

Project:

Model: VSHPe

Vertical Stack Heat Pump

w/ Integrated ERV

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

Dev. F

Date:

Revision: 0

OMEGA Job #:

SUBMITTAL SET

Presented By:

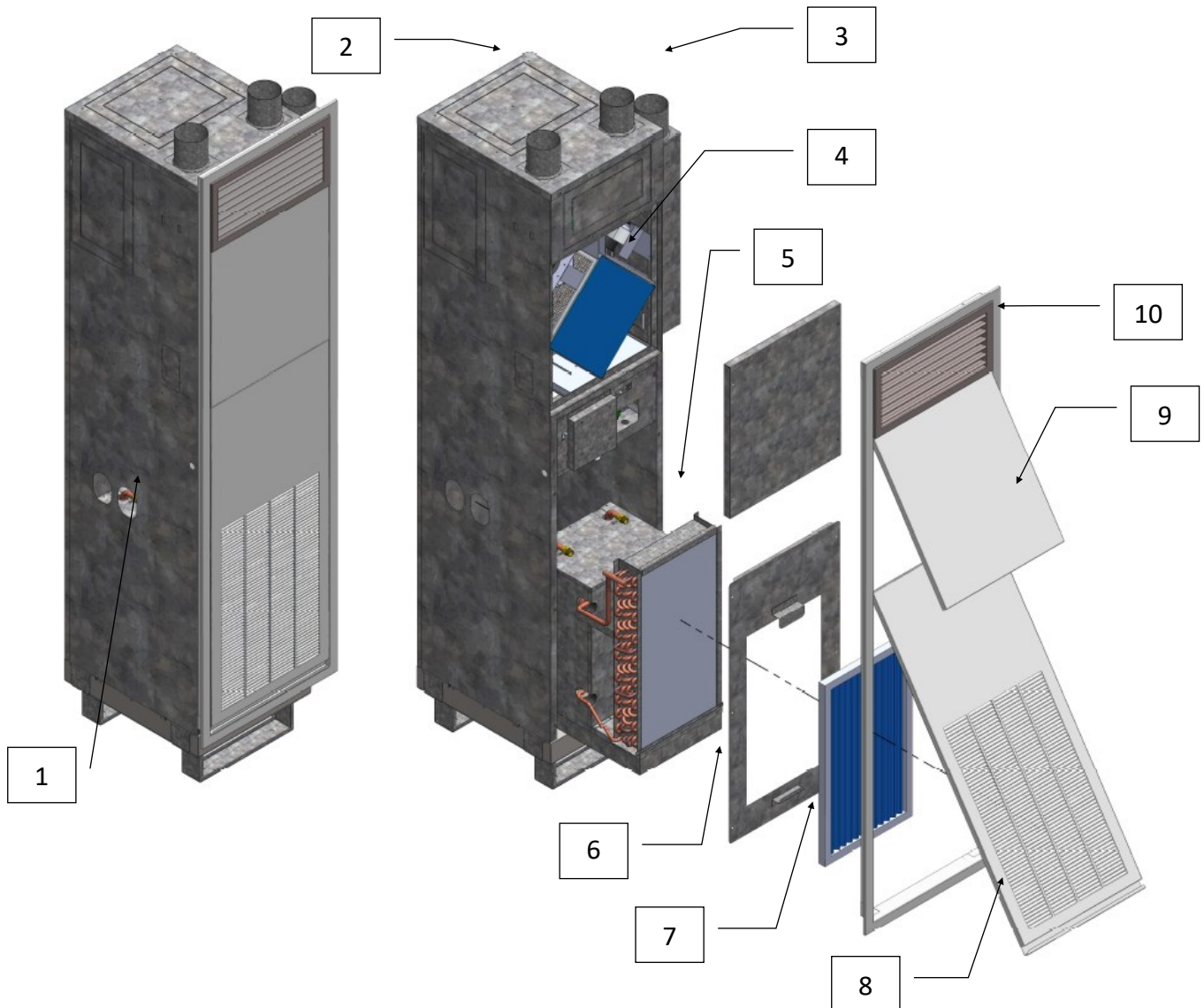


SUMMARY PAGE

- Vertical Stack Heat Pumps with Integrated ERV
- ECM Fan Motor
- DC ERV Fan Motors
- ERV Port Configurations as per schedule
- Polymer, washable ERV Core
- Fully Modulating OA Damper, Normally Closed, Spring Return
- "Whisper" Mode for Constant Low CFM Air Circulation
- Standard Efficiency Chassis / High Efficiency Chassis

VSHPe - 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 (Type A4 ERV Port Configuration)
4. Removable ERV core.
5. Heat pump chassis.
6. Chassis service cover panel.
7. 1” air filter.
8. Acoustic return air (R/A) panel for chassis, blower and electrical compartments.
9. ERV service panel.
10. Removable optional supply discharge grille panel (not to scale).





VSHPe (SE) PERFORMANCE TABLE - STANDARD EFFICIENCY CHASSIS

Unit Model	Refrig.	Air Flow (SCFM)	Water Flow (GPM)	WPD (FT)	WLHP Cooling ¹		WLHP Heating ¹		GLHP Cooling ²		GLHP Heating ²	
					Capacity (BTUH)	EER	Capacity (BTUH)	COP	Capacity (BTUH)	EER	Capacity (BTUH)	COP
VSHPe 030	R-410A	350	2.6	11.0	8,900	12.5	11,900	4.5	9,200	14.1	7,500	3.2
VSHPe 040	R-410A	460	3.5	11.1	11,600	13.5	14,700	4.5	12,000	15.3	9,200	3.2
VSHPe 050	R-410A	530	4.0	14.3	15,000	15.0	17,200	4.8	15,600	16.5	10,800	3.3
VSHPe 060	R-410A	630	5.1	20.2	17,900	14.5	22,500	4.5	18,600	15.7	14,000	3.2
VSHPe 080	R-410A	820	6.7	10.2	23,000	14.5	28,000	4.5	23,900	15.7	17,500	3.2
VSHPe 100	R-410A	1010	7.9	14.2	28,700	14.5	35,500	4.6	29,900	15.6	22,200	3.2
VSHPe 120	R-410A	1200	9.0	18.4	36,000	13.8	43,000	4.5	36,200	15.0	28,700	3.2

¹Performance based on ARI/ISO 13256-1 Water Loop conditions at 86F EWT Cooling, 68F EWT Heating.
²Performance based on ARI/ISO 13256-1 Ground Loop conditions at 77F EWT Cooling, 32F EWT Heating.
Cooling performance shown is for 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 030	208-230/1/60	1	@ 3.7	22.0	1/4	1.2	1.0	5.9	6.8	15
VSHPe 040	208-230/1/60	1	@ 4.7	25.0	1/4	1.3	1.0	7.0	8.2	15
VSHPe 050	208-230/1/60	1	@ 5.6	29.0	1/3	2.2	1.0	8.8	10.2	15
VSHPe 060	208-230/1/60	1	@ 7.4	33.0	1/3	2.3	1.0	10.7	12.6	15
VSHPe 080	208-230/1/60	1	@ 10.9	62.9	1/2	4.2	1.0	16.1	18.8	25
VSHPe 100	208-230/1/60	1	@ 13.5	72.5	1/2	4.2	1.0	18.7	22.1	35
VSHPe 120	208-230/1/60	1	@ 15.4	83.9	1/2	4.2	1.0	20.6	24.5	35

VSHPe (SE) PHYSICAL DATA

Model	Cabinet	Cabinet (lbs)	Chassis (lbs)	Total Chassis Fluid Volume*	
				Fluid Volume (In ³)	Fluid Volume (US gallons)
VSHPe 030	Y	175	77	30.4	0.13
VSHPe 040				33.8	0.15
VSHPe 050		178	110	49.8	0.22
VSHPe 060					
VSHPe 080	Z	243	150	134.0	0.58
VSHPe 100		243	165		
VSHPe 120		243	175		

VSHPe (SE) FILTER SIZES

Model	Cabinet Size	Replacement Filter Size (in)
VSHPe 030	Y	14 x 25 x 1
VSHPe 040		
VSHPe 050		16 x 25 x 1
VSHPe 060		
VSHPe 080	Z	20 x 25 x 1
VSHPe 100		
VSHPe 120		



