

ENGINEERING GUIDE

# FH Fan-Coil Units Low-Profile, Horizontal



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**NOTES:**

- Johnson Controls offers Web-Select®, the industry’s first web-based rating and selection program for complete unit, coil and sound selection. See your representative for more information.
- Some drawings are not shown in this catalog.
- All data herein is subject to change without notice.
- Drawings not for installation purposes; refer to IOM manual.
- ETL Report Number 539840.
- City of New York Material and Equipment Acceptance (MEA) File Numbers:
  - FHF and FHP: MEA 53-98-E
  - FHX: MEA 53-98-E Vol. II.

## **FEATURES AND BENEFITS**

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### **HIGH PERFORMANCE**

Johnson Controls FH Series horizontal low profile fan coil units are designed to maximize flexibility of selection and installation.

The units are also designed to exceed the stringent quality standards of the institutional market, while remaining cost competitive in the light commercial segment of the market.

Johnson Controls horizontal fan coil units set the new standards for quality, flexibility, and competitive pricing.

### **DESIGN FLEXIBILITY**

The extensive variety of standard options available on the FH Series units are where you find the versatility to fit any HVAC system designer's needs.

Options include: rear or bottom ducted return, foil faced or elastomeric closed cell foam insulation, solid or telescoping bottom panels for unit recessing, single wall stainless steel drain pans, electric heat with single point power connection. All electric heat units are listed with ETL as an assembly and carry the cETL label.

All units comply with the latest edition of ARI Standard 440 for testing and rating fan coil units, are certified, and display the ARI symbol.

High Efficiency motors, fan relays, disconnects and fusing mean easier coordination between mechanical and electrical trades.

Coil options allow for three or four row chilled water or DX cooling coils. One or two row hot water or standard steam coils may be placed in the preheat or reheat position.

Silent solid state relays are available for fan and electric heat control in sound sensitive environments.

### **CONVENIENT INSTALLATION**

All FH Series fan coil units are shipped completely assembled, reducing field installation time and labor.

All units are thoroughly inspected and tested prior to shipment, eliminating potential problems at startup. Motor wiring is brought to a junction box on the outside of the unit casing, reducing electrical hook-up time.

Plenum units are field reversible for either rear or bottom return without special adapters, tools or additional parts.

All FH Series fan coil units have the option of a hinged cover electrical enclosure in the bottom of the unit. The expansive compartment allows for easy access to all electrical components, terminal blocks and wiring.

Factory furnished valve packages assure proper fit, operation and performance.

For fast track jobs, the FH Series fan coil is available on Quick Ship with 5, 10 or 15 day lead times.

### **QUALITY PRODUCT**

Concealed Model FH Series fan coil units are built from galvanized steel. This metal surpasses the ASTM 125 hour salt spray test for corrosion and rust. Exposed Model FHX cabinetry is powder coated galvanized steel.

Standard insulation is 1/2 inch thick fiberglass, complying with UL 181 and NFPA 90A. Optional foil faced or elastomeric closed cell foam insulation may be specified.

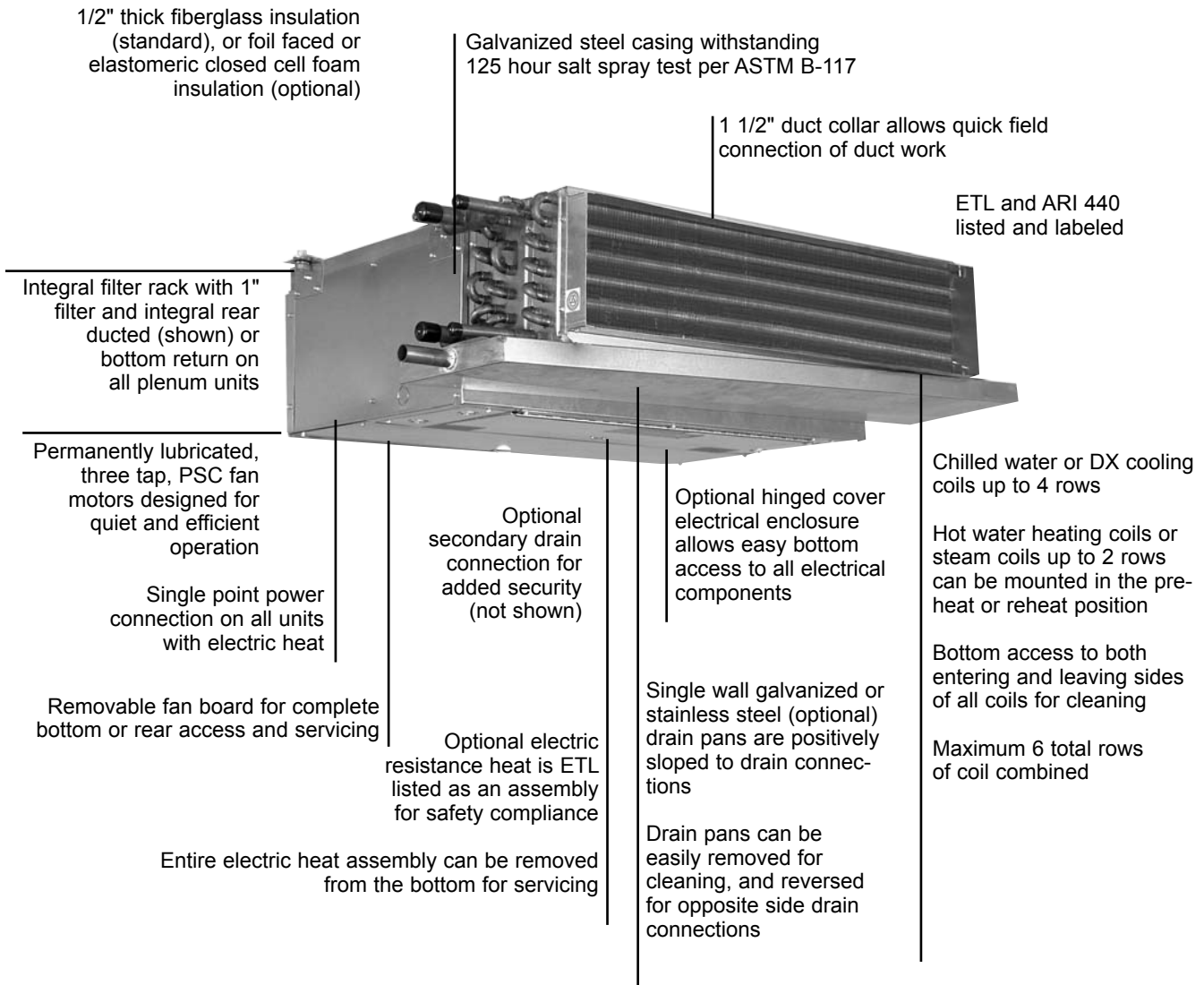
All units, with or without electric heat, are cETL listed and labeled. All wiring is in compliance with NEC, assuring safety and quality for the owner.

FH Series fan coil units have a removable fan assembly. The entire fan assembly can be removed from the unit and serviced easily on a workbench.

# CONSTRUCTION FEATURES

## MODEL FHP

FH Series fan coils have many standard and optional features which are unique to the industry (see page 6 for a complete listing).



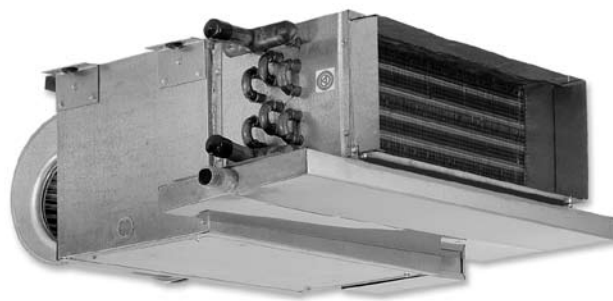
## MODEL FHX

Horizontal Exposed Cabinet



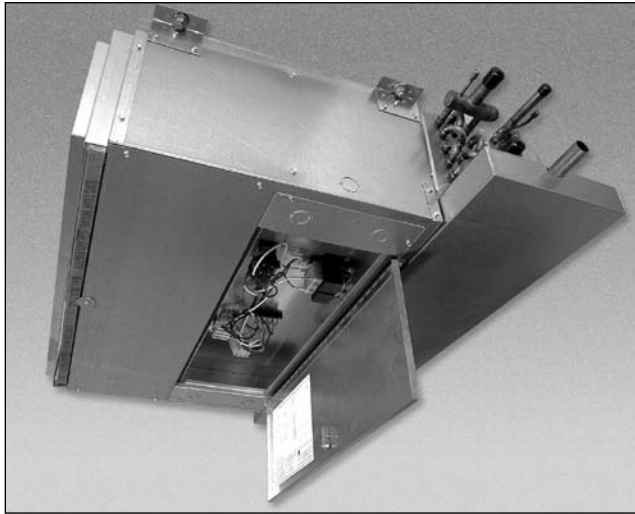
## MODEL FHF

Horizontal Free Return



## CONSTRUCTION FEATURES

### MODELS FHF/FHP/FHX



#### ELECTRICAL ENCLOSURE

The bottom hinged electrical enclosure provides access to a spacious electrical compartment. This compartment houses all electric heat and control components. Terminal strips are furnished for simple power and control wiring connections. Multiple knockouts allow wiring entries from either side of the compartment.

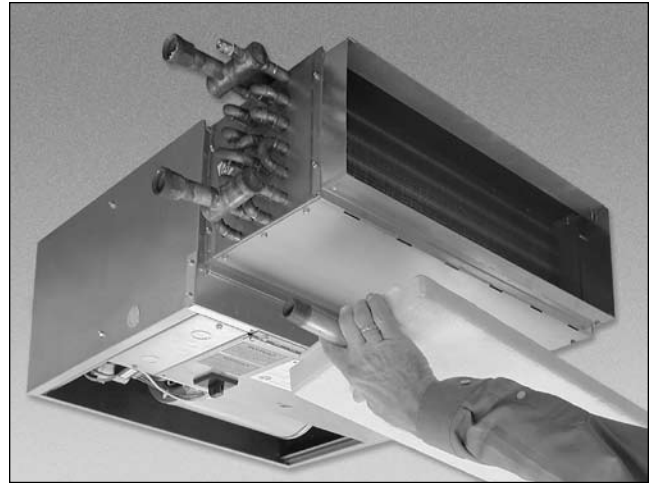


#### FILTERS

One inch throwaway filters are tight fitting to prevent air bypass. Filters are easily removable from the bottom through the access panel or plenum.

