BULLETIN VAV 107

VAV FANS

Variable Air Volume Vane Axial Fans

CHICAGO BLOWER CORPORATION • GLENDALE HEIGHTS, ILLINOIS • USA

D/47 Vane Axial Fans

Chicago's Design 47 Vane Axial fans are specified by architects, engineers and industrial firms worldwide to meet today's environmental challenges. Chicago fans are selected for internationally renowned installations such as the Sidney Opera House, Petronas Twin Towers and United's O'Hare Terminal. Vane axial fans are chosen for their reliability, low initial cost and space saving configuration. Chicago's variable air volume fans provide maximum efficiency even in unpredictable environments. Two types of Chicago D/47 Vane Axial direct drive fans are offered, Controllable Pitch and Adjustable Pitch. Both supply volumes to 250,000 cfm, pressures to 15 sp. and sizes to 81-1/8".

Chicago Blower fans are recognized for their reliability and industrial quality. Every phase of fan construction is governed by strict Chicago guidelines and stringent AMCA requirements. For application evaluations and fan recommendations, contact a Chicago Blower representative.

Controllable Pitch

Controllable Pitch fans respond automatically to changes in temperature, humidity, air flow, gas concentration and air quality. Clearly the best choice for variable air volume systems, they are also used in sensitive industrial applications to maintain constant conditions regardless of air demand.

Adjustable Pitch

Adjustable Pitch fans are specified for applications less critical to environmental variations, typically seasonal changes or system expansion. Blade pitch is adjusted externally at the hub to increase or decrease volume and pressure.

Chicago Blower certifies that the Design 47 Fans shown herein are licensed to bear the AMCA Seal. The ratings are based on tests and procedures performed in accordance with AMCA Publication 211 and comply with the requirements of the AMCA Certified Ratings Program.

Cover photo by Carol M. Highsmith

Optional Equipment

For Both Adjustable Pitch and Controllable Pitch Fans

Streamlined Inlet Bell

An inlet bell reduces entry loss and is necessary to obtain rated performance on open inlets. The inlet bell, or a casing extension, must be used with Controllable pitch fans. Heavy gauge spinning bolts to inlet flange, but is not designed to support the fan.

Inlet or Outlet Cone

Since a vaneaxial fan can have a diameter about 20% smaller than the duct, a tapered cone is used to connect with either the inlet or outlet. An inlet cone may also be used on open fans to avoid large velocity pressure loss. The flanged, punched cone bolts to fan and duct and will support fan in any position except cantilever.

Access Door

The access door is located in the optional inlet/outlet cone to facilitate blade inspection, adjustment or cleaning. The doors are gasketed and are sealed airtight with quick release latches.

Spool Piece

A non-tapered housing extension complete with latched door is used in installations where an access door cannot be provided in the duct.

Guard Screen

Heavy gauge wire screen protects fan blades from foreign debris. It fits fan flange, inlet or outlet cone, or inlet bell.

Companion Angle Rings

Angle rings facilitate installation with both flexible and slip-fit connections.

Mounting Feet

Heavy reinforced steel plate welded to the fan housing is suitable for floor or ceiling mounting.

Vibration Isolators

Spring type and elastomer in-shear rubber or neoprene mounts reduce vibration transmission in any fan mounting position.

Sound Attenuator

Attenuator reduces sound levels in noise sensitive applications. It bolts to fan inlet or outlet. Acoustical cones are available in lieu of standard cones.

Variable Inlet Vanes

Manually adjusted vanes are used to vary volume when frequency changes are required. Assembly bolts to fan flange.

Controllable Pitch Fan shown with optional mounting feet. Casing extension with motor tie supports is standard for large NEMA frame motors.

Automatic Electric Control

For Controllable Pitch Fans

Electric Option includes an electric/pneumatic transducer to translate user electric signals to the pneumatic signals required by the pilot positioner.

Compressed air for the Electric Option is furnished either by the user or by an auxiliary pneumatic power pressure system available from Chicago Blower. The auxiliary system consists of an air compressor, receiver, gauges, filters, drains and air lines. It is either mounted to the fan casing or furnished loose for user mounting.

Fan Selection Guidelines

Altitude and Temperature Correction Factors

Design 47 fans were tested and rated on the basis of handling air at standard density of .075 lb./ft.^{3}.

In order to select a fan for operation at any other temperature or altitude, it is necessary to correct the pressure from operating density to standard density, select the fan, then correct the required horsepower from standard to operating conditions.

The correction factor chart below gives the ratio of actual to standard densities at various temperatures and altitudes. Apply the factors as follows:

Ps Standard = Ps Actual ÷ Factor;
BHP Actual = BHP Standard x Factor

For Example

Required Duty: 30,000 CFM at 1.58" Ps at 120°F at 4000' elevation

From chart below: Factor is .790
1.58 Actual ÷ .790 = 2.0" Ps Standard

Select fan model from selection chart: 4450 - B12 - 1160

BHP at Standard = 14.6
BHP at Operating Conditions = 14.6 x .790 = 11.53

Air Temp. °F.	ALTITUDE - FEET ABOVE SEA LEVEL												
	0	500	1000	1500	2000	3000	4000	5000	6000	7000	8000	9000	10000
	BAROMETRIC PRESSURE - INCHES MERCURY												
	29.92	29.38	28.86	28.33	27.82	26.82	25.84	24.90	23.98	23.09	22.22	21.39	20.58
– 20	1.205	1.183	1.162	1.141	1.121	1.080	1.041	1.000	.965	.930	.895	.860	.829
– 10	1.178	1.157	1.136	1.116	1.096	1.055	1.018	.980	.944	.909	.875	.841	.810
0	1.152	1.131	1.111	1.091	1.071	1.032	.995	.958	.923	.889	.856	.823	.793
+ 10	1.128	1.108	1.087	1.068	1.049	1.011	.975	.938	.904	.871	.838	.805	.776
20	1.104	1.084	1.064	1.045	1.027	.989	.954	.919	.884	.852	.820	.788	.760
30	1.082	1.063	1.043	1.025	1.006	.969	.935	.900	.867	.835	.804	.773	.744
40	1.060	1.041	1.022	1.004	.986	.950	.916	.882	.849	.818	.788	.757	.729
50	1.039	1.020	1.002	.984	.966	.931	.898	.864	.832	.802	.772	.742	.715
60	1.019	1.001	.982	.965	.948	.913	.880	.848	.816	.787	.757	.728	.701
70	1.000	.982	.964	.947	.930	.896	.864	.832	.801	.772	.743	.714	.688
80	.982	.964	.947	.930	.913	.880	.848	.817	.787	.758	.730	.701	.676
90	.964	.947	.929	.913	.897	.864	.833	.802	.772	.744	.716	.688	.663
100	.946	.929	.912	.896	.880	.848	.817	.787	.758	.730	.703	.675	.651
120	.914	.898	.881	.866	.850	.819	.790	.760	.732	.706	.679	.653	.629
140	.883	.867	.851	.836	.821	.791	.763	.735	.707	.682	.656	.630	.608
160	.855	.840	.824	.810	.795	.766	.739	.711	.685	.660	.635	.610	.588
180	.828	.813	.798	.784	.770	.742	.715	.689	.663	.639	.615	.591	.570
200	.803	.789	.774	.760	.747	.720	.694	.668	.643	.620	.597	.573	.552

Unity basis is standard air density of .075 lb./ft.^{3}. This is equivalent to dry air at 70°F. at Sea Level (29.92" Hg Barometric Pressure).

