

SECTION 15740

SPECIFICATION FOR HI-VELOCITY FAN COIL SYSTEMS

1.0 GENERAL

1.01 DESCRIPTION

A. Scope

This section specifies four sizes of fan coil units designed for hydronic heating and air conditioning. Fan coils can be installed in horizontal and vertical flow positions.

B. Equipment List

Table 1 - Heating BTUH

Item	BTUH @ 190°F EWT	BTUH @ 160°F EWT	Kw Electrical Strip	TX Cooling MBH	H ² O Cooling 42°F EWT
HE-50 / RPM-50	56,200	44,400	5 – 15 Kw	24,000	26,000
HE-70 / RPM-70	79,700	62,900	5 – 18 Kw	36,000	37,800
HE-100 / RPM-100-4	112,300	84,300	5 – 23 Kw	48,000	55,000
HE-100 / RPM-100-5	134,000	100,700	5 – 23 Kw	60,000	62,900

1.02 PERFORMANCE REQUIREMENTS

A. General

Fan coil units specified in this section shall be designed as a closed loop hydronic fan coil system, with published BTUH ratings with entering water temperatures set between 130° and 190° F. System shall allow for heating, TX or chilled water-cooling, and heat pump applications with electric coil back-ups. Entering water temperature and BTUH outputs shall match performance listed in Table 1.

B. Operating Requirements

The fan coil units shall be designed, rated, and approved by CSA/UL and shall conform to applicable ASHRAE, ARI and DOE standards.

C. Flow Requirements:

Airflow should be minimum of 220 CFM per ton of cooling. Maximum airflow shall be 275 CFM per ton. Any proposed alternate system below 220 CFM per ton shall be up-sized to match the specified airflow and mechanical code make-up air requirements. Any alternate airflows shall be determined and submitted through a mass flow program for the Electronic Performance Control (EPC) Motor. Minimum outlets per ton heating is 6 – 8, minimum per ton cooling is 8-10. Supply duct design pressures are sized to run between .80 and 1.3 inches static pressure. 2” outlets typically run between 24 and 25 CFM, with a maximum of 36 CFM per outlet. Each outlet will cover between 80 to 100 square feet, depending on heat gains and losses, ventilation and fresh air requirements. See Table 2 for minimum and maximum per fan coil size.

D. Electrical

The fan coil control electronic circuitry shall automatically recognize and accept 110/220 voltage, and 50/60 hertz cycles. Pre-wired printed circuit board shall allow for heating, cooling, heat pumps, and electrical strip heat, with automatic reset surge protection and fused integral system. Low voltage control circuitry to include provisions for two stage heating and cooling, dehumidification and constant fan.

E. Motor

Motor and motor control sequencing shall be a FASCO programmable EPC motor and controller. Motor to be a three phase induction motor controlled through variable frequency drive, utilizing mass flow technology programming. Field programming shall be available from 1.5 to 5 tons, with a minimum of five (5) settings available for each ton setting. Tonnage and airflow variations shall be factory set or field done with dip-switch technology. Motor shall be capable of accepting 110/220 volt power without extra wiring requirements, and both 50/60 hertz. Motor to provide operating efficiencies of not less than 75%, and airflow ranges from 300 to 1,300 CFM. Watt draws shall be available for all size fan coils and ranges. Constant fan should not exceed 55 to 75 watts for any size fan coil, should not exceed 320 watts on low heating, 510 watts on high heating, or 720 watts on high speed cooling for any size.

F. Piping

Sweat water connections are 1/2" Cu for the HV-50, 3/4" for the HV-70 and HV-100. All lines should be piped so as not to restrict use of the access panels, filter section, or electrical enclosure. When the potential for gravity flow of the hot water exists, check valves may be needed on both the supply and return lines.

1.03 QUALITY ASSURANCE

A. Fan coil units shall be a total indoor air quality system complete with heating, cooling, air filtration, humidity control and fresh air make up. The fan coil must be factory manufactured, assembled and tested.

B. References

All equipment furnished under this specification shall comply with the following standards:

<u>Reference</u>	<u>Title</u>
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ARI	Air-Conditioning and Refrigeration Institute
CSA	Canadian Standards Association
DOE	Department of Energy
UL	Underwriters Laboratories

C. Pre-qualification

Fan coil manufacturer shall have a minimum five-year history in North America with successful installation and operation of fan coil units. Alternate manufacturers shall submit to the engineer the full requirements of 1.04 A-N, and demonstrate full compliance at least 72 hours prior to bid date to be considered a qualified bidder.

