CATALOG

CFL Series Fan-Powered, Low-Height, VAV Terminals

ENVIRO-TEC

TABLE OF CONTENTS

Features And Benefits 2
Standard Construction 4
Construction Features 5
Standard And Optional Features 6
Application And Selection 7
Dimensional Data 10
Unit Arrangement 13
Primary Airflow Calibration 14
AHRI Ratings/Fan Performance PSC 15
Sound Power Data 16
EC Fan Motor Option 18
General Selection, EC Motor 19
Fan Performance, EC Motor 20
Electric Heat 21
Hot Water Coil Data 22
Guide Specifications 27

NOTES:

- All data herein is subject to change without notice. Some drawings are not shown in this catalog.
- Drawings not for installation purposes; refer to IOM manual.
- Construction drawings and performance data contained herein should not be used for submittal purposes.
- ETL Report Number 3053210-001.

FEATURES AND BENEFITS

QUIET COMFORT

Low Height Applications Model CFL fan terminals are specifically designed for quiet operation in shallow or congested ceiling spaces. They offer improved space comfort and flexibility for a wide variety of HVAC systems. This is critical in today's buildings, where occupants are placing more emphasis on indoor acoustics.

OCCUPANT-SENSITIVE

Due to heightened interest in Indoor Air Quality, many HVAC system designers are focusing on the effects of particulate contamination within a building's occupied space. Often, HVAC system noise is overlooked as a source of occupied space contamination. The CFL terminal is specifically designed to eliminate obtrusive fan noise from reaching the occupants, while providing constant air motion in the space.

Occupants will benefit from the CFL design that minimizes low frequency (125Hz-250Hz) sound levels that typically dominate the space sound level. The CFL also minimizes the fluctuation in sound levels that occur during VAV damper modulation.

DESIGN FLEXIBILITY

Selection and Layout The CFL provides flexibility in system design. Reduced noise at the fan terminal allows the system designer to place properly sized units directly above occupied spaces. It is not necessary to use the crowded space above a hall or corridor to locate the equipment. This will reduce lengthy and expensive discharge duct runs. The FlowStar™ sensor ensures accurate control, even when space constraints do not permit long straight inlet duct runs to the terminal.

CONVENIENT INSTALLATION

Quality All CFL terminals are thoroughly inspected during each step of the manufacturing process, including a comprehensive "pre-ship" inspection, to assure the highest quality product available. Each unit is also "run-tested" before leaving the factory to ensure trouble free field "start-up."

Quick Installation A standard single point electrical main power connection is provided. Electronic controls and electrical components are located on the same side of the casing for quick access, adjustment, and trouble-shooting. Installation time is minimized with the availability of factory calibrated controls. Terminals can be ordered with left or right hand control configurations to facilitate clearance requirements from obstructions in a congested ceiling cavity.

Air Balance Finite fan speed adjustment is accomplished with an electronic SCR controller. The SCR fan speed controller is offered by ENVIRO-TEC and is compatible with the fan motor. This minimizes electronic interference and harmonic distortion that occurs from non-compatible motor and SCR components.

FEATURES AND BENEFITS

Increased motor life and efficiency result from the compatible design.

CFL terminals utilize Electrically Commutated motors that accommodate a broad range of flow and static pressure field conditions while dramatically increasing efficiency.

The FlowStar™ sensor ensures accurate airflow measurement, regardless of the field installation conditions. A calibration label and wiring diagram is located on the terminal for quick reference during start-up.

The terminal is constructed to allow installation with standard metal hanging straps. Optional hanger brackets for use with all-thread support rods or wire hangers are also available.

VALUE AND SECURITY

Quality All metal components are fabricated from galvanized steel. Unlike most manufacturers' terminals, the steel used in the CFL is capable of withstanding a 125 hour salt spray test without showing any evidence of red rust.

Energy Efficiency In addition to quiet and accurate temperature control, the building owner will benefit from lower operating costs. The highly amplified velocity pressure signal from the FlowStar™ inlet sensor allows precise airflow control at low air velocities.

The FlowStar™ sensor's airfoil shape provides minimal pressure drop across the terminal.This allows the central fan to run at a lower pressure and with less brake horsepower. Energy efficient Electronically Commutated motors are manufactured to ensure efficient, quiet, reliable, and low maintenance operation.

Fan terminals that utilize a single speed motor must rely solely on an SCR controller to obtain the reduction in fan capacity. At minimum turndown, they suffer from excessive power consumption and high motor winding temperatures, significantly reducing the motor life.

As a standard, Model CFL is available with an ECM fan motor, providing efficiency ratings between 70% and 80% for most applications.

Agency Certification Model CFL terminals, including those with electric heat, are listed with ETL as an assembly, and bear the ETL label. CFL terminals comply with applicable NEC requirements, are tested in accordance with AHRI Standard 880, and are certified by AHRI.

Maintenance and Service CFL fan terminals require no periodic maintenance other than optional filter replacement. If component replacement becomes necessary, the unit is designed to minimize field labor. Both top and bottom casing panels can be removed to provide easy access to the fan assembly, and the motor electrical leads are easily unplugged.

Controls Model CFL terminals are available with the Verasys® Zone Equipment Control Assembly (ZEC). The ZEC Series DDC (shown below) combines controller, pressure sensor, and actuator housed in one pre-assembled unit. The Mobile Access Portal (MAP) Gateway Tool (shown below, sold separately) allows for convenient configuration via direct connection to the ZEC.

ENVIRO-TEC® manufactures a complete line of controls specifically designed for use with CFL terminals. These controls are designed to accommodate a multitude of control schemes. Pneumatic Controls, and Consignment DDC controls are also available.

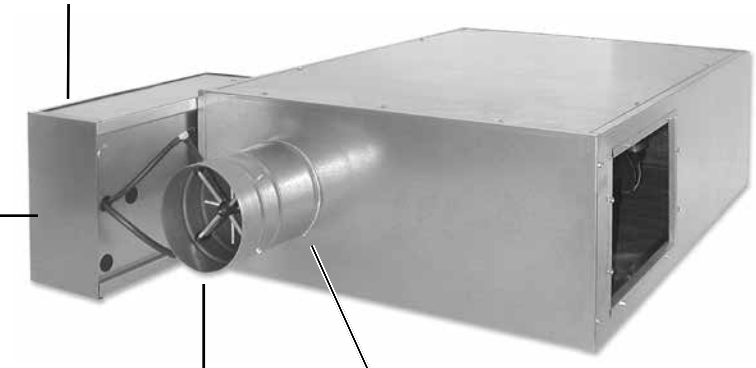
From the most basic to the most sophisticated sequence of operation, the controls are designed by experts in VAV terminal operation. Refer to the Electronic Controls Selection Guide, and the Pneumatic Controls Selection Guide for a complete description of the sequences and schematic drawings that are available.

Standard features include the patented FlowStar™ airflow sensor, ETL Listing, NEMA 1 enclosure, 24 volt control transformer, floating modulating actuator, balancing tees and plenum rated tubing.

STANDARD CONSTRUCTION

MODEL CFL

The CFL terminal incorporates many **standard** features that are expensive options for other manufacturers.



OPTIONAL CONSTRUCTION FEATURES (see page 6 for complete listing)

- ECM fan motor
- Mounting brackets (not shown) to accept all-thread hanging rods or wire hangers
- Double wall construction
- Scrim reinforced foil faced insulation meeting ASTM C1136 for mold, mildew, and humidity resistance
- Elastomeric closed cell foam insulation
- Filter located at induction inlet
- Hot water, steam, or electric heating coils
- Factory control options: Verasys® ZEC Series DDC for BACnet, Pneumatic, or Consignment DDC Controls
- Factory provided piping packages.

CONSTRUCTION FEATURES

ACCURATE AND ENERGY-SAVING AIRFLOW CONTROL WITH THE PATENTED FLOWSTAR™ SENSOR

Many VAV terminals waste energy due to an inferior airflow sensor design that requires the minimum CFM setpoint to be much higher than the IAQ calculation requirement. This is common with interior spaces that will be effected year round. These inferior VAV terminals waste energy in several ways. First, the primary air fan (e.g. AHU) supplies more CFM than the building requires. The higher minimum CFM setpoint overcools the zone with VAV terminals without integral heat. To maintain thermal comfort a building engineer would need to change the minimum setpoint to zero CFM compromising indoor air quality. Inferior VAV terminals with integral heat provide adequate comfort in the space but waste significant energy as energy is consumed to mechanically cool the primary air only to have more energy consumed to heat the cooled primary air. Significant energy savings is obtained with proper sizing and by making sure approved VAV terminals are capable of controlling at low CFM setpoints, providing the minimum ventilation requirement.

Currently, most DDC controllers have a minimum differential pressure limitation between 0.015” and 0.05” w.g. The major DDC manufacturers can control down to 0.015” w.g. An airflow sensor that does not amplify, e.g., a Pitot tube, requires about 490 FPM to develop 0.015” w.g. differential pressure. The FlowStar™ develops 0.015” w.g. pressure with only 290 FPM on a size 6 round inlet and less than 310 FPM for a size 12 rectangular. Consequently, VAV terminals utilizing a non-amplifying type sensor could have minimum CFM’s that are well over 50% higher than a ENVIRO-TEC terminal. Many airflow sensors provide some degree of amplification simply due to the decrease in free area of the inlet from large area of the sensor. These VAV terminals still require minimum CFM’s up to 30% higher than a ENVIRO-TEC terminal, have higher sound levels, and higher pressure drop requiring additional energy consumption at the primary air fan.

A VAV system designed with ENVIRO-TEC terminals consumes significantly less energy than a comparable system with competitor’s terminals. The FlowStar™ airflow sensor reduces energy consumption by allowing lower zone minimum CFM setpoints, greatly reducing or eliminating “reheat”, and by imposing less resistance on the primary air fan.

The ENVIRO-TEC air valve features the FlowStar™ airflow sensor which has brought new meaning to airflow control accuracy. The multi-axis design utilizes between 12 and 20 sensing points that sample total pressure at center points within equal concentric cross-sectional areas on round inlets, effectively traversing the air stream in two planes. Each distinct pressure reading is averaged within the center chamber before exiting the sensor to the controlling device.

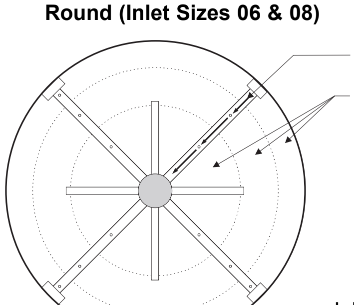
This sensor adds a new dimension to signal amplification. Most differential pressure sensors provide a signal between .5 and 2 times the equivalent velocity pressure signal. The FlowStar™ provides a differential pressure signal that is up to 3 times the equivalent velocity pressure signal. This amplified signal allows more accurate and stable airflow control at low airflow capacities. Low airflow control is critical for indoor air quality, reheat minimization, and preventing over cooling during light loads.

Unlike other sensors which use a large probe surface area to achieve signal amplification, the FlowStar™ utilizes an unprecedented streamline design which generates amplified signals unrivaled in the industry. The streamlined design also generates less pressure drop and noise.

The VAV schedule should specify the minimum and maximum airflow setpoints, maximum sound power levels, and maximum air pressure loss for each terminal. The specification for the VAV terminal must detail the required performance of the airflow sensor. For maximum building occupant satisfaction, the VAV system designer should specify the airflow sensor as suggested in the Guide Specifications of this catalog.

FlowStar™ Airflow Sensor Patent #5,481,925

Round (Inlet Sizes 06 & 08)

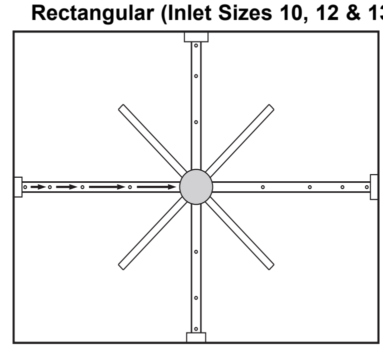


Each pressure input signal is routed to the center averaging chamber

Round Inlets Only: Equal concentric circular areas, each with three circles. Total pressure measured at the center of each concentric circle for maximum accuracy, as outlined in ASHRAE Fundamentals Handbook.

