Energy Guide

Fan Efficiency Grades

FEG Ratings

GREENHECK
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BUILDING VALUE IN AIR.

July
2013

FEG Certified Fans

Model	Location		Mounting					Airflow				Application							Drive Type		Impeller Type			Performance	
	Outdoor	Indoor	Roof Curb	Base/Floor	Hanging	Wall	Ceiling Mounted	Exhaust	Supply	Reversible	Recirculate	General/Clean Air	Contaminated Air	Spark Resistant	Grease (UL 762)	Smoke Control (UL)	High Wind (150 mph)	High Temp (above 200°F)	Belt	Direct	Centrifugal	Propeller/Axial	Mixed Flow	Maximum Volume (cfm)	Maximum Static Pressure (in. wg)
UTILITY FANS																									
SFD	✓	✓		✓	✓			✓	✓			✓	✓				✓			✓	✓			2,600	2.5
SFB	✓	✓		✓	✓			✓	✓			✓	✓				✓		✓		✓			25,200	3.25
SWB	✓	✓		✓	✓			✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓			30,000	5
CENTRIFUGAL FANS																									
BISW	✓	✓		✓	✓			✓	✓			✓	✓	✓	✓	✓		✓	✓	✓	✓			220,000	22
BIDW	✓	✓		✓	✓			✓	✓			✓							✓		✓			360,000	14
AFSW	✓	✓		✓	✓			✓	✓			✓	✓	✓		✓		✓	✓		✓			190,000	14
AFDW	✓	✓		✓	✓			✓	✓			✓							✓		✓			380,000	14
PLENUM FANS																									
QEM		✓																	✓	✓				35,000	6.5
QEP		✓		✓	✓			✓	✓			✓							✓	✓	✓			210,000	12
HPA	✓	✓	✓	✓	✓			✓	✓			✓		✓		✓			✓		✓			21,000	10
MIXED FLOW FANS																									
QEI-L	✓	✓	✓	✓	✓			✓	✓			✓	✓	✓	✓	✓			✓				✓	115,000	8.5
QEI	✓	✓	✓	✓	✓			✓	✓			✓	✓	✓	✓	✓			✓				✓	115,000	8.5
QEID	✓	✓	✓	✓	✓			✓	✓			✓		✓		✓				✓			✓	83,000	9.5
TUBE AXIAL FANS																									
TDI	✓	✓	✓	✓	✓			✓	✓			✓		✓						✓		✓		53,000	1
TBI-CA	✓	✓	✓	✓	✓			✓	✓			✓		✓					✓			✓		95,000	3
TBI-FS	✓	✓	✓	✓	✓			✓	✓			✓				✓		✓	✓			✓		76,000	5.5
AX	✓	✓	✓	✓	✓	✓		✓	✓			✓		✓		✓				✓		✓		115,000	5
VANE AXIAL FANS																									
VAB	✓	✓	✓	✓	✓			✓	✓			✓		✓					✓			✓		140,000	8
VAD	✓	✓	✓	✓	✓			✓	✓			✓		✓						✓		✓		242,000	10

Fan Efficiency Grades

Introduction to Fan Efficiency Grades

Over the past few years we have seen more focus on energy efficiency and that trend will likely continue. One example of this is the development of a Fan Efficiency Grade (FEG) by AMCA as a result of a request from ASHRAE 90.1 to establish a minimum acceptable fan efficiency level.

Fan Efficiency

Fan efficiency is a measure of a fan's ability to convert mechanical shaft power (torque and shaft speed) into useful aerodynamic power (airflow and pressure). Expressed as a percentage, fan efficiency represents the fraction of the input power that is converted to output power. The actual efficiency can be calculated at any point on the fan curve by the following equations.

When the pressure considered is fan static pressure:

$$\text{Fan Static Efficiency} = \frac{\text{CFM x Ps}}{\text{6343 x BHP}}$$

When the pressure considered is fan total pressure:

$$\text{Fan Total Efficiency} = \frac{\text{CFM x Pt}}{\text{6343 x BHP}}$$

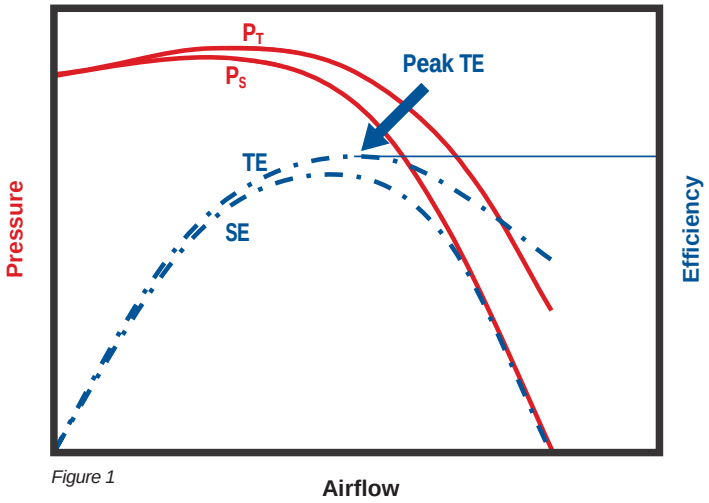

Figure 1

Fan efficiency varies with the point of operation on a fan curve and can be plotted as a function of airflow: Note that fan efficiency curves are not constant or even nearly constant. They rise up to a peak value, then drop off again. Every fan has a "sweet spot", where the efficiency is highest.

