**Mechanical Specifications**

**WHISPERLINE (WATER SOURCE) (GROUND SOURCE) HEAT PUMPS**

PART 1 GENERAL

* 1. SECTION INCLUDES

# A. Vertical Stack Water Source Heat Pumps

* 1. RELATED SECTIONS
  2. REFERENCES

1. ETL Listed under Underwriters Laboratories Standard for Safety UL1995 for heat pumps.
2. AHRI ISO Standard 13256-1
   1. DELIVERY, STORAGE AND HANDLING
3. Deliver products to site, store and protect from the weather and construction debris. Heat pumpcabinets and refrigeration chassis must be individually packaged and be tagged with site location, model number and configuration.
   1. ENVIROMENTAL REQUIREMENTS
4. Protect units from construction debris by covering all openings prior to start-up of the equipment. Units must not be used for heating, cooling, or ventilation prior to the start-up of equipment for permanent use. Use of the equipment for the temporary heating, cooling or ventilation is prohibited.
   1. FACTORY TESTING

## All units shall be factory tested at normal operating conditions. Cabinets and fans shall be tested to verify proper fan and control operation. Refrigeration chassis shall be factory tested with cataloged water flow rates and sequenced to verify the proper operation of safety controls. Testing without utilizing cataloged water flow rates is unacceptable. All factory risers shall be pressure tested for leaks.

* 1. SUBMITTAL DOCUMENTATION

1. Standard submittals shall include capacities, drawings, electrical data, installation, operation and maintenance manuals and other details.

PART 2 PRODUCTS

* 1. TYPE

1. Vertical Stack (Water Source) (Ground Source) Heat Pump with integral risers, discharge arrangements, hose kits, and all accessories. Units shall be (standard range 60°F to 95°F (15.6°C to 35°C)) (extended range 20⁰F to 120⁰F (‒6.7⁰C to 48.9⁰C)) entering fluid temperature for (water source) (ground source) heat pump applications.
   1. CAPACITY
2. Shall be as indicated on the drawings, which are based on Whalen units. Capacities shall be certified under AHRI ISO Standard 13256-1.
   1. CABINETS
3. The one-piece unit cabinet shall be fabricated of reinforced 22-gauge continuous G60 galvanized steel. All internal assemblies shall be welded and treated to prevent corrosion.
4. The cabinet shall be insulated with 1/2-inch thick 2-pound density thermal and acoustical fiberglass insulation meeting material standard ASTM-C1071 and have an integral water repellent. The insulation shall have a fungi and bacteria resistant barrier with no growth conforming to ASTM-C1338, ASTM G21 and ASTM G22 and meet fire safety standards under NFPA90A and NFPA90B. (OPTION) 1-inch thick 1-1/2-pound density thermal and acoustical fiberglass insulated discharge plenum.
5. The cabinet shall allow the placement of vertical risers on any side not being used for service access or discharge air openings.
6. The cabinet will have slots with edge protectors to accommodate movement of the risers with the isolation valves affixed (see 2.05 B). The slots shall remain covered with insulation to minimize air infiltration.
7. Cabinet return and discharge air openings shall be factory cut and flanged on all sides. All insulation located behind cabinet openings must be removed by the unit manufacturer prior to shipment. Knockouts for field cutting are unacceptable.
8. Cabinet design shall allow a minimum 5-inches below the chassis access opening to allow for full height baseboard.
9. (OPTION) A factory installed vibration isolation pad shall be installed on the bottom of the unit.
10. The heat pump cabinets shall be shipped separately from, and prior to the refrigeration chassis for early installation at the jobsite.
    1. REFRIGERATION CHASSIS
11. The refrigeration chassis consisting of the compressor, air coil, water coil, reversing valve, expansion device, receiver, filter-drier, and safety controls shall be slide-rail base mounted in the cabinet, and shall be designed for easy removal after disconnecting the two hoses and a polarized electrical power plug.
12. The compressor shall be the sealed hermetic type approved and tested for reverse cycle operation. Internal thermal overload protection shall be provided. The compressor shall be internally isolated and externally hard rubber mounted to the floating chassis. Compressor motors shall be permanent split capacitor (PSC) type.
13. The air coils shall be copper tubes mechanically bonded to aluminum fins, multi-circuited to insure maximum coil distribution and effectiveness, and a minimum of three rows deep. The coil shall be rated to withstand 600 psig refrigerant working pressure. Face velocity shall not exceed 400 feet per minute to insure quiet operation and positive condensate drainage.
14. The water coils shall incorporate an electro-coated steel outer tube and a copper inner tube. The inner tube shall be spirally fluted and bonded to the outer tube to insure controlled refrigerant velocity and distribution. The coil shall be rated to withstand 650 psig refrigerant and 400 psig fluid working pressures. (OPTION) Provide Cupro-nickel COAX coil.
15. The reversing valve shall be 4-way electric type, pilot operated for quiet reversal.
16. (OPTION) Automatic flow control valve – An automatic flow control valve shall be provided with each chassis and be factory preset for a fixed flow rate regardless of system pressure. Each automatic balancing valve shall be capable of operation over a pressure differential range of 2 to 80 PSID. Valves must utilize threaded connections and be easily removable for cleaning and maintenance.
17. (OPTION1) Standard Two-way, two-position (On/Off) control valve (30 psi differential pressure) – A two-way, two-position (On/Off) electric control valve shall be factory mounted and wired into the refrigeration chassis.