Inlet Sizes 06, 08, & 10: 12 Sensing Points
Inlet Sizes 12 & 13: 16 Sensing Points

Rectangular (Inlet Sizes 10, 12 & 13)



STANDARD AND OPTIONAL FEATURES

STANDARD FEATURES

Construction
- AHRI 880 certified and labeled
- Galvanized steel construction
- Casing: 20 gauge
- 1/2” thick fiberglass insulation
- Large top and bottom access openings allowing removal of complete fan assembly for all heating coil options

Fan Assembly
- Forward curved, dynamically balanced, direct drive, galvanized blower wheel
- 115, 208/230 or 277 volt single-phase, ECM motor
- Brushless DC
- Thermally protected motor
- Vibration isolation motor mounts
- Single point wiring

Primary Air Valve
- Round inlets: 22 gauge galvanized steel with embossed rigidity rings
- Rectangular inlets: 18 gauge galvanized steel construction
- Low thermal conductance damper shaft
- Position indicator on end of damper shaft
- Mechanical stops for open and closed position
- FlowStar™ center averaging airflow sensor
- Balancing tees

Hot Water Coils
- AHRI 410 certified and labeled
- 1, 2, 3, or 4 row coils
- Left or right hand connections
- Tested at a minimum of 450 PSIG under water and rated at 450 PSIG working pressure at 200°F

Electrical
- cETL listed for safety compliance with UL 60335
- NEMA 1 wiring enclosure

Electric Heat
- cETL listed as an assembly for safety compliance per UL 60335
- Automatic reset primary and back-up secondary manual reset thermal limits
- Single point power connection
- Hinged electrical enclosure
- Fusing per NEC

Controls
- Verasys® ZEC Series DDC for BACnet
- Pneumatic Controls

OPTIONAL FEATURES

Construction
- Foil faced scrim backed insulation
- Elastomeric closed cell foam insulation
- Double wall construction with 22 gauge liner
- 1” filter rack with throwaway filter

Fan Assembly
- 120, 208/230 and 277 volt single-phase ECM motors
- ECM motor controls of Solo(TM) or Sync(TM)

Electrical
- Full unit toggle disconnect
- Inline motor fusing
- Primary and secondary transformer fusing

Electric Heat
- Proportional (SSR) heater control
- Magnetic contactors
- Door interlocking disconnect switches

Configuration Tool
- Mobile Access Portal (MAP) Gateway Tool (sold separately)

Controls
- Consignment DDC controls (factory mount and wire controls provided by others)

Piping Packages
- Factory assembled – shipped loose for field installation
- 1/2” and 3/4”, 2-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)

APPLICATION AND SELECTION

PURPOSE OF SERIES FLOW FAN TERMINALS

Series flow fan powered terminals offer improved space comfort and flexibility in a wide variety of applications. Substantial operating savings can be realized through the recovery of waste heat, reduced central fan horsepower requirements and night setback operation.

Heat Recovery The CFL recovers heat from lights and core areas to offset heating loads in perimeter zones. Additional heat is available at the terminal unit using electric, steam, or hot water heating coils. Controls are available to energize remote heating devices such as wall fin, fan coils, radiant panels, and roof load plenum unit heaters.

IAQ The CFL enhances the indoor air quality of a building by providing constant air motion, and higher air volumes in the heating mode than typically provided by straight VAV single duct terminals or parallel flow fan terminals. The higher air capacity provides continuous air motion in the space and lowers the heating discharge air temperature. This combination improves air circulation, preventing accumulation of CO_2 concentrations in stagnant areas. Increased air motion improves occupant comfort. The higher air capacity also improves the performance of diffusers and minimizes diffuser “dumping”.

ACOUSTICAL CONCEPTS

The focus on indoor air quality is also having an effect on proper selection of air terminal equipment with respect to acoustics.

Sound At the zone level, the terminal unit generates acoustical energy that can enter the zone along two primary paths. First, sound from the unit fan can propagate through the downstream duct and diffusers before entering the zone (referred to as Discharge or Airborne Sound). Acoustical energy is also radiated from the terminal casing and travels through the ceiling cavity and ceiling system before entering the zone (referred to as Radiated Sound).

To properly quantify the amount of acoustical energy emanating from a terminal unit at a specific operating condition (i.e. CFM and static pressure), manufacturers must measure and publish sound power levels.

The units of measurement, decibels, actually represent units of power (watts). The terminal equipment sound power ratings provide a consistent measure of the generated sound independent of the environment in which the unit is installed. This allows a straight forward comparison of sound performance between equipment manufacturers and unit models.

Noise Criteria (NC) The bottom line acoustical criteria for most projects is the NC (Noise Criteria) level. This NC level is derived from resulting sound pressure levels in the zone. These sound pressure levels are the effect of acoustical energy (sound power levels) entering the zone caused by the terminal unit and other sound generating sources (central fan system, office equipment, outdoor environment, etc.).

The units of measurement is once again decibels; however, in this case decibels represent units of pressure (Pascals), since the human ear and microphones react to pressure variations.

There is no direct relationship between sound power levels and sound pressure levels. Therefore, we must predict the resulting sound pressure levels (NC levels) in the zone based in part by the published sound power levels of the terminal equipment. The NC levels are totally dependent on the project specific design, architecturally and mechanically. For a constant operating condition (fixed sound power levels), the resulting NC level in the zone will vary from one project to another.

AHRI 885 A useful tool to aid in predicting space sound pressure levels is an application standard referred to as AHRI Standard 885. This standard provides information (tables, formulas, etc.) required to calculate the attenuation of the ductwork, ceiling cavity, ceiling system, and conditioned space below a terminal unit. These attenuation values are referred to as the “transfer function” since they are used to transfer from the manufacturer’s sound power levels to the estimated sound pressure levels resulting in the space below, and/or served by the terminal unit. The standard does not provide all of the necessary information to accommodate every conceivable design; however, it does provide enough information to approximate the transfer function for most applications. Furthermore, an Appendix is provided that contains typical attenuation values. Some manufacturers utilize different assumptions with respect to a “typical” project design; therefore, cataloged NC levels should not be used to compare acoustical performance. Only certified sound power levels should be used for this purpose.

DESIGN RECOMMENDATIONS FOR A QUIET SYSTEM

The AHU Sound levels in the zone are frequently impacted by central fan discharge noise that either breaks out (radiates) from the ductwork or travels

APPLICATION AND SELECTION

through the distribution ductwork and enters the zone as airborne (discharge) sound. Achieving acceptable sound levels in the zone begins with a properly designed central fan system which delivers relatively quiet air to each zone.

Supply Duct Pressure One primary factor contributing to noisy systems is high static pressure in the primary air duct. This condition causes higher sound levels from the central fan and also higher sound levels from the terminal unit, as the primary air valve closes to reduce the pressure. This condition is compounded when flexible duct is utilized at the terminal inlet, which allows the central fan noise and air valve noise to break out into the ceiling cavity and then enter the zone located below the terminal.

Ideally, the system static pressure should be reduced to the point where the terminal unit installed on the duct run associated with the highest pressure drop has the minimum required inlet pressure to deliver the design airflow to the zone. Many of today's HVAC systems experience 0.5" w.g. pressure drop or less in the main trunk. For systems that will have substantially higher pressure variances from one zone to another, special attention should be paid to the proper selection of air terminal equipment.

To date, the most common approach has been to select (size) all of the terminals based on the worst case (highest inlet static pressure) condition. Typically, this results in 80% (or higher) of the terminal units being oversized for their application. This in turn results in much higher equipment costs, but more importantly, drastically reduced operating efficiency of each unit. This consequently decreases the ability to provide comfort control in the zone. In addition, the oversized terminals cannot adequately control the minimum ventilation capacity required in the heating mode.

A more prudent approach is to utilize a pressure reducing device upstream of the terminal unit on those few zones closest to the central fan. This device could simply be a manual quadrant type damper if located well upstream of the terminal inlet. In tight quarters, perforated metal can be utilized as a quiet means of reducing system pressure. This approach allows all of the terminal units to experience a similar (lower) inlet pressure. They can be selected in a consistent manner at lower inlet pressure conditions that will allow more optimally sized units.

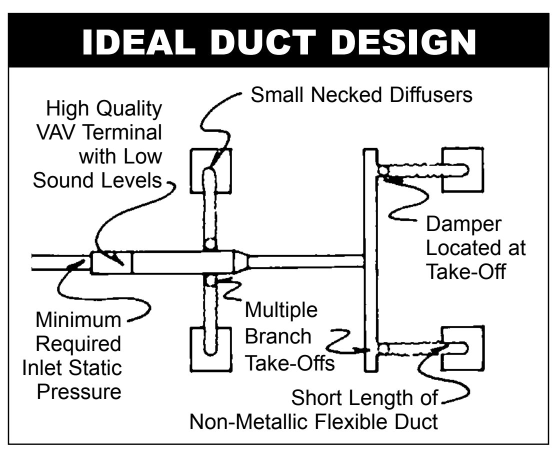
Inlet duct that is the same size as the inlet collar and as straight as possible will achieve the best acoustical performance. For critical applications, flexible duct should not be utilized at the terminal inlet.

Zoning On projects where internal lining of the downstream duct is not permitted, special considerations should be made to assure acceptable noise levels will be obtained. In these cases, a greater number of smaller zones will help in reducing sound levels. Where possible, the first diffuser takeoff should be located after an elbow or tee and a greater number of small necked diffusers should be utilized, rather than fewer large necked diffusers.

The downstream ductwork should be carefully designed and installed to avoid noise regeneration. Bull head tee arrangements should be located sufficiently downstream of the terminal discharge to provide an established flow pattern downstream of the fan. Place diffusers downstream of the terminal after the airflow has completely developed.

Downstream splitter dampers can cause noise problems if placed too close to the terminal, or when excessive air velocities exist. If tee arrangements are employed, volume dampers should be used in each branch of the tee, and balancing dampers should be provided at each diffuser tap. This arrangement provides maximum flexibility in quiet balancing of the system. Casing radiated sound usually dictates the overall room sound levels directly below the terminal. Because of this, special consideration should be given to the location of these terminals as well as to the size of the zone. Larger zones should have the terminal located over a corridor or open plan office space and not over a small confined private office. Fan powered terminals should never be installed over small occupied spaces where the wall partitions extend from slab-to-slab (i.e. firewalls or privacy walls).

Fan Terminal Isolation Model CFL fan terminals are equipped with sufficient internal vibration dampening means to prevent the need for additional external isolation. Flexible duct connectors at the unit discharge



APPLICATION AND SELECTION

typically do more harm than good. The sagging membrane causes higher air velocities and turbulence, which translates into noise. Furthermore, the discharge noise breaks out of this fitting more than with a hard sheet metal fitting.

SELECTION GUIDELINES

The CFL fan terminal has been designed to provide maximum flexibility in matching primary air valve capacities (cooling loads) with unit fan capacities. The overall unit size is dictated by the fan size. With each unit fan size, multiple primary air valve sizes are available to handle a wide range of cooling capacities.

The fan should be sized first to determine the unit size. The selection is made by cross plotting the specified fan capacity and external static pressure on the appropriate fan performance curves (see page 20). Terminals utilizing hot water heating coils require the summation of the coil air pressure drop and the design E.S.P. to determine the total E.S.P. It is common to have more than one fan size which can meet the design requirements. Typically, the selection begins with the smallest fan that can meet the capacity. Occasionally this selection may not meet the acoustical requirements and thus the next larger fan size should be selected. “Upsizing” may also occur when it is necessary to meet the design capacity on the medium or low motor tap.

Fan selections can be made anywhere in the non-shaded areas. Each fan performance curve depicts the actual performance of the relative motor without additional fan balance adjustment. Actual specified capacities which fall below a particular fan curve is obtained by adjustment of the electronic “Solo or Sync” EC fan speed controller. After the proper fan is selected, the unit size is fixed and then the appropriate primary air valve is selected. Most of the unit fan sizes have three air valve sizes to select from. The middle size will typically be utilized. It is the size that is matched with the unit fan to deliver 100% cooling capacity for the majority of fan selections.

The larger primary air valve will be used in applications where the system fan is undersized, requiring a larger air valve to take advantage of lower pressure losses. While helping in this fashion, a penalty is paid by having a higher controllable minimum airflow setpoint than could be achieved with a smaller inlet size.

The smaller primary air valve will most often be utilized with thermal storage systems where lower than normal primary air temperatures are utilized. In these cases, the maximum design primary airflow is less than the fan capacity (typically 60 to 80%), and therefore a smaller air valve may be appropriate.

SYSTEM PRESSURE CONSIDERATIONS

Since the terminal unit fan is selected to move 100% of the design airflow to the zone, all downstream pressure losses are neglected when determining minimum primary air inlet pressure to the unit. The central fan is only required to overcome the minimal loss through the unit air valve, reducing the central fan total pressure and horsepower requirements. Due to extremely low pressure drop of the air valve, central fan operating inlet static pressures may be as low as 0.5” w.g.

COMMON MISAPPLICATION

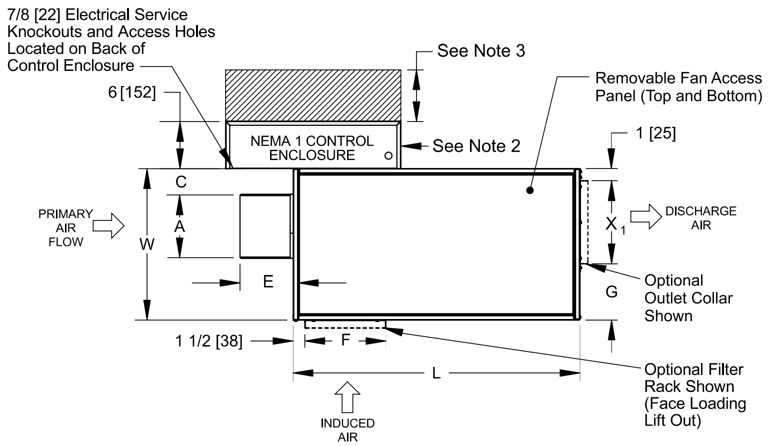
It should be noted that a conventional Series Flow Fan Terminal cannot be applied as a booster fan. In problem areas where there is insufficient primary airflow capacity, this terminal will not aid in pulling more air from the primary duct. Instead the unit fan will draw air from the plenum inlet which has less resistance.

The induction opening should never be sealed, as this will cause problems should the primary airflow increase beyond the unit fan capacity. In this condition, the fan casing becomes pressurized which will eventually stall the fan motor and cause premature failure.

