Indoor Packaged Unit   
Constant Volume Application

HVAC Guide Specifications

Size Range: **30 to 60 Tons**

Carrier Model Number:

**50BVW — Water-Cooled Packaged Cooling Unit**

* General
* SYSTEM DESCRIPTION
* Units shall be water-cooled, cooling only self contained packaged air conditioning units. Capacities, models, and unit arrangement shall be as shown on the unit schedule and the contract drawings. Units shall be rated and certified in accordance with ANSI/AHRI/ASHRAE/ISO (American National Standard Institute/Air-Conditioning, Heating and Refrigeration Institute/American Society of Heating, Refrigerating, and Air-Conditioning Engineers/International Organization for Standardization) 13256-1. All equipment shall be tested, investigated, and determined to comply with the requirements of the standards for Heating and Cooling Equipment UL-60335-2-40 for the United States and CSA C22.2 No. 60335-2-40 for Canada, by Intertek Testing Laboratories (ETL). The units shall have ETL-US-C labels.
* Units shall be supplied completely factory built and capable of operation with an entering water temperature range from 50 to 110°F. Quality control system shall automatically perform via computer: triple leak check, pressure tests, evacuation and accurately charging of system, detailed heating and cooling mode tests, and quality cross checking all operational and test conditions to pass/fail criteria.
* Units shall be individually packaged on wooden skids with protective corner posts and plastic stretch wrapping for maximum protection.
* QUALITY ASSURANCE
* Units shall be rated in accordance with ANSI/AHRI/ASHRAE/ISO (American National Standard Institute/Air-Conditioning, Heating and Refrigeration Institute/American Society of Heating, Refrigerating, and Air-Conditioning Engineers/International Organization for Standardization) 13256-1. Standard cabinet panel insulation shall meet NFPA (National Fire Protection Association) 90A requirements, air erosion and mold growth limits of UL-181, stringent fungal resistance test per ASTM-C1071 and ASTM G21 and shall meet zero level bacteria growth per ASTM (American Society for Testing and Materials) G22.
* Each unit shall be completely factory assembled, piped, wired, and tested. Units shall be leak tested and charged with a full operating charge of refrigerant (water-cooled only).
* Units shall then be disassembled into their individual modules for shipping and assembly on site.
* Factory test shall include, but not be limited to: complete run check of all electrical components and safeties, including proper control sequencing; pressure test of refrigerant coils and condensers; leak check of completed refrigerant circuits; leak check of completed water circuit (water-cooled units only); compressor run check.
* Products
* EQUIPMENT
* General:

The unit shall be comprised of two distinct modules: the main air-conditioning section and the filter/pre cooling coil section. The unit shall be designed for easy assembly. Water-cooled units shall be built for an entering water temperature range from 50°F to 110°F. The refrigeration circuit shall remain intact during disassembly and reassembly. All high-boy modules shall be able to pass through a 36 in. steel framed door.

* Cabinet:

1. The frame shall be fabricated of an angle iron framework. Unit exterior panels shall be 18 gauge G90 galvanized steel for corrosion protection.
2. Each section shall incorporate removable access panels. The complete cabinet frame and access panels shall be insulated with 1/2 in., dual density, coated fiberglass insulation.
3. The main air conditioning section and the filter/pre-cooling coil section shall contain a stainless steel drain pan.
4. Low-boy cabinet shall be available on all models. Blower shall be dropped into main coil section reducing the overall height of the unit. This is for those applications where there is a restriction in the height of the unit.
5. All units shall have a stainless-steel drain pan as standard to comply with this project’s IAQ (indoor air quality) requirements. Painted steel or plastic is not acceptable. Drain pan must include a condensate overflow safety switch that will shut the unit down in an overflow event.
6. Insulated basepan shall provide additional sound deadening characteristics and corrosion protection in the compressor compartment.

* Evaporator:

1. The direct expansion coil shall be a minimum of 3 rows and be fabricated from 3/8 in. or 3/4 in. OD seamless copper tubing, mechanically bonded to rippled and corrugated aluminum fins.
2. Each individual evaporator coil shall be removable for replacement without disturbing the remaining refrigerant circuits.
3. Each evaporator coil circuit shall be fed by an adjustable thermostatic expansion valve, with external equalizer, sized to provide efficient operation at full and at part load operating points in the cooling mode.

