling	Heating
Std. Entering Fluid Temperature (EFT)	85°F	70°F	85°F	55°F	85°F	35 - 50°F
Min. Entering Fluid Temperature (EFT)	50°F	60°F	50°F	50°F	30°F	20°F
Max. Entering Fluid Temperature (EFT)	110°F	90°F	110°F	90°F	110°F	90°F
Min. GPM/Ton	1.5		2.25		2.25	
Design GPM/Ton	3		3		3	
Max. GPM/Ton	4		4		4	

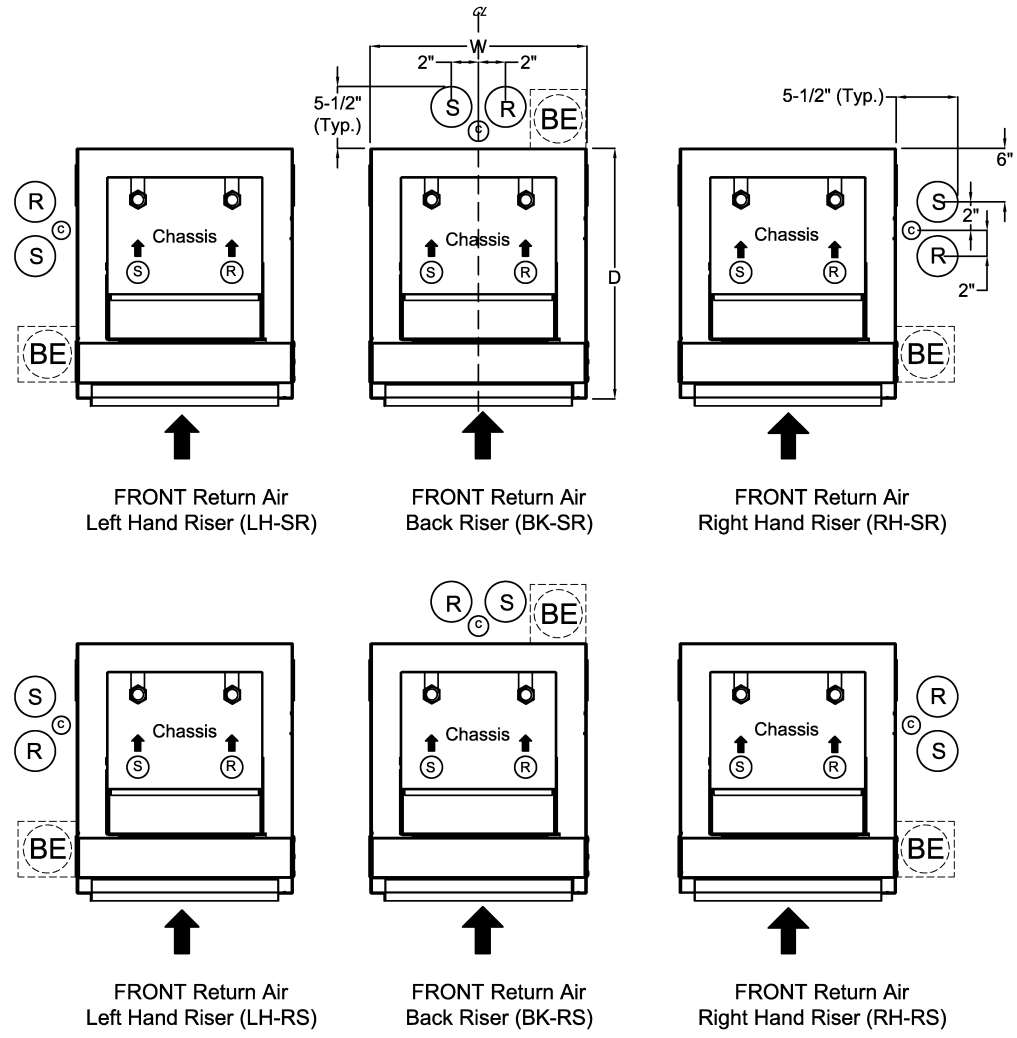
CFM Limits	
Min. CFM/Ton	300
Design CFM/Ton	400
Max. CFM/Ton	450

CAUTION

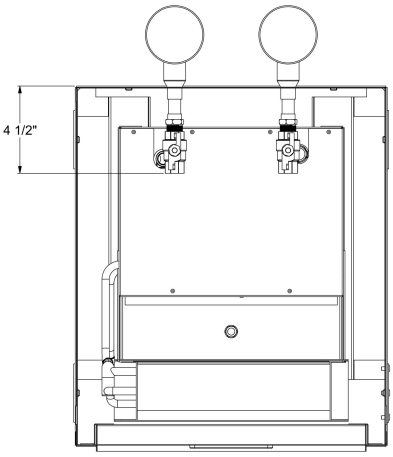
Design limits can not be combined. Combining maximum or minimum limits is not allowed. This could exceed the operation and design limits of the unit.

For example: It is not allowed to combine maximum entering air temperature (EAT) limits with maximum entering fluid temperature (EFT) limits.

RISER HANDING CONVENTIONS



BE Typical Bathroom Exhaust Snorkel Location (High Efficiency Core)

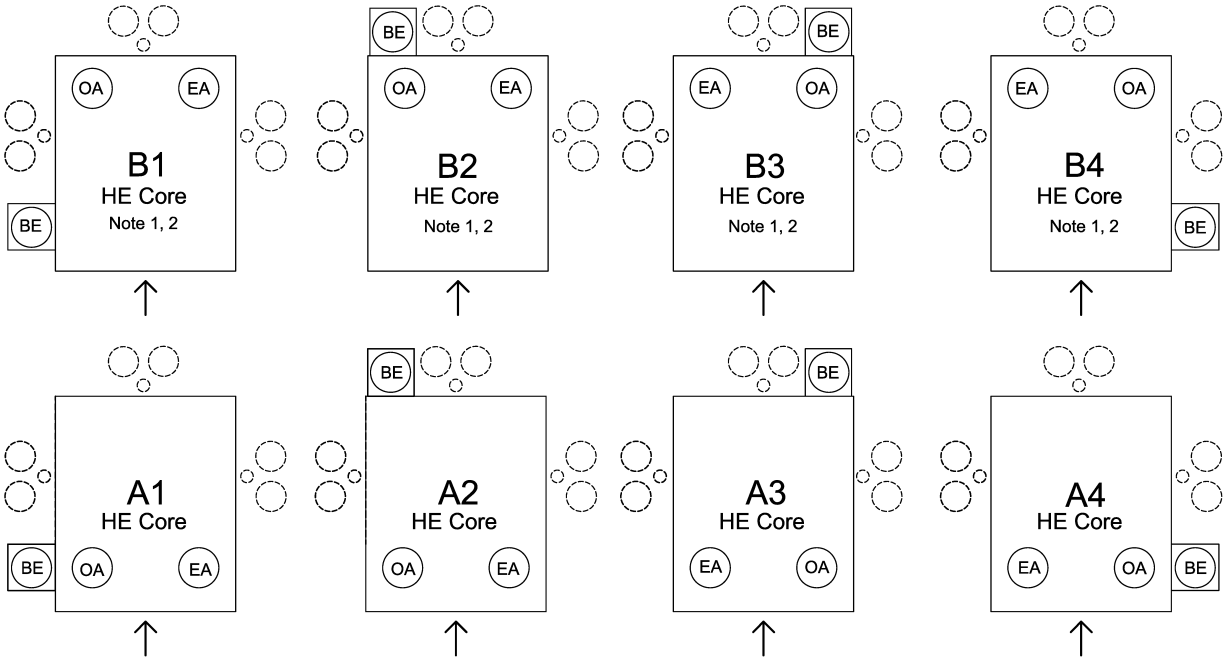


S = Supply Riser
C = Condensate Riser
R = Return Riser

Note:

- Units do not come with a riser chase or riser sleeve. Depiction shown indicates typical coring openings.
- Supply & Return risers shown are 3-inch. Condensate riser shown is 1.25-inch.
- Recommended riser shut-off valves protrude inside fan cabinet by 4.5-inches.

ERV CONFIGURATIONS - COUNTER FLOW HIGH EFFICIENCY +80% CORE)



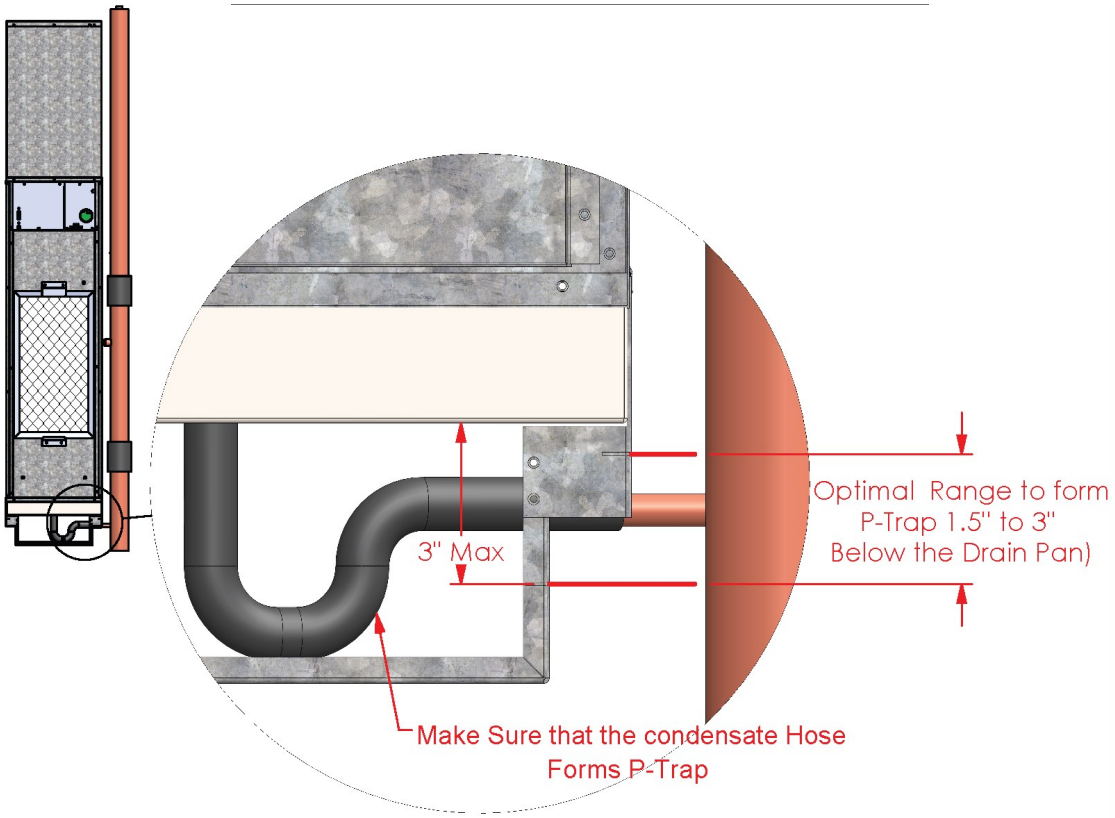
Acceptable Riser Locations:

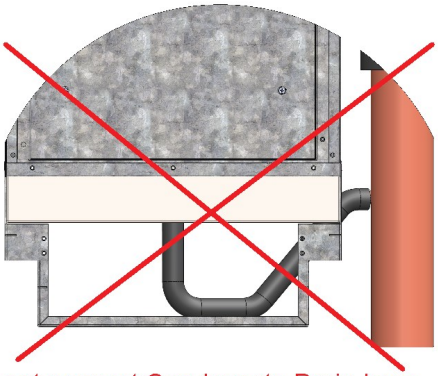
EA - Exhaust Air to Outside
BE - Bathroom Exhaust to ERV
OA - Outside Air to ERV

Front of Unit ↑

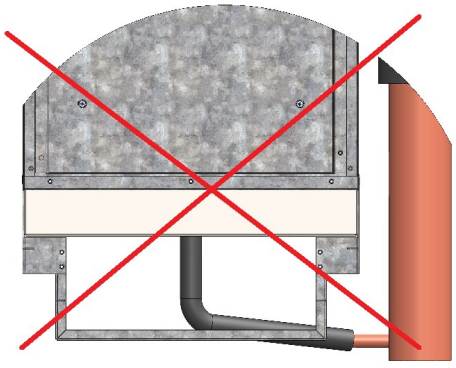
Note:
1 - Left supply air discharge option partially restricted
2 - Right supply air discharge option partially restricted

CONDENSATE CONNECTION & RISER KNOCKOUTS



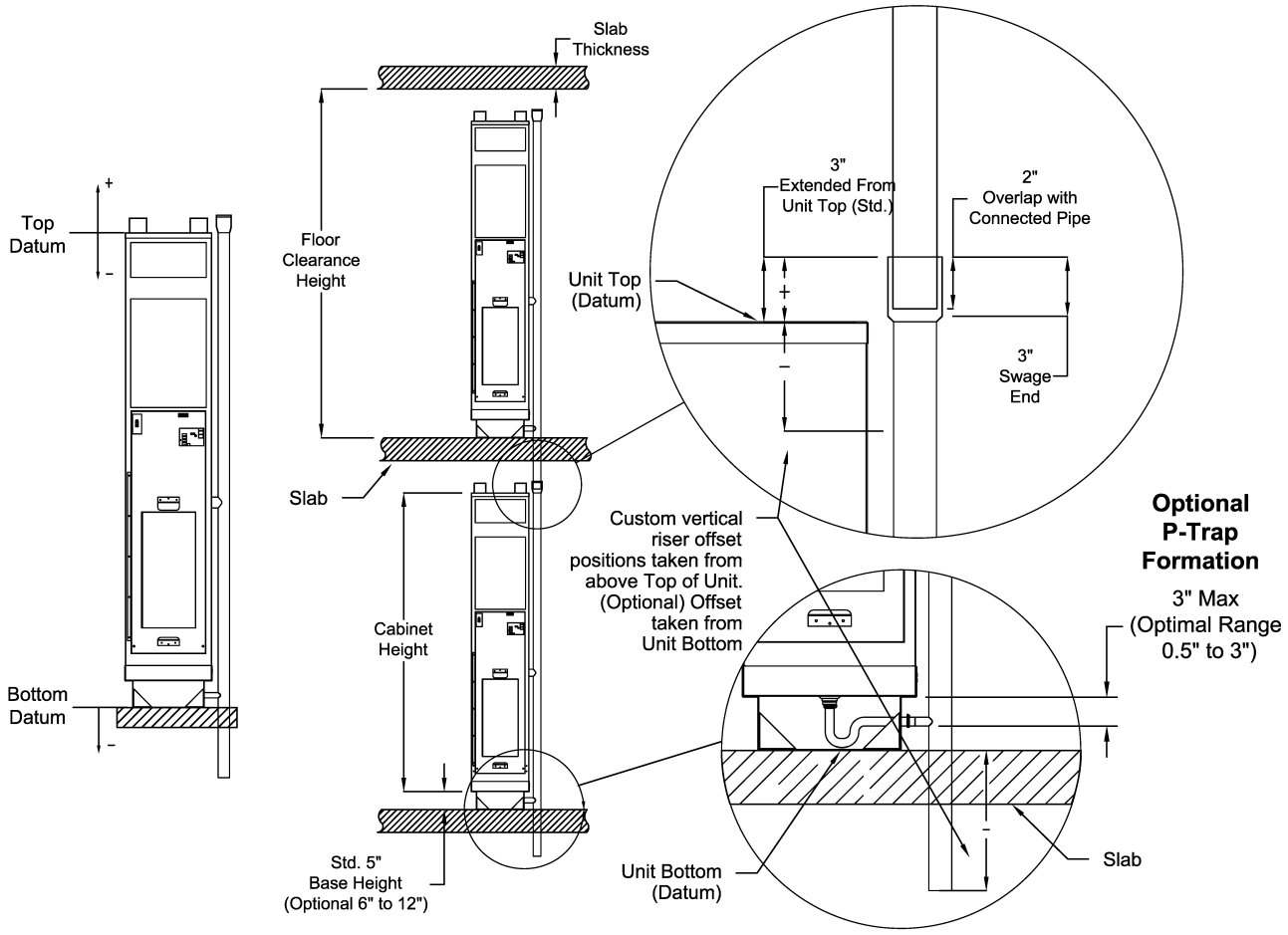


Do not connect Condensate Drain hose higher than the level of drain pan



Do not connect Condensate Drain hose too lower. It will not form P-Trap

TYPICAL RISER INSTALL DETAIL



Notes:

- Risers are positioned relative to cabinet using a standard “Top” Datum reference (optional “Base” Datum). Top Datum Offset indicates where the top of riser will be located relative to top of cabinet. A Base Datum indicates where bottom of riser will be located below the base of cabinet.
- Upon request Omega will provide 3 inch deep swage on risers of same pipe size (optional for all risers) for connection to units on the floor below.
- Risers should insert 2 inches into the 3 inch deep swage connection (minimum 1 inch insertion is required)
- Riser Length = Floor Clearance Height + Slab Thickness + 2 inch (overlap) (Rounded up to 120” or 144”).
- Omega supplies two standard riser lengths, 120” (10’) and 144” (12’).
- Supply extension tailpieces or reducers for joining dissimilar piping sizes are optional.
- Risers available in Type L and Type M copper.
- Condensate riser comes with optional 3/8-inch thick closed cell insulation to prevent condensation.
- Optional insulation on supply and return risers is available for 3/8-inch and 1/2-inch closed cell insulation.

HOSE KIT DETAILS

Hose Kit Sizes

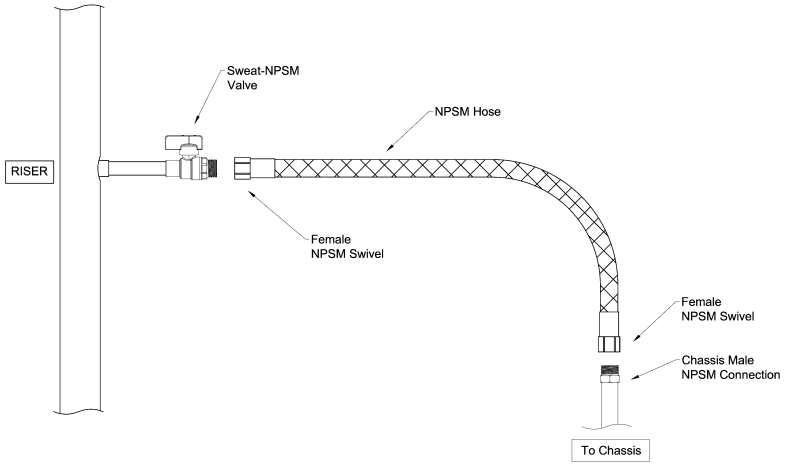
Model	Hose Kit	
	Size (in)	Length (in)
VSHPe 030	1/2	24
VSHPe 040	1/2	24
VSHPe 050	1/2	24
VSHPe 060	1/2	24
VSHPe 080	3/4	30
VSHPe 100	3/4	30
VSHPe 120	3/4	30

Recommended optional hose kits are supplied with each unit. Hose kit configurations vary by unit size as shown.

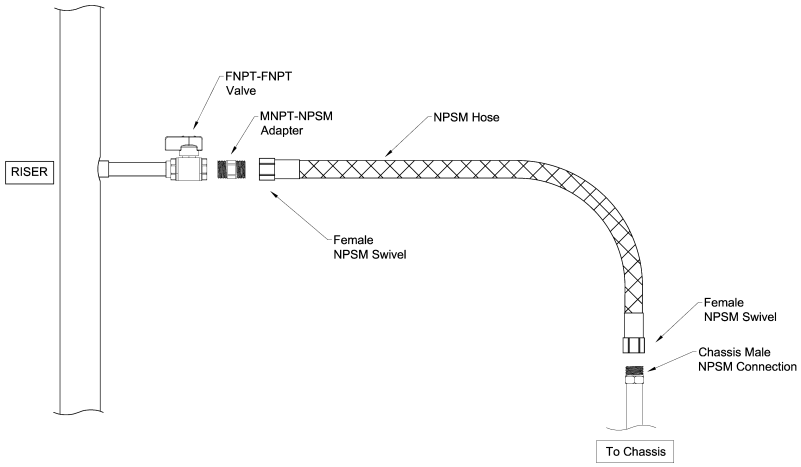
Isolation Valve Notes:

- Standard NPSM sweat connected isolation valves are provided for Factory or Field Supplied Copper Risers.
- Optional Female NPT x Female NPT valves are intended for Field Supplied Risers. Includes MNPT-MNPSM hose adaptors with hose kit.