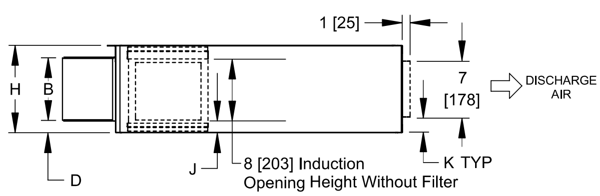
DIMENSIONAL DATA

MODEL CFL

UNIT SIZES 06, 08, AND 11

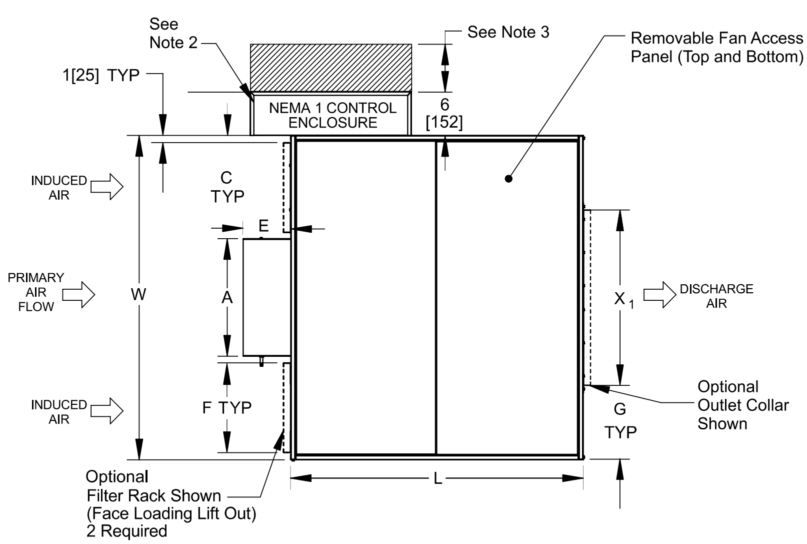


Top View

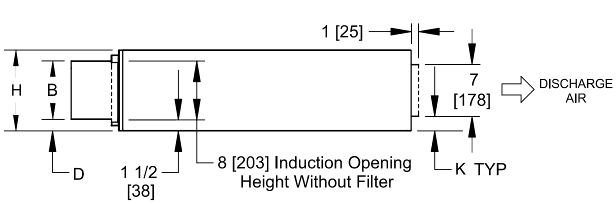


Side View

UNIT SIZE 19



Top View



Side View

DIMENSIONAL DATA

MODEL CFL

UNIT SIZE	A	B	C	D	E	F	J	W	H	L	MODEL CFL			CFL-WC		CFL-EH	
											X_1	G	K	X_2	K	X_3	K
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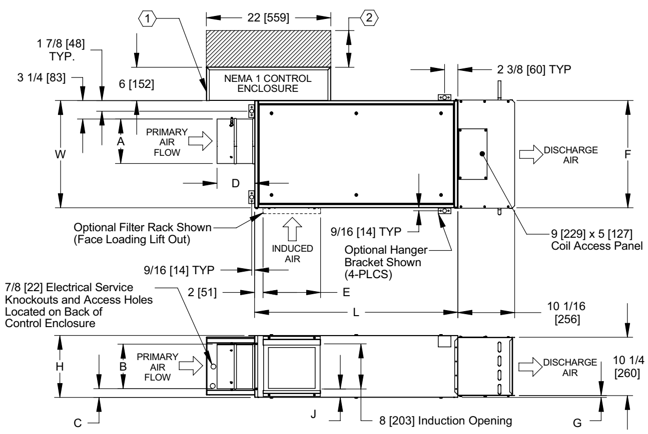
1008	10 [254]	8 [203]	3 1/4 [83]	1 1/2 [38]	6 11/16 [170]	12 [305]	1 1/2 [38]	26 [660]	11 [279]	36 [914]	11 1/2 [292]	13 1/2 [343]	2 [51]	26 [660]	3/8 [10]	12 5/8 [321]	1 1/2 [38]
1011	10 [254]	8 [203]	3 1/4 [83]	2 [51]	6 11/16 [170]	14 [356]	2 [51]	30 [762]	12 [305]	40 [1016]	11 1/2 [292]	17 1/2 [445]	2 1/2 [64]	30 [762]	7/8 [22]	12 5/8 [321]	2 [51]
1211	14 [356]	8 [203]	3 1/4 [83]	2 [51]	6 11/16 [170]	14 [356]	2 [51]	30 [762]	12 [305]	40 [1016]	11 1/2 [292]	17 1/2 [445]	2 1/2 [64]	30 [762]	7/8 [22]	12 5/8 [321]	2 [51]
1019	10 [254]	8 [203]	17 [432]	1 1/2 [38]	6 1/2 [165]	12 [305]	1 1/2 [38]	44 [1118]	11 [279]	40 [1016]	23 3/4 [603]	10 1/8 [257]	2 [51]	44 [1118]	3/8 [10]	23 13/16 [605]	1 1/2 [38]
1219	14 [356]	8 [203]	15 [381]	1 1/2 [38]	6 1/2 [165]	12 [305]	1 1/2 [38]	44 [1118]	11 [279]	40 [1016]	23 3/4 [603]	10 1/8 [257]	2 [51]	44 [1118]	3/8 [10]	23 13/16 [605]	1 1/2 [38]
1319	16 [406]	8 [203]	14 [356]	1 1/2 [38]	6 1/2 [165]	12 [305]	1 1/2 [38]	44 [1118]	11 [279]	40 [1016]	23 3/4 [603]	10 1/8 [257]	2 [51]	44 [1118]	3/8 [10]	23 13/16 [605]	1 1/2 [38]

NOTES:
1. φ indicates a round inlet (sizes 0406, 0606, 0608, 0806 and 0808). Sizes 1008, 1011, 1019, 1211, 1219 and 1319 have rectangular inlets.
2. Control enclosure is standard with factory mounted electronic controls.
3. Check all national and local codes for required clearances.
4. All dimensions are in inches [mm].
5. Arrangement #1 shown. Other control and heater handing arrangements shown on pages 12 and 13.
6. Drawings are not to scale and not for submittal or installation purposes.

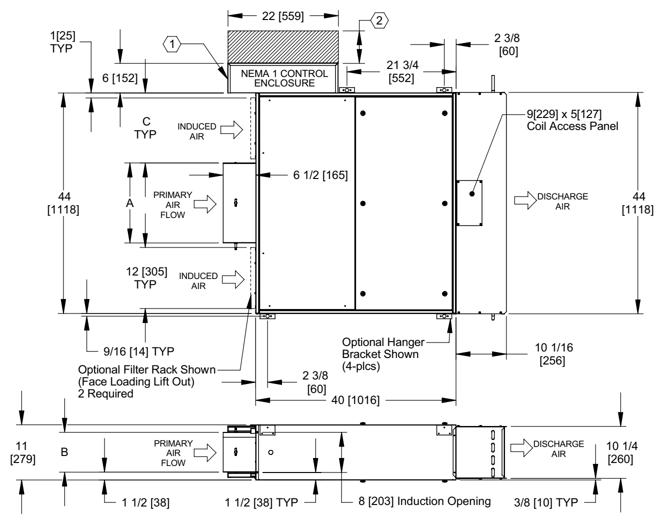
DIMENSIONAL DATA

MODEL CFL-WC HOT WATER COIL DETAIL

UNIT SIZES 06, 08, AND 11

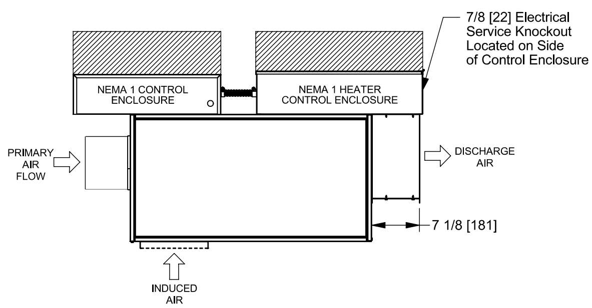


UNIT SIZE 19

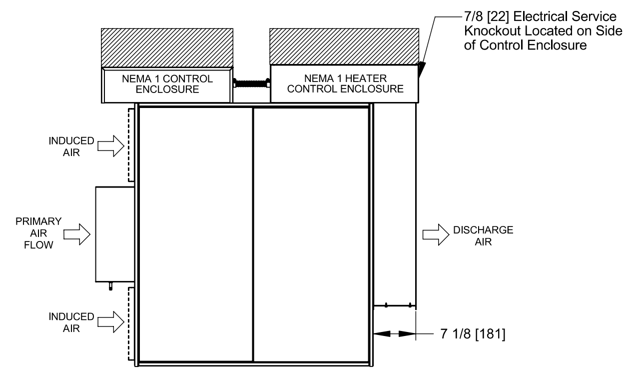


MODEL CFL-EC HOT ELECTRIC HEAT DETAIL

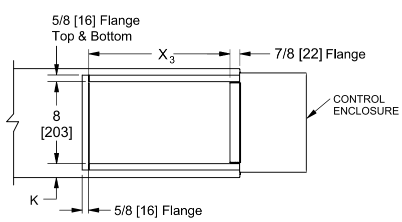
UNIT SIZES 06, 08, AND 11



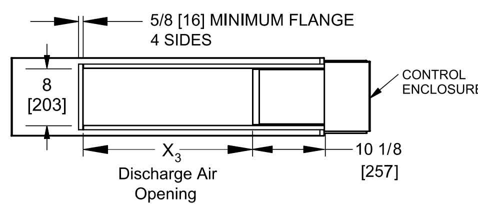
UNIT SIZE 19



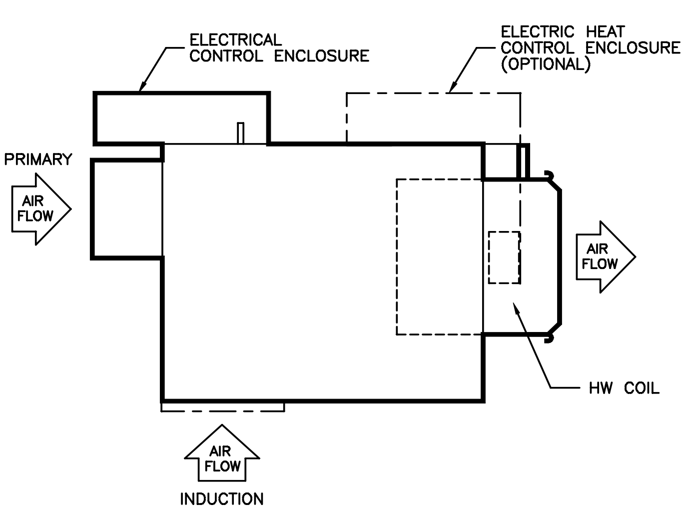
Outlet Detail



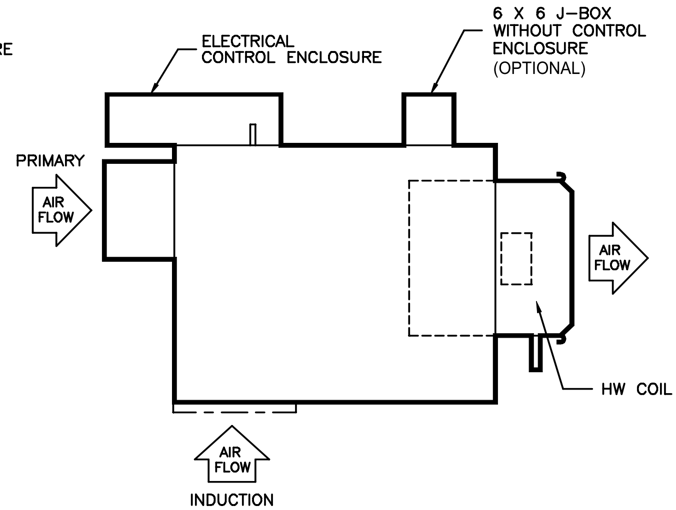
Outlet Detail



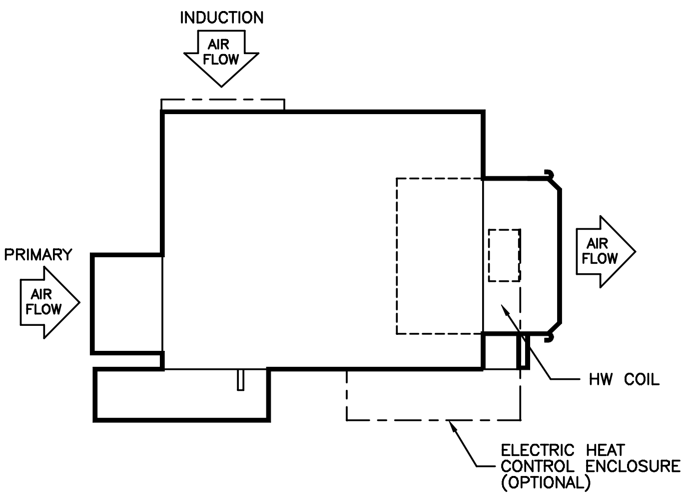
UNIT ARRANGEMENT



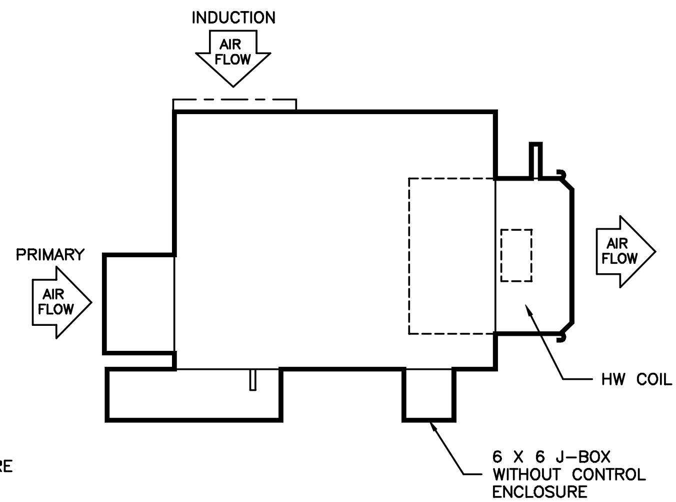
SIZES XX06, XX08, XX11
ARRANGEMENT 1
Left Hand Control
Left Hand Hot Water Coil or Left Hand Electric Heat



