# Price High Performance Horizontal Fan Coil Units

# Division 23 – Heating, Ventilating, and Air Conditioning

# Section 23 82 19 – Fan Coil Units

The following specification is for a defined application. Price would be pleased to assist in developing a specification for your specific need.

# PART 1 – GENERAL

##  Section Includes

1. High Performance Horizontal Fan Coil Units.

##  Related Requirements

1. Section 01 40 00 - Quality Requirements
2. Section 01 74 19 - Construction Waste Management and Disposal
3. Section 01 78 00 - Closeout Submittals
4. Section 01 79 00 - Demonstration and Training
5. Section 23 09 93 - Sequence of Operations for HVAC Controls.
6. Section 23 21 13 - Hydronic Piping: Connections to heating coils.
7. Section 23 21 14 - Hydronic Specialties: Connections to heating coils.
8. Section 23 31 00 - HVAC Ducts and Casings.
9. Section 23 33 00 - Air Duct Accessories.
10. Section 23 37 00 - Air Outlets and Inlets.
11. Section 23 82 00 - Convection Heating and Cooling Units: Air coils.
12. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

##  Reference Standards

1. All referenced standards and recommended practices in this section pertain to the most recent publication thereof, including all addenda and errata.
2. AHRI 410 - Standard for Forced-Circulation Air-Cooling and Air-Heating Coils.
3. AHRI 440 - Standard for Performance Rating of Room Fan-Coils.
4. AHRI 880 - Standard for Performance Rating of Air Terminals.
5. AHRI 885 - Standard Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets.
6. ASHRAE 62.1 - Standard for Ventilation for Acceptable Indoor Air Quality.
7. ASHRAE 130 - Standard for Laboratory Methods of Testing Air Terminal Units
8. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
9. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
10. ASTM E488/E488M - Standard Test Methods for Strength of Anchors in Concrete Elements.
11. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
12. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association.
13. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Underwriters Laboratories Inc.

##  Administrative Requirements

1. Pre-installation Meeting: Conduct a pre-installation meeting one week prior to the start of the work of this section, and require attendance by all affected installers.
2. Sequencing: Ensure that utility connections are achieved in an orderly and efficient manner.

##  Submittals

1. Product Data shall be provided with data indicating configuration, general assembly, and materials used in fabrication, including catalog performance ratings that indicate airflow, static pressure, NC designation, electrical characteristics, and connection requirements.
2. Shop Drawings shall indicate configuration, general assembly, and materials used in fabrication, and electrical characteristics and connection requirements.
3. Manufacturer shall include schedules listing discharge and radiated sound power level for each of second through seventh octave bands at inlet static pressures from 1 to 3 inch water gauge.
4. Certificates shall be issued to certify that the air coil capacities, pressure drops, and selection procedures meet or exceed specified requirements or coils are tested and rated in accordance with AHRI 410.
5. Manufacturer's Installation Instructions shall indicate support and hanging details, installation instructions, recommendations, and service clearances required.
6. Project Record Documents shall record actual locations of units and controls components and locations of access doors.
7. Operation and Maintenance Data shall include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists. Include directions for resetting constant-volume regulators.
8. Manufacturer’s warranty shall be submitted and ensure forms have been completed in Owner's name and registered with manufacturer.
9. Maintenance Materials shall be furnished for the Owner's use in maintenance of the project.

##  Quality Assurance

1. Manufacturer Qualifications shall be specified in this section, with minimum ten years of documented experience.
2. Product Listing Organization Qualifications: The manufacturer shall be listed with an organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and be acceptable to authorities having jurisdiction.

##  Warranty

1. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
2. Provide 18 month manufacturer warranty from date of shipment for air fan coil units, integral sound attenuators, integral heating coils, and integral controls.

