

Project:

Model: VSHYe

Vertical Stacked

Hybrid Heating & Cooling

w/ Integrated ERV

High Efficiency (HE)

Dev. F

Date:

Revision: 0

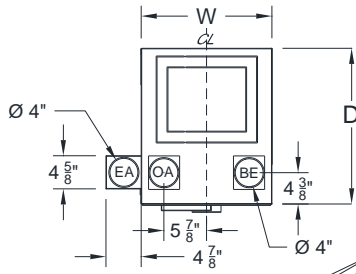
OMEGA Job #:

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
- High Efficiency DX Cooling Chassis with Hydronic Heating Coil

VSHYe - CABINET DIMENSIONS


ERV Max. external static pressure (ESP) drop is 0.25" WG per air stream

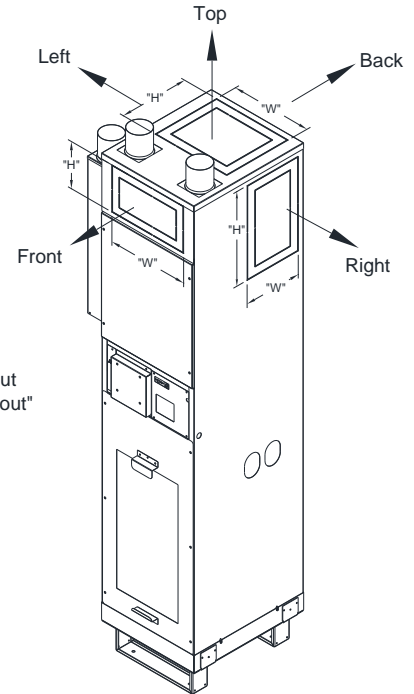
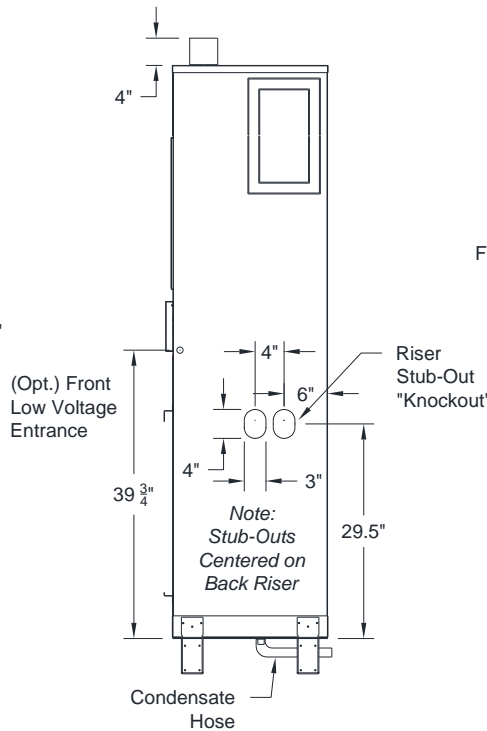
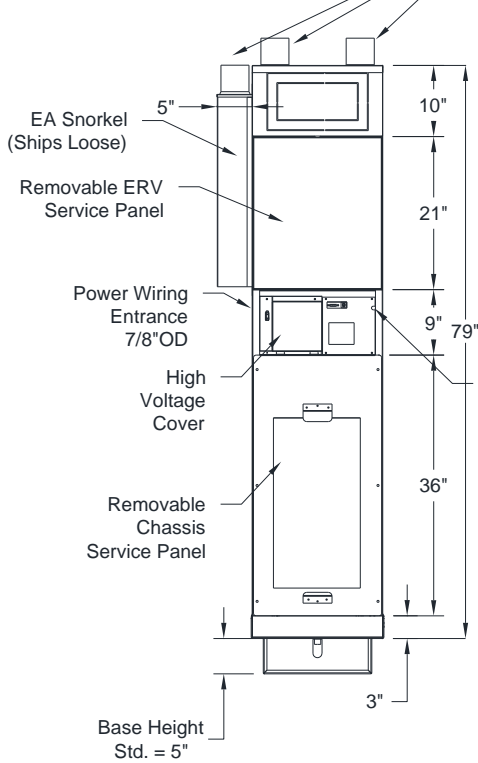
Air Velocity through supply air grill is recommended between 300-500FPM

VSHPe-050 to 120 units are not recommended for application as single horizontal supply opening

EA Snorkel ships loose and is field installed

 4" Duct collar is provided on all units
 Recommended to use 5"OD size duct for VSHPe-060 to 120 units. Adapter by others