SIZES XX06, XX08, XX11
ARRANGEMENT 2
Left Hand Control
Right Hand Hot Water Coil



SIZES XX06, XX08, XX11
ARRANGEMENT 3
Right Hand Control
Right Hand Hot Water Coil or Right Hand Electric Heat



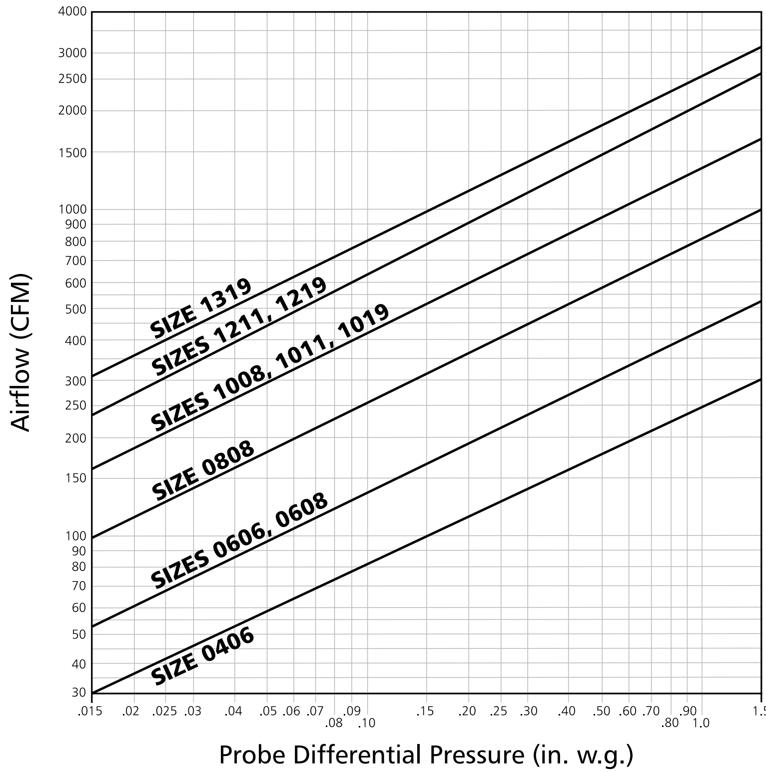
SIZES XX06, XX08, XX11
ARRANGEMENT 4
Right Hand Control
Left Hand Hot Water Coil

NOTE: Induction location shown is typical of unit sizes 06, 08 and 11 as shown on Dimensional Drawings. Size 19 induction inlets are located on both sides of the primary air inlet and are not influenced by handing arrangement.

PRIMARY AIRFLOW CALIBRATION

FLOWSTAR™ CALIBRATION CHART

(For dead-end differential pressure transducers)



NOTE: Maximum and minimum CFM limits are dependent on the type of controls that are utilized. Refer to the table below for specific values. When DDC controls are furnished by others, the CFM limits are dependent on the specific control vendor that is employed. After obtaining the differential pressure range from the control vendor, the maximum and minimum CFM limits can be obtained from the chart above (many controllers are capable of controlling minimum setpoint down to .015” w.g.).

AIRFLOW RANGES (CFM)

UNIT SIZE	400 SERIES (PNEUMATIC) STANDARD CONTROLLER		7000 SERIES ANALOG ELECTRONIC / INTELLIZONE® DIGITAL ELECTRONIC		DDC CONSIGNMENT CONTROLS (See Notes Below)				
					MIN. Min. transducer differential pressure (in. w.g.)			MAX. Max. transducer differential pressure (in. w.g.)	
	MIN.	MAX.	MIN.	MAX.	.015	.03	.05	1.0	> 1.5
0406	43	250	35	250	30	43	55	250	250
0606, 0608	75	490	60	550	53	75	97	435	530
0806, 0808	145	960	115	1000	105	145	190	840	1000
1008, 1011, 1019	235	1545	170	1600	170	235	305	1370	1600
1211, 1219	340	1800	240	1800	240	340	435	1800	1800
1319	445	1900	315	1900	315	445	575	1900	1900

1. Minimum and maximum airflow limits are dependent on the specific DDC controller supplied. Contact the control vendor to obtain the minimum and maximum differential pressure limits (inches W.G.) of the transducer utilized with the DDC controller.
2. Maximum CFM is limited to value shown in General Selection Data.

AHRI RATINGS/FAN PERFORMANCE, PSC

AHRI STANDARD RATINGS

SIZE	PRIMARY AIRFLOW RATE (CFM)	FAN AIRFLOW RATE (CFM)	ELEC. POWER INPUT (WATTS)	MIN. OPER. PRESS. (IN. W.G.)	STANDARD RATINGS - SOUND POWER LEVEL, dB re: 1 x 10^{-12} WATTS																	
					RADIATED												DISCHARGE					
					FAN ONLY						1.5" WATER STATIC PRESSURE						FAN ONLY					
					Hz Octave Band Center Frequency						Hz Octave Band Center Frequency						Hz Octave Band Center Frequency					
					125	250	500	1000	2000	4000	125	250	500	1000	2000	4000	125	250	500	1000	2000	4000
0806	600	600	230	0.06	65	56	53	52	45	38	64	58	57	56	47	45	77	70	65	65	61	59
1008	900	900	350	0.04	68	60	59	59	49	40	69	65	60	60	52	44	79	73	69	67	63	62
1011	1100	1100	500	0.06	68	64	60	60	52	46	73	69	63	60	54	49	82	74	71	69	67	66
1319	1750	1900	850	0.13	75	69	66	65	55	48	72	69	66	64	57	54	82	76	73	72	68	68

NOTE: Fan external static pressure is 0.25" w.g.
- Duct end corrections included in sound power levels per AHRI Standard 880.

SOUND POWER DATA

UNIT SIZE	CFM	DISCHARGE						RADIATED																							
		FAN ONLY						0.5" Inlet ΔPs						1.0" Inlet ΔPs						1.5" Inlet ΔPs						3.0" Inlet ΔPs					
		OCTAVE BAND NUMBER						OCTAVE BAND NUMBER						OCTAVE BAND NUMBER						OCTAVE BAND NUMBER						OCTAVE BAND NUMBER					
		2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7
0406	100	69	63	57	53	49	44	51	42	44	37	33	35	51	43	45	40	34	36							51	44	47	44	39	43
	150	70	64	57	54	50	45	52	43	44	39	33	35	52	45	46	42	35	36							53	47	50	47	42	45
	200	71	64	58	55	51	46	52	43	44	40	34	35	53	46	47	43	36	37							54	50	52	50	44	46
	250	72	65	59	56	53	48	53	45	45	41	34	35	55	48	48	44	37	38							55	52	54	51	45	46
0606	100	69	63	57	53	49	44	51	42	44	37	33	35	51	43	45	40	34	36							51	44	47	44	39	43
	200	71	64	58	55	51	46	52	43	44	40	34	35	53	46	47	43	36	37							54	50	52	50	44	46
	300	72	65	59	57	54	49	54	47	47	43	35	36	55	50	49	45	37	38							58	55	56	53	47	48
	400	73	65	59	58	54	50	57	52	52	48	39	37	59	54	54	50	39	38							63	60	59	56	49	49
	500	75	67	61	60	57	54	60	55	54	51	40	38	61	57	56	52	40	39							65	63	62	58	50	50
0806	300	72	65	59	57	54	49	51	46	46	43	36	36	52	47	47	44	39	39	54	49	50	48	43	43	56	52	54	54	49	49
	400	73	65	59	58	54	50	54	48	47	44	37	36	56	50	50	47	39	39	57	52	52	50	43	43	58	54	56	55	50	50
	500	75	67	61	60	57	54	57	51	50	47	40	36	58	53	51	48	41	39	59	54	54	51	44	43	61	57	58	55	50	50
	600	77	70	65	65	61	59	62	55	54	52	43	39	63	57	55	54	45	42	64	58	57	56	47	45	65	61	60	59	53	53
0608	300	63	59	55	51	46	33	48	47	45	41	35	34	51	49	47	43	38	37							56	54	53	51	47	45
	400	66	61	57	54	49	45	52	50	49	46	37	36	54	52	50	46	38	37							59	58	56	52	47	45
	500	69	63	59	56	52	49	59	55	54	52	41	37	59	56	55	51	40	37							63	61	59	56	49	47
0808	300	63	59	55	51	46	33	48	45	44	40	34	35	50	47	46	43	38	36							54	51	52	50	46	43
	400	66	61	57	54	49	45	51	48	48	44	35	35	53	50	48	45	40	36							58	55	54	53	51	47
	500	69	63	59	56	52	49	57	53	51	49	36	35	59	55	53	52	40	36							62	58	58	57	55	50
	600	72	65	62	59	55	53	59	54	53	50	39	35	60	56	54	52	42	37							64	61	59	59	56	51
	700	73	66	63	60	57	55	62	56	55	54	42	36	63	58	56	55	44	39							66	63	60	59	57	51
	800	76	70	66	64	61	59	64	59	56	55	44	38	65	60	58	57	48	40							69	66	62	61	58	52
	900	78	73	68	66	63	62	65	61	59	57	48	40	67	63	60	59	50	42							70	67	63	62	58	52
1008	500	69	63	59	56	52	49	56	51	50	47	35	35	58	54	52	38	36	37	60	56	54	46	41	40	62	58	58	59	49	45
	600	72	65	62	59	55	53	60	54	53	51	39	36	60	56	52	50	40	37	62	58	54	53	43	41	64	60	58	59	49	48
	700	73	66	63	60	57	55	62	56	54	54	41	36	63	58	55	55	43	39	64	60	57	56	46	43	67	63	61	59	51	49
	800	76	70	66	64	61	59	65	59	56	55	44	37	66	61	57	56	48	40	68	63	59	58	50	44	70	66	62	60	53	50
	900	79	73	69	67	63	62	67	61	57	58	48	38	68	63	59	59	50	41	69	65	60	60	52	44	70	67	63	61	54	51

NOTES:

See notes on the following page.

SOUND POWER DATA

UNIT SIZE	CFM	DISCHARGE						RADIATED																							
		FAN ONLY						0.5" Inlet ΔPs						1.0" Inlet ΔPs						1.5" Inlet ΔPs						3.0" Inlet ΔPs					
		OCTAVE BAND NUMBER						OCTAVE BAND NUMBER						OCTAVE BAND NUMBER						OCTAVE BAND NUMBER						OCTAVE BAND NUMBER					
		2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7
1011	800	76	69	67	66	62	59	66	60	54	53	44	36	66	61	54	53	43	36	67	62	57	55	47	42	69	65	63	58	54	53
	900	77	72	68	67	64	62	68	61	56	55	46	38	68	62	56	55	46	39	69	64	59	56	49	45	71	67	63	59	55	54
	1000	80	73	69	68	67	65	70	63	58	57	48	41	71	65	59	57	49	43	72	66	61	58	52	47	73	69	64	60	56	54
	1100	82	74	71	69	67	66	72	66	59	59	50	43	73	68	61	59	52	46	73	69	63	60	54	49	75	70	65	62	58	57
1211	1000	80	73	69	68	67	65	68	62	57	56	47	39	71	64	58	56	50	45							73	67	64	66	57	56
	1100	81	74	70	68	67	66	69	62	58	57	48	40	73	66	60	58	51	46							74	69	66	66	58	56
1019	800	68	60	61	57	53	49	55	53	53	50	41	35	57	56	54	52	43	38							63	63	61	61	54	53
	1000	69	62	63	60	56	54	59	56	55	53	43	36	61	58	56	55	44	39							65	65	62	61	55	53
	1200	70	64	65	62	58	57	62	58	58	57	47	39	64	62	59	58	50	41							68	68	64	63	56	51
	1400	70	65	65	64	60	59	64	61	60	59	51	45	66	63	61	61	53	50							71	70	66	65	58	53
	1600	74	69	68	66	62	62	69	63	63	60	52	48	70	65	64	61	56	52							71	70	68	64	60	52
1219	800	68	60	61	57	53	49	53	52	51	46	38	35	55	55	53	49	40	37							60	61	59	59	50	47
	1000	69	62	63	60	56	54	57	55	54	50	40	35	59	58	55	53	43	39							63	64	61	59	52	49
	1200	70	64	65	62	58	57	60	57	56	53	43	37	61	59	57	54	44	39							66	66	63	60	53	50
	1400	70	65	65	64	60	59	63	59	58	55	44	38	64	61	59	57	47	40							68	67	64	62	55	51
	1600	74	69	68	66	62	62	65	63	60	58	48	40	67	65	62	60	52	43							70	69	66	64	58	55
	1800	76	71	70	68	65	65	68	65	63	60	51	43	69	66	63	61	52	44							72	71	67	66	59	56
1319	1400	70	65	65	64	60	59	64	61	59	58	48	41	65	62	60	58	50	47	66	65	63	60	53	52	68	69	67	64	59	59
	1600	74	69	68	66	62	62	67	63	61	60	50	42	67	64	62	60	52	48	68	66	64	62	55	52	69	69	66	65	59	58
	1750	76	70	69	68	64	64	68	66	62	60	52	46	68	66	64	62	54	50	72	69	66	64	57	54	73	70	68	66	60	60
	1800	76	71	70	68	65	65	69	65	62	60	51	44	69	66	63	61	53	49	73	70	66	66	58	55	75	71	68	66	60	60
	1900	82	76	73	72	68	68	70	66	63	62	53	45	70	67	64	62	54	49	74	70	67	67	59	55	75	72	69	68	61	60

NOTES:
- Data obtained from tests conducted in accordance with AHRI Standard 880.
- Sound levels are expressed in decibels, dB re: 1 x 10^{12} Watts.
- Fan external static pressure is 0.25" w.g.
- Duct end corrections included in sound power levels per AHRI Standard 880.
- Certified AHRI data is highlighted blue. Application data (not highlighted blue) is outside the scope of the certification program.