# PART 2 – PRODUCTS

## 2.01 General

1. Basis of Design: Price Industries, Inc.
2. High Performance Horizontal Fan Coil Unit: FCHG.
3. High Performance Quiet Horizontal Fan Coil Unit: FCHGQ
4. Performance Requirements:
	1. Units shall have published sound power level data tested in accordance with AHRI 880 and ASHRAE 130, and shall use attenuation values found in Appendix E of AHRI 885.
	2. Units shall be ETL listed in compliance with UL/ANSI 1995, and performance certified with the latest edition of AHRI 440.

## 2.02 High Performance Horizontal Fan Coil Units

1. General:
	1. Furnish and install Price FCHG Fan Coil Units where indicated on the plans and in the specifications.
	2. Units shall be completely factory assembled, tested and shipped as two pieces. The drain pan shall be shipped loose for field installation by others.
	3. All units shall be capable of meeting or exceeding the scheduled capacities for cooling, heating and air delivery.
	4. All unit dimensions for each model and size shall be considered maximums.
2. Construction:
	1. Unit Casing
		1. The unit casing shall be fabricated of 20 gauge galvanized steel panels and shall have a bottom access panel to allow removal of the fan and servicing of the unit.
		2. All units shall have a slip and drive duct collar connection on the discharge.
		3. All exterior panels shall be insulated with 1/2 inch thick insulation.
	2. Discharge Collar:
		1. All units shall have a minimum one inch duct collar on the discharge.
	3. Liners:
		1. Standard:
			1. Fiberglass Liner – FG
				1. Insulation shall comply with the requirements of UL 181 (erosion), ASTM C1338 (fungi resistance), ASHRAE 62.1, and ASTM C1071, having a maximum flame/smoke spread of 25/50 for both the insulation and the adhesive when tested in accordance with ASTM E84 and NFPA 90A. The insulation shall comply with Antimicrobial Performance Rating of zero with no observed growth, per UL181.
				2. The insulation shall be secured with adhesive.
				3. Insulation edges exposed to the airstream shall be coated with NFPA approved sealant.
		2. Optional Liners:
			1. Closed Cell Polymeric Foam Insulation – FF
				1. Insulation shall conform to UL 181 for erosion and NFPA 90A for fire, smoke and melting, and comply with a 25/50 Flame Spread and Smoke Developed Index per ASTM E84 or UL 723.
				2. The insulation shall be secured with adhesive.
			2. Foil Board Insulation – FB
				1. Insulation shall conform to UL 181 for erosion and NFPA 90A for fire, smoke and melting, and comply with a 25/50 Flame Spread and Smoke Developed Index per ASTM E84 or UL 723.
				2. The insulation shall be secured with adhesive.
				3. Insulation edges exposed to the airstream shall be coated with NFPA approved sealant.
	4. Unit Mounting (**Optional**):
		1. The unit shall be mounted with the use of (**select one**):
			1. Hanger brackets: The manufacturer shall supply 12 gauge zinc coated steel hanger brackets, shipped loose for field installation with threaded hanger rods supplied by others.
			2. Spring isolators: The manufacturer shall supply spring isolators and hanger brackets, shipped loose for field installation with threaded hanger rods supplied by others. The spring isolators shall be rated according to the weight of the fan coil unit and oriented according to the manufacturer’s instructions to properly damper the fan coil.
	5. Blower:
		1. The blower shall be a dynamically balanced, forward curved, double width/double inlet (DWDI) centrifugal type, constructed of zinc coated galvanized steel for corrosion resistance.
	6. Motor:
		1. The unit shall be supplied with an electronically commutated motor (ECM), complete with a single phase integrated controller/inverter that operates the wound stator and senses motor position to electronically commutate the stator.
		2. The motor rotor shall be permanent magnet type with near zero rotor losses.
		3. The motor shall be permanently lubricated with ball bearings, maintaining a minimum of 70% efficiency over its entire operating range.
		4. The motor shall be supplied complete with a manual fan speed controller for field adjustment of fan air flow set-point.
		5. The speed controller shall accept as standard a [0-10VDC], or [4-20mA] signal for remote fan adjustment from a building automation system.
		6. The ECM shall be furnished with factory programming:
			1. Pressure Independent Flow Program
	7. A pressure independent flow program shall be provided to allow the ECM to compensate for fluctuations in external static pressure, providing constant airflow.