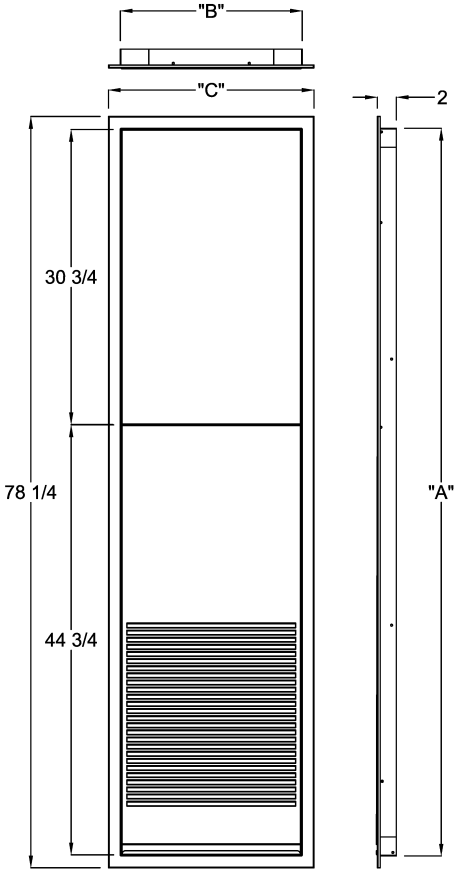
STANDARD VALVE - SWEAT CONNECTED NPSM

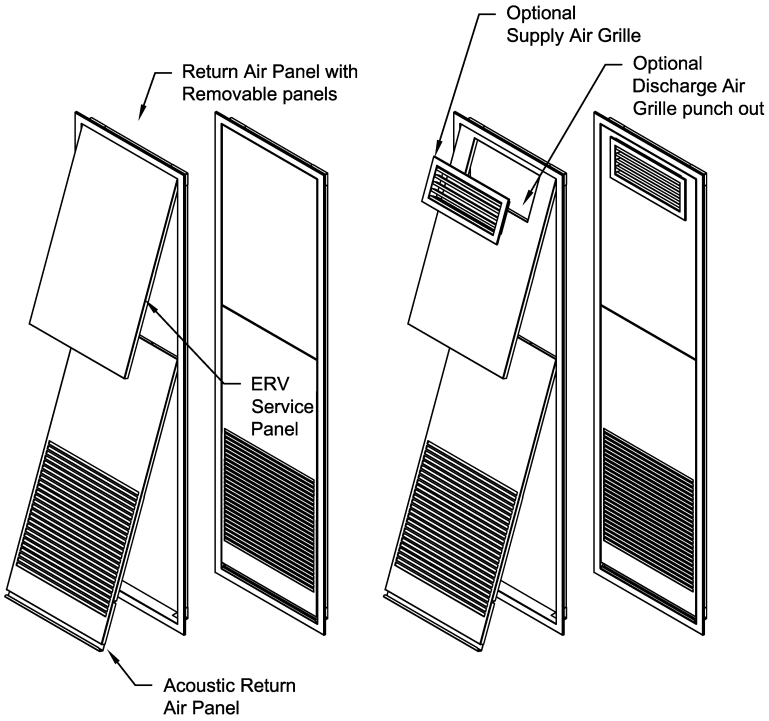


OPTIONAL FPT VALVE - FPT to FPT



ACOUSTIC RETURN AIR PANEL - Type 'A'





Return Air Panels comes in 3 varieties:

- ☐ Closed. Blank access panel with no supply grille.
- ☐ Open with optional supply air grille - double deflection (DD)
- ☐ Open with optional supply air grille - double deflection with opposed blade damper (DDOBD)

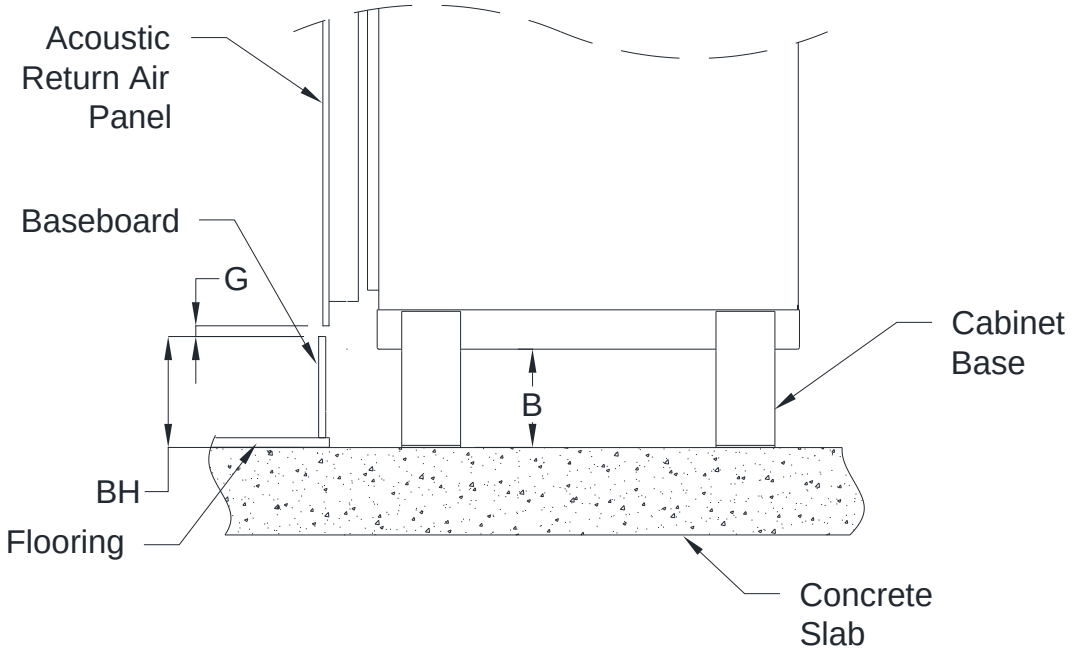
Type 'A' Acoustic ERV RA Panel Sizes

Model	Cabinet Size	RA Panel Dimensions (inches)		
		A	B	C
VSHPe 030	Y	78	19 5/8	22
VSHPe 040				
VSHPe 050				
VSHPe 060				
VSHPe 080	Z	78	23 5/8	26
VSHPe 100				
VSHPe 120				

Notes:

- Sound baffle (not shown) is shipped loose and field installed behind Return Air Panel door.
- Panel is lined with acoustic insulation for enhanced sound attenuation.
- Return air panel supplied in standard powder coat appliance white finish.
- Front supply discharge will increase NC sound levels.

ACOUSTIC PANEL CABINET BASE HEIGHT CALCULATION



Return Air Panel Cabinet Base Height Calculation

ERV Panel Cabinet Base Height Calculation:

BH = Baseboard Height + Finish Floor Height*

G = Gap (recommend min 0.5") between baseboard and panel.

B = Cabinet Base Height (Min. 5", 1" increments)

B = BH + G - 1"

Note: *Include flooring thickness, underlayment, and any concrete leveling as part of calculation.

Example:

If using a 6" baseboard, with 1" Finished Flooring height, and 0.5" gap:

B = (6" + 1") + (0.5") - 1"

B = 6.5"

Therefore we round up to a 7" Cabinet Base required.

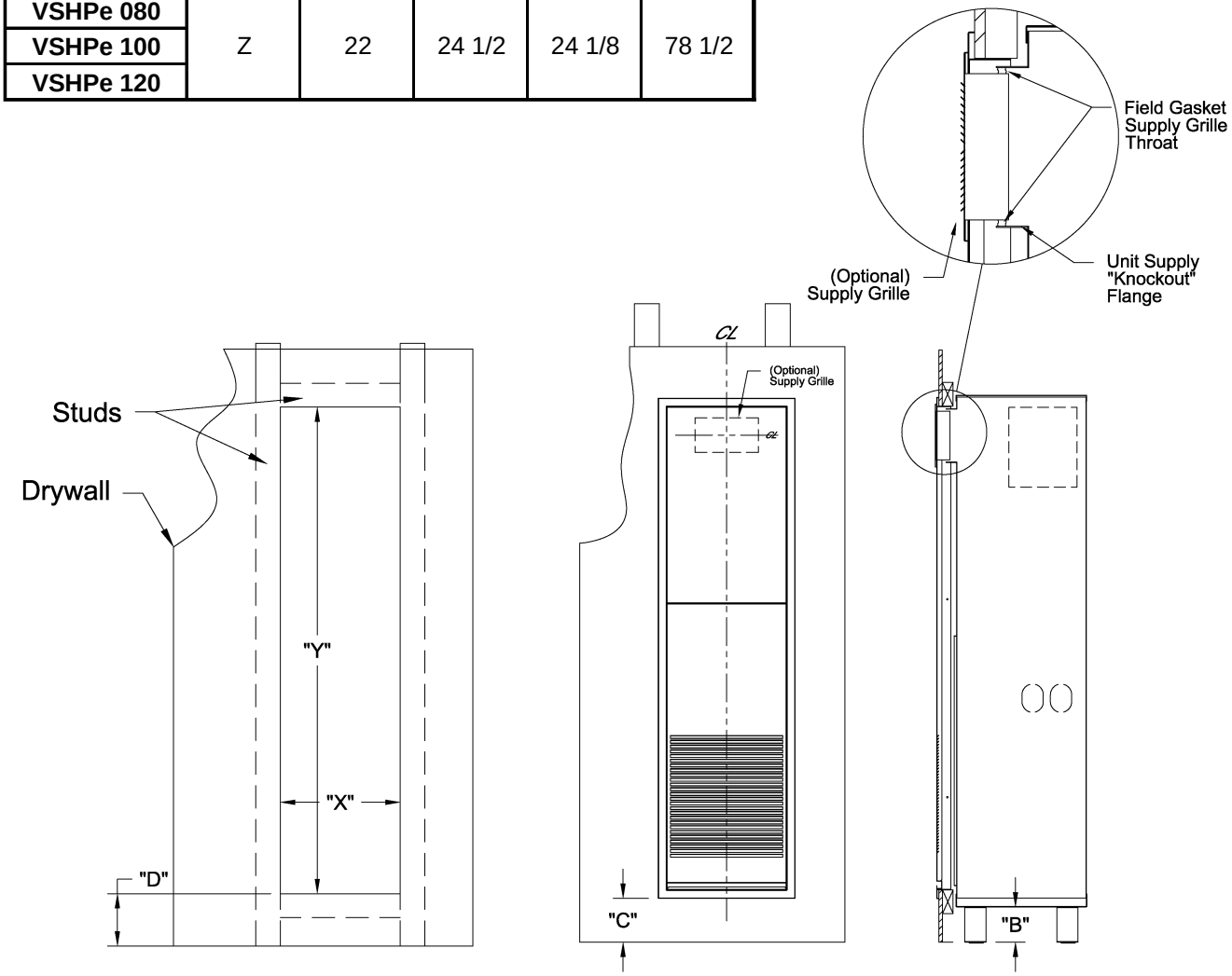
Baseboard vs. Cabinet Base Height

Baseboard Height*	Cabinet Base Height
Up to 4-1/2"	5"
>4-1/2 to 5-1/2"	6"
>5-1/2" to 6-1/2"	7"
>6-1/2" to 7-1/2"	8"

*Includes 1" Total Flooring
*Using gap G= 0.5"
(top of baseboard to return panel flange)

ACOUSTIC RETURN AIR PANEL FURRING DETAILS - Type 'A'

Model	Cabinet Size	Cabinet Dimensions (in)		Rough-In (in)	
		W	D	"X"	"Y"
VSHPe 030	Y	18	20 1/2	20 1/8	78 1/2
VSHPe 040					
VSHPe 050					
VSHPe 060					
VSHPe 080	Z	22	24 1/2	24 1/8	78 1/2
VSHPe 100					
VSHPe 120					



