General

TAHVIEH HAMOON Airfoil Centrifugal Fans Utilize the latest design techniques to product a quiet highly efficient air mover. Aerodynamically designed blades and air passages allow more air to be handled with less horsepower and at lower sound level. this fan has been designed for applications where low operating cost and quiet operation are prime considerations.

Efficiency

Most important is sustained high efficiency over the range of optimum selection. the ultimate measure of fan performance is operating efficiency High efficiency means lower operation costs throughout the life of the equipment Normal selection is slightly to the right of peak efficiency , thereby assuring adequate pressure reserve.

Quiet Operation

Precise orientation of wheel blades, combined with careful aerodynamic design of wheel and casing, decreases air turbulence and increases pressure conversion efficiency. The result is a quieter operating fan.

Airfoil Blading

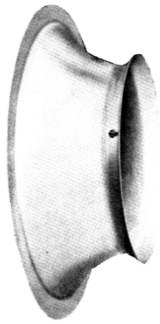
Provides full streamline airflow for greater operating efficiency and perceptibly quieter performance .

Airfoil Advantages…

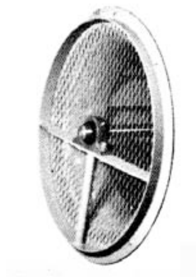
• Steeply Rising Pressure Curve… Ensures minimum variation in volume with change in system pressure and provides a pressure reserve above the normal selection range.
• Low Operating Cost…Maximum peak and operating efficiencies, with minimum power requirements.
• Quieter Operation…Aerodynamically correct airflow provided by airfoil blading permits quiet operation, so important whenever air is moved.
• Non – overloading horsepower characteristic.
• Full Value…Superior design, workmanship, application and service.
• Wide Range of Application…fans are available to meet many commercial and industrial requirements in both general purpose and heavy duty construction.

FAN CLASS

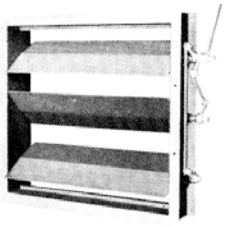
VOLUME range cfm	CLASS I 0"-3" sp	CLASS II 3"-6" sp	CLASS III 6"-10" sp	CLASS IV 10"-15" sp

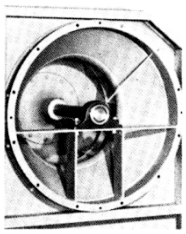


INLET SCREENS are available to protect personnel on installations without an inlet duct. They also provide protection against foreign objects entering the fan. The screen consists of heaby gauge expanded metal mounted on a flanged steel ring.

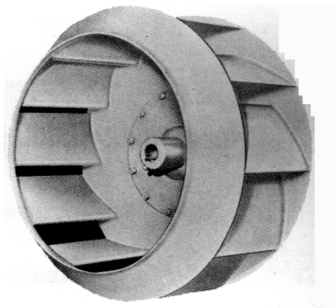


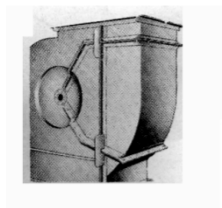
OUTLET DAMPERS, both single acting and opposed type are available for either manual or automatic control. They offer an economical means for reducing air volume or isolating fan from the discharge duct. Dampers are available for all fans in steel, aluminum or ther materials.

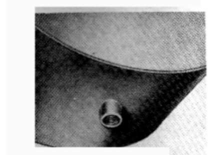




FLANGED INLETS of heavy rolled angle are available on all single inlet fans in Class I, II and III. Predrilled bolt holes afford easy field connection to mating duct flange where rigid connections are required.







Fan Construction

Housing

All SWSI and DWDI housings are fabricated from rigidly braced steel and provided with streamlined spun inlets which guide the air into the wheel guide the air into the wheel with a minimum of interference.

Either fixed or rotatable discharge housings are available for both single and double width. Fixed discharge housings are standard for sized 40 and larger, and are continuously welded.

