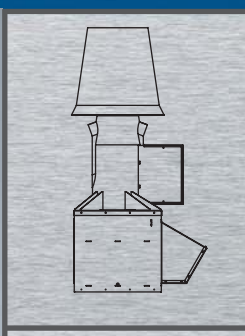
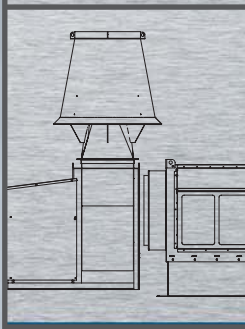
Laboratory Exhaust Systems

Vektor™-MD · Vektor™-CD

High Plume Dilution













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Building Value in Air.

July
2008

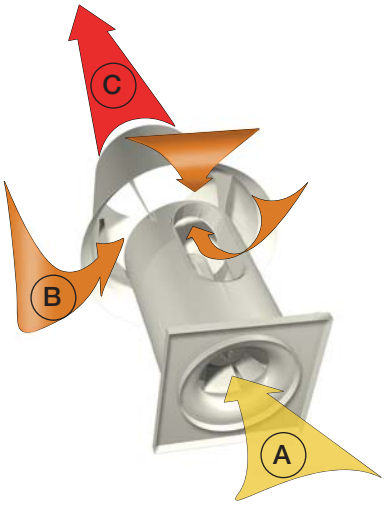
High Plume Dilution Laboratory Exhaust System - Vektor

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The Greenheck Vektor™ High Plume Dilution Blower (patent pending) employs a unique discharge nozzle design that entrains additional ambient air, diluting the exhaust effluent from the laboratory, which reduces exhaust contaminant concentration. More important, the addition of the ambient air increases the Vektor's discharge windband mass flow and velocity, resulting in greater nozzle discharge momentum, displacing the diluted effluent high above the roof.

How Vektor Technology Works...

Laboratory exhaust is drawn into the Vektor fan (A). The exhaust is discharged into the Vektor multi-stage induction nozzle and ambient dilution air is induced into the Vektor nozzle (B). The laboratory exhaust plus induced dilution air is discharged at high velocity to atmosphere (C).





FLEXIBLE ARRANGEMENTS = EASE OF APPLICATION

Greenheck Vektor Lab Exhaust systems are available in an inline arrangement utilizing mixed flow impeller (Vektor-MD) technology, as well as side inlet centrifugal arrangement utilizing a centrifugal impeller (Vektor-CD). Both Vektor arrangements are available in belt as well as direct drive.

Greenheck has the most extensive line of laboratory exhaust systems.



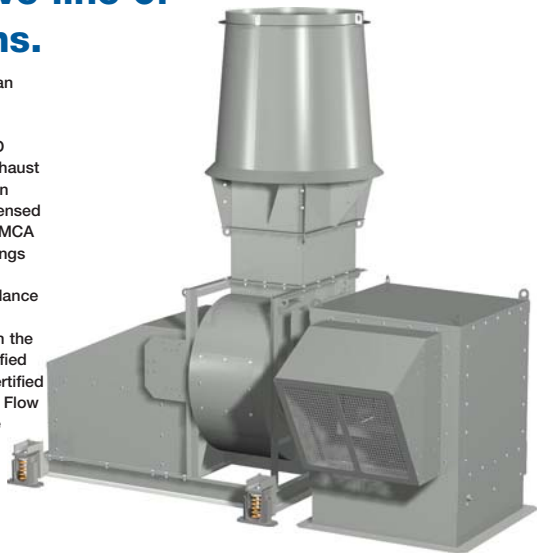
Vektor-MD Inline Mixed Flow

Greenheck Fan Corporation certifies that the Vektor-MD laboratory exhaust fan models 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. The AMCA Certified Ratings Seal applies to air performance only.

Greenheck Fan Corporation certifies that the Vektor-CD laboratory exhaust models 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. The AMCA Certified Ratings Seal applies to Induced Flow Fan Air and Sound Performance (AMCA Standard 260).