Discharge Supply Air Opening Field "Knockouts" with 1-1/2" Duct Flange


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

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

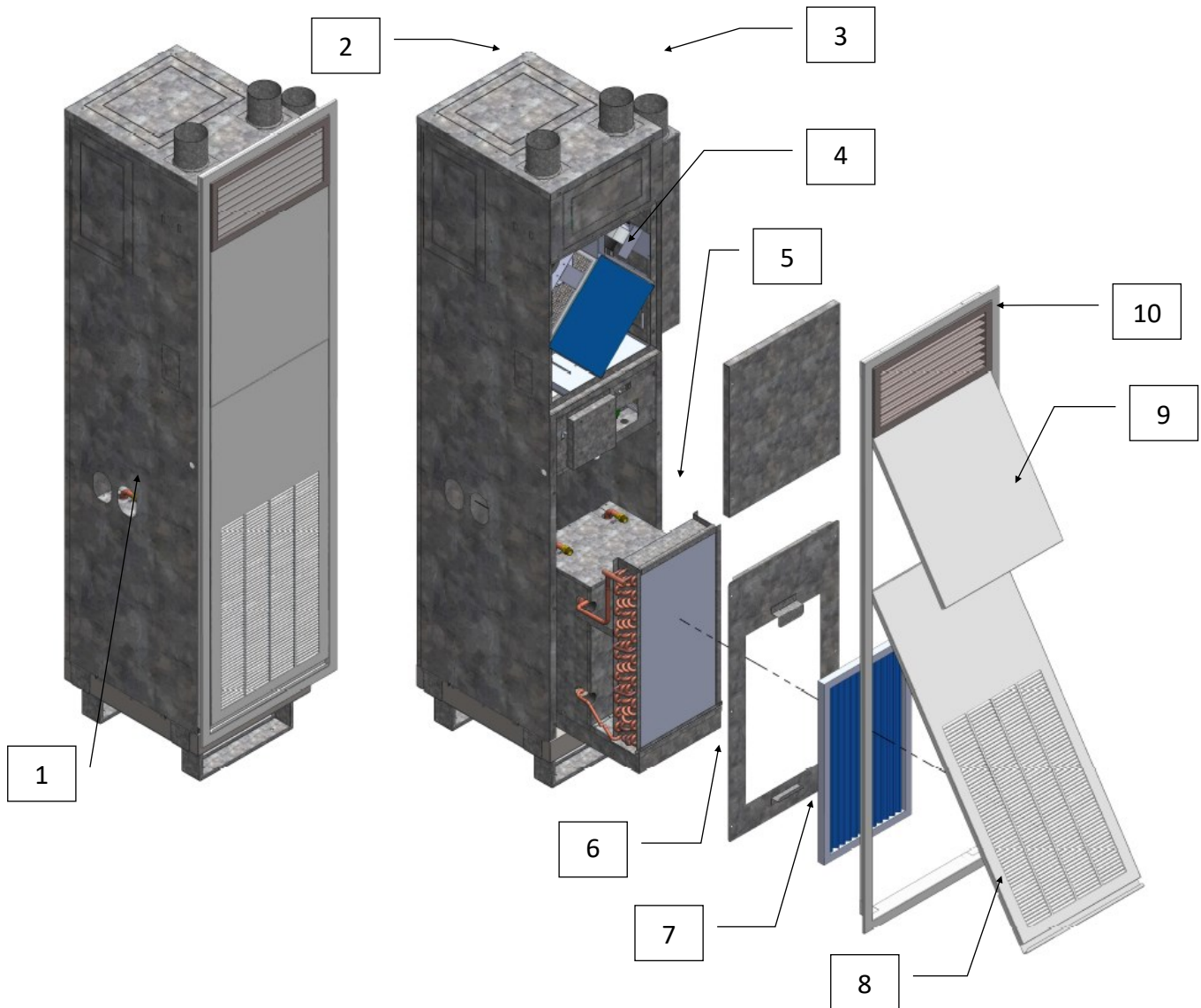
VSHYe - CABINET DIMENSIONS & SUPPLY DISCHARGE OPENING SIZES

Model	Capacity (Tons)	Cabinet Size	Dimensions (in)		VSHPe Supply Discharge Opening ("W" X "H") inches			
			W	D	Front	Back	Right/Left	Top
VSHYe 030	3/4	Y	18	21.5	14 x 8	8 x 14	10 x 12	12 x 12
VSHYe 040	1				14 x 8	8 x 14	10 x 14	12 x 12
VSHYe 050	1 1/4				14 x 8	8 x 14	10 x 16	14 x 12
VSHYe 060	1 1/2				14 x 8	8 x 14	10 x 16	14 x 12
VSHYe 080	2	Z	22	25.5	18 x 8	8 x 18	14 x 18	14 x 14
VSHYe 100	2 1/2				18 x 8	8 x 18	14 x 20	16 x 14
VSHYe 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.

VSHYe - 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 ERV core.
5. Hybrid 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).



VSHYe - PERFORMANCE TABLE—WATER LOOP CONDITIONS

Unit Model	Refrig.	Air Flow (CFM)	Heating (105F EWT)				Cooling (86F EWT)			
			Water Flow (GPM)	*WPD (FT)	LWT (°F)	¹ Capacity (BTUH)	³ Capacity (BTUH)	EER	Water Flow (GPM)	⁴ WPD (FT)
VSHYe 030	R-410A	330	2.25	5.8	95.6	10,500	9,200	12.5	2.5	11.0
VSHYe 040	R-410A	400	3.0	5.0	96.3	12,900	12,200	13.5	3.2	11.1
VSHYe 050	R-410A	510	3.5	5.5	95.8	16,000	15,000	15.0	3.9	14.3
VSHYe 060	R-410A	640	4.5	8.8	96.7	18,600	18,100	14.5	4.7	20.2
VSHYe 080	R-410A	830	6.0	6.3	97.1	23,700	23,300	14.5	6.3	10.2
VSHYe 100	R-410A	1020	7.5	7.4	97.5	28,000	29,500	14.5	7.7	14.2
VSHYe 120	R-410A	1180	9.0	10.6	97.9	31,800	35,900	13.0	9.0	18.4

* Water pressure drop (WPD) through Hydronic coil only. Does not include PD system piping, valves or hoses.

¹ Based on 70F EAT. Heating performance does not include fan motor heat.

² Nominal capacity performance based on ARI/ISO 13256-1 Water Loop conditions at 86F EWT Cooling.

³ Cooling performance shown is for 80.6F DB and 66.2F WB entering air.

⁴ Water pressure drop (WPD) through Coaxial Condenser coil. Does not include PD system piping, valves or hoses.
 Hybrid heat option available only on units with ECM.

VSHYe - ELECTRICAL DATA (ECM)

Model	Supply Voltage	Compressor			Blower		ERV FLA	Total Unit FLA	MCA	MaxFuse/Circuit Breaker
		Qty	RLA	LRA	HP	FLA				
VSHYe 030	208-230/1/60	1	@ 3.7	22.0	1/4	1.2	1.0	5.9	6.8	15
VSHYe 040	208-230/1/60	1	@ 4.7	26.0	1/4	1.3	1.0	7.0	8.2	15
VSHYe 050	208-230/1/60	1	@ 5.5	26.0	1/3	2.2	1.0	8.7	10.1	15
VSHYe 060	208-230/1/60	1	@ 7.0	38.0	1/3	3.0	1.0	11.0	12.8	15
VSHYe 080	208-230/1/60	1	@ 10.9	62.9	1/3	2.6	1.0	14.5	17.2	25
VSHYe 100	208-230/1/60	1	@ 13.5	72.5	1/2	4.2	1.0	18.7	22.1	35
VSHYe 120	208-230/1/60	1	@ 15.4	83.9	1/2	4.2	1.0	20.6	24.5	35

VSHYe - ECM FAN DATA

Unit Size	EC Motor Speed	Minimum 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* MODE	N/A	N/A	225	210	195	175	160	145	130	115	100	85	70	-	-
	MED	220	350	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* MODE	N/A	N/A	250	230	225	205	180	160	145	125	110	90	75	-	-
	MED	300	460	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* MODE	N/A	N/A	450	430	410	390	370	350	320	300	270	250	220	-	-
	MED	375	530	-	-	550	540	520	505	485	470	450	430	410	390	375
	HIGH			-	-	-	-	-	-	555	540	525	510	490	475	460
060	WHISPER* MODE	N/A	N/A	450	430	410	390	370	350	320	300	270	250	220	-	-
	MED	450	630	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* MODE	N/A	N/A	620	580	560	520	480	440	410	380	340	300	260	-	-
	MED	600	820	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* MODE	N/A	N/A	620	580	560	520	480	440	410	380	340	300	260	-	-
	MED	750	1010	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* MODE	N/A	N/A	620	580	560	520	480	440	410	380	340	300	260	-	-
	MED	900	1200	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 tap is not available with Whisper mode.

VSHYe - ERV FAN DATA

% PWM Signal / Power	Potentiometer Dial Setting	ESP (External Static) inwg											
		0.00	0.025	0.05	0.075	0.10	0.15	0.20	0.25	0.30	0.40	0.50	
25% Speed @ 6 Watts	10 O'clock	43	34	28	22	18	12	-	-	-	-	-	-
37% Speed @ 13 Watts	11 O'clock	70	54	43	34	27	15	7	-	-	-	-	-
45% Speed @ 18 Watts	12 O'clock	85	67	55	44	35	23	15	-	-	-	-	-
57% Speed @ 30 Watts	1 O'clock	111	95	83	74	68	54	45	37	30	21	15	
69% Speed @ 43 Watts	2 O'clock	139	124	114	106	104	91	82	73	63	53	44	
82% Speed @ 61 Watts	3 O'clock	168	155	150	141	139	127	119	107	96	85	72	
95% Speed @ 82 Watts	4 O'clock	187	172	166	157	156	145	137	124	115	105	91	

- 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)

VSHYe - 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	85°F

Fluid Limits	Standard Range	
	Cooling	Heating
Std. Entering Water Temperature (EWT)	85°F	105°F
Min. Entering Water Temperature (EWT)	50°F	90°F
Max. Entering Water Temperature (EWT)	120°F	120°F

