omega
HEAT PUMP

OMEGA VSHPe SERIES

Product Guide

VERTICAL STACKED WATER SOURCE HEAT PUMPS

with Integrated ERV

MODEL: VSHPe (SE), VSHPe-G (HE)

STANDARD & HIGH EFFICIENCY

FAN CABINET DEV. F

CHASSIS DEV.F & DEV. G

CONTROL BOARD V3

DOCUMENT RELEASE: OMEGA-VSHPe.F-PGD-2205.1

Supersedes OMEGA-VSHPe.F-PGD-2204

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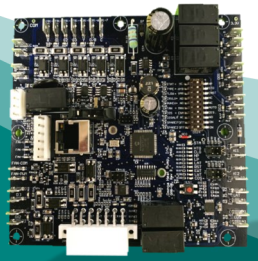

TABLE OF CONTENTS

OMEGA Heat Pumps
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1. GENERAL DESIGN

1.1 Product Overview

All Omega Vertical Stack Heat Pumps with Integrated ERV (VSHPe Series) are engineered for quiet and reliable year round operation.

Reliability

Omega water-source heat pump systems provide reliable year round heating and cooling operation. Each unit features an advanced microprocessor controller for ensuring reliable and energy efficient heating and cooling comfort. The integrated ERV module is powered by a smart microprocessor controller for optimized fresh air exchange and energy recovery.

Serviceability

Omega VSHPe units feature a slide out chassis and a blower assembly which are easily accessible through the front return air panel. For servicing or repairs, a spare replacement chassis can be temporarily swapped in allowing for uninterrupted operation. Integrated ERV is accessible through an easily removable front access panel. Lightweight ERV core slides out to simplify routine maintenance. The unique design allows for access to all components and sensors without the need to slide out and disassemble bulky ERV module as found in other equipment.

Energy Efficient

A heat pump system can transfer energy to different zones in a building. During moderate weather, solar heat gain on the south side of a building may require cooling while the north side requires heating. Fresh air introduction is done through the integral ERV to recover energy that would be otherwise lost.

Customizable

Omega units can be customized to meet the specific requirements of any project. Some options include: choice of supply discharge air locations and sizes, ERV port and fresh air duct locations, and remote thermostat control.

Two Phase Installation

The equipment is shipped to site in two stages for integration with the phases of construction. This avoids potential issues with storage, and on-site damage and allows mechanical units to be installed in acceptable environmental conditions.

Phase 1

- During the initial stages of construction, the cabinets are installed. As construction progresses, they become part of the interior wall structure.

Phase 2

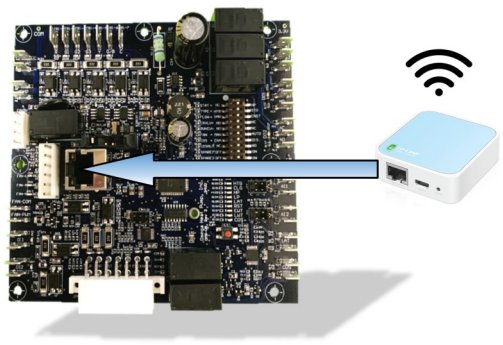
- The refrigeration chassis is shipped as required and installed into the cabinet after riser loop commissioning and majority of construction is completed. Riser loop must be cleaned and flushed and chemically treated prior to installing chassis units.

Testing & Quality

To maintain the highest level of quality control, each refrigeration chassis is factory charged and tested before being shipped to the job site. The chassis production and testing line features a computer controlled 6-step quality control (QC) system to ensure that every stage of chassis production is tested and re-tested. Units are performance tested in Omega's state-of-the-art in-house test facility to ensure unit performance and reliability meets or exceeds industry standards. Each unit is AHRI certified and ETL listed.

Diagnostics & Data Logging

Each unit features Omega's latest heat pump control technology. The on-board LED display provides quick troubleshooting. Using the wireless webpage tool customer can do a deep dive for greater diagnostic and data log information to make informed decisions. Easily accessed through a smartphone, tablet or laptop.



1.2 Key Features

Energy Efficient Design

- High efficiency compressors and blower motors
- High efficient ERV and DC fan motors
- Optimized air-coil circuiting of refrigerant coils
- Refrigerant metering thermal expansion valves
- Low pressure drop water coaxial coils
- Coefficient of Performance (COP)/Energy Efficiency Ratio (EER) meets or exceeds ASHRAE 90.1

Quiet Operation

- High density sound insulated cabinet
- Noise attenuating return air panels
- Double isolated chassis base
- Compressor mounted on vibration isolators

Space Considerations

- Compact footprint
- Quiet operation
- Fire and mould resistant insulation
- Heavy duty cabinet construction
- Architectural supply grilles and return air panels
- Durable, long life gasketing on chassis
- Convenient room side, front access to the air filter
- Choice of discharge air opening configurations and ERV port configurations
- Riser mounting location flexibility

Acoustical Design Features—Standard Silver Series

- 1-inch high density sound insulation throughout
- Double isolated chassis base to isolate the refrigeration chassis from the cabinet
- Compressor elastomeric isolation mounts
- Unit base with closed cell foam isolation pads
- Optimized design of refrigerant piping for reduced compressor noise

Reliability

- Factory tested and charged with R-410A
- Industry leading rotary and scroll compressors
- Modern components and microprocessor controlled safety protection devices

Environment

- Eco-friendly refrigerant (R-410A)
- Recyclable materials used in unit construction
- Energy efficient EC fan motors
- High-efficient DX and water coils

Service

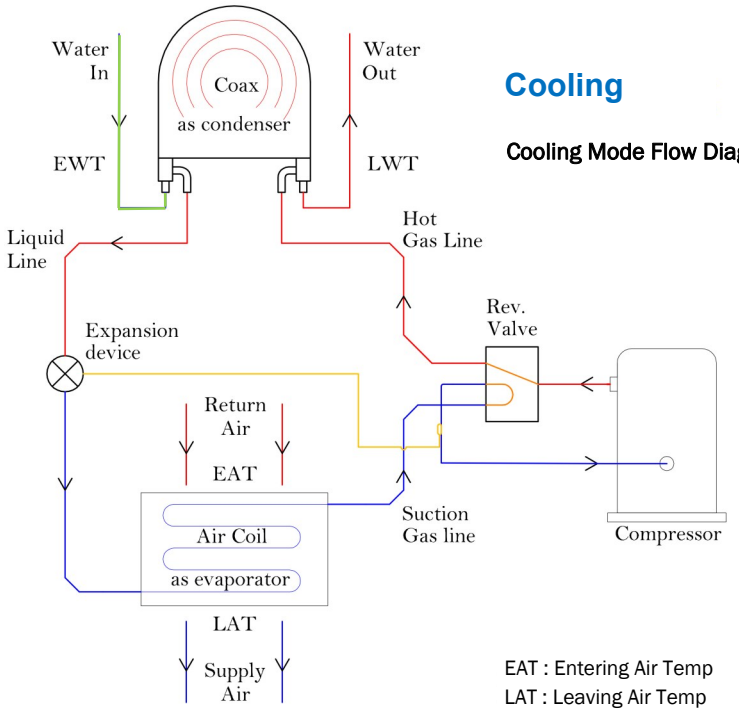
- Slide-out chassis for easy removal and servicing
- Slide out ERV Core for maintenance and cleaning
- Easily serviceable ERV components and sensors
- All control components in one location
- Plug-n-play harnesses
- Capacitor in front of unit
- Easy disconnecting water connections
- Refrigerant service access ports
- Simple LED diagnostics on control board
- Wireless Webpage diagnostics
- Test-mode and data logging for troubleshooting

Certification

All Omega products are listed by ETL (Intertek) Omega products conform to UL STD 1995 and certified to CSA C22.2 NO. 236.

VSHP (HRP) units are AHRI certified as per ANSI/ASHRAE/ISO 13256 and conform to CAN/CSA-C13256-1.

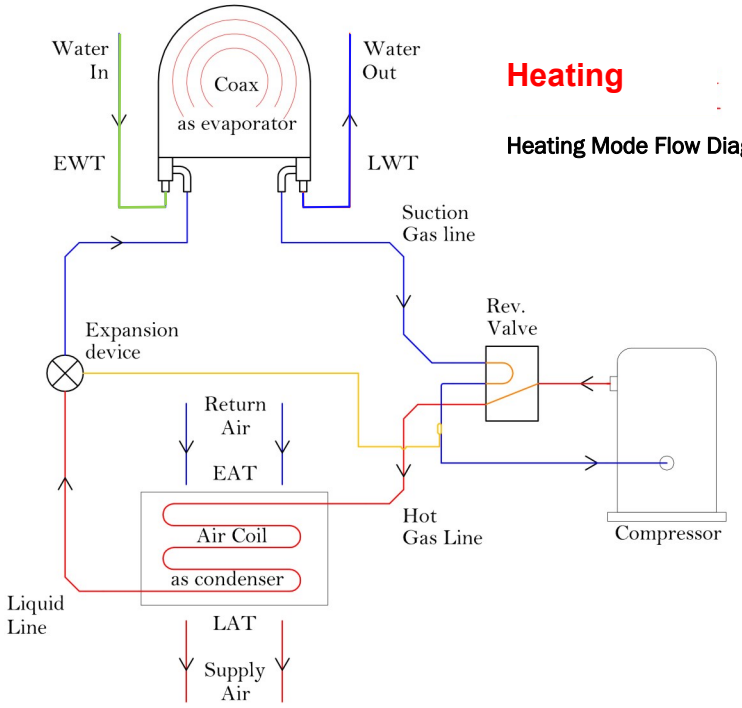
1.3 Heat Pump Operation Schematic



Cooling

Cooling Mode Flow Diagram

EAT : Entering Air Temp
LAT : Leaving Air Temp
EWT : Entering Water Temp
LWT : Leaving Water Temp



Heating

Heating Mode Flow Diagram

2. PRODUCT DETAILS

2.1 Standard & Optional Features

STANDARD FEATURES

Cabinet

The galvanized 20 gauge sheet metal cabinet is designed for structural rigidity, installation flexibility, and serviceability. Cabinet heights of up to 120" are available. Cabinet interior is lined with 1" thick acoustic, thermal, mould and fire resistant insulation rated to meet NFPA 90.

Standard Efficiency (SE) Chassis

Standard efficiency chassis balances cost with efficiency requirements. Unit meets or exceeds AHRI minimum efficiency requirements.

Control Panel with Advanced Microprocessor

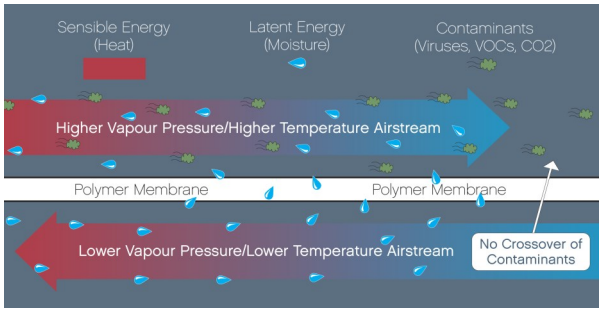
All controls and contactors are mounted in the electrical box connected with quick connect plugs. Each unit features microprocessor controller. Unit comes with optional four temperature sensors: entering and leaving water temperature sensors (EWT & LWT), suction freeze-stat sensor (RST), and supply air temperature (SAT) sensor. All controls are accessible from the front of the unit for easy service and troubleshooting. Controller status, diagnostics, and data logger can be accessed through a webpage tool.

Integral ERV (Energy Recovery Ventilator)

ERV module is located above electrical panel inside discharge plenum. The CORE Energy Recovery Ventilation Solutions polymer core and all controls and sensors are easily accessible through the front return air panel.

ERV Microprocessor is located in the unit electrical box. ERV Core is made of a polymer membrane and transfers both heat and humidity (sensible and latent energy transfer) for one air stream to another while preventing the transfer of odors, gases, VOCs and contaminants.

ERV Core is water washable and easily accessible through the front of the unit via ERV service cover panel. No reaching in the back of the unit or disconnecting & sliding out entire ERV module.



ERV controller and logic modulate air stream to maintain fresh air introduction temperatures above 50F supply discharge to prevent dumping of cold air into occupied space. ERV is powered by dual ECM fans with fan speed control located in the electrical box for balancing OA (Outdoor Air) and BE (Bathroom Exhaust). During bathroom exhaust fan operation ERV bathroom timer will send signal to unit to operate ERV fans on high speed mode. During normal fresh air circulation, ERV fans operate on low fan speed.

ECM & Blower

A centrifugal forward curved double width double inlet (DWDI) blower with a direct drive motor assembly with easy removal and servicing provides air delivery. Multi-speed EC motors (ECM) are standard for improved fan operating efficiency and fan performance across a wider operating range over traditional PSC motors. Includes Omega's "Whisper Mode" fan-on operation capability for low CFM continuous air circulation.

Field Selectable Supply Air Discharge

Cabinets feature our standard "Knockout" style supply discharge openings for field selectable supply air openings in Left, Right, Front, Back, and/or Top configurations. Openings are available on the same side as mounted risers for added flexibility.

DX Coil

Air to refrigerant coils are multi-row with copper tubes and enhanced aluminum fins. Coil fins are mechani-

cally bonded to the tubes. The coils are fully cased with a handy grip point for chassis removal.

Compressors
High efficient R-410A compressors are standard, rotary type 0.75 to 1.5 Ton (VSHPe 030-060) and scroll type 2 to 3 Ton (VSHPe 080-120). Compressors are mounted to the chassis frame with elastomer vibration isolators to minimize vibration transmission. As standard the compressor chassis is mounted on a double isolated base for enhanced noise attenuation to prevent vibration transmission into the occupied space.

Coax-Coil
The water to refrigerant coaxial coil is tube in tube with a convoluted inner copper tube design. The coaxial coil is selected for minimum water pressure drop and low fouling characteristics. The coils are optimized for heat pump operation.

Stainless Steel Drain Pan
Standard stainless steel drain pan provides corrosion resistance. Drain pan is positively sloped, externally insulated with a 7/8 inch O.D. connection and factory mounted p-trap condensate hose.

Reversing Valve
A 4-way reversing valve, pilot operated, sliding piston type with solenoid coil is installed in each heat pump chassis to change refrigerant flow. Reversing valve is installed in "Energized to Cool" mode and "Fails to Heating" mode.

Thermostatic Expansion Valve (TXV)
All units come with a bi-flow thermostatic expansion valve (TXV). TXV is precision machined brass assembly providing precise refrigerant flow metering with bleed port.

Air Filter
Unit comes with standard 1-inch MERV 8 disposable media filters.

OPTIONAL FEATURES

High Efficiency (HE) Chassis
High-efficiency chassis where higher operating efficiency is required. Higher efficient components increase operating efficiency. Ideally suited for geothermal applications. Larger heat exchanger surface area provides maximum efficiency.

Auto Shut-Off Control Valve
Optional factory installed 2-way automatic shut-off control valves shut off water flow to the unit when compressor is not operating. Available in close-off pressures 25 psig low close-off, 40 psig, and 50 psig high close-off pressure.

Automatic Balancing Valve
Optional automatic balancing valves are factory installed for automatically limiting water flow through the unit to the nominal rated flow rate (±10% of rated GPM) over a large differential pressure range of 2-80 psig (3-80 psig for VSHP 080 to 120 units).

Y-Strainer (HE Chassis)
Optional 20 mesh y-strainer installed on the water circuit inside the chassis.

Condensate Overflow Sensor (COFS)
Condensate overflow sensor (electronic) is mounted to the unit drain pan for detecting overflow conditions such as a clogged condensate drain. If condensate switch is tripped compressor operation is stopped.

Supply, Return & Condensate Risers
Risers are available in Type M and Type L copper. Factory supplied risers come standard with manual shut-off isolation ball valves soldered to the riser tee. Risers can be ordered swaged or as straight pipe and with optional insulation.

Geothermal (GEO)
A geothermal option (GEO) package includes an insulated water circuit and condenser coil to prevent condensation. Geothermal option is only intended for fluid loops containing a glycol mixture for freeze protection. If a water only loop is being utilized, it is recommended to select the Low Temperature Water option.

Coaxial Freeze Protection (LTW)
A Low Temp Water (LTW) option package is designed for low temperature heating water loops below 55°F EWT providing coaxial freeze protection. Unit is fitted with high pressure water safety switches to shut compressor operation in the event of a high pressure situation.

Return Air Panel

Omega offers an **Acoustic** and a **Perimeter** style ERV panel. Acoustic is a stamped blade style, top hinging removable panel. Panel comes with three removable sections: lower section allows access to compressor, blower section and electrical box; middle panel accesses ERV core and sensors; and upper panel serves as either a discharge grille or blank panel, both of which allow access to modulating damper. All panels are easily removed for quick servicing.

RS-485 Communication Board

A RS-485 add-on communication board is supplied to communicate with SmartONE® building automation systems. Includes remote temperature sensor (RTS). RTS acts as back-up thermostat air temperature sensor in the event of communication disruption with in-suite wall pad.

MERV 13 Filter

Unit comes with 2-inch filter rack with MERV 13 rated pleated filter for enhanced air filtration and performance.

Corrosion Protected DX Coils (HE Chassis)

DX evaporator coils are available with two coating options: Epoxy coated (EC) meeting 1000 hours of Salt Spray ASTM B117 protection; or Electrofin® E-coat (EF) an electro-deposition coating process meets corrosion resistance of 15,000 hours salt spray resistance per ASTM B117. Coated coils provide superior corrosion protection and extended life expectancy over traditional non-coated coils.

