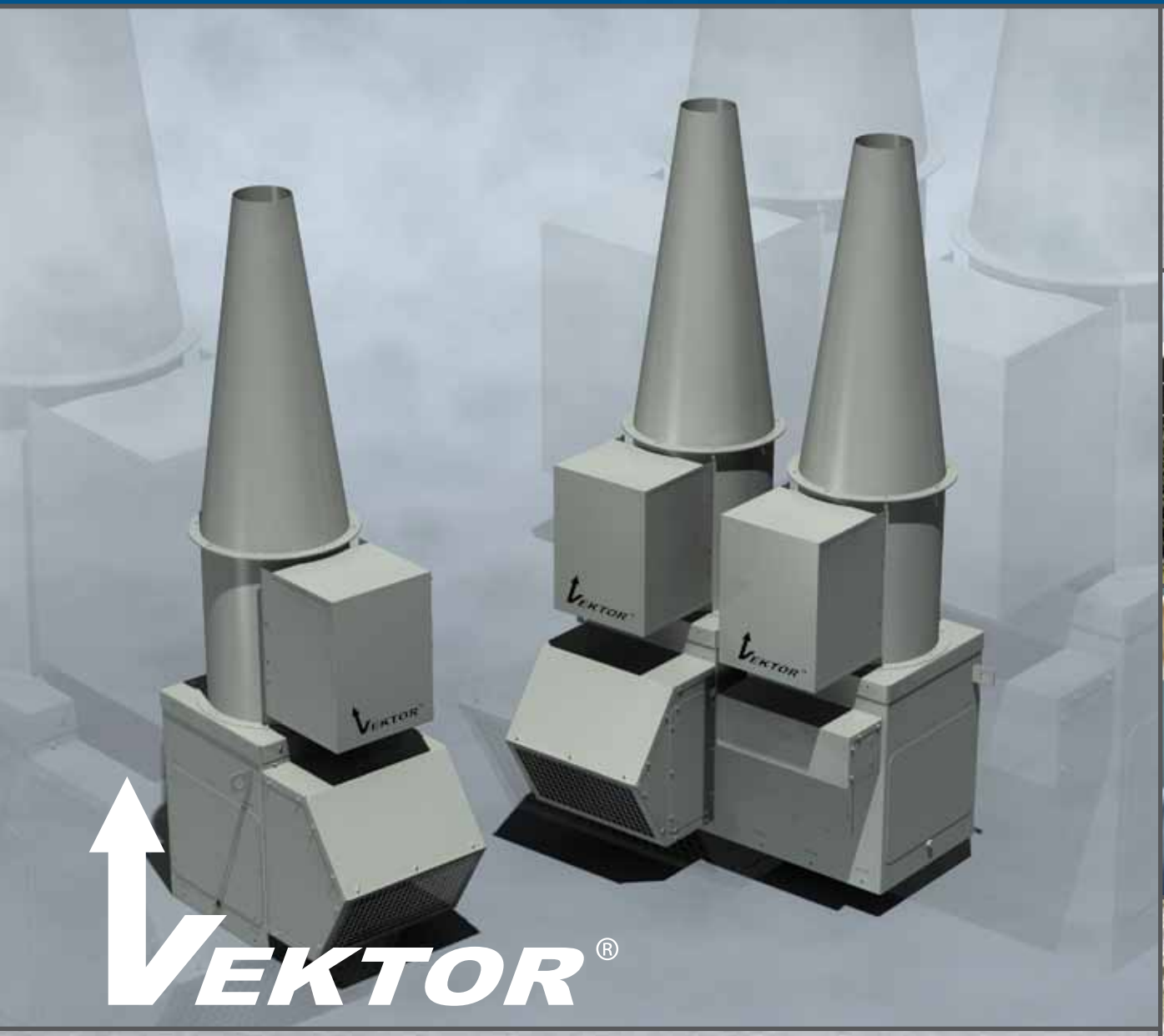
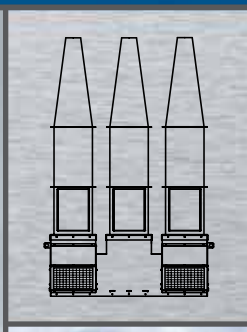
Laboratory Exhaust Systems

Vektor®-H

High Plume











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Building Value in Air.