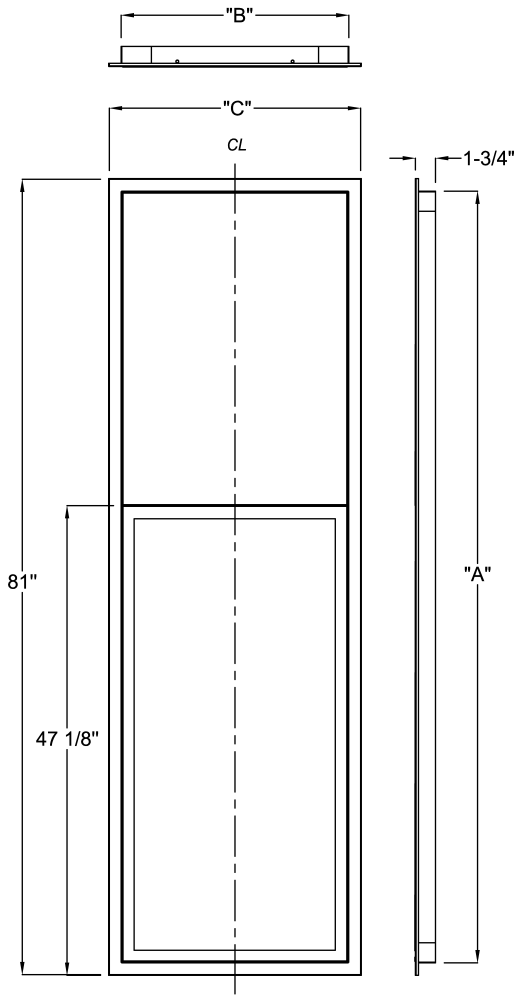
Drywall & Stud Detail | Front Panel View | Side Cutaway View

B = Cabinet Base Height (Min 5", increases in 1" increments)
C = Panel Flange Height from Base of Cabinet (**B** + 1")
D = Rough-In Height from Base of Cabinet (**B** + 2")

NOTES:

- Center vertically and horizontally RA panel supply opening with unit front "knockout" supply discharge
- For optional RA panels with supply grille: apply gasket tape to supply grille throat to insert into unit supply discharge flange
- Front discharge will increase NC sound levels.

PERIMETER RETURN AIR PANEL - 2 PANEL - Type '2P'



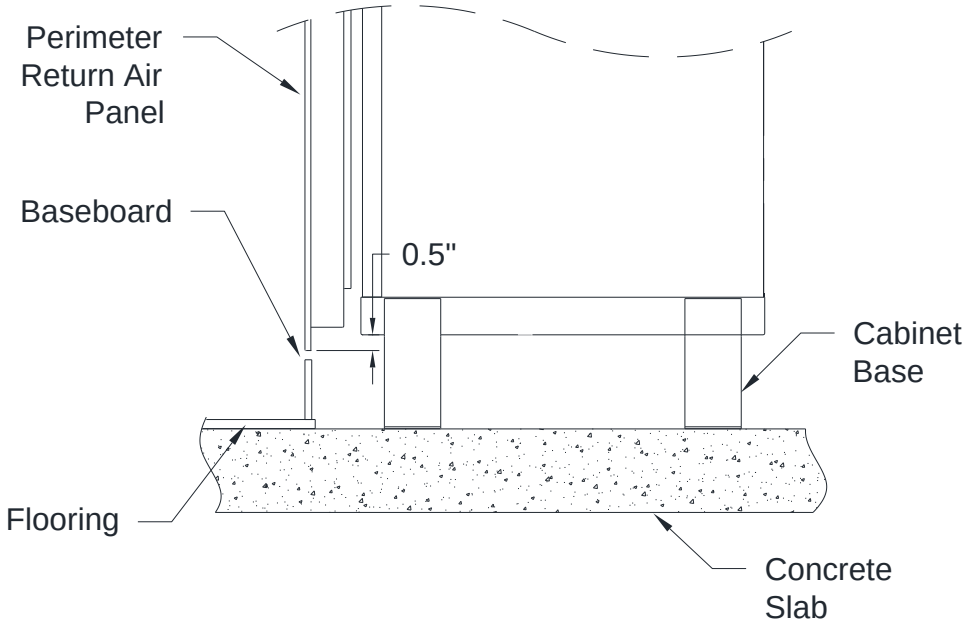
Perimeter ERV RA Panel Sizes - Type '2P'

Model	Cabinet Size	RA Panel Dimensions (inches)		
		A	B	C
VSHPe 030	Y	78 5/8	23 1/8	24 5/8
VSHPe 040				
VSHPe 050				
VSHPe 060				
VSHPe 080	Z	78 5/8	27 1/8	28 5/8
VSHPe 100				
VSHPe 120				

Notes:

- 2 Panel Perimeter Panel shown above.
- Panel is lined with acoustic insulation for enhanced sound attenuation.
- Return air panel supplied in standard powder coat 'white' finish.
- Specifications or actual panel appearance are under continuous improvement and may change or appear different from shown.

PERIMETER PANEL CABINET BASE HEIGHT CALCULATION



Return Air Panel Cabinet Base Height Calculation

Perimeter Panel Cabinet Base Height Calculation:

BH = Baseboard Height + Finish Floor Height*
G = Gap (min 0.5")
B = Cabinet Base Height
(Min. 5", increases in 1" increments)

B = BH + G + 0.5"

Note: *Include flooring thickness, underlayment, and any concrete leveling as part of calculation.

Example:

If using a 5" baseboard, with 1" Finished Flooring height, and 0.5" gap:

B = (5" + 1") + (0.5") + 0.5"

B = 7"

Therefore a 7" Cabinet Base is required.

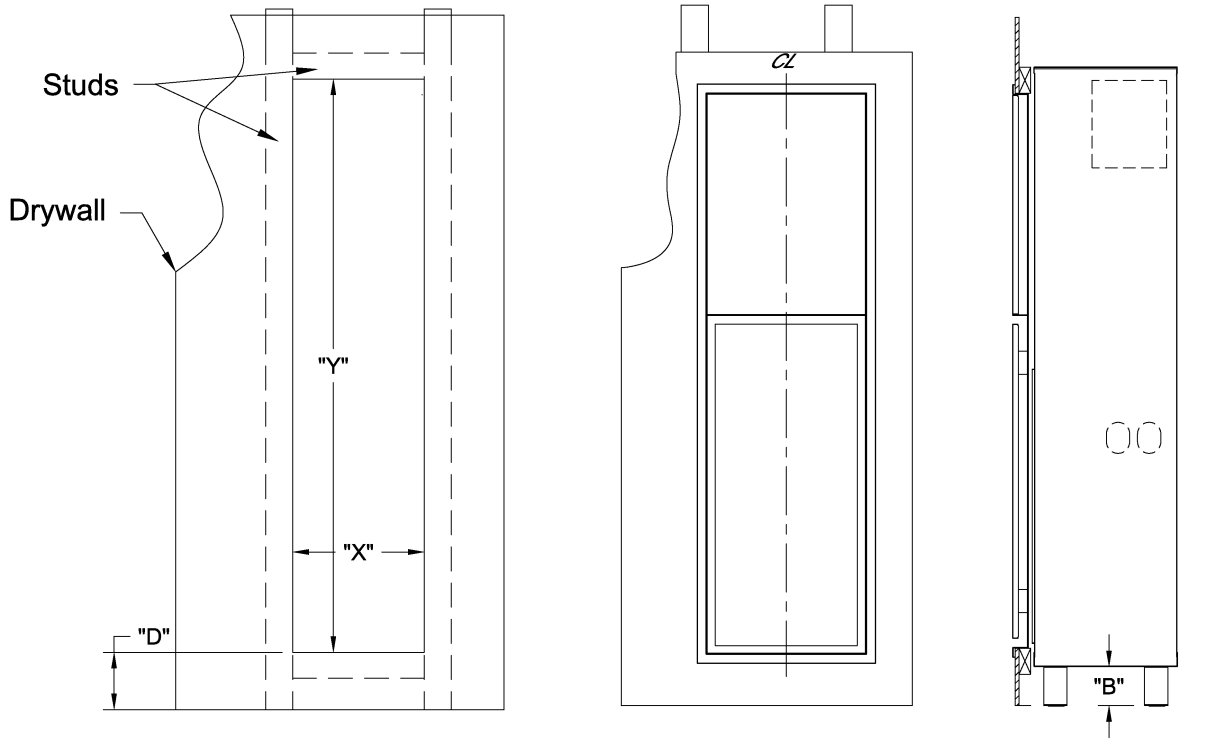
Baseboard vs. Cabinet Base Height

Baseboard Height*	Cabinet Base Height
Up to 3"	5"
>3" to 4"	6"
>4" to 5"	7"
>5" to 6"	8"

*Includes 1" Total Flooring
*Using gap G= 0.5" (from top of baseboard to return panel flange)

PERIMETER RETURN AIR PANEL FURRING DETAILS

Model	Cabinet Size	Cabinet Dimensions (in)		Rough-In (in)	
		W	D	"X"	"Y"
VSHPe 030	Y	18	20 1/2	23 3/8	78 7/8
VSHPe 040					
VSHPe 050					
VSHPe 060					
VSHPe 080	Z	22	24 1/2	27 3/8	78 7/8
VSHPe 100					
VSHPe 120					



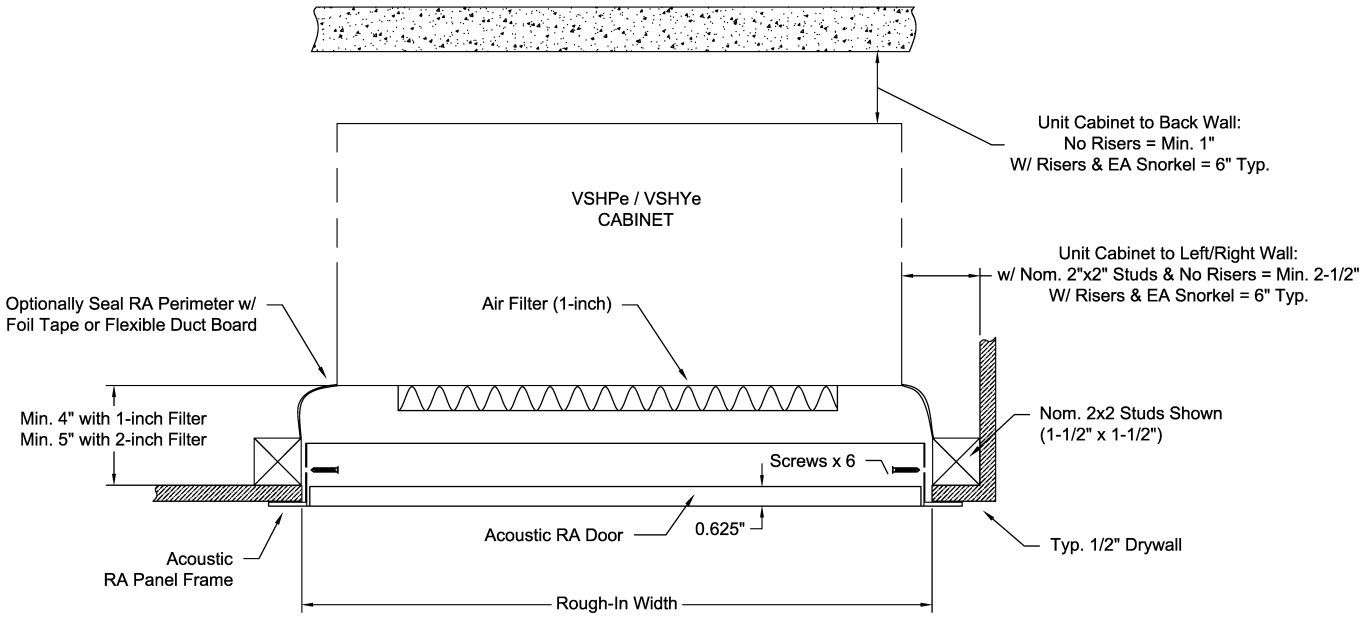
Drywall & Stud Detail | Front Panel View | Side Cutaway View

B = Cabinet Base Height (Std 5" Base, optional 6" to 12")
C = Panel Flange Height from Base of Cabinet (**B** + 1")
D = Rough-In Height from Base of Cabinet (**B** + 2")

NOTES:
- Align panel with unit to allow for access to electrical, ERV and chassis compartment.