	8. The air volume flow rate shall be maintained to within five percent of desired flow in a system with up to 0.50 inches water gauge of external static pressure.
	9. Drain Pans:
		1. All units shall be supplied with a primary drain pan with single wall, galvanized steel for corrosion resistance.
		2. The primary drain pan shall extend under the entire cooling coil and drain into the auxiliary pan.
		3. Drain pans shall be of one-piece construction and be positively sloped for condensate removal.
		4. Drain pans shall be externally insulated with fire retardant foam insulation. The insulation shall carry no more than a 25/50 Flame Spread and Smoke Developed Rating per ASTM E84 and UL 723 and an Antimicrobial Performance Rating of zero with no observed growth per UL 181.
		5. (**Optional**): Provide primary drain pan with type 304 stainless steel construction for superior corrosion resistance. Stainless steel drain pans shall be externally insulated and meet or exceed the requirements stated above.
		6. (**Optional**): Provide an auxiliary drain pan for overflow protection of the primary drain pan.
		7. (**Optional**): Provide a secondary drain connection on the auxiliary drain pan for condensate overflow.
	10. Filters:
		1. All units shall be furnished with a minimum one inch thick nominal glass fiber throwaway filter.
		2. The filter shall have a Minimum Efficiency Reporting Value (MERV) of MERV3.
		3. (**Optional**): The units shall be furnished with a two inch pleated [MERV8] or [MERV13] filter.
	11. Electrical:
		1. Units shall be furnished with single point power connection.
		2. Units shall be furnished with a NEMA 250, Type 1 electrical enclosure.
	12. Unit Options:
		1. Permanent Split Capacitor (PSC) motor:
			1. Motors shall be direct coupled to the blower with isolation provided between motor and blower assembly.
			2. All motors shall be UL and CSA listed with automatic reset thermal overload protection.
			3. Motors shall be modulating, single phase, 60 Hertz permanent split capacitor (PSC) type with permanently lubricated sleeve bearings.
			4. The motor shall be complete with an electronic speed controller to allow continuously adjustable fan speed from minimum to maximum. Speed control shall be matched to operate with the motor, and shall be equipped with a factory-set minimum voltage stop to ensure the motor will not operate in stall mode.
			5. (**Optional**) Motors shall have quick connectors to allow service and removal without the need for tools.
		2. Water Cooling and Heating Coils:
			1. All water coils shall be rated and certified in accordance with the current edition of AHRI 410, and shall bear the AHRI seal on the unit casing.
			2. All cooling and heating coils shall optimize rows and fins per inch to meet the specified capacity.
			3. Coils shall have seamless copper tubes and shall be mechanically expanded to provide an efficient, permanent bond between the tube and fin.
			4. Fins shall have a high efficiency aluminum surface optimized for heat transfer, air pressure drop and carryover.
			5. All water coils shall be hydrostatically tested to a minimum 390 pounds per square inch, with a minimum burst pressure of 1800 pounds per square inch at ambient temperature. All water coils are rated for a maximum of 300 pounds per square inch working pressure at 200 degrees Fahrenheit.
			6. Cooling and heating coils shall be in separate coil casings.
			7. Units with cooling coils shall be supplied with an integral condensate diverting section to prevent condensate carry over.
		3. Electric Heating Coils:
			1. Electric coils shall be factory-mounted and of the capacity scheduled on the drawings.
			2. The assembly shall be UL 1995 and ETL certified.
			3. The heater frame and cabinet shall be constructed of heavy gauge galvanized steel.
			4. Heating elements shall be high resistance and low oxidation nickel chromium wire.
			5. Electric coils shall be supplied with a 24V control transformer and contactor.
			6. Two thermal cutouts of automatic reset and manual reset type shall be provided as primary and secondary overload protection, respectively. Fused secondary thermal cutout devices are not acceptable.
			7. The heating element shall be interlocked with the fan to ensure that the fan is operational prior to the heating elements being energized.
			8. (**Optional**): A door-interlock disconnect switch shall be provided to cut power to the electric coil prior to accessing components in the control enclosure.