Basic Fan Laws

Changes in volume, pressure, and horsepower occur in accordance with the fan laws when fan speed and/or gas density changes while the fan is applied to a fixed system. When operating density is other than standard (.75#/ft.3), pressure must be corrected to standard conditions for fan selection and horsepower must be corrected from standard to operating conditions as in the example above. Performance may be adjusted according to the fan laws by changing fan speed.

Constant: Variable:	Density (D) Speed (N)	Speed (N) Density (D)
Volume (Q) Change	$Q_2 = Q_1\left(\frac{N_2}{N_1}\right)$	No Change
Pressure (P) Change	$P_2 = P_1\left(\frac{N_2}{N_1}\right)^2$	$P_2 = P_1\left(\frac{D_2}{D_1}\right)$
HP (H) Change	$H_2 = H_1\left(\frac{N_2}{N_1}\right)^3$	$H_2 = H_1\left(\frac{D_2}{D_1}\right)$

Total Pressure Concept

Chicago Blower Design 47 performance is published in terms of Total Pressure. Total Pressure = Static Pressure + Velocity Pressure

$$\text{Velocity Pressure} = \left(\frac{\text{CFM}}{\text{Fan Area x 4005}}\right)^2$$

where Fan Area = cross sectional area at the flow point considered

"Static Pressure" is unrelated to air motion. It is a pressure that exerts a force equal in all directions, like the air pressure in a balloon or pressure vessel, and can be Positive or Negative.

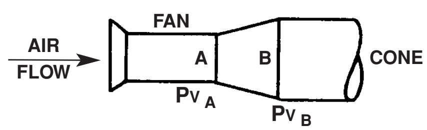
"Velocity Pressure" is the kinetic energy applied to motion or speed of the air through a duct system. It is always Positive in character.

A fan "sees" only Total Pressure. It cannot recognize Static or Velocity Pressure as separate quantities. Therefore, the "Total Pressure Concept" must be considered to assure that any variation in the actual installation from the installation in which the fan was tested is accounted for.

A fan is normally tested blowing into a duct of the same cross-sectional area as the fan outlet. When it is rated on Static Pressure, the rating is based on Total Pressure minus Velocity Pressure in the test duct. The rating is only valid if the fan is installed similar to the test setup. If it is not, the true Static Pressure capability will be greater or less than the rated Static Pressure. The difference will be the difference between actual Velocity Pressure and the Velocity Pressure based on the fan area.

Use of Outlet or Inlet Cone

Cones may be used to transition from the fan to ducts larger or smaller than the fan. Outlet cones may also be used to minimize Velocity Pressure loss and regain Static pressure. Air leaves a diverging discharge cone (Point B) at a lower velocity than at the cone inlet (Point A), therefore, at a lower Velocity Pressure. Consequently, more of the fan's Total Pressure capability is available for Static Pressure than would be available with the fan blowing into a duct of diameter equal to the fan.



For the Standard VAV cone effective Pv is: $Pv_E = Pv_A - (Pv_A - Pv_B)\ .8$

Where a cone is used, the rated Static Pressure is increased by the amount equal to $Pv_E - Pv_B$.

Where the fan has an open discharge (does not blow into a cone, duct or transition), the Velocity Pressure must be based on the annular area; that is, the fan casing area minus the hub area. Since annulus velocity is generally very high, the benefit of using a cone when discharging to atmosphere is apparent.

Note: AMCA certified ratings do not apply when factors are used.

Fan Areas (Ft²)

FAN SIZE	CASING AREA	CONE AREA	ANNULAR AREAS			
			HUB A	HUB B	HUB LB	HUB C
1650	1.48	2.18	0.66	–	–	–
1825	1.82	2.70	1.00	–	–	–
2000	2.18	3.27	1.36	–	–	–
2225	2.70	3.98	1.88	–	–	–
2450	3.27	4.91	2.45	1.45	–	–
2700	3.98	5.94	3.16	2.16	–	–
3000	4.91	7.27	4.09	3.09	–	–
3300	5.94	8.84	5.12	4.12	–	–
3650	7.27	10.80	6.45	5.45	–	3.22
4025	8.84	13.10	–	7.02	5.50	4.79
4450	10.80	16.05	–	8.98	7.46	6.75
4900	13.10	19.63	–	11.28	9.76	9.05
5425	16.05	24.12	–	14.23	12.71	12.00
6000	19.63	29.07	–	–	–	15.58
6650	24.12	35.89	–	–	–	20.07
7300	29.07	44.17	–	–	–	25.02
8112	35.89	54.54	–	–	–	31.84

Fan Application Formulas

$$*d = 1.326 \times \frac{Pb}{°F + 460}$$

$$Pt = Ps + Pv$$

$$*Pv = \left(\frac{Q}{A \times 4005}\right)^2 = \left(\frac{V}{4005}\right)^2$$

$$\text{Fan BHP} = \frac{Q \times Pt}{6362 \times n_t} = \frac{Q \times Ps}{6362 \times n_s}$$

For 3 phase motors: $\text{BHP output} = \dfrac{E \times I \times ME \times Pf \times 1.73}{746}$

For 3 phase motors: $\text{Kw input} = \dfrac{E \times I \times Pf \times 1.73}{1000}$

For 1 phase motors: $\text{BHP output} = \dfrac{E \times I \times ME \times Pf}{746}$

For 1 phase motors: $\text{Kw input} = \dfrac{E \times I \times Pf}{1000}$

To plot a System Curve where Ps1 and Q1 are known, use the following formula to find other curve points:

$$Ps\,2 = Ps1 \left(\frac{Q_2}{Q_1}\right)^2$$

To determine round duct equivalent of rectangular duct for same friction loss and volumetric capacity:

$$DR = 1.265 \sqrt[5]{\frac{(ab)^3}{a + b}}$$

* Formulas for d and Pv are applicable to dry air only.

Symbol	Definition
A	area (ft.^{2})
a	side a of rectangular duct
b	side b of rectangular duct
BHP	brake horsepower
Q	air volume flow (ft.^{3}/min.)
d	air density (lb/ft.^{3})
DR	diameter of round duct
E	volts
°F	temperature (Fahrenheit)
I	amps
KW	kilowatts
ME	motor efficiency (dec.)
n_s	fan static efficiency (dec.)
n_t	fan total efficiency (dec.)
Pb	barometric pressure (inches mercury)
Pf	power factor
Ps	static pressure (inches WG)
Pt	total pressure (inches WG)
Pv	velocity pressure (inches WG)
V	velocity (ft./min)

Fan Sound Data

Chicago Blower design 47 Vane Axial Fans have been carefully noise tested in accordance with AMCA Standard Test Code No. 300 for sound Rating of Air Moving Devices. Certified Sound Rating data is available upon request.

Sound data is as complete as it is possible to provide. It permits the engineer to compare noise levels accurately with other fans if they are also accurately tested and rated according to the AMCA Code. It permits the engineer to determine dB A levels quickly without calculation, and provides the information needed to determine dBA levels for specific installations.