1.04 SUBMITTALS

Submittals shall include the following:

- A. Airflow per ton of cooling (CFM/ton)
- B. Number of outlets/ton and type of adjustable dampers
- C. Seer ratings if not exempt, of outdoor condensing unit for A/C applications
- D. Motor voltage and acceptance of 110/220 volt 50/60 hertz
- E. Watt draws on constant fan, low speed heating, and high speed cooling for each size fan coil
- F. Wiring diagram
- G. Heat calc program (or appropriate heat loss/ heat gain calculations)
- H. Sound test data for minimum and maximum number of outlets

- I. Coil approvals
- J. Control panel, or any controller submitted as a packaged alternate, shall meet requirements of 2.03 B
- K. Unit construction, including finish coating, insulation, metal gauge
- L. Calculations on air passes through filter/hour to show a minimum of 1.5/hour Preferred range is 2 – 2.5/hour
- M. Show sizing and CFM of make-up air @ .35 to .50 changes/hour to meet code.
- N. A copy of this specification with addenda updates, and all referenced sections, with each paragraph check marked to show specification compliance (COM) or marked to show deviations (DEV)

1.05 ENVIRONMENTAL CONDITIONS

Fan coils to be located indoors; however, attic, crawl space and garage conditions are fully acceptable.

2.0 PRODUCTS

2.01 ACCEPTABLE PRODUCTS

Fan coils shall be manufactured by Energy Saving Products Ltd, or pre-approved equal.

2.02 MATERIALS

A. Components

<u>Component</u>	<u>Material</u>
Casing	22 Gauge Sheet Metal with white polyester powder coating
Blower	G-90 forward curved centrifugal
Motor (FASCO)	3/4 HP VFD Motors, 115/230 V, 50/60 hertz
Printed Circuit Board	Capable of all functions in 2.03B
WM (Water Coil Module)	Cu tubing, Al Fins, 20 Ga Galv Endsheets
RPM (TX Cooling Module)	Cu tubing, Al Fins, 16 Ga Galv Endsheets To include site-glass, TX valve, access ports and freeze stat. Factory pre-piped as standard.

B. Accessories

1. Unless ordered as a blower unit only, all fan coils shall be shipped complete with heating coil, pre-wired and ready to install.
2. Chilled water or TX cooling coils to be selected by engineer.
3. Electric coil for heat pump back up shall be installed in the fan coil housing
4. 2" flex kits shall include saddle taps and gaskets for supply main.
5. Rough-in boots with adjustable dampers shall be provided for each outlet.
6. Supply and return spiral metal ducts to be provided, installed, insulated (supply), and sealed by contractor.
7. Hi-velocity fan coil units require a hot water source for provision of heat distribution. A high efficiency stainless steel condensing boiler is the preferred choice due to response time and fuel efficiency. Cast iron boilers and dual-purpose hot water tanks may also be used if the engineer approves a de-rated response time and lower BTUH with a hot water tank.
8. Return air base is acoustically lined with 1" insulation as is the fan coil unit.
9. A filter or complete air purification package must be included with the fan coil unit.
 - a. Ultra-Sun's Sun-Pure Model SP220 with an ASHRAE rated MERV 11 filter will be the base design. The frame shall be powder coated with no

- exposed metal surfaces, and sturdy enough to support the complete weight of a five-ton fan coil unit in a bottom return air configuration.
- b. SP220 or approved equal shall be fully upgradeable by adding two (2) 20 watt UV germicidal lamps and photo catalytic technology for the removal of germs, viruses, bacteria, VOC's, chemicals, odors, carbon monoxide and other hydrocarbons. The photo catalytic grid shall contain a minimum of 70 square feet of titanium oxide catalyst exposure and sized to handle 1.5 to 5 tons. Unit shall be single side access and capable of upgrade without any change to the ductwork. Contractor will be responsible for any required mating transitions in the return air duct. Frame size is W: 21" x H: 25" x D: 10.25". Alternate units with by-pass systems will not be allowed due to unanticipated contaminants passing untreated and potentially fouling the coils or blower.

2.03 CONSTRUCTION

- A. The fan coil shall be fabricated of white powder coated 22 Ga sheet metal with a 1" sound attenuating insulation. The blower is a forward curve fan powered by 115/220V energy efficient variable frequency direct drive motor. All coils will be CSA / UL approved. Units must be single side access for coil, motor, and controls access.
- B. Control panel shall be pre-wired with the following auxiliary control operations:
 - Terminal contacts for freeze-stat controller
 - 24V terminals for condensing unit
 - 24V terminals for 2 or 3 wire zone valves
 - Terminals for Electric strip coils
 - Auxiliary SPDT dry contact relay for low or line voltage
 - Potable water circuit board for circulator with timer override microchip
 - Constant fan, low & high speed heating, dehumidification, low & high speed cooling, with 5 factory pre-sets for adjustment on each speed.
 - Dip switch technology for factory and field set two stage operation, tonnage selections, and air flow settings
 - Fuseable link and surge protection with automatic reset