Cupro-Nickel Heat Exchanger

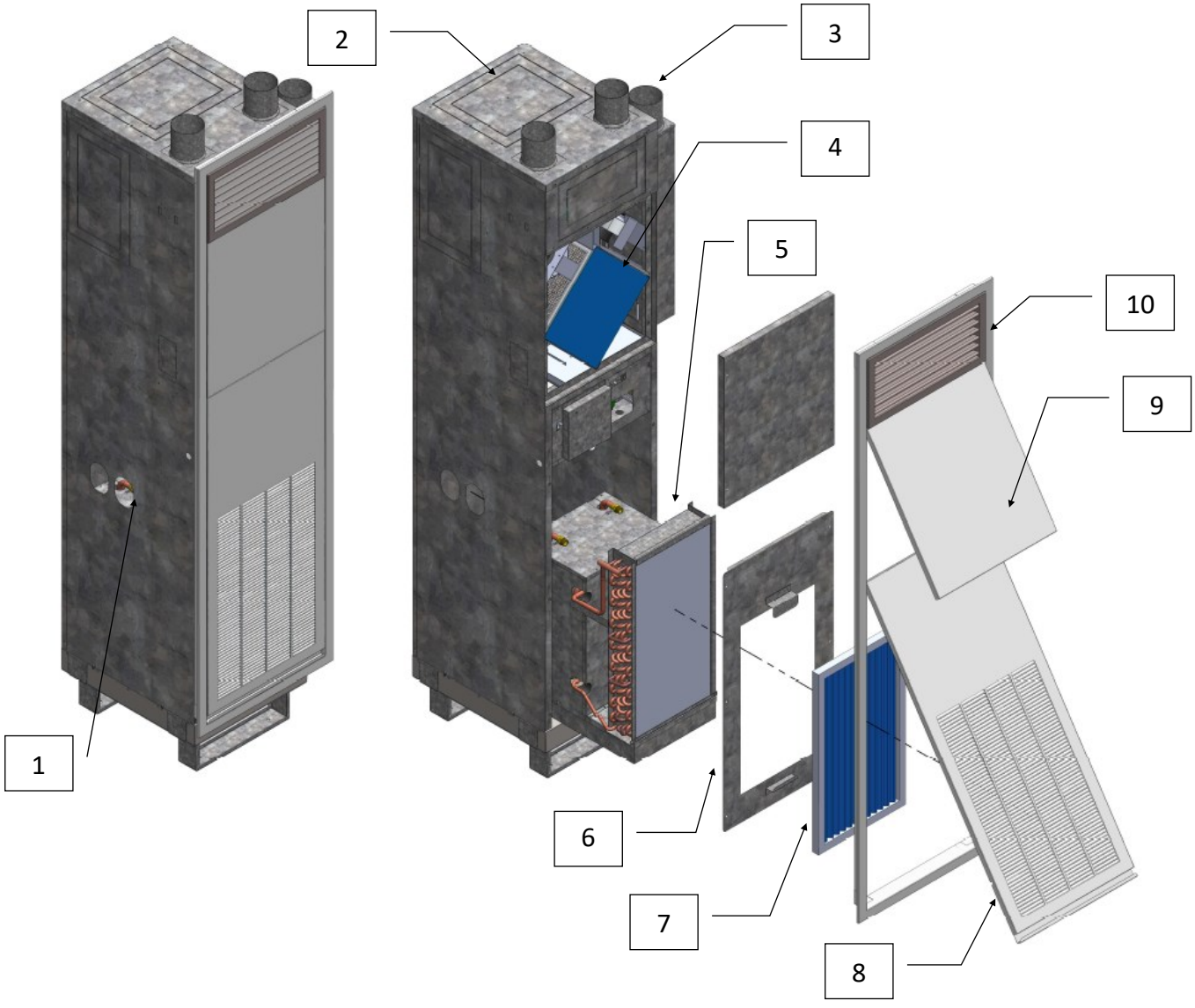
Optional cupro-nickel coaxial coil provides excellent corrosion resistance versus standard copper coaxial from loop water corrosion and fouling. Ideally suited for use with open loop systems.

BTU Meter

Units can be configured to accept various BTU meter applications. Contact factory for more details.

2.2 VSHPe Assembly 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. 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.



2.3 Noise Attenuation Features

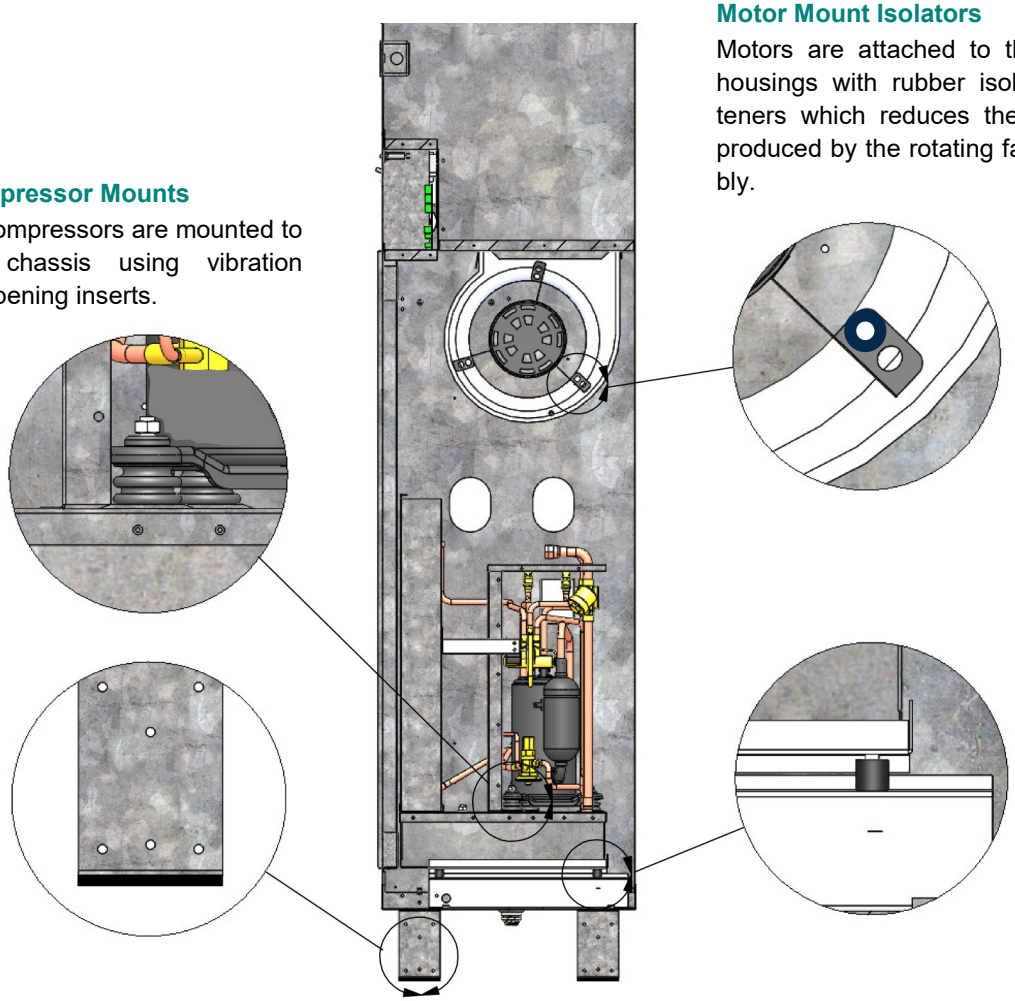
Omega Heat Pump VSHPe units offer 4 separate methods of vibrational isolation (Shown below).

Motor Mount Isolators

Motors are attached to the blower housings with rubber isolation fasteners which reduces the vibration produced by the rotating fan assembly.

Compressor Mounts

All compressors are mounted to the chassis using vibration dampening inserts.



Unit Foot Insulation

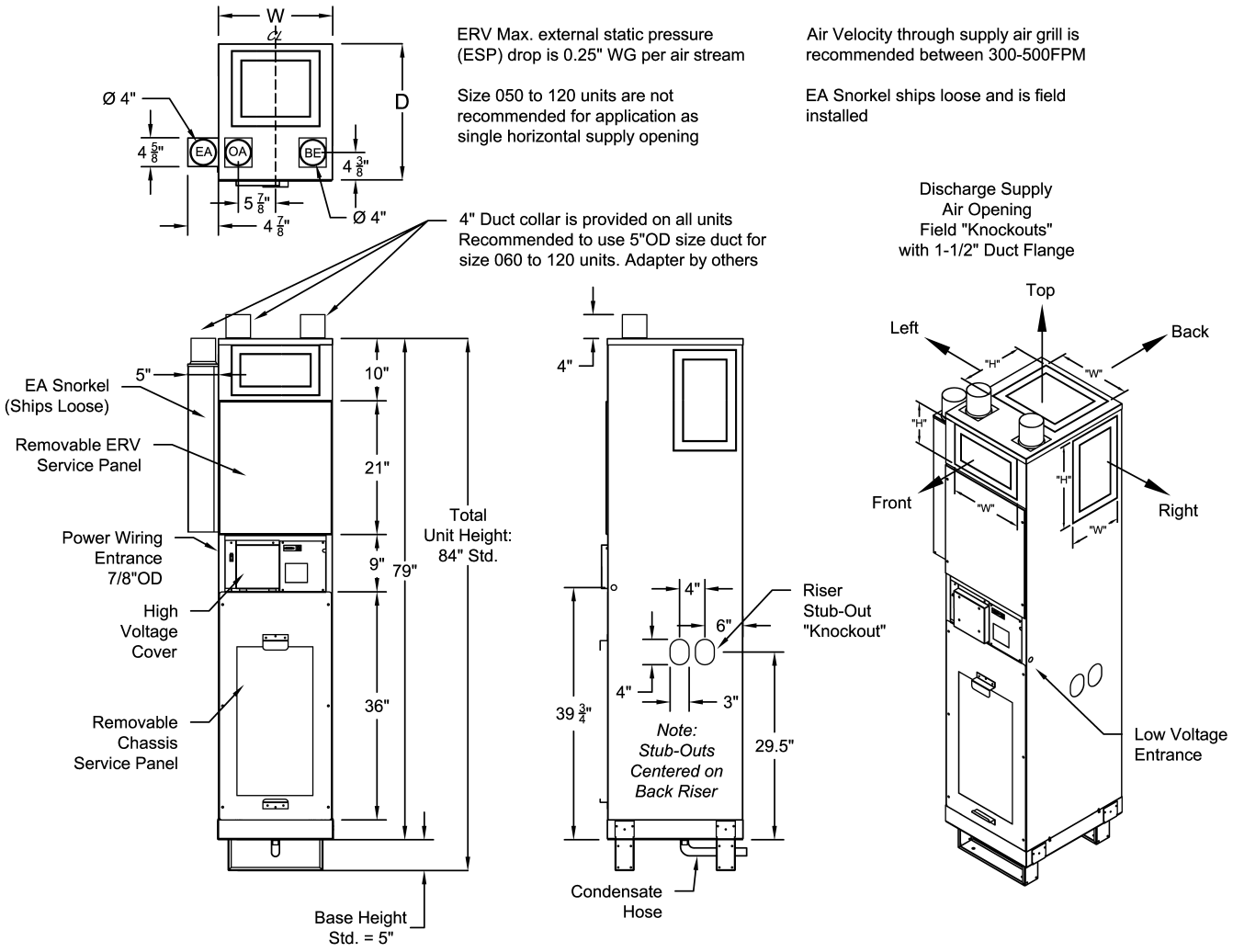
1/4” closed cell foam pads are factory installed under the cabinet base to isolate the unit from the floor surface.

Vibrational Rail

The refrigeration chassis is mounted on a double isolated base with rubberized dampeners to isolate the chassis from the cabinet to minimize noise

3. CABINET DIMENSIONS & CONFIGURATIONS

3.1 VSHPe Series Cabinet



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

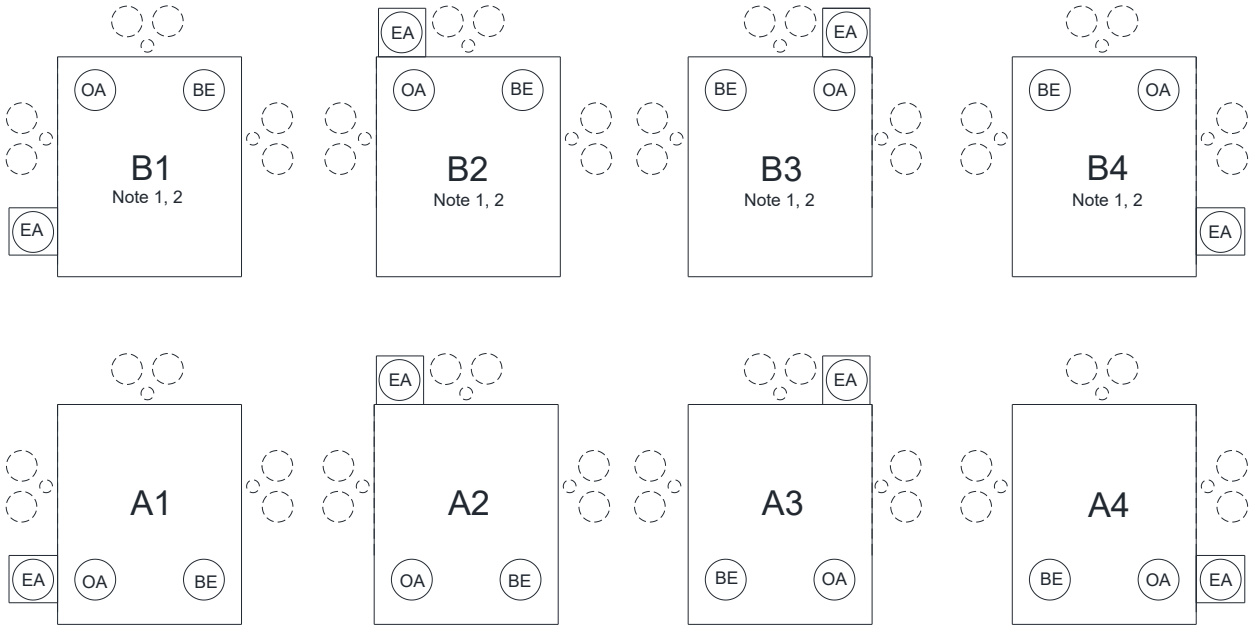
VSHPe Cabinet Dimensions

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	21.5	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	25.5	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.

3.2 ERV Configurations (Top View)

Omega VSHYe cabinet features up to 8 ERV Port configurations. Left Hand (Type A1) and Right Hand (Type A4) are our standard ERV port configurations. Additional configurations are available as shown below. See Furring section for more details.



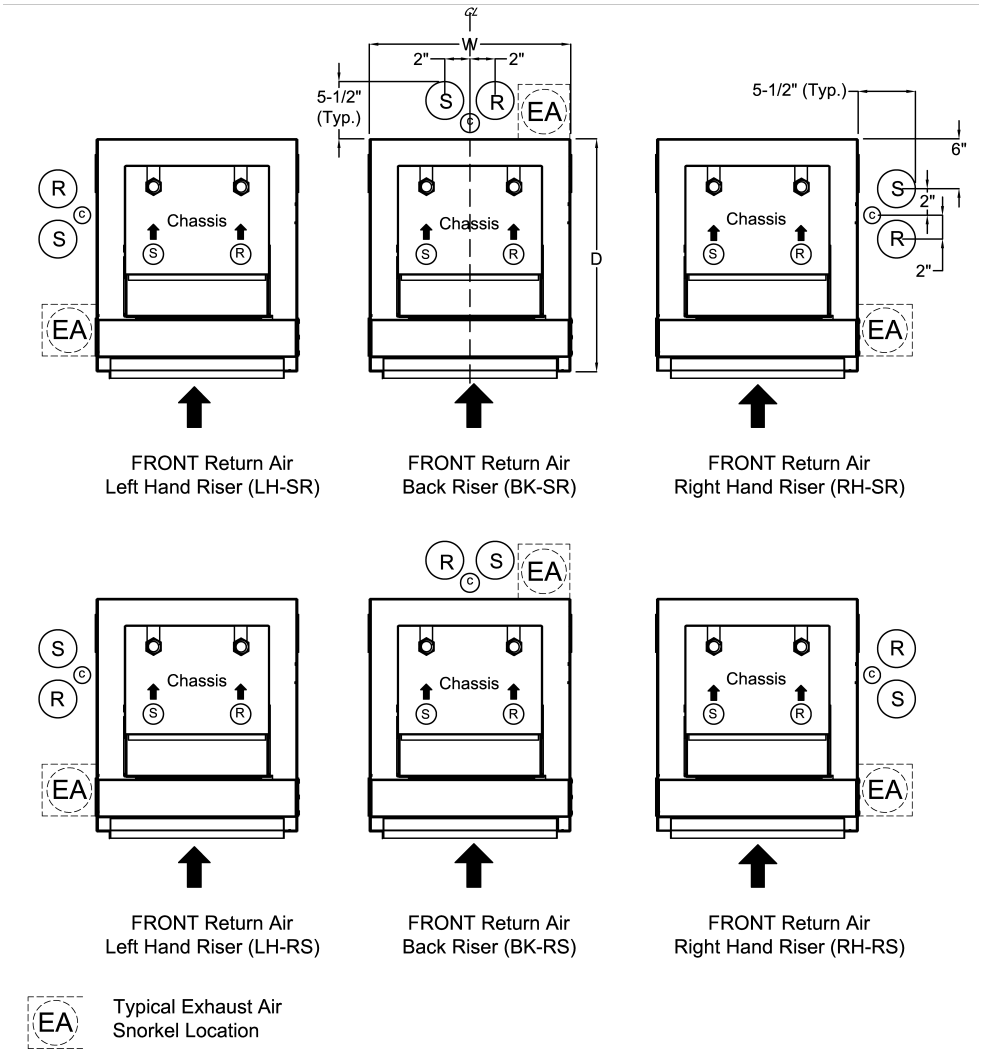
Acceptable Riser Locations:

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

4. RISERS & HOSE KITS

4.1 Riser Handing Conventions (Top View)

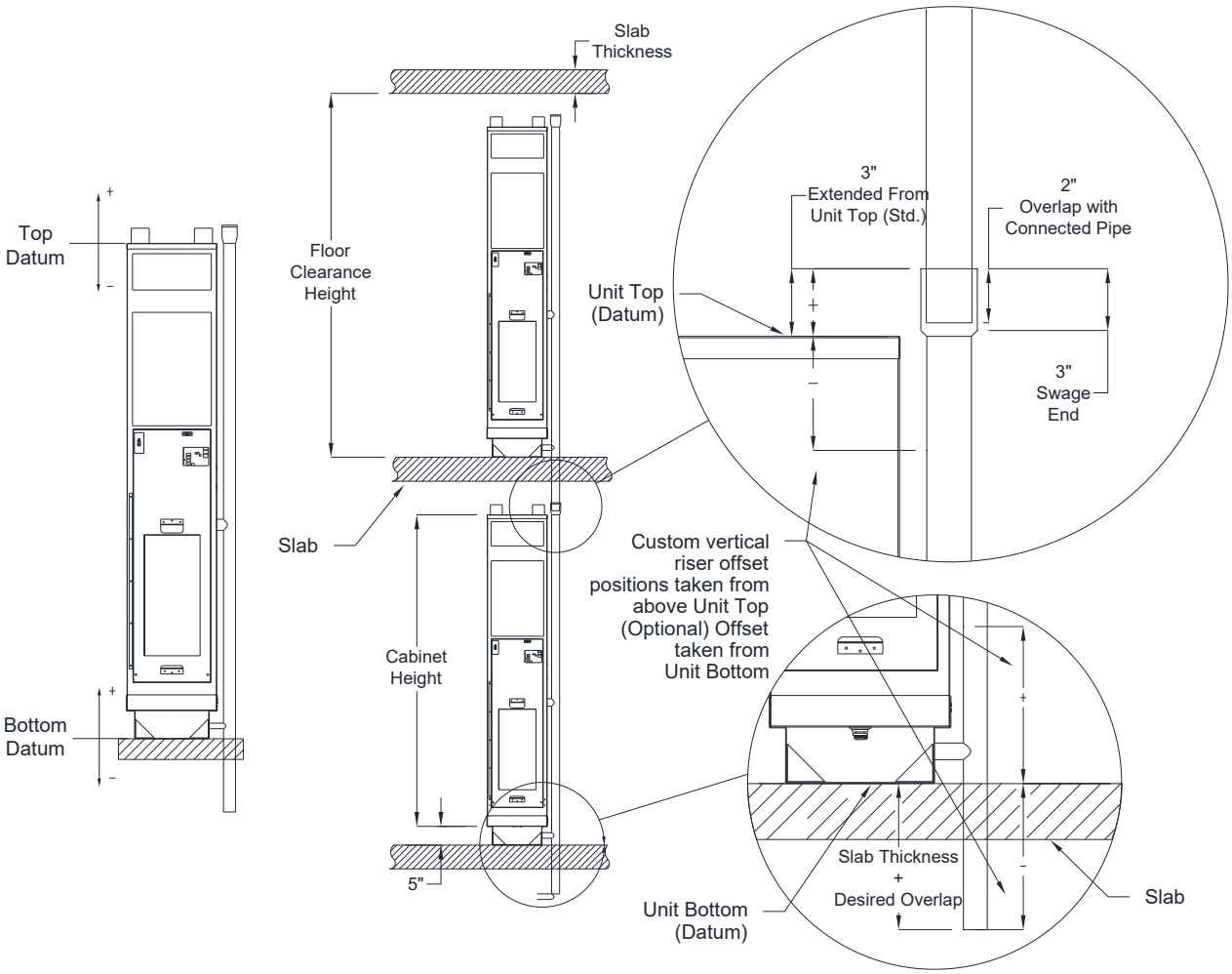


S = Supply Riser
C = Condensate Riser
R = Return Riser

Notes:

- As viewed from top, risers can be order in either SR configuration (supply, condensate, return) or RS (return, condensate, supply).
- Optional risers come in Type M or L copper . Risers can be ordered from factory with 3 inch deep swage.
- Contractor to provide riser transition pieces when joining dissimilar riser sizes.
- Risers available in sizes, 3/4” to 4”. Consult factory for larger sizes.
- All handing's determined by facing front of the unit (return air opening).