#### COILS

All fan coils are available in 2 or 4 pipe configurations. The heating coil may be placed in the reheat or preheat position. On concealed models, heating and cooling coils are available with right, left or opposite side connections.



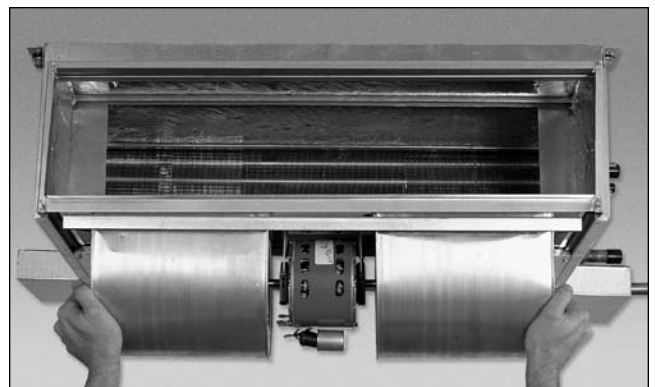
#### DRAIN PAN

Standard drain pans are externally insulated, single wall galvanized steel with an option for stainless steel. Drain pans are available with secondary drain connection. On concealed models, the FH Series drain pan is easily removable for cleaning or reversing connections.



#### TELESCOPING BOTTOM PANEL

The telescoping bottom panel allows for fully recessing the unit while permitting service access into the ceiling plenum. The architectural ceiling panel is finished with a durable powder coat paint.



#### FAN DECK

The fan assembly is easily removed without disconnecting the ductwork for service access to motors and blowers at, or away from the unit.

# STANDARD AND OPTIONAL FEATURES

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## STANDARD FEATURES

### Construction

#### All Units

- ARI 440 certified and labeled
- Galvanized steel construction
- 1/2" thick fiberglass insulation
- 1 1/2" duct discharge collar
- Four point hanger mounting brackets

#### Plenum units

- Integral filter rack with 1" throwaway filter
- Integral rear ducted return - field reversible to bottom return

#### Exposed units

- Stamped louver supply and return air grilles
- Durable powder coat paint
- 18 gauge bottom panel construction

### Coils

- Cooling - 3 or 4 row chilled water or DX, heat pump compatible
- Heating - 1 or 2 row hot water or steam – reheat or pre-heat position
- 6 total rows of cooling and heating coils maximum
- 1/2" O.D. seamless copper tubes
- 0.016" tube wall thickness
- High efficiency aluminum fin surface for optimizing heat transfer, pressure drop and carryover
- Left or right hand, same or opposite side connections
- Access to entering and leaving air sides for cleaning
- Removable for service
- Manual air vents

### Drain Pans

- Single wall, galvanized steel, externally insulated – fire retardant and antimicrobial
- Positively sloped to drain connection
- Removable, field reversible
- 7/8" O.D. primary drain connection

### Fan Assemblies

- Forwardly curved, DWDI centrifugal type
- 115 volt, single phase, three tap PSC motors
- Quick disconnect motor connections
- Removable fan/motor deck for service

### Electrical

- cETL listed for safety compliance
- Electrical junction box for field wiring terminations
- Terminal block for field connections

### Electric Heat

- ETL listed as an assembly for safety compliance
- Integral electric heat assembly with removable elements for easy service
- Automatic reset primary and back-up secondary thermal limits
- Single point power connection
- Bottom hinged electrical enclosure

## OPTIONAL FEATURES

### Construction

#### All units

- Foil faced fiberglass insulation
- Elastomeric closed cell foam insulation

#### Plenum units

- Bottom return
- 1" pleated filters (MERV 6)
- Spare 1" throwaway filters
- Telescoping Bottom Panels

#### Exposed units

- 1" pleated filters (MERV 6)
- Double deflection discharge grille
- Ducted supply and/or return

### Coils

- Automatic air vents
- Stainless steel coil casings
- 0.025" tube wall (standard on steam)

### Drain Pans

- Stainless steel construction with external insulation
- 5/8" O.D. secondary drain connection
- Auxiliary drip pans, galvanized or stainless steel

### Fan Assemblies

- 208-230, 220 & 277 volt, single phase, three tap PSC motors

### Electrical

- Bottom hinged cover electrical enclosure
- SCR fan speed controller
- Fan relay packages
- Silent solid state fan relays
- Toggle disconnect switch
- Condensate overflow switch (drain pan)
- Main fusing
- Unit and remote mounted three speed fan switches

### Electric Heat

- Manual reset secondary thermal limits
- Door interlocking disconnect switches
- Main fusing
- Silent relay/contactors

### Piping Packages

- Factory assembled – shipped loose for field installation
- 1/2" and 3/4", 2 way and 3 way normally closed, two position electric motorized valves
- Isolation ball valves with memory stop
- Fixed and adjustable flow control devices
- Unions and P/T ports
- Floating point modulating control valves
- High pressure close-off actuators (1/2" = 50 PSIG; 3/4" = 25 PSIG)

### Thermostats

- Remote mounted analog, digital display or programmable
- 2 and 4 pipe control sequences
- Automatic and manual changeover
- Integral three speed fan switches

# COILS, PHYSICAL DATA

## COILS

Johnson Controls offers hot water, chilled water, direct expansion (DX), and standard steam coils for specific application with all FH Series Fan Coil Units. Strict on-site inspection before, during, and after installation guarantees the highest quality and performance available.

### STANDARD FEATURES

- Cooling - 3 or 4 row chilled water or DX
- Heating - 1, 2, 3 or 4 row hot water or, 1 or 2 row steam
- 6 total rows of cooling and heating coils maximum
- 1/2" O.D. seamless copper tubes
- 0.016" tube wall thickness
- High efficiency aluminum fin surface for optimizing heat transfer, pressure drop and carryover
- Left or right hand, same or opposite side connections
- Manual air vents

### OPTIONAL FEATURES

- Automatic air vents
- Stainless steel coil casings
- 0.025" tube wall thickness (standard on steam coils)
- DX coils are heat pump compatible

Johnson Controls offers Web-Select™, the industry's first web-based fan coil rating and selection program for complete unit, coil and sound selection. See your representative for more information.

UNIT SIZE	COIL FACE AREA	MODEL FHX				MODEL FHP	
		RETURN AIR GRILLE FREE AREA	SUPPLY AIR GRILLE FREE AREA	FILTER FACE AREA	NOMINAL FILTER SIZES	FILTER FACE AREA	NOMINAL FILTER SIZES
20	1.04 [.09]	0.47 [.04]	0.40 [.04]	1.77 [.16]	30 x 8.5 x 1 [762 x 216 x 25]	1.18 [.11]	20 x 8.5 x 1 [508 x 216 x 25]
25	1.35 [.13]	0.58 [.05]	0.50 [.05]	2.36 [.22]	(2) 20 x 8.5 x 1 [508 x 216 x 25]	1.54 [.14]	26 x 8.5 x 1 [660 x 216 x 25]
30	1.56 [.14]	0.68 [.06]	0.56 [.05]	2.36 [.22]	(2) 20 x 8.5 x 1 [508 x 216 x 25]	1.77 [.16]	30 x 8.5 x 1 [762 x 216 x 25]
40	2.08 [.19]	0.81 [.08]	0.80 [.07]	2.95 [.27]	(1) 20, (1) 30 x 8.5 x 1 [508, 762 x 216 x 25]	2.36 [.22]	(2) 20 x 8.5 x 1 [508 x 216 x 25]
50	2.60 [.24]	1.01 [.09]	0.96 [.09]	3.54 [.33]	(2) 30 x 8.5 x 1 [762 x 216 x 25]	2.95 [.27]	(1) 20, (1) 30 x 8.5 x 1 [508, 762 x 216 x 25]
60	3.13 [.29]	1.15 [.11]	1.20 [.11]	4.13 [.38]	(2) 20, (1) 30 x 8.5 x 1 [508, 762 x 216 x 25]	3.54 [.33]	(2) 30 x 8.5 x 1 [762 x 216 x 25]

**NOTES:**

1. Face and free areas are in square feet [square meters].
2. Filter sizes are in inches [millimeters].
3. Return Air Grille Free Area applies to FHX and Telescoping Bottom Panel return grilles.
4. Supply Air Grille Free Area applies to FHX supply grille and minimum free area allowable for a supply grille supplied by others.