## 2.03 High Performance Quiet Horizontal Fan Coil Units

1. Basis of Design: Price Industries, Inc.
2. High Performance Quiet Horizontal Fan Coil Unit: FCHGQ (direct digital controls).
3. Performance Requirements:
4. Units shall have published sound power level data tested in accordance with AHRI 880 and ASHRAE 130.
5. Units shall be ETL listed in compliance with UL/ANSI 1995, and performance certified with the latest edition of AHRI Standard 440.
6. General:
7. Furnish and install Price FCHGQ Fan Coil Units where indicated on the plans and in the specifications.
8. Units shall be completely factory assembled, tested and shipped as three pieces. The drain pan shall be shipped loose for field installation by others.
9. All units shall be capable of meeting or exceeding the scheduled capacities for cooling, heating and air delivery.
10. All unit dimensions for each model and size shall be considered maximums.
11. Construction:
	1. Unit Casing
12. The unit casing shall be fabricated of 20 gauge galvanized steel panels and shall have a bottom access panel to allow removal of the fan and servicing of the unit.
13. All units shall have a slip and drive duct collar connection on the discharge.
14. All exterior panels shall be insulated with 1/2 inch thick insulation.
15. Discharge Collar:
16. All units shall have a minimum one inch duct collar on the discharge.
17. Liners:
18. Standard:
19. Fiberglass Liner – FG
	* + - 1. Insulation shall comply with the requirements of UL 181 (erosion), ASTM C1338 (fungi resistance), ASHRAE 62.1, and ASTM C1071, having a maximum flame/smoke spread of 25/50 for both the insulation and the adhesive when tested in accordance with ASTM E84 and NFPA 90A. The insulation shall comply with Antimicrobial Performance Rating of 0 with no observed growth, per UL181.
				2. The insulation shall be secured with adhesive.
				3. Insulation edges exposed to the airstream shall be coated with NFPA approved sealant.
20. Optional Liners:
21. Closed Cell Polymeric Foam Insulation – FF
22. Insulation shall conform to UL 181 (erosion) and NFPA 90A for fire, smoke and melting, and comply with a 25/50 Flame Spread and Smoke Developed Index per ASTM E84 or UL 723.
23. The insulation shall be secured with adhesive.
24. Foil Board Insulation – FB
25. Insulation shall conform to UL 181 (erosion) and NFPA 90A for fire, smoke and melting, and comply with a 25/50 Flame Spread and Smoke Developed Index per ASTM E84 or UL 723.
26. The insulation shall be secured with adhesive.
27. Insulation edges exposed to the airstream shall be coated with NFPA approved sealant.
28. Unit Mounting (**Optional**):
29. The unit shall be mounted with the use of (**select one**):
30. Hanger brackets: The manufacturer shall supply 12 gauge zinc coated steel hanger brackets, shipped loose for field installation with threaded hanger rods supplied by others.
31. Spring isolators: The manufacturer shall supply spring isolators and hanger brackets, shipped loose for field installation with threaded hanger rods supplied by others. The spring isolators shall be rated according to the weight of the fan coil unit and oriented according to the manufacturer’s instructions to properly damper the fan coil.
32. Blower:
33. The blower shall be a dynamically balanced, forward curved, double width/double inlet (DWDI) centrifugal type, constructed of zinc coated galvanized steel for corrosion resistance.
34. Motor:
35. The unit shall be supplied with an electronically commutated motor (ECM), complete with a single phase integrated controller/inverter that operates the wound stator and senses motor position to electronically commutate the stator.
36. The motor rotor shall be permanent magnet type with near zero rotor losses.
37. The motor shall be permanently lubricated with ball bearings, maintaining a minimum of 70% efficiency over its entire operating range.
38. The motor shall be supplied complete with a manual fan speed controller for field adjustment of fan air flow set-point.
39. The speed controller shall accept as standard a [0-10VDC], or [0-20mA] signal for remote fan adjustment from a building automation system.
40. The ECM shall be furnished with factory programming (**select one**):