VSHPe (HE) PERFORMANCE TABLE - HIGH EFFICIENCY CHASSIS

Unit Model	Refrig.	Air Flow (SCFM)	Water Flow (GPM)	WPD (FT)	WLHP Cooling ¹		WLHP Heating ¹		GLHP Cooling ²		GLHP Heating ²	
					Capacity (BTUH)	EER	Capacity (BTUH)	COP	Capacity (BTUH)	EER	Capacity (BTUH)	COP
VSHPe 030G	R-410A	330	2.5	11.0	9,200	14.6	11,600	5.2	9,500	16.0	7,500	3.3
VSHPe 040G	R-410A	400	3.2	11.1	12,200	14.5	14,700	5.0	12,500	15.5	9,300	3.3
VSHPe 050G	R-410A	510	3.9	14.3	15,000	15.5	17,200	5.3	15,400	17.1	10,600	3.4
VSHPe 060G	R-410A	640	4.7	20.2	18,100	14.5	21,500	5.0	18,800	16.0	13,800	3.3
VSHPe 080G	R-410A	830	6.3	10.2	23,300	15.0	30,000	5.2	23,900	16.5	17,500	3.4
VSHPe 100G	R-410A	1020	7.7	14.2	29,500	14.8	34,100	5.1	31,000	16.6	21,500	3.3
VSHPe 120G	R-410A	1180	9.0	18.4	35,900	14.2	41,000	5.0	36,200	15.5	25,100	3.3

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

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 030G	208-230/1/60	1	@ 3.7	22.0	1/4	1.2	1.0	5.9	6.8	15
VSHPe 040G	208-230/1/60	1	@ 4.7	26.0	1/4	1.3	1.0	7.0	8.2	15
VSHPe 050G	208-230/1/60	1	@ 5.5	26.0	1/3	2.2	1.0	8.7	10.1	15
VSHPe 060G	208-230/1/60	1	@ 7.0	38.0	1/3	3.0	1.0	11.0	12.8	15
VSHPe 080G	208-230/1/60	1	@ 10.9	62.9	1/2	4.2	1.0	14.5	18.8	25
VSHPe 100G	208-230/1/60	1	@ 13.5	72.5	1/2	4.2	1.0	18.7	22.1	35
VSHPe 120G	208-230/1/60	1	@ 15.4	83.9	1/2	4.2	1.0	20.6	24.5	35

VSHPe (HE) PHYSICAL DATA

Model Series	VSHPe 030G	VSHPe 040G	VSHPe 050G	VSHPe 060G	VSHPe 080G	VSHPe 100G	VSHPe 120G
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		
Refrigerant Charge (ozs)	23	29	36	38	36	45	47

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	0.25/3	0.25/3	0.33/3	0.33/3	0.5/3	0.50/3	0.50/3

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

VSHP-G Chassis Weight (lb)	72	77	105	110	150	165	175
VSHP-G Cabinet Weight (lb)	175	175	178	178	243	243	243

VSHPe - ECM FAN DATA

Model	EC Motor Speed	External Static Pressure Option	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
020	WHSPER* MODE	N/A	N/A	N/A	210	195	180	160	145	130	115	100	75	55	-	-	-
	LOW	LOW ESP	150	200	250	240	225	210	200	185	150	-	-	-	-	-	-
	MED				-	-	255	240	225	215	200	190	175	165	150	-	-
	MED	HIGH ESP			-	-	255	240	225	215	200	190	175	165	150	-	-
	HIGH				-	-	-	-	260	240	230	220	210	195	185	175	165
030	WHSPER* MODE	N/A			N/A	N/A	225	210	195	175	160	145	130	115	100	85	70
	LOW	LOW ESP	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
	MED	HIGH ESP			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	WHSPER* MODE	N/A			N/A	N/A	250	230	225	205	180	160	145	125	110	90	75
	LOW	LOW ESP	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
	MED	HIGH ESP			460	450	445	440	430	425	415	405	395	385	375	365	355
	HIGH				-	-	-	-	470	465	455	445	435	430	420	410	400
050	WHSPER* MODE	N/A			N/A	N/A	450	430	410	390	370	350	320	300	270	250	220
	LOW	LOW ESP	375	530	520	510	490	470	450	430	410	390	375	-	-	-	-
	MED				-	-	550	540	520	505	485	470	450	430	410	390	375
	MED	HIGH ESP			-	-	550	540	520	505	485	470	450	430	410	390	375
	HIGH				-	-	-	-	-	-	555	540	525	510	490	475	460
060	WHSPER* MODE	N/A			N/A	N/A	450	430	410	390	370	350	320	300	270	250	220
	LOW	LOW ESP	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
	MED	HIGH ESP			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	WHSPER* MODE	N/A			N/A	N/A	620	580	560	520	480	440	410	380	340	300	260
	LOW	LOW ESP	600	820	800	760	740	720	695	660	640	620	-	-	-	-	-
	MED				880	860	840	820	800	780	750	720	700	670	650	625	600
	MED	HIGH ESP			880	860	840	820	800	780	750	720	700	670	650	625	600
	HIGH				-	-	-	-	895	880	860	820	805	795	780	770	760
100	WHSPER* MODE	N/A			N/A	N/A	620	580	560	520	480	440	410	380	340	300	260
	LOW	LOW ESP	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
	MED	HIGH ESP			1080	1060	1040	1010	990	970	950	930	900	880	860	840	820
	HIGH				-	-	-	-	1110	1090	1070	1060	1040	1020	990	980	960
120	WHSPER* MODE	N/A			N/A	N/A	620	580	560	520	480	440	410	380	340	300	260
	LOW	LOW ESP	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
	MED	HIGH ESP			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. LOW Fan Speed may not be available depending on the board software version.

VSHPe - ERV FAN DATA

% PWM Signal / Power	Potentiometer Dial Setting	ESP (External Static) inwg								
		0.00	0.05	0.10	0.15	0.20	0.25	0.30	0.40	0.50
25% @ 6 Watts	10 O'clock	45	30	20	10	-	-	-	-	-
37% @ 13 Watts	11 O'clock	70	45	25	15	5	-	-	-	-
45% @ 18 Watts	12 O'clock	85	55	35	25	15	-	-	-	-
57% @ 30 Watts	1 O'clock	110	85	70	55	45	35	30	20	15
69% @ 43 Watts	2 O'clock	140	115	105	90	80	75	65	55	45
82% @ 61 Watts	3 O'clock	170	150	140	125	120	105	95	85	70
95% @ 82 Watts	4 O'clock	185	165	155	145	135	125	115	105	90

Notes:

- All airflow ratings are taken at lowest voltage rating of dual rating (ie. 208 volt).
- ERV external static setting is based on exhaust duct run.
- ESP capability shown per fan.
- Recommended ERV fan speeds are field set to match duct static. Default factory settings may not match site conditions and requirements.
- Watts includes both ERV fans.
- Internal Manual OA Slider Damper may be used to control OA introduction in the event of variable OA conditions (i.e. wind stack effect)

VSHPe - 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	60°F
Min. Entering Fluid Temperature (EFT)	50°F	55°F	50°F	45°F	30°F	20°F
Max. Entering Fluid Temperature (EFT)	110°F	90°F	110°F	90°F	110°F	90°F