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

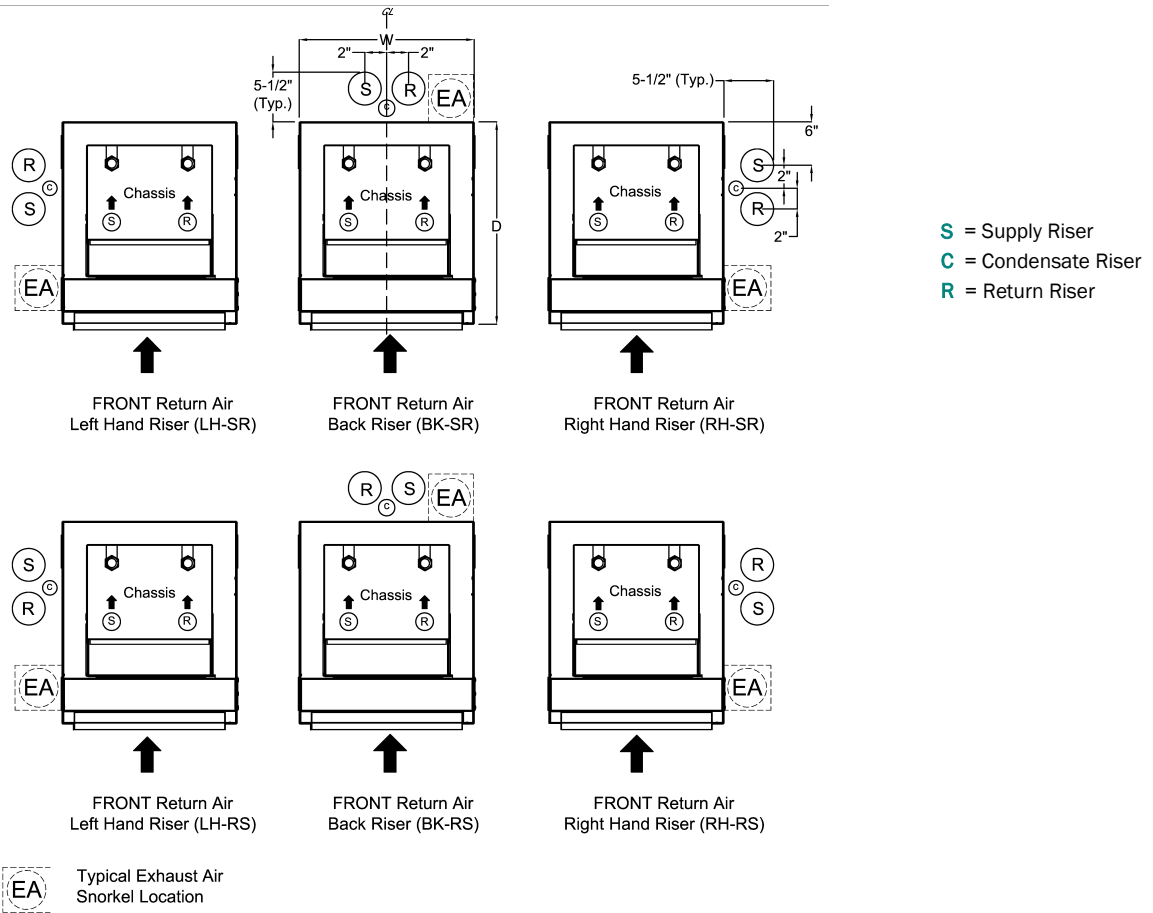
Fluid GPM Limits	
Min. GPM/Ton	2
Design GPM/Ton	3
Max. GPM/Ton	4

CAUTION

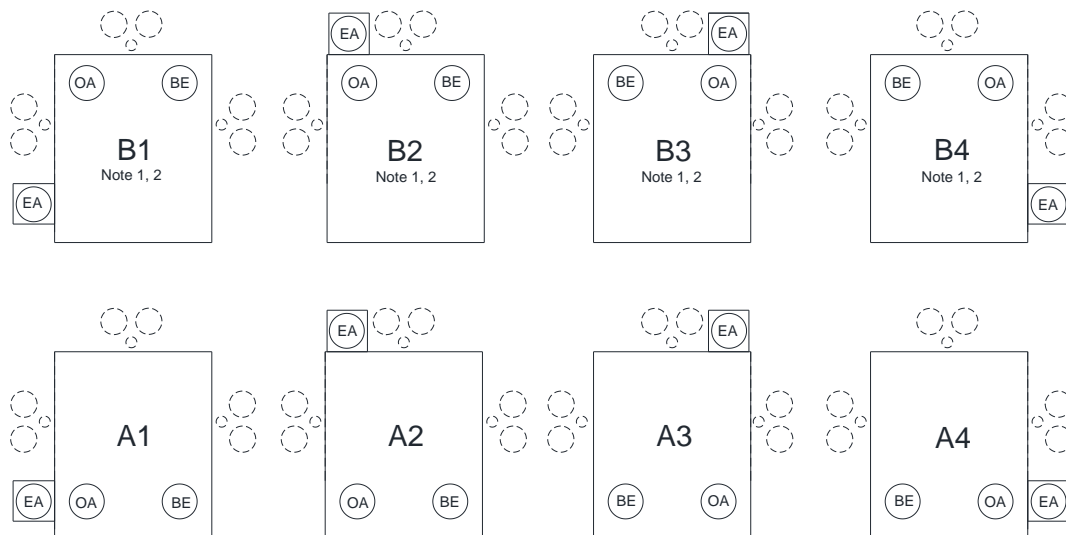
Design limits can not be combined. Combining maximum or minimum limits is not allowed. This could exceed the operation and design limits of the unit.

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

VSHYe - RISER HANDING CONVENTIONS



VSHYe - ERV CONFIGURATIONS (TOP VIEW)

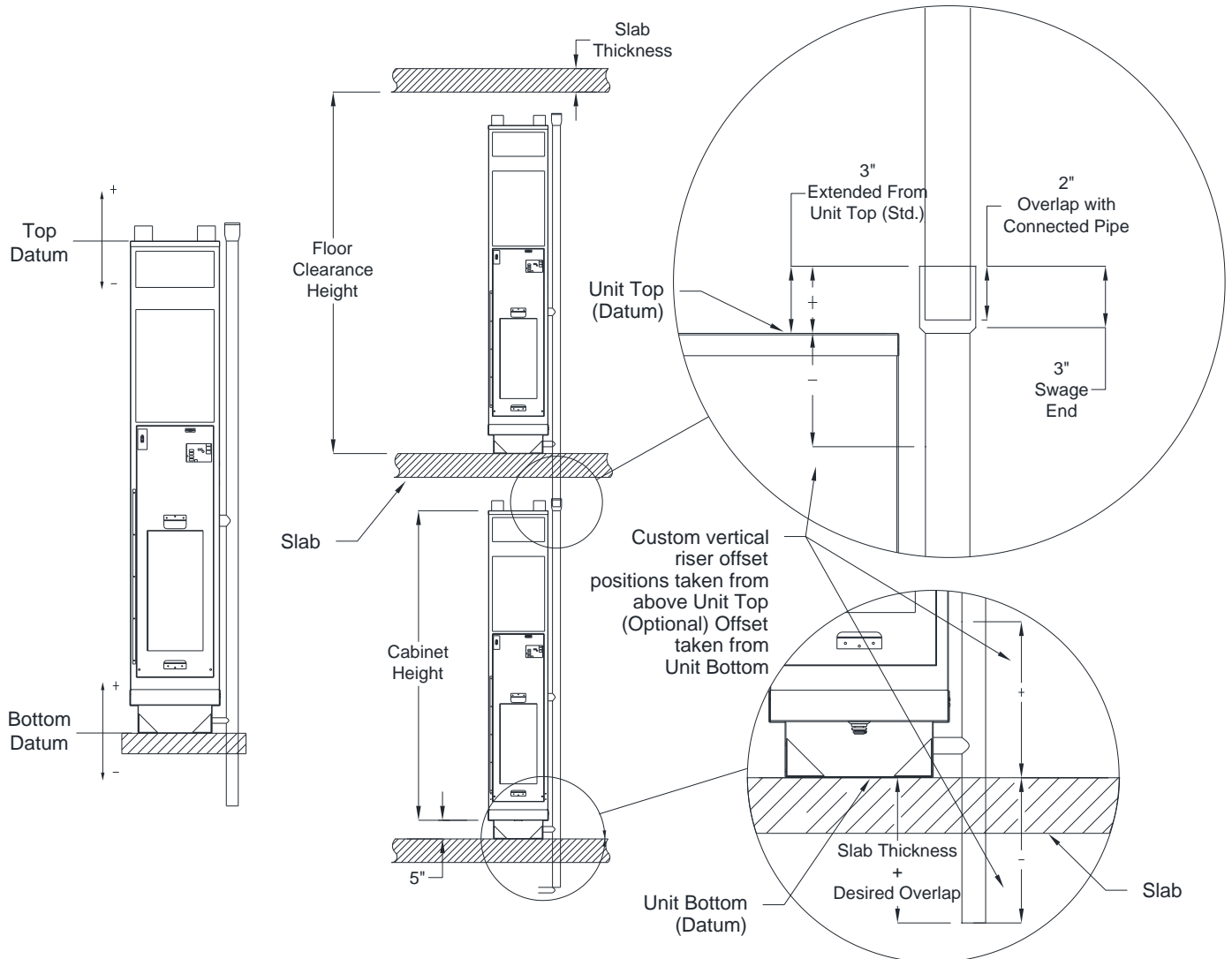


Acceptable Riser Locations:

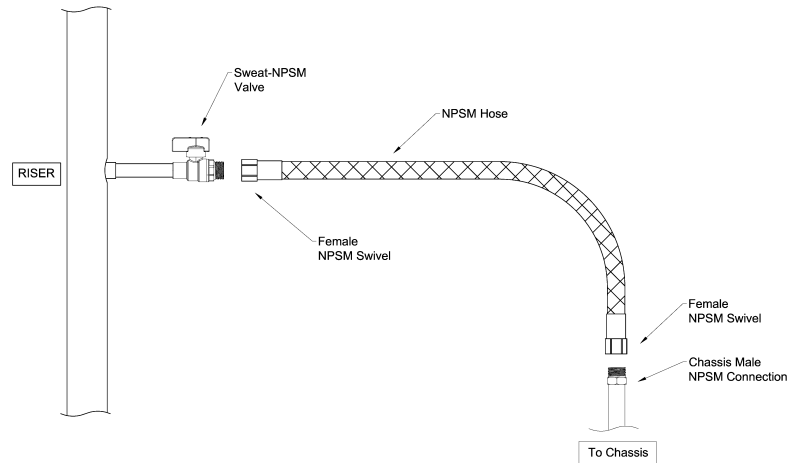
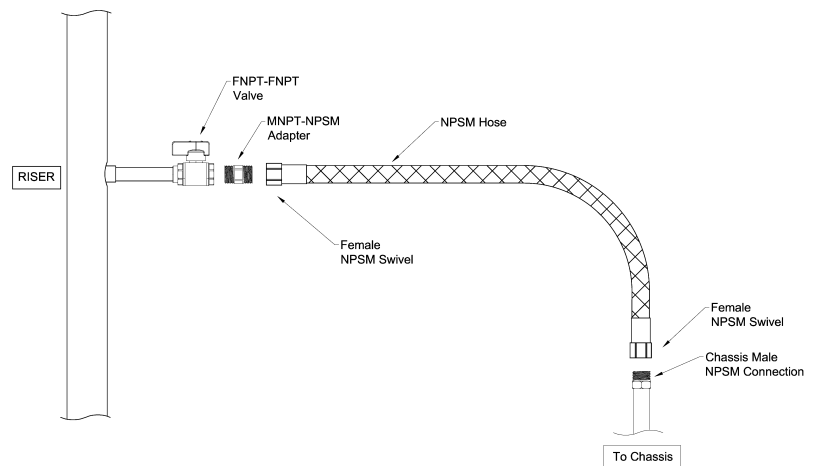
EA - Exhaust Air to Outside
BE - Bathroom Exhaust to ERV
OA - Outside Air to ERV

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

Note:
Configurations A1 and A4 are standard.

VSHYe - 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.

VSHYe - HOSE KIT DETAILS
STANDARD VALVE - SWEAT CONNECTED NPSM

OPTIONAL FPT VALVE - FPT to FPT

Hose Kit Sizes

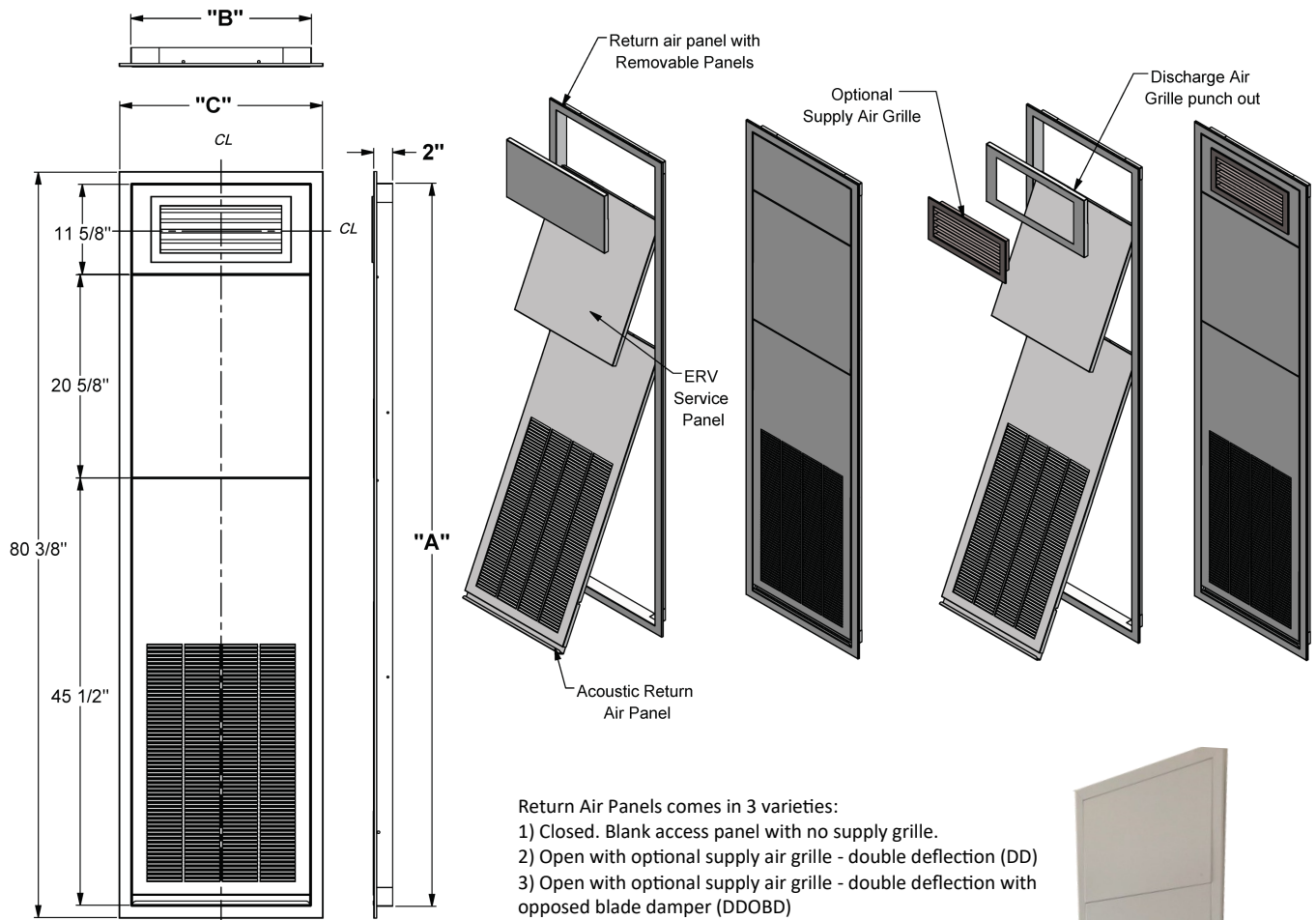
Model	Hose Kit	
	Size (in)	Length (in)
VSHYe 030	1/2	24
VSHYe 040	1/2	24
VSHYe 050	1/2	24
VSHYe 060	1/2	24
VSHYe 080	3/4	30
VSHYe 100	3/4	30
VSHYe 120	3/4	30

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.