4.2 Riser Sizing Reference

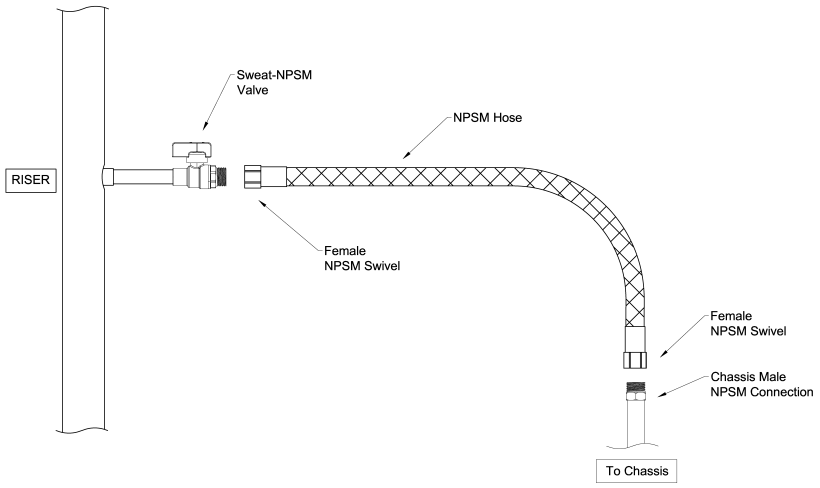


Notes:

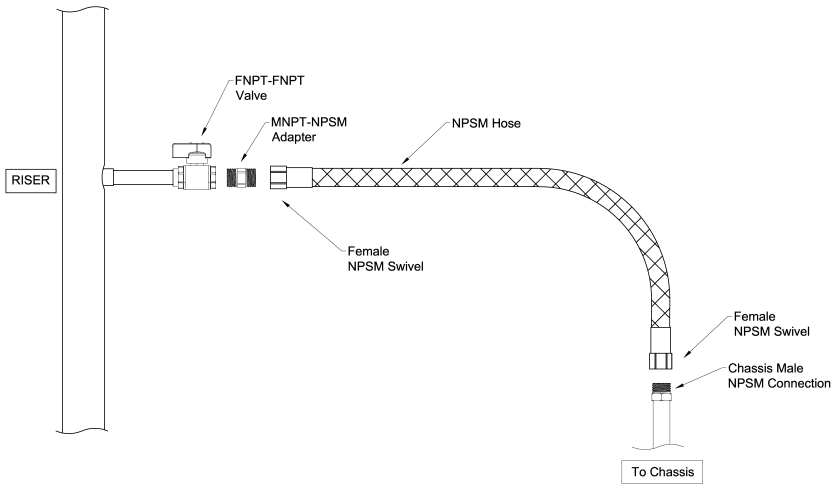
- Risers are positioned relative to cabinet using a standard “Top” Datum reference (optional “Base” Datum). Top Datum Offset indicates where the top of riser will be located relative to top of cabinet. A Base Datum indicates where bottom of riser will be located relative to base of cabinet.
- Upon request 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/DWV 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.

4.3 Hose Kit Details

STANDARD VALVE - SWEAT CONNECTED NPSM



OPTIONAL FPT VALVE - FPT to FPT



Hose Kit Sizes

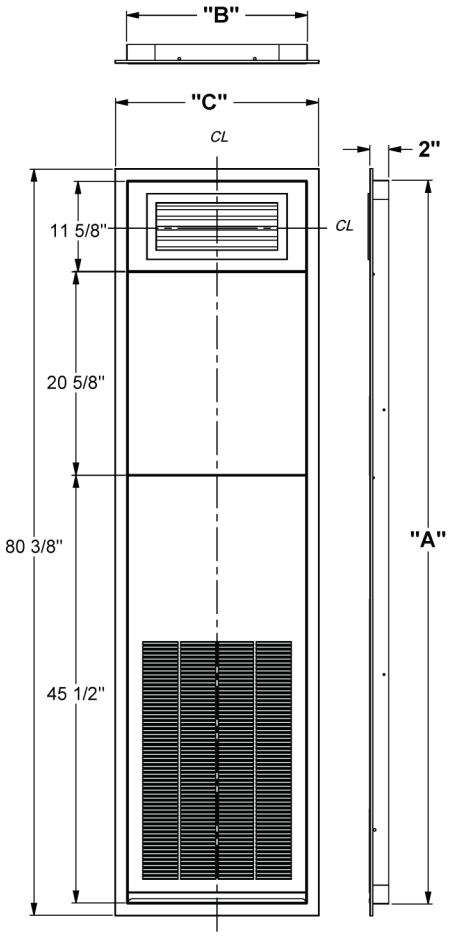
Model	Hose Kit	
	Size (in)	Length (in)
VSHPe 030	1/2	24
VSHPe 040	1/2	24
VSHPe 050	1/2	24
VSHPe 060	1/2	24
VSHPe 080	3/4	30
VSHPe 100	3/4	30
VSHPe 120	3/4	30

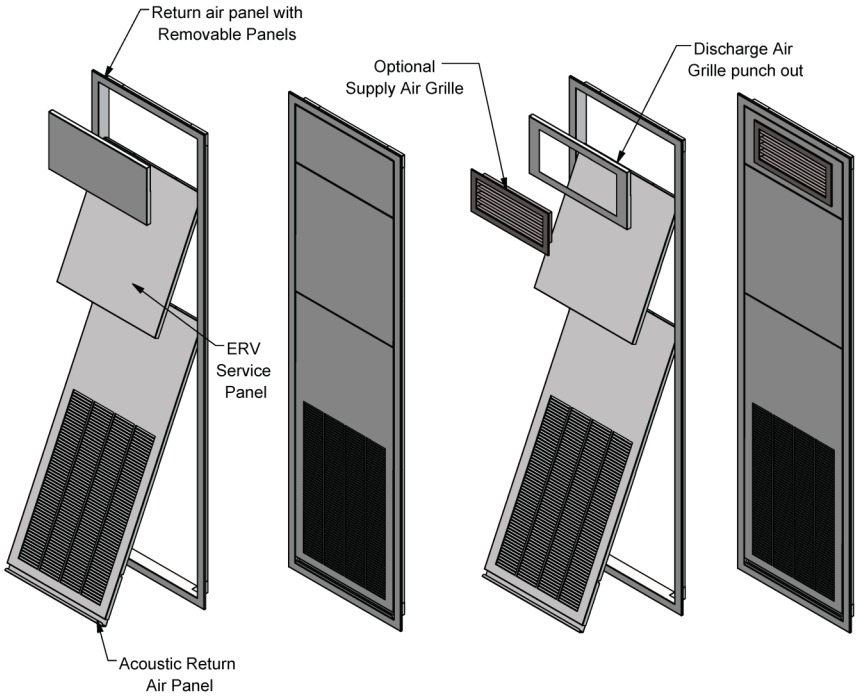
Isolation Valve Notes:

- 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.

5. RETURN AIR PANELS

5.1 Acoustic Front Return Air Panel





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)

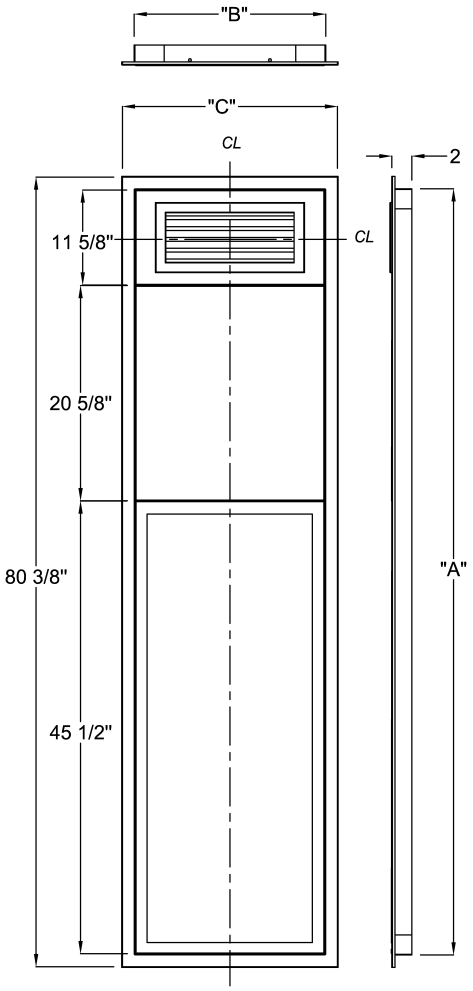
Acoustic & Perimeter ERV RA Panel Sizes

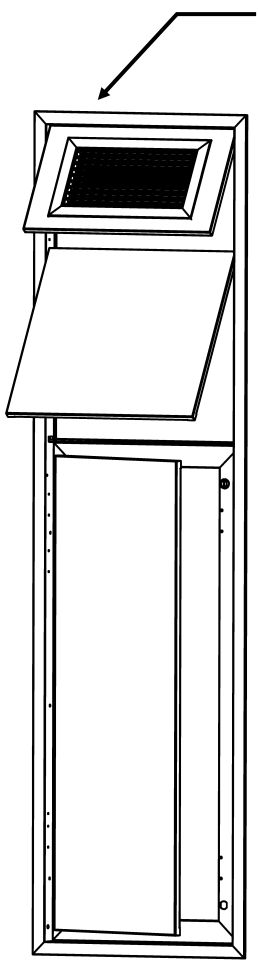
Model	Cabinet Size	RA Panel Dimensions (inches)		
		A	B	C
VSHPe 030	Y	78	19 5/8	22
VSHPe 040				
VSHPe 050				
VSHPe 060				
VSHPe 080	Z	78	23 5/8	26
VSHPe 100				
VSHPe 120				

Notes:

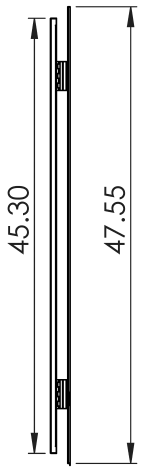
- Panel is lined with acoustic insulation for enhanced sound attenuation.
- Return air panel supplied in standard powder coat appliance white finish.
- Version 2 panel shown. Perimeter style panel dimensions are equivalent.

5.2 Perimeter Front Return Air Panel





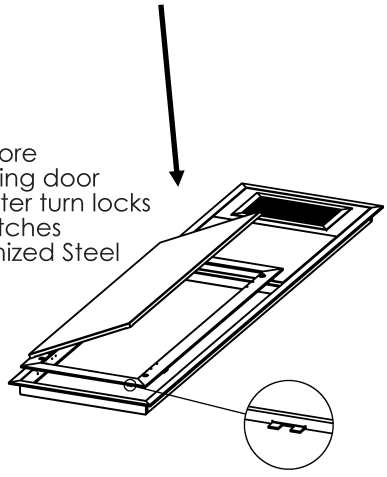
Removable core with door



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)

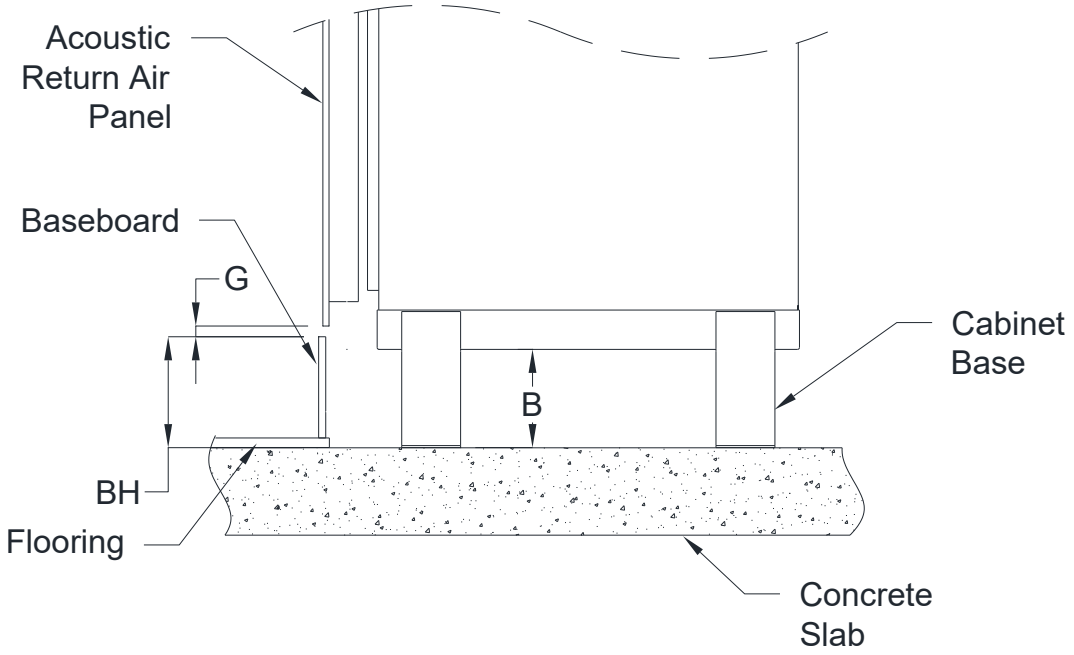
- Peripheral RA
- Removable core
- Lower side swing door
- 2 slotted quarter turn locks
- 6 Magnet Catches
- 22 ga. Galvanized Steel



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.

5.3 RA 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"

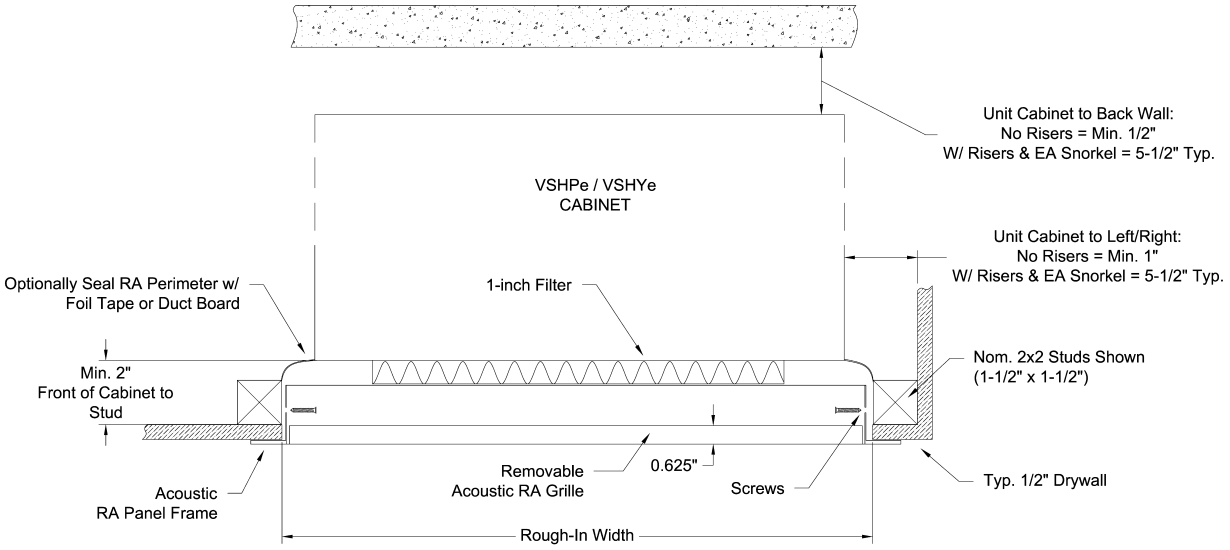
Therefore we round up to a 7" Cabinet Base required.

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)

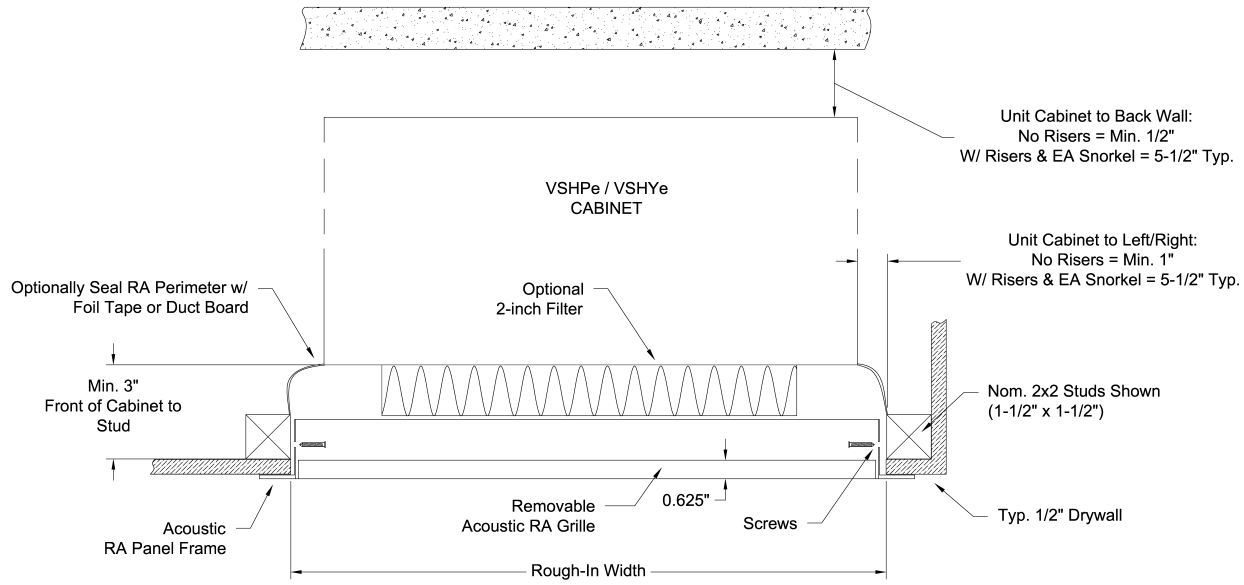
5.4 RA Panel Furring Details - Plan View



Standard 1-Inch Filter Bracket

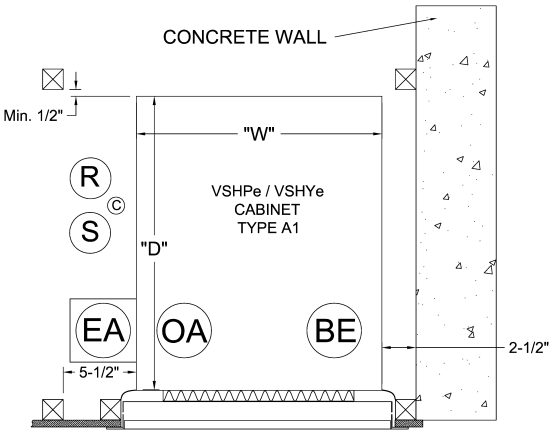
Notes:

- 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.