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

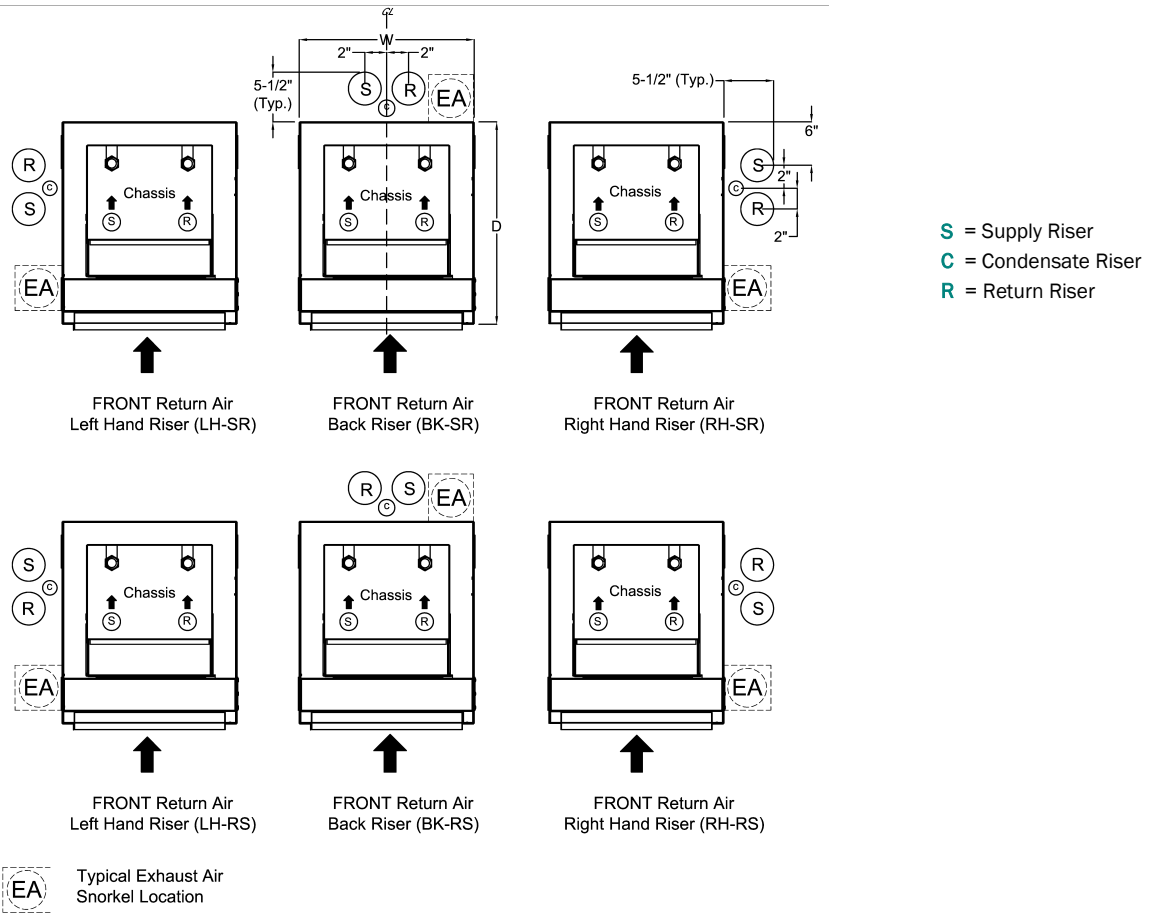
Fluid GPM Limits	
Min. GPM/Ton	1.5
Design GPM/Ton	3
Max. GPM/Ton	4

CAUTION

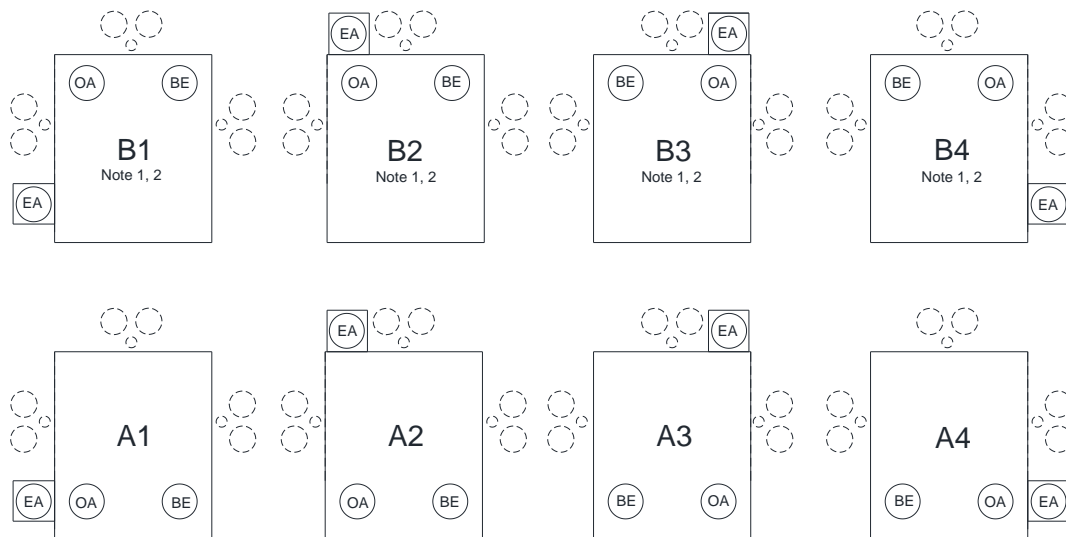
Design limits can not be combined. Combining maximum or minimum limits is not allowed. This could exceed the operation and design limits of the unit.

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

VSHPe - RISER HANDING CONVENTIONS



VSHPe - ERV CONFIGURATIONS (TOP VIEW)

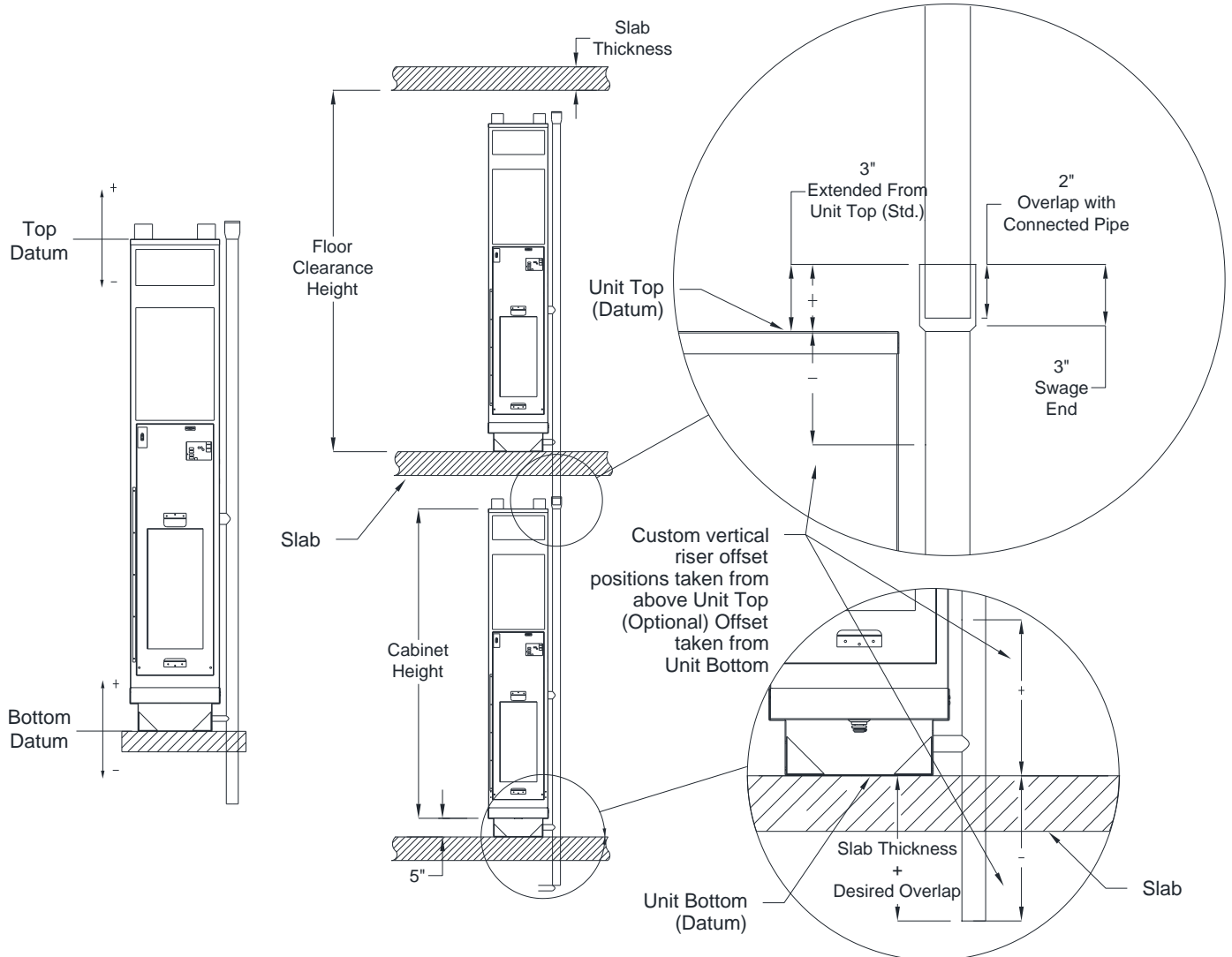


Acceptable Riser Locations: 