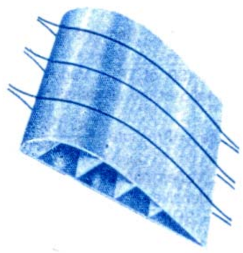
Housings are fabricated using beaded or welded types of construction depending on fan size or class split housings to meet specific job and/or shipping requirements are also available. All Class III and IV, SWSI and DWDI housings are continuously welded.

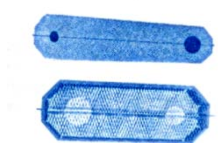
WHEELS

The rotating elements of a fan are most important and must be designed and fabricated to provide the highest practical aerodynamic performance with smooth vibration free operation. This complete line of AF wheels feature:

- Shock   -   free airflow, minimizing turbulence and sound.
- Hubs designed to guide the air into the blades.
- Wheels statically and dynamically balanced.

Welding of the blades to the wheel back or center plate and rim(s) provides the necessary strength and rigidity for all classes of construction. Continuous welding of the trailing edge of AF blades . Not only minimizes trailing eddies which contribute to the sound output of the fan, but help protect the hollow blading from internal corrosion.





Intended Service

In general fans are built to suit the service for which they are intended to perform. Variations in rotation, discharge class of construction, arrangements, bearing type and location are but a few of the many different options that are available. Fans may also be built to handle air at elevated temperatures

With protective coatings or special metals to resist the effects of corrosive air or gases and with spark resistant construction.

High Temperatures

Centrifugal fans are available for handling air at temperatures up to 800 f (427 C). The correct fan arrangement, special construction, and limitations placed upon the maximum operating speeds are important considerations that must be taken into account when elevated temperatures are involved.

In addition, particularly with larger fans, the temperature rate of change required to be handled becomes extremely important. The rates of expansion of the wheel hub and shaft continued trouble – free operation.

Maximum temperature change for any 10 minute period exceeding 40 F (22 C) change should be referred to the factory.

Refer to top of capacity table page for maximum class fan RPM at standard conditions. The chart on page 4 shows the RPM corrections required when operating a fan above 79 f (21 C).

Protective Coatings
Standard finish for Centrifugal fans consists of one primer and overcoat of gray acrylic alkyd paint applied inside and out. An aluminum silicone paint or equal is applied for high temperature applications exceeding 300 F (149 C). Industrial use of fans handling corrosive gases requires special consideration in the construction and finish of the fans. Fans are available with neoprene, phenolic, vinyl, epoxy and special paints to meet most applications.

Special Metals
Centrifugal fans can be constructed of stainless steel, aluminum and other special metals. Fans constructed of special metals. Fans constructed of special metals are used in applications where a standard fan with a special coating will not give satisfactory results. Fan of special metals are generally higher in first cost, but may be justified life expectancy is increased.

Bearings
Self-aligning, grease lubricated, antifriction bearings are standard. Minimum starting friction, simple maintenance and long trouble – free life expectancy, make them ideal for fan service. In general, ball bearings are used for the higher speeds and roller bearings for heavy loads and at slower speed.

Spun Inlets
Deep streamlined inlets reduce incoming air turbulence and losses to a minimum. Overlapping of rims allows air to move into the wheel without obstruction.

Reinforcing Braces
Angle bracing, which essentially forms a beam section, eliminates the possibility of casing pulsation and vibration. In certain fan sizes, the bracing angles are used to permit simple connection of square or rectangular ducts directly to the fan. This eliminates the usual duct transition piece.

Housing Design
The spiral shaped housing is designed to receive the air leaving the wheel and reduce its velocity with a minimum of turbulence, thereby efficiently converting the velocity pressure to static pressure for increased performance.

Cutoff
The discharge cutoff is specially shaped for maximum efficiency and strength.

Wheel Construction
Shock – free flow at the leading edge of the blades, plus streamlined flow over the blade surfaces, increases wheel efficiency and quietness.

Wheels have die – formed airfoil blades welded to back plate and rims to provide a particularly rigid assembly. All wheels are statically and dynamically balanced to ensure smooth operation.