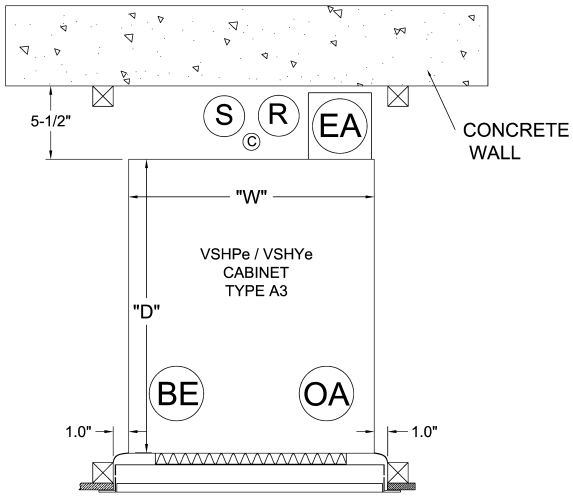


Optional 2-Inch Filter Bracket

5.5 RA Panel Furring Details - Stud Furring



Furring Type A1, B1
Type A4, B4 are Mirrored



Furring Type A3, B3
Type A2, B2 are Mirrored

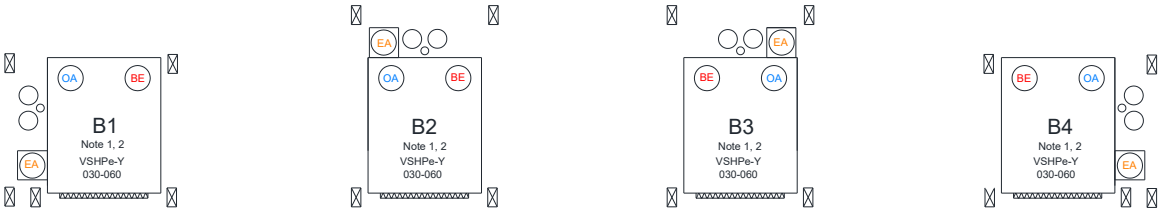
R © Return Riser
Condensate Riser
S Supply Riser

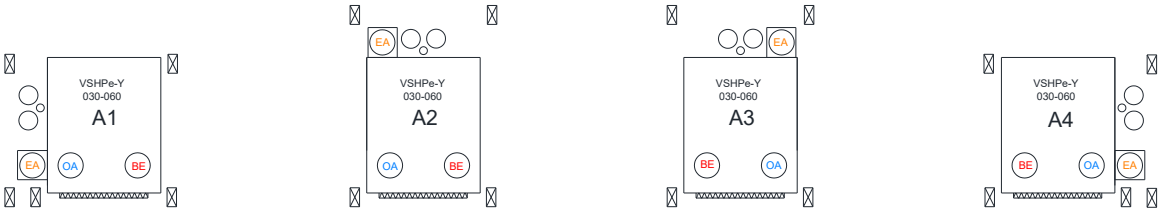
EA - Exhaust Air to outside
BE - Bathroom Exhaust to ERV
OA - Outside Air to ERV

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).



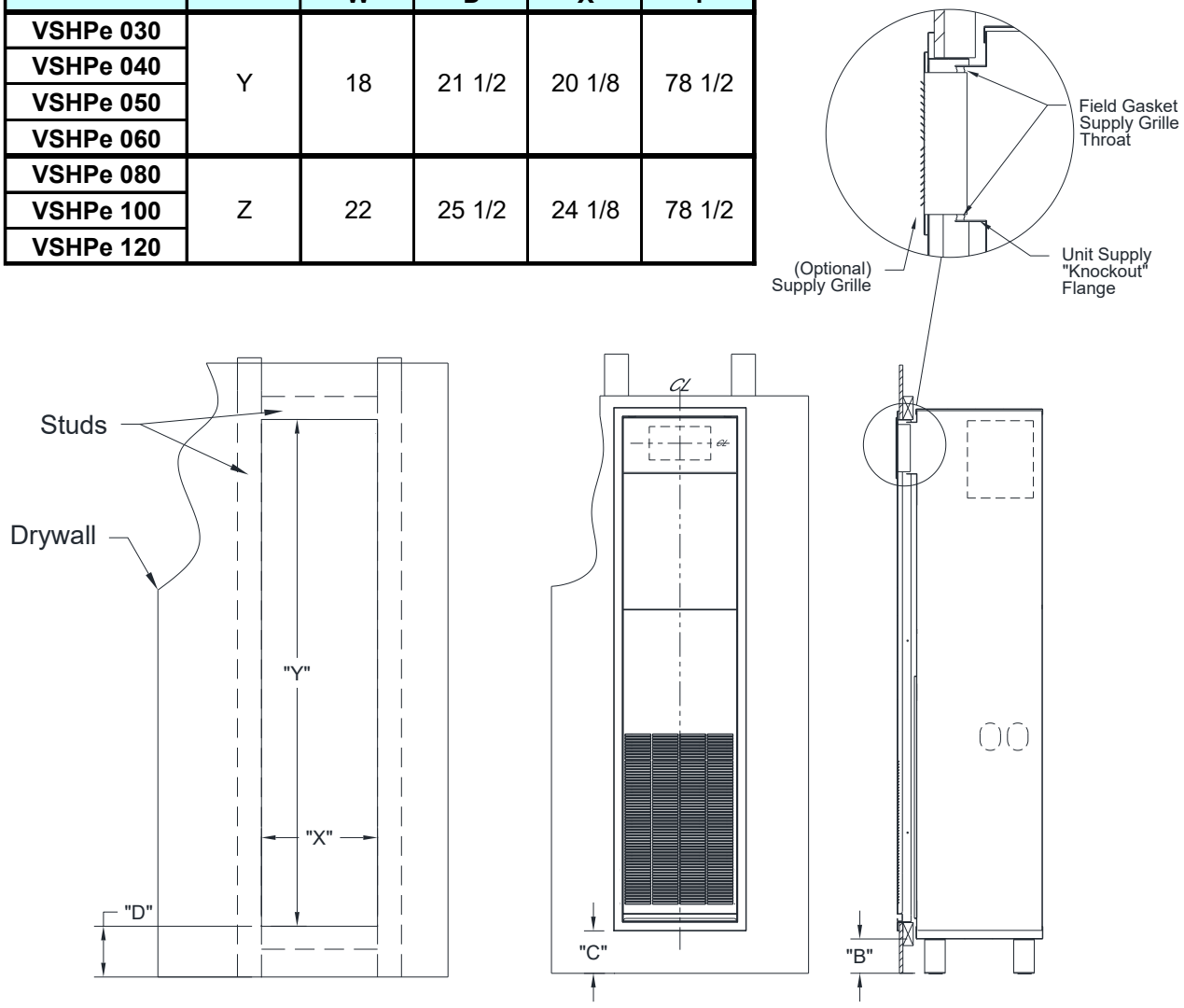


Typ. 2x4 Closet Framing

5.6 RA Panel Furring Details - Front View

Acoustic & Perimeter RA Panel Furring Sizes

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: (Optional) apply gasket tape to supply grille throat to insert into unit supply discharge flange**

6. PERFORMANCE & ELECTRICAL DATA

6.1 VSHPe (SE) Performance Data - Standard Efficiency

VSHPe (SE) ISO Performance Data

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

[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 is for 80.6F DB and 66.2F WB entering air.
Heating performance shown based on 68F entering air.

VSHPe (SE) Electrical Data

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

Minimum voltage 200 V. Operating voltage 208-230 V, single phase
Adhere to all applicable electrical codes
RLA - Rated load amps
LRA - Locked rotor amps

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		

6.2 VSHPe (HE) Performance Data - High Efficiency

VSHPe (HE) ISO Performance Data

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

[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 is for 80.6F DB and 66.2F WB entering air.
Heating performance shown based on 68F entering air.

VSHPe (HE) Electrical Data

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

Minimum voltage 200 V. Operating voltage 208-230 V, single phase
Adhere to all applicable electrical codes
RLA - Rated load amps
LRA - Locked rotor amps
FLA - Full load amps

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

6.3 EC Motor (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	WHISPER* 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	WHISPER* 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	WHISPER* 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	WHISPER* 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	WHISPER* 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	WHISPER* 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	WHISPER* 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	WHISPER* 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

6.4 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)

6.5 VSHPe (SE) Expanded Heating & Cooling Performance Tables

VSHP SE 030														
GPM	WPD	Cooling								Heating				
		EWT	LWT	Total Cap. (Btuh)	Sensible Cap. (Btuh)	Watts	EER	THR (Btuh)	EWT	LWT	Total Cap. (Btuh)	Watts	COP	THA (Btuh)
1.3	3.7								20	15.3	5301	676	2.3	2992
1.8	6.9								20	16.4	5487	682	2.4	3160
2.4	12.1								20	17.2	5669	687	2.4	3323
2.6	14.2								20	17.4	5719	689	2.4	3368
1.3	3.5	30	49.1	10775	7626	486	22.1	12435	30	23.6	6455	696	2.7	4081
1.8	6.6	30	43.9	10977	7700	471	23.3	12585	30	25.2	6681	701	2.8	4289
2.4	11.6	30	40.5	11179	7807	449	24.9	12710	30	26.3	6903	707	2.9	4491
2.6	13.5	30	39.7	11237	7847	440	25.5	12738	30	26.5	6965	709	2.9	4547
1.3	3.4	40	58.8	10456	7577	521	20.1	12235	40	31.9	7629	714	3.1	5193
1.8	6.3	40	53.7	10652	7651	505	21.1	12376	40	33.9	7897	720	3.2	5442
2.4	11.0	40	50.3	10848	7757	481	22.6	12489	40	35.3	8160	726	3.3	5684
2.6	12.9	40	49.6	10905	7796	471	23.1	12513	40	35.6	8233	727	3.3	5750
1.3	3.2	50	68.5	10102	7494	564	17.9	12028	50	40.2	8825	732	3.5	6328
1.8	6.0	50	63.4	10291	7567	547	18.8	12157	50	42.6	9135	737	3.6	6619
2.4	10.6	50	60.2	10481	7672	520	20.1	12257	50	44.3	9438	743	3.7	6901
2.6	12.4	50	59.4	10535	7711	510	20.6	12277	50	44.6	9522	745	3.7	6979
1.3	3.1	60	78.1	9712	7378	616	15.8	11813	60	48.4	10041	748	3.9	7488
1.8	5.8	60	73.2	9894	7450	596	16.6	11930	60	51.3	10393	754	4.0	7821
2.4	10.2	60	70.0	10077	7553	568	17.8	12014	60	53.2	10738	760	4.1	8144
2.6	11.9	60	69.2	10129	7592	557	18.2	12029	60	53.7	10834	762	4.2	8234
1.3	3.0	70	87.7	9287	7228	675	13.8	11592	70	56.6	11277	764	4.3	8671
1.8	5.6	70	82.9	9461	7299	654	14.5	11694	70	59.9	11673	770	4.4	9046
2.4	9.8	70	79.8	9636	7400	623	15.5	11761	70	62.2	12061	776	4.6	9412
2.6	11.5	70	79.0	9686	7438	610	15.9	11769	70	62.7	12169	778	4.6	9514
1.3	2.9	80	97.4	8827	7045	743	11.9	11362	80	64.8	12534	779	4.7	9877
1.8	5.4	80	92.6	8992	7114	720	12.5	11449	80	68.5	12974	785	4.8	10297
2.4	9.5	80	89.6	9158	7213	685	13.4	11496	80	71.1	13405	791	5.0	10705
2.6	11.2	80	88.8	9206	7250	672	13.7	11498	80	71.7	13525	793	5.0	10818
1.3	2.9	85	102.2	8584	6941	780	11.0	11245	85	68.8	13171	786	4.9	10489
1.8	5.4	85	97.5	8744	7009	755	11.6	11323	85	72.8	13633	792	5.0	10931
2.4	9.4	85	94.4	8906	7106	719	12.4	11360	85	75.5	14086	798	5.2	11361
2.6	11.0	85	93.7	8952	7142	705	12.7	11358	85	76.2	14212	800	5.2	11480
1.3	2.8	90	107.0	8331	6829	819	10.2	11126	90	72.9	13812	793	5.1	11107
1.8	5.3	90	102.4	8487	6895	793	10.7	11195	90	77.1	14297	799	5.2	11571
2.4	9.3	90	99.3	8644	6991	755	11.4	11221	90	80.0	14772	805	5.4	12023
2.6	10.9	90	98.6	8689	7027	740	11.7	11216	90	80.6	14904	807	5.4	12149
1.3	2.8	100	116.6	7800	6579	903	8.6	10882						
1.8	5.2	100	112.1	7946	6643	875	9.1	10932						
2.4	9.1	100	109.1	8093	6735	833	9.7	10935						
2.6	10.7	100	108.4	8135	6770	816	10.0	10921						
1.3	2.7	110	126.2	7234	6295	995	7.3	10631						
1.8	5.2	110	121.8	7369	6357	964	7.6	10661						
2.4	9.0	110	118.9	7505	6445	918	8.2	10638						
2.6	10.6	110	118.2	7544	6478	900	8.4	10616						

Cooling capacity is based on 80.6ºF DB and 66.2ºF WB entering air.
Heating capacity is based on 68ºF DB entering air.
Blank sections are outside the operation range.

VSHP SE 040														
GPM	WPD	Cooling								Heating				
		EWT	LWT	Total Cap. (Btuh)	Sensible Cap. (Btuh)	Watts	EER	THR (Btuh)	EWT	LWT	Total Cap. (Btuh)	Watts	COP	THA (Btuh)
1.7	3.8								20	15.3	6789	831	2.4	3954
2.4	7.4								20	16.6	7044	837	2.5	4189
3.3	13.8								20	17.4	7267	843	2.5	4390
3.5	15.4								20	17.5	7300	844	2.5	4420
1.7	3.6	30	48.6	13971	9838	530	26.4	15780	30	23.8	8190	854	2.8	5275
2.4	7.0	30	43.3	14308	9998	501	28.5	16019	30	25.4	8497	860	2.9	5562
3.3	13.0	30	39.7	14487	10132	482	30.1	16130	30	26.5	8765	866	3.0	5809
3.5	14.6	30	39.2	14488	10151	480	30.2	16125	30	26.7	8806	868	3.0	5845
1.7	3.4	40	58.4	13659	9772	582	23.5	15645	40	32.2	9607	877	3.2	6613
2.4	6.6	40	53.2	13989	9932	550	25.4	15867	40	34.2	9968	883	3.3	6953
3.3	12.4	40	49.6	14164	10064	529	26.8	15968	40	35.6	10283	890	3.4	7246
3.5	13.9	40	49.1	14164	10083	527	26.9	15962	40	35.9	10330	891	3.4	7289
1.7	3.2	50	68.2	13267	9652	643	20.6	15463	50	40.6	11043	901	3.6	7970
2.4	6.3	50	63.0	13587	9810	609	22.3	15665	50	43.0	11457	907	3.7	8363
3.3	11.7	50	59.5	13757	9941	585	23.5	15753	50	44.7	11819	914	3.8	8702
3.5	13.2	50	59.0	13758	9959	582	23.6	15746	50	45.0	11874	915	3.8	8752
1.7	3.1	60	77.9	12794	9478	715	17.9	15235	60	49.0	12496	924	4.0	9343
2.4	6.0	60	72.8	13103	9632	677	19.4	15413	60	51.9	12965	930	4.1	9790
3.3	11.1	60	69.3	13266	9761	650	20.4	15485	60	53.8	13375	937	4.2	10177
3.5	12.5	60	68.8	13267	9779	648	20.5	15477	60	54.2	13436	938	4.2	10234
1.7	2.9	70	87.5	12240	9249	797	15.4	14961	70	57.4	13967	947	4.3	10735
2.4	5.7	70	82.5	12536	9400	754	16.6	15110	70	60.6	14491	954	4.5	11236
3.3	10.6	70	79.2	12692	9525	724	17.5	15165	70	62.9	14949	961	4.6	11671
3.5	11.9	70	78.6	12693	9543	722	17.6	15156	70	63.3	15018	962	4.6	11735
1.7	2.8	80	97.1	11606	8965	889	13.1	14640	80	65.7	15455	971	4.7	12143
2.4	5.4	80	92.2	11886	9111	841	14.1	14757	80	69.4	16035	977	4.8	12700
3.3	10.1	80	89.0	12034	9233	808	14.9	14792	80	72.0	16542	984	4.9	13183
3.5	11.4	80	88.4	12035	9250	805	15.0	14782	80	72.4	16618	986	4.9	13255
1.7	2.7	85	101.9	11258	8803	939	12.0	14463	85	69.9	16206	982	4.8	12854
2.4	5.3	85	97.1	11530	8947	888	13.0	14562	85	73.8	16814	989	5.0	13439
3.3	9.9	85	93.8	11674	9066	853	13.7	14586	85	76.5	17345	996	5.1	13946
3.5	11.1	85	93.3	11675	9083	850	13.7	14576	85	77.0	17426	998	5.1	14021
1.7	2.7	90	106.6	10891	8627	991	11.0	14273	90	74.1	16961	994	5.0	13570
2.4	5.2	90	101.9	11154	8768	938	11.9	14354	90	78.2	17597	1001	5.2	14182
3.3	9.7	90	98.7	11293	8885	901	12.5	14367	90	81.1	18154	1008	5.3	14714
3.5	10.9	90	98.2	11293	8902	897	12.6	14356	90	81.5	18238	1010	5.3	14793
1.7	2.6	100	116.1	10095	8235	1103	9.1	13860						
2.4	5.0	100	111.5	10338	8369	1044	9.9	13901						
3.3	9.3	100	108.4	10467	8481	1003	10.4	13889						
3.5	10.4	100	107.9	10468	8497	999	10.5	13877						
1.7	2.5	110	125.5	9218	7788	1225	7.5	13400						
2.4	4.8	110	121.1	9441	7915	1159	8.1	13398						
3.3	9.0	110	118.1	9559	8021	1114	8.6	13359						
3.5	10.1	110	117.7	9559	8036	1109	8.6	13345						

Cooling capacity is based on 80.6ºF DB and 66.2ºF WB entering air.
Heating capacity is based on 68ºF DB entering air.
Blank sections are outside the operation range.