January
2012

Laboratory Exhaust Systems
Vektor-H

GREENHECK
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The Vektor®-H is a cost-effective, self-contained, high plume laboratory exhaust system designed to remove hazardous or noxious fumes from a laboratory, dilute the fumes with bypass air and expel them from the laboratory building so the fumes do not contaminate the roof area or are re-entrained into building make-up air systems.

Benefits of the Vektor-H:

- Licensed to bear the AMCA Seal for Sound and Air Performance
- Applicable to constant or variable volume exhaust systems
- Meets ANSI Z9.5, NFPA 45 and ASHRAE guidelines
- Performance capacities from 270 - 24,000 cfm and up to 3.5 in. wg per fan (459 – 40,776 m^3/hr and up to 875 Pa)
- Configurable in single, double or triple fan systems
- Spark B resistant construction

Greenheck Fan Corporation certifies that the Vektor-H laboratory exhaust 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. The Ratings Seal applies to sound and air performance as shown in the Vektor-H Performance catalog, 00.LAB.NB002 R2 1-2012

OSP#: 0223-10



Vektor-H

The Greenheck Vektor Advantage

The Greenheck Vektor-H laboratory exhaust system is a better, lower cost alternative to a field built-up exhaust system.

- Installed quickly and easily on Greenheck's reinforced roof curb model GPFHL
- Requires less roof deck space
- Designed to withstand up to 125 mph wind-loads without guy wires
- A cleaner installation with fewer roof penetrations
- No performance losses due to field fabricated inlet or outlet ducts



Vektor-H system | Field built-up system

Ease of Maintenance

The Vektor-H provides safe, easy inspection and maintenance of internal fan components. By removing one access panel, service to the fan wheel, shaft and bearing assembly is accomplished without removing the fan from the system.



Computer Aided Product Selection

Greenheck's CAPS program provides fast selection of Vektor-H units along with detailed drawings and fan specifications. Download CAPS at www.greenheck.com.



Licenses, Certifications & Standards

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Licenses and Certifications

AMCA

For Vektor-H performance pages showing AMCA licensed data for sound and air performance, please refer to the Vektor-H Laboratory Exhaust System Performance catalog.

UL 705 Power Ventilator

Vektor-H models are available with the UL/cUL 705 (Underwriters Laboratory) Listing on a wide variety of 50 and 60 hertz motors. This listing ensures the use of UL approved electrical components. Motors are available in NEMA totally enclosed, fan cooled (TEFC), or explosion proof (EXP) designs.

c UL US LISTED

Model Vektor-H is available with the UL/cUL 705 Electrical Listing File #E40001

UL 762 Restaurant Exhaust

The Vektor-H, inline grease exhaust fan, is an alternative for kitchen applications when the requirement for a high plume rise is deemed necessary. The Vektor-H with the UL 762 grease option is designed to withstand the demands of high temperature kitchen grease exhaust. UL 762 is concerned with fans designed for removal of smoke and grease laden vapors.

UL US LISTED

Model Vektor-H is available with the UL 762 Listing (Power Ventilators for Restaurant Exhaust Applications) Maximum Operating Temperature 400ºF File #MH11745

Seismic

As an industry leader, Greenheck manufactures seismically certified products to maintain structural integrity during and after a seismic event. While OSHPD standards were originally developed for health care facilities, they are also being required on projects outside of health care when specifying engineers and building owners want to ensure certified equipment is received.

Based on Greenheck's design and construction features, the Vektor-H is the first seismic compliant laboratory exhaust fan available for use in contaminated exhaust air applications. Vektor-H complies with IBC 2006, IBC 2009 and is certified for OSHPD's Special Seismic Certification Pre-approval under OSP# 0223-10.

To meet these requirements, the Vektor-H seismic certified equipment was shake table tested at an independent test facility in accordance with ICC-ES AC 156 and under the responsible charge and review of a California Structural Engineer. The test simulates the most severe seismic conditions anywhere in the United States and includes the most severe spectral response accelerations, an Importance Factor of 1.5, an SDS Value of 2.28, all Site Classes, all Occupancy Categories and all Seismic Design Categories (A-F with F being the most severe).

Standards

ANSI/AIHA Z9.5 — Laboratory Ventilation American National Standards Institute, Inc.