EC FAN MOTOR OPTION

THE ENERGY EFFICIENT SOLUTION

ENVIRO-TEC offers an alternative to the PSC motor that significantly increases the operating efficiency of fan terminal units. This motor is frequently referred to as an ECM (electronically commutated motor). It is a brushless DC (BLDC) motor utilizing a permanent magnet rotor. The motor has been in production for years and is commonly used in residential HVAC units. Fan speed control is accomplished through a microprocessor based variable speed controller (inverter) integral to the motor. The motor provides **peak efficiency ratings between 70 & 80%** for most applications.

ECM FEATURES AND BENEFITS

Ultra-High Motor & Controller Energy Efficiency
DC motors are significantly more efficient than AC motors. At full load the EC motor is typically 20% more efficient than a standard induction motor. Due to acoustical considerations, the fan motor on a fan powered terminal typically operates considerably less than full load. At this condition the overall motor / controller (SCR) efficiency can be cut in half. Due to the permanent magnet, DC design, the EC motor maintains a high efficiency at low speeds. Most fan powered unit selections will have an overall efficiency greater than 75%. Furthermore, the motor heat gain is greatly reduced providing additional energy savings by reducing the cold primary air requirement.

Pressure Independent Fan Volume
The integral microprocessor based controller includes a feature that provides sensorless (no external feedback) constant airflow operation by automatically adjusting the speed and torque in response to system pressure changes. This breakthrough will no doubt have far reaching benefits and endless applications. For starters, the fan volume supplied to the space will not significantly change as a filter becomes loaded. This provides new opportunities for medical applications where space pressurization and HEPA filters are applied. The air balance process will become simpler and more accurate since the fan volume will not need to be re-adjusted after the diffuser balance is accomplished.

Factory Calibrated Fan Volume
Due to the pressure independent feature, the fan capacity can now be calibrated at the factory. Within the published external pressure limits, the fan motor will automatically adjust to account for the varying static pressure requirements associated with different downstream duct configurations. This feature should not preclude the final field air balance verification process during the commissioning stage of a project. An electronic (PWM) speed control device is provided to allow field changes of the fan capacity as the need arises. Fan volume can be field calibrated in two fashions depending on the type of PWM control board provided on the unit. For the Solo PWM board, a potentiometer is provided allowing manual adjustment using an instrument type screwdriver. If a Sync PWM board is provided, the fan volume can be calibrated through the BMS using an analog output (2 to10VDC typical) to the speed controller. A fan volume versus DC volts calibration chart is provided.

Designer / Owner Flexibility

The ECM incorporates ball bearings in lieu of sleeve bearings typically utilized with an induction motor. Unlike a sleeve bearing motor, the ECM does not have a minimum RPM requirement for bearing lubrication. This allows it to operate over a much wider speed range. One motor can handle the capacity range previously handled by two motors, allowing simplification of the product line and considerable flexibility to the designer. The owner also benefits since equipment changes are much less likely with tenant requirement changes. A reduced spare parts inventory is another plus.

Custom Applications —
Programmable Fan Operation
Boundless control opportunities arise due to the controllability of a DC motor combined with an integral microprocessor. Various input signals can direct the motor to behave in an application specific mode. For instance, multiple discrete fan capacities can be achieved. In addition, the fan speed can be varied in response to the space temperature load. The fan can also be programmed for a soft start. The motor starts at a very low speed and slowly ramps up to the required speed.

Extended Motor Life
The high motor efficiency provides a significantly reduced operating temperature compared to an induction motor. The lower temperature increases the longevity of all electrical components and therefore the life of the motor. The ball bearings do not require lubrication and do not adversely impact the motor life. Most fan powered applications will provide a motor life between 60,000 and 100,000 hours. A motor life of twenty five years will not be uncommon for a series flow fan terminal and a longer life can be expected for a parallel flow unit.

GENERAL SELECTION, EC MOTOR

UNIT SIZE	CFM	MIN Ps[1] (IN W.G.)	PROJECTED ROOM NOISE CRITERION (NC)[3] DIS. FAN ONLY	RADIATED 0.5" INLET Ps	RADIATED 1.0" INLET Ps	RADIATED 3.0" INLET Ps	FAN HP	VOLTS	FLA[5]
0406	100	0.01	26	--	--	21			
	150	0.02	28	--	20	24			
	200	0.03	29	--	21	26			
	250	0.04	30	--	22	29		120	5.0
0606	100	0.02	26	--	--	21			
	200	0.05	29	--	21	26			
	300	0.10	26	21	23	31	1/3		
	400	0.19	27	26	29	34			
	500	0.32	30	29	31	37			
0806	300	0.02	26	20	21	29		277	2.6
	400	0.04	27	21	24	31			
	500	0.06	30	24	25	33			
	600	0.08	33	29	30	35			
0608	300	0.07	--	--	21	28			
	400	0.18	--	23	24	31			
	500	0.34	22	29	30	34			
0808	300	0.02	--	--	20	26			
	400	0.04	--	22	22	29		120	5.0
	500	0.05	22	25	28	33			
	600	0.09	26	28	29	34			
	700	0.11	26	30	31	35	1/3		
	800	0.15	29	31	33	37			
	900	0.18	33	34	35	38			
1008	500	0.02	22	24	26	33			
	600	0.03	26	28	26	33		277	2.6
	700	0.03	26	29	30	36			
	800	0.04	29	31	32	37			
	900	0.05	33	32	34	38			
1011	800	0.03	29	30	31	38			
	900	0.03	31	32	33	38		120	7.7
	1000	0.04	34	35	37	40	1/2		
	1100	0.06	36	37	39	42			
1211	1000	0.02	34	33	36	39		277	4.1
	1100	0.02	35	34	39	41			
1019	800	0.01	--	28	29	36			
	1000	0.02	20	30	31	37			
	1200	0.04	22	33	34	39			
	1400	0.06	23	35	36	41			
	1600	0.08	28	38	39	44		120	10.0
1219	800	0.02	--	25	28	34			
	1000	0.05	20	29	30	36	2 @ 1/3		
	1200	0.08	22	31	32	38			
	1400	0.11	23	33	34	39			
	1600	0.14	28	35	37	41			
	1700	0.17	29	37	38	42			
1319	1400	0.08	23	34	35	42		277	5.2
	1600	0.10	28	36	37	42			
	1700	0.13	30	37	38	44			

Most variable speed electronic devices, including the EC motor, operate with a rectified and filtered AC power. As a result of the power conditioning, the input current draw is not sinusoidal; rather, the current is drawn in pulses at the peaks of the AC voltage. This pulsating current includes high frequency components called harmonics.

Harmonic currents circulate on the delta side of a Delta-Wye distribution transformer. On the Wye side of the transformer, these harmonic currents are additive on the neutral conductor. A transformer used in this type of application must be sized to carry the output KVA that will include the KVA due to circulating currents.

Careful design must be provided when connecting single-phase products to three-phase systems to avoid potential problems such as overheating of neutral wiring conductors, connectors, and transformers. In addition, design consideration must be provided to address the degradation of power quality by the creation of wave shape distortion.

In summary, proper consideration must be given to the power distribution transformer selection and ground neutral conductor design to accommodate the 3-phase neutral AMPs shown in the adjacent table. Specific guidelines are available from the factory.

NOTES:

1. Min. ΔPs is the static pressure difference across the primary air valve with the damper wide open. All downstream losses (including optional hot water coil) are handled by the unit fan and need not be considered for primary air performance calculations.
2. Performance data obtained from tests conducted in accordance with AHRI Standard 880.
3. NC values are calculated using attenuation values provided in appendix E of AHRI 885-2008, as shown on the right.
4. Dash (-) indicates NC level less than 20.
5. Calculate wire feeder size and maximum overcurrent protective device per NEC and local code requirements. Recommended fuse type shall be UL Class RK5, J, CC or other motor rated fuse.
6. For three-phase conductor sizing, multiply FLA by 1.73.

DISCHARGE ATTENUATION VALUES	OCTAVE BAND 2	3	4	5	6	7
Small Box (< 300 CFM)	24	28	39	53	59	40
Medium Box (300-700 CFM)	27	29	40	51	53	39
Large Box (> 700 CFM)	29	30	41	51	52	39

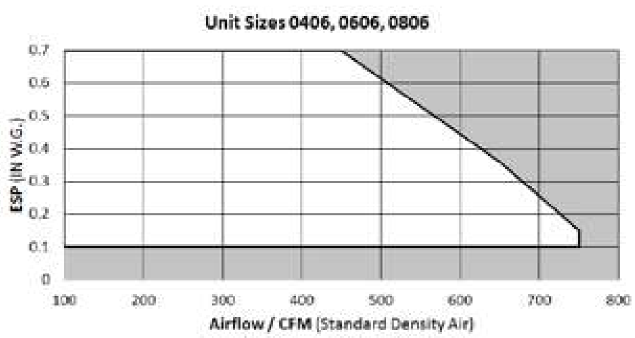
RADIATED ATTENUATION VALUES	OCTAVE BAND 2	3	4	5	6	7
Type 2 - Mineral Fiber Ceiling	18	19	20	26	31	36

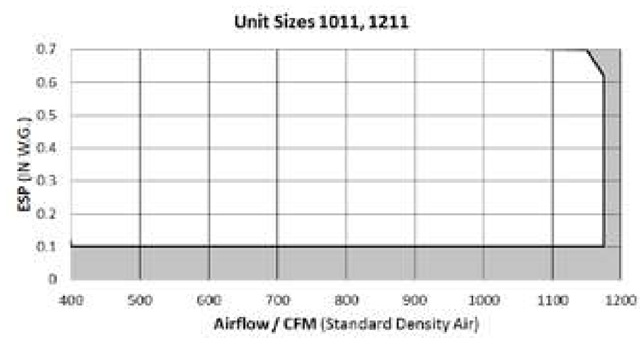
FAN PERFORMANCE, EC MOTOR

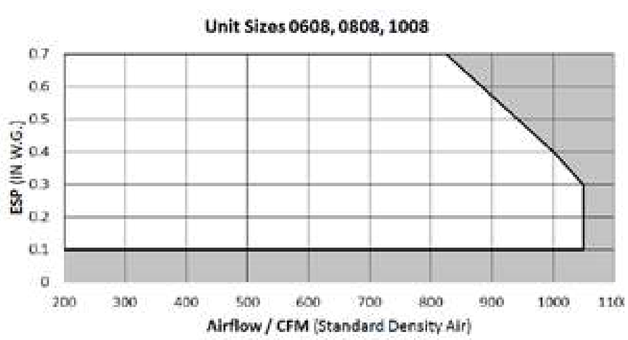
GENERAL FAN NOTE

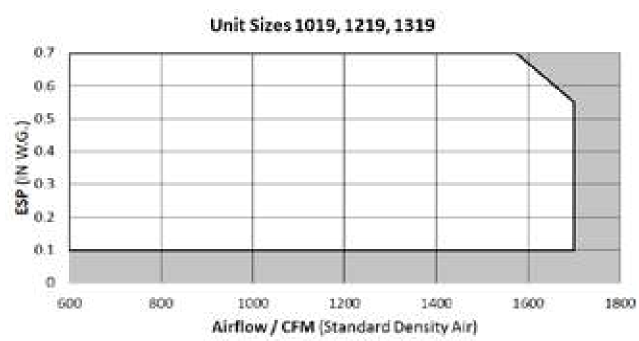
The fan curves depicted on this page are for EC motors. Actual specified capacities which fall below the fan curve can be obtained by adjustment of the fan speed controller. Selections should only be made in the nonshaded areas. The minimum external static pressure requirement is shown for each fan assembly. The unit fan should not be energized prior to realizing this minimum external static pressure.

Terminals equipped with a hot water heating coil require the addition of the coil pressure drop to the specified external static pressure before making the fan selection.