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

Note:
1 - Left supply air discharge option not available
2 - Right supply air discharge option not available

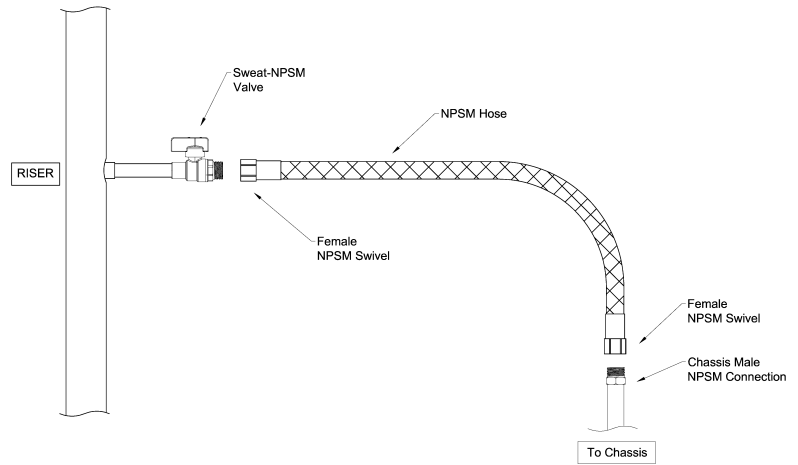
Note:
Configurations A1 and A4 are standard.

VSHPe - TYPICAL RISER INSTALL DETAIL

Notes:

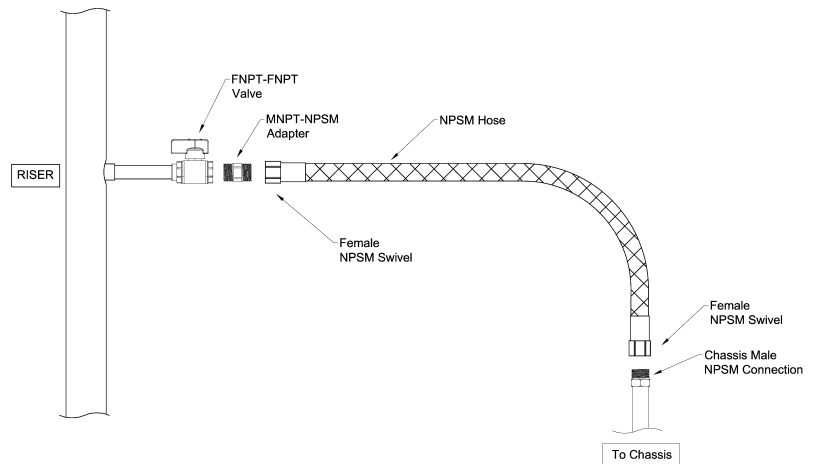
- Risers are positioned relative to cabinet using a standard "Top" Datum reference (optional "Base" Datum). Top Datum Offset indicates where the top of riser will be located relative to top of cabinet. A Base Datum indicates where bottom of riser will be located relative to base of cabinet.
- Upon request 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'), to be field cut on-site.
- Omega does not supply extension tailpieces or transition riser pieces for joining dissimilar piping sizes. Items are field provided.
- Risers available in Type L and Type M copper.
- Condensate riser have optional 3/8-inch thick closed cell insulation to prevent condensation.
- Optional insulation on supply and return risers is also available up to 1-inch thick.

VSHPe - HOSE KIT DETAILS

STANDARD VALVE - SWEAT CONNECTED NPSM



OPTIONAL FPT VALVE - FPT to FPT



Hose Kit Sizes

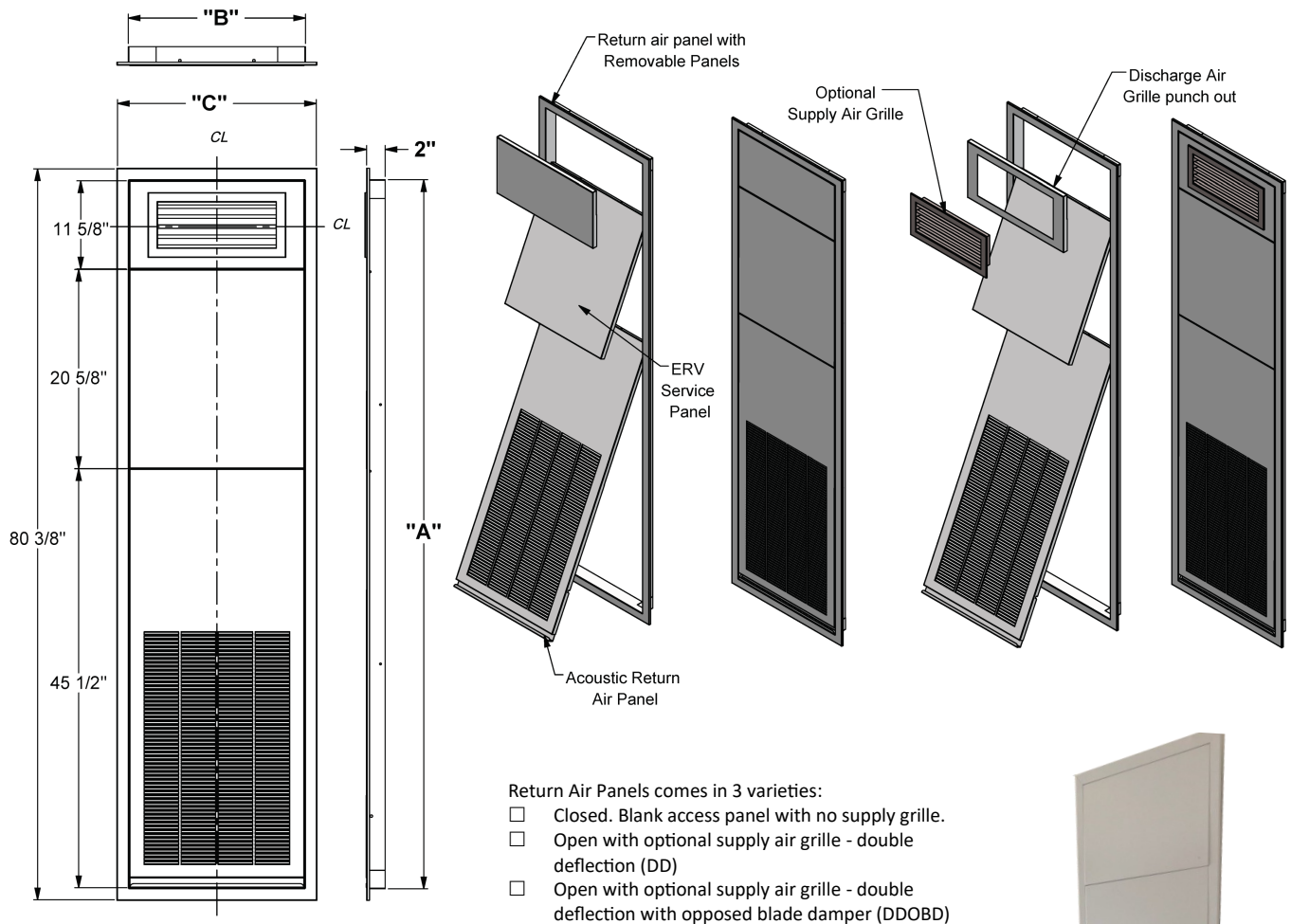
Model	Hose Kit	
	Size (in)	Length (in)
VSHPe 030	1/2	24
VSHPe 040	1/2	24
VSHPe 050	1/2	24
VSHPe 060	1/2	24
VSHPe 080	3/4	30
VSHPe 100	3/4	30
VSHPe 120	3/4	30

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 valves are for Field Supplied Risers only. Includes MNPT-MNPSM hose adaptors with hose kit.