* Supply Fan:

1. Supply fans shall be double-width double-inlet (DWDI) forward curved type of Class II construction.
2. All fans shall be statically and dynamically balanced.
3. Fan shafts shall be mounted in heavy-duty 150,000-hour greasable pillow-block bearings.
4. The fan motor shall be open drip-proof (ODP), 3-phase, NEMA T-frame E high-efficiency EPACT rated, 1800 rpm, with grease lubricated ball bearings. Motor shall be compatible with variable frequency drive (VFD).
5. Fan shall be belt driven with fixed-pitch motor and fan pulley, with multiple matched belts; drive shall be selected for 110% of motor horsepower and to provide maximum static capability in stable fan operation and when applied with variable frequency drive (VFD).
6. Airflow configurations for Highboy cabinets shall include rear return, front supply; or rear return, rear supply.
7. Airflow configurations for Lowboy cabinets shall include rear return, top supply; or rear return, front supply.

* Supply Fan Capacity Control/Variable Frequency:

Variable frequency drive (VFD) shall include:

1. Factory-installed VFD motor control device, provided with a NEMA Type 1 enclosure, and factory-mounted, wired and tested. The VFD shall control motor speed to maintain set point static pressure at the supply duct sensor location.
2. A duct differential pressure transmitter (DPT) shall be factory supplied (ships in control enclosure) for field installation. Field supplied wiring, pneumatic tubing, and pressure pick up port are required.

* Refrigeration Circuit:

1. Each unit shall contain multiple independent refrigeration circuits.
2. Each circuit shall include a high-efficiency heavy-duty scroll compressor.
3. Each circuit shall have high and low pressure cutouts.
4. Each circuit shall be dehydrated and factory charged with R-454B refrigerant.
5. Suction and discharge Schrader valves shall be provided for manifold gauge connections to facilitate servicing.
6. [Optional] Hot Gas Bypass: Units shall be supplied with an ETL listed hot gas bypass valve with factory supplied and installed controls to prevent air coils from frost development by taking hot gas and bypassing the water coil and expansion device and reintroducing the hot gas into the refrigeration line prior to the air coil. The hot gas bypass valve shall maintain a minimum refrigerant suction pressure to allow for a light load cooling module or a low entering air temperature cooling mode. The HGBP valve shall be factory set for opening pressure to 120 psig, this set point can be adjusted (75-150 psig,) in the field.
7. Modulating Hot Gas Reheat for Variable Air Volume (VAV) units: Units shall be equipped with fully modulating hot gas reheat (MHGRH). The MHGRH valve shall be controlled by the unit DDC controls to help control discharge air conditions.
8. A2L refrigerant Leak detection shall be provided with units exceeding refrigerant charge 64 oz. per circuit for the refrigerant leak detection system.

* Compressors:

1. Each unit shall have multiple high-efficiency scroll compressors with internal or external motor protection and a time delay to prevent short cycling and simultaneous starting of compressors following a power failure.
2. Each compressor shall be on an independent refrigerant circuit.
3. The compressors shall be mounted on rubber isolators.

* Water-Cooled Condensers:

1. All condensers shall be coaxial tube-in-tube for maximum heat transfer efficiency and performance.
2. Inner water tubes shall be either standard copper or optional cupronickel with large internal diameters for reduced waterside pressure drops.
3. Outer tubes shall be painted steel.
4. All condensers shall be rated at 600 psig operating refrigerant pressures and 450 psig waterside pressures.
5. [Optional] Cupronickel coaxial water-to-refrigerant heat exchangers shall be provided, with cupronickel inner water tube construction.
6. [Optional] Extended range units shall provide an insulated water circuit for the coaxial coil and refrigerant circuit to prevent condensation, and therefore potential dripping problems, in applications where the entering water temperature is beyond the normal operating range. Units shall be capable of operation with an entering water temperature range from 20 to 110°F.