**PHYSICAL DATA****ARI STANDARD RATINGS**

MODEL / SIZE	COIL		AIRFLOW CFM (Dry Flow)	COOLING CAPACITY		WATER		POWER INPUT (WATTS)
	Rows	FPI		QT (BTUH)	QS (BTUH)	Flow Rate (GPM)	WPD ft-wg	
FHF 20	3	10	330	8000	5900	1.8	1.6	81
FHF 25	3	10	450	11500	8500	2.6	3.4	138
FHF 30	3	10	640	13200	9900	3.2	7.6	152
FHF 40	3	10	800	18500	14300	4.2	3.7	263
FHF 50	3	10	1140	24000	19300	5.4	7.4	402
FHF 60	3	10	1590	34000	26500	7.6	14.6	489
FHF 20	4	10	320	8500	6000	1.8	3.1	77
FHF 25	4	10	430	11600	8600	2.6	6.6	135
FHF 30	4	10	610	15900	10400	3.9	10.9	151
FHF 40	4	10	780	22200	16600	4.9	7.2	261
FHF 50	4	10	1040	28500	22500	6.4	12.9	380
FHF 60	4	10	1510	41400	31300	9.2	27.1	466
FHP 20	3	10	270	6900	5300	1.6	1.2	81
FHP 25	3	10	420	10900	8100	2.5	3.1	132
FHP 30	3	10	540	11900	8100	2.8	6.1	152
FHP 40	3	10	770	18100	13900	4.1	3.5	263
FHP 50	3	10	1010	22300	18200	5.0	7.1	372
FHP 60	3	10	1460	32300	25600	7.2	13.3	489
FHP 20	4	10	260	8800	6000	1.6	2.5	77
FHP 25	4	10	410	10900	8100	2.5	6.0	130
FHP 30	4	10	520	15100	10300	3.5	10.0	151
FHP 40	4	10	740	21300	15900	4.8	6.9	261
FHP 50	4	10	970	27200	21400	6.1	11.9	361
FHP 60	4	10	1370	38600	28400	8.6	23.8	466
FHX 20	3	10	240	6300	4800	1.5	1.1	75
FHX 25	3	10	310	8900	6500	2.0	2.2	127
FHX 30	3	10	450	10400	7100	2.5	4.9	135
FHX 40	3	10	650	16300	12400	3.7	2.9	245
FHX 50	3	10	820	19500	15700	4.4	5.6	337
FHX 60	3	10	1130	27500	21500	6.1	10.0	402
FHX 20	4	10	240	6300	4700	1.5	2.1	65
FHX 25	4	10	300	8700	6300	2.0	4.0	125
FHX 30	4	10	440	12800	8300	3.1	7.9	130
FHX 40	4	10	630	18900	14000	4.2	5.5	235
FHX 50	4	10	780	23400	18300	5.3	9.1	321
FHX 60	4	10	1040	31900	24200	7.1	16.8	383

**NOTE:** Based on 80°F DB and 67°F WB EAT, 45°F EWT, 10°F temperature rise, high fan speed. Motor type is PSC and motor voltage is 115/1/60. Airflow under dry coil conditions. Models FHX tested at 0.0" external static pressure. Models FHF and FHP tested at 0.05" external static pressure.



# PHYSICAL DATA

## HEATING CAPACITY

UNIT TYPE	UNIT SIZE	NOMINAL CFM	1 ROW			2 ROW		
			QS (MBH)	GPM	WPD	QS (MBH)	GPM	WPD
FHP FHF	20	250	8.6	0.4	0.2	15.7	0.8	0.9
	25	400	15.0	0.6	0.6	21.0	1.1	3.1
	30	500	16.1	0.8	0.6	29.2	1.5	3.2
	40	750	23.6	1.2	1.5	40.5	2.1	1.6
	50	1000	28.7	1.5	0.7	53.7	2.7	2.9
	60	1400	36.1	1.9	1.1	66.9	3.4	4.7
FHX	20	250	7.9	0.4	0.3	14.0	0.8	1.5
	25	350	10.8	0.6	0.5	19.3	1.0	2.6
	30	450	13.5	0.7	0.9	24.0	1.3	4.8
	40	650	20.4	1.1	2.0	34.0	1.8	1.7
	50	850	22.5	1.2	0.7	40.7	2.1	3.1
	60	1200	30.9	1.6	1.2	55.4	2.9	5.5

NOTE: Based on 70°F DB EAT, 180°F EWT, 40°F temperature drop, high fan speed.

## UNIT WEIGHT DATA

COMPONENT		UNIT SIZE					
		20	25	30	40	50	60
FHF BASE UNIT		40 [18]	51 [23]	59 [27]	69 [31]	91 [41]	111 [50]
FHP BASE UNIT		45 [20]	56 [25]	65 [30]	80 [36]	103 [47]	123 [56]
FHX BASE UNIT		119 [54]	138 [63]	155 [70]	181 [82]	220 [100]	257 [117]
COIL ROWS	1 ROW - DRY	8 [4]	10 [5]	11 [5]	13 [6]	15 [7]	18 [8]
	1 ROW - WET	10 [5]	12 [5]	13 [6]	15 [7]	18 [8]	21 [10]
	2 ROW - DRY	11 [5]	13 [6]	15 [7]	18 [8]	22 [10]	26 [12]
	2 ROW - WET	14 [6]	16 [7]	18 [8]	22 [10]	27 [12]	32 [15]
	3 ROW - DRY	14 [6]	17 [8]	19 [9]	24 [11]	29 [13]	34 [15]
	3 ROW - WET	17 [8]	21 [10]	24 [11]	30 [14]	36 [16]	42 [19]
	4 ROW - DRY	17 [8]	20 [9]	23 [10]	29 [13]	36 [16]	42 [19]
	4 ROW - WET	21 [10]	25 [11]	29 [13]	36 [16]	45 [20]	53 [24]

NOTE: Unit weight data is in pounds [kilograms].

# ELECTRIC HEAT

Johnson Controls offers electric heating coils for specific application with all FH Series Fan Coil units. This allows the flexibility to provide an unrivaled amount of electric heat options in one complete package.

## STANDARD FEATURES

- ETL listed as an assembly for safety compliance
- Single point power connection
- Mounted in preheat position
- Automatic reset primary and back-up secondary thermal limits
- Internal wiring rated at 105°C
- Integral electric heat assembly with removable element for easy service
- Stainless steel terminals and hardware



## USEFUL FORMULAS

$$kW^* = \frac{CFM \times \Delta T \times 1.085^{**}}{3413}$$

$$1\emptyset \text{ AMPs} = \frac{kW \times 1000}{Volts}$$

\* 1kW = 3413 BTU/H

\*\* Capacity at sea level

### Altitude Considerations:

Reduce by 0.034 for each 1000 ft. of altitude above sea level.

Example: 5000 ft./1000 ft. = 5

5 x 0.034 = 0.17

1.085 - 0.17 = 0.915

## OPTIONAL FEATURES

- Silent solid state relays
- Manual reset secondary limits
- Door interlocking disconnect switch
- Main fusing

## ELECTRICAL CALCULATIONS INFORMATION

1. Contact your local Johnson Controls sales office.
2. Non-Fused Door Interlock Disconnect Switch shall be sized according to MCA.
3. Fused Door Interlock Disconnect Switch and Main Fusing shall be sized according to MOP.

## ELECTRIC HEAT SELECTION CHART (AMPS)

UNIT SIZE	MBH	5.1	6.8	10.2	13.7	17.1	20.5	25.6	27.3	34.1
	KW	1.5	2.0	3.0	4.0	5.0	6.0	7.0	8.0	10.0
	VOLTS	AMPS								
20	115	13.0	17.4	26.1						
	208	7.2	9.6	14.4						
	230	6.5	8.7	13.0						
	277	5.4	7.2	10.8						
25	115	13.0	17.4	26.1						
	208	7.2	9.6	14.4						
	230	6.5	8.7	13.0						
	277	5.4	7.2	10.8						
30	115	13.0	17.4	26.1	34.8	43.5				
	208	7.2	9.6	14.4	19.2	24.0	28.8			
	230	6.5	8.7	13.1	17.4	21.7	26.1			
	277	5.4	7.2	10.8	14.4	18.1	21.7			
40	115		17.4	26.1	34.8	43.5				
	208		9.6	14.4	19.2	24.0	28.8	33.7		
	230		8.7	13.1	17.4	21.7	26.1	30.4		
	277		7.2	10.8	14.4	18.1	21.7	25.3		
50	115			26.1	34.8	43.5				
	208			14.4	19.2	24.0	28.8	33.7	38.5	
	230			13.1	17.4	21.7	26.1	30.4	34.8	
	277			10.8	14.4	18.1	21.7	25.3	28.9	
60	115			26.1	34.8	43.5				
	208			14.4	19.2	24.0	28.8	33.7	38.5	
	230			13.1	17.4	21.7	26.1	30.4	34.8	43.5
	277			10.8	14.4	18.1	21.7	25.3	28.9	36.1

### NOTES:

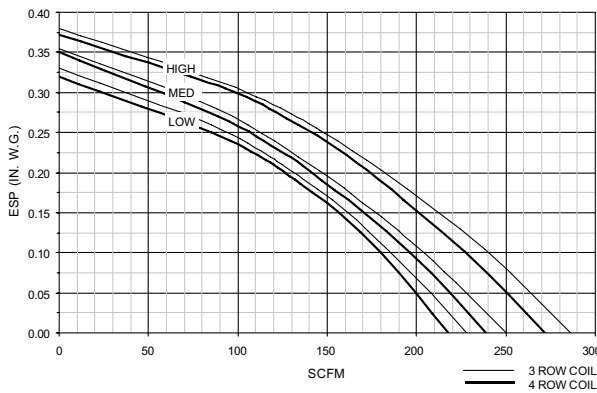
1. Shaded areas of the electric heat selection chart indicate kW and voltage options not available.
2. Available voltages are single phase, 60 hertz.
3. Size heater for Leaving Air Temperature (LAT) less than 104°F.
4. Silent, solid state heater relay is available for sound sensitive environments.
5. Ask your Johnson Controls representative about continuously modulating electric heat using SSR and special control options.