For applications requiring lowest noise levels, Chicago Blower has attenuators available designed specifically for Design 47 characteristics. Vane Axial fans are easier and less costly to attenuate than Centrifugal fans. An attenuated Design 47 fan can provide lowest noise levels at low cost within the building space.

Engineering Specifications

General:

Provide variable volume vaneaxial fans as shown on the drawings of the capacities and type as shown on the fan schedule. All fans shall be licensed to bear the AMCA Certified Rating Seal for Air Performance and Sound Power Level. Acceptable vendors are: Chicago Blower Corporation.

Housings:

Fan housings are to be precisely formed with integral rolled flanges on inlet and outlet. Housings shall be mechanically expanded to insure concentricity. Fans 36-1/2" diameter and smaller shall be made from not less than 7 ga. thickness metal. Fans 40-1/4" diameter and larger shall be made from not less than 1/4" thick metal. Housings shall include not less than 9 stationary guidevanes, inner fairing, and motor bulkhead to receive a NEMA "C"-face, flange mounted, TEAO electric motor. Motor mounting plates will vary in thickness, but will not be less than the following:

A Hub	B Hub	C Hub
3/8"	3/4"	1"

Motor mounting plates will be fabricated so the bolts holding the C-face motor are not in shear. and if the motor is removed it can be replaced in the original location without the use of shims or ancillary centering devices.

Rotors:

Fan blades are to be cast from A356-T51 aluminum alloy. Blades shall be airfoil shaped for maximum efficiency and twisted from hub to tip to obtain equal air distribution along the blade. Blade and shank are to be cast integral to insure maximum blade integrity. Blade shall have an index mark cast into the skirt for setting position of blade. To insure wheel integrity, the method of retaining the blade in the hub and the method for holding the blade at the proper pitch shall be separate, so the blade retaining mechanism is not affected by blade adjustments. Hubs are to be one piece, cast from A356-T6 aluminum alloy. Each blade socket in the hub shall have vernier to be used in conjunction with blade index mark for accurately setting angle of attack of blade.

Aluminum Castings:

1. Chemical verification of virgin metal shall be provided. Chemistry of the aluminum shall be checked during the course of a heat and adjustments made as necessary.
2. Test bars shall be pored at the start and finish of each heat. Test bars shall be submitted to a qualified test laboratory for confirmation of proper mechanical properties of castings. Failure of test bars will cause rejection of castings made from that heat.
3. All castings will be visually inspected for obvious flaws and workmanship.
4. Since identification of cracks is important to the integrity of castings and cracks cannot be properly identified by radiographic inspection, all casting lots shall undergo sample liquid penetrant examination. Such examination shall be made in an approved laboratory by personnel qualified and certified in accordance with SNT-TC-1A (Procedure Qualification and Certification of Non-Destruction Testing). Casting lots failing this inspection will be rejected.
5. After castings are penetrant tested, samples shall be radiographically inspected. Radiographic samples and acceptance/rejection criteria shall conform to Aluminum Association Standard AA-CS-M5-85. Rejection of samples will cause rejection of entire heat.

Controllable Pitch Assembly:

For decreased maintenance, assembly will include permanently lubricated ball thrust bearings for each blade. Compatibility of turn down to zero flow shall be required when indicated. Loss of control signal or de-energizing fan will cause blades to rotate to minimum flow position.

Actuator consists of pneumatic piston with spring return mounted integrally and rotating with rotor assembly. Supply air is 80 PSI and is transferred to piston by a rotating union. Pilot positioner, suitable for 3-15 PSI control signal, is mounted externally and feedback signal is provided by cable connection to piston.

Optimum Efficiency Selection Chart

This chart presents a general selection method for Chicago Blower VAV Vaneaxial Fans. All fans selected from this chart should be checked for exact horsepower and operating characteristics by consulting the individual fan curve for that selection.

USING THE SELECTION CHART

A) Enter the chart with the specified volume and static pressure to find the most efficient selection.

B) Since the chart is based on total pressure, the velocity pressure must be determined for the fan selected in A above and added to the static pressure to arrive at a total pressure. Velocity pressure is determined by the following formula

$$VP = \left(\frac{CFM}{\text{Fan Area x } 4005}\right)^2$$

The fan areas are on page 5.

C) Re-enter the chart with the specified volume and calculated total pressure to verify your original selection.

D) Approximate horsepower of the selected fan may be determined by using the chart efficiency for the selected fan in the following formula:

$$HP = \frac{CFM \text{ x } TP}{6362 \text{ x eff}}$$

E) Refer to the individual fan curve for exact BHP and possible energy savings by utilizing a diverging outlet cone.

EXAMPLE: 40,000 CFM at 4.0" SP

A) Enter the chart with 40,000 CFM and 4.0" SP. Entry falls into 80% efficiency area for a Model 4450-B6-1760.

B) Determine TP -

TP = SP + VP

TP = 4.0 = .86 = 4.86

$$VP = \left(\frac{40{,}000}{10.8 \text{ x } 4005}\right)^2 = .86$$

C) Re-enter the chart with 40,000 CFM and 4.86 TP. The selection remains 4450-B6-1760.

Determine approximate HP

$$HP = \frac{CFM \text{ x } TP}{6362 \text{ x eff}} = \frac{40{,}000 \text{ x } 4.86}{6362 \text{ x } .8} = 38$$

TOTAL PRESSURE

VAV Fan Model Numbers

EXAMPLE: MODEL 4450-B6-1760

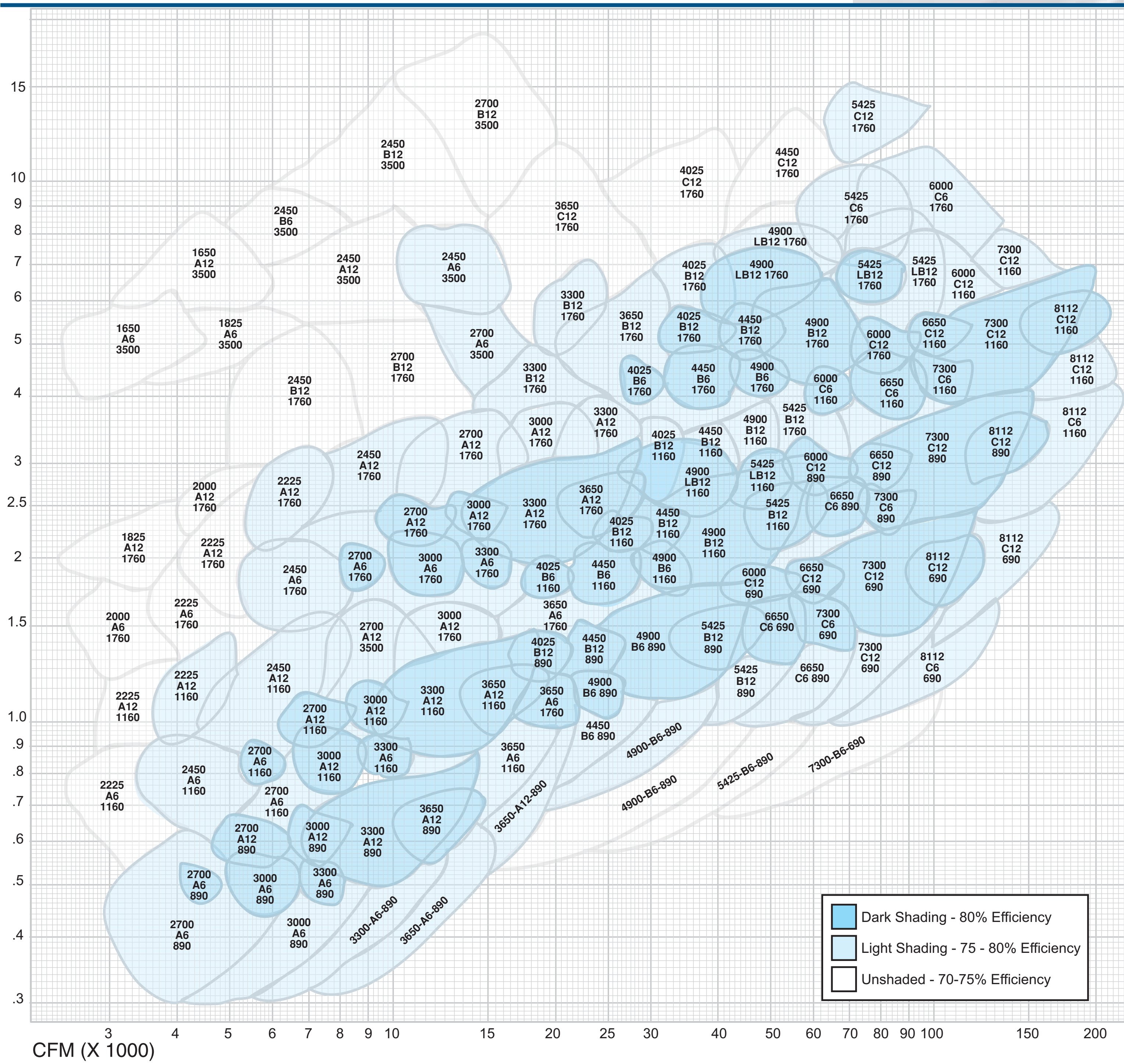
The model number indicates the following:

