

# Laboratory Exhaust System

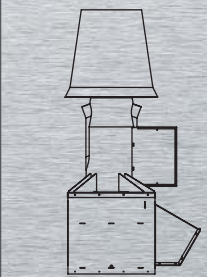
## Vektor™

### High Plume Dilution

 **VEKTOR™**



Patent Pending



 **GREENHECK**  
Building Value in Air.

May  
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# High Plume Dilution Laboratory Exhaust System - Vektor

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 nozzle mass flow and velocity, resulting in greater nozzle discharge momentum, displacing the diluted effluent high above the roof.

## Design Features

Through the application of a specially designed multi-stage high velocity exhaust induction nozzle incorporated in the Greenheck Vektor, ambient dilution air is entrained and mixed with the exhaust effluent and accelerated to a high velocity, giving the exhaust additional momentum to be displaced high above the roof.

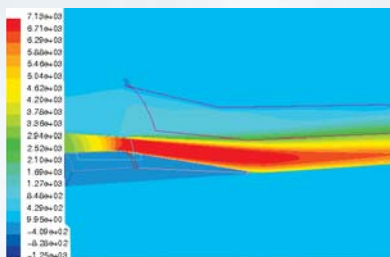
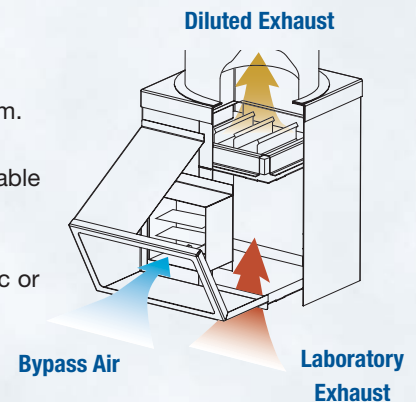
The mixed-flow impeller of the Greenheck Vektor is available in either AMCA type "C" or type "B" spark resistant construction... a necessity for laboratories that exhaust flammable and explosive solvent vapors.

Belt drive flexibility on the Greenheck Vektor not only offers safe and easy motor replacement without accessing the contaminated interior of the blower, but also offers the ability to compensate for system static pressure variations (balancing) and future system performance changes.

In addition, Vektor offers an optional bypass air plenum and damper assembly that can be used to add additional ambient air to the exhaust of a constant volume, lab exhaust system. This additional bypass air increases the dilution of the exhaust effluent, and also increases the exhaust momentum, resulting in greater exhaust displacement above the roof. On variable volume systems, the bypass air plenum and damper allows a reduction of lab exhaust by bleeding ambient air into the exhaust fan, while the fan runs at constant RPM and CFM. Greenheck can provide, if necessary, the bypass air damper with the appropriate electronic or pneumatic damper, factory mounted.



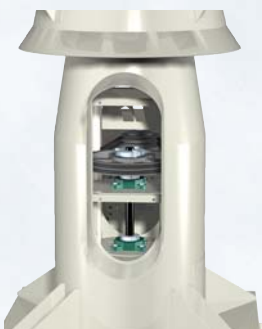
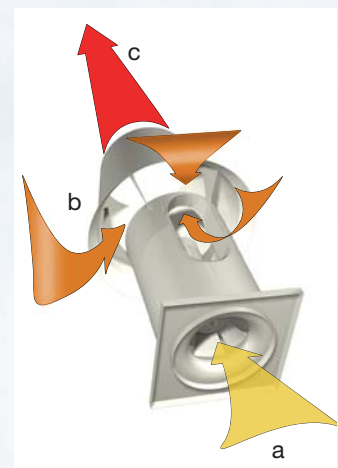
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The Vektor High Plume Dilution Laboratory Exhaust System is the result of state of the art computational fluid dynamics and testing analysis, combined with over a half century of Greenheck's air movement engineering and manufacturing expertise.

### 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).



### Safe, Ease of Maintenance

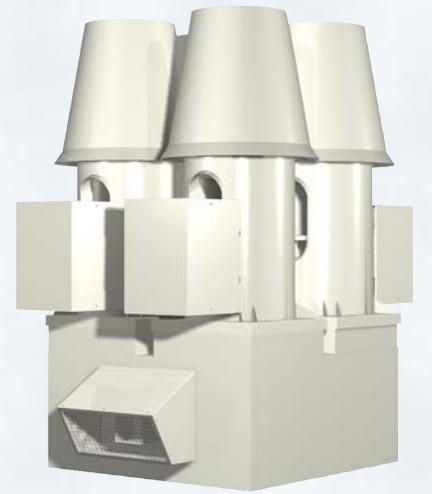
The Vektor Laboratory Exhaust System provides safe, easy inspection and maintenance of the fan drive components. The housing of the Vektor is bifurcated with the motor, belt drive, and bearings all located outside the contaminated air stream. Replacement of any of these components, if required, does not require removal of the fan from the system or exposing maintenance, service personnel to the contaminated interior of the fan.