ELECTRIC HEAT

MODEL CFL-EH

STANDARD FEATURES

- cETL listed as an assembly for safety compliance per UL 60335
- Primary auto-reset high limit
- Secondary high limit with manual reset
- Hinged control panel
- Ni-Chrome elements
- Primary/secondary power terminations
- Fusing per NEC
- Wiring diagram and ETL label
- Fan interlock device (relay or P.E. switch)
- Single point power connection
- Available kW increments are as follows:
  0.5 to 12.0 kW – .50 kW;
  12.0 to 25.0 kW – 1.0 kW

OPTIONAL FEATURES

- Disconnect (toggle or door interlocking)
- P.E. switches
- Magnetic contactors
- Proportional control (SSR)
- 24 volt control transformer
- Airflow switch

SELECTION PROCEDURE

With standard heater elements, the maximum capacity (kW) is obtained by dividing the heating (fan) SCFM by 70. In other words, the terminal must have at least 70 SCFM per kW. In addition, each size terminal has a maximum allowable kW based upon the specific heater element configuration (i.e. voltage, phase, number of steps, etc.). Contact your representative for design assistance.

Heaters require a minimum of 0.1” w.g. downstream static pressure to ensure proper operation.
Max ESP of 0.5 in. wg. on CFL - EH.

For optimum diffuser performance in overhead heating applications, the supply air temperature should be within 20°F of the desired space temperature. This typically requires a higher air capacity which provides higher air motion in the space increasing thermal comfort. The electric heater should be selected with this in mind, keeping the LAT as low as possible.

Selection Equations

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

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

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

** Air density at sea level - reduce by 0.036 for each 1000 feet of altitude above sea level.*

SINGLE POINT POWER		ELECTRIC HEAT kw LIMITS UNIT SIZE							
Heater Volts	Motor Volts	0406, 0606 0806		0608, 0808 1008		1011, 1211		1019, 1219, 1319	
		Min	Max	Min	Max	Min	Max	Min	Max
115-120 / 1-Q	115-120 / 1-Q	0.5	4.5	0.5	4.5	0.5	5.5	0.5	5.5
208 / 1-Q	208 / 1-Q	0.5	7	0.5	8.5	0.5	9.5	0.5	9.5
230-240 / 1-Q	230-240 / 1-Q	0.5	7	0.5	9.5	0.5	11	0.5	11
277 / 1-Q	277 / 1-Q	1	7	1	11	1	13	0.5	13
208 / 3-Q, 3 wire	208/ 3-Q, 3 wire	1	7	1	11	1	15	1	17
240 / 3-Q 3 wire	240 / 3-Q 3 wire	1	7	1	11	1	15	1	19
208 / 3-Q, 4 wire	208 / 3-Q, 4 wire	1	7	1	11	1	15	1	19
240 / 3/-Q, 4 wire	240 / 3/-Q, 4 wire	1	7	1	11	1	15	1	19

Calculating Line Amperage

$$\text{Single Phase Amps} = \frac{kW \times 1000}{Volts}$$

$$\text{Three Phase Amps} = \frac{kW \times 1000}{Volts \times 1.73}$$

HOT WATER COIL DATA

MODEL CFL-WC

STANDARD FEATURES

- Aluminum fin construction with die-formed spacer collars for uniform spacing
- Mechanically expanded copper tubes leak tested to 450 PSIG air pressure and rated at 450 PSIG working pressure at 200°F
- 1, 2, 3 and 4 row configurations
- Male sweat type water connections
- Top and bottom access plate in coil casing

OPTIONAL FEATURES

- Multi-circuit coils for reduced water pressure drop
- Opposite hand water connections

DEFINITION OF TERMS

EAT Entering Air Temperature (°F)
LAT Leaving Air Temperature (°F)
EWT Entering Water Temperature (°F)
LWT Leaving Water Temperature (°F)
CFM Air Capacity (Cubic Feet per Minute)
GPM Water Capacity (Gallons per Minute)
MBH 1,000 BTUH
BTUH Coil Heating Capacity(British Thermal Units per Hour)
ΔT EWT minus EAT

SELECTION PROCEDURE

Hot Water Coil Performance Tables are based upon a temperature difference of 115°F between entering water and entering air. If this ΔT is suitable, proceed directly to the performance tables for selection. All pertinent performance data is tabulated.

ENTERING WATER - AIR TEMPERATURE DIFFERENTIAL (ΔT) CORRECTION FACTORS															
ΔT	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
FACTOR	0.15	0.19	0.23	0.27	0.31	0.35	0.39	0.43	0.47	0.51	0.55	0.59	0.63	0.67	0.71
ΔT	85	90	95	100	105	110	115	120	125	130	135	140	145	150	155
FACTOR	0.75	0.79	0.83	0.88	0.92	0.96	1.00	1.04	1.08	1.13	1.17	1.21	1.25	1.29	1.33

The table above gives correction factors for various entering ΔT's (difference between entering water and entering air temperatures). Multiply MBH values obtained from selection tables by the appropriate correction factor above to obtain the actual MBH value. Air and water pressure drop can be read directly from the selection table. The leaving air and leaving water temperatures can be calculated from the following fundamental formulas:

$$LAT = \frac{EAT + BTUH}{1.085 \times CFM}$$

$$LWT = \frac{EWT - BTUH}{500 \times GPM}$$

HOT WATER COIL DATA

MODEL CFL-WC UNIT SIZES 0406, 0606, 0806
STANDARD CIRCUITING

AIRFLOW		WATER FLOW			LAT (°F)		LWT (°F)		CAPACITY (MBH)	
Rate (CFM)	Air PD (IN.W.G.)	Rate (GPM)	Water PD (FT.W.G.) 1 Row	Water PD (FT.W.G.) 2 Row	1 Row	2 Row	1 Row	2 Row	1 Row	2 Row
100	1 Row 0.01 2 Row 0.01	0.5	0.41	0.81	128.1	152.8	152.0	141.1	6.8	9.5
		1.0	1.30	2.48	135.1	160.8	164.4	158.7	7.6	10.4
		2.0	4.57	8.63	139.3	164.9	171.7	168.9	8.0	10.8
		4.0	16.26	-	141.6	-	175.7	-	8.3	-
200	1 Row 0.01 2 Row 0.02	0.5	0.41	0.81	108.8	129.2	141.2	123.3	9.5	13.9
		1.0	1.30	2.48	116.2	141.1	157.2	146.3	11.1	16.5
		2.0	4.57	8.63	121.0	148.0	167.5	161.5	12.1	18.0
		4.0	16.26	-	123.8	-	173.4	-	12.7	-
300	1 Row 0.02 2 Row 0.04	0.5	0.41	0.81	99.1	115.3	134.7	113.5	11.1	16.3
		1.0	1.30	2.48	106.2	128.1	152.6	138.1	13.4	20.5
		2.0	4.57	8.63	111.0	136.2	164.6	156.3	15.0	23.2
		4.0	16.26	-	114.0	-	171.8	-	15.9	-
400	1 Row 0.03 2 Row 0.07	0.5	0.41	0.81	93.1	106.4	130.3	107.1	12.2	17.9
		1.0	1.30	2.48	99.8	119.0	149.1	132.2	15.1	23.4
		2.0	4.57	8.63	104.6	127.7	162.4	152.2	17.1	27.2
		4.0	16.26	-	107.5	-	170.5	-	18.4	-
500	1 Row 0.05 2 Row 0.10	0.5	0.41	0.81	89.0	100.1	126.9	102.6	13.0	19.0
		1.0	1.30	2.48	95.4	112.3	146.4	127.7	16.4	25.6
		2.0	4.57	8.63	99.9	121.2	160.6	148.9	18.9	30.4
		4.0	16.26	-	102.9	-	169.5	-	20.5	-
600	1 Row 0.07 2 Row 0.13	0.5	0.41	0.81	86.0	95.6	124.2	99.3	13.7	19.9
		1.0	1.30	2.48	92.0	107.2	144.1	124.1	17.5	27.4
		2.0	4.57	8.63	96.4	116.0	159.0	146.1	20.4	33.2
		4.0	16.26	-	99.3	-	168.5	-	22.3	-

MULTI-CIRCUITING

AIRFLOW		WATER FLOW			LAT (°F)		LWT (°F)		CAPACITY (MBH)	
Rate (CFM)	Air PD (IN.W.G.)	Rate (GPM)	Water PD (FT.W.G.) 1 Row	Water PD (FT.W.G.) 2 Row	1 Row	2 Row	1 Row	2 Row	1 Row	2 Row
100	1 Row 0.01 2 Row 0.01	0.5	0.09	0.14	124.6	149.5	153.5	142.6	6.5	9.2
		1.0	0.30	0.49	132.7	158.8	165.0	159.2	7.3	10.2
		2.0	1.01	1.59	137.7	163.7	171.9	169.0	7.9	10.7
		4.0	3.69	5.71	140.7	166.2	175.8	174.4	8.2	11.0
200	1 Row 0.01 2 Row 0.02	0.5	0.09	0.14	105.4	125.3	144.2	126.7	8.7	13.1
		1.0	0.30	0.49	113.5	138.1	158.4	147.6	10.5	15.8
		2.0	1.01	1.59	119.1	146.1	168.0	162.0	11.7	17.6
		4.0	3.69	5.71	122.7	150.6	173.6	170.5	12.5	18.5
300	1 Row 0.02 2 Row 0.04	0.5	0.09	0.14	96.0	111.7	138.9	118.2	10.1	15.2
		1.0	0.30	0.49	103.6	124.8	154.3	140.2	12.5	19.4
		2.0	1.01	1.59	109.1	134.0	165.3	157.0	14.3	22.4
		4.0	3.69	5.71	112.7	139.5	172.0	167.6	15.5	24.2
400	1 Row 0.03 2 Row 0.07	0.5	0.09	0.14	90.3	103.1	135.2	112.7	11.0	16.5
		1.0	0.30	0.49	97.3	115.8	151.3	135.0	14.0	22.0
		2.0	1.01	1.59	102.7	125.3	163.2	153.2	16.3	26.1
		4.0	3.69	5.71	106.3	131.3	170.8	165.3	17.9	28.7
500	1 Row 0.05 2 Row 0.10	0.5	0.09	0.14	86.5	97.3	132.5	108.9	11.6	17.5
		1.0	0.30	0.49	92.9	109.2	149.0	131.1	15.1	24.0
		2.0	1.01	1.59	98.1	118.7	161.6	150.2	17.9	29.1
		4.0	3.69	5.71	101.6	125.0	169.8	163.3	19.8	32.5
600	1 Row 0.07 2 Row 0.13	0.5	0.09	0.14	83.7	93.0	130.4	106.0	12.1	18.2
		1.0	0.30	0.49	89.7	104.2	147.1	128.0	16.1	25.5
		2.0	1.01	1.59	94.6	113.6	160.2	147.7	19.3	31.6
		4.0	3.69	5.71	98.1	119.9	169.0	161.7	21.5	35.7

NOTES:
1. Data is based on 180°F entering water and 65°F entering air temperature at sea level. See selection procedure for other conditions.
2. For optimum diffuser performance in overhead heating applications, the supply air temperature should be within 20°F of the desired space temperature. This typically requires a higher air capacity which provides higher air motion in the space, increasing thermal comfort. The hot water coil should be selected with this in mind, keeping the LAT as low as possible.

HOT WATER COIL DATA

MODEL CFL-WC UNIT SIZES 0608, 0808, 1008
STANDARD CIRCUITING

AIRFLOW		WATER FLOW			LAT (°F)		LWT (°F)		CAPACITY (MBH)	
Rate (CFM)	Air PD (IN.W.G.)	Rate (GPM)	Water PD (FT.W.G.) 1 Row	Water PD (FT.W.G.) 2 Row	1 Row	2 Row	1 Row	2 Row	1 Row	2 Row
200	1 Row 0.01	0.5	0.47	0.93	114.2	134.8	136.4	118.4	10.7	15.1
	2 Row 0.01	1.0	1.45	2.81	122.8	147.8	154.4	143.3	12.5	17.9
		2.0	5.10	9.71	128.2	154.9	165.9	160.0	13.7	19.5
		4.0	18.03	-	131.4	-	172.6	-	14.4	-
300	1 Row 0.01	0.5	0.47	0.93	103.6	120.0	128.8	107.3	12.5	17.9
	2 Row 0.03	1.0	1.45	2.81	112.0	134.5	148.7	133.9	15.3	22.6
		2.0	5.10	9.71	117.6	143.5	162.5	153.8	17.1	25.5
		4.0	18.03	-	121.0	-	170.6	-	18.2	-
400	1 Row 0.02	0.5	0.47	0.93	96.9	110.3	123.6	100.3	13.8	19.6
	2 Row 0.04	1.0	1.45	2.81	104.9	125.0	144.6	127.0	17.3	26.0
		2.0	5.10	9.71	110.6	134.8	159.7	149.0	19.7	30.3
		4.0	18.03	-	114.0	-	169.1	-	21.3	-
500	1 Row 0.03	0.5	0.47	0.93	92.3	103.4	119.7	95.5	14.8	20.8
	2 Row 0.06	1.0	1.45	2.81	99.9	117.7	141.3	121.8	18.9	28.6
		2.0	5.10	9.71	105.5	128.0	157.5	145.1	21.9	34.1
		4.0	18.03	-	108.9	-	167.8	-	23.8	-
600	1 Row 0.04	0.5	0.47	0.93	88.9	98.4	116.6	92.0	15.6	21.7
	2 Row 0.08	1.0	1.45	2.81	96.2	112.1	138.6	117.7	20.2	30.6
		2.0	5.10	9.71	101.5	122.5	155.7	141.8	23.7	37.4
		4.0	18.03	-	105.0	-	166.7	-	26.0	-
700	1 Row 0.05	0.5	0.47	0.93	86.3	94.5	114.1	89.3	16.2	22.4
	2 Row 0.10	1.0	1.45	2.81	93.2	107.6	136.3	114.3	21.4	32.3
		2.0	5.10	9.71	98.4	118.0	154.0	139.0	25.3	40.2
		4.0	18.03	-	101.8	-	165.7	-	27.9	-
800	1 Row 0.06	0.5	0.47	0.93	84.3	91.4	112.0	87.1	16.7	22.9
	2 Row 0.12	1.0	1.45	2.81	90.8	103.9	134.4	111.5	22.3	33.7
		2.0	5.10	9.71	95.9	114.1	152.6	136.5	26.7	42.6
		4.0	18.03	-	99.2	120.9	164.8	155.2	29.7	-