Fan Efficiency Grades

Fan efficiency grades, or FEGs, are a means of classifying fans based on the peak total efficiency on their fan curve. Since they are based on the peak value, FEGs represent the potential of the fan to be operated in an efficient manner. They can also be thought of as a measure of the aerodynamic quality of the fan. FEGs do not take into account the efficiency of the drive (belt drive) or the motor. They are intended to be used by regulatory codes as a simple means of establishing minimum fan efficiency.

Within a given fan model, larger fans are typically more efficient than smaller fans. This trend is recognized by the FEG grading system in that the efficiency requirements are lower for smaller fan diameters. In order to determine the FEG for a given fan size, the peak total efficiency on the fan curve is entered at the appropriate fan diameter. The FEG value can then be read off the chart:

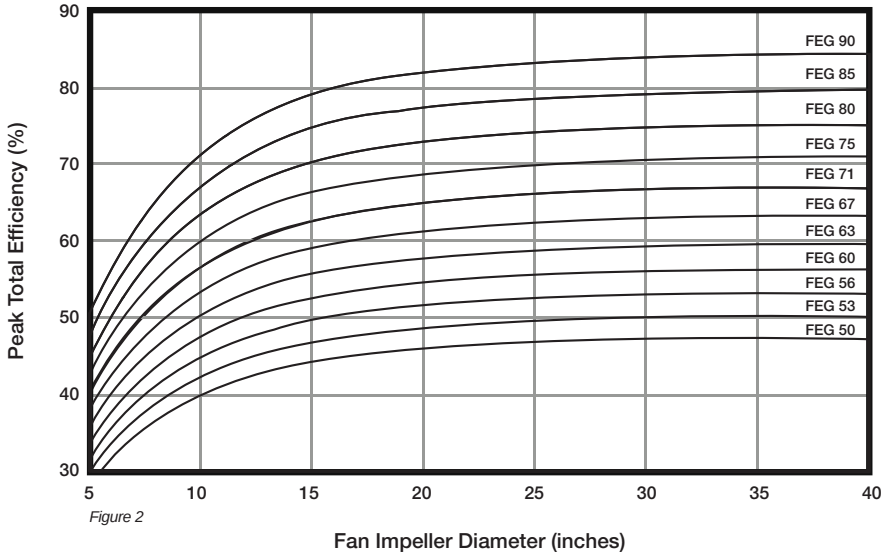

Figure 2

Due to the shape of the FEG curves, fans with a given construction level will generally have the same or nearly the same FEG values. For example, airfoil centrifugal fans of a given model might all be FEG85, while a line of forward curve blowers could all fall within FEG63 and FEG67. Fans with peak efficiencies that fall below the FEG50 grade are not classified.

Given the peak total efficiency and the impeller diameter, the FEG rating can be determined. For example, a fan with a 22 inch diameter fan wheel with a peak total efficiency of 74% would have and FEG80 rating.

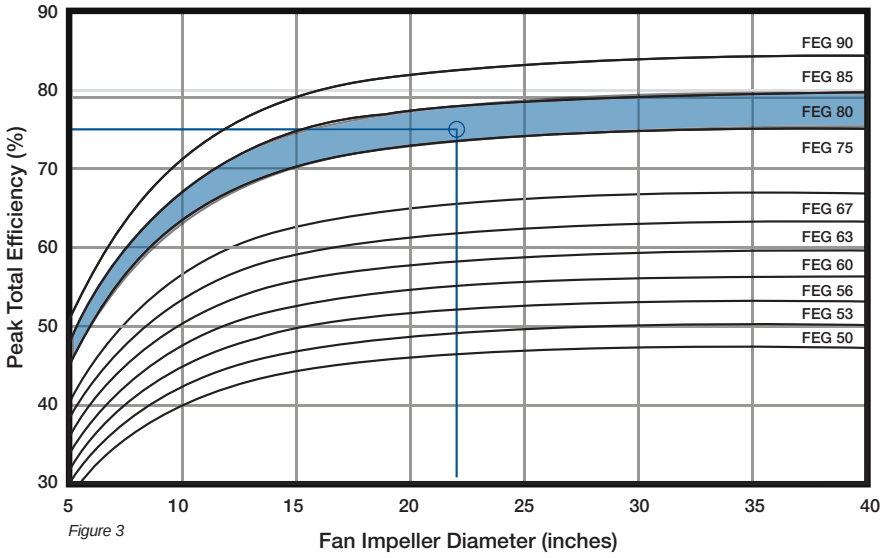

Figure 3

FEGs and Fan Selection

Energy codes such as ASHRAE 90.1 may establish minimum FEG values for certain fan applications. These minimum values represent baseline levels. Fans with FEGs below established levels cannot be considered for these applications.

However, *FEGs should not be used as a substitute for power during the selection process.* There are many situations where a fan with a higher FEG value will actually require more power than a fan with a lower FEG.