# FAN PERFORMANCE CURVES

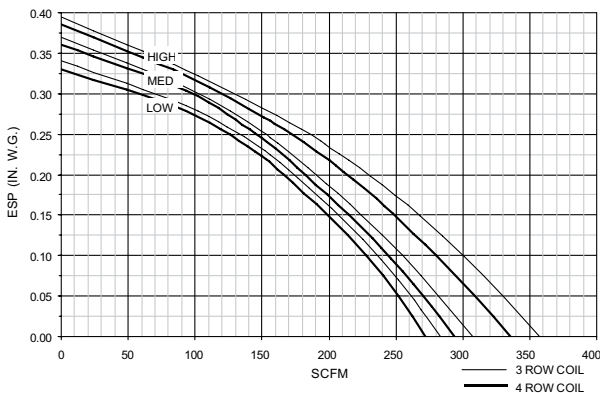
1. Fan curves on the following pages depict actual performance of each motor tap without any additional fan balance adjustment. Actual capacities which fall below each curve can be obtained by adding an adjustment device. Units should not be run prior to installation of downstream ductwork; otherwise, damage to the motor may result.
2. Johnson Controls Fan Coil Units are equipped with permanent split-capacitor (PSC) motors with three taps (High, Medium and Low) which provides variable horsepower outputs. Most often, size selections are conservative and actual CFM requirements and/or external static pressure requirements are lower than those specified. In this case, the unit fan motor can be run at low or medium tap, substantially reducing the operating cost of the unit.
3. All fan curves are for 115/1/60 motors and include pressure losses for cabinet, electric heater, and 3 or 4 row coil. Plenum units include a clean 1" throwaway filter. For other coil configurations, adjust performance curves based on pressure losses for the coils using Web-Select®.
4. See page 14 for fan motor electrical data.
5. For additional high static pressure applications and rating points, contact factory.

## Size 20

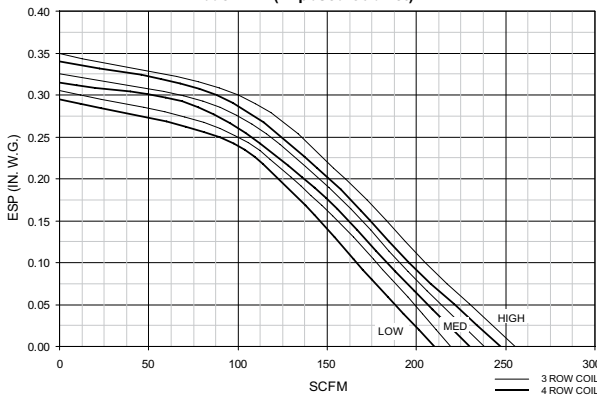
Model FHP (Plenum)



Model FHF (Free Return)

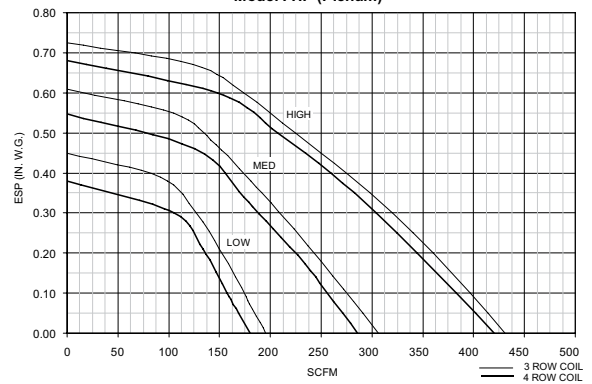


Model FHX (Exposed Cabinet)

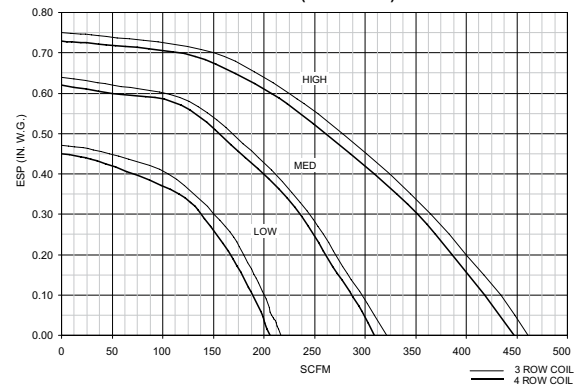


## Size 25

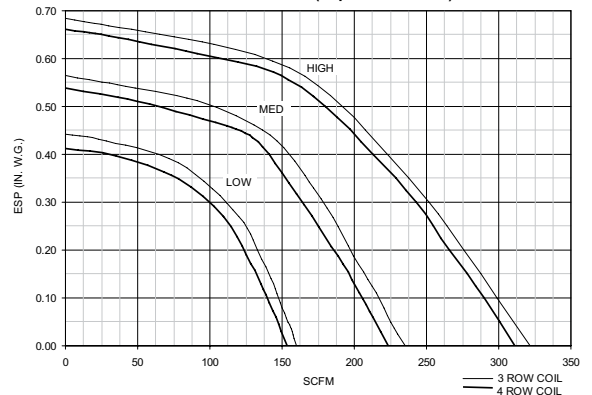
Model FHP (Plenum)



Model FHF (Free Return)



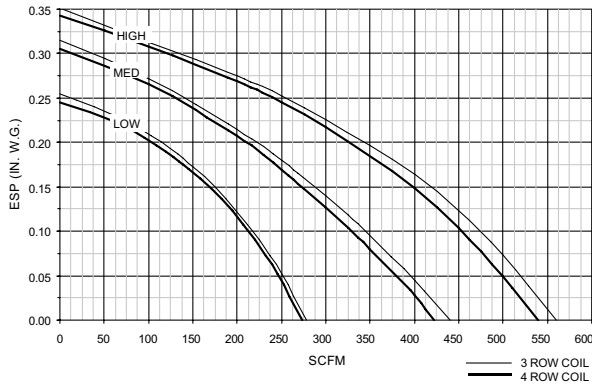
Model FHX (Exposed Cabinet)



# FAN PERFORMANCE CURVES

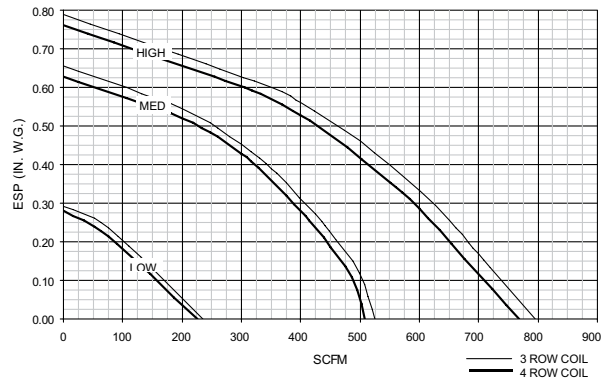
## Size 30

Model FHP (Plenum)

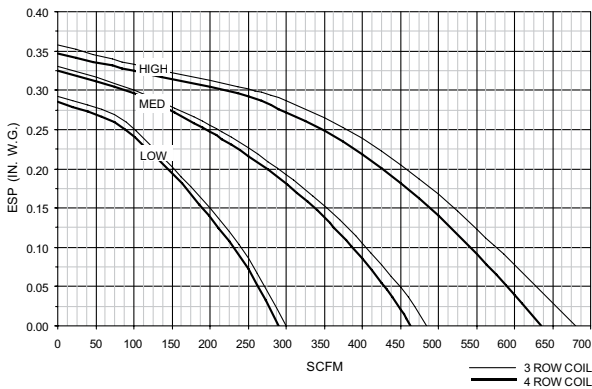


## Size 40

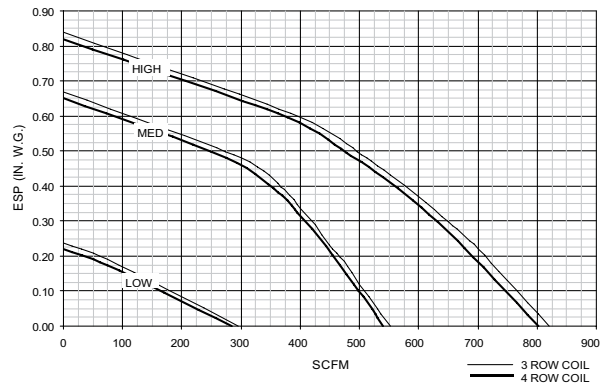
Model FHP (Plenum)



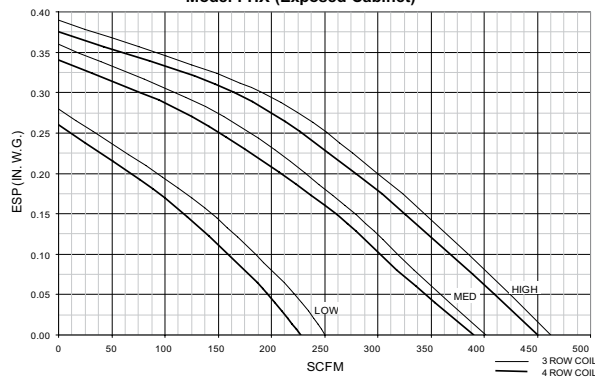
Model FHF (Free Return)



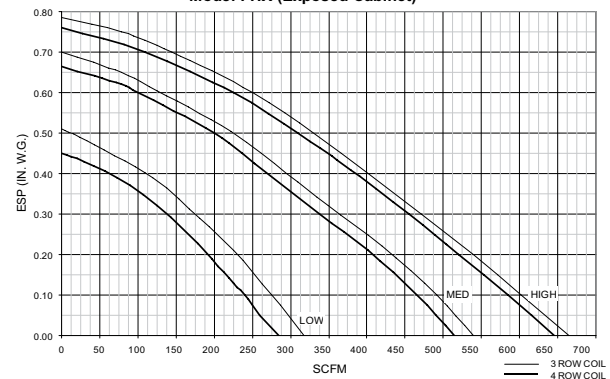
Model FHF (Free Return)



Model FHX (Exposed Cabinet)