MULTI-CIRCUITING

AIRFLOW		WATER FLOW			LAT (°F)		LWT (°F)		CAPACITY (MBH)	
Rate (CFM)	Air PD (IN.W.G.)	Rate (GPM)	Water PD (FT.W.G.) 1 Row	Water PD (FT.W.G.) 2 Row	1 Row	2 Row	1 Row	2 Row	1 Row	2 Row
200	1 Row 0.01	0.5	0.09	0.16	111.0	131.4	139.2	121.4	10.0	14.4
	2 Row 0.01	1.0	0.32	0.54	120.3	145.2	155.5	144.5	12.0	17.4
		2.0	1.08	1.75	126.5	153.3	166.3	160.4	13.3	19.1
		4.0	3.95	6.23	130.3	157.7	172.7	169.7	14.1	20.1
300	1 Row 0.01	0.5	0.09	0.16	100.6	116.8	132.7	111.4	11.6	16.8
	2 Row 0.03	1.0	0.32	0.54	109.4	131.7	150.4	135.7	14.4	21.7
		2.0	1.08	1.75	115.8	141.6	163.1	154.5	16.5	24.9
		4.0	3.95	6.23	119.8	147.3	170.8	166.3	17.8	26.7
400	1 Row 0.02	0.5	0.09	0.16	94.2	107.4	128.3	105.2	12.7	18.4
	2 Row 0.04	1.0	0.32	0.54	102.5	122.1	146.8	129.6	16.2	24.7
		2.0	1.08	1.75	108.7	132.7	160.6	150.0	18.9	29.3
		4.0	3.95	6.23	112.8	139.1	169.4	163.5	20.7	32.1
500	1 Row 0.03	0.5	0.09	0.16	89.9	100.9	125.1	101.0	13.5	19.5
	2 Row 0.06	1.0	0.32	0.54	97.6	114.9	143.9	124.9	17.6	27.0
		2.0	1.08	1.75	103.6	125.8	158.5	146.3	20.9	32.9
		4.0	3.95	6.23	107.7	132.7	168.1	161.2	23.1	36.7
600	1 Row 0.04	0.5	0.09	0.16	86.7	96.1	122.6	97.8	14.1	20.2
	2 Row 0.08	1.0	0.32	0.54	93.9	109.4	141.6	121.2	18.8	28.8
		2.0	1.08	1.75	99.7	120.2	156.8	143.3	22.6	35.9
		4.0	3.95	6.23	103.8	127.4	167.1	159.2	25.2	40.6
700	1 Row 0.05	0.5	0.09	0.16	84.3	92.5	120.5	95.4	14.6	20.9
	2 Row 0.10	1.0	0.32	0.54	91.0	105.0	139.6	118.2	19.7	30.3
		2.0	1.08	1.75	96.7	115.7	155.4	140.7	24.0	38.4
		4.0	3.95	6.23	100.6	123.0	166.1	157.5	27.0	44.0
800	1 Row 0.06	0.5	0.09	0.16	82.3	89.6	118.8	93.4	15.0	21.3
	2 Row 0.12	1.0	0.32	0.54	88.7	101.4	138.0	115.7	20.6	31.6
		2.0	1.08	1.75	94.2	111.9	154.1	138.5	25.3	40.6
		4.0	3.95	6.23	98.0	119.3	165.3	155.9	28.6	47.0

NOTES:

1. Data is based on 180°F entering water and 65°F entering air temperature at sea level. See selection procedure for other conditions.
2. For optimum diffuser performance in overhead heating applications, the supply air temperature should be within 20°F of the desired space temperature. This typically requires a higher air capacity which provides higher air motion in the space, increasing thermal comfort. The hot water coil should be selected with this in mind, keeping the LAT as low as possible.

HOT WATER COIL DATA

MODEL CFL-WC UNIT SIZES 1011, 1211
STANDARD CIRCUITING

AIRFLOW		WATER FLOW			LAT		LWT		CAPACITY	
Rate	Air PD	Rate	Water PD (FT.W.G.)		(°F)		(°F)		(MBH)	
(CFM)	(IN.W.G.)	(GPM)	1 Row	2 Row	1 Row	2 Row	1 Row	2 Row	1 Row	2 Row
500		0.5	0.51	1.01	93.8	104.8	116.5	92.5	15.6	21.6
	1 Row 0.02	1.0	1.56	3.04	102.1	120.1	139.0	119.2	20.1	29.9
	2 Row 0.05	2.0	5.42	10.43	108.1	131.1	156.1	143.4	23.3	35.8
		4.0	19.10	-	111.8	-	167.0	-	25.4	-
600		0.5	0.51	1.01	90.3	99.6	113.2	88.9	16.4	22.5
	1 Row 0.03	1.0	1.56	3.04	98.1	114.3	136.1	114.8	21.5	32.0
	2 Row 0.06	2.0	5.42	10.43	104.0	125.5	154.1	139.8	25.3	39.3
		4.0	19.10	-	107.7	-	165.7	-	27.8	-
700		0.5	0.51	1.01	87.5	95.5	110.6	86.2	17.1	23.1
	1 Row 0.04	1.0	1.56	3.04	95.0	109.6	133.6	111.3	22.7	33.8
	2 Row 0.08	2.0	5.42	10.43	100.7	120.8	152.3	136.8	27.1	42.3
		4.0	19.10	-	104.4	-	164.7	-	29.9	-
800		0.5	0.51	1.01	85.3	92.3	108.4	84.1	17.6	23.7
	1 Row 0.05	1.0	1.56	3.04	92.4	105.7	131.5	108.3	23.8	35.3
	2 Row 0.10	2.0	5.42	10.43	98.0	116.8	150.7	134.2	28.6	44.9
		4.0	19.10	-	101.7	-	163.7	-	31.8	-
900		0.5	0.51	1.01	83.5	89.7	106.5	82.4	18.1	24.1
	1 Row 0.06	1.0	1.56	3.04	90.3	102.4	129.6	105.8	24.7	36.5
	2 Row 0.12	2.0	5.42	10.43	95.7	113.4	149.3	131.8	30.0	47.2
		4.0	19.10	-	99.4	-	162.8	-	33.5	-
1000		0.5	0.51	1.01	82.1	87.6	104.9	81.0	18.5	24.4
	1 Row 0.07	1.0	1.56	3.04	88.5	99.7	128.0	103.6	25.5	37.6
	2 Row 0.14	2.0	5.42	10.43	93.8	110.5	148.1	129.8	31.2	49.2
		4.0	19.10	-	97.4	-	162.0	-	35.1	-
1100		0.5	0.51	1.01	80.8	85.8	103.5	79.8	18.8	24.7
	1 Row 0.08	1.0	1.56	3.04	87.0	97.3	126.5	101.8	26.2	38.5
	2 Row 0.16	2.0	5.42	10.43	92.1	107.9	146.9	127.9	32.3	51.1
		4.0	19.10	-	95.7	-	161.2	-	36.6	-

MULTI-CIRCUITING

AIRFLOW		WATER FLOW			LAT		LWT		CAPACITY	
Rate	Air PD	Rate	Water PD (FT.W.G.)		(°F)		(°F)		(MBH)	
(CFM)	(IN.W.G.)	(GPM)	1 Row	2 Row	1 Row	2 Row	1 Row	2 Row	1 Row	2 Row
500		0.5	0.10	0.17	91.4	102.5	121.7	97.5	14.3	20.3
	1 Row 0.02	1.0	0.34	0.58	99.8	117.5	141.5	122.1	18.8	28.4
	2 Row 0.05	2.0	1.13	1.85	106.3	129.0	157.1	144.6	22.4	34.6
		4.0	4.10	6.56	110.6	136.2	167.3	160.2	24.7	38.6
600		0.5	0.10	0.17	88.1	97.5	119.0	94.3	15.0	21.1
	1 Row 0.03	1.0	0.34	0.58	95.9	111.7	139.0	118.2	20.1	30.4
	2 Row 0.06	2.0	1.13	1.85	102.2	123.3	155.2	141.3	24.2	37.9
		4.0	4.10	6.56	106.5	130.8	166.1	158.1	27.0	42.8
700		0.5	0.10	0.17	85.5	93.7	116.8	91.8	15.5	21.7
	1 Row 0.04	1.0	0.34	0.58	92.9	107.1	136.8	115.0	21.1	31.9
	2 Row 0.08	2.0	1.13	1.85	99.0	118.6	153.6	138.5	25.8	40.6
		4.0	4.10	6.56	103.2	126.4	165.1	156.2	29.0	46.5
800		0.5	0.10	0.17	83.4	90.7	114.9	89.8	16.0	22.2
	1 Row 0.05	1.0	0.34	0.58	90.4	103.4	135.0	112.4	22.0	33.2
	2 Row 0.10	2.0	1.13	1.85	96.3	114.6	152.2	136.1	27.1	43.0
		4.0	4.10	6.56	100.5	122.5	164.2	154.5	30.8	49.8
900		0.5	0.10	0.17	81.8	88.2	113.4	88.2	16.4	22.6
	1 Row 0.06	1.0	0.34	0.58	88.4	100.2	133.5	110.1	22.8	34.4
	2 Row 0.12	2.0	1.13	1.85	94.1	111.3	151.0	133.9	28.4	45.1
		4.0	4.10	6.56	98.2	119.2	163.4	152.9	32.4	52.8
1000		0.5	0.10	0.17	80.4	86.2	112.0	86.9	16.7	23.0
	1 Row 0.07	1.0	0.34	0.58	86.7	97.6	132.1	108.2	23.5	35.3
	2 Row 0.14	2.0	1.13	1.85	92.2	108.4	149.8	132.1	29.5	47.0
		4.0	4.10	6.56	96.2	116.3	162.6	151.6	33.8	55.5
1100		0.5	0.10	0.17	79.3	84.5	110.9	85.8	17.0	23.2
	1 Row 0.08	1.0	0.34	0.58	85.2	95.3	130.8	106.5	24.1	36.1
	2 Row 0.16	2.0	1.13	1.85	90.6	105.8	148.8	130.4	30.5	48.6
		4.0	4.10	6.56	94.5	113.7	162.0	150.3	35.2	58.0

NOTES:
1. Data is based on 180°F entering water and 65°F entering air temperature at sea level. See selection procedure for other conditions.
2. For optimum diffuser performance in overhead heating applications, the supply air temperature should be within 20°F of the desired space temperature. This typically requires a higher air capacity which provides higher air motion in the space, increasing thermal comfort. The hot water coil should be selected with this in mind, keeping the LAT as low as possible.