And within a given model, even though all sizes may have the same FEG value, the power required will vary significantly from size to size. This is due to two reasons. First, the FEG value is based on the peak efficiency on the fan curve. The actual efficiency can drop significantly on either side of this peak. The power consumed by the fan is a result of the actual efficiency at the point of operation, not the peak efficiency. Regulatory codes have recognized this shortcoming by requiring fan selections to fall within a certain range of the peak efficiency on the fan curve, but this range can be quite large.

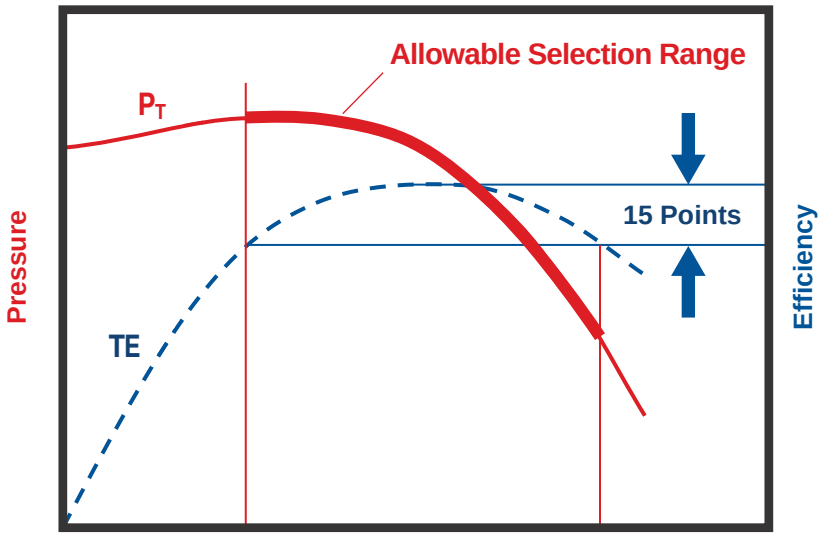

Figure 4

Second, FEGs are based on total efficiency, which is based on total pressure, not static efficiency, which is based on static pressure (see the equations on page 3). With ducted fans, the velocity pressure component of the total pressure overcomes duct losses, and therefore total efficiency is an appropriate measure of fan efficiency. Higher total efficiency will result in a lower consumed power. In contrast, fans with a non-ducted outlet lose the velocity pressure component, and therefore their higher FEGs will not necessarily have lower operating power.

Since FEGs are based on the peak total efficiency on the fan curve, they ***represent the potential*** of the fan to be operated efficiently. However, when it comes to the fan selection process, *FEGs are not a good indicator of the actual power absorbed by a fan.* Instead of FEGs, one should look directly at the fan input power (Bhp).

CAPS

As the leading industry fan selection tool, CAPS allows users to directly compare multiple fan selections for a given operating point. Potential fan selections can be sorted based on any criteria, including actual operating power. Using CAPS data, a simple payback analysis can be used to compare higher first cost with annual operating costs. First cost should ideally include all installed costs to the owner, including installation and wiring costs. But when fans are run for a significant portion of the day, the increased cost of a more efficient fan selection can often pay for itself within the first year.

Selection Using Total Pressure

A ducted application is shown using a belt driven vane axial fan selected for 30,000 cfm at 4.0 inches Total Pressure.

Fan Size	Fan RPM	Operating Power (Bhp)	Total Efficiency (%)	Motor Size (hp)	Inlet LwA	FEG Value	Annual Operating Cost	Total Installed Cost
VAB-30F14	2556	30.87	61	40	117	71	$12,104	$14,700
VAB-36F17	1926	26.35	72	30	111	75	$10,332	$16,300
VAB-42F21	1448	25.39	74	30	106	75	$ 9,955	$18,100
VAB-48F26	1133	27.67	68	30	107	75	$10,849	$21,400
VAB-54F30	1025	29.34	71	30	109	75	$11,504	$23,250

The operating cost is based on the fan operating 12 hours per day, 365 days per year, with an electricity rate of $0.12 per kW-Hr. If the most efficient fan, the VAB-42F21, was compared with the least expensive fan, the VAB-30F14, the payback is less than 2 years:

	VAB-30F14	VAB-42F21
Total Installed Cost	$14,700	$18,100
Annual Energy Cost	$12,104	$9,955

Payback = ($18,100 - $14,700) / ($12,104 - $9,955) = 1.6 years

Selection Using Static Pressure

For a fan that discharges into an open space without a duct, static pressure is always used to compare fan selections. In the next example, a sidewall prop fan is required to deliver 40,000 cfm at 0.125 inches of Static Pressure. In this case, the Total Efficiency is also calculated for each fan:

Fan Size	Fan RPM	Ps	Operating Power (Bhp)	Static Efficiency	Total Efficiency	Peak Total Efficiency	Inlet LwA	FEG	Annual Operating Cost	Total Installed Cost
SBE-3L48	638	0.13	6.91	11%	66%	67%	92	71	$2,709	$3,520
SBE-3L54	488	0.13	5.81	14%	54%	55%	92	56	$2,278	$3,940
SBE-3L60	346	0.13	3.93	20%	58%	59%	85	60	$1,540	$4,340
SBE-3L72	260	0.13	2.63	30%	60%	60%	82	63	$1,031	$5,920