NFPA 45 — Standard on Fire Protection for Laboratories using Chemicals

NFPA 90a — Installation of Air Conditioning and Ventilating Systems

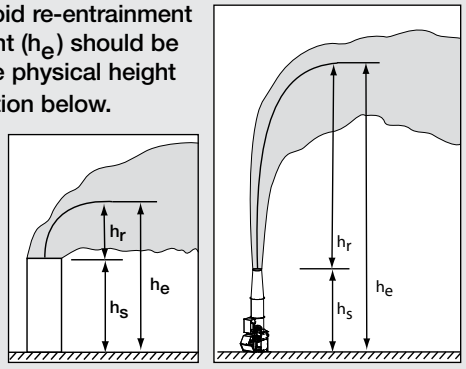
NFPA 91 — Exhaust Systems for Air Conveying of Materials

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 (h_e) should be used when analyzing design issues. The effective stack height is the physical height of the fan system (h_s) plus the plume rise (h_r), found from the equation below.

The plume rise 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 = nozzle exit velocity, ft/min. (m/s)
d = nozzle diameter, ft (m)
U = wind speed, ft/min. (m/s)
* From ASHRAE Laboratory Design Guide, Equation 9-2



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

Standard Construction Features and Options

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Coatings

Hi-Pro™ Polyester - An electrostatically applied and baked, corrosion-resistant polyester resin with excellent chemical and corrosion resistance.

LabCoat™ - A two-coat system that is an electrostatically applied and baked, two-part corrosion-resistant polyester resin and zinc-rich primer.

1. **Nozzle -** High velocity, conical discharge nozzle manufactured from welded steel and coated with LabCoat. The nozzle reduces system effects associated with a quick or abrupt reduction in the discharge stack diameter.
2. **Extension -** Standard component on sizes 9 through 22 to increase the overall system height to a minimum of 10 ft. *(3 m)* above the roof deck. The extension is manufactured from welded steel and coated with LabCoat.
3. **Motor Cover -** Designed to protect the motor and drive components from rain, moisture, dust, and dirt. The motor cover is manufactured from welded steel and coated with LabCoat.
4. **NEMA-3R Toggle Disconnect Switch -** Factory mounted and wired NEMA-3R switch is available to disconnect power prior to performing field service work.
5. **Drives -** Belts and sheaves are sized for 200% of motor horsepower with a minimum of two belts.
6. **Motor -** Premium efficient, standard NEMA frame, TEFC motor with a 1.00 service factor is standard.
7. **Wheel -** A backward-inclined, non-overloading wheel manufactured of welded aluminum and coated with Hi-Pro Polyester.
8. **Bypass Air Plenum *(optional)* -** Facilitates the addition of ambient air to the exhaust airstream. The additional air increases the dilution of the exhaust air and also increases the discharge momentum resulting in greater displacement above the roof. On variable volume systems, the bypass air plenum and damper allow reduction of lab exhaust volume by adding ambient air to the exhaust airstream. This allows the fan to run at a constant speed without the need for a variable frequency drive. Bypass air plenums are constructed of heavy-gauge welded steel and are coated with LabCoat.
9. **Isolation Damper *(optional)* -** A parallel blade damper used to allow maintenance on a fan while others are in operation. The isolation damper also prevents backflow on a redundant fan while the system is operating. Dampers are fabricated of steel or aluminum and are coated with Hi-Pro Polyester. Control options are gravity or electric (2-position, spring return) actuators.
10. **Bypass Air Damper *(optional)* -** Opposed blade damper used to bring ambient air into the fan system for additional dilution or an increase in plume rise. Dampers fabricated of steel are coated with Hi-Pro Polyester. Control options are electric or pneumatic (modulating) or a manual quadrant.
11. **Weatherhood - *(optional - with Bypass Air Damper)*** Designed to protect the bypass air damper and actuator (optional) from rain, moisture, dust, and dirt. Weatherhoods are manufactured from welded steel and coated with LabCoat.
12. **Roof Curb -** A structural support fabricated of 14 gauge galvanized/galvaneal steel structurally reinforced to provide a minimum wind-load rating of 125 mph (200 km/hr) without the use of guy wires on the installed Vektor-H system.