3.0 EXECUTION

3.01 INSTALLATION

- A. Location

The fan coil unit can be located in a horizontal or vertical position, and can be suspended from the ceiling or placed directly on the floor. Location of the fan coil will vary depending on the following: length of duct runs, usable floor space, serviceability and accessibility to unit, minimizing structural changes, location of heating/cooling source, and available space in mechanical room.
- B. Ducting

The main supply duct attached to the top of the fan coil shall be installed so there is a minimum of 18" of straight duct before a tee or elbow is used. The supply duct shall be sealed for leaks and covered with R8 insulating sleeve if duct is located in an unconditioned area, or any time when cooling is used. Selection of main plenum location shall ensure that the 2" flex duct length is minimized with a maximum run length of 25 ft. Ducting layout to be matched as per the design and install manual of Energy Saving Products Ltd., or pre-approved equal.
- C. Ducting Return & Fresh Air

Return air duct shall be sized per unit as in Table 2. At the contractor's option the duct can be square or rectangular utilizing the round equivalent. If flexible duct is used in lieu of spiral or snap-lock, up size the flex duct to be 2" larger than the

specified size. For additional sound attenuation, the return air duct shall be sound lined with a 1" sound acoustic insulation, continuing at least 5' back from the unit. An outside make-up air duct should be inserted into the return air duct, preferably at least five feet from the fan coil unit. The size of the make-up air duct is typically 4" to 6" in diameter, but should be sized with the code requirements and confirmed with the engineer. Return air duct transitions to the filter or cooling coil shall be a 20° angle per side where possible, and not exceed 30° per side for proper airflow.

D. Flex Duct

Flex duct shall be 2" diameter, and insulated either R-4 or R-8 in unconditioned space. For correct airflow and sound attenuation, the standard flex lengths should be either 10' minimum or 15' runs. The effective throw of air mixing out off a flex run and factor supplied diffuser box is 18 feet. If a desired run length is less than 10', the flex duct can be coiled in the allowable space to maintain the 10' minimum. Run lengths may be extended up to a maximum length of 25', however this might cause reduced flow for those areas and an additional run should be added, or consult the factory. The flex duct kits shall include a saddle tap complete with gasket to attach to the supply duct. Rough-in boots shall also be provided in each flex duct kit. Boots shall have an integral damper capable of fully open and close adjustments at each outlet. Standard faceplates are white plastic and able to accept paint. Optional faceplates can be oak, maple, bronze, brass, or brushed nickel.

E. Drilled outlets and linear grills.

Drilled outlets in the supply duct may be used in lieu of flex duct in high ceiling, large open area rooms with high occupancy, high vaulted ceiling or atrium type rooms, and rooms with widths over 20 feet. The potential for noise is greater with drilled outlets, and should not be used in residential applications. When calculating the number of outlets, a 1 1/4" drilled outlet is equal to one (1) 2" flex run, and a 2" drilled outlet is equal to two (2) flex runs. For cooling applications, the duct would require a minimum of (8) 1 1/4" holes or (4) 2" holes per ton. Linear grills may be used when grouping 2 or more outlets together, and should be kept a minimum of 6" on center, and within 2" of the open area grill. Contact the factory for design assistance on any applications using drilled outlets or linear grills.

F. Table 2 - Units specified and duct sizing and outlet quantity

Model #	Supply Air & Max. Length*	Return Air	Min # Outlets	Max # Outlets	CFM
HE-50	8" Ø – 70'	12"	14	24	550
HE-70	8" Ø – 80'	12"	20	32	750
HE-100-4	10" Ø – 100'	14"	32	42	1,100
HE-100-5	10" Ø – 120'	16"	40	52	1,250

*Maximum length is from the unit to the supply run end cap. More than one run per unit is allowable, and the allowable length will work in two (2) directions. Consult with the factory or the manufacturer's rep for questions or concerns regarding duct lay-outs and balancing the air flow when the duct run is split with Tee's.

3.02 TESTING

Fan coils must be di-electrically tested during manufacturing. Motor function and circuit board operation shall be tested prior to shipment of fan coil. Sound transmission data must be available upon request for outlet's dba ratings.

3.03 WARRANTY

- A. One year limited warranty. The motor, controls and wiring are free from defects in workmanship for one year from date of purchase.
- B. Five year limited warranty. The heat exchanger is free from defects in workmanship for 5 years from date of purchase.
- C. Two year limited warranty. The electric resistance heater is free from defects in workmanship for 2 years from date of purchase.
- D. The above noted warranty applies only to fan coil unit and does not include connections, attachments, and other products or materials furnished by the installer.

3.04 TRAINING

A factory-authorized representative will supply the fan coil owner with appropriate instructions for the recommended operation and maintenance procedures. Additional training shall be provided if necessary.