Note that the smaller 48 inch fan requires more than 2.5 times the Bhp than the larger 72 inch fan, yet the Total Efficiency is higher! The total efficiency is “taking credit” for a high velocity pressure at the fan outlet that is lost (wasted) as soon as it leaves the fan. For this reason, Total Efficiency and FEGs are a poor indicator of the power required by the fan. Static Efficiency is directly related to the operating power. In addition to being the most efficient and quietest fan, the 72 inch fan will pay for itself in 1.4 years:

	SBE-3L48	SBE-3L72
Total Installed Cost	$3,520	$5,920
Annual Energy Cost	$2,709	$1,031

Payback = ($5,920 - $3,520) / ($2,709 - $1,031) = 1.4 years

Additional Steps to Reducing Energy Usage

Minimize the system pressure requirements: System pressure is the most important factor in determining fan energy consumption. Fan power consumed is directly proportional to system pressure requirements. Any effort invested in reducing system pressure will pay for itself many times over. Use components and installation practices that minimize pressure losses – bell mouth or tapered duct entrances, low duct velocities, gradual contractions and expansions within the duct, turning vanes in elbows, low pressure drop filters and coils, etc. When balancing systems, use a reduced fan speed instead of balancing dampers.

ASHRAE 90.1 "Energy Standard for Buildings except Residential" includes fan power limits expressed in Bhp per CFM. These limits can only be met when system static pressures are kept to a minimum.

Use variable volume whenever possible: VAV systems are used in most building HVAC systems. Significant fan energy reduction can be realized with reduced air volume at partial loads. Modern variable speed drives can pay for themselves quickly with fan energy savings.

An important consideration in VAV systems is the static pressure setpoint. Locate the pressure measurement as far from the fan as possible to keep the setpoint pressure as low as possible. Use static pressure setpoint reset controls to minimize the fan speed and maximize the benefit of the VAV system at reduced airflow.

Simple controls for VAV systems are available from Greenheck. See Vari-Green Controls brochure for more information.

Specify efficient fan designs: Scrolled centrifugal fans are more efficient than unhoused or inline centrifugal fans. Airfoil or backward curved centrifugal wheels are much more efficient than forward curve wheels. Mixed flow fans are more efficient and quieter than most other inline fans. Cast aluminum props have more efficient blade designs that consume less energy than single thickness propeller blades.

Fan Efficiency Grades provide a measure of peak fan efficiency for a given fan design. Values are published for various fan models on pages 8-15.

Use direct driven fans whenever possible: The frictional losses in belt drives vary with the hp, speed, and type of drive, but they can always be eliminated with direct driven fans. Direct drive fans also have the added benefit of reduced maintenance.

Small, low horsepower fans will achieve substantial energy savings using direct drive. This is especially true with single phase motors. See Greenheck Vari-Green motor brochure for more information.

Fans with motors up to 15-25 hp are prime candidates for direct drive. Most three phase motors can be operated with VSD's up to 90 hz. CAPS will guide you through these selections at non-synchronous speeds. The VSD can then be used instead of dampers for final system balancing! The direct drive advantage is reduced when the fan size gets large, especially when expensive 8 pole motors are required.

Make an efficient fan selection: Use total pressure and total efficiency for ducted fan selections. Use static pressure and static efficiency for selection of fans with no outlet duct. Pay attention to the location of operating point on the fan curve remembering that all fan curves will have a maximum efficiency point, with reduced efficiency on either side of this peak. Always consider a larger fan size and calculate the payback for this investment.

Efficient fan selections also have acoustical benefits since higher efficiency operation generally means lower sound levels.

Use energy recovery equipment: Energy recovery ventilators utilize the energy contained in exhausted air to precondition the incoming outdoor ventilation air. They can transfer energy associated with sensible and latent heat between airstreams. Energy recovery systems can reduce the cost of meeting ASHRAE 62 ventilation rates and can reduce the load on other HVAC components. See the Greenheck Energy Recovery Application Manual for more information.

Avoid unnecessary system effects: System effects are installed inlet or outlet conditions that adversely affect fan performance. They result in pressure losses that continue to consume energy for the life of the fan. As an example, an elbow installed the wrong way on a fan outlet can result in pressure losses twice that normally expected from the elbow. System effects should be avoided whenever possible to help conserve energy. See Greenheck Product Application Guide FA/101-99 or AMCA publication 201 for more information.

FEG Rated Products

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Mixed Flow Fans

Mixed flow fans are an excellent choice for inline ventilation applications. This fan design combines the best axial and centrifugal properties: high fan efficiency, low sound levels, and a smooth, steep fan curve for stable fan selections. Mixed flow fans can be mounted in any position from horizontal to vertical and their compact design allows for installations in space limited areas.

Models QEI/QEID

Models QEI/QEID include the universal mounting system for motor position changes in the field. Fans have slip-fit collars for quick and easy connection to ductwork. Typical applications include ventilation of office buildings, concert halls, parking garages, educational facilities, libraries, and dormitories. Air handling quality bearings with $L_{(10)}$ life in excess of 80,000 hours (equivalent to an average life of 400,000 hours) (QEI) and vibration test of complete assembly at the factory prior to shipment. Capacities range from 500 to 115,000 cfm (850 to 195,386 m^3/hr) and 8.5 in. wg (2,108 Pa). AMCA Licensed for Sound (inlet and outlet) and Air Performance.