Fan Diameter	=	44-1/2"
Hub Series	=	B
Number of Blades	=	6
Fan Speed	=	1760 RPM

Refer to Chicago Blower's *fan.net* selection program for performance fan curves and sound data.

Contact your local Chicago Blower sales engineer for software and assistance

The following information is r
Chicago Blower Design 47 V
mation must be complete to as



Ordering Information

...equired when ordering a ...ane Axial Fan. This infor- ...ssure proper performance.

1. Fan Size, Model Number and RPM
2. Fan Duty Requirements: CFM, Total or Static Pressure, Gas Density, Gas Composition (if not clean air), Maximum Temperature, Normal Operating Pressure.
4. Where operating density is other than .075#/ft.^{3} : state
   a. At what density required pressure value is measured.
   b. At what other density, if any, fan will be expected to operate.
5. Motor Characteristics: HP, RPM, Volts, Phase, Hertz, enclosure if other than TEAO required.
6. Accessories required.

Compare the Efficiency of a Controllable Pitch Fan

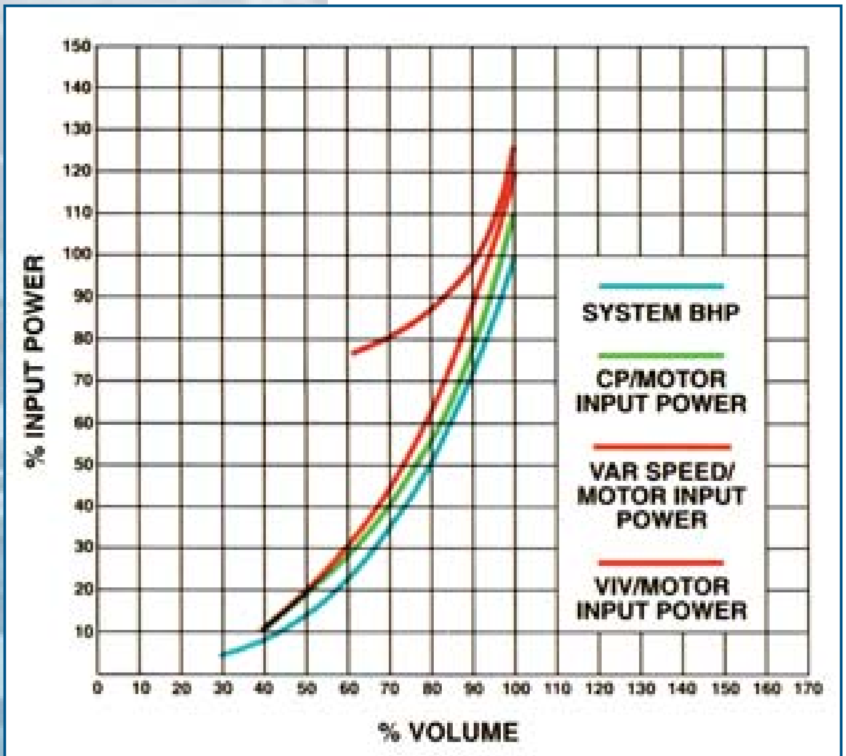
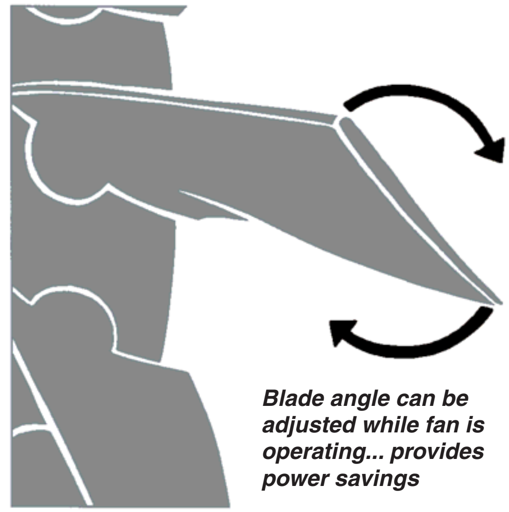


Figure 1



Controllable Pitch Fan Blades

To properly compare various methods of volume control, you need to look further than just brake horsepower savings. Owners do not pay for brake horsepower, they pay for electricity consumed (input power). Inefficiencies in powered equipment should be included in any comparison of volume control methods. Figure 1 depicts the power consumption of various types of volume control apparatus applied to a fan operating on a normal system curve where the required pressure varies as the square of the volume of air). The blue line depicts the system brake horsepower requirements as a percentage of the full load requirement. The other lines depict the input power requirements for the various types of volume control when applied to this system in conjunction with a 90% efficient motor.

1. The green line indicates the input power required for a controllable pitch VAV Vane axial fan. Note at full load, since we are using a 90% efficient motor, the input power requirement is greater than 100%.
2. The orange line indicates the input power required when applying an adjustable frequency speed controller to the same fan (published data from manufacturer of adjustable frequency speed controller). Note at full load, the input power requirement is greater due to inefficiencies in both motor and speed controller.
3. The red line depicts the input power required for the same fan utilizing an inlet vane control damper.

Note that until you exceed 50% turndown, the Controllable Pitch fan requires less power than the adjustable frequency speed controller. This is due to the inefficiencies in the frequency control apparatus.

At 80% of full load flow, the controllable pitch fan consumes 15% less power than the adjustable frequency and 39% less than a variable inlet vane control.