Selection And

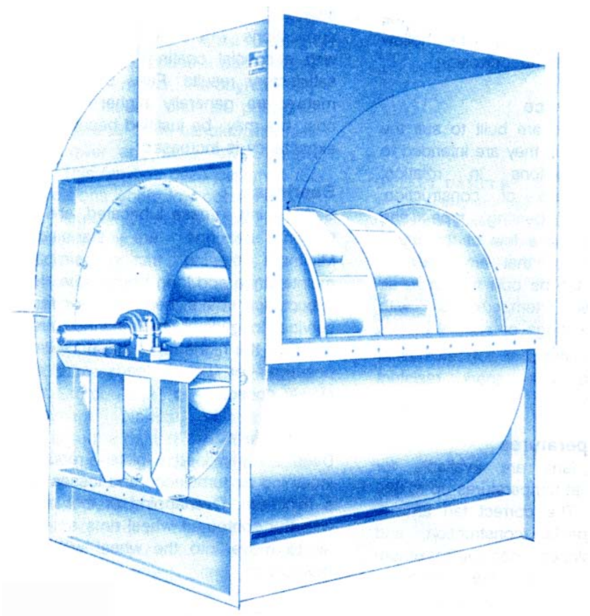
Manual Sample Selection

A size SWSI fan must deliver 16830 CFM (7.94 m³sec) at 1½ inches wg (373 pa) static pressure. The fan must perform at an altitude of 4000 feet (1219 m) with air entering the fan inlet at 300 F (148.8 C) .

1. Obtain the density factor from the table below. For 300 F (148.8 C) at an altitude of 4000 Feet (1219 m), the factor is 1.656. This same ratio can be obtained by Interpolation using the corresponding metric table (see illustration).
2. Convert the actual static pressure to standard conditions (SP E).

Sp E = 1.5”wg (373 pa) * 1.66

= 2.48”wg(616.5 Pa).



Base

The base is fabricated from steel for maximum support and stiffness.

Heavy Bearing Support

Heavy steel bearing supports maintain accurate alignment, prevent bearing distortion and offer a minimum of resistance to airflow.

Shafts

Shafts are fabricated from medium carbon steel (larger fans utilize forged shafts) and all are carefully turned ground and polished to size. All shafts are correctly designed to give safe deflection and operate well below the first critical speeds.

RADIAL INLET VANES

Accurately control air volume while maintaining stream lined flow at the fan inlet. In let vanes can be furnished for all sizes of blowers and are suitable for either manual or automatic control devices.

The manually controlled vanes are provided with the quadrant type locking device shown.

Fan Laws

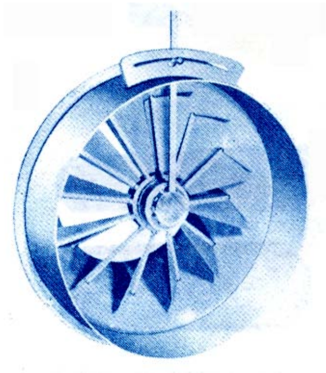
Two basic fan laws relate performance variables for any fan of a given design. An understanding of these relationships is necessary to select fans when they are handing air or gas which is different than standard or when fan performance adjustments must be made on existing systems. Both of these laws apply to a given unchanged duct system.

FAN LOW # 1
Speed Variable – Constant Air Density

A
Volume (CFM)…Varies directly as the ratio of the speeds.
$CFM_2 = CFM_1 * (\frac{RPM_2}{RPM_1})$

B
Pressure (SP of TP)…Varies directly as the square of the speed ratio.
$Pressure_2 = Pressure_1 * (\frac{RPM_2}{RPM_1})^2$

C
Power…Varies directly as the cube of the speed ratio.
$BHP_2 = BHP_1 = Pressure_1 * (\frac{RPM_2}{RPM_1})^3$



FAN LOW # 2
Air Density Variable – Constant Speed

A
Volume (CFM)… Remains unchanged

B
Pressure (SP of TP)…Varies directly as the ratio of the air densities.
$Pressure_2 = Pressure_1 * (\frac{Air\ Density_2}{Air\ Density_1})$

C
Power…Varies directly as the ratio of the air densities.
$BHP_2 = BHP_1 * (\frac{Air\ Density_2}{Air\ Density_1})$

SMOOTHER … QUIETER … MORE ECONOMICAL

Application

3
Use the specified airflow rate and equivalent static pressure (SP E**)** to obtion the fan speed and power requirements from the fan rating tables.