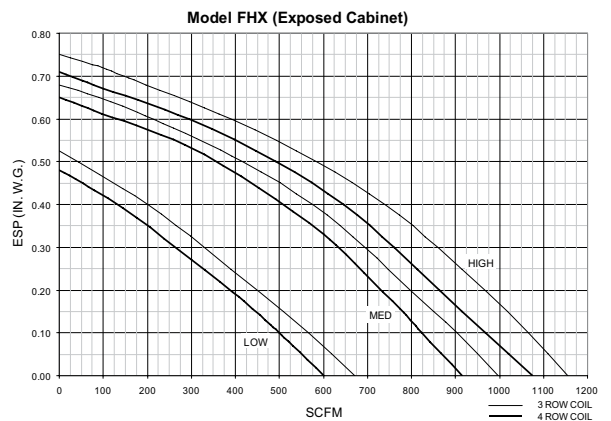
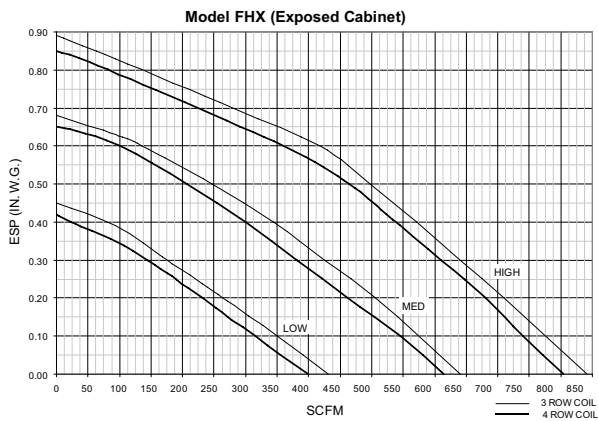
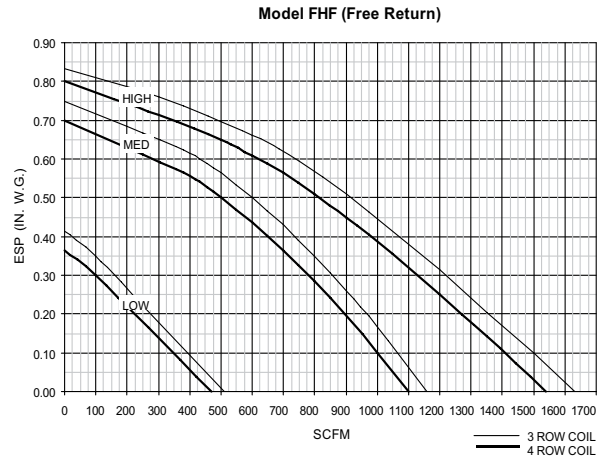
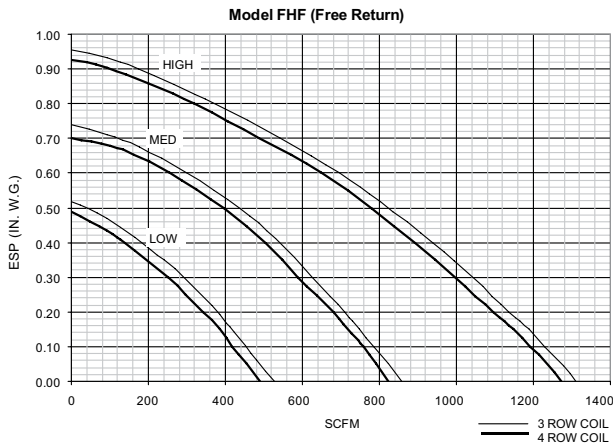
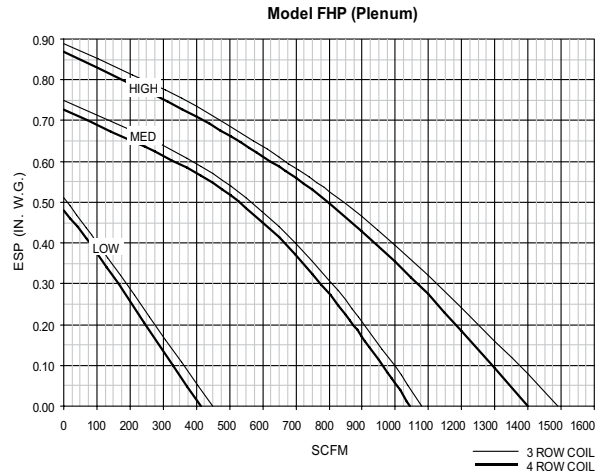
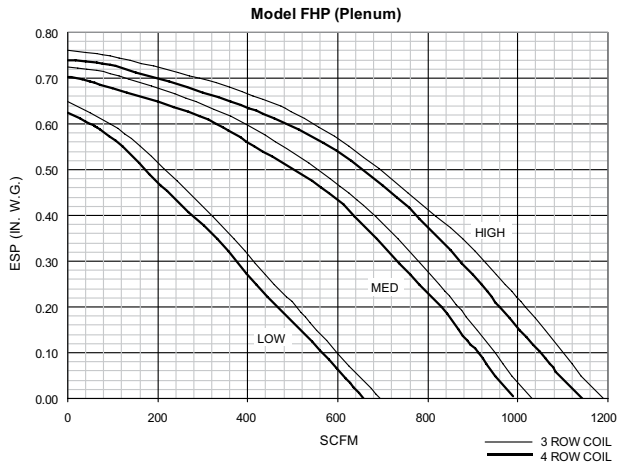
Model FHX (Exposed Cabinet)



# FAN PERFORMANCE CURVES

## Size 50

## Size 60



# MOTOR, FAN AND SOUND DATA

## MOTOR AND FAN DATA

UNIT SIZE	FAN SPEED	MOTOR H.P. (QTY.)	# OF FANS	115 VOLTS		208-230 VOLTS		277 VOLTS	
				AMPS	WATTS	AMPS	WATTS	AMPS	WATTS
20	High	(1) 1/30	1	0.8	57	0.6	77	0.3	71
	Medium	(1) 1/50		0.4	39	0.3	49	0.3	48
	Low	(1) 1/60		0.3	33	0.3	43	0.3	41
25	High	(1) 1/15	1	1.1	125	0.5	120	0.5	120
	Medium	(1) 1/30		0.9	90	0.3	80	0.3	80
	Low	(1) 1/60		0.5	60	0.2	60	0.2	60
30	High	(1) 1/10	2	1.9	165	0.8	158	0.8	162
	Medium	(1) 1/30		0.8	76	0.3	75	0.5	65
	Low	(1) 1/60		0.5	47	0.2	54	0.4	41
40	High	(1) 1/6	2	2.5	261	1.4	284	1.0	254
	Medium	(1) 1/12		1.5	162	0.5	171	0.5	152
	Low	(1) 1/40		0.6	75	0.4	79	0.3	74
50	High	(1) 1/8	3	1.6	215	0.9	216	0.8	214
		(1) 1/6		2.5	257	1.4	233	1.0	255
	Medium	(1) 1/15		1.3	145	0.6	109	0.5	132
		(1) 1/12		1.5	156	0.5	106	0.5	151
	Low	(1) 1/40		0.8	69	0.3	63	0.3	86
		(1) 1/40		0.6	75	0.4	62	0.3	84
60	High	(2) 1/6	4	5.0	522	2.8	568	2.0	508
	Medium	(2) 1/12		3.0	324	1.0	342	1.0	304
	Low	(2) 1/40		1.2	150	0.6	158	0.6	148

### NOTES:

- Motor electrical data is nameplated data. Actual data will vary with application.
- 230 volt motor is nameplated for 208-230/1/60. Use 230 volt motor data for 208 volt applications.
- Unit size 30, 208-230 and 277 volt motors are 1/12 HP at high tap.

## SOUND DATA

UNIT SIZE	FAN SPEED	SCFM	TOTAL SOUND POWER LEVEL						
			OCTAVE BAND / CENTER FREQUENCY (HZ)						
			2/125	3/250	4/500	5/1000	6/2000	7/4000	8/8000
20	High	282	55	59	53	50	46	38	36
	Medium	216	50	52	47	44	38	31	32
	Low	175	47	48	43	39	32	27	31
25	High	420	58	62	57	54	51	44	39
	Medium	286	53	53	49	45	41	34	29
	Low	180	48	42	38	36	33	27	27
30	High	522	60	60	57	56	50	44	40
	Medium	458	57	55	54	52	46	40	36
	Low	269	48	44	43	39	32	27	31
40	High	810	65	68	64	60	55	51	47
	Medium	565	59	59	57	51	46	40	35
	Low	300	51	46	41	36	28	27	30
50	High	1050	61	66	68	62	56	52	49
	Medium	840	56	61	63	55	49	44	40
	Low	490	48	53	59	46	39	33	32
60	High	1400	67	72	70	68	59	54	51
	Medium	1050	61	65	67	57	52	47	42
	Low	500	50	56	48	40	33	28	31