At 70% of full load, the controllable pitch fan consumes 10% less power than the adjustable frequency and even as low as 60% of full load, the savings is 5%.

It should be noted that since most variable volume systems operate at their design point only a few hours per year,it is common, and good practice to select the controllable pitch fan to the right of its most efficient operating area. As the system turns down, the fan will run in the normal system operating range at a high efficiency level.

Also, most variable volume systems have fixed resistances that do not vary with the volume of air being supplied. When the system requires a high turn down, care must be taken in fan selection when adjustable speed control is used so the fan is not forced into an unstable operating point at low air flow.

The most common use of the controllable pitch fan is on the system curve where the system pressure varies as the square of the volume. Figure 2 indicates such a system. The orange line indicates horsepower consumed as the fan operates along the system. Note the selection was made so the design point is to the right of the most efficient operating area so that even at 75% of flow, the fan will operate at equal or higher efficiency than it does at the design flow.

With a controllable pitch fan, you are not limited to operating on the system as noted above. Figure 3 indicates the operation of controllable pitch fan constant static pressure system. With the fan depicted, you can operate on a constant static pressure down to 25% of the design flow. Since the system pressure remains constant, the horsepower savings are not as great as for Figure 2, but still amount to a substantial energy savings.

You can also apply the controllable pitch fan to a system when a constant volume of air is required at varying pressures. Figure 4 is representative of this type of system and indicates the energy that can be saved by using the controllable pitch fan.

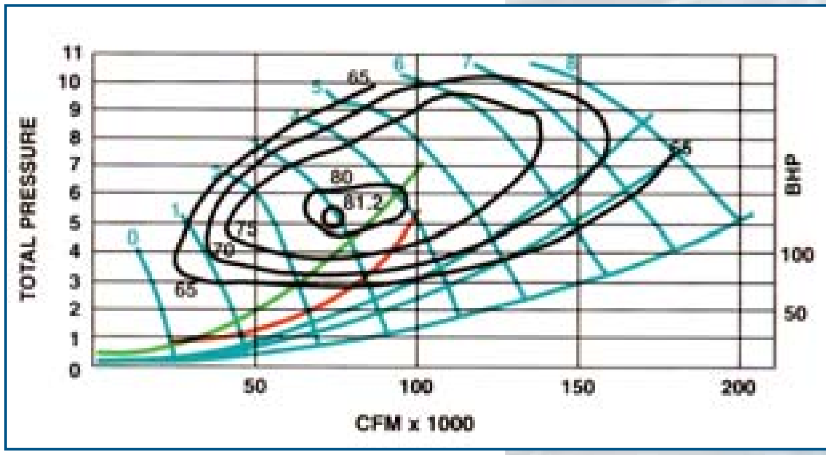


Figure 2

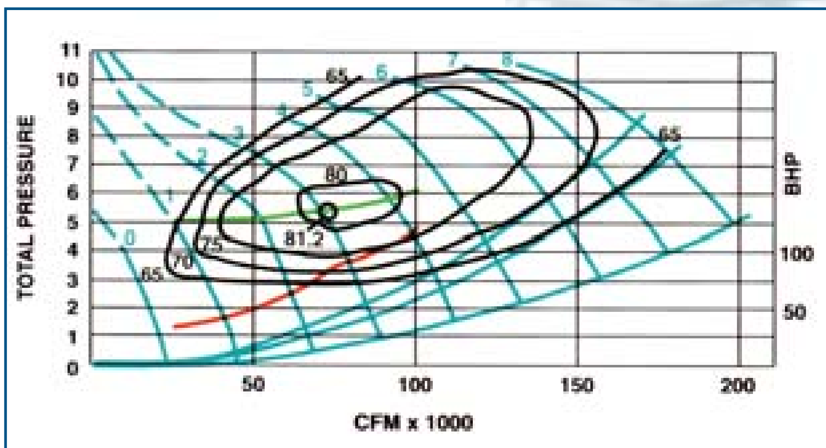


Figure 3

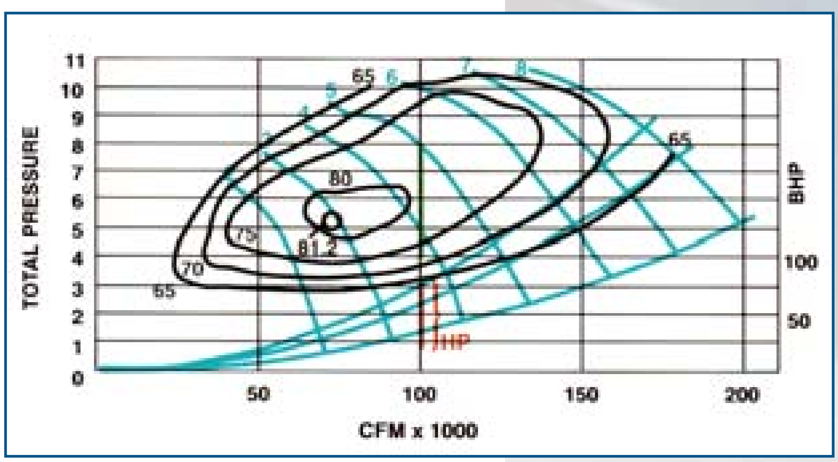
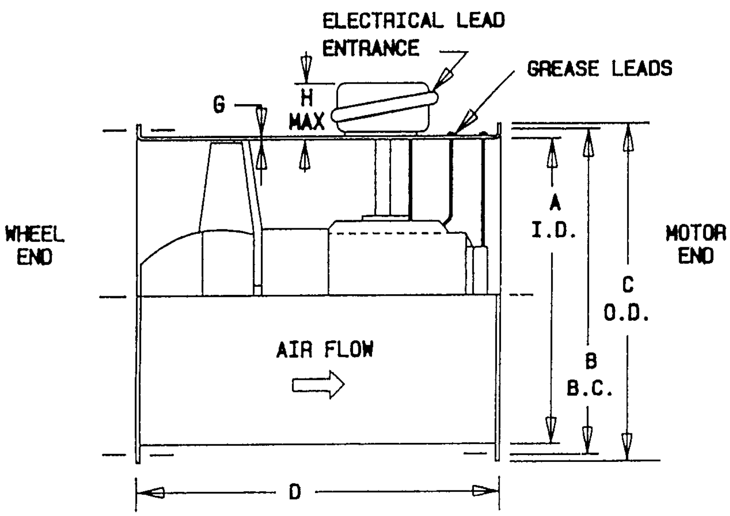
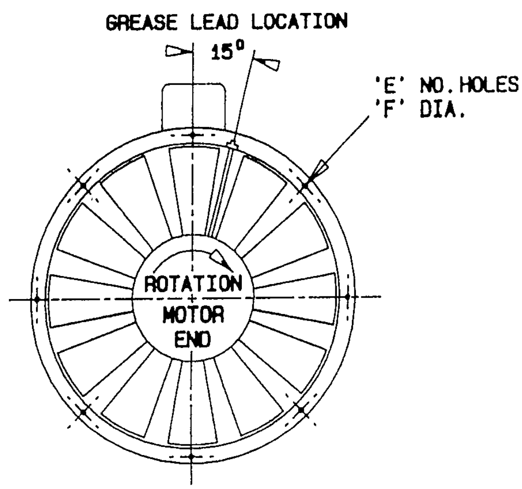