* Hydronic Factory-Installed Options:

1. [Optional] Waterside Economizer: Waterside economizer shall be completely installed at the factory, with an additional condensate drain pan, motorized 3-way valve, and all internal electric controls. Economizer coils are 2 or 4 row coils. Waterside economizer assembly shall be rated at minimum 450 psig and UL (Under-writers Laboratories) listed for applications with the heat pump. This option is externally mounted outside the unit.
2. [Optional] Hot water coil shall be factory-installed on the inlet side of the direct expansion cooling coils with field piping connections on the side of the unit. The hot water control valve is to be provided in the field by other parties.

* Filter section:

The unit shall be supplied with 4 in. deep pleated, 30% high-efficiency filters. The filters shall have side access capability through an access panel.

* Controls, Safeties, and Diagnostics:

1. Electrical:
2. Controls and safety devices will be factory wired and mounted within the unit. Controls shall include fan relay, compressor contactor, 24-v transformer, and Unit Protection Module (UPM). The standard transformer shall be rated for a minimum 100 VA. All units shall be name plated for use with time-delay fuses or HACR circuit breakers.
3. Units shall include a factory provided wiring diagram on the inside of the control access panel.
4. Each unit shall be wired and tested at the factory prior to shipment.
5. Wiring shall comply with NEC requirements and shall conform with all applicable UL standards.
6. The units shall have a single point power connection. Control power shall be supplied through a factory-installed, low voltage control circuit transformer with an integral resettable circuit breaker.
7. The fan motor starter shall have a magnetic three-line, ambient compensated overload protector with a manual reset.
8. A terminal block shall be provided for the main power connection.
9. Unit shall have a short circuit current (SCCR) rating of 5kA.
10. All units shall have a Unit Protection Module (UPM) printed circuit board which implements following equipment safeties:
11. anti-short cycle time delay (5-minute delay on break)
12. random start time delay on initial power
13. brownout/surge/power interruption protection
14. 120 second low pressure switch bypass timer
15. high refrigerant pressure shutdown
16. low refrigerant pressure shutdown
17. water coil freeze protection shutdown
18. air coil freeze protection shutdown
19. high condensate level shutdown
20. 24 vac alarm output for remote fault indication
21. refrigerant leak shutdown
22. intelligent alarm reset
23. The UPM shall automatically reset after a safety shutdown. Restart the unit if the cause of the shutdown no longer exists (except for low temperature and high condensate level shutdowns). Should a fault re-occur within 60 minutes after reset, then a “hard” lockout will occur. A light-emitting diode (LED) shall annunciate the following alarms: brownout, high refrigerant pressure, low refrigerant pressure, low water temperature and a high level of condensate in the drain pan, refrigerant leak fault. The LED will display each fault condition as soon as the fault occurs. If a hard lockout occurs, then the fault LED will display the type of fault until the unit is reset.

The UPM shall feature the following field configurable adjustments:

1. lock out reset on thermostat interruption or power reset
2. two or four restart attempts before a hard lockout
3. test mode (reduces all time delays to 5 seconds for diagnostic work)
4. air/water coil freeze limit trip
5. Units shall be provided with SCU Open DDC controller with an advanced controls logic and include following features:
6. variable air volume (vav) control
7. high/low static lockout
8. supply fan status
9. UPM alarm
10. filter status
11. fire/smoke detector alarm
12. condenser water temperature alarm
13. static pressure sensor failure alarm
14. high and low supply air temperature alarm
15. DDC controller shall be capable of performing the following functions:
16. Capacity control based on discharge-air temperature (VAV [variable air volume]). Capacity control shall be accomplished through the use of compressor staging and modulating hot gas reheat.
17. Supply fan volume control shall control output from a variable frequency drive to maintain duct static pressure at user-configured set point.
18. Alerts and Alarms:

Control shall continuously monitor all sensor inputs and control outputs to ensure safe and proper system operation. Alerts shall be generated whenever sensor conditions have gone outside user-configured criteria for acceptability. Alarms shall be initiated when unit control detects that a sensor input value is outside its valid range (indicating a defective device or connection that prevents full unit operation), that an output has not functioned as expected, or that a safety device has tripped.

* Accessories:

User interfaces for commissioning are available for VAV 50BVW.