VSHP SE 050														
GPM	WPD	Cooling								Heating				
		EWT	LWT	Total Cap. (Btuh)	Sensible Cap. (Btuh)	Watts	EER	THR (Btuh)	EWT	LWT	Total Cap. (Btuh)	Watts	COP	THA (Btuh)
2.8	8.1								20	16.5	8036	918	2.6	4905
3.5	12.5								20	17.1	8227	923	2.6	5078
3.8	14.6								20	17.3	8288	924	2.6	5134
4	16.1								20	17.4	8322	925	2.6	5165
2.8	8.0	30	44.5	18244	13803	577	31.6	20215	30	25.3	9704	945	3.0	6479
3.5	12.2	30	41.7	18436	13906	562	32.8	20353	30	26.2	9934	950	3.1	6691
3.8	14.3	30	40.7	18475	13932	557	33.2	20377	30	26.4	10008	952	3.1	6760
4	15.8	30	40.2	18486	13944	555	33.3	20380	30	26.6	10049	953	3.1	6798
2.8	7.8	40	54.3	17710	13568	638	27.8	19888	40	34.2	11434	971	3.4	8119
3.5	12.0	40	51.5	17896	13669	621	28.8	20015	40	35.2	11704	977	3.5	8371
3.8	14.1	40	50.6	17934	13695	616	29.1	20036	40	35.6	11791	978	3.5	8453
4	15.5	40	50.0	17945	13707	613	29.3	20038	40	35.8	11840	979	3.5	8498
2.8	7.7	50	64.0	17141	13321	709	24.2	19559	50	43.0	13226	997	3.9	9823
3.5	11.8	50	61.3	17321	13420	689	25.1	19674	50	44.2	13539	1003	4.0	10118
3.8	13.8	50	60.4	17357	13445	684	25.4	19691	50	44.6	13640	1004	4.0	10213
4	15.3	50	59.9	17368	13457	681	25.5	19692	50	44.9	13696	1005	4.0	10266
2.8	7.5	60	73.8	16537	13061	788	21.0	19228	60	51.7	15081	1022	4.3	11593
3.5	11.6	60	71.1	16711	13158	767	21.8	19329	60	53.2	15438	1028	4.4	11931
3.8	13.6	60	70.2	16746	13183	761	22.0	19342	60	53.7	15553	1030	4.4	12040
4	15.0	60	69.7	16756	13194	758	22.1	19342	60	54.0	15617	1031	4.4	12100
2.8	7.4	70	83.5	15898	12788	878	18.1	18894	70	60.4	16998	1046	4.8	13428
3.5	11.4	70	80.9	16065	12883	854	18.8	18980	70	62.1	17401	1052	4.8	13811
3.8	13.3	70	80.0	16099	12907	847	19.0	18990	70	62.7	17530	1054	4.9	13934
4	14.7	70	79.5	16109	12918	844	19.1	18988	70	63.0	17602	1055	4.9	14002
2.8	7.3	80	93.2	15224	12502	977	15.6	18558	80	69.0	18978	1070	5.2	15327
3.5	11.2	80	90.6	15385	12595	950	16.2	18628	80	71.0	19428	1076	5.3	15757
3.8	13.1	80	89.8	15417	12619	943	16.4	18634	80	71.6	19572	1078	5.3	15895
4	14.5	80	89.3	15426	12629	939	16.4	18630	80	72.0	19653	1079	5.3	15972
2.8	7.2	85	98.1	14875	12354	1030	14.4	18389	85	73.3	19991	1081	5.4	16301
3.5	11.1	85	95.5	15031	12446	1002	15.0	18450	85	75.4	20465	1087	5.5	16755
3.8	13.0	85	94.7	15063	12470	994	15.2	18454	85	76.1	20617	1089	5.5	16901
4	14.3	85	94.2	15072	12480	990	15.2	18449	85	76.5	20702	1090	5.6	16982
2.8	7.2	90	103.0	14516	12203	1085	13.4	18220	90	77.6	21020	1093	5.6	17292
3.5	11.0	90	100.4	14669	12294	1056	13.9	18272	90	79.8	21518	1099	5.7	17769
3.8	12.9	90	99.6	14700	12317	1047	14.0	18274	90	80.5	21678	1101	5.8	17923
4	14.2	90	99.1	14709	12328	1043	14.1	18268	90	81.0	21768	1102	5.8	18009
2.8	7.0	100	112.7	13773	11892	1203	11.4	17879						
3.5	10.8	100	110.2	13918	11980	1170	11.9	17913						
3.8	12.7	100	109.4	13947	12003	1161	12.0	17909						
4	14.0	100	108.9	13956	12013	1156	12.1	17902						
2.8	6.9	110	122.4	12995	11568	1330	9.8	17536						
3.5	10.6	110	120.0	13132	11654	1294	10.1	17550						
3.8	12.4	110	119.2	13160	11676	1284	10.2	17542						
4	13.7	110	118.7	13168	11686	1279	10.3	17531						

Cooling capacity is based on 80.6ºF DB and 66.2ºF WB entering air.
Heating capacity is based on 68ºF DB entering air.
Blank sections are outside the operation range.

VSHP SE 060														
GPM	WPD	Cooling								Heating				
		EWT	LWT	Total Cap. (Btuh)	Sensible Cap. (Btuh)	Watts	EER	THR (Btuh)	EWT	LWT	Total Cap. (Btuh)	Watts	COP	THA (Btuh)
2.7	7.0								20	15.0	11009	1285	2.5	6626
3.9	14.1								20	16.4	11453	1300	2.6	7017
4	14.8								20	16.5	11481	1301	2.6	7042
5.2	24.5								20	17.2	11719	1311	2.6	7246
2.7	6.8	30	47.1	20687	15331	668	31.0	22967	30	23.6	13071	1317	2.9	8577
3.9	13.7	30	41.9	21118	15589	634	33.3	23282	30	25.3	13597	1333	3.0	9050
4	14.3	30	41.6	21147	15607	632	33.5	23304	30	25.4	13631	1334	3.0	9080
5.2	23.8	30	39.0	21405	15778	618	34.7	23513	30	26.4	13913	1344	3.0	9328
2.7	6.6	40	57.2	20497	15485	754	27.2	23069	40	32.1	15161	1349	3.3	10557
3.9	13.3	40	52.0	20925	15746	715	29.3	23365	40	34.3	15771	1365	3.4	11113
4	14.0	40	51.7	20953	15764	713	29.4	23385	40	34.4	15810	1366	3.4	11149
5.2	23.2	40	49.0	21209	15937	696	30.5	23586	40	35.6	16137	1377	3.4	11440
2.7	6.4	50	67.1	20128	15504	854	23.6	23041	50	40.7	17278	1381	3.7	12567
3.9	12.9	50	62.0	20548	15765	810	25.4	23311	50	43.2	17974	1397	3.8	13207
4	13.6	50	61.7	20576	15783	807	25.5	23331	50	43.4	18019	1398	3.8	13248
5.2	22.6	50	59.0	20827	15956	789	26.4	23519	50	44.8	18392	1409	3.8	13584
2.7	6.3	60	77.0	19579	15387	968	20.2	22883	60	49.2	19424	1412	4.0	14606
3.9	12.6	60	71.9	19987	15646	919	21.8	23122	60	52.1	20206	1429	4.1	15331
4	13.3	60	71.6	20015	15664	916	21.9	23139	60	52.3	20257	1430	4.2	15377
5.2	22.0	60	68.9	20259	15835	895	22.6	23313	60	53.9	20676	1441	4.2	15759
2.7	6.1	70	86.7	18851	15133	1097	17.2	22596	70	57.6	21597	1443	4.4	16674
3.9	12.4	70	81.7	19244	15389	1041	18.5	22797	70	61.0	22468	1460	4.5	17485
4	13.0	70	81.4	19270	15406	1038	18.6	22812	70	61.2	22523	1461	4.5	17537
5.2	21.6	70	78.8	19505	15575	1014	19.2	22967	70	63.1	22989	1472	4.6	17965
2.7	6.0	80	96.4	17943	14745	1241	14.5	22179	80	66.1	23799	1474	4.7	18771
3.9	12.1	80	91.5	18317	14993	1178	15.6	22336	80	69.9	24758	1491	4.9	19670
4	12.7	80	91.2	18342	15010	1174	15.6	22348	80	70.1	24819	1492	4.9	19728
5.2	21.2	80	88.6	18566	15175	1147	16.2	22481	80	72.2	25333	1503	4.9	20203
2.7	6.0	85	101.2	17421	14499	1319	13.2	21922	85	70.3	24910	1489	4.9	19831
3.9	12.0	85	96.3	17785	14744	1251	14.2	22055	85	74.3	25914	1506	5.0	20774
4	12.6	85	96.0	17809	14761	1247	14.3	22065	85	74.6	25978	1508	5.1	20834
5.2	21.0	85	93.5	18026	14922	1219	14.8	22186	85	76.8	26515	1519	5.1	21333
2.7	5.9	90	106.0	16855	14220	1400	12.0	21632	90	74.5	26028	1504	5.1	20898
3.9	11.9	90	101.2	17207	14460	1328	13.0	21739	90	78.8	27077	1522	5.2	21886
4	12.5	90	100.9	17230	14476	1324	13.0	21748	90	79.0	27144	1523	5.2	21949
5.2	20.8	90	98.4	17440	14635	1294	13.5	21856	90	81.3	27706	1534	5.3	22471
2.7	5.8	100	115.4	15588	13559	1573	9.9	20956						
3.9	11.8	100	110.8	15913	13788	1492	10.7	21006						
4	12.3	100	110.5	15935	13804	1488	10.7	21012						
5.2	20.5	100	108.1	16129	13955	1454	11.1	21091						
2.7	5.8	110	124.8	14141	12763	1761	8.0	20150						
3.9	11.6	110	120.3	14436	12978	1670	8.6	20137						
4	12.2	110	120.1	14456	12993	1665	8.7	20139						
5.2	20.3	110	117.8	14632	13135	1627	9.0	20186						

Cooling capacity is based on 80.6ºF DB and 66.2ºF WB entering air.
Heating capacity is based on 68ºF DB entering air.
Blank sections are outside the operation range.

VSHP SE 080														
GPM	WPD	Cooling								Heating				
		EWT	LWT	Total Cap. (Btuh)	Sensible Cap. (Btuh)	Watts	EER	THR (Btuh)	EWT	LWT	Total Cap. (Btuh)	Watts	COP	THA (Btuh)
3.4	3.9								20	16.0	11936	1553	2.3	6638
4.9	7.6								20	17.1	12476	1574	2.3	7107
6.5	12.9								20	17.7	12869	1591	2.4	7440
6.7	13.6								20	17.8	12905	1593	2.4	7470
3.4	3.6	30	47.5	26825	18423	850	31.6	29727	30	24.4	14754	1584	2.7	9350
4.9	7.2	30	42.3	27482	18737	802	34.3	30219	30	25.9	15422	1605	2.8	9945
6.5	12.2	30	39.3	27934	19046	767	36.4	30552	30	26.8	15908	1623	2.9	10370
6.7	12.9	30	39.1	27972	19083	764	36.6	30580	30	26.9	15952	1625	2.9	10408
3.4	3.5	40	57.6	26521	18448	961	27.6	29801	40	32.8	17620	1623	3.2	12081
4.9	6.8	40	52.3	27170	18762	907	30.0	30264	40	34.8	18418	1645	3.3	12804
6.5	11.6	40	49.3	27617	19071	867	31.8	30577	40	35.9	18998	1663	3.3	13322
6.7	12.3	40	49.1	27655	19108	864	32.0	30603	40	36.0	19051	1665	3.4	13368
3.4	3.3	50	67.5	25979	18324	1095	23.7	29715	50	41.2	20533	1671	3.6	14832
4.9	6.5	50	62.3	26615	18636	1033	25.8	30139	50	43.6	21463	1694	3.7	15685
6.5	11.0	50	59.3	27052	18943	988	27.4	30424	50	45.0	22139	1712	3.8	16296
6.7	11.7	50	59.0	27089	18979	984	27.5	30447	50	45.1	22201	1714	3.8	16351
3.4	3.2	60	77.3	25199	18052	1251	20.1	29470	60	49.6	23494	1727	4.0	17602
4.9	6.2	60	72.2	25815	18359	1180	21.9	29844	60	52.4	24558	1750	4.1	18586
6.5	10.6	60	69.2	26240	18662	1129	23.2	30094	60	54.1	25332	1770	4.2	19293
6.7	11.2	60	68.9	26276	18698	1125	23.4	30114	60	54.2	25402	1772	4.2	19357
3.4	3.0	70	87.1	24181	17633	1431	16.9	29064	70	58.0	26503	1791	4.3	20392
4.9	6.0	70	82.0	24773	17933	1350	18.4	29378	70	61.2	27703	1815	4.5	21509
6.5	10.2	70	79.1	25180	18228	1291	19.5	29586	70	63.1	28575	1835	4.6	22313
6.7	10.8	70	78.8	25214	18264	1286	19.6	29603	70	63.3	28655	1837	4.6	22385
3.4	2.9	80	96.7	22925	17065	1633	14.0	28497	80	66.4	29559	1863	4.6	23201
4.9	5.8	80	91.7	23486	17356	1540	15.2	28743	80	70.0	30898	1889	4.8	24453
6.5	9.8	80	88.9	23872	17642	1473	16.2	28901	80	72.2	31870	1909	4.9	25355
6.7	10.4	80	88.6	23905	17676	1467	16.3	28913	80	72.4	31959	1912	4.9	25436
3.4	2.9	85	101.5	22208	16726	1742	12.7	28154	85	70.5	31105	1903	4.8	24613
4.9	5.7	85	96.6	22751	17011	1644	13.8	28361	85	74.4	32514	1928	4.9	25933
6.5	9.7	85	93.8	23125	17291	1572	14.7	28491	85	76.7	33537	1950	5.0	26884
6.7	10.2	85	93.5	23157	17325	1566	14.8	28501	85	76.9	33630	1952	5.0	26970
3.4	2.9	90	106.2	21431	16350	1858	11.5	27771	90	74.7	32662	1944	4.9	26029
4.9	5.6	90	101.4	21956	16629	1752	12.5	27936	90	78.8	34142	1970	5.1	27419
6.5	9.5	90	98.6	22317	16903	1676	13.3	28038	90	81.3	35217	1992	5.2	28419
6.7	10.1	90	98.4	22347	16935	1670	13.4	28045	90	81.5	35314	1994	5.2	28509
3.4	2.8	100	115.7	19699	15487	2105	9.4	26885						
4.9	5.5	100	111.0	20182	15751	1986	10.2	26960						
6.5	9.3	100	108.3	20513	16011	1900	10.8	26998						
6.7	9.9	100	108.1	20542	16042	1892	10.9	26999						
3.4	2.8	110	125.0	17730	14477	2376	7.5	25839						
4.9	5.4	110	120.5	18164	14723	2241	8.1	25813						
6.5	9.2	110	118.0	18463	14966	2144	8.6	25780						
6.7	9.7	110	117.7	18488	14995	2135	8.7	25775						

VSHP SE 100														
GPM	WPD	Cooling								Heating				
		EWT	LWT	Total Cap. (Btuh)	Sensible Cap. (Btuh)	Watts	EER	THR (Btuh)	EWT	LWT	Total Cap. (Btuh)	Watts	COP	THA (Btuh)
4.3	4.9								20	15.4	16575	1993	2.4	9774
6.1	10.1								20	16.6	17105	2003	2.5	10271
6.5	11.5								20	16.8	17180	2005	2.5	10338
8.1	18.2								20	17.4	17323	2013	2.5	10453
4.3	4.7	30	46.8	32087	21667	1165	27.5	36063	30	23.5	20897	2051	3.0	13899
6.1	9.8	30	41.9	32705	21993	1119	29.2	36523	30	25.2	21565	2061	3.1	14533
6.5	11.1	30	41.2	32813	22055	1113	29.5	36612	30	25.5	21659	2063	3.1	14620
8.1	17.6	30	39.1	33132	22262	1110	29.8	36921	30	26.3	21839	2071	3.1	14772
4.3	4.5	40	56.9	32010	22131	1266	25.3	36332	40	31.7	24852	2105	3.5	17669
6.1	9.4	40	52.0	32627	22464	1216	26.8	36777	40	33.9	25646	2115	3.6	18429
6.5	10.8	40	51.3	32734	22527	1210	27.0	36864	40	34.3	25759	2118	3.6	18533
8.1	17.0	40	49.1	33052	22738	1207	27.4	37171	40	35.4	25973	2126	3.6	18718
4.3	4.4	50	66.9	31635	22339	1395	22.7	36395	50	40.1	28440	2156	3.9	21083
6.1	9.1	50	62.0	32245	22675	1339	24.1	36815	50	42.8	29350	2167	4.0	21956
6.5	10.4	50	61.3	32350	22739	1333	24.3	36899	50	43.2	29478	2169	4.0	22077
8.1	16.4	50	59.2	32665	22952	1329	24.6	37201	50	44.5	29723	2178	4.0	22292
4.3	4.3	60	76.8	30962	22291	1550	20.0	36252	60	48.7	31662	2204	4.2	24141
6.1	8.9	60	72.0	31559	22627	1488	21.2	36638	60	51.7	32675	2215	4.3	25117
6.5	10.1	60	71.3	31663	22690	1481	21.4	36717	60	52.2	32818	2217	4.3	25252
8.1	16.0	60	69.1	31971	22903	1477	21.6	37012	60	53.7	33091	2226	4.4	25494
4.3	4.2	70	86.7	29992	21988	1732	17.3	35903	70	57.5	34518	2249	4.5	26844
6.1	8.6	70	81.9	30570	22319	1663	18.4	36246	70	60.8	35621	2260	4.6	27910
6.5	9.9	70	81.2	30670	22382	1655	18.5	36319	70	61.3	35777	2262	4.6	28057
8.1	15.5	70	79.0	30969	22591	1651	18.8	36602	70	63.0	36075	2272	4.7	28324
4.3	4.1	80	96.4	28724	21429	1941	14.8	35348	80	66.4	37007	2291	4.7	29190
6.1	8.4	80	91.7	29278	21752	1864	15.7	35638	80	70.0	38190	2302	4.9	30335
6.5	9.6	80	91.0	29374	21813	1855	15.8	35704	80	70.6	38357	2304	4.9	30494
8.1	15.2	80	88.9	29659	22017	1850	16.0	35972	80	72.4	38676	2314	4.9	30781
4.3	4.0	85	101.2	27978	21054	2056	13.6	34994	85	70.9	38114	2310	4.8	30230
6.1	8.3	85	96.5	28518	21371	1974	14.4	35254	85	74.7	39332	2322	5.0	31410
6.5	9.5	85	95.9	28611	21431	1964	14.6	35315	85	75.3	39504	2324	5.0	31574
8.1	15.0	85	93.8	28889	21632	1959	14.7	35575	85	77.1	39833	2334	5.0	31870
4.3	4.0	90	106.0	27158	20614	2177	12.5	34588	90	75.5	39129	2329	4.9	31181
6.1	8.2	90	101.4	27682	20925	2090	13.2	34815	90	79.4	40380	2341	5.1	32393
6.5	9.4	90	100.7	27773	20984	2080	13.4	34872	90	80.0	40556	2343	5.1	32561
8.1	14.8	90	98.7	28043	21180	2074	13.5	35123	90	81.9	40894	2353	5.1	32866
4.3	3.9	100	115.6	25295	19544	2440	10.4	33621						
6.1	8.1	100	111.1	25782	19839	2342	11.0	33777						
6.5	9.2	100	110.4	25867	19894	2331	11.1	33824						
8.1	14.6	100	108.4	26119	20081	2325	11.2	34053						
4.3	3.8	110	125.0	23134	18218	2729	8.5	32449						
6.1	8.0	110	120.7	23580	18493	2621	9.0	32524						
6.5	9.1	110	120.0	23657	18545	2608	9.1	32558						
8.1	14.3	110	118.1	23887	18719	2601	9.2	32764						

Cooling capacity is based on 80.6ºF DB and 66.2ºF WB entering air.
Heating capacity is based on 68ºF DB entering air.
Blank sections are outside the operation range.