VSHYe - RETURN AIR PANEL



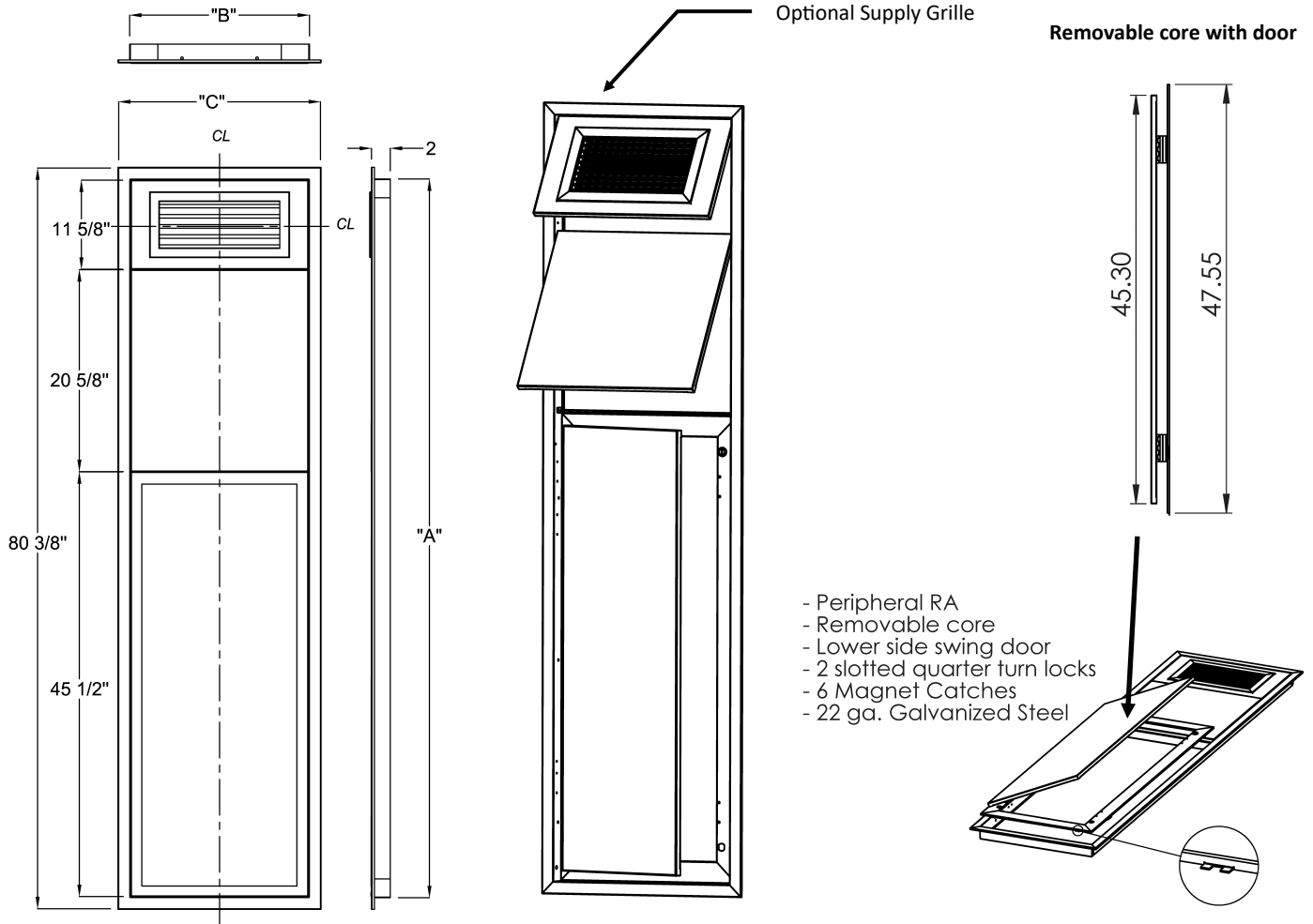
Model	Cabinet Size	Acoustic RA Panel Dimensions (inches)		
		A	B	C
VSHYe 030	Y	78	19 5/8	22
VSHYe 040				
VSHYe 050				
VSHYe 060				
VSHYe 080	Z	78	23 5/8	26
VSHYe 100				
VSHYe 120				

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.



VSHYe - PERIMETER RETURN AIR PANEL


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

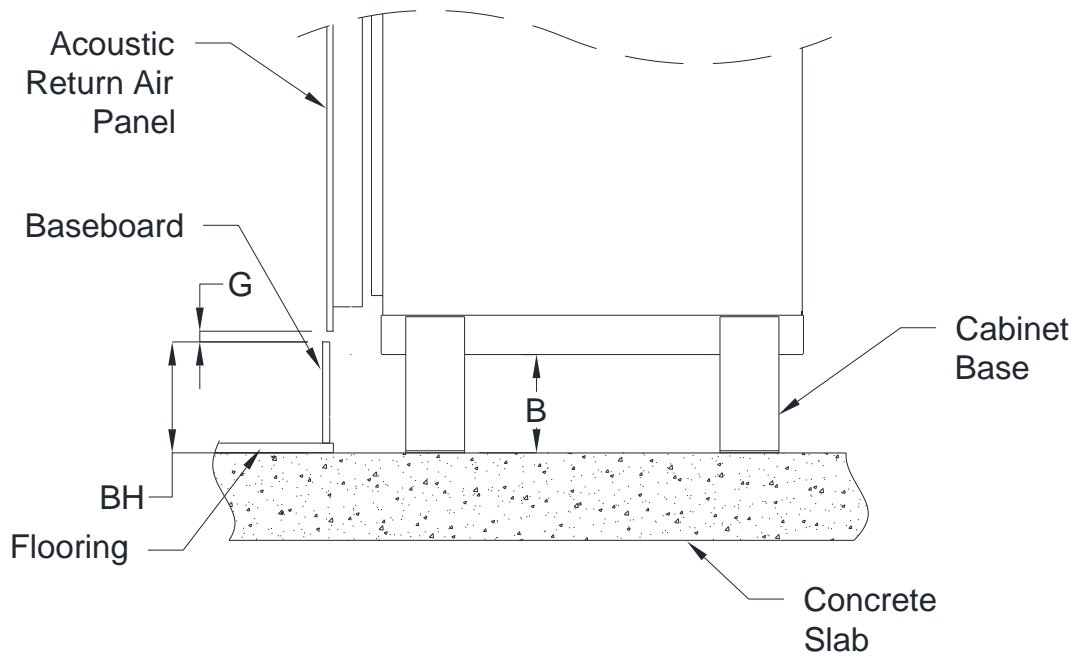
Return Air Panels comes in 3 varieties:

- 1) Closed. Blank access panel with no supply grille.
- 2) Open with optional supply air grille - double deflection (DD)
- 3) 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.

VSHYe - Acoustic Panel Cabinet Base Height Calculation



Acoustic Panel Cabinet Base Height Calculation

Acoustic 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

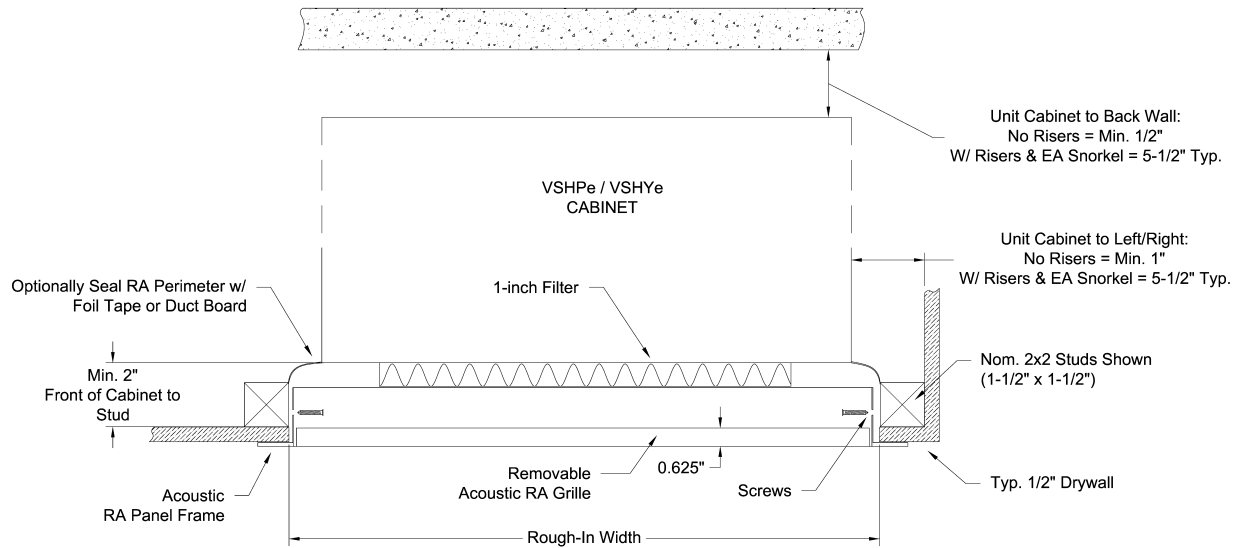
Baseboard Height*	Cabinet Base Height
Up to 4-1/2"	5"
>4-1/2 to 5-1/2"	6"
>5-1/2" to 6-1/2"	7"
>6-1/2" to 7-1/2"	8"