HOT WATER COIL DATA

MODEL CFL-WC UNIT SIZES 1019, 1219, 1319
STANDARD CIRCUITING

AIRFLOW		WATER FLOW			LAT (°F)		LWT (°F)		CAPACITY (MBH)	
Rate (CFM)	Air PD (IN.W.G.)	Rate (GPM)	Water PD (FT.W.G.) 1 Row	Water PD (FT.W.G.) 2 Row	1 Row	2 Row	1 Row	2 Row	1 Row	2 Row
800	1 Row 0.03 2 Row 0.05	0.5	0.62	1.24	88.0	94.3	99.1	77.3	19.9	25.4
		1.0	1.88	3.70	96.9	110.3	123.7	100.3	27.6	39.3
		2.0	6.49	12.64	104.0	123.9	145.5	128.0	33.8	51.0
		4.0	22.71	-	108.7	-	160.6	-	37.8	-
1000	1 Row 0.04 2 Row 0.08	0.5	0.62	1.24	84.3	89.0	95.3	74.6	20.9	26.0
		1.0	1.88	3.70	92.4	103.6	119.6	95.2	29.7	41.8
		2.0	6.49	12.64	99.1	116.9	142.2	122.7	37.0	56.2
		4.0	22.71	-	103.8	-	158.5	-	42.0	-
1200	1 Row 0.05 2 Row 0.10	0.5	0.62	1.24	81.6	85.4	92.5	72.8	21.6	26.5
		1.0	1.88	3.70	89.1	98.6	116.3	91.5	31.3	43.6
		2.0	6.49	12.64	95.5	111.4	139.5	118.6	39.7	60.3
		4.0	22.71	-	100.0	-	156.7	-	45.6	-
1400	1 Row 0.07 2 Row 0.13	0.5	0.62	1.24	79.6	82.7	90.3	71.6	22.1	26.8
		1.0	1.88	3.70	86.5	94.7	113.6	88.7	32.6	45.1
		2.0	6.49	12.64	92.7	107.0	137.1	115.1	42.0	63.8
		4.0	22.71	-	97.1	-	155.1	-	48.6	-
1600	1 Row 0.08 2 Row 0.16	0.5	0.62	1.24	78.0	80.6	88.5	70.6	22.6	27.0
		1.0	1.88	3.70	84.5	91.6	111.3	86.4	33.8	46.2
		2.0	6.49	12.64	90.4	103.4	135.1	112.2	44.0	66.6
		4.0	22.71	-	94.7	-	153.7	-	51.4	-
1800	1 Row 0.10 2 Row 0.20	0.5	0.62	1.24	76.8	79.0	87.1	69.9	22.9	27.2
		1.0	1.88	3.70	82.8	89.2	109.4	84.5	34.7	47.1
		2.0	6.49	12.64	88.4	100.4	133.3	109.7	45.7	69.1
		4.0	22.71	-	92.6	-	152.4	-	53.9	-
2000	1 Row 0.12 2 Row 0.23	0.5	0.62	1.24	75.7	77.6	85.8	69.3	23.2	27.4
		1.0	1.88	3.70	81.4	87.1	107.7	83.0	35.6	47.9
		2.0	6.49	12.64	86.8	97.9	131.7	107.6	47.3	71.2
		4.0	22.71	-	90.9	106.8	151.3	133.8	56.1	-

MULTI-CIRCUITING

AIRFLOW		WATER FLOW			LAT (°F)		LWT (°F)		CAPACITY (MBH)	
Rate (CFM)	Air PD (IN.W.G.)	Rate (GPM)	Water PD (FT.W.G.) 1 Row	Water PD (FT.W.G.) 2 Row	1 Row	2 Row	1 Row	2 Row	1 Row	2 Row
800	1 Row 0.03 2 Row 0.05	0.5	0.12	0.21	86.4	93.1	104.8	81.5	18.5	24.3
		1.0	0.39	0.69	95.0	108.3	127.0	103.7	26.0	37.6
		2.0	1.28	2.17	102.3	122.0	146.9	129.6	32.4	49.4
		4.0	4.62	7.62	107.5	131.2	161.1	150.6	36.8	57.4
1000	1 Row 0.04 2 Row 0.08	0.5	0.12	0.21	82.8	88.1	101.5	78.7	19.3	25.0
		1.0	0.39	0.69	90.7	101.8	123.4	99.0	27.8	39.9
		2.0	1.28	2.17	97.6	115.0	143.9	124.8	35.3	54.2
		4.0	4.62	7.62	102.6	124.6	159.1	147.0	40.8	64.5
1200	1 Row 0.05 2 Row 0.10	0.5	0.12	0.21	80.3	84.6	99.0	76.8	19.9	25.5
		1.0	0.39	0.69	87.5	97.0	120.5	95.6	29.2	41.6
		2.0	1.28	2.17	94.0	109.6	141.4	120.9	37.7	58.0
		4.0	4.62	7.62	98.9	119.2	157.4	144.0	44.1	70.5
1400	1 Row 0.07 2 Row 0.13	0.5	0.12	0.21	78.5	82.0	97.1	75.4	20.4	25.8
		1.0	0.39	0.69	85.0	93.3	118.1	92.9	30.4	42.9
		2.0	1.28	2.17	91.2	105.3	139.3	117.8	39.8	61.1
		4.0	4.62	7.62	96.0	114.8	155.9	141.4	47.0	75.6
1600	1 Row 0.08 2 Row 0.16	0.5	0.12	0.21	77.0	80.1	95.5	74.4	20.8	26.1
		1.0	0.39	0.69	83.1	90.4	116.2	90.8	31.3	44.0
		2.0	1.28	2.17	89.0	101.8	137.5	115.1	41.6	63.8
		4.0	4.62	7.62	93.6	111.2	154.6	139.1	49.5	80.0
1800	1 Row 0.10 2 Row 0.20	0.5	0.12	0.21	75.8	78.5	94.2	73.5	21.1	26.3
		1.0	0.39	0.69	81.5	88.0	114.5	89.0	32.2	44.9
		2.0	1.28	2.17	87.1	98.9	136.0	112.8	43.1	66.0
		4.0	4.62	7.62	91.6	108.1	153.5	137.1	51.8	84.0
2000	1 Row 0.12 2 Row 0.23	0.5	0.12	0.21	74.9	77.2	93.1	72.9	21.4	26.5
		1.0	0.39	0.69	80.2	86.0	113.0	87.6	32.9	45.6
		2.0	1.28	2.17	85.5	96.4	134.5	110.9	44.5	68.0
		4.0	4.62	7.62	89.9	105.4	152.4	135.3	53.9	87.5

NOTES:

1. Data is based on 180°F entering water and 65°F entering air temperature at sea level. See selection procedure for other conditions.
2. For optimum diffuser performance in overhead heating applications, the supply air temperature should be within 20°F of the desired space temperature. This typically requires a higher air capacity which provides higher air motion in the space, increasing thermal comfort. The hot water coil should be selected with this in mind, keeping the LAT as low as possible.

GUIDE SPECIFICATIONS

GENERAL

Furnish and install ENVIRO-TEC® Model CFL, or equal, Series Flow Constant Volume Fan Powered Terminals of the sizes and capacities scheduled. Units shall be ETL listed. Terminals with electric heat shall be listed as an assembly. Separate listings for the terminal and electric heater are not acceptable. Terminals shall include a single point electrical connection. Terminal units shall be AHRI certified and bear the AHRI 880 seal.

The entire unit shall be designed and built as a single unit. Field-assembled components or built-up terminals employing components from multiple manufacturers are not acceptable.

CONSTRUCTION

Terminals shall be constructed of not less than 20 gauge galvanized steel, able to withstand a 125 hour salt spray test per ASTM B-117.

Casing shall be internally lined with 1/2” thick fiberglass insulation, rated for a maximum air velocity of 5000 f.p.m. Maximum thermal conductivity shall be .24 (BTU • in) / (hr • ft2 • °F). 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.

Casing shall have top and bottom access to gain access to the primary air valve and fan assembly. The opening shall be sufficiently large to allow complete removal of the fan if necessary. Multiple discharge openings are not acceptable. All appurtenances including control assemblies, control enclosures, hot water heating coils, and electric heating coils shall not extend beyond the top or bottom of the unit casing.

SOUND

The terminal manufacturer shall provide AHRI certified sound power data for radiated and discharge sound. The sound levels shall not exceed the octave band sound power levels indicated on the schedule. If the sound data does not meet scheduled criteria, the contractor shall be responsible for the provision and installation of any additional equipment or material necessary to achieve the scheduled sound performance.

PRIMARY AIR VALVE

Rectangular shaped primary air valves shall consist of minimum 18 gauge galvanized steel. Cylindrically shaped primary air valves shall consist of minimum 22 gauge galvanized steel and include embossment rings for rigidity. The damper blade shall be connected to a solid shaft by means of an integral molded sleeve which does not require screw or bolt fasteners. The shaft shall be manufactured of a low thermal conducting composite material, and include a molded damper position indicator visible from the exterior of the unit. The damper shall pivot in nylon bearings. The damper actuator shall be mounted on the exterior of the terminal for ease of service. The valve assembly shall include internal mechanical stops for both full open and closed positions. The damper blade seal shall be secured without use of adhesives. The air valve leakage shall not exceed 1% of maximum inlet rated airflow at 3” W.G. inlet pressure for cylindrical valves. Rectangular valve leakage shall not exceed 2% of maximum inlet rated airflow at 3” W.G. inlet pressure.

PRIMARY AIRFLOW SENSOR

Differential pressure airflow sensor shall traverse the duct along two perpendicular diameters. Single axis sensor shall not be acceptable for duct diameters 6” or larger. A minimum of 12 total pressure sensing points shall be utilized. The total pressure inputs shall be averaged using a pressure chamber located at the center of the sensor. A sensor that delivers the differential pressure signal from one end of the sensor is not acceptable. Balancing taps shall be provided for field airflow measurements.

FAN ASSEMBLY

The unit fan shall utilize a forward curved, dynamically balanced, galvanized wheel with a direct drive motor. The motor shall be an “Electronically Commutated Motor”, (ECM) type.

ECM Fan Motor

Fan motor shall be ECM. Motor shall be brushless DC controlled by an integral controller / inverter that operates the wound stator and senses rotor position to electronically commutate the stator. Motor shall be permanent magnet type with near-zero rotor losses designed for synchronous rotation. The motor shall utilize permanently lubricated ball bearings. Motor shall maintain minimum 70% efficiency over the entire operating range. Motor speed control shall be accomplished through a PWM (pulse width modulation) controller specifically designed for compatibility with the ECM. The speed controller shall have terminals for field verification of fan capacity utilizing a digital volt meter. A calibration graph shall be supplied indicating Fan

GUIDE SPECIFICATIONS

CFM verses DC Volts.

The fan motor shall be unpluggable from the electrical leads at the motor case for simplified removal (open frame motors only). The motor shall be mounted to the fan housing using torsion isolation mounts properly isolated to minimize vibration transfer.

The terminal shall utilize an electronic (Solo or Sync(TM)) fan speed controller for aid in balancing the fan capacity. The speed controller shall have a turn down stop to prevent possibility of harming motor bearings.

HOT WATER COIL

Terminal shall include an integral hot water coil where indicated on the plans. The coil shall be manufactured by the terminal unit manufacturer and shall have a minimum 22 gauge galvanized sheet metal casing. Stainless steel casings, or galvannealed steel casings with a baked enamel paint finish, may be used as an alternative. Coil to be constructed of pure aluminum fins with full fin collars to assure accurate fin spacing and maximum tube contact. Fins shall be spaced with a minimum of 10 per inch and mechanically fixed to seamless copper tubes for maximum heat transfer.

Each coil shall be hydrostatically tested at 450 PSIG under water, and rated for a maximum 450 PSIG working pressure at 200°F. Coils shall incorporate a built in, flush mounted access plate, allowing top and bottom access to coil.

ELECTRIC HEATERS

Terminal shall include an integral electric heater where indicated on the plans. Heater shall be manufactured by the terminal unit manufacturer. The heater cabinet shall be constructed of not less than 20 gauge galvanized steel. Stainless steel cabinets, or galvannealed steel casings with a baked enamel paint finish, may be used as an alternative. Heater shall have a hinged access panel for entry to the controls.

A power disconnect shall be furnished to render the heater non-operational. Heater shall be furnished with all controls necessary for safe operation and full compliance with UL 60335 and National Electric Code requirements.

Heater shall have a single point electrical connection. It shall include a primary disc-type automatic reset high temperature limit, secondary high limit(s) with manual reset, Ni-Chrome elements, and fusing per UL and NEC. Heater shall have complete wiring diagram with label indicating power requirement and kW output. Heater shall be interlocked with fan terminal so as to preclude operation of the heater when the fan is not running.

OPTIONS

Foil Faced Insulation
Insulation shall be covered with scrim backed foil facing. All insulation edges shall be covered with foil or metal nosing. In addition to the basic requirements, insulation shall meet ASTM C1136 for insulation facings, and ASTM C1338 for biological growth in insulation.

Elastomeric Closed Cell Foam Insulation
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.

Double Wall Construction
The terminal casing shall be double wall construction using a 22 gauge galvanized metal liner.

Filters
Terminals shall include a filter rack and 1” thick disposable fiberglass filter, allowing removal without horizontal sliding.

PIPING PACKAGES

Provide a standard factory assembled valve piping package to consist of a 2-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 450 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

GUIDE SPECIFICATIONS

device for each piping package.

Option: Provide unions and/or 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.

CONTROLS

DDC for BACnet
Each VAV terminal unit shall be bundled with a digital controller. The controller shall be compatible with a MS/TP (Master-Slave/Token-Passing) BACnet system network. A unique network address and a BACnet site address shall be assigned to each controller, and referenced to the tagging system used on the drawings and in the schedules provided by the Project Engineer. All controllers shall be factory mounted and wired, with the controller's hardware address set, and all of the individual terminal's data pre-loaded into the controller. The terminal's data shall include, but not be limited to Max CFM, Min CFM, Heating CFM, and terminal K factor. Heating system operating data shall also be factory installed for all terminals with heat. Communications with the digital controller shall be accomplished through the MS/TP BACnet network or through a Bluetooth connector. The digital controller shall have hardware input and output connections to facilitate the specified sequence of operation in either the network mode, or on a stand-alone basis. The terminal unit manufacturer shall coordinate, where necessary, with the Temperature Control Contractor.

Pneumatic Controls
Units shall be controlled by a pneumatic differential pressure reset volume controller. Controller shall be capable of pressure independent operation down to 0.03 inches W.G. differential pressure and shall be factory set to the specified airflow (CFM). Controller shall not exceed 11.5 scim (Standard Cubic Inches per Minute) air consumption @ 20 PSIG. Unit primary air valve shall modulate in response to the room mounted thermostat and shall maintain airflow in relation to thermostat pressure regardless of system static pressure changes. An airflow (CFM) curve shall be affixed to the terminal unit expressing differential pressure vs. CFM. Pressure taps shall be provided for field use and ease of balancing. Terminal unit manufacturer shall supply and manufacture a 5 to 10 PSIG pneumatic actuator capable of a minimum of 45 in. lbs. of torque. Actual sequence of operation is shown on the contract drawings. Terminal unit manufacturer shall coordinate, where necessary, with the Temperature Control Contractor.

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