Catalog: *Mixed Flow Fans — QEI (belt drive)/QEID (direct drive)*

MODEL SIZE	MODEL QEI		
	QE-L	QEI I	QEI II
	FEG Rating		
9			60
12	75	75	71
15	75	75	71
16	71	71	71
18	75	75	75
20	75	75	75
22	75	75	80
24	75	75	80
27	80	80	80
30	80	80	80
33	80	80	80
36	80	80	80
40	80	80	80
44	80	80	80
49	80	80	80
54	80	80	80
60	80	80	80

Greenheck Fan Corporation certifies that the model QEI-L, QEI-I/II and QEID shown herein are licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and AMCA Publication 311 and comply with the requirements of the AMCA Certified Ratings Program.

MODEL QEID (Direct Drive shown by Percent Wheel Width)											
MODEL SIZE	50	55	60	65	70	75	80	85	90	95	100
	FEG Rating										
12	56	56	56	56	60	60	63	63	63	67	67
15	67	67	71	71	71	71	75	75	75	75	75
16	67	67	67	71	71	71	71	71	71	75	75
18	67	67	67	67	71	71	71	71	71	71	71
20	63	67	67	67	71	71	71	71	71	71	71
22	67	71	71	71	71	71	75	75	71	75	75
24	67	67	71	71	71	71	75	71	71	75	75
27	67	67	71	71	71	71	71	71	71	75	75
30	67	67	71	71	71	71	71	71	71	75	75
33	71	71	71	75	75	75	75	75	75	75	75
36	71	71	71	75	75	75	75	75	75	75	75
40	71	71	71	75	75	75	75	75	75	75	75
44	71	71	71	75	75	75	75	75	75	75	75
49	71	71	71	75	75	75	75	75	75	75	75
54	71	71	71	75	75	75	75	75	75	75	75

Greenheck Fan Corporation certifies that the model QEI-L, QEI-I/II and QEID shown herein are licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and AMCA Publication 311 and comply with the requirements of the AMCA Certified Ratings Program.

Tube Axial Fans

Axial inline fans are designed for ducted indoor or outdoor applications. They are available in both direct drive and belt drive and with cast aluminum or fabricated steel propellers.

Inline or Roof Upblast: Models TDI/TBI-CA

Models TDI/TBI-CA axial fans feature a cast aluminum hub and airfoil blades. The universal mounting system allows for vertical or horizontal installations. Typical applications include clean air, fume exhaust, and spark-resistant construction. Capacities range from 800 to 95,000 cfm (1,359 to 161,406 m^3/hr) and 3.25 in. wg (806 Pa). AMCA Licensed for Air Performance.

Catalogs: Tube Axial Inline Fans — TDI &TBI-CA Level 3

Inline or Roof Upblast: Models TBI-FS

Model TBI-FS has a fabricated steel hub and airfoil blades. It is suitable for continuous high temperature (400ºF/204ºC max.) for inline configurations, (500ºF/260ºC max.) for roof upblast configuration and is available with UL Power Ventilators for Smoke Control Systems. The universal mounting system accommodates any vertical or horizontal installation configuration. Typical applications involve clean air, industrial processes, and high-temperature exhaust. Capacities range from 3,300 to 76,000 cfm (5,607 to 129,124 m^3/hr) for inline configurations [5,500 to 74,000 cfm (9,345 to 125,727 m^3/hr) for roof upblast configurations] and 3.5 in. wg (868 Pa). Bolt-on straightening vanes are available for increased efficiency. AMCA Licensed for Sound and Air Performance.

Catalog: Medium Pressure Axial Fans — TBI-FS Levels 3, 4 & 5

MODEL TDI LEVEL 3 Direct Drive Cast Aluminum Hub			
FAN DIA.	FEG RATING		
	3 Blade	4 Blade	6 Blade
18	85	75	71
20	80	75	75
24	75	75	75
30	75	75	75
36	71	71	71
42	75	75	75
48	75	75	71

Greenheck Fan Corporation certifies that the models TDI and TBI-CA tube axial inline fans shown herein are licensed to bear the AMCA seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and comply with the requirements of the AMCA Certified Ratings Program.

MODEL TBI-CA Belt Drive Cast Aluminum Hub		
Fan Dia.	SIZE	FEG Rating
18	3L18	–
	3M18	50
	3H18	60
20	3H20	67
24	3H24	67
30	3H30	71
36	3H36	71
42	3H42	63
48	3H48	63
54	3H54	63
60	3H60	63

Greenheck Fan Corporation certifies that the models TDI and TBI-CA tube axial inline fans shown herein are licensed to bear the AMCA seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and comply with the requirements of the AMCA Certified Ratings Program.