Vektor-MD and Vektor-CD are listed for Electrical UL/cUL 705 –File no. 40001

c UL US LISTED



Vektor-CD Side Inlet Centrifugal

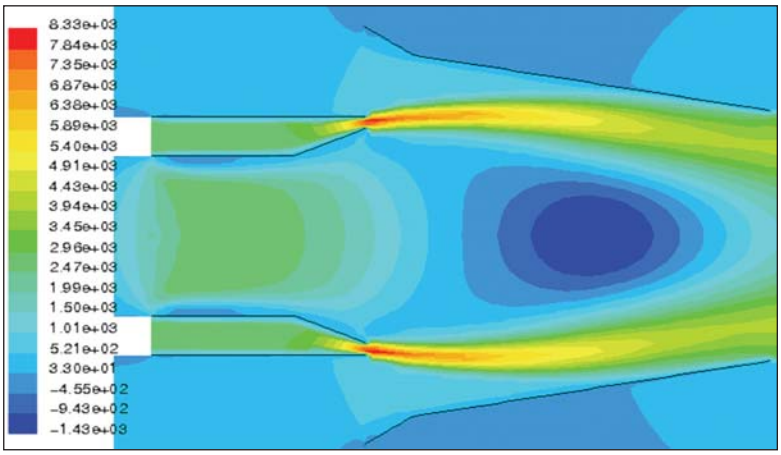
Why use the Greenheck Vektor Lab Exhaust System?

The main objective of a laboratory exhaust system is to remove hazardous or noxious fumes from a laboratory, dilute the fumes as much as possible and expel them from the lab building so that the fumes do not contaminate the roof area nor are re-entrained into the building makeup air system.

The Greenheck Vektor™ High Plume Dilution Blower is a self-contained laboratory exhaust system, which offers the following benefits:

- Significant plume rise without unsightly exhaust stacks that detract from buildings aesthetics
- Significant dilution of laboratory exhaust effluent, reducing levels of contaminant concentration
- Inline mixed flow or side inlet centrifugal arrangements
- Reliable belt or direct drive systems
- Efficient and quiet blower technology
- Unique “vacuum shaft seal” (Vektor-MD) insuring that hazardous or noxious fumes do not escape through the shaft opening (Patent Pending)
- AMCA class C or B spark resistant construction
- L_{10}-200,000 hour minimum life fan shaft bearings
- Premium high efficiency motor, standard
- Application to constant or variable volume exhaust systems
- Efficient discharge nozzle design
- LabCoat™ a two part corrosion resistant baked polyester resin coating with zinc rich epoxy primer
- Safe and easy maintenance
- Flow applications from 1,500 - 90,000 cfm @ up to 14 in. ESP per fan
- Multiple fan assemblies on a factory provided common plenum
- Meets ANSI Z9.5, UL 705, and ASHRAE lab design guidelines

The Vektor High Plume Dilution Laboratory Exhaust system is the result of state of the art computational fluid dynamics and testing analysis, combined with over a half century of Greenheck’s air movement engineering and manufacturing expertise.





No one tests and certifies performance like Greenheck!



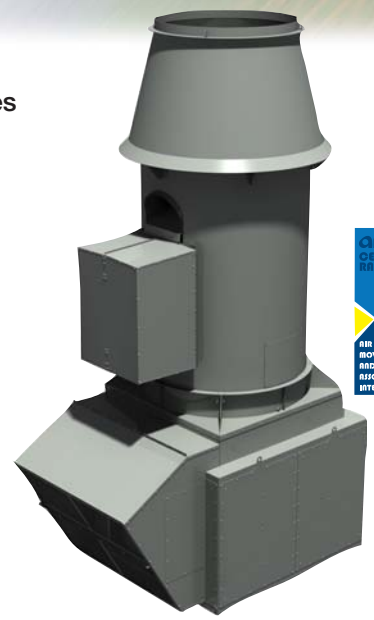




Vektor-MD Mixed Flow

Design Features

- Uses roof mounted inline blower to exhaust and dilute laboratory space
- Ideal for applications
  - Where roof space is limited (minimal footprint)
  - Demands high levels of exhaust at moderate to high static pressures
- Utilizes mixed flow impeller technology



Patent Pending

Benefits:

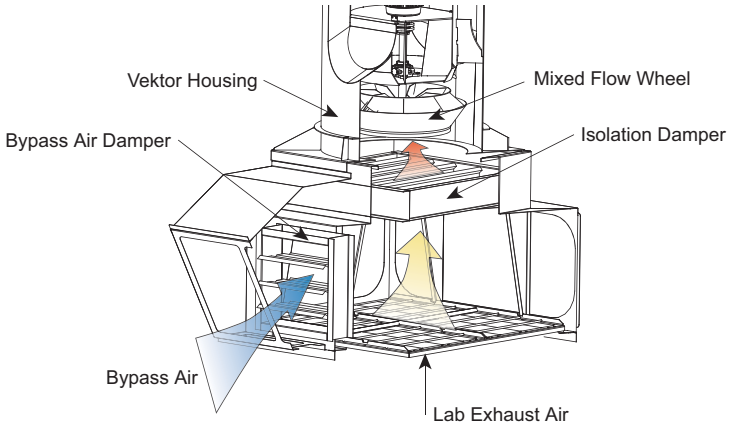
- Efficient operation for reduced energy consumption
- Lower overall sound levels - 5-20 dB less than inline centrifugal or axial exhaust fans

Construction:

- Heavy gauge, welded steel
- Available with AMCA spark C or B construction
- LabCoat™ electrostatically powder coated with corrosion resistant Hi-Pro Polyester with zinc rich epoxy primer – Dark Gray 041 (standard)
- Range of optional colors available
- Lifting lugs & guards manufactured with coated stainless or galvaneal steel

Bypass Air Plenums:

- Single or multiple VK-MD inline exhaust blowers
- Modular in design to easily adapt to different configurations
- Can be added to a system on retrofits
- Available in single or double wall construction
- Designed to handle windloads up to 125 mph without guy wires
- Bypass air and isolation dampers
  - Low leakage airfoil blades
  - LabCoat™ electrostatically powder coated with corrosion resistant Hi-Pro Polyester with zinc rich epoxy primer – Dark Gray 041 (standard)
  - Sized specifically for each application
  - Factory-mounted electric or pneumatic actuators available



Belt Drive



Features

- AMCA arrangement 9
- Provides safe, easy inspection and maintenance of fan drive components
- Housing is bifurcated with motor, belt drive and bearings located outside of contaminated airstream
- Replacement does not require removal of fan from the system or exposure to contaminated interior
- Sized for 200% of the motor horsepower
- Minimum of two drive belts
- Ability to adjust fan RPM to compensate for system static pressure variations (balancing) and future system performance requirements



Vektor-MD Mixed Flow

Direct Drive

Reliability without sacrificing maintenance safety

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Features



- AMCA arrangement 2
- Utilizes a unique design offering safe and easy motor replacement
- Utilizes a single ridged self-aligning coupling, connecting the motor shaft to the impeller shaft
- Allows maintenance personnel safe and easy method for motor removal, if required
- Motor bearings do not support the weight of fan impellers: Longer motor life

Abridged Performance of the Vektor-MD High Plume Dilution Exhaust Blower

Fan Size	Inlet CFM		Discharge CFM	Effective Plume Rise (h_e)
15	Max	6,000	15,600	51
	Min	3,000	4,500	24
16	Max	7,300	18,980	56
	Min	3,500	5,200	25
18	Max	8,500	22,100	58
	Min	4,300	6,500	29
20	Max	10,000	26,000	60
	Min	5,500	8,200	32
22	Max	13,000	31,200	66
	Min	7,000	9,800	33
24	Max	16,000	38,400	70
	Min	9,000	12,600	37
27	Max	19,000	45,600	78
	Min	10,000	13,800	39

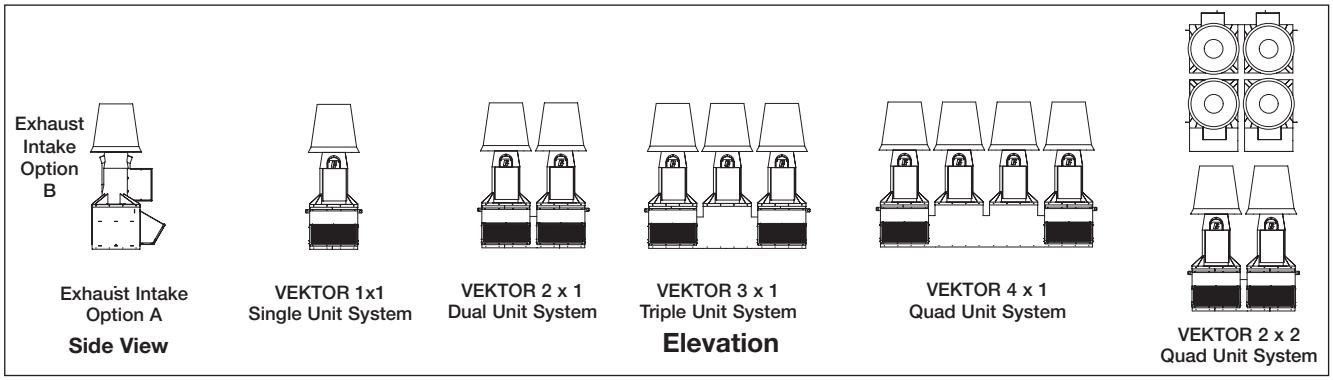
Fan Size	Inlet CFM		Discharge CFM	Effective Plume Rise (h_e)
30	Max	24,000	57,600	86
	Min	13,000	17,900	44
33	Max	29,000	63,800	91
	Min	16,000	20,500	45
36	Max	36,000	79,200	106
	Min	18,000	23,000	48
40	Max	43,000	94,600	115
	Min	22,000	28,200	52
44	Max	53,000	116,600	128
	Min	27,000	31,900	56
49	Max	65,000	130,000	137
	Min	33,000	38,900	63
54	Max	80,000	160,000	152
	Min	40,000	47,200	68