Figure 4

Adjustable Pitch Vane Axial Fan Arrangement 4





HUB DIA.	FAN SIZE	DIMENSION - INCHES A	B	C	D	E	F	G	WEIGHT BARE FAN LESS MOTOR
“A” MAX MOTOR FRAME 256	1650	$16\frac{1}{2}$	$18\frac{1}{4}$	$19\frac{3}{4}$	29	8	$\frac{7}{16}$	10	145
	1825	$18\frac{1}{4}$	20	$21\frac{1}{2}$		8		10	157
	2000	20	22	$23\frac{1}{2}$		12		7	195
	2225	$22\frac{1}{4}$	$24\frac{5}{16}$	$25\frac{3}{4}$		12			212
	2450	$24\frac{1}{2}$	$26\frac{3}{8}$	28		12			228
	2700	27	29	31		12			248
	3000	30	32	34		16			269
	3300	33	35	37		16			293
	3650	$36\frac{1}{2}$	39	41	29	16			324
“B” MAX MOTOR FRAME 365	2450	$24\frac{1}{2}$	$26\frac{3}{8}$	28	38	12			383
	2700	27	29	31		12			415
	3000	30	32	34		16			452
	3300	33	35	37		16			488
	3650	$36\frac{1}{2}$	39	41		16	$\frac{7}{16}$	7	524
	4025	$40\frac{1}{4}$	$42\frac{7}{8}$	$44\frac{3}{4}$		24	$\frac{9}{16}$	$\frac{1}{4}$	663
	4450	$44\frac{1}{2}$	$47\frac{1}{8}$	49		24			713
	4900	49	$51\frac{9}{16}$	54		24			772
	5425	$54\frac{1}{4}$	$56\frac{13}{16}$	$59\frac{1}{4}$	38	24			835
“LB.” MAX MOTOR FRAME 445	4025	$40\frac{1}{4}$	$42\frac{7}{8}$	$44\frac{3}{4}$	50	24			773
	4450	$44\frac{1}{2}$	$47\frac{1}{8}$	49	50	24			834
	4900	49	$51\frac{9}{16}$	54	50	24			905
	5425	$54\frac{1}{4}$	$56\frac{13}{16}$	$59\frac{1}{4}$	50	24	$\frac{9}{16}$		983
“C” MAX MOTOR FRAME 449	3650	$39\frac{1}{2}$	39	41	51	16	$\frac{7}{16}$		1040
	4025	$40\frac{1}{4}$	$42\frac{7}{8}$	$44\frac{3}{4}$		24	$\frac{9}{16}$		1096
	4450	$44\frac{1}{2}$	$47\frac{1}{8}$	49		24			1165
	4900	49	$51\frac{9}{16}$	54		24			1242
	5425	$54\frac{1}{4}$	$56\frac{13}{16}$	$59\frac{1}{4}$		24			1307
	6000	60	$63\frac{1}{8}$	$65\frac{1}{2}$		32			1423
	6650	$66\frac{1}{2}$	$69\frac{5}{8}$	72		32			1533
	7300	73	$76\frac{3}{8}$	79		32			1665
	8112	$81\frac{1}{8}$	$84\frac{1}{8}$	$87\frac{1}{8}$	51	32	$\frac{9}{16}$	$\frac{1}{4}$	1835

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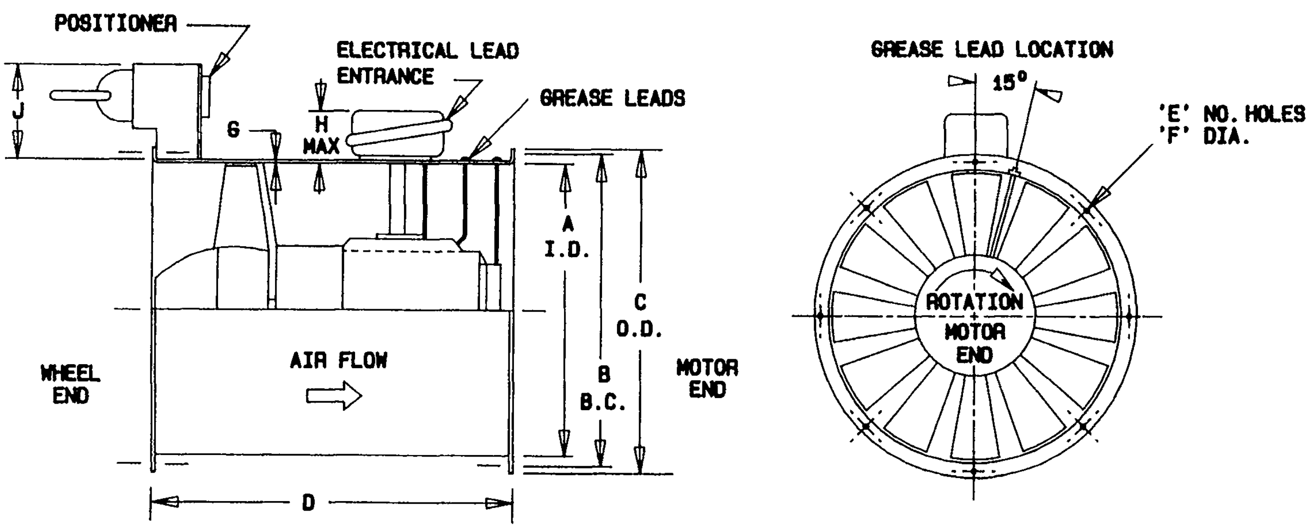
TEAO MOTOR FRAME	WEIGHT	H*
143	65	$4\frac{13}{16}$
145	65	$4\frac{13}{16}$
182	95	$4\frac{11}{16}$
184	95	$4\frac{11}{16}$
213	170	$4\frac{11}{16}$
215	170	$4\frac{11}{16}$
254	270	$5\frac{3}{8}$
256	270	$5\frac{3}{8}$
284	330	$5\frac{3}{8}$
286	420	$5\frac{3}{8}$
324	520	$8\frac{13}{16}$
326	575	$8\frac{13}{16}$
364	750	$8\frac{13}{16}$
365	875	$8\frac{13}{16}$
404	1070	$8\frac{13}{16}$
405	1185	$8\frac{13}{16}$
444	1575	$11\frac{3}{4}$
445	1875	$11\frac{3}{4}$

* ESTIMATE ONLY, VARIES WITH MOTOR MANUFACTURER

Controllable Pitch Vane Axial Fan Arrangement 4



HUB DIA.	FAN SIZE	DIMENSION - INCHES A	B	C	D	E	F	G	J	WEIGHT BARE FAN LESS MOTOR
	2450	24 1/2	26 3/8	28	38	12	7/16	7	9	444
	2700	27	29	31		12				476
"B"	3000	30	32	34		16				513
MAX.	3300	33	35	37		16				549
MOTOR	3650	36 1/2	39	41		16	7/16	7		585
FRAME	4025	40 1/4	42 7/8	44 3/4		24	9/16	1/4		724
365	4450	44 1/2	47 1/8	49		24				774
	4900	49	51 9/16	54		24				833
	5425	54 1/4	56 13/16	59 1/4	38	24				896
"LB" MAX.	4025	40 1/4	42 7/8	44 3/4	50	24				834
MOTOR	4450	44 1/2	47 1/8	49	50	24				895
FRAME	4900	49	51 9/16	54	50	24				966
445	5425	54 1/4	56 13/16	59 1/4	50	24	9/16			1044
	3650	36 1/2	39	41	51	16	7/16			1206
	4025	40 1/4	42 7/8	44 3/4		24	9/16			1262
"C"	4450	44 1/2	47 1/8	49		24				1331
MAX.	4900	49	51 9/16	54		24				1408
MOTOR	5425	54 1/4	56 13/16	59 1/4		24				1473
FRAME	6000	60	63 1/8	65 1/2		32				1589
449	6650	66 1/2	69 5/8	72		32				1699
	7300	73	76 3/8	79		32				1831
	8112	81 1/8	84 1/8	87 1/8	51	32	9/16	1/4	9	2001