(OPTION2) High Pressure Two-way, two-position (On/Off) control valve (60 psi differential pressure) – A two-way, two-position (On/Off) electric control valve shall be factory mounted and wired into the refrigeration chassis.

1. The chassis shall be shipped separately from the WSHP cabinets to prevent exposure to, and fouling from finishing work.
2. Water connections between chassis and the riser shall be accomplished via an Insta-Lock™ quick connect accessory hose kit consisting of synthetic yarn-reinforced EPDM core hose surrounded by a 304 stainless-steel braid. Hose kit shall have brass fittings with stainless-steel locking balls and EPDM seals. Hose ends shall have colored bands to indicate supply or return water as well as colored indicator to verify locking status which connects to Insta-Lock™ fitting on chassis and mating shut-off valve. ***Threaded connections with or without sealing washers are not permitted.*** The hose kit shall be rated for maximum working pressure of 750 psi and minimum burst pressure rating of 2250 psi.

* 1. RISERS

1. The unit manufacturer shall furnish Type M (OPTION: Type L) copper supply and return condenser water risers as an integral factory-assembled component of the heat pump. Supply and return risers shall be protected by a galvanized steel pipe chase the length of the cabinet. (OPTION) Provide (3/8) (1/2)-inch thick closed-cell riser insulation the length of the cabinet for ground-source applications.
2. Ball-type isolation valves shall be factory assembled on the risers by the heat pump manufacturer. The chassis shall be connected to the isolation valves through high-pressure stainless steel hoses provided by the unit manufacturer, to isolate compressor noise and vibration from the piping system. Connection of the refrigerant chassis to building water system through the use of unions is unacceptable.
3. The unit manufacturer shall furnish the heat pump cabinet with the supply and return risers connected together (short circuited) between the isolationvalves to facilitate flushing by bypassing water directly into the return loop without the water passing thru any device in the unit (i.e. refrigeration chassis, automatic flow control valve).
4. The condensate drain riser shall be Type M copper and insulated the length of the cabinet with 3/8-inch closed-cell insulation.
   1. DRAIN PAN
5. The drain pan shall collect and drain condensate that may form from any component internal to the heat pump and shall be fabricated of welded and soldered 20 Ga. 304 stainless steel. The copper condensate drain shall be rolled and soldered into the pan.

* 1. FANS

1. The fan shall be slow speed forward curved centrifugal type capable of two fan speeds, and shall be accessible for removal and maintenance through the return air opening.
   1. MOTORS
2. Fan motors for heat pumps under 2-ton shall be of the permanently lubricated PSC standard or hi-static pressure (OPTION: ECM) type, as required; suitable for the current characteristics shown on the drawings, and shall have built-in thermal overload protection.
3. Fan motors for heat pumps 2-ton and above shall be of the permanently lubricated constant-torque ECM (OPTION: constant-volume ECM) type, suitable for the current characteristics shown on the drawings, and shall have built-in overload protection.
4. Motors shall be plug-in, multi-speed type with 1050-RPM maximum.
5. (OPTION) Provide a two-speed fan switch located behind the acoustic return air panel. The fan switch must be configurable for use with available fan speed motor taps.
   1. SUPPLY GRILLES
6. (OPTION 1) The supply grilles shall be of the single deflection type fabricated of clear anodized aluminum. All supply openings shall be painted black with a damper assembly and sight baffle provided when one unit is serving two separate rooms.

(OPTION 2) The supply grilles shall be of the single deflection type fabricated of (factory white painted extruded aluminum) or (custom painted extruded aluminum) (SELECT ONE). All supply openings shall be painted black with a damper assembly and sight baffle provided when one unit is serving two separate rooms.

(OPTION 3) The supply grilles shall be of the double deflection type fabricated of (clear anodized extruded aluminum), (factory white painted extruded aluminum) or (custom painted extruded aluminum) (SELECT ONE). All supply openings shall be painted black with a damper assembly and sight baffle provided when one unit is serving two separate rooms.