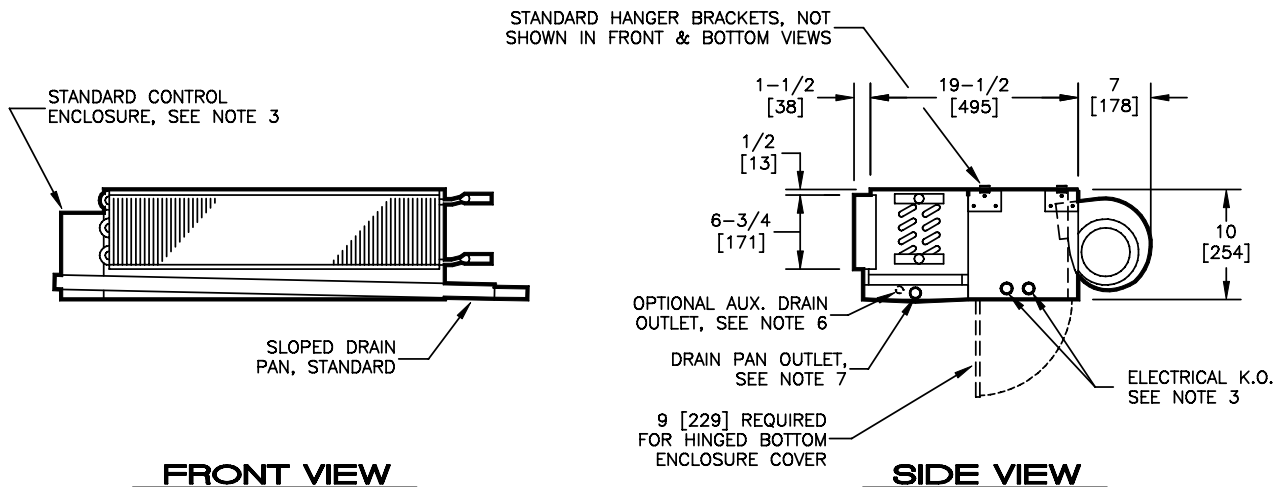
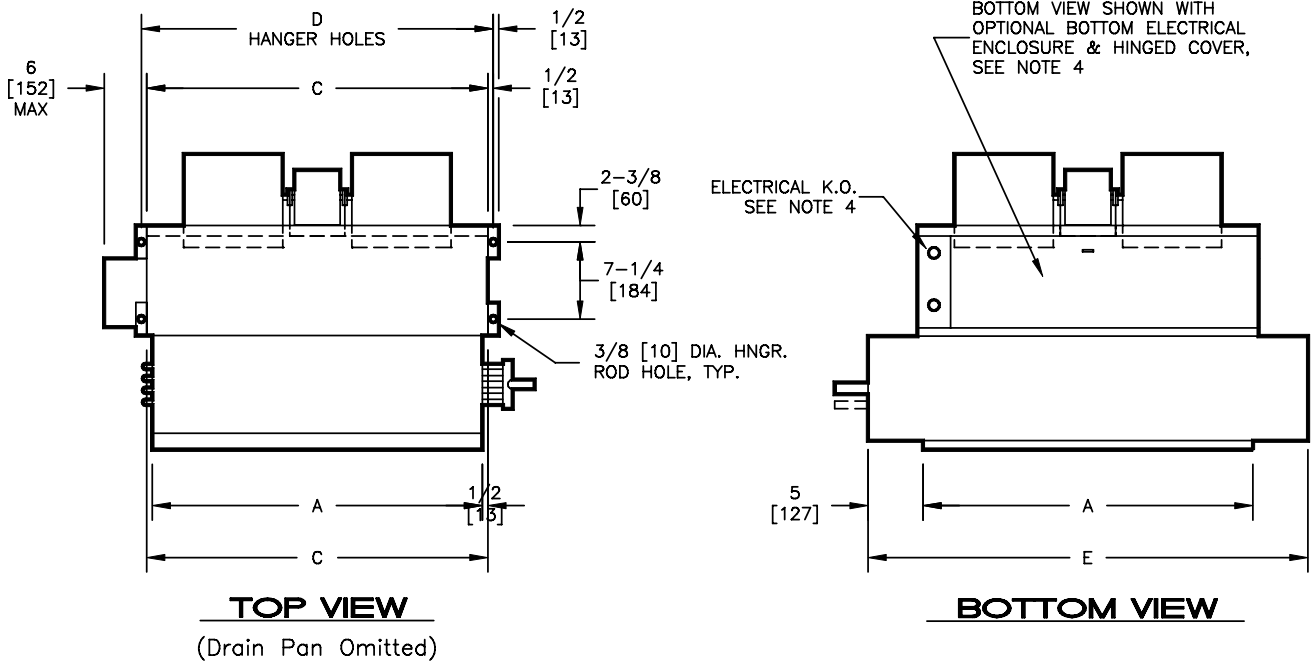
### NOTES:

- Sound data tested in accordance with ARI 350-2000.
- Sound levels are expressed in decibels, dB RE:  $1 \times 10^{-12}$  watts.
- Total sound power level data based on Model FHP with fan CFM at corresponding motor tap with 115/1/60 volt motor, 3 or 4 row coil, 1" throwaway filter, 0.0" external static pressure and standard rated internal pressure losses.

# DIMENSIONAL DATA

## MODEL FHF FREE RETURN UNITS

Drawings are not to scale and not for submittal or installation purposes.



### DIMENSIONS - In [mm]

UNIT SIZE	A	C	D	E
20	20 [508]	21 [533]	22 [559]	30 [762]
25	26 [660]	27 [686]	28 [711]	36 [914]
30	30 [762]	31 [787]	32 [813]	40 [1016]
40	40 [1016]	41 [1041]	42 [1067]	50 [1270]
50	50 [1270]	51 [1295]	52 [1321]	60 [1524]
60	60 [1524]	61 [1549]	62 [1575]	70 [1778]

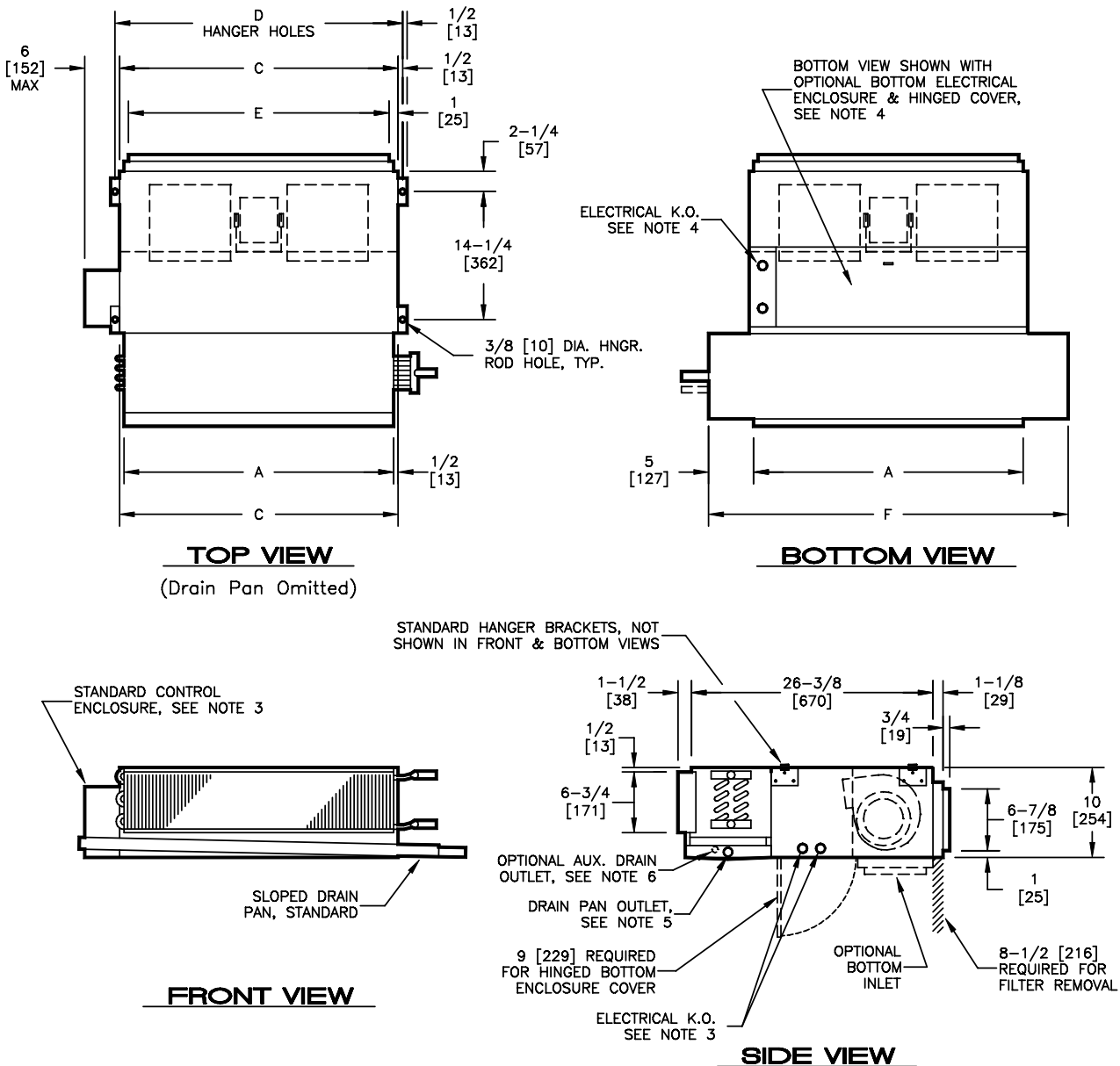
**NOTES:**

1. All dimensions in Inches [millimeters]. All dimensions  $\pm 1/4"$  [6mm]. Metric values are soft conversion.
2. Left hand unit shown, right hand unit opposite.
3. Standard control enclosure is mounted on unit side opposite cooling coil connections. Unit casing includes (2) knockouts on each side. Provide sufficient clearance to access electrical controls and comply with applicable codes and ordinances.
4. Optional bottom control enclosure with hinged cover replaces standard side mounted enclosure and includes (2) additional knockouts on bottom of unit, on left side.
5. Standard externally foam coated galvanized steel drain pan has 7/8" ODM copper outlet. Stainless steel drain pan has 3/4" MPT galvanized steel outlet.
6. Aux. drain outlet is 5/8" ODM copper or 3/8" MPT galvanized steel respectively.
7. See coil connection drawings for coil connection sizes and locations.

# DIMENSIONAL DATA

## MODEL FHP PLENUM UNITS

Drawings are not to scale and not for submittal or installation purposes.



### DIMENSIONS - In [mm]

UNIT SIZE	A	C	D	E	F
20	20 [508]	21 [533]	22 [559]	19 [483]	30 [762]
25	26 [660]	27 [686]	28 [711]	25 [635]	36 [914]
30	30 [762]	31 [787]	32 [813]	29 [737]	40 [1016]
40	40 [1016]	41 [1041]	42 [1067]	39 [991]	50 [1270]
50	50 [1270]	51 [1295]	52 [1321]	49 [1245]	60 [1524]
60	60 [1524]	61 [1549]	62 [1575]	59 [1499]	70 [1778]

**NOTES:**

1. All dimensions in Inches [millimeters]. All dimensions  $\pm 1/4"$  [6mm]. Metric values are soft conversion.
2. Left hand unit shown, right hand unit opposite.
3. Standard control enclosure is mounted on unit side opposite cooling coil connections. Unit casing includes (2) knockouts on each side. Provide sufficient clearance to access electrical controls and comply with applicable codes and ordinances.
4. Optional bottom control enclosure with hinged cover replaces standard side mounted enclosure and includes (2) additional knockouts on bottom of unit, on left side.
5. Standard externally foam coated galvanized steel drain pan has 7/8" ODM copper outlet. Stainless steel drain pan has 3/4" MPT galvanized steel outlet.
6. Aux. drain outlet is 5/8" ODM copper or 3/8" MPT galvanized steel respectively.
7. See coil connection drawings for coil connection sizes and locations.