## 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 building aesthetics
- Significant dilution of laboratory exhaust
- AMCA licensed Seal for sound and air performance (pending)
- Efficient and quiet mixed flow blower technology
- Unique shaft “vacuum seal” insuring that hazardous or noxious fumes do not escape through the shaft opening
- AMCA type B or C spark resistant construction
- Reliable, belt drive flexibility
- L(10) 200,000 hour minimum life bearings [Average or L(50) 1,000,000]
- High efficient motor, Standard
- Quiet acoustical performance
- Application to constant or variable volume exhaust systems
- Efficient discharge nozzle design
- Corrosion resistant polyester resin coating
- Ease of maintenance
- Flow applications from 3,000 - 80,000 CFM @ 8 in. Ps per fan
- Multiple fan assemblies on a factory provided common plenum
- Meets ANSI Z9.5, UL 705 and ASHRAE lab design guidelines



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## Abridged Performance of the Vektor High Plume Dilution Exhaust Blower

Fan Size	Inlet CFM	Discharge CFM	Plume Rise above roof (ft)	Fan Size	Inlet CFM	Discharge CFM	Plume Rise above roof (ft)
15	Max 6,000	15,600	51	30	Max 24,000	57,600	86
	Min 3,000	4,500	24		Min 13,000	17,900	44
16	Max 7,300	18,980	56	33	Max 29,000	63,800	91
	Min 3,500	5,200	25		Min 16,000	20,500	45
18	Max 8,500	22,100	58	36	Max 36,000	79,200	106
	Min 4,300	6,500	29		Min 18,000	13,000	48
20	Max 10,000	26,000	60	40	Max 43,000	94,600	115
	Min 5,500	8,200	32		Min 22,000	28,200	52
22	Max 13,000	31,200	66	44	Max 53,000	116,600	128
	Min 7,000	9,800	33		Min 27,000	31,900	56
24	Max 16,000	38,400	70	49	Max 65,000	130,000	137
	Min 9,000	12,600	37		Min 33,000	38,900	63
27	Max 19,000	45,600	78	54	Max 80,000	160,000	152
	Min 10,000	13,800	39		Min 40,000	47,200	68

### 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
- Maximum discharge CFM and plume rise shown is attainable using Greenheck's exclusive VNT™ (Variable Nozzle Technology)

# Plume Height

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\*:

$$h_r = 3.0 \times (V \times d / U)$$

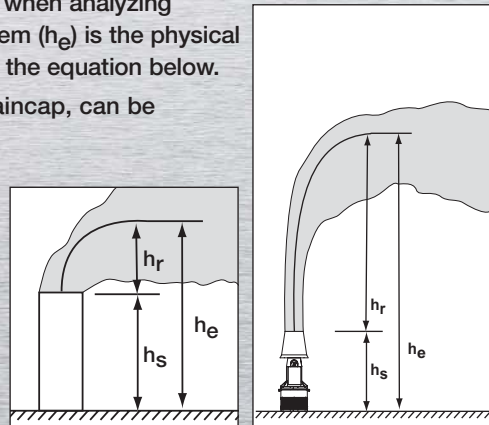
$h_r$  = plume rise, ft (m)

$V$  = 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

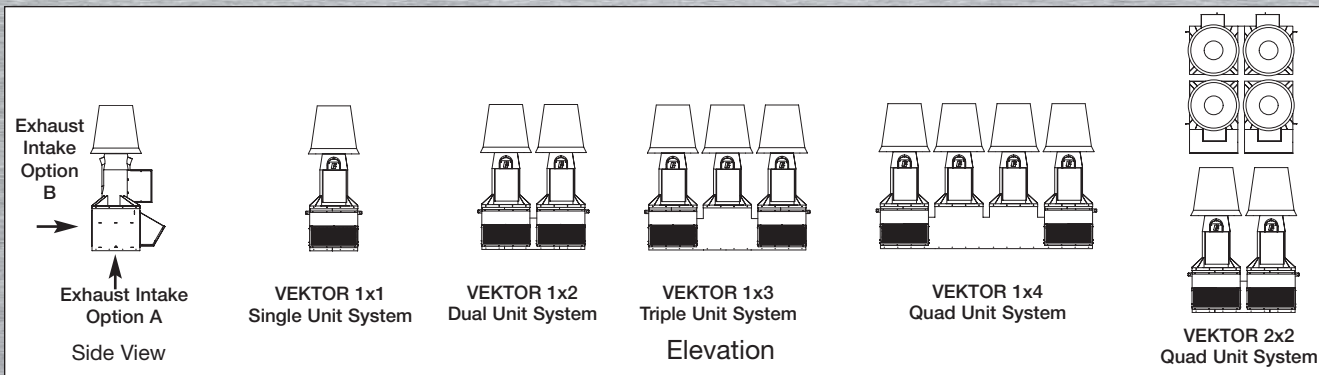


## System Configuration

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

### Standard Options:

- Plenum
- Isolation Damper
- Bypass Air Damper
- Curb
- Disconnect
- Controls
- Acoustic Attenuation



## 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 Warranty

Greenheck warrants this equipment to be free from defects in material and workmanship for a period of one year 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. Motors are warranted by the motor manufacturer for a period of one year. 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.*