TEAO MOTOR FRAME	WEIGHT	H*
143	65	4 13/16
145	65	4 13/16
182	95	4 11/16
184	95	4 11/16
213	170	4 11/16
215	170	4 11/16
254	270	5 3/8
256	270	5 3/8
284	330	5 3/8
286	420	5 3/8
324	520	8 13/16
326	575	8 13/16
364	750	8 13/16
365	875	8 13/16
404	1070	8 13/16
405	1185	8 13/16
444	1575	11 3/4
445	1875	11 3/4

* ESTIMATE ONLY. VARIES WITH MOTOR MANUFACTURER.

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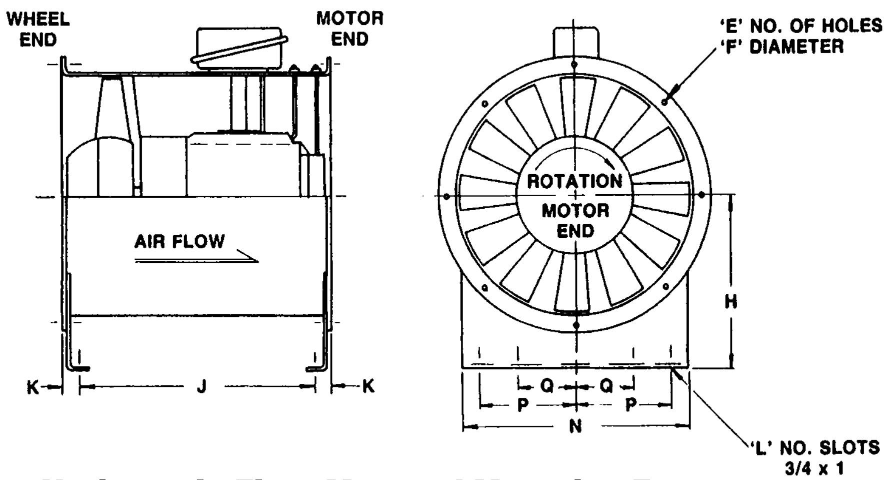
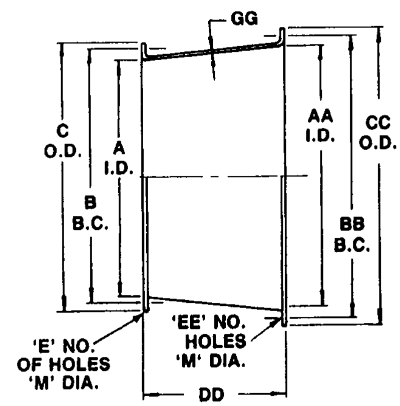
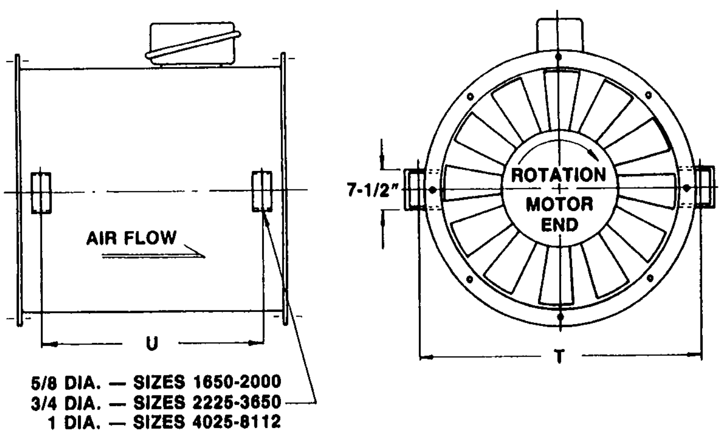
Accessories Vane Axial Fan Arrangement 4



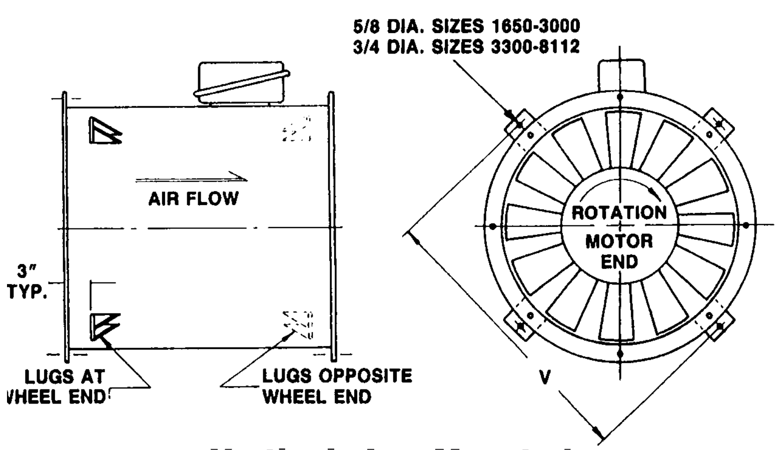
Horizontal - Floor Mounted Mounting Feet