RETURN AIR PANEL FURRING - Plan View

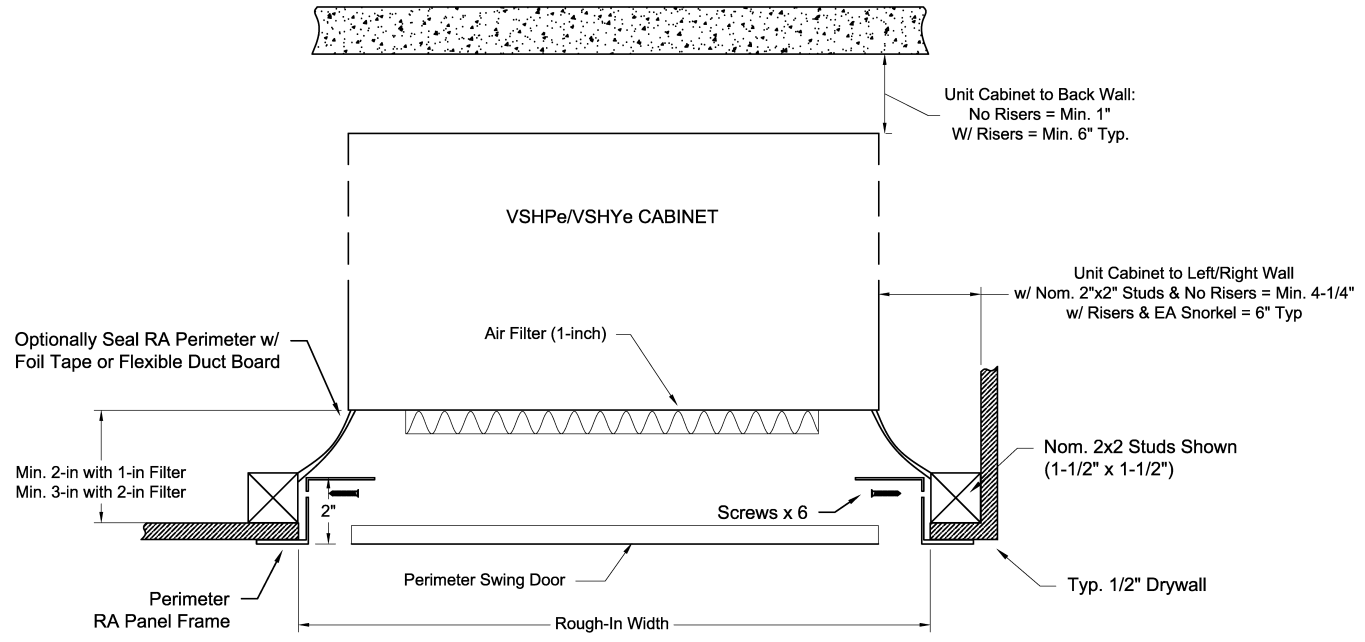
Acoustic Return Air Panel



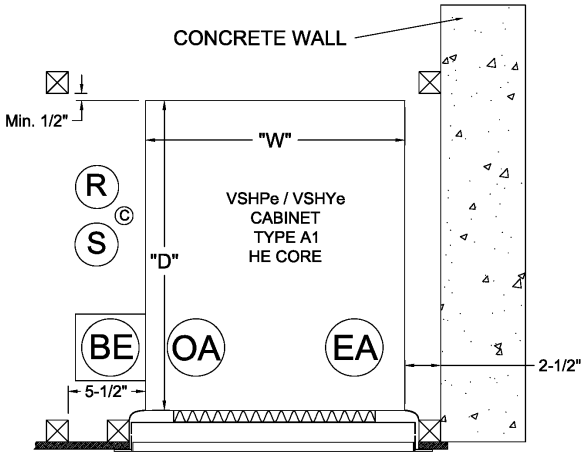
Notes:

- Return air panel should be centered in front of the unit return air opening. Test a mock-up factory provided RA panel to ensure all clearances are met before proceeding with construction of framing.
- Recommend to insulate the drywall enclosure with acoustical insulation for additional sound attenuation.
- Optionally seal RA panel inner flange to unit, ensure no hard connections are made to avoid noise transmission. Connection should be flexible.
- Acoustic Return Air Baffle not shown..

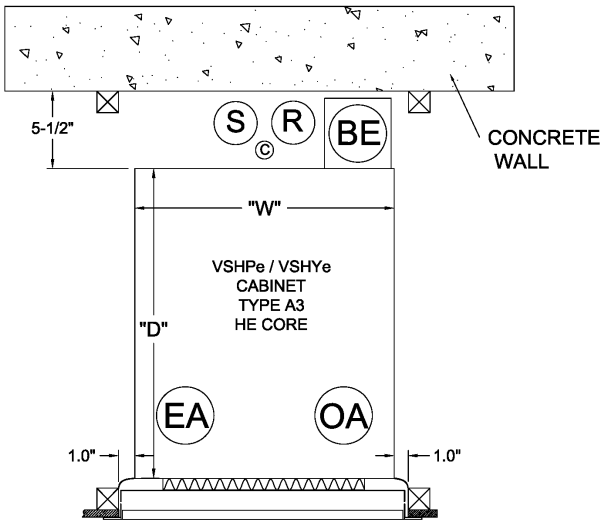
Perimeter Return Air Panel



RETURN AIR PANEL DETAILS - Stud Furring



Furring Type A1, B1
Type A4, B4 are Mirrored



Furring Type A3, B3
Type A2, B2 are Mirrored

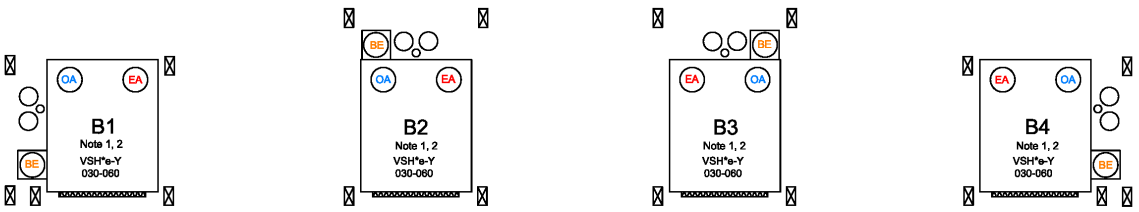
R © S — Return Riser, Condensate Riser, Supply Riser

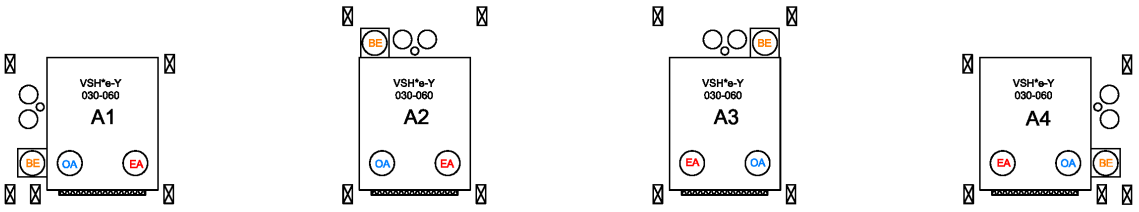
EA - Exhaust Air to outside
BE - Bathroom Exhaust to ERV
OA - Outside Air to ERV

Typ. 2x2 Closet Framing - Acoustic Panel

Notes:

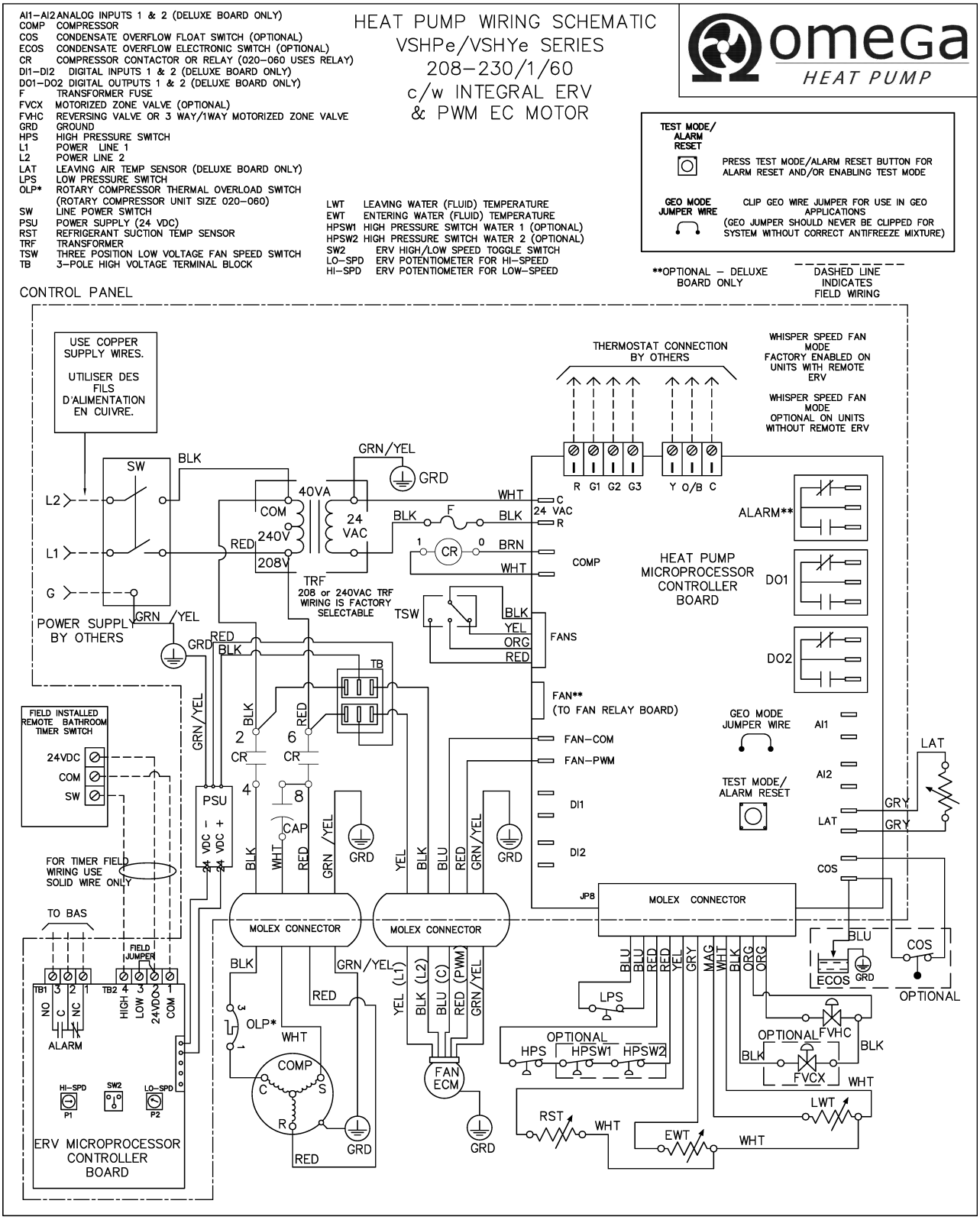
- Return air panel should be centered in front of the unit return air opening.
- Optionally, insulate the drywall enclosure with acoustical insulation for additional sound attenuation.
- Acoustic Panel with 2x2 Studs shown above. Risers shown as 3" Supply and Return and 1.25" Condensate.
- Risers can be positioned on any side (Back, Left, Right).





Typ. 2x4 Closet Framing

ELECTRICAL SCHEMATIC



Notes:

- Deluxe Control board shown, some features not available on standard basic board.as indicated in electrical schematic legend.

ELECTRICAL SCHEMATIC w/ OPTIONAL SMARTONE® COMMUNICATION

AI1–AI2 ANALOG INPUTS 1 & 2 (DELUXE BOARD ONLY)
COMP COMPRESSOR
COS CONDENSATE OVERFLOW FLOAT SWITCH (OPTIONAL)
ECOS CONDENSATE OVERFLOW ELECTRONIC SWITCH (OPTIONAL)
CR COMPRESSOR CONTACTOR OR RELAY (020–060 USES RELAY)
DI1–DI2 DIGITAL INPUTS 1 & 2 (DELUXE BOARD ONLY)
DO1–DO2 DIGITAL OUTPUTS 1 & 2 (DELUXE BOARD ONLY)
F TRANSFORMER FUSE
FVCX MOTORIZED ZONE VALVE (OPTIONAL)
FVHC REVERSING VALVE OR 3 WAY/1WAY MOTORIZED ZONE VALVE
GRD GROUND
HPS HIGH PRESSURE SWITCH
L1 POWER LINE 1
L2 POWER LINE 2
LAT LEAVING AIR TEMP SENSOR (DELUXE BOARD ONLY)
LPS LOW PRESSURE SWITCH
OLP* ROTARY COMPRESSOR THERMAL OVERLOAD SWITCH (ROTARY COMPRESSOR UNIT SIZE 020–060)
SW LINE POWER SWITCH
PSU POWER SUPPLY (24 VDC)
RST REFRIGERANT SUCTION TEMP SENSOR
TRF TRANSFORMER
TSW THREE POSITION LOW VOLTAGE FAN SPEED SWITCH
TB 3–POLE HIGH VOLTAGE TERMINAL BLOCK

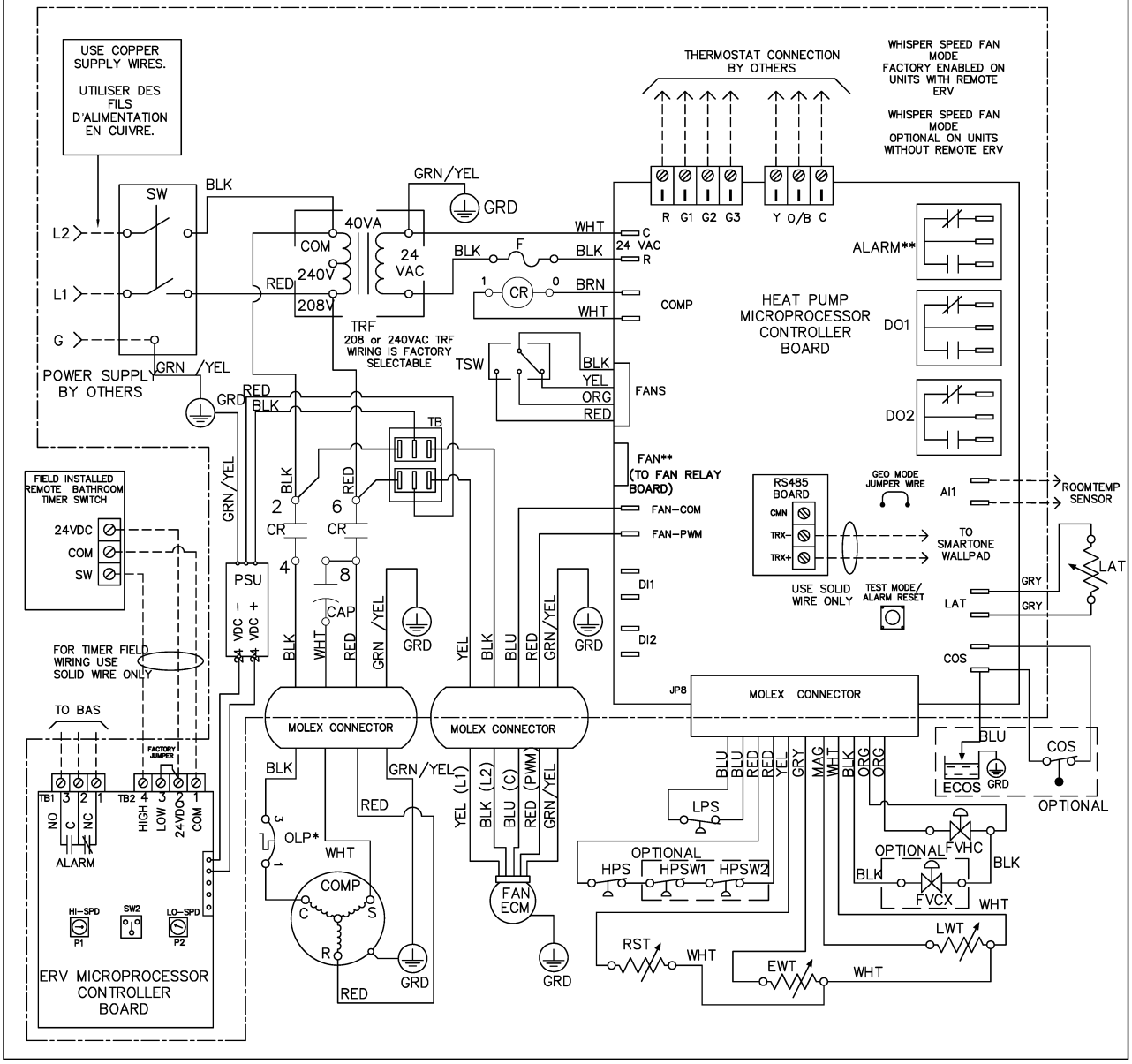
LWT LEAVING WATER (FLUID) TEMPERATURE
EWT ENTERING WATER (FLUID) TEMPERATURE
HPSW1 HIGH PRESSURE SWITCH WATER 1 (OPTIONAL)
HPSW2 HIGH PRESSURE SWITCH WATER 2 (OPTIONAL)
SW2 ERV HIGH/LOW SPEED TOGGLE SWITCH
LO–SPD ERV POTENTIOMETER FOR HI–SPEED
HI–SPD ERV POTENTIOMETER FOR LOW–SPEED