* 1. RETURN AIR PANEL

1. (OPTION 1) Painted Flush Mounted Acoustical Panel – The return air opening shall be covered with a flush mounted hinged front acoustical panel with return air entering through the bottom, top and both sides. The panel shall be fabricated of etched galvanized steel and painted factory white. The return air panel shall allow for filter removal without the use of tools.

(OPTION 2) Flush Mounted Acoustical Panel – The return air opening shall be covered with a flush mounted hinged front acoustical panel with return air entering through the bottom, top and both sides. The panel shall be fabricated of etched galvanized steel suitable for field painting to match the room décor after attachment to the field installed drywall framing on the front of the unit. The return air panel shall allow for filter removal without the use of tools.

(OPTION 3) Unit Mounted Acoustical Panel - The return air opening shall be covered with a standard solid hinged front acoustical panel with return air entering through the bottom, top and both sides. The front panel shall be fabricated of etched galvanized steel suitable for field painting to match the room decor. The return air panel shall allow for filter maintenance without the use of tools.

(OPTION 4) Standard Return Air Grille – The return air opening shall be covered with an (Standard) Clear anodized aluminum, (Option A) Factory white painted extruded aluminum or (Option B) Custom painted extruded aluminum air grille that is attached directly to the unit with two screws.

(OPTION 5) Removable Core Return Air Grille – The return air opening shall be covered with a (Standard) clear anodized aluminum, (Option A) factory white painted extruded aluminum or (Option B) custom painted extruded aluminum air grille with quick-removal fasteners for easy filter removal without the use of tools.

* 1. FILTERS

## (STANDARD) Filters shall be 1” thick disposable fiberglass media, MERV 4.

(OPTION 1) Filters shall be 1” thick disposable pleated media, MERV 8.

(OPTION 2) Filters shall be 1” thick disposable pleated media, MERV 13.

(OPTION 3) Filters shall be 1” thick permanent aluminum cleanable media, MERV 4.

* 1. OUTDOOR AIR

A. (OPTION 1) Heat pumps to be furnished with an outdoor air plenum for field installation incorporating an outdoor air opening to provide conditioning of outdoor air and manual (motorized) block-off damper. The OA plenum shall be attached directly to the front of the heat pump unit and surround the return air opening. The outdoor air opening shall be located on the side of the plenum kit for either right or left side connection.

(OPTION 2) Heat pumps to be furnished with a "deep cabinet" configuration incorporating an outdoor air opening to provide conditioning of outdoor air and manual (motorized) block-off damper. Outdoor air opening must be placed before the heat pump air coil to allow conditioning while the heat pump is operating. The outdoor air opening shall be located on either side of the cabinet.

* 1. POWER SUPPLY

1. Single point field power connection is made to unit junction box through either of the 7/8" knockouts located on the side or on the top of the cabinet as shown on the drawings.

(OPTION 1) Each unit shall include a non-fused disconnect switch, factory mounted and wired.

(OPTION 2) Each unit shall include a fused disconnect switch, factory mounted and wired.

* 1. CONTROLS

Unit shall include a solid-state control board as part of the unit control system incorporating these features:

Random start compressor protection. Anti-short cycle compressor minimum OFF time delay. Safety controls that protect the compressor from the following conditions:

High pressure

Low pressure (Loss of Charge Protection)

Low airflow

Low liquid flow

Low entering air temperature

Brown-out power conditions

Condensate Overflow Protection

Low liquid temperature protection with three different settings based on liquid properties.

Status LED indicating the device causing a fault condition.

Soft lockout feature that provides for an automatic reset prior to the initiation of a hard lockout.

Test mode capability with shortened time delays for servicing.

* 1. THERMOSTAT

1. The heat pump manufacturer shall provide a 24-volt manual changeover wall thermostat with a HEAT-OFF-COOL system switch and AUTO-ON fan selector switch.
2. On units up to two tons of cooling, the thermostat shall be unit mounted at a height of 48 inches from the bottom of the cabinet. On units greater than two tons of cooling, the thermostat shall be remote mounted.
3. Others shall install thermostat by plugging into the control wiring with a polarized male-female plug after the walls are finished when unit mounted or attaching to color coded pigtails when remote mounted. High voltage, return air thermostats with remote bulbs subject to damage during routine service will not be accepted.
   1. SPARE PARTS
4. The installing contractor shall provide to the Owner one spare chassis for each fifty heat pumps of a given size.

## PART 3 EXECUTION

* 1. INSTALLATION

1. Furnish as shown on the drawings and as specified herein, vertical stack water source heat pumps with integral risers, and with capacity and electrical characteristics as scheduled. Units shall be Series VI as manufactured by The Whalen Company of Easton, MD.
2. Install in accordance with manufacturer's installation instructions. Install units plumb and level, and maintain manufacturer's recommended clearances for the unit and accessories.
3. Follow manufacturer's recommendations for cleaning and flushing.