4
The speed is correct as selected from the performance table (when elevated temperature are involved, compare with the maximum allowable speed of the fan). The power requirements must be converted back to the actual operating conditions by using the ratio of the actual density to standard density.
Divide the tabular power from step 3 by the density ratio from step 1:

Power $= \frac{8.5\ HP\ (6.3\ KW)}{1.66}$

= 5.1 HP (3.8 KW)

5
Check specifications to determine if the fan will be expected to operate at lower temperatures (such as at start – up of a requirement at this lower temperature).
Assume the system will start with the fan handling air at 70 F(21 C).

A
The air density ratio for 70 F (21 C) and 4000 feet (1219 m) is 1.16.

B
Convert the power at standard conditions 70 F (21 C) and 4000 feet (1219 m) elevation:

Power $= \frac{8.5\ HP\ (6.3KW)}{1.16}$

=7.3 HP (5.4KW)

C
Select a motor based upon the maximum power required or 7.3, HP (5.4 kW).

Temperature/RPM Corrections

Maximum allowable class speeds shown above each fan performance table refer to fans of standard construction operating at 70F (21 C). Since the strength of steel decreases appreciably with temperature rise, maximum allowable speeds must be corrected accordingly.
Reduce maximum allowable fan speed by applying RPM correction factors from the following table.

AIR DENSITY AT VARIOUS ALTITUDES AND AIR TEMPERATURE

AIR GAS TEMP OF	Altltude in Ft, Above sea Level With Corresponding Barometric Pressure in Inches Hg.										
	0 29.9	1000 28.9	2000 27.8	3000 26.8	4000 25.8	5000 24.9	6000 24	7000 23.1	8000 22.2	9000 21.4	10000 20.58
-20	0.83	0.86	0.86	0.93	0.96	1.00	1.04	1.08	1.12	1.16	1.21
0	0.87	0.91	0.94	0.97	1.01	1.04	1.08	1.13	1.17	1.22	1.26
50	0.96	1.00	1.04	1.07	1.11	1.16	1.20	1.25	1.30	1.35	1.40
70	1.00	1.04	1.08	1.12	1.16	1.20	1.25	1.30	1.35	1.40	1.45
100	1.06	1.10	1.14	1.18	1.22	1.27	1.32	1.37	1.42	1.48	1.54
150	1.15	1.19	1.24	1.30	1.33	1.38	1.44	1.49	1.55	1.61	1.67
200	1.25	1.29	1.34	1.39	1.44	1.50	1.56	1.61	1.68	1.75	1.81
250	1.34	1.39	1.44	1.50	1.55	1.61	1.67	1.74	1.80	1.88	1.95
300	1.44	1.49	1.54	1.60	1.66	1.72	1.79	1.86	1.93	2.01	2.08

AIR GAS TEMP F	Altltude in Ft, Above sea Level With Corresponding Barometric Pressure in Inches Hg.										
	0 29.9	1000 28.9	2000 27.8	3000 26.8	4000 25.8	5000 24.9	6000 24	7000 23.1	8000 22.2	9000 21.4	10000 20.58
350	1.53	1.59	1.65	1.71	1.77	1.84	1.91	1.98	2.06	2.14	2.22
400	1.62	1.68	1.75	1.81	1.88	1.95	2.03	2.10	2.18	2.27	2.36
450	1.72	1.78	1.85	1.92	1.99	2.07	2.15	2.23	2.31	2.40	2.49
500	1.81	1.88	1.95	2.02	2.10	2.18	2.26	2.35	2.44	2.54	2.63
550	1.91	1.98	2.05	2.13	2.20	2.29	2.38	2.47	2.56	2.67	2.77
600	2.00	2.08	2.15	2.23	2.32	2.40	2.50	2.59	2.69	2.84	2.91
650	2.10	2.17	2.25	2.34	2.43	2.52	2.62	2.72	2.83	2.93	3.05
700	2.19	2.27	2.35	2.44	2.53	2.63	2.73	2.83	2.94	3.07	3.18
800	2.38	2.46	2.55	2.65	2.75	2.86	2.97	3.08	3.20	3.32	3.45