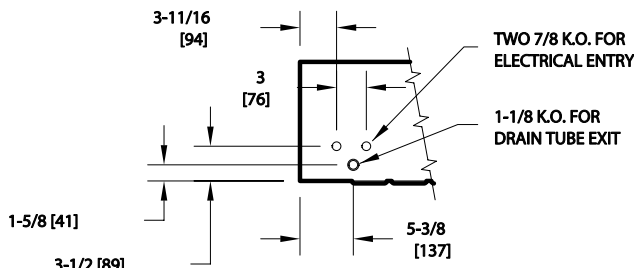
# DIMENSIONAL DATA

## MODEL FHX EXPOSED CABINET UNITS

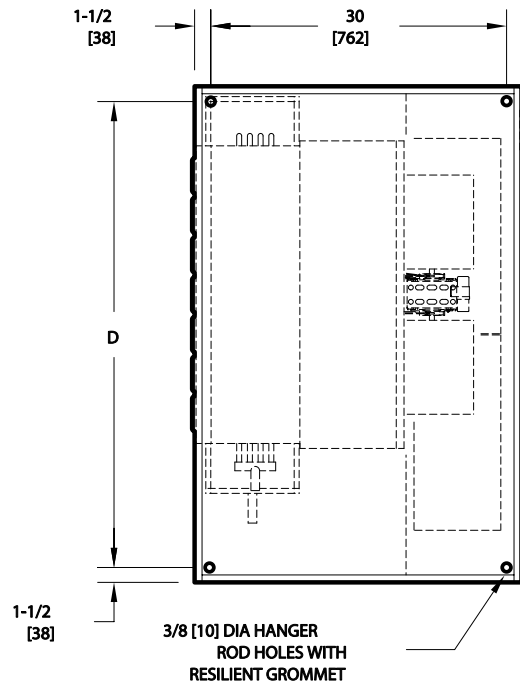
Drawings are not to scale and not for submittal or installation purposes.

**NOTES:**

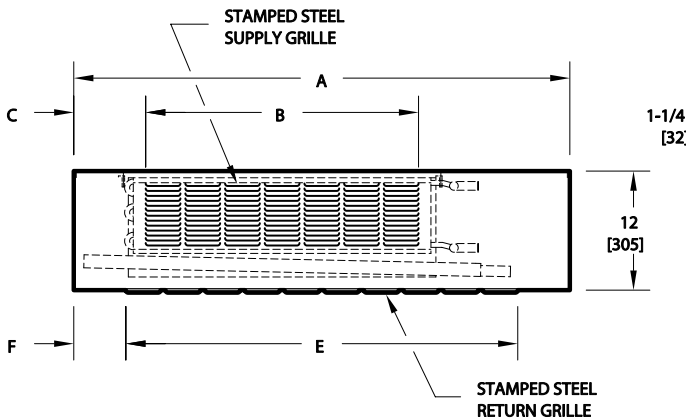
1. All dimensions are Inches [millimeters]. All dimensions  $\pm 1/4"$  [6mm]. Metric values are soft conversion.
2. Left hand unit shown, right hand unit opposite.
3. Electrical enclosure size and location may vary with optional features.  
Provide sufficient clearance to access electrical controls and comply with applicable codes and ordinances.
4. Drain piping should be routed through casing opening indicated to provide proper drain slope.
5. Louvered bottom panel is hinged and removable for access to filter and fan assembly.
6. Fixed bottom panel is removable for access to optional electrical enclosure, coil, and drain pan.
7. Internal insulation of field piping may be required.
8. Field piping casing penetrations must be cut in the field to match individual job requirements.



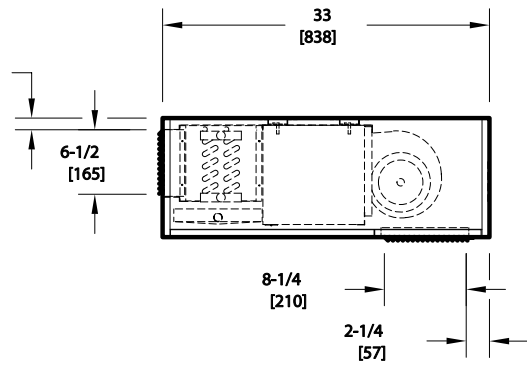
**PARTIAL REAR VIEW**  
(TYPICAL EACH SIDE)



**TOP VIEW**



**FRONT VIEW**



**SIDE VIEW**

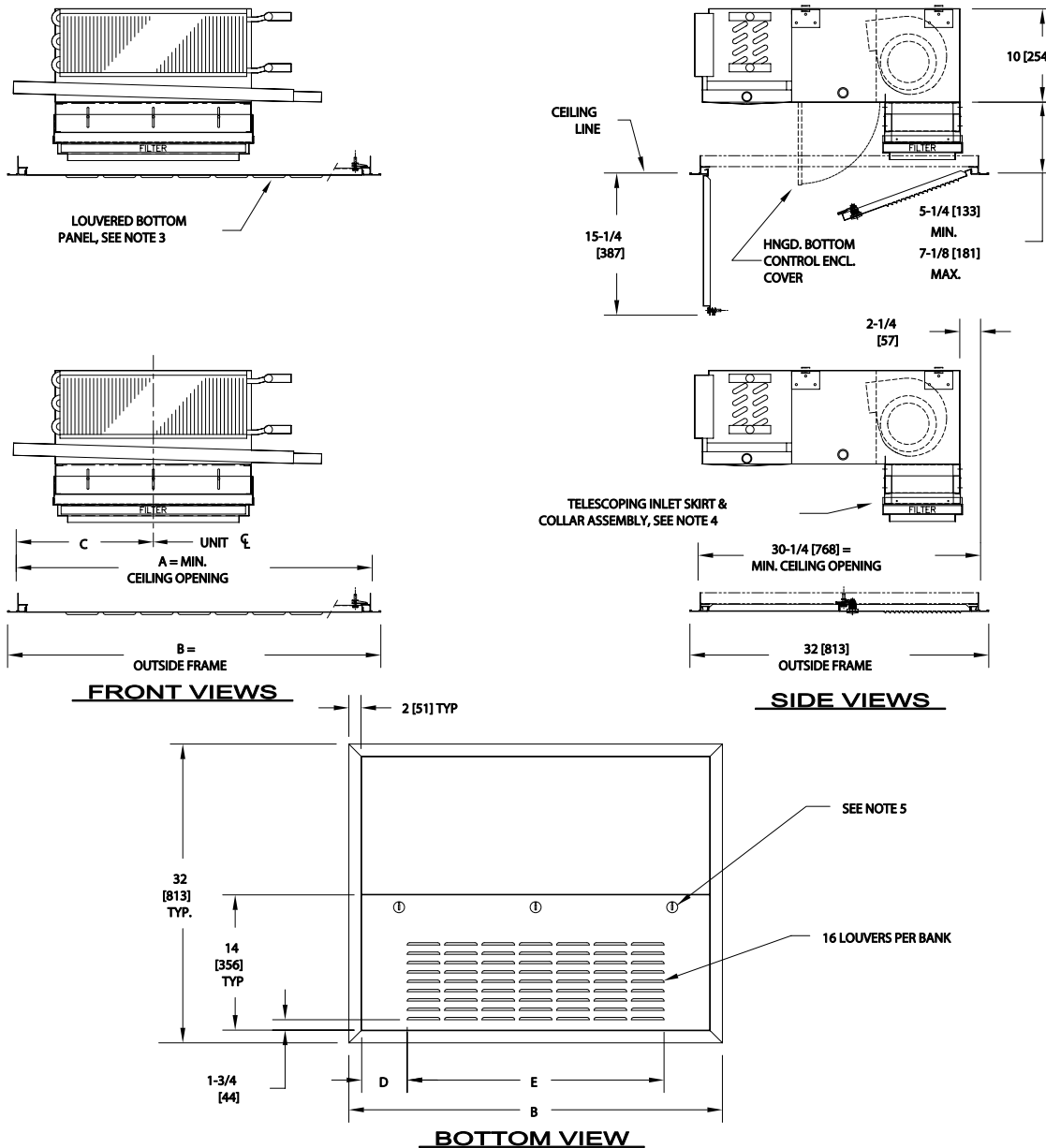
### DIMENSIONS - In [mm]

UNIT SIZE	A	B	C	D	E	F
20	40 [1016]	19-1/2 [495]	6-1/4 [159]	37 [940]	27-1/2 [699]	6-1/4 [159]
25	46 [1168]	23-1/2 [597]	6-1/4 [159]	43 [1092]	35-1/2 [902]	5-1/4 [133]
30	50 [1270]	27-1/2 [699]	7-1/4 [184]	47 [1194]	39-1/2 [1003]	5-1/4 [133]
40	60 [1524]	39-1/2 [1003]	6-1/4 [159]	57 [1448]	47-1/2 [1207]	6-1/4 [159]
50	70 [1778]	47-1/2 [1207]	7-1/4 [184]	67 [1702]	59-1/2 [1511]	5-1/4 [133]
60	80 [2032]	59-1/2 [1511]	6-1/4 [159]	77 [1956]	67-1/2 [1715]	6-1/4 [159]

# DIMENSIONAL DATA

## TELESCOPING BOTTOM PANEL

Drawings are not to scale and not for submittal or installation purposes.