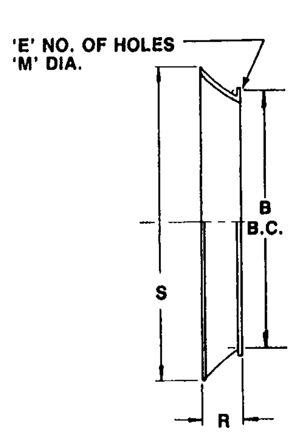
Inlet/Outlet Cone



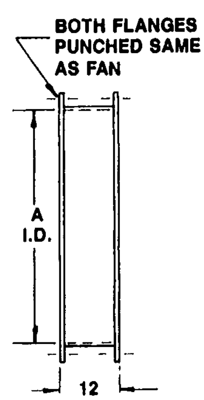
Horizontal - Lug Mounted



Vertical - Lug Mounted



Inlet Bell



Casing Extension

HUB DIA.	FAN SIZE	A	B	C	E	F	H	J	K	L	M	N	P	Q	R	S	T	U	V	AA	BB	CC	DD	EE	GG
		DIMENSION IN INCHES																							
	1650	16 1/2	18 1/4	19 3/4	8	7/16	13	26	1 1/2	2	5/8	17	5 1/2	—	3 5/16	21 7/16	18 1/2	21	24 3/4	20	22	23 1/4	10 3/8	12	10
	1825	18 1/4	20	21 1/2	8		14	26	1 1/2	2		18	6	—	3 11/16	23 5/8	20 1/2		26 1/2	22 1/4	24 5/16	25 1/2	11 3/8		
"A"	2000	20	22	23 1/2	12		16	25 7/8	1 9/16	2		22 1/2	8 1/4	—	4	26 1/8	22 1/2		28 3/8	24 1/2	26 3/8	28	12 7/16		
MAX.	2225	22 1/4	24 5/16	25 3/4			17			3		24 1/2	9 1/4	—	4 7/16	28 5/8	24 3/4		30 5/8	27	29	30 1/2	13 7/8	12	
MOTOR	2450	24 1/2	26 3/8	28			18					25	9 1/2	—	4 7/8	31 3/8	27 1/8		32 7/8	30	32	33 1/2	15 7/8	16	
FRAME	2700	27	29	31	12		20					28	11	—	5 7/16	34 1/16	29 5/8		35 3/8	33	35	37	17 1/4	16	
256	3000	30	32	34	16		22	25 7/8	1 9/16			31	12 1/2	—	8	38 5/16	32 3/4		38 3/8	36 1/2	39	40 1/2	18 1/2	16	
	3300	33	35	37	16		24	25 1/4	1 15/16			31	12 1/2	—	8	41 13/16	35 7/8		42 7/8	40 1/4	42 7/8	44 1/4	20 3/4	24	
	3650	36 1/2	39	41	16		26	25 1/4	1 15/16			34	13	—	8	46 5/16	39 3/8	21	46 3/8	44 1/2	47 1/8	49	22 3/4	24	
	2450	24 1/2	26 3/8	28	12		18	34 7/8	1 9/16			25	9 1/2	—	4 7/8	31 3/8	27 1/8	30	32 7/8	30	32	33 1/2	15 7/16	16	
	2700	27	29	31	12		20	34 7/8	1 9/16			28	11	—	5 7/16	34 1/16	29 5/8		35 3/8	33	35	37	17 1/4	16	
"B"	3000	30	32	34	16		22	34 7/8	1 9/16			31	12 1/2	—	8	38 5/16	32 3/4		38 3/8	36 1/2	39	40 1/2	18 1/2	16	
MAX.	3300	33	35	37	16		24	34 1/8	1 15/16			31	12 1/2	—	8	41 13/16	35 7/8		42 7/8	40 1/4	42 7/8	44 1/4	20 3/4	24	
MOTOR	3650	36 1/2	39	41	16	7/16	26	34 1/8	1 15/16	3		34	13	—	8	46 5/16	39 3/8		46 3/8	44 1/2	47 1/8	49	22 3/4		10
FRAME	4025	40 1/4	42 7/8	44 3/4	24	9/16	29	32 1/2	2 3/4	4		38	15	5	8	51 1/4	43 3/8		50 1/4	49	51 9/16	53 1/2	25		7
365	4450	44 1/2	47 1/8	49			31					40	15 1/2	5 1/2	8 15/16	57 3/4	47 3/4		54 1/2	54 1/4	56 13/16	58 3/4	27 3/4	24	
	4900	49	51 9/16	54			34					44	17	6	9 13/16	63 1/16	52 1/4		59	60	63 1/8	65	31 5/8	32	
	5425	54 1/4	56 13/16	59 1/4			38	32 1/2				48	18 1/2	6 1/2	10 7/8	70 1/8	57 1/2	30	64 1/4	66 1/2	69 5/8	71 1/2	35	32	
"LB" MAX.	4025	40 1/4	42 7/8	44 3/4			29	44 1/2				38	15	5	8	51 1/4	43 3/8	42	50 1/4	49	51 9/16	53 1/2	25	24	
MOTOR	4450	44 1/2	47 1/8	49			31					40	15 1/2	5 1/2	8 15/16	57 3/4	47 3/4		54 1/2	54 1/4	56 13/16	58 3/4	27 3/4	24	
FRAME	4900	49	51 9/16	54			34					44	17	6	9 13/16	63 1/16	52 1/4		59	60	63 1/8	65	31 5/8	32	
445	5425	54 1/4	56 13/16	59 1/4	24	9/16	38	44 1/2	2 3/4	4		48	18 1/2	6 1/2	10 7/8	70 1/8	57 1/2	42	64 1/4	66 1/2	69 5/8	71 1/2	35	32	7
	3650	36 1/2	39	41	16	7/16	26	47	2	3		34	13	—	8	46 5/16	39 3/8	42	46 3/8	44 1/2	47 1/8	49	22 3/4	24	10
	4025	40 1/4	42 7/8	44 3/4	24	9/16	29	45 1/2	2 3/4	4		38	15	5	8	51 1/4	43 3/8		50 1/4	49	51 9/16	53 1/2	25	24	7
"C"	4450	44 1/2	47 1/8	49			31					40	15 1/2	5 1/2	8 15/16	57 3/4	47 3/4		54 1/2	54 1/4	56 13/16	58 3/4	27 3/4	24	
MAX.	4900	49	51 9/16	54			34					44	17	6	9 13/16	63 1/16	52 1/4		59	60	63 1/8	65	31 5/8	32	
MOTOR	5425	54 1/4	56 13/16	59 1/4	24		38	45 1/2	2 3/4			48	18 1/2	6 1/2	10 7/8	70 1/8	57 1/2		64 1/4	66 1/2	69 5/8	71 1/2	35		
FRAME	6000	60	63 1/8	65 1/2	32		41	44 1/2	3 1/4			52	20	6 5/8	12	76 7/8	63 1/4		70	73	76 3/8	78 1/2	37		7
449	6650	66 1/2	69 5/8	72			44				5/8	58	23	8	13 5/16	85	69 7/8		76 1/2	81 1/8	84 1/4	86 5/8	41 1/2	32	1/4
	7300	73	76 3/8	79			49				3/4	64	26	9	14 5/8	93 3/4	76 3/8		83	90	93 3/8	96	48 3/16	32	1/4
	8112	81 1/8	84 1/4	87 1/8	32	9/16	53	44 1/2	3 1/4	4	3/4	70	29	10	16 1/4	104	84 1/2	42	91 1/8	100	103 3/8	106	53 17/32	32	1/4

DO NOT USE FOR GENERAL CONSTRUCTION UNLESS CERTIFIED BY CHICAGO BLOWER CORP.

ACCESSORY WEIGHTS						
FAN SIZE	INLET BELL	GUARD SCREEN	CONE	MTG. FEET	HORIZ. LUGS	VERT. LUGS
1650	7	1.0	43	15	5	5
1825	8	1.5	55	16	5	5
2000	10	2.0	66	24	5	5
2225	12	2.0	77	26	8	5
2450	15	3.0	97	35	8	5
2700	24	3.0	116	43	8	5
3000	29	4.0	140	56	8	5
3300	34	5.0	169	57	8	11
3650	40	6.0	206	97	8	11

ACCESSORY WEIGHTS						
FAN SIZE	INLET BELL	GUARD SCREEN	CONE	MTG. FEET	HORIZ. LUGS	VERT. LUGS
4025	44	10.0	329	131	13	11
4450	49	12.0	402	140	13	11
4900	54	14.0	500	164	13	11
5425	60	17.0	611	200	13	11
6000	93	19.0	717	211	13	11
6650	103	23.0	1234	239	13	11
7300	113	27.0	1479	293	13	11
8112	125	29.0	1824	327	13	11