AIR GAS TEMP c	Altltude in meters, Above sea Level With Corresponding Barometric Pressure in Inches Hg.										
	0 760	250 738	500 717	750 697	1000 677	1250 657	1500 639	1750 620	2000 603	2500 569	3000 536
0	0.93	0.95	0.98	1.01	1.04	1.08	1.10	1.14	1.16	1.23	1.32
21	1.00	1.03	1.05	1.09	1.12	1.15	1.19	1.22	1.27	1.33	1.41
50	1.10	1.12	1.16	1.19	1.23	1.27	1.30	1.33	1.39	1.47	1.56

AIR GAS TEMP c	Altltude in meters Above sea Level With Corresponding Barometric Pressure in Inches Hg.										
	0 760	250 738	500 717	750 697	1000 677	1250 657	1500 639	1750 620	2000 603	2500 569	3000 536
250	1.79	1.82	1.89	1.92	2.00	2.04	2.13	2.17	2.22	2.38	2.50
275	1.85	1.92	1.96	2.04	2.08	2.13	2.22	2.27	2.33	2.50	2.63
300	1.96	2.00	2.04	2.13	2.17	2.22	2.33	2.38	2.44	2.63	2.78

75	1.18	1.22	1.25	1.28	1.33	1.37	1.41	1.45	1.49	1.59	1.67	325	2.04	2.08	2.13	2.22	2.27	2.33	2.44	2.50	2.56	2.70	2.86
100	1.27	1.30	1.33	1.39	1.43	1.47	1.52	1.54	1.59	1.69	1.79	350	2.13	2.17	2.22	2.33	2.38	2.44	2.50	2.56	2.63	2.86	3.03
125	1.35	1.39	1.43	1.47	1.52	1.56	1.61	1.67	1.69	1.82	1.92	375	2.17	2.27	2.33	2.38	2.44	2.56	2.63	2.70	2.78	2.94	3.13
150	1.43	1.47	1.52	1.56	1.61	1.67	1.69	1.75	1.82	1.92	2.04	400	2.27	2.33	2.44	2.50	2.56	2.63	2.70	2.78	2.86	3.30	3.23
175	1.52	1.56	1.61	1.67	1.69	1.75	1.82	1.85	1.92	2.04	2.17	425	2.38	2.44	2.50	2.56	2.63	2.70	2.86	2.94	3.03	3.13	3.33
200	1.61	1.64	1.69	1.75	1.79	1.85	1.92	1.96	2.04	2.13	2.27	450	2.44	2.50	2.63	2.70	2.78	2.86	2.94	3.03	3.13	3.23	3.45
225	1.69	1.72	1.79	1.85	1.89	1.96	2.00	2.08	2.13	2.27	2.38	475	2.56	2.63	2.70	2.78	2.86	2.94	3.03	3.13	3.23	3.45	3.57

TEMPERATURE RPM CORRECTIONS

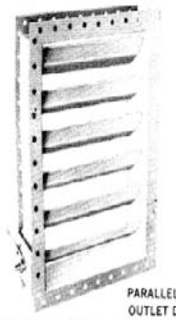
Maximum allowable class speeds shown above each fan performance table refer to fans of standard construction operating at 70 ˚F (21˚C). since the strength of steel decreases appreciably with temperature rise, maximum allowable speed must be corrected accordingly.

Reduce maximum allowable fan speed by applying RPM Correction factors from the following table.

TEMP	-20 F to 150 F (-29˚ C to 66˚F)	150˚ F - 300˚F (66˚ C - 149˚C)	300˚ F - 600˚F (149˚ C -316˚C)	600˚ F - 800˚F (316˚ C -427˚C)
FACTOR	1.0	0.957	0.880	0.790

MODIFICATIONS

TAHVIEH HAMOON fan can be modified or furnished with accessory equipment to meet many special conditions or requirements.