HEAT PUMP WIRING SCHEMATIC
VSHPe/VSHYe SERIES
SMARTONE COMMUNICATION
208–230/1/60
c/w INTEGRAL ERV
& PWM EC MOTOR

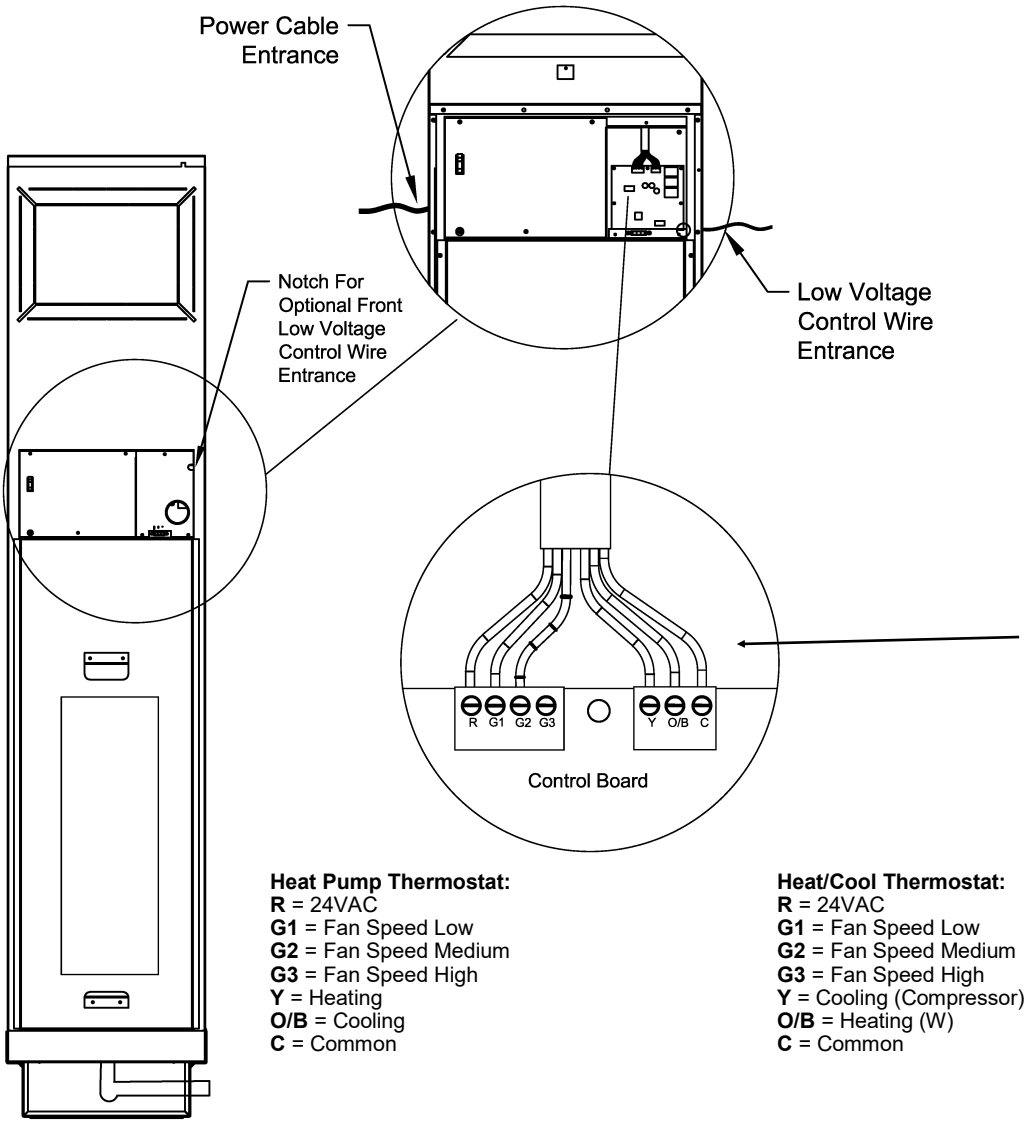
omega HEAT PUMP

TEST MODE/ ALARM RESET — PRESS TEST MODE/ALARM RESET BUTTON FOR ALARM RESET AND/OR ENABLING TEST MODE
GEO MODE JUMPER WIRE — CLIP GEO WIRE JUMPER FOR USE IN GEO APPLICATIONS (GEO JUMPER SHOULD NEVER BE CLIPPED FOR SYSTEM WITHOUT CORRECT ANTIFREEZE MIXTURE)

**OPTIONAL – DELUXE BOARD ONLY
DASHED LINE INDICATES FIELD WIRING



ELECTRICAL CONTROL WIRING



Field supplied 6-wire thermostat cable shown.

Min. 5-wire required for smart thermostats.

Min. 4-wire required for basic battery powered thermostats

Heat Pump Thermostat:
R = 24VAC
G1 = Fan Speed Low
G2 = Fan Speed Medium
G3 = Fan Speed High
Y = Heating
O/B = Cooling
C = Common

Heat/Cool Thermostat:
R = 24VAC
G1 = Fan Speed Low
G2 = Fan Speed Medium
G3 = Fan Speed High
Y = Cooling (Compressor)
O/B = Heating (W)
C = Common

Note: Thermostats may require a field installed jumper at the thermostat base to work in heat pump mode and/or field programming. Verify procedure in thermostat manual.

VSHPe - UNIT CONTROLS (ECM)

Fan Control with EC Motors (ECM)

Pulse Width Modulated (PWM) signal is utilized to control fan motor speeds between 0 and 100% of full speed. The controller has been programmed to use 3 pre-programmed speeds for Low, Medium and High. With optional Whisper Mode when there is a no request for cooling or heating, unit will operate in 'Whisper Mode' for ultra low fan speed air circulation.

Whisper Mode

When Whisper mode is enabled (factory default) and there is no call for heating or cooling, the unit will run the fan at an ultra low speed to circulate the fresh air being introduced by the integrated ERV.

Thermostat Connection

A minimum 4-wire thermostat cable is required for basic single fan speed thermostats where common wire is not required. A 5 -wire cable is recommended for most modern thermostats.

Ensure thermostat provides 24V power to G (fan) terminal during call for heating or cooling.

Fan Speed Set by Thermostat

Wire thermostat wire to required fan speed terminal:

G1 Signal = LOW fan speed enabled

G2 Signal = MEDIUM fan speed enabled

G3 Signal = HIGH fan speed enabled

Manual Fan Speed Control - 3-Speed Selector Switch

Enable the unit mounted 3-speed selector switch. Fan speed will be determined by the position of the unit mounted 3-speed fan selector switch:

L = LOW fan speed

M = MEDIUM fan speed

H = HIGH fan speed

SEQUENCE OF OPERATION

Hard Lock-Out

In the event the board has entered a Hard Lock-Out state control board must be reset by pressing the TEST button on the control board.

Call for Heating and Cooling

When a compressor request is made, the optional motorized auto shut-off control valve will open. The compressor contactor will then be energized so long as none of the following fault conditions are present:

- High-Pressure Alarm
- Low-Pressure Alarm
- Refrigerant Suction Temperature (RST) Alarm
- Compressor Anti-Short Cycle 7 min. timer has not expired
- Water Valve Open and Closed timer
- Low-pressure bypass timer
- Random wait time on unit power up timer
- Fan-On timer
- Condensate Over Flow Alarm
- (**Optional**) High-Pressure Water Alarm (HPSW)
- (**Optional**) Entering Water Temperature (EWT) is greater than 115°F
- (**Optional**) Leaving Water Temperature (LWT) greater than 127°F

Low-Pressure Bypass

During a call for compressor, the low-pressure switch is bypassed for the first 3 minutes of compressor operation to prevent nuisance low-pressure start-ups.

RST - Refrigerant Suction Alarm

For standard or LTW range option, RST sensor is set to 28°F. If the temperature drops below 28°F unit will alarm and stop compressor operation.

Timers and Interlocks

Microprocessor board utilizes a number of timers and interlocks in the control sequence of the unit.

Anti-Short Cycle Timer

The compressor anti-short cycle timer of 7 minutes starts every time a call for compressor is terminated to prevent compressor over cycling.

Random Wait Time on Unit Power Up

Microprocessor controller uses a random wait time during unit start up between 1-30 seconds.

Integrated ERV Control

Omega ERV is verified and meets CAN/CSA-C439 standard for extreme low ambient outdoor operation at -13°F(-25°C). The ERV is set from factory to operate continuously and auto-balances the Outdoor Air and Exhaust Air flows to ensure maximum efficiency. Factory default speed setting is set to 30 CFM continuous and 100 CFM exhaust (bathroom) mode. ERV fans can be field set to meet design conditions up to 140 CFM at 0.3" ESP.

Featuring a modulating outdoor air damper to maintain ERV Supply Air above 50°F (10°C), the ERV operates down to extreme low ambient conditions. During extreme low ambient conditions if ice formation is detected the ERV controller will auto-enable defrost mode as required without turning off and continuing to supply Outdoor Air.

VSHPe - MECHANICAL SPECIFICATIONS

1 GENERAL

Vertical stacked heat pump units shall be Omega VSHPe Series with integrated ERV. Units shall provide scheduled capacities at the ampacity and voltage shown on the drawings. Specified airflow shall be at the scheduled external static pressure and shall include the effects of a wet coil and clean filter.

Each unit shall be factory tested and ship factory-charged with R-454B refrigerant. All units from 3/4 to 3 Tons shall be tested and certified to ASHRAE/ANSI/AHRI/ ISO 13256-1, UL60335-2-40, and ETL listed for United States and Canada. Each unit shall have factory affixed label showing ASHRAE/ANSI/AHRI/ISO and ETL logos. Cabinets and refrigeration chassis shall be factory wired and pre-piped.

2 CABINET

2.1 The vertical stacked heat pump units shall be **Omega VSHPe Series** with an integrated ERV. Units shall provide scheduled capacities at the ampacity and voltage specified.

2.2 The cabinet shall be 20-gauge galvanized steel with riveted internal components for rigidity. Cabinet shall have internal surfaces insulated with 1 inch thick, 3.5 lbs. high-density, mold resistant, thermal and acoustic insulation. Insulation shall meet NFPA 90, UL-181, and ASTM-C1071 standards and insulation shall have a flame spread of less than 25, and a smoke developed classification of less than 50 per ASTM E-84 and UL 723.

2.3 Physical dimensions of each unit shall be accommodated within furring / ceiling-slab spaces provided as shown on the architectural drawings

2.4 Provide a minimum 5” (optional 6” to 12”) high stand factory installed to the bottom of the sheet metal cabinet to elevate the unit 5” above the floor.

2.5 A removable inner chassis service panel allowing service access to the fan and compressor compartment shall be provided with each unit.

2.6 A removable inner ERV service panel allowing front service access to the ERV, ERV fans and filters shall be provided with each unit. ERV mounted in the back of the cabinet or on the side of the unit is not accepted.

2.7 The drain pan shall be minimum 18-gauge stainless steel. The drain pan outlet shall be readily accessible for cleaning with a 7/8 inch OD copper drain connection. Unit shall be provided with a flexible p-trap condensate hose for connection to the condensate riser. Drain pan shall be removable to allow for access and inspection of p-trap and drain connection to riser.

2.8 Factory installed supply and return risers shall be (Type L) (Type M) copper, with (factory) (field) mounted shut-off ball valves on each supply and return riser. Valves shall be brass and rated for 400 psig. A (Type M/DWV) condensate riser shall be (factory) (field) installed. Risers sizes shall be installed according to building plans.

2.9 Risers shall have optional factory provided 3-inch deep swage. Transition pieces, couplings, anchors, and compensators shall be field supplied.

2.10 Unit cabinet shall come with supply discharge opening “knockouts”. All cabinet discharge openings shall include 1-1/2 inch drywall flange around the full opening perimeter. Supply discharge “knockouts” are cut and field selected.

2.11 Supply ducts shall not be rigidly attached to the cabinet and shall be acoustically isolated from cabinet using flexible canvas connections. Contractor shall install flex connection on all discharge openings. There shall be no rigid connection to supply-air discharge grilles or supply ducts.

2.12 Each unit shall have a sectionalized removable Acoustic Return Air panel. The panels shall be easily removable without tools. The lower panel section shall have access to the filter, chassis compartment, blower assembly, and service disconnect. The upper panel shall provide access to the ERV section, including a removable ERV core, fans and sensors. Acoustic panels shall come with a return air baffle, shipped loose and field installed.

2.13 **(Optional)** Perimeter Return Air Panel shall be provided with 2 Panel (Type 2P) design with side swing door and upper removable panel.

2.14 **(Optional)** Front supply discharge grille shall be provided that integrates with ERV Return Air Panel. Supply discharge grille shall be provided as double deflection or with optional opposed blade dampers.

2.15 (**Optional)** Provide each unit with a 2-inch filter bracket to accept 2-inch thick MERV 13 pleated filters.

2.16 The drain pan shall come standard with an electronic condensate overflow switch to stop compressor operation if water is detected.

3 FAN & BLOWER

3.1 Each unit shall include a factory mounted forward curved, double inlet double width centrifugal direct drive fan and motor assembly with internal overload protection. The blower fan assembly shall be positioned horizontally from a sheet metal blower deck. Single inlet fans are not accepted.

3.2 Units shall be supplied with an ECM fan motor as standard. Fan motors speeds shall be field selectable by wiring thermostat to required fan speed terminals.