Performance certified is for installation type A: free inlet, free outlet. Performance ratings do not include the effects of appurtenances such as isolation dampers and bypass air plenums. Power rating (BHP) does not include transmission losses.

Notes:

- Minimum Inlet CFM based upon ANSI Z9.5, minimum discharge velocity of 3,000 fpm
- Plume rise calculation based upon 10 mph cross wind *(see back cover)*
- Maximum discharge CFM and plume rise shown is attainable using Greenheck's exclusive VNT™ (Variable Nozzle Technology)

Vektor-MD Arrangements



System Configuration

Detailed layout and dimensions, as well as specifications, are available for the Vektor-MD High Plume Exhaust system in various configurations.

Standard Options:

- Plenum
- Isolation Damper
- Bypass Air Damper
- Curb
- Disconnect
- Controls
- Double Wall Plenums
- Sure-Aire
- Jib Cranes

Vektor-CD Centrifugal

Design Features

- Utilize a roof mounted centrifugal blower to exhaust the laboratory space
- Ideal for applications
  - Requiring horizontal air intake
  - Systems with external static pressures in excess of 14 inches wg
- Uses backward curved flat blade and backward curved airfoil blade technology



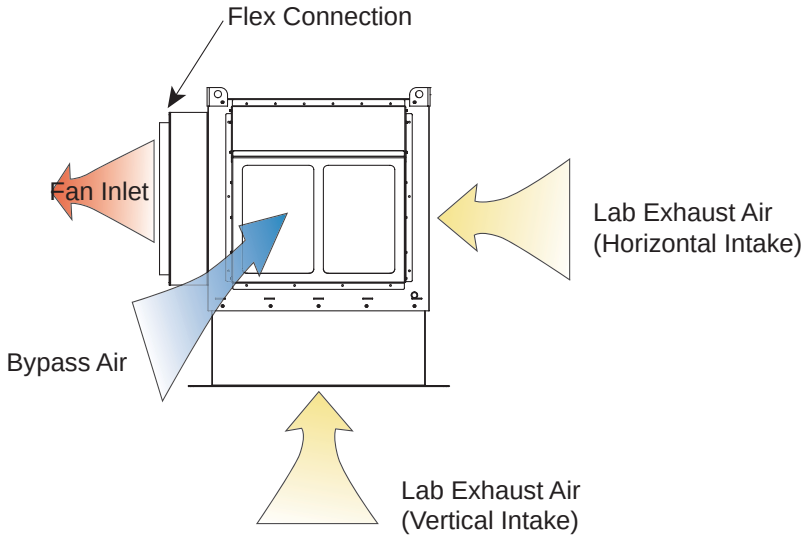
Patent Pending

Benefits:

- Efficient operation for reduced energy consumption
- Lower overall sound levels

Construction:

- Heavy gauge, welded steel
- Available with AMCA spark C or B construction
- LabCoat™ electrostatically powder coated with corrosion resistant Hi-Pro Polyester with zinc rich epoxy primer – Dark Gray 041 (standard)
- Range of optional colors available
- Lifting lugs & guards manufactured with coated stainless or galvaneal steel



Bypass Air Plenums:

- Single or multiple VK-CD centrifugal blowers
- Modular in design to easily adapt to different configurations
- Can be added to a system on retrofits
- Available in single or double wall construction
- Designed to handle windloads up to 125 mph without guy wires
- Bypass air and isolation dampers
  - Low leakage airfoil blades
  - LabCoat™ electrostatically powder coated with corrosion resistant Hi-Pro Polyester with zinc rich epoxy primer – Dark Gray 041 (standard)
  - Sized specifically for each application
  - Factory-mounted electric or pneumatic actuators available