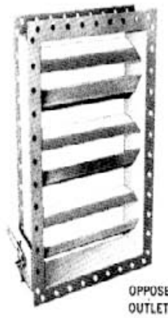


PARALLEL BLADE OUTLET DAMPER

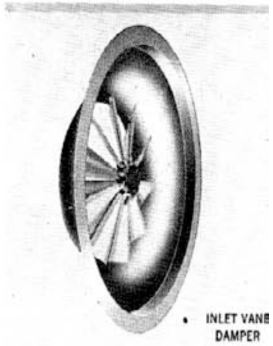
STANDARD BALL BEARING

INLET VANE DAMPERS

Inlet van dampers can be furnished to provide an effective means of reducing or regulating air volume flow when required. Dampers can be furnished for manual or automatic control.



OPPOSED BLADE OUTLET DAMPER



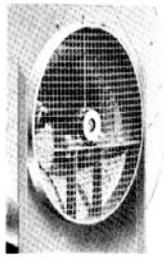
INLET VANE DAMPER

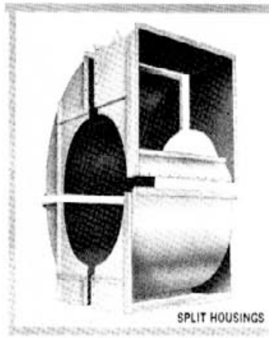
OUTLET DAMPERS

Outlet dampers can be furnished in number of types for regulating air volume. Types available are: single blade, parallel or opposed acting. Streamlined, parallel or opposed acting.

ACCESS DOORS

Two types of access doors are available for cleaning of fan wheel and scroll. A quick release door is recommended where frequent cleaning is necessary.





SPLIT HOUSINGS

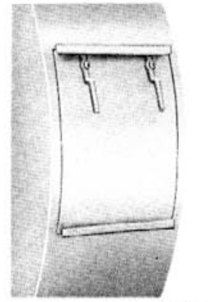
SHAFT COOLING WHEEL

Shaft cooling wheels can be furnished for high temperature application to protect the inboard bearing from radiated head from the fan housing and convected heat from the shaft.

INLET SCREENS

Accessory inlet screens of 1½” mesh wire are available where there is no duct connected to the fan inlet. Screens are bolted to the fan inlet for easy removal.