VSHPe - ACOUSTIC RETURN AIR PANEL



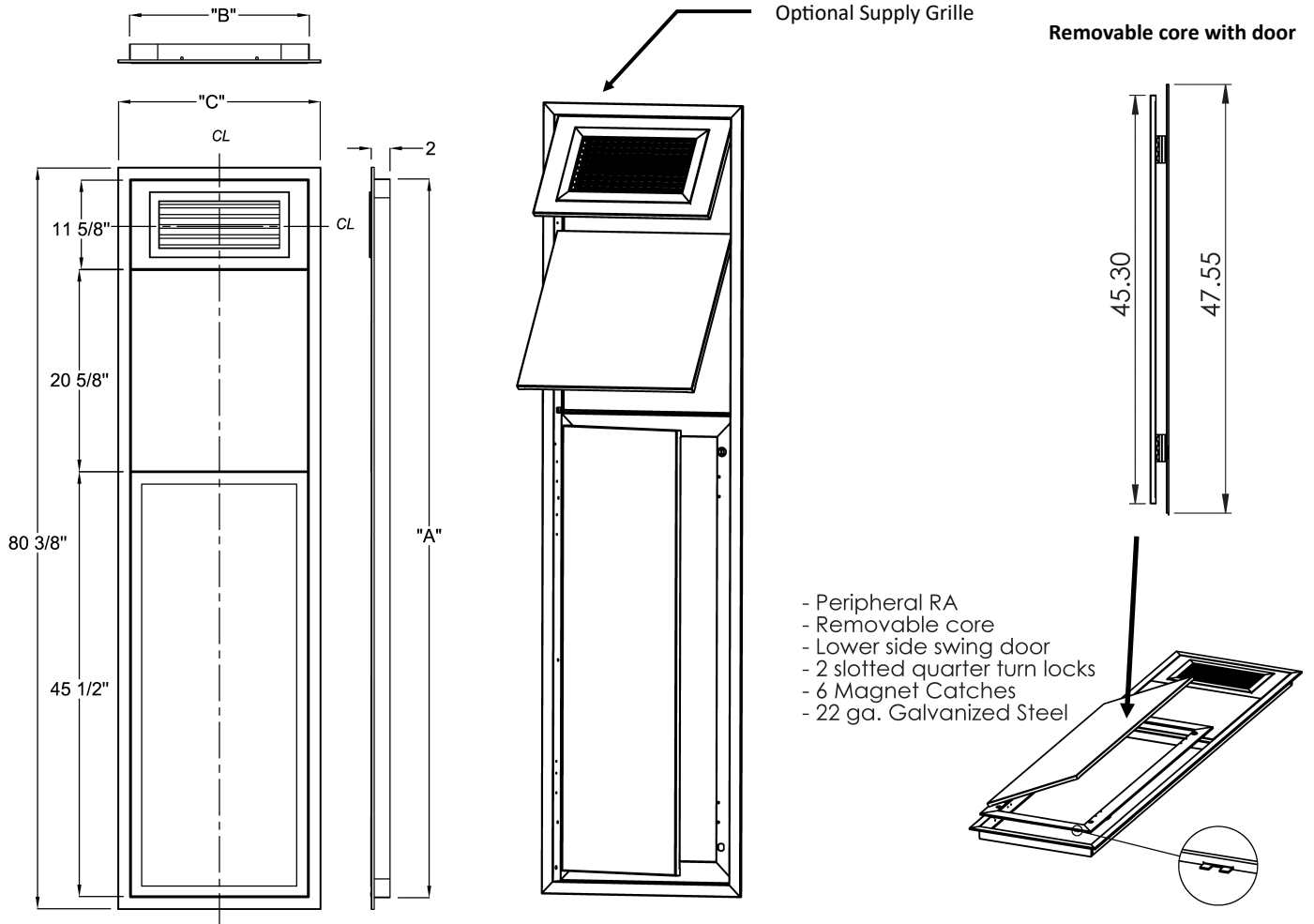
Model	Cabinet Size	RA Panel Dimensions (inches)		
		A	B	C
VSHPe 030	Y	78	19 5/8	22
VSHPe 040				
VSHPe 050				
VSHPe 060				
VSHPe 080	Z	78	23 5/8	26
VSHPe 100				
VSHPe 120				

Note: V2 Panel dimensions

Notes:

- Panel is lined with acoustic insulation for enhanced sound attenuation.
- Return air panel supplied in standard powder coat appliance white finish.
- Version 2 panel shown. Perimeter style panel dimensions are equivalent.



VSHPe - PERIMETER RETURN AIR PANEL


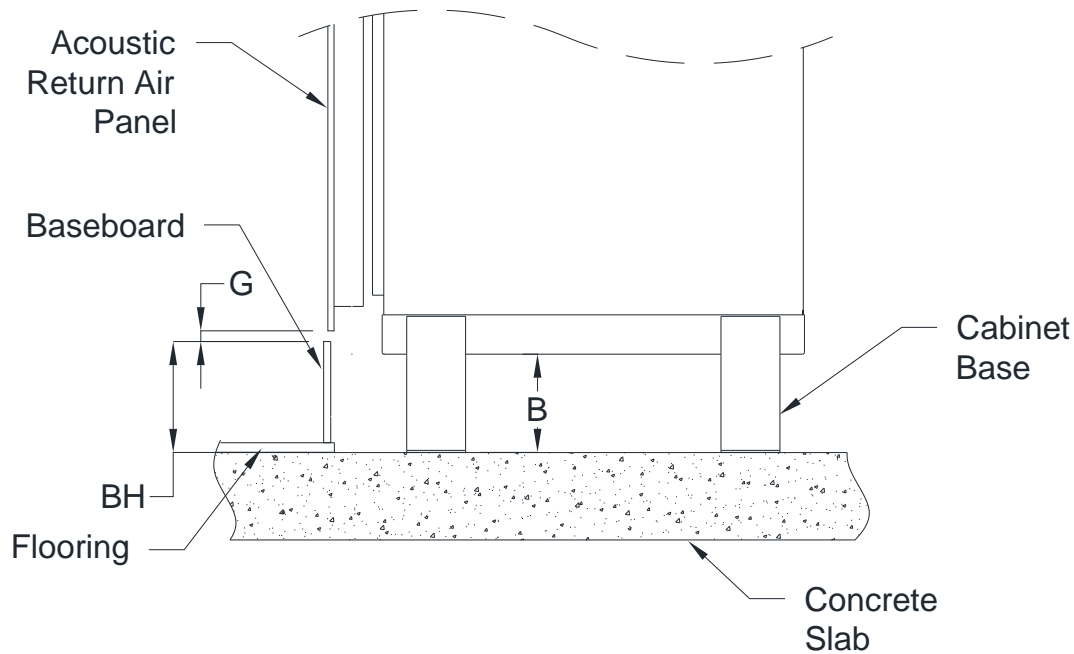
Model	Cabinet Size	RA Panel Dimensions (inches)		
		A	B	C
VSHPe 030	Y	78	19 5/8	22
VSHPe 040				
VSHPe 050				
VSHPe 060				
VSHPe 080	Z	78	23 5/8	26
VSHPe 100				
VSHPe 120				

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)

Notes:

- Perimeter Panel shown above with Optional Supply Grille.
- Panel is lined with acoustic insulation for enhanced sound attenuation.
- Return air panel supplied in standard powder coat appliance white finish.

VSHPe - RETURN AIR PANEL FURRING DETAILS


Return Air Panel Cabinet Base Height Calculation

Acoustic & Perimeter 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.

Example: Baseboard - Base Height

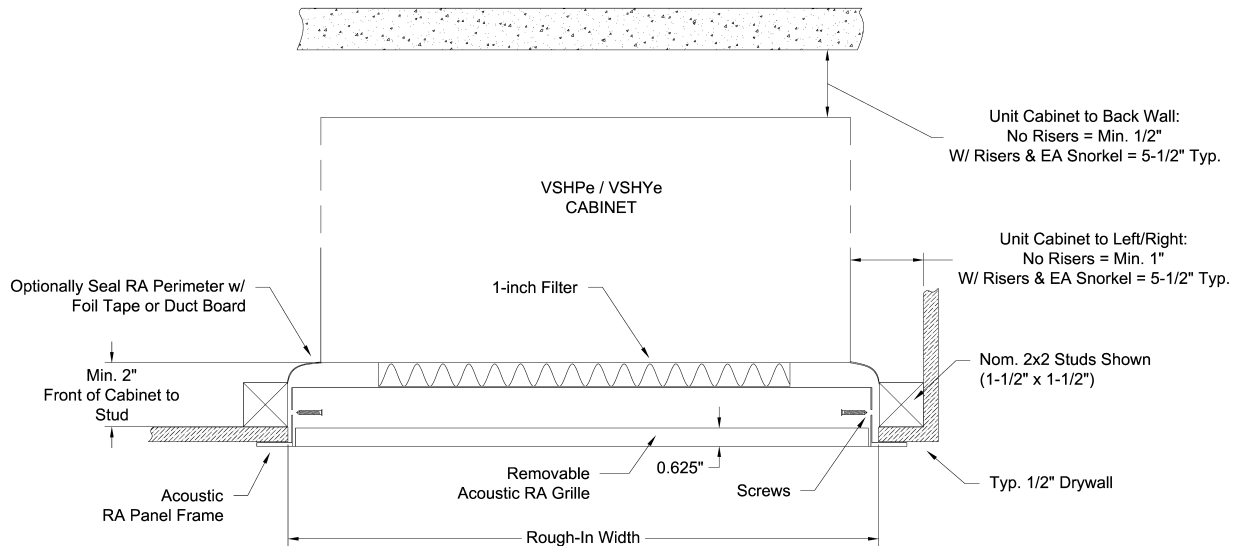
Baseboard Height*	Cabinet Base Height
Up to 4-1/2"	5"
>4-1/2 to 5-1/2"	6"
>5-1/2" to 6-1/2"	7"
>6-1/2" to 7-1/2"	8"