VSHP SE 120														
GPM	WPD	Cooling								Heating				
		EWT	LWT	Total Cap. (Btuh)	Sensible Cap. (Btuh)	Watts	EER	THR (Btuh)	EWT	LWT	Total Cap. (Btuh)	Watts	COP	THA (Btuh)
5.5	9.6								20	14.9	22232	2415	2.7	13992
7	14.7								20	15.9	22789	2432	2.7	14491
8	18.7								20	16.3	23065	2441	2.8	14737
9	23.2								20	16.7	23265	2448	2.8	14912
5.5	9.2	30	47.4	42291	28363	1609	26.3	47784	30	23.5	26172	2476	3.1	17724
7	14.1	30	43.8	43038	28681	1560	27.6	48364	30	24.8	26828	2494	3.2	18320
8	17.9	30	42.1	43400	28826	1534	28.3	48635	30	25.4	27153	2503	3.2	18613
9	22.2	30	40.8	43651	28916	1513	28.9	48814	30	25.8	27388	2510	3.2	18824
5.5	8.9	40	57.3	41510	28328	1754	23.7	47498	40	32.2	30106	2543	3.5	21429
7	13.5	40	53.7	42244	28646	1701	24.8	48049	40	33.7	30861	2561	3.5	22122
8	17.2	40	52.0	42598	28790	1672	25.5	48305	40	34.4	31234	2571	3.6	22463
9	21.3	40	50.7	42845	28881	1649	26.0	48473	40	35.0	31505	2578	3.6	22709
5.5	8.5	50	67.1	40494	28108	1927	21.0	47069	50	40.8	34035	2616	3.8	25108
7	13.0	50	63.6	41209	28423	1868	22.1	47585	50	42.6	34888	2635	3.9	25898
8	16.6	50	61.9	41555	28566	1836	22.6	47823	50	43.4	35310	2644	3.9	26287
9	20.5	50	60.6	41796	28657	1811	23.1	47976	50	44.1	35616	2652	3.9	26567
5.5	8.2	60	76.9	39241	27702	2127	18.5	46499	60	49.5	37957	2695	4.1	28761
7	12.6	60	73.4	39934	28012	2062	19.4	46971	60	51.5	38909	2714	4.2	29647
8	16.0	60	71.8	40269	28154	2027	19.9	47188	60	52.5	39380	2724	4.2	30084
9	19.8	60	70.5	40502	28243	1999	20.3	47324	60	53.2	39720	2732	4.3	30398
5.5	8.0	70	86.6	37752	27110	2354	16.0	45786	70	58.2	41874	2780	4.4	32388
7	12.2	70	83.2	38419	27414	2283	16.8	46209	70	60.5	42924	2800	4.5	33370
8	15.5	70	81.6	38741	27552	2244	17.3	46400	70	61.5	43443	2810	4.5	33855
9	19.2	70	80.3	38966	27639	2213	17.6	46517	70	62.4	43819	2818	4.6	34203
5.5	7.8	80	96.3	36027	26332	2609	13.8	44932	80	66.9	45785	2871	4.7	35989
7	11.9	80	92.9	36663	26628	2530	14.5	45298	80	69.4	46933	2892	4.8	37066
8	15.1	80	91.3	36971	26762	2487	14.9	45459	80	70.6	47501	2902	4.8	37599
9	18.7	80	90.1	37185	26847	2452	15.2	45555	80	71.6	47912	2910	4.8	37981
5.5	7.7	85	101.1	35076	25874	2747	12.8	44451	85	71.3	47739	2919	4.8	37779
7	11.7	85	97.8	35695	26164	2664	13.4	44786	85	73.9	48935	2940	4.9	38905
8	14.9	85	96.2	35995	26296	2619	13.7	44932	85	75.1	49528	2950	4.9	39461
9	18.4	85	95.0	36204	26379	2582	14.0	45016	85	76.1	49956	2959	4.9	39861
5.5	7.6	90	105.9	34066	25369	2892	11.8	43935	90	75.6	49691	2968	4.9	39563
7	11.6	90	102.6	34668	25654	2804	12.4	44237	90	78.4	50936	2989	5.0	40737
8	14.7	90	101.1	34959	25783	2756	12.7	44366	90	79.7	51553	3000	5.0	41316
9	18.2	90	99.9	35161	25864	2718	12.9	44438	90	80.7	51999	3009	5.1	41733
5.5	7.5	100	115.5	31869	24220	3202	10.0	42797						
7	11.4	100	112.3	32432	24492	3105	10.4	43028						
8	14.5	100	110.8	32704	24615	3052	10.7	43121						
9	17.9	100	109.6	32893	24693	3010	10.9	43165						
5.5	7.4	110	125.0	29436	22885	3540	8.3	41516						
7	11.2	110	121.9	29956	23142	3432	8.7	41669						
8	14.3	110	120.4	30207	23259	3374	9.0	41723						
9	17.7	110	119.3	30382	23332	3327	9.1	41737						

Cooling capacity is based on 80.6ºF DB and 66.2ºF WB entering air.
Heating capacity is based on 68ºF DB entering air.
Blank sections are outside the operation range.

6.6 VSHPe (HE) Expanded Heating & Cooling Performance Tables

VSHP HE 020														
GPM	WPD	Cooling								Heating				
		EWT	LWT	Total Cap. (Btuh)	Sensible Cap. (Btuh)	Watts	EER	THR (Btuh)	EWT	LWT	Total Cap. (Btuh)	Watts	COP	THA (Btuh)
1.2	2.4								20	16.1	4055	494	2.4	2369
1.7	4.8								20	17.0	4179	489	2.5	2512
2.1	7.2								20	17.4	4279	458	2.7	2716
2.5	10.1								20	17.6	4378	404	3.2	3001
1.2	2.3	30	45.5	8197	5468	315	26.0	9274	30	24.2	5202	511	3.0	3457
1.7	4.4	30	41.0	8357	5552	302	27.6	9389	30	25.7	5362	506	3.1	3636
2.1	6.7	30	39.0	8423	5619	292	28.9	9419	30	26.3	5490	474	3.4	3873
2.5	9.4	30	37.5	8434	5686	281	30.0	9394	30	26.6	5617	418	3.9	4192
1.2	2.1	40	55.5	8145	5495	340	24.0	9305	40	32.5	6288	528	3.5	4488
1.7	4.1	40	51.1	8304	5580	326	25.5	9416	40	34.5	6481	522	3.6	4701
2.1	6.2	40	49.0	8369	5647	315	26.6	9443	40	35.3	6635	489	4.0	4967
2.5	8.8	40	47.5	8380	5714	303	27.6	9415	40	35.7	6789	431	4.6	5320
1.2	2.0	50	65.5	8011	5487	372	21.5	9282	50	40.9	7311	542	4.0	5461
1.7	3.9	50	61.0	8168	5571	357	22.9	9386	50	43.3	7535	536	4.1	5706
2.1	5.8	50	59.0	8232	5638	345	23.9	9408	50	44.3	7715	502	4.5	6001
2.5	8.2	50	57.5	8242	5706	332	24.8	9376	50	44.9	7894	443	5.2	6383
1.2	1.8	60	75.3	7796	5443	413	18.9	9205	60	49.4	8272	556	4.4	6376
1.7	3.6	60	70.9	7949	5527	396	20.1	9300	60	52.2	8526	549	4.5	6651
2.1	5.5	60	68.9	8011	5593	382	21.0	9315	60	53.4	8729	515	5.0	6972
2.5	7.7	60	67.4	8021	5660	368	21.8	9279	60	54.1	8932	454	5.8	7384
1.2	1.7	70	85.1	7500	5364	461	16.3	9075	70	57.9	9171	568	4.7	7234
1.7	3.4	70	80.8	7646	5446	442	17.3	9156	70	61.1	9453	561	4.9	7537
2.1	5.1	70	78.7	7707	5512	427	18.0	9164	70	62.5	9678	526	5.4	7883
2.5	7.2	70	77.3	7716	5578	412	18.7	9121	70	63.3	9903	464	6.3	8321
1.2	1.6	80	94.8	7122	5249	518	13.8	8890	80	66.6	10008	579	5.1	8034
1.7	3.2	80	90.5	7261	5329	496	14.6	8956	80	70.2	10315	572	5.3	8363
2.1	4.9	80	88.5	7319	5394	479	15.3	8954	80	71.7	10561	536	5.8	8731
2.5	6.8	80	87.1	7328	5458	462	15.9	8905	80	72.6	10806	473	6.7	9194
1.2	1.6	85	99.6	6903	5178	549	12.6	8777	85	71.0	10403	584	5.2	8412
1.7	3.1	85	95.4	7038	5258	526	13.4	8834	85	74.7	10722	577	5.4	8753
2.1	4.7	85	93.4	7093	5321	508	14.0	8828	85	76.3	10977	541	6.0	9133
2.5	6.7	85	92.0	7102	5384	490	14.5	8774	85	77.3	11233	477	6.9	9607
1.2	1.6	90	104.4	6663	5099	582	11.4	8651	90	75.4	10782	588	5.4	8776
1.7	3.1	90	100.2	6793	5177	558	12.2	8699	90	79.3	11113	582	5.6	9129
2.1	4.6	90	98.3	6847	5239	539	12.7	8686	90	80.9	11378	545	6.1	9519
2.5	6.5	90	96.9	6855	5302	520	13.2	8629	90	82.0	11643	480	7.1	10004
1.2	1.5	100	113.9	6123	4913	655	9.3	8358						
1.7	2.9	100	109.9	6243	4988	628	9.9	8385						
2.1	4.4	100	108.0	6292	5048	606	10.4	8360						
2.5	6.2	100	106.6	6300	5108	584	10.8	8294						
1.2	1.4	110	123.4	5501	4691	735	7.5	8011						
1.7	2.8	110	119.4	5609	4763	705	8.0	8014						
2.1	4.3	110	117.6	5653	4820	680	8.3	7975						
2.5	6.0	110	116.3	5660	4878	656	8.6	7899						

Cooling capacity is based on 80.6ºF DB and 66.2ºF WB entering air.
Heating capacity is based on 68ºF DB entering air.
Blank sections are outside the operation range.

VSHP HE 030														
GPM	WPD	Cooling								Heating				
		EWT	LWT	Total Cap. (Btuh)	Sensible Cap. (Btuh)	Watts	EER	THR (Btuh)	EWT	LWT	Total Cap. (Btuh)	Watts	COP	THA (Btuh)
1.3	4.3								20	14.4	5669	586	2.8	3669
1.8	8.1								20	15.7	5868	591	2.9	3853
2.4	14.1								20	16.6	6063	596	3.0	4031
2.6	16.5								20	16.9	6117	597	3.0	4080
1.3	4.1	30	49.1	11145	7922	373	29.9	12418	30	22.7	6823	605	3.3	4758
1.8	7.7	30	44.0	11354	7999	361	31.4	12588	30	24.5	7063	610	3.4	4981
2.4	13.6	30	40.6	11563	8110	344	33.6	12738	30	25.7	7298	615	3.5	5198
2.6	15.9	30	39.8	11623	8152	337	34.5	12775	30	26.0	7363	617	3.5	5258
1.3	4.0	40	58.8	10827	7872	408	26.5	12219	40	31.0	7998	624	3.8	5870
1.8	7.4	40	53.8	11029	7950	395	27.9	12378	40	33.2	8279	629	3.9	6134
2.4	13.0	40	50.4	11233	8060	376	29.9	12516	40	34.7	8554	634	4.0	6391
2.6	15.3	40	49.7	11291	8101	369	30.6	12550	40	35.0	8630	635	4.0	6462
1.3	3.8	50	68.5	10472	7790	451	23.2	12011	50	39.2	9194	641	4.2	7005
1.8	7.2	50	63.5	10668	7866	437	24.4	12160	50	41.9	9516	646	4.3	7311
2.4	12.6	50	60.2	10865	7975	416	26.1	12284	50	43.7	9832	652	4.4	7609
2.6	14.7	50	59.5	10922	8016	408	26.8	12313	50	44.1	9920	653	4.5	7691
1.3	3.7	60	78.1	10083	7674	502	20.1	11797	60	47.4	10410	658	4.6	8165
1.8	6.9	60	73.3	10272	7749	487	21.1	11932	60	50.5	10775	663	4.8	8513
2.4	12.2	60	70.0	10461	7856	463	22.6	12042	60	52.6	11133	669	4.9	8852
2.6	14.2	60	69.3	10515	7896	454	23.2	12065	60	53.1	11232	670	4.9	8946
1.3	3.6	70	87.8	9658	7524	562	17.2	11575	70	55.6	11646	674	5.1	9348
1.8	6.7	70	83.0	9839	7598	544	18.1	11696	70	59.2	12055	679	5.2	9739
2.4	11.8	70	79.8	10020	7703	518	19.3	11788	70	61.6	12455	684	5.3	10120
2.6	13.8	70	79.1	10072	7742	508	19.8	11806	70	62.1	12567	686	5.4	10225
1.3	3.5	80	97.5	9198	7341	629	14.6	11346	80	63.8	12903	688	5.5	10554
1.8	6.6	80	92.7	9370	7413	610	15.4	11451	80	67.8	13356	694	5.6	10989
2.4	11.5	80	89.6	9543	7516	580	16.4	11523	80	70.5	13799	699	5.8	11413
2.6	13.5	80	88.9	9592	7554	569	16.9	11534	80	71.1	13923	701	5.8	11530
1.3	3.5	85	102.3	8954	7237	666	13.4	11228	85	67.8	13539	695	5.7	11166
1.8	6.5	85	97.6	9122	7308	646	14.1	11325	85	72.1	14015	701	5.9	11623
2.4	11.4	85	94.5	9290	7409	614	15.1	11387	85	74.9	14480	707	6.0	12069
2.6	13.4	85	93.8	9338	7447	603	15.5	11395	85	75.6	14610	708	6.0	12192
1.3	3.4	90	107.1	8702	7125	705	12.3	11109	90	71.9	14181	702	5.9	11784
1.8	6.5	90	102.4	8865	7194	683	13.0	11197	90	76.4	14679	708	6.1	12264
2.4	11.3	90	99.4	9028	7294	650	13.9	11248	90	79.4	15166	714	6.2	12731
2.6	13.2	90	98.7	9075	7331	638	14.2	11252	90	80.1	15302	715	6.3	12860
1.3	3.4	100	116.7	8171	6875	789	10.3	10865						
1.8	6.4	100	112.1	8324	6942	765	10.9	10934						
2.4	11.1	100	109.1	8477	7038	728	11.6	10962						
2.6	13.0	100	108.4	8521	7074	714	11.9	10958						
1.3	3.3	110	126.3	7604	6591	882	8.6	10614						
1.8	6.3	110	121.8	7747	6656	854	9.1	10663						
2.4	11.0	110	118.9	7890	6748	813	9.7	10665						
2.6	12.9	110	118.2	7930	6783	797	9.9	10652						

Cooling capacity is based on 80.6ºF DB and 66.2ºF WB entering air.
Heating capacity is based on 68ºF DB entering air.
Blank sections are outside the operation range.

VSHP HE 040														
GPM	WPD	Cooling								Heating				
		EWT	LWT	Total Cap. (Btuh)	Sensible Cap. (Btuh)	Watts	EER	THR (Btuh)	EWT	LWT	Total Cap. (Btuh)	Watts	COP	THA (Btuh)
1.7	4.1								20	14.2	7450	742	2.9	4919
2.4	8.0								20	15.7	7730	747	3.0	5181
3.3	14.8								20	16.7	7974	753	3.1	5406
3.5	16.6								20	16.9	8011	754	3.1	5440
1.7	3.9	30	48.7	14169	10015	504	28.1	15888	30	22.7	8851	765	3.4	6240
2.4	7.6	30	43.4	14511	10178	477	30.4	16138	30	24.5	9182	770	3.5	6554
3.3	14.1	30	39.9	14692	10314	458	32.1	16255	30	25.9	9473	776	3.6	6825
3.5	15.8	30	39.3	14693	10333	456	32.2	16249	30	26.1	9517	777	3.6	6865
1.7	3.7	40	58.5	13857	9949	556	24.9	15753	40	31.1	10268	788	3.8	7579
2.4	7.2	40	53.3	14192	10112	526	27.0	15986	40	33.4	10654	794	3.9	7945
3.3	13.4	40	49.8	14369	10247	505	28.5	16092	40	35.0	10990	800	4.0	8262
3.5	15.1	40	49.2	14370	10266	503	28.6	16086	40	35.3	11041	801	4.0	8309
1.7	3.5	50	68.3	13465	9829	617	21.8	15572	50	39.5	11704	812	4.2	8935
2.4	6.9	50	63.2	13790	9990	584	23.6	15783	50	42.2	12143	817	4.4	9355
3.3	12.8	50	59.6	13962	10123	561	24.9	15877	50	44.1	12527	823	4.5	9718
3.5	14.4	50	59.1	13963	10142	559	25.0	15870	50	44.4	12585	824	4.5	9772
1.7	3.4	60	78.1	12992	9655	689	18.9	15344	60	47.9	13157	835	4.6	10309
2.4	6.6	60	72.9	13306	9812	652	20.4	15531	60	51.0	13650	841	4.8	10782
3.3	12.2	60	69.5	13472	9944	626	21.5	15609	60	53.2	14082	847	4.9	11193
3.5	13.7	60	68.9	13472	9962	624	21.6	15602	60	53.6	14147	848	4.9	11254
1.7	3.2	70	87.7	12438	9426	771	16.1	15070	70	56.2	14628	858	5.0	11700
2.4	6.3	70	82.7	12738	9580	730	17.5	15228	70	59.8	15176	864	5.1	12228
3.3	11.7	70	79.3	12897	9708	701	18.4	15289	70	62.3	15656	870	5.3	12687
3.5	13.1	70	78.7	12898	9726	698	18.5	15280	70	62.7	15729	872	5.3	12755
1.7	3.1	80	97.4	11804	9142	863	13.7	14749	80	64.6	16116	881	5.4	13109
2.4	6.0	80	92.4	12089	9292	817	14.8	14876	80	68.6	16721	888	5.5	13692
3.3	11.2	80	89.0	12240	9416	784	15.6	14916	80	71.4	17249	894	5.7	14199
3.5	12.6	80	88.5	12240	9433	781	15.7	14907	80	71.8	17329	895	5.7	14274
1.7	3.0	85	102.1	11456	8980	913	12.6	14572	85	68.7	16867	893	5.5	13820
2.4	5.9	85	97.2	11733	9127	864	13.6	14680	85	73.0	17500	899	5.7	14431
3.3	11.0	85	93.9	11879	9249	829	14.3	14710	85	75.9	18053	906	5.8	14962
3.5	12.3	85	93.4	11880	9266	826	14.4	14700	85	76.4	18136	907	5.9	15041
1.7	3.0	90	106.9	11089	8804	965	11.5	14382	90	72.9	17622	905	5.7	14535
2.4	5.8	90	102.1	11356	8948	913	12.4	14473	90	77.4	18283	911	5.9	15174
3.3	10.8	90	98.8	11498	9068	877	13.1	14491	90	80.5	18861	918	6.0	15730
3.5	12.1	90	98.3	11499	9085	874	13.2	14480	90	81.0	18948	919	6.0	15813
1.7	2.9	100	116.4	10293	8412	1077	9.6	13969						
2.4	5.6	100	111.7	10541	8549	1019	10.3	14019						
3.3	10.4	100	108.5	10673	8664	979	10.9	14013						
3.5	11.6	100	108.0	10673	8680	975	10.9	14001						
1.7	2.8	110	125.9	9416	7965	1199	7.9	13509						
2.4	5.4	110	121.3	9643	8095	1135	8.5	13516						
3.3	10.0	110	118.2	9764	8203	1090	9.0	13483						
3.5	11.3	110	117.7	9764	8218	1086	9.0	13470						

Cooling capacity is based on 80.6ºF DB and 66.2ºF WB entering air.
Heating capacity is based on 68ºF DB entering air.
Blank sections are outside the operation range.