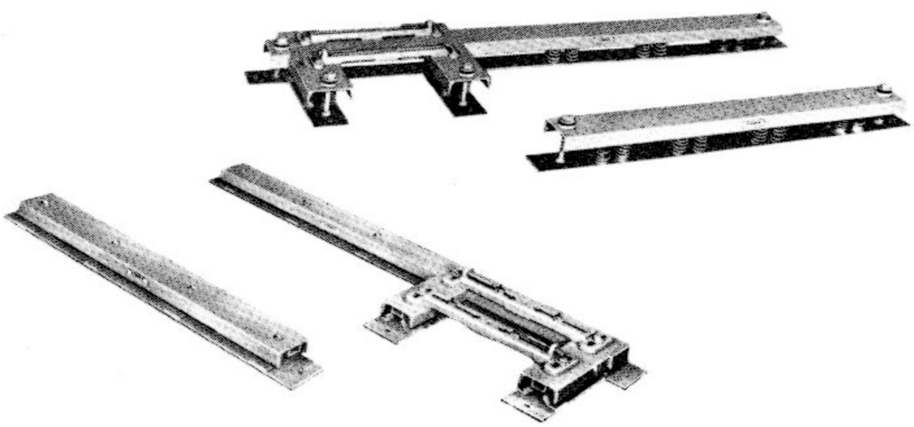
COOLING WHEEL



ACCESS DOOR

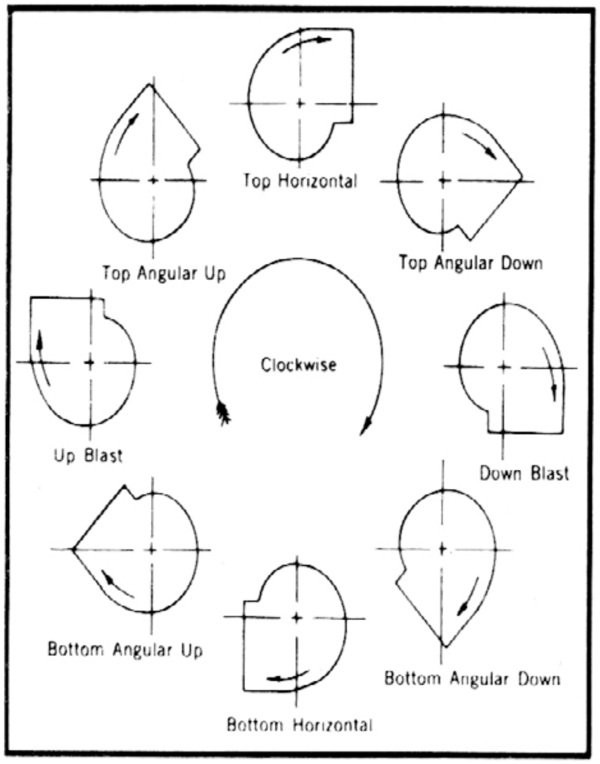
VIBRATION BASES

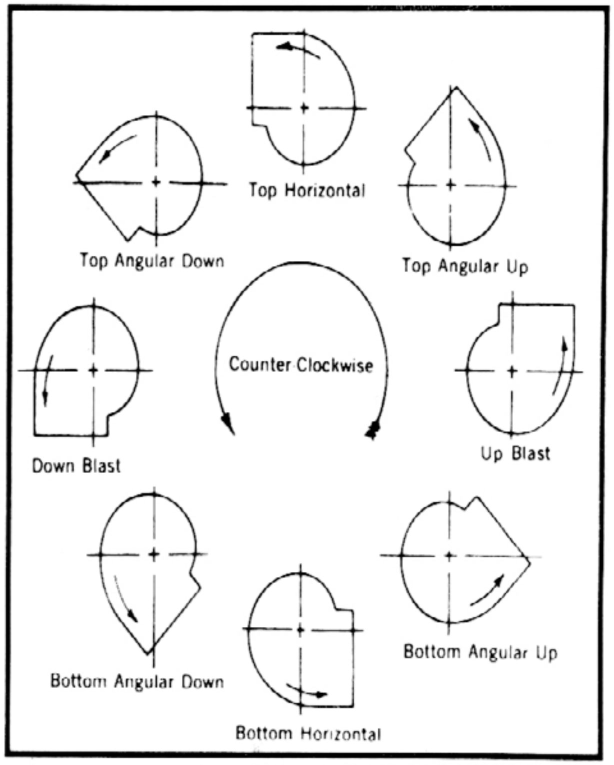
Vibration bases are available in a number of types to provide an efficient method of isolating fans and motors, thereby reducing the transmission of vibration to the building structure.



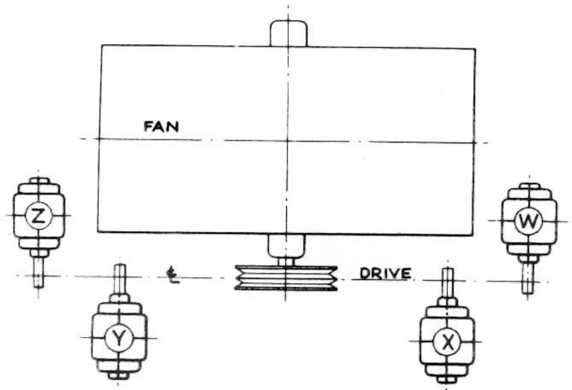
DESIGNATION FOR DIRECTION OF RATATION AND DISCHARGE

Direction of rotation is determined from drive side for either single or double width, or single or double inlet fans. (The driving side of a single inlet fan is considered to be the side opposite the inlet regardless of actual location of the drive.) for fan in – verted for ceiling suspension, direction of rotation and Dis charge is determined when fan is resting on floor.