*Includes 1" Total Flooring

*Using gap G= 0.5"

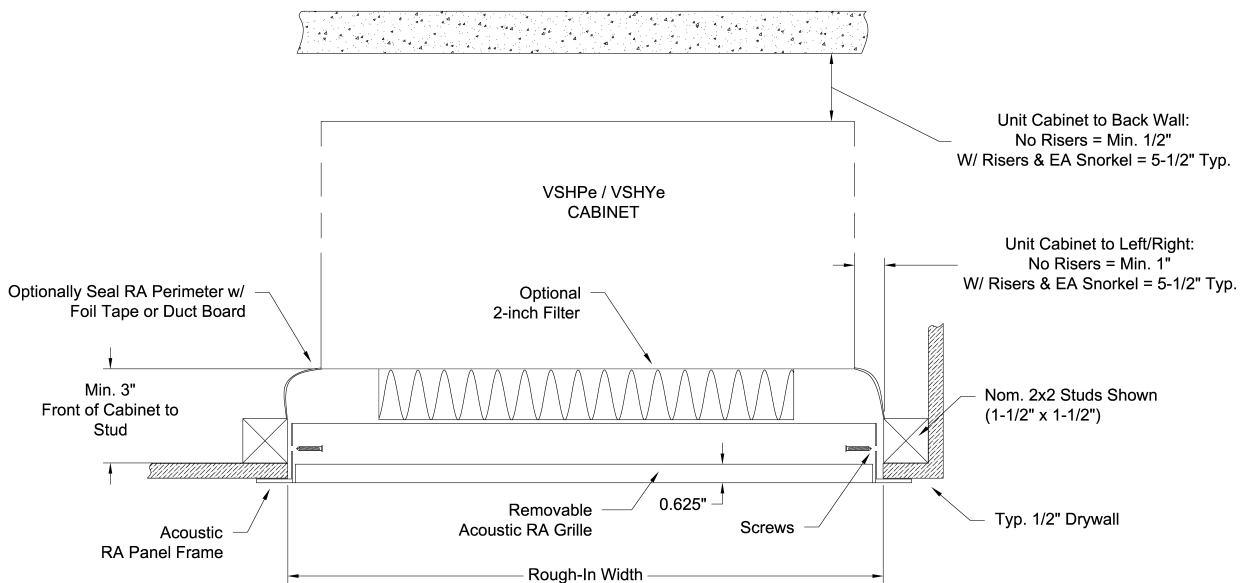
(top of baseboard to return panel flange)

VSHPe - RETURN AIR PANEL FURRING - Plan View

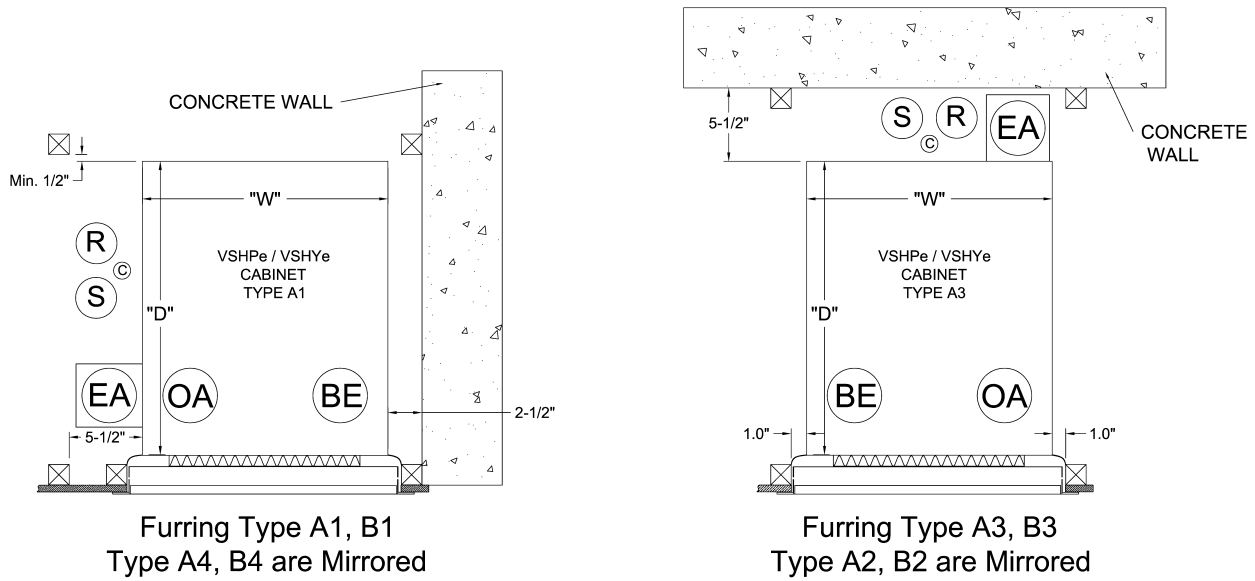





Notes:

- Return air panel should be centered in front of the unit return air opening.
- Optionally, insulate the drywall enclosure with plenum rated acoustical insulation for additional sound attenuation.
- Acoustic RA Panel shown; Perimeter Panel rough-in dimensions are equivalent.



VSHPe - RETURN AIR PANEL DETAILS - Stud Furring

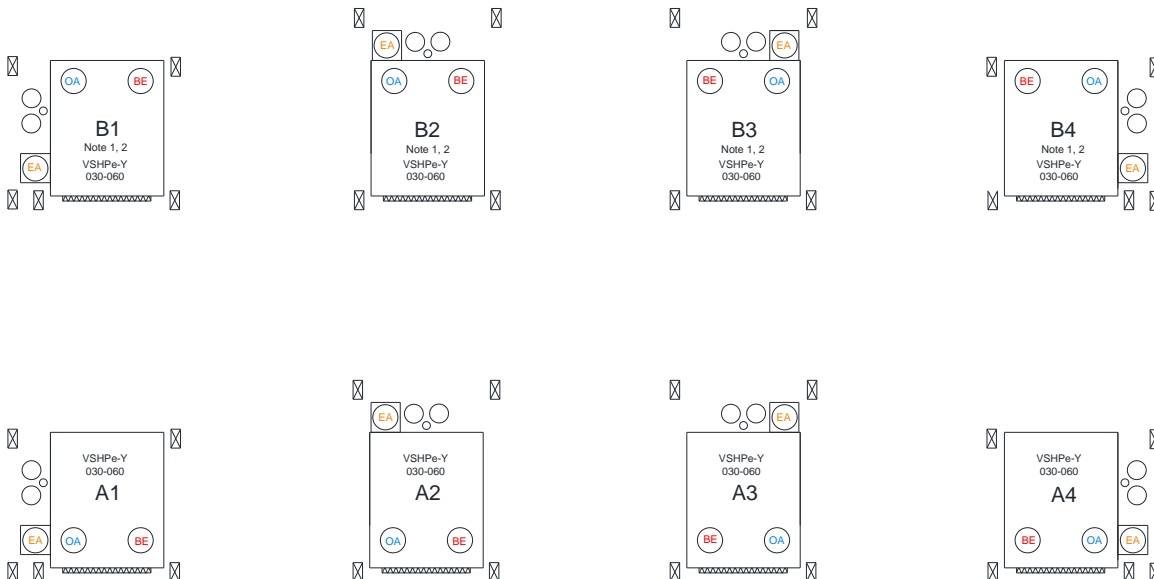


- | | | |
|---|------------------|------------------------------|
|  | Return Riser | EA - Exhaust Air to outside |
|  | Condensate Riser | BE - Bathroom Exhaust to ERV |
|  | Supply Riser | OA - Outside Air to ERV |