Belt Drive Features

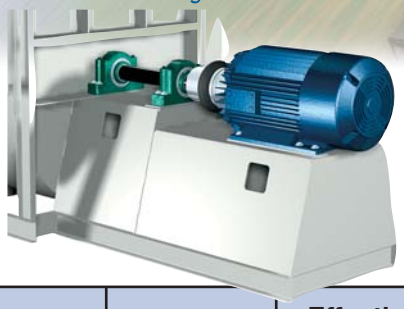
- AMCA modified arrangement 1
- Provides safe, easy inspection and maintenance of fan drive components
- Motor replacement does not require removal of fan from the system or exposure to contaminated interior
- Provides ability to compensate for system static pressure variations (balancing) and future system performance changes
- Sized for 200% of the motor horsepower
- Minimum of two drive belts
- Offers safe and easy motor replacement without accessing the contaminated interior



Vektor-CD Centrifugal

Direct Drive

- AMCA arrangement 8
- Utilizes a flexible coupling that connects the motor shaft to the impeller shaft
- Motor removal done without removing the fan and without contacting the contaminated airstream
- Motor bearings do not support the weight of fan impellers: Longer motor life

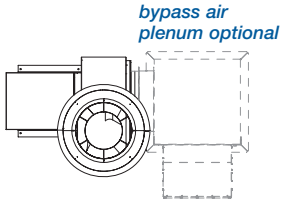


Fan Size	Inlet CFM		Discharge CFM	Effective Plume Rise (h_e)	Fan Size	Inlet CFM		Discharge CFM	Effective Plume Rise (h_e)
10	Max	1500	3000	23	30	Max	26000	52000	67
	Min	200	400	16		Min	7800	15600	43
12	Max	4400	8800	32	36	Max	38000	76000	78
	Min	1200	2400	22		Min	12000	24000	50
15	Max	6600	13200	37	40	Max	47000	94000	90
	Min	1700	3400	24		Min	15200	30400	60
16	Max	8000	16000	40	44	Max	57000	96900	88
	Min	2000	4000	25		Min	19000	32300	59
18	Max	9500	19000	46	49	Max	70000	119000	95
	Min	2750	5500	32		Min	25000	42500	65
20	Max	11500	23000	50	54	Max	80000	136000	100
	Min	3200	6400	33		Min	29000	49300	68
24	Max	17250	34500	57	60	Max	90000	153000	105
	Min	4800	9600	37		Min	36000	61200	74

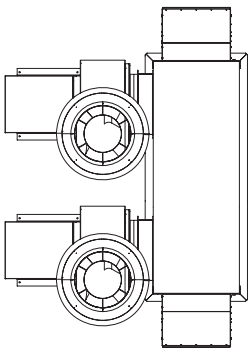
Performance certified is for installation type C: ducted inlet, free outlet. Performance ratings do not include the effects of appurtenances (accessories). Power rating (BHP) does not include transmission losses.

Notes:

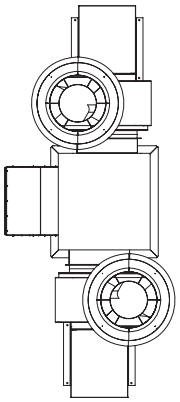
- Minimum Inlet CFM based upon ANSI Z9.5, minimum discharge velocity of 3,000 fpm
- Plume rise calculation based upon 10 mph cross wind *(see back cover)*
- Maximum discharge CFM and plume rise shown is attainable using Greenheck's exclusive VNT™ (Variable Nozzle Technology)