*Includes 1" Total Flooring

*Using gap G= 0.5"

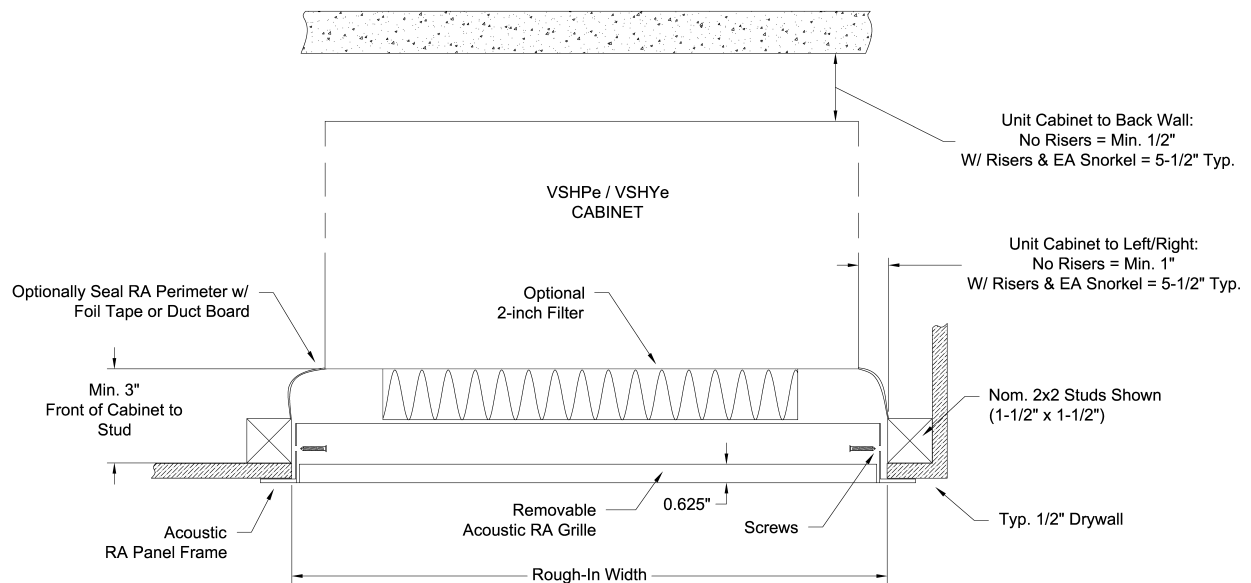
(top of baseboard to return panel flange)

VSHYe - Acoustic Panel Furring Details - Plan View

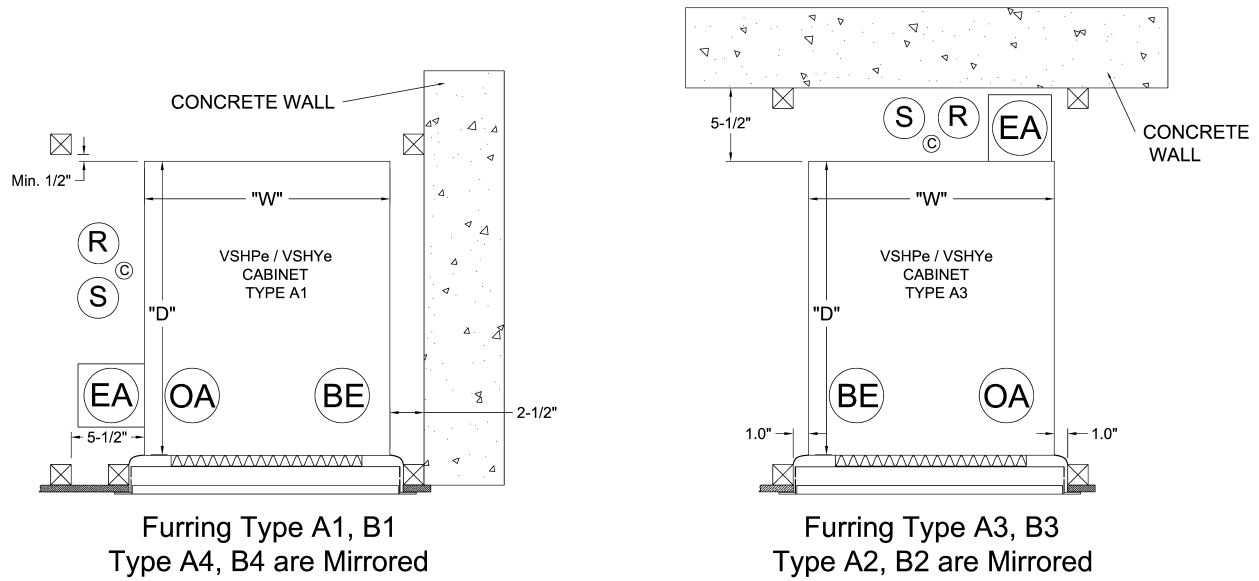


Notes:

- 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.



VSHYe - RETURN AIR PANEL DETAILS - Stud Furring

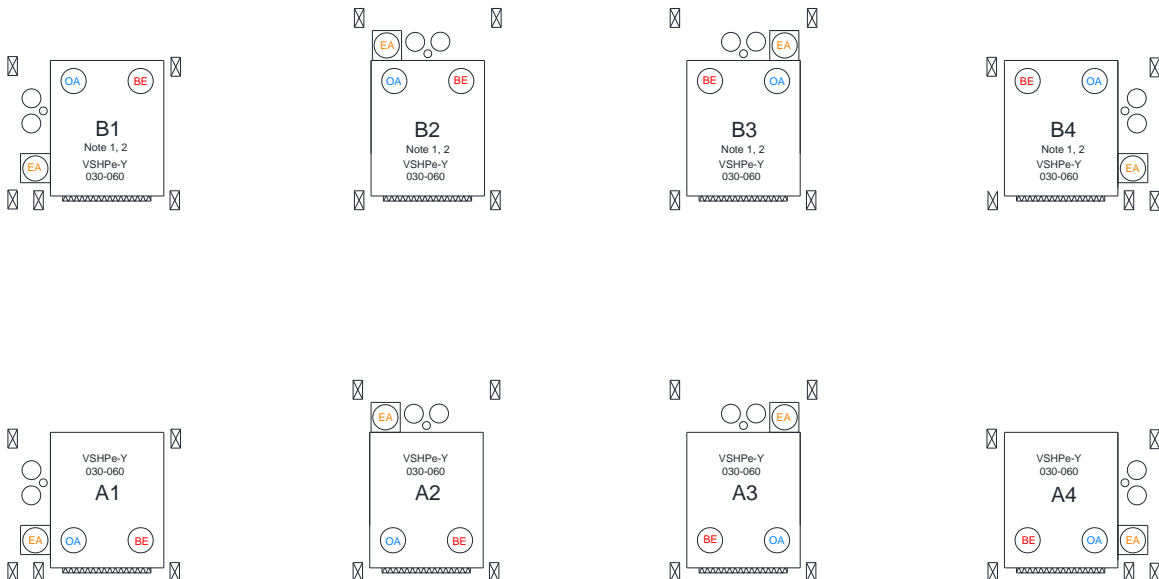


- | | | |
|--|------------------|------------------------------|
| | Return Riser | EA - Exhaust Air to outside |
| | Condensate Riser | BE - Bathroom Exhaust to ERV |
| | Supply Riser | OA - Outside Air to ERV |