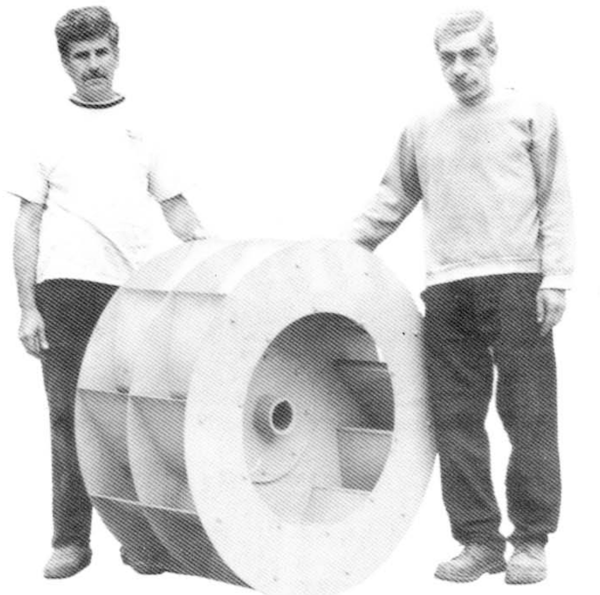




MOTOR POSITION



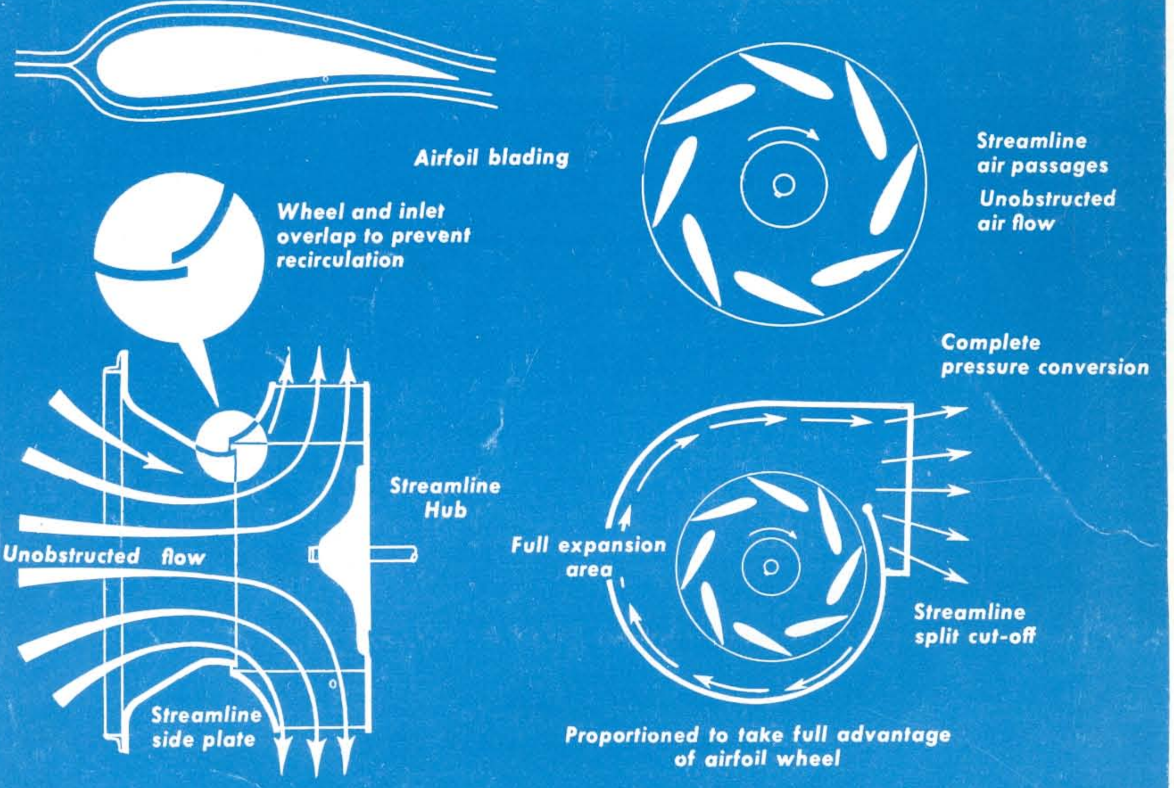
Location of motor is determined by facing the drive side of fan and designating the motor position by letters W, X, Y, or Z as the case may be.



TAHVIEH HAMOON

AIRFOIL FANS

WITH FULL FLOW STREAMLINING . . . .



TAHVIEH HAMOON

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