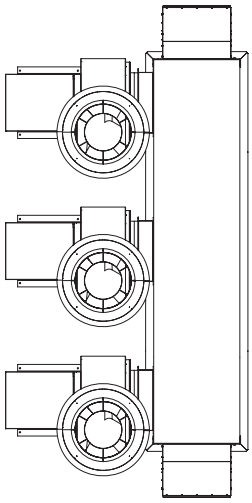
Vektor-CD
Single Fan System



Vektor-CD
Dual Fan System



Vektor-CD
Opposed Fan System



Vektor-CD
Triple Unit System

System Configuration

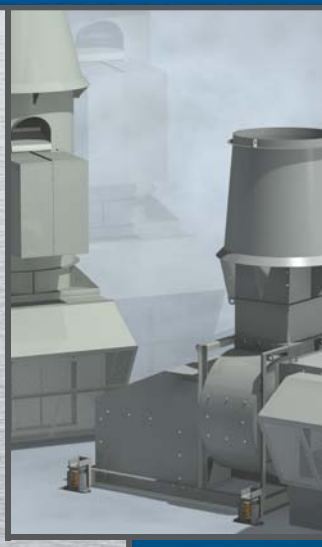
Detailed layout and dimensions, as well as specifications, are available for the Vektor-CD High Plume Exhaust system in various configurations.

Standard Options:

- Plenum
- Isolation Damper
- Bypass Air Damper
- Curb
- Disconnect
- Controls
- Double Wall Plenums
- Sure-Aire

Plume Height

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It is important that the exhaust plume height be great enough to avoid re-entrainment of exhaust air and to disperse the exhaust. The effective stack height should be used when analyzing design issues. The effective stack height of a fume exhaust system (h_e) is the physical height of the fan system (h_s) plus the plume rise (h_r), found from the equation below.

The plume rise height from an exhaust stack, with no hinged raincap, can be calculated using the following equation*: $h_r = 3.0 \times (V \times d / U)$

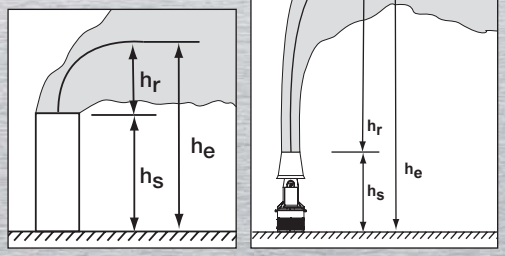
h_r = plume rise, ft (m)

V = Stack exit velocity, fpm (m/s)

d = stack diameter, ft (m)

U = wind speed, fpm (m/s)

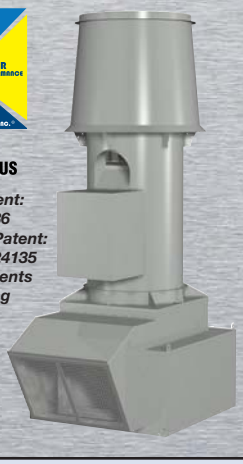
* From ASHRAE Laboratory Design Guide, Equation 9-2



Note: Graphical comparison of Vektor to low velocity, traditional stack.

VEKTOR™ Family of Lab Exhaust Systems





U.S. Patent: 7320636
Singapore Patent: 124106, 124135
Other Patents Pending



U.S. Patent: 124105
Other Patents Pending

	Vektor-H	Vektor-MD	Vektor-CD
Housing Style	Inline Centrifugal	Inline Mixed Flow	Centrifugal
Stack Style	High Plume Nozzle	High Plume Dilution Nozzle	High Plume Dilution Nozzle
Min Flow	270 cfm (850 m^3/hr)	1,500 cfm (2,550 m^3/hr)	500 cfm (850 m^3/hr)
Max Flow	24,000 cfm (40,750 m^3/hr)	80,000 cfm (135,900 m^3/hr)	100,000 cfm (170,000 m^3/hr)
Max ESP	Up to 3.5 in. wg (875 Pa)	Up to 8 in. wg (2000 Pa)	Up to 14 in. wg (3500 Pa)
c UL us LISTED	Listed for Electrical 705 (File no. 40001) and Grease Removal 762 Power Ventilators for Restaurant Exhaust Appliances (File no. MH11745)	Listed for Electrical 705 (File no. 40001)	Listed for Electrical 705 (File no. 40001)
AMCA Certification	Sound and Air Performance	Air Performance	Induced Flow Fan Air and Sound Performance
Warranty	1 Year	3 Years	3 Years

Our Warranty

Greenheck warrants this equipment to be free from defects in material and workmanship for a period of one year (Vektor-H) or three years (Vektor-MD, Vektor-CD) from the purchase date. Any units or parts which prove defective during the warranty period will be replaced at our option when returned to our factory, transportation prepaid. Should motors furnished by Greenheck prove defective during this period, they should be returned to the nearest authorized motor service station. Greenheck will not be responsible for any removal or installation costs.

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

U.S. GREEN BUILDING COUNCIL MEMBER

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Vektor Systems Rev. 4 July 2008 SP
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