### DIMENSIONS - In [mm]

UNIT SIZE	STANDARD PANEL				
	A	B	C	D	E
20	38-1/8 [968]	40 [1016]	14-1/2 [368]	4-1/4 [108]	27-1/2 [699]
25	44-1/8 [1121]	46 [1168]	17-1/2 [445]	3-1/4 [83]	35-1/2 [902]
30	48-1/8 [1222]	50 [1270]	19-1/2 [495]	3-1/4 [83]	39-1/2 [1003]
40	58-1/8 [1476]	60 [1524]	24-1/2 [622]	4-1/4 [108]	47-1/2 [1207]
50	68-1/8 [1730]	70 [1778]	29-1/2 [749]	3-1/4 [83]	59-1/2 [1511]
60	78-1/8 [1984]	80 [2032]	34-1/2 [876]	4-1/4 [108]	67-1/2 [1715]

- NOTES:
- All dimensions are Inches [millimeters]. All dimensions  $\pm 1/4"$  [6mm]. Metric values are soft conversion.
  - Left hand unit shown, right hand unit opposite.
  - Portions of the inlet louver not directly below unit inlet may require covering in the field on applications where infiltration of ceiling plenum air into space is undesired.
  - Telescoping skirt and collar assembly must be field adjusted to assure a proper fit between filter frame and louvered inlet panel assembly.
  - 1/4 Turn latch, (2) qty for standard sizes, (3) qty for sizes 40-60.

# GUIDE SPECIFICATIONS

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## GENERAL

Furnish and install Johnson Controls Model FH Horizontal Concealed Direct Drive Fan Coil Units where indicated on the plans and in the specifications. Units shall be completely factory assembled, tested and shipped as one piece. All units shall be capable of meeting or exceeding the scheduled capacities for cooling, heating and air delivery. All unit dimensions for each model and size shall be considered maximums. Units shall be ETL listed in compliance with UL/ANSI Standard 1995, and be certified as complying with the latest edition of ARI Standard 440.

## CONSTRUCTION

All unit chassis shall be fabricated of heavy gauge galvanized steel panels able to meet 125 hour salt spray test per ASTM B-117. All exterior panels shall be insulated with 1/2" thick insulation with a maximum k value of .24 (BTU • in) / (hr • ft<sup>2</sup> • °F) and rated for a maximum air velocity of 5000 f.p.m. Insulation must meet all requirements of ASTM C1071 (including C665), UL 181 for erosion, and carry a 25/50 rating for flame spread/smoke developed per ASTM E-84, UL 723 and NFPA 90A.

All concealed units shall have a minimum 1-1/2" duct collar on the discharge. Plenum and exposed units shall have a minimum 3/4" duct collar on the return.

All exposed units shall have exterior panels fabricated of galvanized steel. The fan and filter bottom access panel shall be attached with quarter turn quick open fasteners to allow for easy removal and access for service.

**Option:** Provide foil faced insulation in lieu of standard. Foil insulation shall meet or exceed the requirements stated above, and in addition meet ASTM Standards C-665 and C-1136 for biological growth in insulation. Insulation shall be lined with aluminum foil, fiberglass scrim reinforcement, and 30 pound kraft paper laminated together with a flame resistant adhesive. All exposed edges shall be sealed to prevent any fibers from reaching the air stream.

**Option:** Provide Elastomeric Closed Cell Foam Insulation in lieu of standard. 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 E-84 or UL 723. Additionally, insulation shall comply with Antimicrobial Performance Rating of 0, no observed growth, per ASTM G-21. Polyethylene insulation is not acceptable.

Unit mounting shall be by hanger brackets provided at four locations. Hanger brackets shall include rubber grommet isolators with brass eyelets for threaded rod.

## PAINTED FINISH

All painted cabinet exterior panels shall be finished with a heat cured anodic acrylic powder paint of the standard factory color.

## SOUND

Units shall have published sound power level data tested in accordance with ARI Standard 350-2000 (non-ducted equipment) and ARI Standard 260-2001 (ducted equipment).

## FAN ASSEMBLY

Unit fan shall be a dynamically balanced, forwardly curved, DWDI centrifugal type constructed of 18 gauge zinc coated galvanized steel for corrosion resistance. Motors shall be high efficiency, permanently lubricated sleeve bearing, permanent split-capacitor type with UL and CSA listed automatic reset thermal overload protection and three separate horsepower taps. Single speed motors are not acceptable.

The fan assembly shall be easily removable for servicing the motor and blower at, or away from the unit. The entire fan assembly shall be able to come out of the unit by removing two screws and unplugging the motor. Plenum unit fan assemblies shall be easily serviced through an access panel provided.

**Option:** Provide an electronic (SCR) fan speed controller as an aid in balancing the fan capacity. The speed controller shall have a turn down stop to prevent the possibility of harming the motor bearings, and incorporate electrical noise suppression to minimize noise on the incoming power lines.

**Option:** Devices used to energize and de-energize (switch) fan speeds must be totally silent. Magnetic, mercury, and/or quiet relays and/or contactors are not acceptable.

## COILS

All cooling and heating coils shall optimize rows and fins per inch to meet the specified capacity. Coils shall have seamless copper tubes and shall be mechanically expanded to provide an efficient, permanent bond between the tube and fin. Fins shall have high efficiency aluminum surface optimized for heat transfer, air pressure drop and carryover.

## GUIDE SPECIFICATIONS

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All coils shall be hydrostatically tested at 450 PSIG air pressure under water, and rated for a maximum of 300 PSIG working pressure at 200°F.

Direct expansion cooling coils shall include a fixed orifice metering device. All evaporator coils shall be factory sealed and charged with a minimum 5 PSIG nitrogen or refrigerated dry air.

Steam coils shall be standard steam type suitable for temperatures above 35°F and 15 PSIG maximum working pressure.

**Option:** Coil casing shall be fabricated from Stainless Steel.

All coils shall be provided with a manual air vent fitting to allow for coil venting.

**Option:** Provide automatic air vents in lieu of manual air vents.

Heating coils shall be furnished in the reheat or preheat position on units with chilled water coils, or in the reheat position for DX coils.

### DRAIN PANS

Primary condensate drain pans shall be single wall, heavy gauge galvanized steel for corrosion resistance, and extend under the entire cooling coil. Drain pans shall be of one-piece construction and be positively sloped for condensate removal. Drain pans on concealed models shall be field reversible for right or left hand connections.

The drain pan shall be externally insulated with a fire retardant, closed cell foam insulation. The insulation shall carry no more than a 25/50 Flame Spread and Smoke Developed Rating per ASTM E-84 and UL 723 and an Antimicrobial Performance Rating of 0, no observed growth, per ASTM G-21.

**Option:** Provide a single wall primary drain pan constructed entirely of heavy gauge stainless steel for superior corrosion resistance. Stainless steel drain pans shall be externally insulated and meet or exceed the requirements stated above.

**Option:** Provide a secondary drain connection on the primary drain pan for condensate overflow.

### FILTERS

All plenum and exposed units shall be furnished with a minimum 1" nominal glass fiber throwaway filter. Filters shall be tight fitting to prevent air bypass. Plenum unit filters shall be easily removable from the bottom of the unit without the need for tools.

**Option:** Provide unit with 1" pleated filter (MERV 6).

### ELECTRICAL

Units shall be furnished with single point power connection. Provide an electrical junction box with terminal strip for motor and other electrical terminations. The factory mounted terminal wiring strip consists of a multiple position screw terminal block to facilitate wiring terminations for the electric control valves and thermostats.

**Option:** Provide a hinged electrical enclosure in the bottom of the unit for easy access to all electrical components, terminal blocks and wiring.

### ELECTRIC HEAT

Furnish an electric resistance heating assembly as an integral part of the fan coil unit, with the heating capacity, voltage and kilowatts scheduled. The heater assembly shall be designed and rated for installation on the fan coil unit without the use of duct extensions or transitions, and be located in the unit as to not expose the fan assembly to excessive leaving air temperatures that could affect motor performance.

The heater and unit assembly shall be listed for zero clearance and meet all NEC requirements, and be ETL listed with the unit as an assembly in compliance with UL/ANSI Standard 1995.

All heating elements shall be open coil type nichrome wire mounted in ceramic insulators and located in an insulated heavy gauge galvanized steel housing. All elements shall terminate in a machine staked stainless steel terminal secured with stainless steel hardware for corrosion resistance. The element support brackets shall be spaced no greater than 3-1/2" on center. All internal wiring shall be rated for 105°C minimum.

## GUIDE SPECIFICATIONS

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All heaters shall include overtemperature protection consisting of an automatic reset primary thermal limit and back up secondary thermal limit. All heaters shall be single stage.

**Option:** Provide a manual reset secondary thermal limit.

All units with electric heat shall have a bottom hinged electrical enclosure for easy access and service to the electrical components and wiring. An incoming line power distribution block shall be provided and designated to accept single point power wiring capable of carrying 125% of the calculated load current.

**Option:** Devices used to energize and de-energize (switch) electric heat must be totally silent. Magnetic, mercury, and/or quiet relays and/or contactors are not acceptable.

### PIPING PACKAGES

Provide a standard factory assembled valve piping package to consist of a 2 or 3 way, on/off, motorized electric control valve and two ball isolation valves.

Control valves are piped normally closed to the coil. Maximum entering water temperature on the control valve is 200°F, and maximum close-off pressure is 40 PSIG (1/2") or 20 PSIG (3/4"). Maximum operating pressure shall be 300 PSIG.

**Option:** Provide 3-wire floating point modulating control valve (fail-in-place) in lieu of standard 2-position control valve with factory assembled valve piping package.

**Option:** Provide high pressure close-off actuators for 2-way on/off control valves. Maximum close-off pressure is 50 PSIG (1/2") or 25 PSIG (3/4").

**Option:** Provide either a fixed or adjustable flow control device for each piping package.

**Option:** Provide pressure-temperature ports for each piping package.

Piping package shall be completely factory assembled, including interconnecting pipe, and shipped separate from the unit for field installation on the coil, so as to minimize the risk of freight damage.

## **NOTES**

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**NOTES**

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