MODEL TBI-FS Belt Drive Fabricated Steel Hub								
FAN DIA.	LEVEL 3				LEVEL 4			
	SIZE	FEG Rating	SIZE	FEG Rating	SIZE	FEG Rating	SIZE	FEG Rating
24	3L24	63	3H24	67	4L24	63	4H24	50
30	3L30	63	3H30	60	4L30	56	4H30	50
36	3L36	63	3H36	67	4L36	63	4H36	53
42	3L42	67	3H42	67	4L42	67	4H42	53
48	3L48	60	3H48	67	4L48	63	4H48	50
54	3L54	67	3H54	67	4L54	63	4H54	53

Greenheck certifies that the model TBI-FS tube axial inline fans shown herein are licensed to bear the AMCA seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and Publication 311 and comply with the requirements of the AMCA Certified Ratings Program.

Tube Axial Fans

Inline or Roof Upblast: Model AX

Model AX features a cast aluminum hub and airfoil blades which have a manually adjustable blade pitch. The universal mounting system allows for vertical or horizontal installations. Typical applications include clean air and are available with UL Power Ventilators for Smoke Control Systems and UL 705. Bolt-on straightening vanes (AX-V) are available for increased efficiency. Capacities range from 500 to 150,000 cfm (850 to 254,852 m^3/hr) and 5.5 in. wg (1,364 Pa). AMCA Licensed for Air Performance.

Catalog: *High Performance Axial Fans — AX*

MODEL AX DIRECT DRIVE*									
Fan Dia	160 mm Hub			190 mm Hub			275 mm Hub		
	Size	4 Blade FEG Rating	6 Blade FEG Rating	Size	4 Blade FEG Rating	6 Blade FEG Rating	Size	6 Blade FEG Rating	9 Blade FEG Rating
12	31-160	71	63						
14	36-160	71	60						
16	41-160	75	71	41-190	67	63			
18	47-160	75	71	47-190	67	67			
21	54-160	80	80	54-190	71	71	54-275	63	60
24	63-160	80	80	63-190	71	71	63-275	67	63
28				72-190	75	71	72-275	71	71
32				80-190	75	75	80-275	75	71
36							90-275	80	75
40							103-275	80	80
44							113-275	80	80

Greenheck certifies that the model AX fans shown herein are licensed to bear the AMCA seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and comply with the requirements of the AMCA Certified Ratings Program.

MODEL AX DIRECT DRIVE*						
Fan Dia	400 mm Hub			533 mm Hub		
	Size	6 Blade FEG Rating	9 Blade FEG Rating	Size	8 Blade FEG Rating	12 Blade FEG Rating
32	80-400	60	56			
36	90-400	67	67			
40	103-400	71	71			
44	113-400	75	71	113-533	63	60
48	123-400	75	71	123-533	67	67
54	140-400	71	71	140-533	71	67
63	160-400	75	75	160-533	75	71

*FEG values for direct drive adjustable pitch props are determined by the most efficient blade pitch.

Vane Axial Fans

Axial inline fans are designed for ducted indoor or outdoor applications. They are available in both direct drive and belt drive and with cast aluminum or fabricated steel propellers.

Model VAB

Model VAB belt drive vane axial fans accommodate for final system balancing and have a manually adjustable blade pitch. These fans are an excellent choice for variable air volume HVAC systems, clean rooms, parking garage exhaust, and tunnel ventilation. For sound critical applications, belt drive vane axial fans are available with Greenheck's sound trap housing. UL/cUL 705 for electrical is available. A complete vibration test of all fans are performed prior to shipment. Capacities range from 2,000 to 125,000 cfm (3,398 to 212,376 m^3/hr) and 9 in. wg (2,232 Pa). AMCA Licensed for Air Performance.

Model VAD

Model VAD is a direct drive vane axial fan designed for commercial and industrial applications where large volumes of air are required at moderate to high pressures. Direct drive vane axial fans have a manually adjustable blade pitch and require minimal maintenance. These fans are an excellent choice for variable air volume HVAC systems, clean rooms, parking garage exhaust, and tunnel ventilation. For sound critical applications, direct drive vane axial fans are available with Greenheck's sound trap housing. UL/cUL 705 for electrical is available. A complete vibration test of all fans are performed prior to shipment. Capacities range from 1,200 to 200,000 cfm (2,039 to 339,802 m^3/hr) and 12 in. wg (2,976 Pa). AMCA Licensed for Air Performance.

Catalog: *Vane Axial Fans — VAB and VAD*

MODEL VAB BELT DRIVE

Fan Dia	14 in. Hub		17 in. Hub		21 in. Hub		26 in. Hub		30 in. Hub	
	Size	FEG Rating	Size	FEG Rating	Size	FEG Rating	Size	FEG Rating	Size	FEG Rating
18	18F14	63								
20	20F14	67								
24	24F14	80	24F17	67						
30	30F14	71	30F17	71	30F21	67				
36	36F14	75	36F17	75	36F21	71	36F26	67		
42			42F17	75	42F21	75	42F26	71		
48					48F21	75	48F26	75	48F30	75
54					54F21	75	54F26	75	54F30	75
60							60F26	71	60F30	71
66							66F26	71	66F30	75
72							72F26	75	72F30	75

Greenheck certifies that the model VAB and VAD fans shown herein are licensed to bear the AMCA seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and comply with the requirements of the AMCA Certified Ratings Program.