VSHP HE 050														
GPM	WPD	Cooling								Heating				
		EWT	LWT	Total Cap. (Btuh)	Sensible Cap. (Btuh)	Watts	EER	THR (Btuh)	EWT	LWT	Total Cap. (Btuh)	Watts	COP	THA (Btuh)
2.8	8.5								20	16.2	8069	804	2.9	5326
3.5	13.0								20	16.9	8260	808	3.0	5502
3.8	15.3								20	17.1	8322	810	3.0	5559
4	16.9								20	17.2	8356	811	3.0	5590
2.8	8.3	30	43.9	17853	13479	480	37.2	19491	30	25.1	9736	831	3.4	6900
3.5	12.8	30	41.2	18041	13579	467	38.6	19634	30	25.9	9967	836	3.5	7115
3.8	15.0	30	40.3	18079	13605	463	39.0	19659	30	26.2	10041	837	3.5	7185
4	16.6	30	39.8	18090	13616	461	39.2	19663	30	26.4	10082	838	3.5	7223
2.8	8.2	40	53.7	17319	13244	541	32.0	19164	40	33.9	11466	858	3.9	8540
3.5	12.6	40	51.0	17501	13343	526	33.3	19296	40	35.0	11738	862	4.0	8795
3.8	14.7	40	50.2	17537	13368	522	33.6	19318	40	35.3	11825	864	4.0	8878
4	16.3	40	49.7	17548	13379	520	33.8	19321	40	35.5	11874	865	4.0	8923
2.8	8.0	50	63.5	16749	12997	611	27.4	18834	50	42.7	13259	883	4.4	10244
3.5	12.3	50	60.8	16925	13093	594	28.5	18954	50	44.0	13573	888	4.5	10542
3.8	14.5	50	60.0	16961	13118	590	28.8	18973	50	44.4	13674	890	4.5	10638
4	16.0	50	59.5	16971	13129	587	28.9	18975	50	44.7	13730	891	4.5	10691
2.8	7.9	60	73.2	16145	12737	691	23.4	18503	60	51.4	15113	908	4.9	12014
3.5	12.1	60	70.6	16315	12831	672	24.3	18609	60	52.9	15471	913	5.0	12355
3.8	14.2	60	69.8	16349	12856	667	24.5	18625	60	53.4	15587	915	5.0	12465
4	15.7	60	69.3	16359	12866	664	24.6	18625	60	53.7	15651	916	5.0	12526
2.8	7.8	70	83.0	15507	12464	780	19.9	18169	70	60.1	17031	933	5.4	13849
3.5	11.9	70	80.4	15670	12556	759	20.6	18260	70	61.9	17434	938	5.4	14234
3.8	14.0	70	79.6	15703	12580	753	20.9	18272	70	62.4	17564	939	5.5	14359
4	15.4	70	79.1	15712	12591	750	21.0	18271	70	62.8	17636	940	5.5	14428
2.8	7.6	80	92.7	14833	12178	879	16.9	17833	80	68.8	19011	956	5.8	15748
3.5	11.7	80	90.2	14989	12268	855	17.5	17908	80	70.8	19461	961	5.9	16181
3.8	13.8	80	89.4	15020	12292	848	17.7	17916	80	71.4	19606	963	6.0	16320
4	15.2	80	89.0	15030	12302	845	17.8	17913	80	71.8	19686	964	6.0	16397
2.8	7.6	85	97.6	14483	12030	932	15.5	17664	85	73.1	20024	968	6.1	16722
3.5	11.6	85	95.1	14635	12119	907	16.1	17731	85	75.2	20498	973	6.2	17179
3.8	13.6	85	94.3	14666	12143	900	16.3	17736	85	75.9	20651	975	6.2	17325
4	15.1	85	93.9	14675	12153	896	16.4	17732	85	76.3	20736	976	6.2	17407
2.8	7.5	90	102.5	14125	11879	988	14.3	17495	90	77.3	21053	979	6.3	17713
3.5	11.5	90	100.0	14273	11967	961	14.9	17552	90	79.6	21552	984	6.4	18193
3.8	13.5	90	99.2	14303	11990	953	15.0	17556	90	80.3	21712	986	6.5	18348
4	14.9	90	98.8	14312	12000	949	15.1	17551	90	80.8	21801	987	6.5	18434
2.8	7.4	100	112.3	13382	11568	1105	12.1	17155						
3.5	11.4	100	109.8	13522	11654	1076	12.6	17193						
3.8	13.3	100	109.0	13551	11676	1067	12.7	17192						
4	14.7	100	108.6	13559	11686	1062	12.8	17185						
2.8	7.3	110	122.0	12604	11244	1233	10.2	16812						
3.5	11.2	110	119.6	12736	11327	1200	10.6	16830						
3.8	13.1	110	118.9	12763	11349	1190	10.7	16824						
4	14.5	110	118.4	12771	11359	1185	10.8	16815						

Cooling capacity is based on 80.6ºF DB and 66.2ºF WB entering air.
Heating capacity is based on 68ºF DB entering air.
Blank sections are outside the operation range.

VSHP HE 060														
GPM	WPD	Cooling								Heating				
		EWT	LWT	Total Cap. (Btuh)	Sensible Cap. (Btuh)	Watts	EER	THR (Btuh)	EWT	LWT	Total Cap. (Btuh)	Watts	COP	THA (Btuh)
2.7	8.0								20	14.8	10368	984	3.1	7010
3.9	16.1								20	16.2	10785	996	3.2	7388
4	16.9								20	16.3	10812	997	3.2	7412
5.2	28.1								20	17.1	11036	1004	3.2	7610
2.5	6.7	30	47.9	20368	15084	594	34.3	22395	30	23.4	12429	1017	3.6	8961
4	16.5	30	41.4	20910	15407	555	37.7	22805	30	25.2	12930	1029	3.7	9420
4.7	22.5	30	39.8	21078	15515	546	38.6	22941	30	25.3	12962	1029	3.7	9450
5.2	27.4	30	38.9	21165	15576	543	39.0	23017	30	26.3	13230	1037	3.7	9691
2.5	6.6	40	58.0	20180	15238	680	29.7	22500	40	31.9	14519	1049	4.1	10941
4	16.1	40	51.4	20716	15564	636	32.6	22886	40	34.1	15104	1061	4.2	11484
4.7	22.0	40	49.8	20882	15673	625	33.4	23016	40	34.2	15142	1062	4.2	11518
5.2	26.8	40	48.9	20969	15735	621	33.7	23090	40	35.5	15455	1070	4.2	11804
2.5	6.4	50	68.0	19812	15256	781	25.4	22478	50	40.4	16637	1080	4.5	12951
4	15.8	50	61.4	20338	15583	730	27.8	22832	50	43.0	17307	1093	4.6	13577
4.7	21.5	50	59.8	20502	15692	718	28.5	22953	50	43.2	17350	1094	4.6	13617
5.2	26.2	50	58.9	20587	15754	714	28.8	23023	50	44.6	17709	1102	4.7	13948
2.5	6.3	60	77.9	19265	15139	897	21.5	22327	60	48.9	18782	1112	5.0	14990
4	15.4	60	71.3	19777	15464	839	23.6	22640	60	51.9	19539	1125	5.1	15701
4.7	21.1	60	69.7	19936	15572	825	24.2	22751	60	52.1	19588	1126	5.1	15747
5.2	25.6	60	68.8	20019	15633	820	24.4	22817	60	53.8	19993	1134	5.2	16123
2.5	6.2	70	87.6	18540	14887	1028	18.0	22047	70	57.4	20956	1142	5.4	17058
4	15.2	70	81.2	19033	15206	961	19.8	22313	70	60.8	21800	1156	5.5	17856
4.7	20.7	70	79.5	19186	15313	945	20.3	22411	70	61.0	21854	1157	5.5	17907
5.2	25.2	70	78.6	19265	15373	939	20.5	22471	70	63.0	22306	1166	5.6	18329
2.5	6.1	80	97.3	17636	14500	1173	15.0	21640	80	65.8	23158	1173	5.8	19155
4	14.9	80	90.9	18105	14810	1097	16.5	21849	80	69.7	24091	1187	5.9	20041
4.7	20.3	80	89.3	18250	14914	1079	16.9	21932	80	70.0	24150	1188	6.0	20097
5.2	24.7	80	88.5	18326	14972	1072	17.1	21985	80	72.1	24650	1197	6.0	20566
2.5	6.0	85	102.1	17117	14255	1251	13.7	21388	85	70.0	24269	1188	6.0	20215
4	14.8	85	95.8	17572	14560	1170	15.0	21566	85	74.2	25247	1202	6.2	21145
4.7	20.2	85	94.2	17713	14662	1151	15.4	21640	85	74.4	25309	1203	6.2	21204
5.2	24.6	85	93.3	17786	14720	1144	15.6	21690	85	76.7	25833	1212	6.2	21696
2.5	6.0	90	106.9	16553	13977	1333	12.4	21104	90	74.2	25387	1203	6.2	21282
4	14.7	90	100.6	16993	14276	1247	13.6	21249	90	78.6	26410	1217	6.4	22256
4.7	20.0	90	99.1	17130	14376	1226	14.0	21314	90	78.8	26475	1218	6.4	22318
5.2	24.4	90	98.2	17200	14432	1219	14.1	21360	90	81.2	27023	1228	6.5	22835
2.5	5.9	100	116.4	15291	13318	1508	10.1	20439						
4	14.5	100	110.3	15698	13604	1411	11.1	20513						
4.7	19.8	100	108.7	15824	13699	1387	11.4	20558						
5.2	24.1	100	107.9	15889	13752	1379	11.5	20595						
2.5	5.9	110	125.7	13851	12525	1698	8.2	19647						
4	14.4	110	119.8	14219	12793	1588	9.0	19640						
4.7	19.6	110	118.4	14333	12883	1562	9.2	19663						
5.2	23.8	110	117.6	14392	12933	1552	9.3	19690						

Cooling capacity is based on 80.6ºF DB and 66.2ºF WB entering air.
Heating capacity is based on 68ºF DB entering air.
Blank sections are outside the operation range.

VSHP HE 080														
GPM	WPD	Cooling								Heating				
		EWT	LWT	Total Cap. (Btuh)	Sensible Cap. (Btuh)	Watts	EER	THR (Btuh)	EWT	LWT	Total Cap. (Btuh)	Watts	COP	THA (Btuh)
3.4	5.1								20	14.7	13618	1342	3.0	9038
4.9	9.9								20	16.1	14235	1360	3.1	9593
6.5	16.9								20	16.9	14683	1375	3.1	9990
6.7	17.9								20	17.0	14724	1377	3.1	10025
3.4	4.9	30	47.4	27042	18611	761	35.5	29639	30	23.1	16436	1373	3.5	11750
4.9	9.5	30	42.3	27704	18928	718	38.6	30154	30	24.9	17181	1392	3.6	12431
6.5	16.2	30	39.4	28160	19240	687	41.0	30503	30	26.0	17722	1407	3.7	12919
6.7	17.2	30	39.1	28198	19277	684	41.2	30532	30	26.1	17771	1409	3.7	12963
3.4	4.7	40	57.5	26738	18635	872	30.7	29713	40	31.5	19302	1413	4.0	14481
4.9	9.2	40	52.3	27392	18952	822	33.3	30199	40	33.8	20177	1432	4.1	15290
6.5	15.6	40	49.4	27843	19265	787	35.4	30527	40	35.1	20812	1448	4.2	15871
6.7	16.5	40	49.1	27881	19302	783	35.6	30555	40	35.2	20870	1450	4.2	15924
3.4	4.5	50	67.4	26196	18511	1005	26.1	29627	50	39.9	22216	1461	4.5	17232
4.9	8.9	50	62.3	26837	18826	948	28.3	30074	50	42.6	23222	1480	4.6	18171
6.5	15.1	50	59.3	27278	19137	907	30.1	30375	50	44.2	23953	1497	4.7	18846
6.7	16.0	50	59.1	27315	19174	904	30.2	30399	50	44.4	24020	1498	4.7	18907
3.4	4.4	60	77.3	25415	18240	1162	21.9	29381	60	48.2	25177	1517	4.9	20002
4.9	8.6	60	72.2	26038	18550	1096	23.8	29779	60	51.4	26317	1537	5.0	21072
6.5	14.6	60	69.2	26466	18856	1049	25.2	30044	60	53.3	27146	1554	5.1	21843
6.7	15.5	60	69.0	26502	18892	1044	25.4	30066	60	53.5	27221	1556	5.1	21912
3.4	4.2	70	87.0	24397	17820	1341	18.2	28975	70	56.6	28185	1581	5.2	22792
4.9	8.3	70	82.0	24995	18124	1265	19.8	29313	70	60.2	29462	1602	5.4	23995
6.5	14.2	70	79.1	25406	18422	1210	21.0	29537	70	62.4	30389	1620	5.5	24862
6.7	15.0	70	78.8	25440	18458	1205	21.1	29555	70	62.6	30474	1622	5.5	24941
3.4	4.1	80	96.7	23142	17253	1543	15.0	28409	80	64.9	31241	1653	5.5	25601
4.9	8.1	80	91.7	23708	17547	1456	16.3	28677	80	69.0	32656	1675	5.7	26939
6.5	13.8	80	88.9	24098	17836	1393	17.3	28851	80	71.4	33684	1694	5.8	27904
6.7	14.7	80	88.6	24131	17870	1387	17.4	28865	80	71.6	33778	1696	5.8	27991
3.4	4.1	85	101.5	22424	16914	1653	13.6	28066	85	69.1	32787	1692	5.7	27013
4.9	8.0	85	96.5	22973	17202	1559	14.7	28295	85	73.4	34272	1715	5.9	28420
6.5	13.7	85	93.8	23351	17485	1492	15.7	28442	85	75.9	35351	1734	6.0	29434
6.7	14.5	85	93.5	23383	17519	1486	15.7	28453	85	76.2	35449	1736	6.0	29525
3.4	4.1	90	106.3	21648	16538	1768	12.2	27683	90	73.3	34345	1734	5.8	28430
4.9	8.0	90	101.4	22178	16819	1668	13.3	27871	90	77.8	35901	1757	6.0	29905
6.5	13.6	90	98.6	22542	17097	1596	14.1	27988	90	80.5	37031	1777	6.1	30969
6.7	14.4	90	98.4	22573	17130	1589	14.2	27997	90	80.7	37134	1779	6.1	31065
3.4	4.0	100	115.8	19916	15675	2016	9.9	26797						
4.9	7.9	100	111.0	20404	15942	1902	10.7	26894						
6.5	13.4	100	108.3	20739	16204	1819	11.4	26948						
6.7	14.2	100	108.0	20768	16236	1812	11.5	26951						
3.4	4.0	110	125.1	17947	14664	2287	7.8	25751						
4.9	7.8	110	120.5	18386	14914	2157	8.5	25747						
6.5	13.2	110	117.9	18688	15160	2063	9.1	25730						
6.7	14.0	110	117.7	18714	15189	2055	9.1	25727						

Cooling capacity is based on 80.6ºF DB and 66.2ºF WB entering air.
Heating capacity is based on 68ºF DB entering air.
Blank sections are outside the operation range.

VSHP HE 100														
GPM	WPD	Cooling								Heating				
		EWT	LWT	Total Cap. (Btuh)	Sensible Cap. (Btuh)	Watts	EER	THR (Btuh)	EWT	LWT	Total Cap. (Btuh)	Watts	COP	THA (Btuh)
4.3	5.3								20	14.7	17285	1738	2.9	11356
6.1	11.1								20	16.1	17838	1746	3.0	11880
6.5	12.6								20	16.3	17916	1748	3.0	11952
8.1	19.9								20	17.0	18065	1755	3.0	12077
4.3	5.1	30	47.0	32728	22151	1140	28.7	36617	30	22.8	21607	1795	3.5	15482
6.1	10.7	30	42.2	33358	22485	1094	30.5	37093	30	24.7	22298	1804	3.6	16143
6.5	12.2	30	41.4	33468	22548	1089	30.7	37185	30	25.0	22395	1806	3.6	16234
8.1	19.2	30	39.3	33793	22759	1086	31.1	37500	30	26.0	22582	1813	3.7	16395
4.3	5.0	40	57.2	32650	22615	1241	26.3	36886	40	31.0	25562	1849	4.1	19251
6.1	10.4	40	52.2	33280	22956	1192	27.9	37347	40	33.4	26379	1859	4.2	20038
6.5	11.8	40	51.5	33389	23020	1186	28.2	37437	40	33.8	26495	1860	4.2	20146
8.1	18.7	40	49.3	33714	23236	1183	28.5	37750	40	35.0	26715	1868	4.2	20341
4.3	4.8	50	67.2	32276	22823	1369	23.6	36949	50	39.5	29151	1901	4.5	22665
6.1	10.1	50	62.3	32898	23167	1315	25.0	37385	50	42.3	30083	1910	4.6	23566
6.5	11.5	50	61.5	33006	23232	1309	25.2	37472	50	42.7	30214	1912	4.6	23690
8.1	18.1	50	59.3	33327	23450	1305	25.5	37781	50	44.1	30466	1920	4.7	23915
4.3	4.7	60	77.1	31603	22776	1525	20.7	36806	60	48.0	32373	1949	4.9	25723
6.1	9.8	60	72.2	32212	23119	1464	22.0	37208	60	51.2	33408	1958	5.0	26726
6.5	11.2	60	71.5	32318	23183	1457	22.2	37290	60	51.7	33554	1960	5.0	26865
8.1	17.6	60	69.3	32632	23401	1453	22.5	37591	60	53.3	33833	1968	5.0	27117
4.3	4.6	70	87.0	30633	22472	1707	17.9	36457	70	56.8	35228	1994	5.2	28426
6.1	9.6	70	82.1	31223	22811	1639	19.1	36816	70	60.3	36354	2003	5.3	29519
6.5	10.9	70	81.4	31326	22875	1631	19.2	36892	70	60.9	36513	2005	5.3	29671
8.1	17.2	70	79.2	31630	23089	1626	19.4	37181	70	62.6	36817	2014	5.4	29947
4.3	4.5	80	96.7	29365	21913	1916	15.3	35903	80	65.7	37717	2035	5.4	30772
6.1	9.4	80	91.9	29931	22244	1839	16.3	36208	80	69.5	38923	2045	5.6	31944
6.5	10.7	80	91.2	30029	22306	1831	16.4	36277	80	70.1	39093	2047	5.6	32107
8.1	16.8	80	89.0	30321	22515	1826	16.6	36551	80	72.0	39418	2056	5.6	32404
4.3	4.5	85	101.5	28619	21538	2030	14.1	35548	85	70.2	38824	2055	5.5	31812
6.1	9.3	85	96.7	29171	21863	1949	15.0	35824	85	74.2	40065	2065	5.7	33019
6.5	10.6	85	96.0	29266	21924	1940	15.1	35888	85	74.8	40240	2067	5.7	33187
8.1	16.7	85	93.9	29551	22129	1935	15.3	36154	85	76.7	40575	2075	5.7	33493
4.3	4.4	90	106.3	27799	21099	2152	12.9	35142	90	74.8	39839	2074	5.6	32763
6.1	9.2	90	101.6	28335	21417	2066	13.7	35385	90	78.9	41113	2084	5.8	34002
6.5	10.5	90	100.9	28428	21477	2056	13.8	35445	90	79.5	41293	2086	5.8	34175
8.1	16.5	90	98.8	28704	21678	2050	14.0	35702	90	81.5	41636	2095	5.8	34489
4.3	4.3	100	115.9	25936	20029	2414	10.7	34176						
6.1	9.0	100	111.3	26436	20330	2318	11.4	34347						
6.5	10.3	100	110.6	26522	20387	2307	11.5	34396						
8.1	16.2	100	108.6	26780	20579	2301	11.6	34633						
4.3	4.3	110	125.4	23774	18703	2704	8.8	33003						
6.1	8.9	110	120.9	24233	18985	2596	9.3	33094						
6.5	10.2	110	120.2	24312	19038	2584	9.4	33131						
8.1	16.0	110	118.2	24549	19216	2577	9.5	33343						

Cooling capacity is based on 80.6ºF DB and 66.2ºF WB entering air.
Heating capacity is based on 68ºF DB entering air.
Blank sections are outside the operation range.