Typ. 2x2 Closet Framing

Notes:

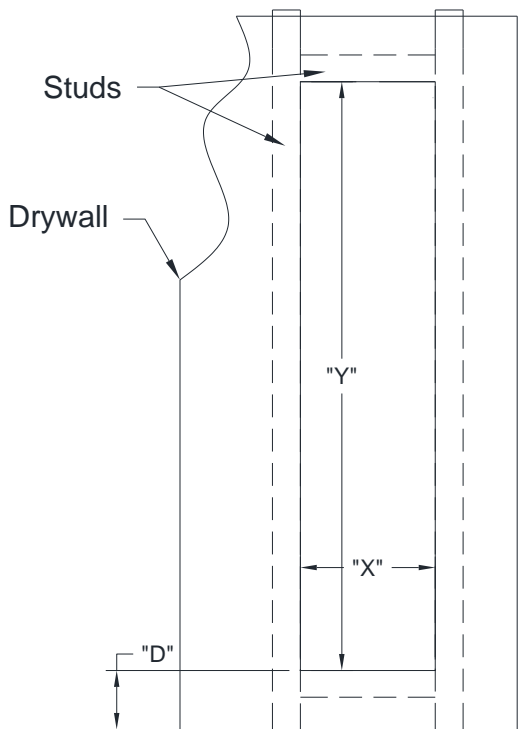
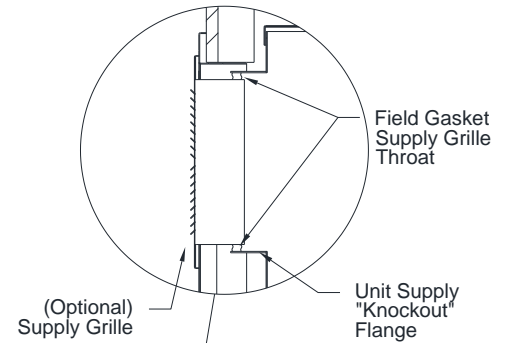
- Return air panel should be centered in front of the unit return air opening.
- Optionally, insulate the drywall enclosure with plenum rated acoustical insulation for additional sound attenuation.
- 2x2 Studs shown. Risers shown as 3" Supply and Return and 1.25" Condensate.
- Risers can be positioned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



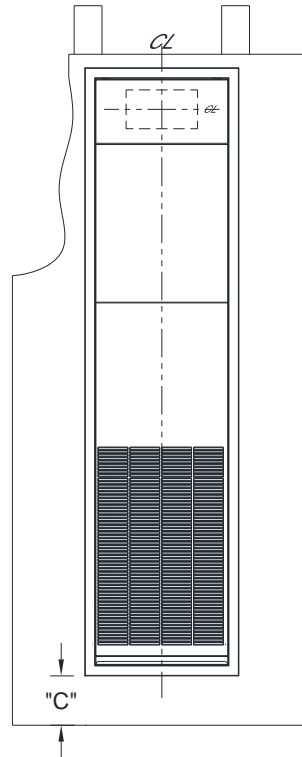
Typ. 2x4 Closet Framing

VSHPe - RETURN AIR PANEL FURRING DETAILS (CONT'D)

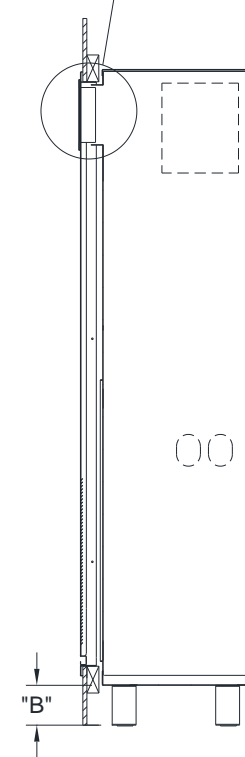
Model	Cabinet Size	Cabinet Dimensions (in)		Rough-In (in)	
		W	D	"X"	"Y"
VSHPe 030	Y	18	21 1/2	20 1/8	78 1/2
VSHPe 040					
VSHPe 050					
VSHPe 060					
VSHPe 080	Z	22	25 1/2	24 1/8	78 1/2
VSHPe 100					
VSHPe 120					



Drywall & Stud
Detail



Front Panel
View



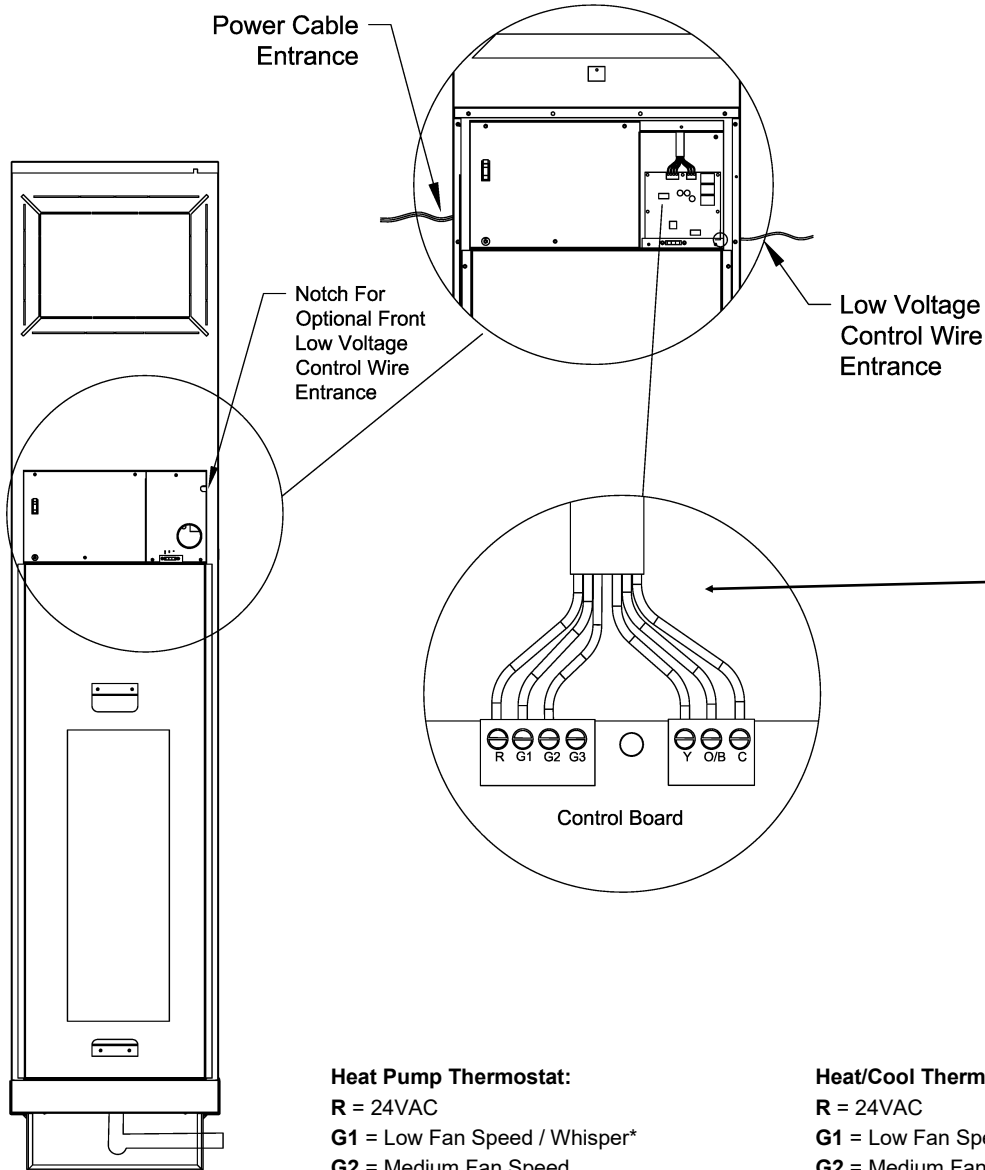
Side Cutaway
View

- 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

VSHPe - ELECTRICAL CONTROL WIRING



Field supplied 6-wire thermostat cable shown.
Min. 5-wire required for smart thermostats.