Typ. 2x2 Closet Framing

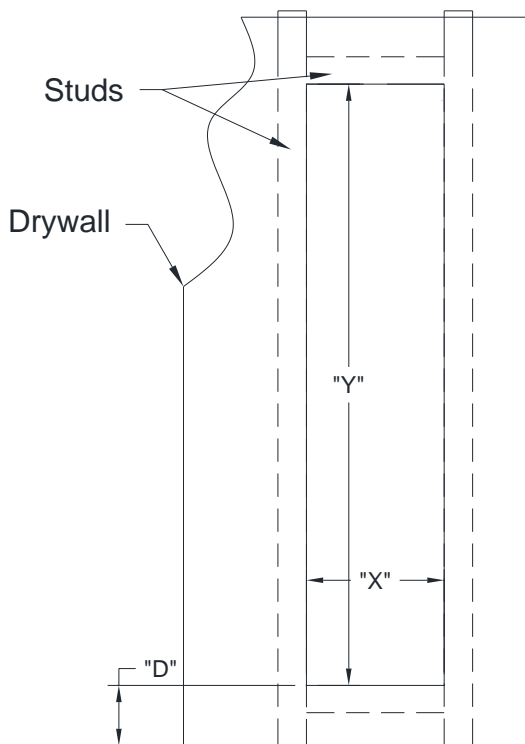
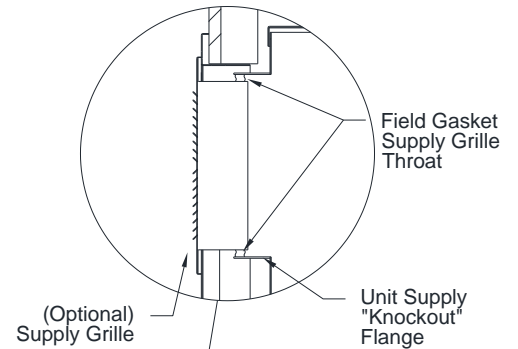
Notes:

- 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).

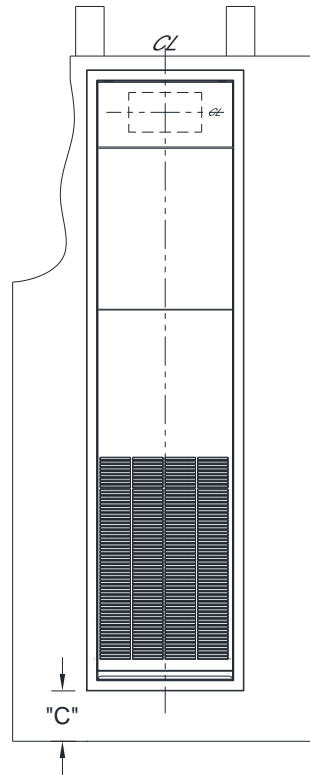


VSHYe - RETURN AIR PANEL FURRING DETAILS (CONT'D)

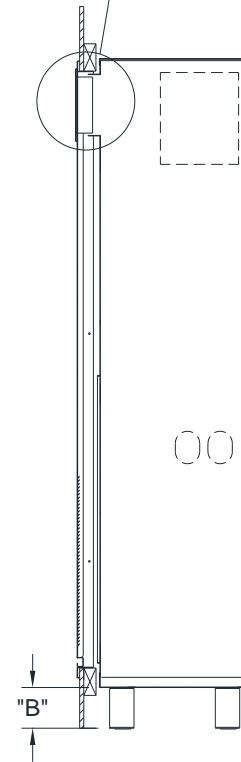
Model	Cabinet Size	Cabinet Dimensions (in)		Rough-In (in)	
		W	D	"X"	"Y"
VSHYe 030	Y	18	21 1/2	20 1/8	78 1/2
VSHYe 040					
VSHYe 050					
VSHYe 060					
VSHYe 080	Z	22	25 1/2	24 1/8	78 1/2
VSHYe 100					
VSHYe 120					



Drywall & Stud
Detail



Front Panel
View



Side Cutaway
View

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

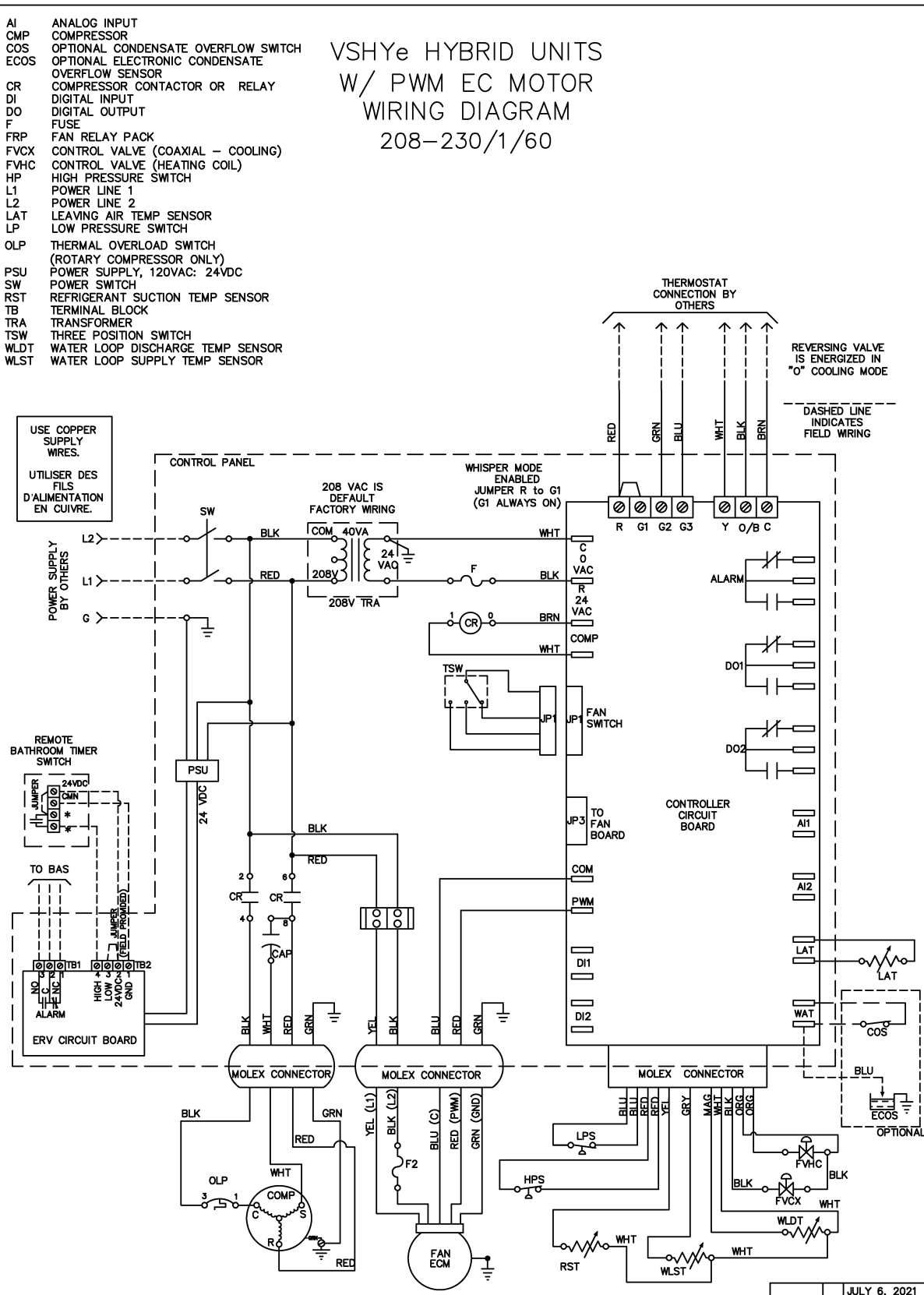
C = Panel Flange Height from Base of Cabinet (**B** + 1")

D = Rough-In Height from Base of Cabinet (**B** + 2")