MODEL VAD DIRECT DRIVE*

Fan Dia	Half Bladed Hub		14 in. Hub		17 in. Hub		21 in. Hub		26 in. Hub		30 in. Hub	
18	18H14	63	18F14	71								
20	20H14	75	20F14	75								
24	24H14	80	24F14	80	24F17	75						
30	30H14	80	30F14	80	30F17	75	30F21	75				
36	36H14	85	36F14	85	36F17	85	36F21	80	36F26	71		
42	42H17	85			42F17	85	42F21	85	42F26	75		
48	48H21	85					48F21	85	48F26	80	48F30	80
54	54H21	80					54F21	80	54F26	80	54F30	80
60	60H26	80							60F26	80	60F30	80
66	66H26	75							66F26	80	72F30	80
72	72H26	80							72F26	85	66F30	85

*FEG values for direct drive adjustable pitch props are determined by the most efficient blade pitch.

Utility Centrifugal Fans

The utility fans include both direct and belt-driven fans. They are self-contained units consisting of the fan, motor, and drive for a variety of commercial and light industrial applications.

Models SFD/SFB

Model SFD (direct drive) and SFB (belt drive) feature quiet and efficient forward-curved wheels. These fans are suitable for ducted exhaust, supply, and return-air applications with clean air. Capacities range from 400 to 25,000 cfm (680 to 42,475 m^3/hr) and 3.25 in. wg (806 Pa). Third-party certified (Florida Products and Miami-Dade Approved) for high wind and AMCA Licensed for Air Performance.

Catalog: Centrifugal Utility Fans — SFD and SFB

Model SWB

Model SWB is a belt-driven fan and features a backward-inclined centrifugal wheel. This fan is suitable for ducted exhaust, supply, and return-air applications. Typical applications include commercial kitchens, fume hoods, and emergency smoke control installations. Available in galvanized, aluminum, or painted construction. Capacities range from 70 to 27,000 cfm (119 to 45,873 m^3/hr) and 5.0 in. wg (1,240 Pa). Third-party certified (Florida Products and Miami-Dade Approved) for high wind and AMCA Licensed for Air Performance.

Catalog: Centrifugal Utility Fans — SWB

MODEL SFB	
MODEL SIZE	FEG Rating
9	67
10	71
12	71
15	67
18	67
20	67
22	71
25	67
27	71
30	67

MODEL SFD	
MODEL SIZE	FEG Rating
6	–
7.5	75
9	71
10	60

MODEL SWB 100	
MODEL SIZE	FEG Rating
106	–
107	–
108	53
110	75
113	75
115	75
116	75
118	75
120	71
124	75
130	75
136	71

MODEL SWB 200	
MODEL SIZE	FEG Rating
206	–
207	–
208	63
210	80
212	80
213	80
215	80
216	75
218	75
220	75
222	75
224	80

MODEL SWB 300	
MODEL SIZE	FEG Rating
327	85
330	85
333	85
336	85
340	85
344	85
349	85

Greenheck Fan Corporation certifies that the model SFD, SFB and SWB, fans shown herein are licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and comply with the requirements of the AMCA Certified Ratings Program.

MODEL SWB 300 AF	
MODEL SIZE	FEG Rating
327	85
330	85
333	90
336	90
340	90
344	90
349	90

Greenheck Fan Corporation certifies that the model SWB Series 300 AF, fans shown herein are licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and AMCA Publication 311 and comply with the requirements of the AMCA Certified Ratings Program.

Industrial Centrifugal Fans

Airfoil (AF) and backward-inclined (BI) centrifugal fans are designed for commercial and industrial applications for exhaust air, supply air, filtration, heating, air conditioning, and industrial process applications. Airfoil centrifugal wheels have the advantage of higher operating efficiencies. Greenheck's centrifugal fans come in two construction options. Series 21 fans offer Greenheck's Permalock™ seam on housing sizes 7-49 for applications up to 8.5 in. wg (2117 Pa). Series 41 fans are manufactured with heavy-gauge, edge-to-edge, welded housing construction for pressures up to 20 in. wg (4981 Pa). All AF and BI model fans use air handling quality bearings, are tested with a complete three-plane vibration test prior to shipment and are AMCA Licensed for Sound and Air Performance.

Single-Width Models BISW/AFSW

Models BISW/AFSW operates in a broad range of fan applications, typically in ducted systems. Versatile construction options allow use in environments which require spark resistance, high temperature tolerance, or resistance to corrosive elements. OPTIONS: Spark-resistant construction, UL 705 Power Ventilators Listing, UL 762 Grease Listing, UL Power Ventilators for Smoke Control Systems Listing. Capacities range from 100 to 190,000 cfm (170 to 322,812 m^3/hr) and 20 in. wg (5,000 Pa).

Catalog: Centrifugal Fans — Series 21 & 41
Centrifugal Fan Performance Supplement — Single-Width

Double-Width Models BIDW/AFDW

Models BIDW/AFDW operate in non-ducted inlet applications, primarily handling clean air below 200ºF. Higher volume capacities allow for a more compact system design than with single-width fans. Air handling quality bearings with L_{10} life in excess of 80,000 hours (equivalent to an average life of 400,000 hours). Each fan is three-plane vibration tested prior to shipment. OPTIONS: UL 705 Power Ventilators Listing. Capacities range from 1,000 to 350,000 cfm (1,699 to 594,654 m^3/hr) and 15 in. wg (3,720 Pa).