Heat Pump Thermostat:

- R = 24VAC
- G1 = Low Fan Speed / Whisper*
- G2 = Medium Fan Speed
- G3 = High Fan Speed
- Y = Compressor On
- O/B = Reversing Valve
- C = Common

Heat/Cool Thermostat:

- R = 24VAC
- G1 = Low Fan Speed / Whisper*
- G2 = Medium Fan Speed
- G3 = High Fan Speed
- Y = Cooling
- O/B = Heating
- C = Common

*Low Fan Speed may be occupied by Whisper Mode and not available as a fan speed depending on board software version.

Check unit DIP switch label for fan settings.

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.

Thermostat Connection

Units come with terminal block mounted to the control board to field wire thermostat cable pigtails. 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 and set DIP Switch #6 on the board to (ON) Auto. Fan speed will be determined by wiring to the G1, G2, or G3 terminals:

G1 Signal = LOW fan speed enabled*

G2 Signal = MEDIUM fan speed enabled

G3 Signal = HIGH fan speed enabled

(* Low Fan Speed May not be available and occupied by Whisper Fan Speed)

Manual Fan Speed Control - 3-Speed Selector Switch**

Enable the unit mounted 3-speed selector switch by setting DIP Switch #6 to OFF (Manual). Run fan wire from thermostat to any of the G1, G2, G3 terminals. 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

(** Not available on VSHPe units)

SEQUENCE OF OPERATION

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
- **(Optional)** High-Pressure Water Alarm

- **(Optional)** Condensate Over Flow Alarm
- Compressor Anti-Short Cycle 7 min. timer has not expired
- **(Optional)** Entering Water Temperature (EWT) is greater than 115°F
- **(Optional)** Leaving Water Temperature (LWT) greater than 127°F

When call for compressor request is terminated, the optional motorized auto shut-off control valve and the blower fan will remain open until the timers have expired.

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 (Optional)

For standard or LTW option, RST sensor is set to 28°F. If running in Geothermal loop, the on-board Geo jumper may be cut to lower the RST alarm point to 7°F.

LAT - Leaving Air Temperature Alarm (Optional)

Leaving air temperature monitors supply air temperature and if temperature is detected below 35°F or above 131°F the LAT LED will flash solid during this time.

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.

Fan-On/Off Timer

The Fan-On timer of 10 seconds starts anytime there is a call for fan request and 10 seconds after a call for compressor is terminated.

Valve Open/Closed Timer

The valve open timer of 1 minute starts anytime a fan and compressor request are made to develop flow in the water coil. The valve closed timer of 1 minute starts anytime a call for compressor is terminated to allow for flushing of the water coil.

Random Wait Time on Unit Power Up

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

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-410A refrigerant. All units from 3/4 to 3 Tons shall be tested and certified by ASHRAE/ANSI/AHRI/ ISO 13256-1 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 A removable inner chassis service panel allowing service access to the fan and compressor compartment shall be provided with each unit.

2.5 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.

2.6 The drain pan shall be 16-gauge stainless steel. The drain pan shall come standard with a condensate overflow switch. 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.

2.7 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.

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

2.9 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.

2.10 Supply ducts shall not be rigidly attached to the cabinet and shall be acoustically isolated from cabinet using flexible canvas connec-

tions. Contractor shall install flex connection on all discharge openings. There shall be no rigid connection to supply-air discharge grilles or supply ducts.

2.11 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.

2.12 (Optional) Perimeter Return Air Panel shall be provided. Return air panel is sectionalized into 3 sections and all panels removable without tools.

2.13 (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.

2.14 Each ERV shall be factory configured for the handing specified 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.

2.15 ERV casing shall be constructed with 22GA galvanized steel. The cabinet shall be fully insulated with 1-inch acoustic insulation. Cabinet is 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.

2.16 Heat Exchanger (HX) core material shall be Polymeric membrane with sensible and latent recovery. ERV core shall have no odor crossover (AHRI 1060 certified for <0.5% crossover), mold and bacteria resistant (certified to ISO 846), and water washable. Cellulose (paper) or plastic cores shall not be accepted.

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

2.18 ERV shall be fitted with an outside air damper controlled by an electronic actuator that can modulate outside air (OA) as required to maintain fresh air introduction and shut-off if required by the freeze protection sequence.

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

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.

3.2 Units shall be supplied with an ECM controlled using a PWM signal. Fan motors speeds shall be field selectable using unit mounted 3-speed fan switch or by wiring thermostat to desired fan speed terminal. Units shall have an ultra-low 'Whisper' mode fan speed for air circulation when there is no call for compressor.

VSHPe - Mechanical Specification (Cont'd)

3.3 ERV compartment shall be fitted with two EC fans. Fan motor speed shall be fully controllable via internal signal. Fan power shall be limited to 45 watts per fan.

3.4 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.

3.5 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.

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. Steel braided hoses without the outer rubber covering are not acceptable.

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, and a reversing valve.

4.4 Compressor shall be hermetically sealed type and protected 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 chassis.

4.11 (Optional) Low Temp Water option: The chassis shall be factory supplied with a Low Temperature Water (LTW) kit. The LTW option shall be utilized for system water loops between 45°F and 55°F in heating mode that do not contain any glycol freeze protection. The

chassis shall come with high water pressure safety switches factory installed.

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.

4.12 (Optional) DX evaporator coils shall be provided in either Epoxy Coated (EC) meeting minimum 1000 hours of Salt Spray ASTM B117 protection; or Electrofin® E-coat (EF) meeting 15,000 hours salt spray resistance per ASTM B117.

4.12 (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.

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 and timers:

- Low Pressure Safety Switch
- High Pressure Safety Switch
- **(Optional)** High Water Pressure Safety Switches
- **(Optional)** Condensate Overflow Switch
- **(Optional)** Entering Water Temperature sensor
- **(Optional)** Leaving Water Temperature sensor
- **(Optional)** 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 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.

5.4 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.

VSHPe - Mechanical Specification (Cont'd)

5.5 Thermostats shall be remote mounted. Unit will come with a 24V terminal block for field connecting a field provided thermostat pig-tail to the controller board terminals. Thermostats can be either Heat/Cool or Heat Pump type. Thermostat shall provide 24V signal to G (fan) terminal during a call for cooling.

5.6 Fan operation shall have an ultra low fan speed "whisper mode" for air circulation when there is no call for compressor to circulate Outdoor Air.

5.7 ECM speed settings are field configurable using the embedded webpage interface to meet site CFM and static requirements.

5.8 (Optional) Units shall come with a SmartOne compatible RS-485 communication add-on board and remote temperature sensor.

6 ERV CONTROLS

6.1 ERV shall be integrated into the Vertical Stack cabinet and configured, full wired at factory. Units that require field installation, field handing configuration and / or field wiring of ERV are not accepted.

6.2 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 an on-board microprocessor controller. ERV shall take temperature readings for Outside Air (OA), Mixed Air (MA), Supply Air (SA), Discharge Air (DA), Bathroom Exhaust Air (BA), and Exhaust Air (EA).

6.3 Air Flow: ERV shall have two speed tap CFM settings: high and low speed modes. Fan speeds are field configurable to meet design ERV CFM conditions in Low and High ERV fan speed requests.

6.4 Defrost Mode: ERV unit shall contain a modulating, Normally Closed, damper for tempering outside air. ERV unit shall enter defrost mode once OA temperatures are below 14°F (-10°C), running in 40-minute cycles to modulate damper to maintain supply air (SA) temperature above 50°F (10°C).

6.5 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.

6.6 Whisper Mode constant air circulation shall distribute the Outdoor Fresh Supply Air (SA) throughout the occupied space and not allow dumping of coil air into the unit return air opening. Units without constant fresh air circulation are not accepted.

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

wiring. Units that require bathroom fan to be field installed are not accepted.

6.8 ERV shall operate continuously when there is no heat pump heating or cooling demand. Units that do not have continuous ERV fan-on capability shall not be accepted.

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 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 representatives of the equipment manufacturer.