VSHP HE 120															
GPM	WPD	Cooling								Heating					
		EWT	LWT	Total Cap. (Btuh)	Sensible Cap. (Btuh)	Watts	EER	THR (Btuh)	EWT	LWT	Total Cap. (Btuh)	Watts	COP	THA (Btuh)	
5.5	10.5								20	13.1	26346	2142	3.6	19038	
7	16.0								20	15.5	22953	2157	3.1	15593	
8	20.3								20	16.0	23231	2165	3.1	15844	
9	25.2								20	16.4	23432	2171	3.2	16024	
5.5	10.1	30	46.9	41604	27369	1454	28.6	46566	30	23.2	26332	2203	3.5	18815	
7	15.4	30	43.5	42339	27676	1410	30.0	47150	30	24.5	26992	2219	3.6	19422	
8	19.5	30	41.9	42694	27816	1386	30.8	47424	30	25.1	27319	2227	3.6	19721	
9	24.2	30	40.6	42942	27903	1366	31.4	47605	30	25.6	27555	2233	3.6	19936	
5.5	9.7	40	56.8	40823	27334	1599	25.5	46279	40	31.8	30266	2270	3.9	22520	
7	14.8	40	53.4	41544	27641	1550	26.8	46835	40	33.4	31025	2286	4.0	23224	
8	18.8	40	51.8	41893	27780	1524	27.5	47094	40	34.1	31400	2295	4.0	23571	
9	23.3	40	50.5	42136	27868	1503	28.0	47264	40	34.7	31672	2301	4.0	23820	
5.5	9.4	50	66.7	39806	27114	1771	22.5	45851	50	40.5	34195	2343	4.3	26200	
7	14.3	50	63.2	40510	27418	1717	23.6	46370	50	42.3	35052	2360	4.4	27000	
8	18.2	50	61.7	40849	27556	1688	24.2	46611	50	43.2	35476	2368	4.4	27395	
9	22.5	50	60.4	41086	27643	1665	24.7	46768	50	43.8	35783	2375	4.4	27679	
5.5	9.1	60	76.5	38553	26708	1971	19.6	45281	60	49.1	38117	2422	4.6	29852	
7	13.9	60	73.1	39235	27007	1911	20.5	45757	60	51.2	39073	2439	4.7	30749	
8	17.6	60	71.5	39564	27144	1879	21.1	45976	60	52.2	39546	2448	4.7	31192	
9	21.8	60	70.2	39793	27229	1853	21.5	46116	60	53.0	39888	2455	4.8	31510	
5.5	8.8	70	86.2	37064	26116	2199	16.9	44568	70	57.8	42034	2507	4.9	33479	
7	13.5	70	82.9	37719	26409	2132	17.7	44995	70	60.2	43088	2525	5.0	34472	
8	17.1	70	81.3	38036	26542	2096	18.1	45188	70	61.3	43609	2534	5.0	34962	
9	21.2	70	80.1	38256	26626	2066	18.5	45309	70	62.2	43987	2541	5.1	35315	
5.5	8.6	80	95.9	35339	25338	2454	14.4	43714	80	66.5	45945	2598	5.2	37080	
7	13.2	80	92.6	35964	25623	2379	15.1	44083	80	69.1	47097	2617	5.3	38169	
8	16.7	80	91.1	36266	25752	2339	15.5	44248	80	70.3	47667	2626	5.3	38706	
9	20.7	80	89.9	36476	25833	2306	15.8	44347	80	71.3	48079	2634	5.4	39093	
5.5	8.5	85	100.7	34388	24880	2592	13.3	43233	85	70.9	47899	2646	5.3	38871	
7	13.0	85	97.4	34996	25159	2513	13.9	43572	85	73.6	49099	2665	5.4	40007	
8	16.5	85	95.9	35290	25286	2470	14.3	43721	85	74.9	49694	2674	5.4	40568	
9	20.5	85	94.7	35494	25366	2436	14.6	43807	85	75.9	50124	2682	5.5	40972	
5.5	8.4	90	105.5	33378	24375	2736	12.2	42717	90	75.2	49851	2695	5.4	40655	
7	12.9	90	102.3	33968	24649	2653	12.8	43023	90	78.0	51100	2714	5.5	41839	
8	16.4	90	100.8	34253	24773	2608	13.1	43155	90	79.4	51719	2724	5.6	42424	
9	20.3	90	99.6	34452	24851	2572	13.4	43229	90	80.5	52166	2732	5.6	42845	
5.5	8.3	100	115.1	31181	23226	3046	10.2	41579							
7	12.7	100	111.9	31732	23487	2954	10.7	41813							
8	16.1	100	110.5	31999	23605	2904	11.0	41909							
9	19.9	100	109.3	32184	23680	2863	11.2	41957							
5.5	8.2	110	124.7	28748	21892	3384	8.5	40298							
7	12.5	110	121.6	29256	22137	3281	8.9	40455							
8	15.9	110	120.1	29502	22249	3226	9.1	40511							
9	19.7	110	119.0	29673	22319	3181	9.3	40529							

Cooling capacity is based on 80.6ºF DB and 66.2ºF WB entering air.
Heating capacity is based on 68ºF DB entering air.
Blank sections are outside the operation range.

7. CORRECTION FACTORS & DESIGN LIMITS

7.1 Correction Factor Tables

Entering Air Correction Factors for Cooling Performance											
EAT Wet Bulb (°F)	COOLING										
	Total Cooling Capacity (BTUh)	Watts (W)	THR (BTUh)	Sensible Cooling (BTUh) @ EAT Dry Bulb (°F)							
				65	70	75	80	80.6	85	90	95
55	0.770	0.989	0.878	0.838	1.038	S	S	S	S	S	S
60	0.873	0.995	0.924	0.609	0.842	1.053	1.247	1.283	S	S	S
65	0.976	0.998	0.984		0.636	0.844	1.054	1.085	1.260	S	S
66.2	1.000	1.000	1.000		0.590	0.798	1.008	1.000	1.215	1.477	S
67	1.016	1.000	1.013		0.553	0.762	0.971	1.010	1.177	1.365	S
70	1.077	1.003	1.058			0.639	0.845	0.883	1.051	1.257	1.440
75	1.180	1.006	1.145				0.639	0.680	0.839	1.039	1.252

S = Sensible Cooling capacity is equal to Total cooling at conditions shown
The cooling capacity based on 80.6ºF DB and 66.2ºF WB entering air.

Actual = Catalog Data x Correction Factor (CF)

EAT- Entering Air Temperature
EWT - Entering Water Temperature
DB - Dry Bulb
WB - Wet Bulb
THR - Total Heat of Rejection
THA - Total Heat of Absorption

Entering Air Correction Factors for Heating Performance			
EAT Dry Bulb (°F)	HEATING		
	Total Heating Capacity (BTUh)	Watts (W)	THA (BTUh)
45	1.077	0.768	1.155
50	1.061	0.818	1.123
55	1.044	0.868	1.088
60	1.027	0.918	1.055
65	1.010	0.968	1.021
68	1.000	1.000	1.000
70	0.993	1.023	0.987
75	0.978	1.071	0.955
80	0.958	1.124	0.915

The heating capacity based on 68ºF DB entering air.

Entering air correction factors table is used to correct the catalog values if the desired EAT is outside of rated EAT. Calculate desired EAT based on the "EAT Wet Bulb" and “EAT Dry Bulb” columns. Multiply the catalog results by the value corresponding to the design EAT and the desired output.

7.1 Correction Factor Tables (Cont'd)

Airflow Correction Factors							
Airflow	COOLING				HEATING		
% Rated CFM	Total Cooling Capacity (BTUh)	Sensible Cooling (BTUh)	Watts (W)	THR (BTUh)	Total Heating Capacity (BTUh)	Watts (W)	THA (BTUh)
70	0.93	0.82	0.97	0.94	0.94	1.08	0.93
75	0.94	0.85	0.98	0.95	0.95	1.06	0.94
80	0.95	0.88	0.98	0.96	0.96	1.05	0.96
85	0.97	0.91	0.99	0.97	0.97	1.03	0.97
90	0.98	0.94	0.99	0.98	0.98	1.02	0.98
95	0.99	0.97	1.00	0.99	0.99	1.01	0.99
100	1.00	1.00	1.00	1.00	1.00	1.00	1.00
105	1.01	1.03	1.00	1.01	1.01	0.99	1.01
110	1.02	1.06	1.01	1.02	1.02	0.98	1.02
115	1.03	1.09	1.01	1.03	1.02	0.98	1.03

Airflow correction factor table is used to correct the catalog values if the desired CFM is outside of rated CFM. Calculate desired CFM based on the "% Rated CFM" column. Multiply the catalog results by the value corresponding to the desired % Rated CFM and the desired output.

Antifreeze Correction Factors						
Glycol Type	% Glycol	COOLING			HEATING	
		Total Cooling Capacity (BTUh)	Sensible Cooling (BTUh)	Watts (W)	Total Heating Capacity (BTUh)	Watts (W)
Ethylene Glycol (E.G.)	0	1.000	1.000	1.000	1.000	1.000
	10	0.996	0.997	1.001	0.990	0.996
	20	0.991	0.992	1.004	0.980	0.992
	30	0.987	0.985	1.009	0.971	0.988
	40	0.982	0.976	1.016	0.961	0.984
	50	0.976	0.965	1.025	0.952	0.980
Propylene Glycol (P.G.)	0	1.000	1.000	1.000	1.000	1.000
	10	0.991	0.991	1.007	0.984	0.993
	20	0.983	0.982	1.012	0.968	0.986
	30	0.975	0.975	1.017	0.953	0.979
	40	0.968	0.968	1.020	0.938	0.972
	50	0.961	0.963	1.023	0.923	0.965

Antifreeze correction factor table is used to correct the catalog values if glycol is being utilized. Calculate the required "% Glycol". Based on desired glycol type. Multiply the catalog results by the value corresponding to the desired glycol type and glycol ratio.

7.2 Design 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.

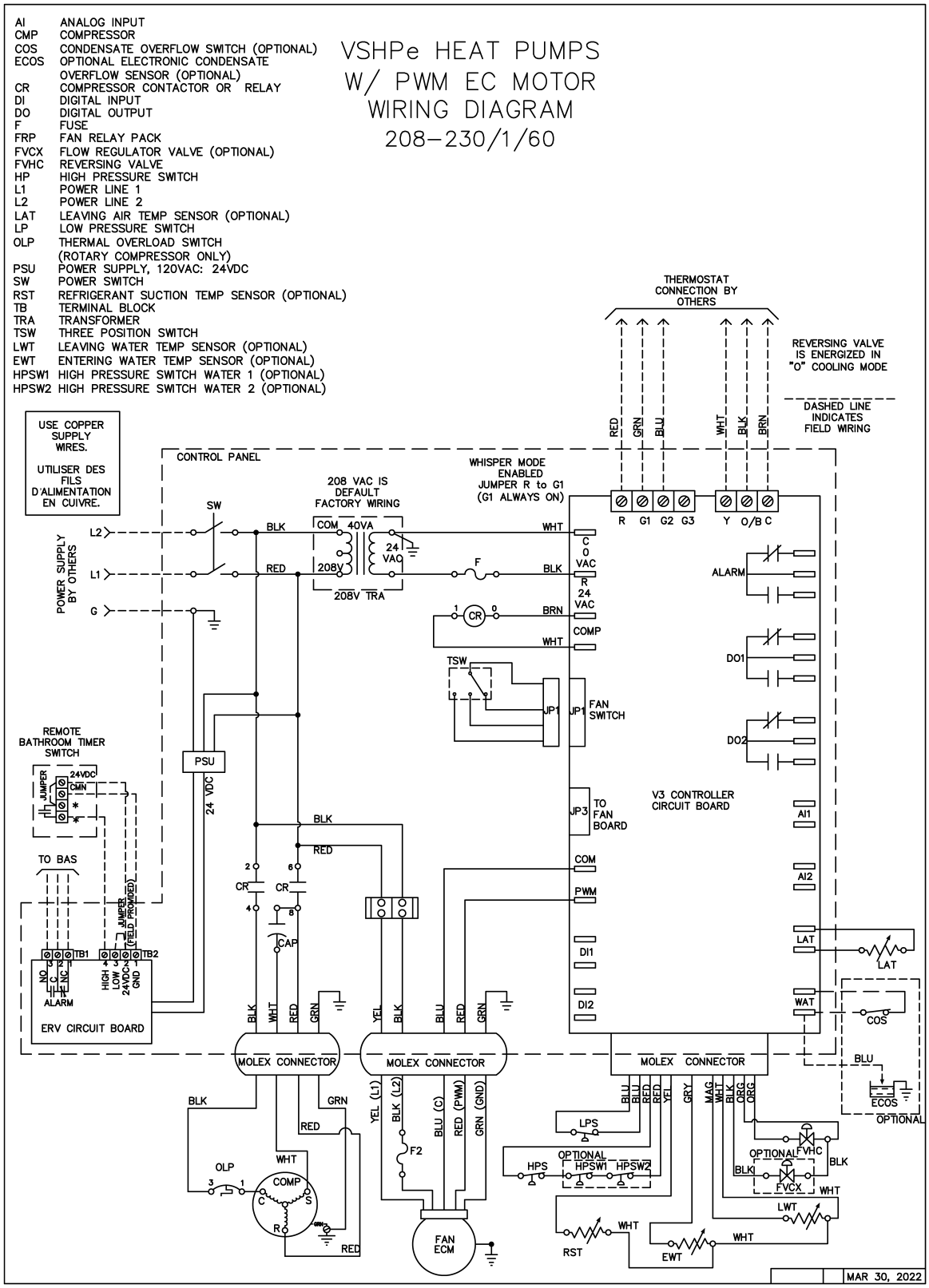
7.3 Antifreeze Percentages

ANTIFREEZE PERCENTAGE (by Volume)	Mininum Leaving Water Temperature F (°C)		
	25 F (-4°C)	30 F (-1°C)	35 F (1.5°C)
	Protects Fluid To:		
	10 F (-12°C)	15 F (-9°C)	20 F (-6.5°C)
Methanol	25%	22%	17%
Propylene Glycol	39%	25%	22%

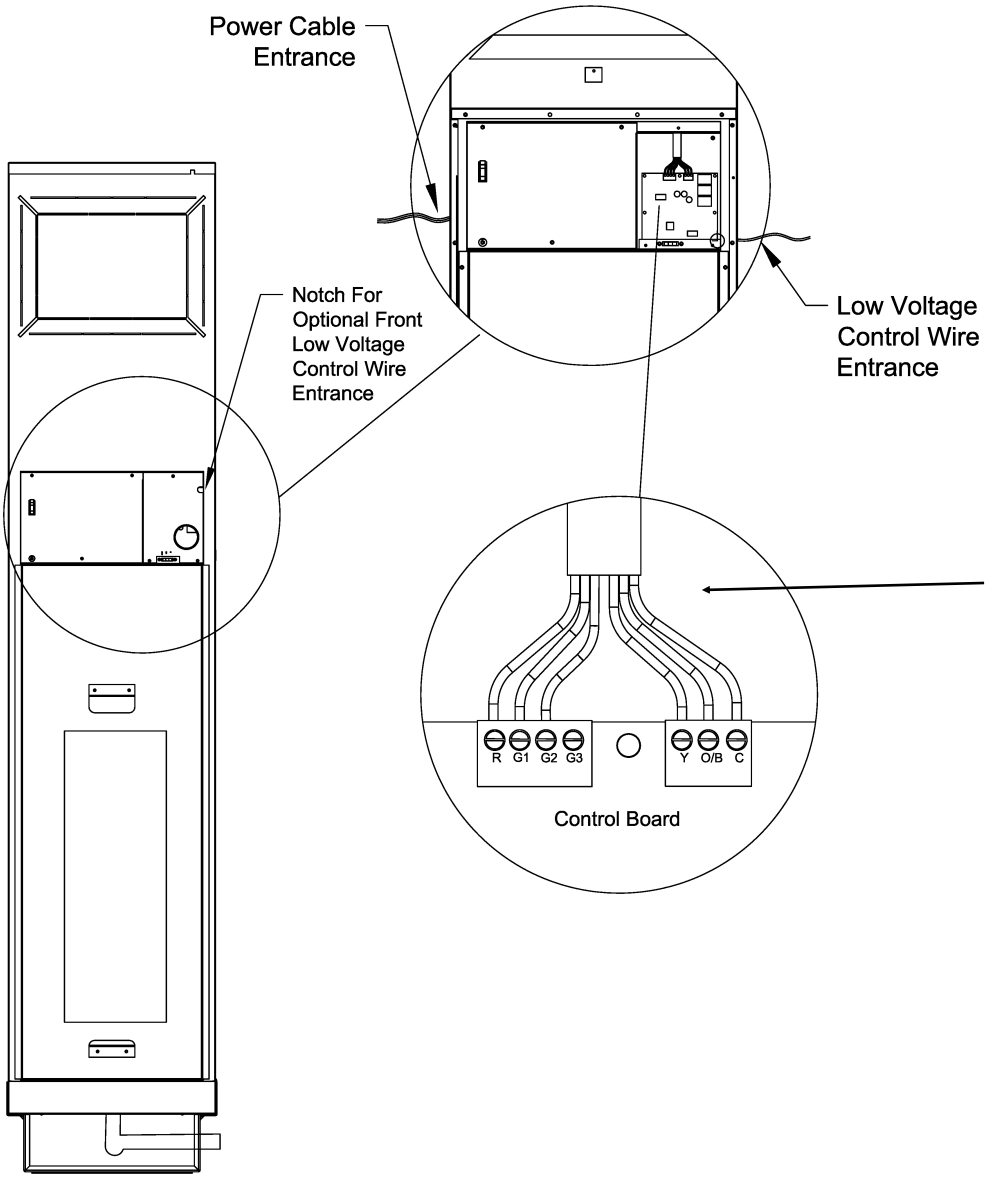
Note: Minimum glycol concentration of 20% is recommended.

9. ELECTRICAL SCHEMATICS & CONTROL WIRING

9.1 Wiring Diagram - Standard ECM (208-230/277V/1Ph/60Hz)



9.2 Thermostat Wiring Details



Field supplied 6-wire thermostat cable shown.

Min. 5-wire required for smart thermostats.

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

10. 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 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 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

SPECIFICATIONS (CONT'D)

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.

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

SPECIFICATIONS (CONT'D)

- 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 24V terminal block for field connecting a field provided thermostat pigtail 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.