Catalog: Centrifugal Fans — Series 21 & 41
Centrifugal Fan Performance Supplement — Double-Width

MODEL 21/41 CENTRIFUGAL FANS				
MODEL SIZE	AFSW	BISW	AFDW	BIDW
	FEG Rating			
7		-		
8		50		
9		60		
10		71		
12		75		85
13		75		85
15		71		80
16		71		80
18	85	80	80	80
20	85	80	75	80
22	85	80	75	80
24	85	80	80	75
27	85	80	80	75
30	85	80	85	75
33	85	80	85	75
36	85	80	85	75
40	90	85	85	75
44	90	85	85	75
49	90	85	85	75
54	90	85	85	75
60	90	85	85	75
66	90	85	85	75
73	90	85	85	75

Greenheck Fan Corporation certifies that the BISW, BIDW, AFSW, AFDW shown herein are licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and Publication 311 and comply with the requirements of the AMCA Certified Ratings Program.

Plenum Fans

Plenum fans are designed for air handling applications where the fan operates unhoused within a pressurized plenum. Plenum fans are designed to be compact in size, have the flexibility to supply multiple air take offs and are economically priced. Quiet and efficient operation is achieved through a 12-bladed, airfoil wheel that helps reduce low frequency tones.

Model QEM

Model QEM utilizes a galvanized framework for light and medium duty applications at a more cost-effective price point than the QEP. QEM units are available in belt and direct drive with a simplified selection of accessories. Capacities range from 1,000 to 30,000 cfm (1,699 to 50,970 m^3/hr) and 5 in. wg (1,240 Pa).

Model QEP

Model QEP plenum fans are designed and engineered for medium and heavier duty applications with a fully welded and painted configuration. The QEP is available in both belt and direct drive and offers numerous accessories to complement your project. Capacities range from 700 to 200,000 cfm (1,189 to 339,802 m^3/hr) and 12 in. wg (2,976 Pa).

Catalog: Plenum Fans — QEM and QEP

MODEL QEM & QEP		
MODEL SIZE	QEM	QEP
	FEG Rating	
12	80	80
15	80	80
16	80	80
18	80	80
20	80	80
22	80	80
24	80	80
27	80	80
30	80	80
33	80	80
36	80	80
40		80
44		80
49		80
54		80
60		80
66		80
73		80

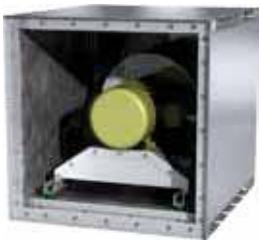
Greenheck Fan Corporation certifies that the Model QEM and QEP plenum fans shown herein are licensed to bear the AMCA seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and Publication 311 and comply with the requirements of the AMCA Certified Ratings Program.

Housed Plenum Fans

Greenheck's housed plenum fan, model HPA, is designed and engineered to provide superior performance and reliability in commercial or industrial applications. The HPA can be used as a single fan in a sound critical application or in parallel to construct a fan array system. The HPA features a modular design with a structural housing that allows multiple modules to stack side-by-side and on top of one another to form an array.

Model HPA

Model HPA housed plenum fans provide high efficiency while maintaining a compact size and low sound power levels. Utilizing a galvanized framework with integral isolation, the HPA uses a high efficiency/low sound 12-blade wheel with a sound attenuating housing to further reduce sound power levels. HPA fans can be easily stacked together in parallel as a fan array offering 100% redundancy. HPA fans are available in 10 sizes (15-36). Capacities range from 700 to 50,000 cfm (1189 to 84,950 m^3/hr) and 10 in. wg (2,491 Pa).



Catalog: *Plenum Fans — HPA*

MODEL HPA			
MODEL SIZE	FEG Rating		
Housing	C	S	L
15	67	71	71
16	67	71	71
18	67	71	71
20	67	71	71
22	67	71	71
24	71	75	75
27	71	75	75
30	71	75	75
33	71	75	75
36	71	75	75

Greenheck Fan Corporation certifies that the model HPA shown herein is licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and AMCA Publication 311 and comply with the requirements of the AMCA Certified Ratings Program.

Keys to Energy Efficiency

- *Minimize the system pressure requirements*
- *Use variable volume whenever possible*
- *Specify efficient fan designs*
- *Use direct-driven fans whenever possible*
- *Make an efficient fan selection*
- *Use energy recovery equipment*
- *Avoid unnecessary system effect*









Building Value in Air

Greenheck delivers value to mechanical engineers by helping them solve virtually any air quality challenges their clients face with a comprehensive selection of top quality, innovative air-related equipment. We offer extra value to contractors by providing easy-to-install, competitively priced, reliable products that arrive on time. And building owners and occupants value the energy efficiency, low maintenance and quiet dependable operation they experience long after the construction project ends.

Our Commitment

As a result of our commitment to continuous improvement, Greenheck reserves the right to change specifications without notice.

Specific Greenheck product warranties are located on greenheck.com within the product area tabs and in the Library under Warranties.

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