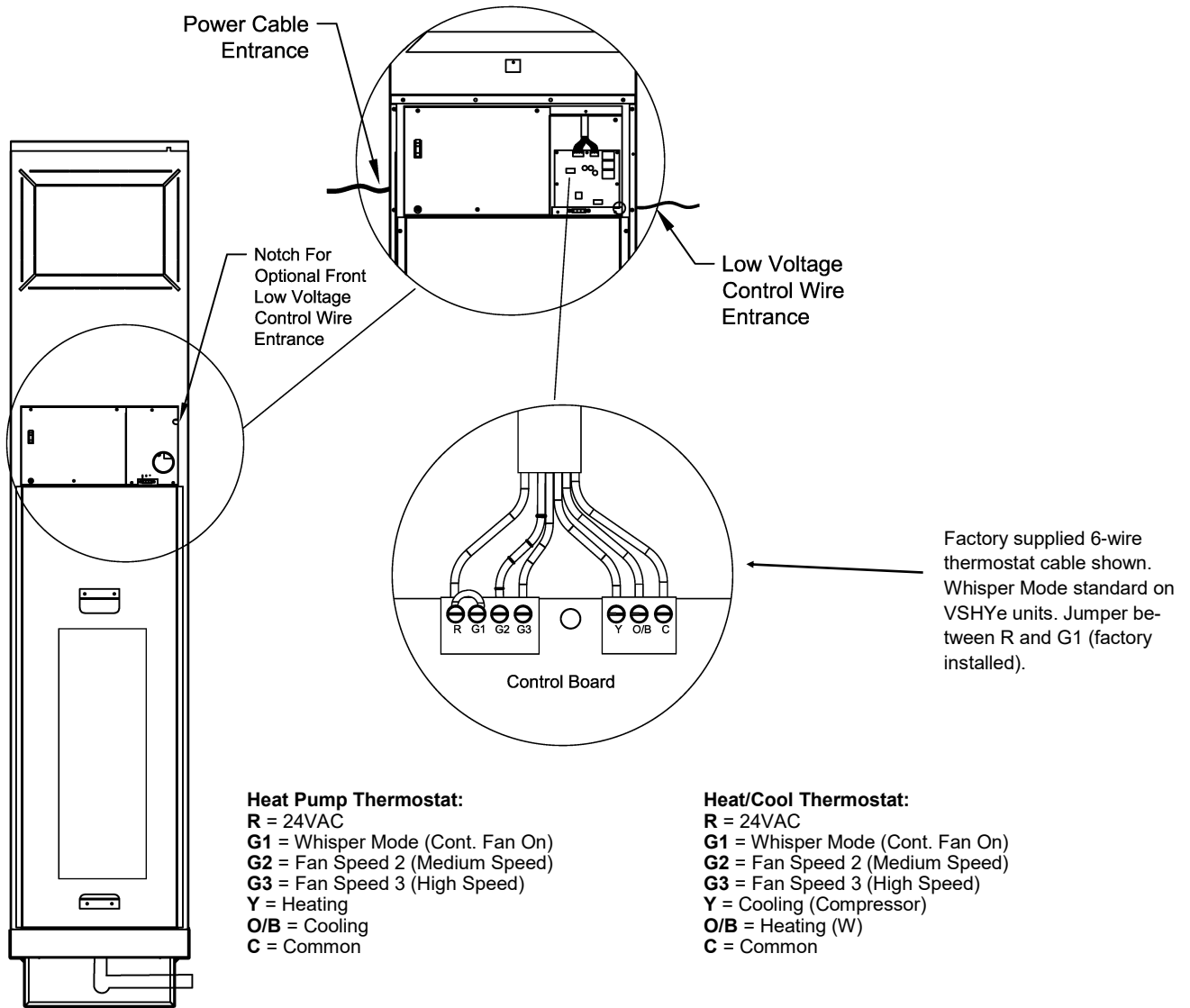
NOTES:

- 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

VSHYe - ELECTRICAL SCHEMATIC



VSHYe - ELECTRICAL CONTROL WIRING



VSHYe - UNIT CONTROLS (ECM)

Fan Control with EC Motors (ECM)

Discrete speed and low voltage PULSE WIDTH MODULATED (PWM) EC motors are utilized to control motor speed between 0 and 100% of full speed. The controller and/or motor are factory programmed to use 3 pre-programmed speeds for Whisper, Medium and High. During a "Fan On" and no request for compressor, unit will operate in 'Whisper Mode' for ultra-low fan speed air circulation.

Thermostat Cable

Unit comes with a 24-inch long standard 6-wire thermostat cable. This cable is factory wired to TB1 and TB2 terminal blocks on the controller board. A minimum 4-wire thermostat cable is required for single fan speed thermostats that do not require a common wire connection. Smart thermostats will require minimum 5-wire thermostat cable to be field installed.

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 fixed to the wiring as connected to the G2 and G3 terminals:

G1 Signal = Whisper Mode (always enabled)

G2 Signal = MEDIUM fan speed enabled.

G3 Signal = HIGH fan speed enabled.

SEQUENCE OF OPERATION

Demand call for Heating or Cooling are initiated at the thermostat.

Call Cooling

When a call for cooling (compressor) request is made, the motorized auto shut-off control valves will divert water flow through coaxial coil. The compressor contactor will then be energized so long as none of the following fault conditions are present:

- High-Pressure Alarm
- Low-Pressure Alarm
- Condensate Over Flow Alarm
- Compressor Anti-Short Cycle 7 min. timer has not expired
- Entering Water Temperature exceeds threshold.
- Leaving Water Temperature exceeds threshold.

When call for compressor (cooling) request is terminated, coaxial motorized auto shut-off control valve will close and the blower fan will remain open for an additional 30 seconds.

Call for Heating

When a call for heating request is made, the motorized auto

shut-off control valves will divert water flow through the hydronic hot water heating coil. When call for heating request is terminated, heating coil motorized auto shut-off control valve will close and the blower fan will remain open for an additional 30 seconds.

Low-Pressure Bypass

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

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.

VSHYe - MECHANICAL SPECIFICATIONS

1 GENERAL

Vertical stacked hybrid heat pump units shall be Omega VSHYe 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 1/2 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 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, mould 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 connections. Contractor shall install flex connection on all discharge openings.

There shall be no rigid connection to supply-air discharge grilles or supply ducts.

2.11 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 handling 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" foil faced fiberglass 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), plastic, aluminum, or HRV cores shall not be accepted.

2.17 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.

2.18 ERV shall be fitted with a modulating outside air damper controlled by an electronic actuator that will 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. Single inlet fans are not accepted.

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

3.3 ERV unit shall be fitted with two Backward Inclined (BI) DC fans. Fan motor speed shall be fully controllable via internal signal. Fan power shall be limited to 45 watts per fan.

VSHYe - Mechanical Specification (Cont'd)

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.

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. Provide plug type electrical connections 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.

4.4 Chassis shall employ two 2-way valves mounted in the chassis compartment to minimize water pressure drop across water circuit. Water flow shall be directed through either the coaxial condenser coil during a call for cooling, or through hydronic heating coil during a call for heating. During a no demand situation, controls valves can be closed to reduce pumping power requirements. Units with 3-way valves are not accepted. By-pass units shall be set in the field using the DIP switch setting on the control board.

4.5 The hydronic heating coil shall be integral to the refrigeration coil. Units with separate heating and cooling coils are not accepted. Integrated hybrid coil shall minimize air pressure drop and maintain efficient fan performance. The Air side coils shall have copper tubes mechanically bonded to aluminum fins. Coils shall be sized to meet scheduled performance for cooling and heating.

4.6 Compressor shall be hermetically sealed type with internal thermal overload protection. Compressor shall be mounted on rubber vibration isolators.

4.7 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.

4.8 (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.

4.9 (Optional) The chassis shall employ optional y-strainer with #20 mesh screen mounted in the chassis compartment to filter any debris and shall be field serviceable.

4.10 (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.

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, (optional) 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
- **(Optional)** Condensate Overflow Switch
- Entering Water Temperature sensor
- Leaving Water Temperature sensor
- Suction line "freeze-stat" temperature sensor
- 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.

5.5 Thermostats shall be remote mounted. Unit will come with a standard 24-inch thermostat whip factory wired 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 or heating.

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 Fresh Air. Whisper mode shall occupy the Low fan speed terminal G1. Field selectable Medium (G2) and High (G3) fan speeds are available.

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 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 representatives of the equipment manufacturer.