4 REFRIGERATION CHASSIS

4.1. Provide high temperature and pressure rated water hoses for connection of the risers to the chassis. The hoses supplied shall be constructed with an inner core of rubber, a stainless-steel metal braid, and rubber outer covering. Fittings shall be brass construction. Hoses shall carry a pressure rating of 600 psig.

4.2. The compressor chassis shall be mounted and vibrationally isolated on 12-gauge slide rails using a double isolated base. Compressor shall have an acoustical enclosure ensuring compressor noise is isolated from air stream. Plug type electrical connections are provided for chassis control and power connections allowing for easy removal of the chassis from the front of the cabinet.

4.3 The refrigeration circuit shall have two service valves, for measuring high and low refrigerant pressure, in the chassis compartment enclosure. The refrigerant circuit shall contain a thermal expansion valve (TXV) refrigerant metering device, high and low safety pressure switches, a suction line freeze sensor, entering and leaving water temperature sensors, and a reversing valve.

4.4 Compressor shall be hermetically sealed type and protected

VSHPe - Mechanical Specification (Cont'd)

with either compressor overload or internal thermal overload protection. Compressor shall be mounted on rubber vibration isolators.

4.5 Air side coils shall have copper tubes mechanically bonded to aluminum fins. Coil shall be sized to meet scheduled performance for cooling and heating. Provide 1" T/A filter on coil face.

4.6 Water side condenser heat exchanger shall be coaxial type with steel outer tube and copper inner tube. Condenser shall be rated at 500 psig water side and 650 psig refrigerant side.

4.7 (**Optional**) High-efficiency chassis shall be provided to meet higher operating efficiency requirements.

4.8 (**Optional**) The chassis shall employ an optional motorized auto shut-off valve to shut off water to the unit when compressor is not running. Valve shall be mounted in the chassis compartment.

4.9 (**Optional**) The chassis shall employ optional autoflow balancing valve mounted in the chassis compartment to maintain specified unit water flow rate over 2-80 psig differential water pressure. Auto flow balancing valve shall be field serviceable.

4.10 (**Optional**) Optional 20 mesh y-strainer shall be installed on the water circuit inside the high efficiency chassis. High Efficiency Chassis Only. On Standard efficiency chassis, y-strainer shall be field installed on the hose kit or at the supply riser shut-off valve.

4.11 (**Optional**) Low Temp Water option: The chassis shall be factory supplied with the High Water Pressure safety switch (LTW) kit. The chassis shall come with high water pressure safety switches factory installed on the water circuit inlet and outlet pipes. In case of freezing or ice formation where hydrostatic pressure increases above 450 psig in the water circuit , compressor operation will be cut-out. The LTW option is recommended on applications where water loops are between 50°F and 60°F in heating mode and do not contain any glycol freeze protection.

4.12 (**Optional**) Geothermal option: The chassis shall be factory supplied with a geothermal kit. The geothermal option includes geothermal rated low-pressure switch, insulated coaxial and insulated water piping. Geothermal option must only be used on loop systems with glycol freeze protection added to the riser loop. Geothermal is required on water loops below 50°F in heating mode.

4.13 **(Optional)** Air coil shall be epoxy coated to aid in the prevention of premature corrosion (formicary, environmental) with minimum 1000 hour salt spray ASTM B117 protection.

4.14 (**Optional**) Optional cupro-nickel coaxial coil shall be provided in lieu of standard copper coaxial for protection from loop water corrosion and fouling and with use in open loop systems.

4.15 (**Optional**) Energize to Heating reversing valve. Reversing valve shall be in cooling on default. On call for Heating reversing valve will energize.

5 CONTROLS

5.1 Each unit shall be factory wired with all necessary controls. Each unit shall come standard with a microprocessor controller mounted in the electrical box. Electrical box shall contain compressor and fan motor contactor, 24 volt control power transformer, terminal block for low voltage field wiring connection, and terminal block for main power electrical connection, unit mounted service disconnect switch.

5.2 The operating and safety controls shall be monitored by the microprocessor controller. Sensor parameters and timers shall be field adjustable to meet site conditions. Controller shall have the following safety switches and sensors:

- Low Pressure Safety Switch
- High Pressure Safety Switch
- Condensate Overflow Switch
- (**Optional**) Entering Water Temperature sensor
- (**Optional**) Leaving Water Temperature sensor
- (**Optional**) High Water Pressure Switches
- Suction line "freeze-stat" temperature sensor
- (**Optional**) Supply Air Temperature sensor
- Compressor Anti-Short Cycle timer
- Water Valve Open and Closed timer
- Low-pressure bypass timer
- Random wait time on unit power up
- Fan-On and Fan-Off timer

5.3 Standard Basic control board shall have High Pressure, Low Pressure, Suction Line (Refrigerant Suction Temperature) sensor alarming capability. Motor speeds can be field programmed when necessary to meet site specific conditions.

5.4 **(Optional)** Deluxe Microprocessor controller shall have embedded webpage diagnostic capability for status updates, quick servicing and troubleshooting on site. Controller shall have data logging with stored alarm states, supply and leaving water temperature, suction line temperature, and supply air temperature readings. Access to controller status and data log shall be available through a smart phone device, tablet or laptop.

5.5 Microprocessor controller shall have 'future proof' feature to accept software updates. Microprocessor board shall be capable of being field updated with newer software patches or custom software as needed.

5.6 Thermostats shall be remote mounted. Thermostats can be either Heat/Cool or Heat Pump type. Thermostat shall provide 24V signal to G (fan) terminal during a call for cooling or heating.

5.7 Fan operation shall have a low fan speed "whisper mode" for air circulation when there is no call for compressor to circulate Outdoor Fresh Air. Unit shall provide all 3 fan speeds plus Whisper mode. Fan speeds are field selectable for Low, Medium or High fan speed.

5.8 ECM speed settings are field configurable using to meet site CFM and static requirements.

5.9 (**Optional)** SmartOne® compatible RS-485 communication add-on board and remote temperature sensor shall be provide for integration with SmartOne® building systems.

6 ERV

6.1 ERV shall be integrated into the Vertical Stack cabinet and configured, fully wired at the factory. Units that require field installation, field handing configuration and / or field wiring of ERV are not accepted. ERV shall be tested to and meet CAN/CSA-C439 standard.

6.2 Each ERV shall be factory configured for the handing speci-

VSHPe - Mechanical Specification (Cont'd)

fied on the room schedule. Each ERV shall be factory installed in the Vertical Stack cabinet and factory wired. ERV's that ship loose and/or are not configured, installed, and wired at factory and/or require field installation are not accepted. ERV power supply shall be factory wired to main unit disconnect. Single source power is required for entire heat pump and ERV. Units requiring separate external power feed for ERV module are not accepted.

6.3 ERV casing shall be constructed with 22GA galvanized steel. The ERV cabinet shall be fully insulated with 1-inch closed cell insulation. Cabinets ERV ports are furnished with 4-inch diameter duct connections. Field Outdoor Air, Bathroom Exhaust and Exhaust Air duct diameters shall be 5 inches in diameter. ERV shall be integral to the cabinet and is factory installed in the fan cabinet section.

6.4 ERV unit shall be fitted with two Backward Inclined (BI) DC fans. Fan motor speed shall be fully controllable via internal signal.

6.5 ERV compartment shall have an additional back-up manual slide damper to be used to further control Outdoor Air (OA) introduction into the chassis compartment supply air stream.

6.6 ERV unit shall provide heat exchange when bathroom exhaust is activated at all times. ERVs that have bathroom air bypass ERV heat exchanger are not acceptable.

6.7 Unit shall be provided with a High Efficiency Sensible counter -flow ERV core. ERV Core shall provided minimum 80% sensible effectiveness at 50CFM in heating mode. Heat Exchanger core material shall be Polymeric membrane with sensible and latent recovery), mold and bacteria resistant, and water washable. Cellulose (paper), plastic, cores shall not be accepted.

6.8 Each of the two air streams shall have independent MERV 6 washable filter media. Each filter shall have a face area of no less than 80 square inches.

6.9 (**Optional)** ERV module shall be provided with MERV 13 filter and/or a charcoal carbon filter on the fresh air outlet stream.

6.10 ERV shall be fitted with an outside air damper controlled by n electronic actuator that will modulate outside air (OA) as required to maintain fresh air introduction and modulate damper to provide fresh air even at low ambient temperatures.

6.11 The built-in ERV control algorithm shall operate to equalize outside air (OA) and exhaust air (EA) flow, which may vary considerably depending on stack effect and different external static of intake and exhaust runs. ERV shall be controlled with a dedicated ERV microprocessor controller. ERV shall operate using thermal balancing algorithm for optimal airflow and temperature operation at set CFM.

6.12 **Air Flow:** ERV shall have two speed tap CFM settings: high and low speed modes. Fan speeds are field set to meet design ERV CFM conditions in Low (constant) and High (bathroom) ERV fan speed requests.

6.13 **Defrost Mode:** ERV unit shall contain a Normally Closed, modulating damper for tempering outside air. ERV shall be capable of maintaining minimum 50 CFM Outdoor Air at a minimum of -13°F (-25°C) without turning off. If frost is detected ERV control logic shall enable defrost mode without turning off and continuing to supply Outdoor Air.

6.14 **Supply Air Temperature:** Recirculation damper shall modulate to temper outside air (OA) to maintain a minimum supply air (SA) temperature of 50°F (10°C) to protect against dumping of cold air into the conditioned space.

6.15 ERV fans shall provide bathroom exhaust requirements without the need for additional field installed bathroom exhaust fan and wiring.

7 TESTING & WARRANTY

7.1 Each chassis unit shall be factory tested using a multi-step computer controlled testing equipment to prevent operator error during factory testing.

7.2 Warranty shall be for parts, 1 year not to exceed 18 months from date of shipment. (Optional) Provide 5-year compressor replacement parts warranty only.

8 EXECUTION

8.1 Units shall be installed neat and level on neoprene vibration isolation pads, supplied by heat pump manufacturer, and secured to floor.

8.2 Flush the system per manufacturer instructions before connecting chassis. Contractor shall join supply and return riser flexible hoses together, at the top/bottom on every riser and at the farthest point from the pump for flushing purposes.

8.3 Installing contractor shall install risers and install riser transition piece connections where riser sizes change.

8.4 The hoses shall be installed in the field by the contractor. The flare fittings on the hoses shall be connected according to industry standard (Finger tighten then tighten with wrench while always using back-up wrench).

8.5 Flush the system per manufacturer instructions before connecting chassis. The riser system shall be flushed, cleaned and commissioned before connecting chassis units to the riser system.

8.6 Contractor shall make all necessary provisions to bring in ducts for "outside air", "bathroom exhaust", and "bathroom air to outside" and field connect each duct to unit mounted take-offs.

8.7 Contractor shall provide duct and grille canvas connections on all single piece units.

8.8 Start-up of units shall be supervised by trained representa-