41. High Turndown Flow Program
42. A high turndown flow program shall be provided to allow the ECM to operate with constant torque to vary the airflow with fluctuations in external static pressure.
43. The motor shall be capable of operating at low speeds to accommodate an increased turndown ratio, a wider airflow range, and decreased energy consumption as compared to typical pressure independent motor programs.
44. Pressure Independent Flow Program
45. A pressure independent flow program shall be provided to allow the ECM to compensate for fluctuations in external static pressure, providing constant airflow.
46. The air volume flow rate shall be maintained to within five percent of desired flow in a system with up to 0.50 inches water gauge of external static pressure.
47. Drain Pans:
48. All units shall be supplied with a primary condensate drain pans with single wall, galvanized steel for corrosion resistance.
49. The primary drain pan shall extend under the entire cooling coil and shall be equipped with a ¾ inch connection.
50. Drain pans shall be of one-piece construction and be positively sloped for condensate removal.
51. Drain pans shall be externally insulated with fire retardant foam insulation. The insulation shall carry no more than a 25/50 Flame Spread and Smoke Developed Rating per ASTM E84 and UL 723 and an Antimicrobial Performance Rating of zero with no observed growth per UL 181.
52. (**Optional**): Provide primary drain pan with type 304 stainless steel construction for superior corrosion resistance. Stainless steel drain pans shall be externally insulated and meet or exceed the requirements stated above.
53. (**Optional**): Provide a secondary drain connection on the auxiliary drain pan for condensate overflow.
54. Filters:
55. All units shall be furnished with a minimum one inch thick nominal glass fiber throwaway filter.
56. The filter shall have a Minimum Efficiency Reporting Value (MERV) of MERV3.
57. (**Optional**): The units shall be furnished with a two inch pleated [MERV8] or [MERV13] filter.
58. Silencer:
59. The silencer shall consist of a 22 gauge solid metal casing, 22 gauge perforated liners, and absorptive acoustic fiberglass liner.
60. Silencer shall be constructed with any of the following acceptable methods:
61. Button lock
62. Pittsburgh lock
63. Welding
64. Rivets, if the above methods are not feasible
65. Screws and mechanical fasteners shall not be acceptable.
66. The silencer noses and perforated liners shall be rigidly fastened to the casing of the silencer on both the top and bottom.
67. The silencer acoustic media shall be shot free inorganic glass fiber with long, resilient fibers, bonded with thermosetting resin, and shall contain 50 percent recycled media. The glass fiber shall be packed with a minimum of ten percent compression to eliminate voids and settling. Density shall be consistent with that used to generate catalog test data.
68. Combustion ratings for the silencer acoustic media shall be equal to or less than a Flame Spread Classification of 25 and Smoke Development Rating of 50 when tested in accordance with ASTM E84, UL 713, and NFPA 255.
69. An integral condensate diverting section shall be built into the silencer to prevent condensate carryover.
70. Media Protection:
	1. Absorptive silencers:
		1. Where indicated on the silencer schedule, media shall be encapsulated in glass fiber cloth to help prevent shedding, erosion and impregnation of the glass fiber.
	2. Film Lined silencers:
		1. The acoustic media shall be completely wrapped with polymer film to help prevent shedding, erosion and impregnation.
		2. The wrapped acoustic media shall be separated from the perforated metal by a factory-installed acoustically transparent spacer.
		3. The spacer shall be flame retardant and erosion resistant.
		4. Mesh, screen or corrugated perforated liner will not be acceptable as a substitute for the specified spacer.
		5. Silencer manufacturer shall provide a written test report showing silencer assemblies have Class 1 flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested according to ASTM E 84, NFPA 255 or UL 723.
71. Electrical:
72. Units shall be furnished with single point power connection.
73. Units shall be furnished with a NEMA 250, Type 1 electrical enclosure.
74. Unit Options and Accessories:
75. Permanent Split Capacitor (PSC) motor:
76. Motors shall be direct coupled to the blower with isolation provided between motor and blower assembly.
77. All motors shall be UL and CSA listed with automatic reset thermal overload protection.
78. Motors shall be modulating, single phase, 60 Hertz permanent split capacitor (PSC) type with permanently lubricated sleeve bearings.
79. The motor shall be complete with an electronic speed controller to allow continuously adjustable fan speed from minimum to maximum. Speed control shall be matched to operate with the motor, and shall be equipped with a factory-set minimum voltage stop to ensure the motor will not operate in stall mode.
80. (**Optional**) Motors shall have quick connectors to allow service and removal without the need for tools.
81. Water Cooling and Heating Coils:
82. All water coils shall be rated and certified in accordance with the current edition of AHRI 410, and shall bear the AHRI seal on the unit casing.
83. All cooling and heating coils shall optimize rows and fins per inch to meet the specified capacity.
84. Coils shall have seamless copper tubes and shall be mechanically expanded to provide an efficient, permanent bond between the tube and fin.
85. Fins shall have high efficiency aluminum surface optimized for heat transfer, air pressure drop and carryover.
86. All water coils shall be hydrostatically tested to a minimum 390 pounds per square inch, with a minimum burst pressure of 1800 pounds per square inch at ambient temperature. All water coils are rated for a maximum of 300 pounds per square inch working pressure at 200 degrees Fahrenheit.
87. Cooling and heating coils shall be in separate coil casings.
88. Units with cooling coils shall be supplied with an integral condensate diverting section to prevent condensate carry over.
89. Electric Heating Coils:
90. Electric coils shall be factory-mounted and of the capacity scheduled on the drawings.
91. The assembly shall be UL 1995 and ETL certified.
92. The heater frame and cabinet shall be constructed of heavy gauge galvanized steel.
93. Heating elements shall be high resistance and low oxidation nickel chromium wire.
94. Electric coils shall be supplied with a 24 volt control transformer and contactor.
95. Two thermal cutouts of automatic reset and manual reset type shall be provided as primary and secondary overload protection, respectively. Fused secondary thermal cutout devices are not acceptable.
96. The heating element shall be interlocked with the fan to ensure that the fan is operational prior to the heating elements being energized.
97. (**Optional**): A door-interlock disconnect switch shall be provided to cut power to the electric coil prior to allowing access to the components in the control enclosure.

# PART 3 – EXECUTION

## 3.01 Examination

1. Verify that conditions are suitable for installation.
2. Verify that field measurements are as shown on the drawings.

## 3.02 Installation

1. Install the fan coil units in accordance with the manufacturer's instructions.
2. See drawings for the size(s) and duct location(s) of the fan coil units.
3. Provide ceiling access doors or locate units above easily removable ceiling components.
4. Support the fan coil units individually from the structure.
5. Embed anchors in concrete in accordance with ASTM E488/E488M.
6. Do not support the fan coils from the ductwork.
7. Connect the fan coils to the ductwork in accordance with Section 23 31 00.
8. Install heating coils in accordance with Section 23 82 00.
9. Verify that electric power is available and of the correct characteristics.

## 3.03 Field Quality Control

1. See Section 01 40 00 - Quality Requirements, for additional quality requirements.

## 3.04 Cleaning

1. See Section 01 74 19 - Construction Waste Management and Disposal for additional cleaning requirements.

## 3.05 Closeout Activities

1. See Section 01 78 00 - Closeout Submittals for closeout submittals.
2. See Section 01 79 00 - Demonstration and Training for additional closeout requirements.