Drain Connection - A drain connection located at the bottom of the fan housing allows for removal of any rain or condensation. An additional drain (standard) is located at the bottom of the bypass air plenum.

Fasteners - All fasteners provided are stainless steel for additional corrosion-resistant protection.

Spark-Resistant Construction - All size fans are manufactured to meet AMCA type "B" spark-resistant construction (aluminum wheel and shaft seal).

Bearings - (Belt Drive) - Air Handling quality bearings in excess of L_{10} - 100,000 hour bearing life (equal to L_{50} - 500,000 hrs). Nylon extended lube lines allow for fan bearing lubrication.



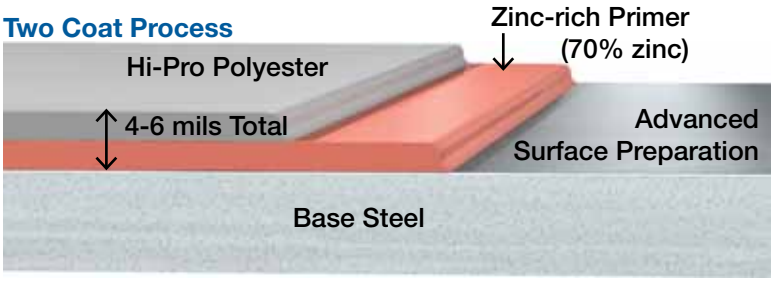
LabCoat Corrosion-Resistant Coating

Components are electrostatically powder coated with LabCoat, a two-part corrosion-resistant zinc-rich coating. Standard color is gray. Optional colors are available upon request.

- Step 1: Advanced surface preparation (8-stage chemical wash)
- Step 2: A zinc-rich epoxy primer is applied and partially cured
- Step 3: The finish coat of polyester resin (Hi-Pro Polyester) is applied and then fully cured at 400ºF

LabCoat is not affected by the UV component of sunlight (does not chalk), and has superior corrosion resistance to acids, alkalis, solvents and harsh environments (high humidity, coastal applications). The LabCoat system exceeds 4000 hour ASTM B117 Salt Spray Resistance.

LabCoat Cross Section



LabCoat Test Data

Salt Spray ASTM B117				
Hours	1000	2000	3000	4000
Permatector				
Hi-Pro Poly				
Perma-Z				
LabCoat				

Durability	
Pencil Hardness ASTM D3363	Cross-Hatch Adhesion ASTM D3359-B
3H	No Failure
2H	No Failure
3H	No Failure
2H	No Failure

* Chemical Resistance Ratings					
Bleach	Sulfuric Acid (10%)	HCl (10%)	MEK	Chlorine (0.1%)	NaOH (20%)
0	0	0	1	0	1

0 - No effect
1 - Slight change in gloss or color
2 - Surface etching, severe staining, but film integrity remains
3 - Significant pitting, cratering, swelling, or erosion with obvious surface deterioration

*For additional chemical resistance of Hi-Pro™ Polyester, see Greenheck Application Guide FA/110-04R2

Specification: Laboratory Exhaust Corrosion-Resistant Coating

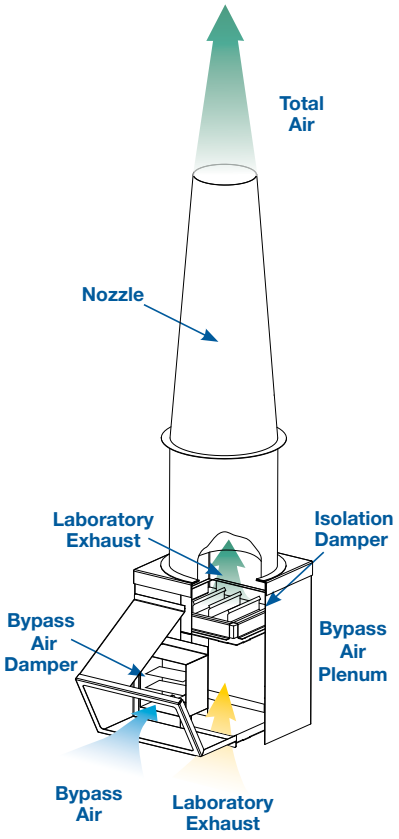
All fan and system components (fan, nozzle, windband, plenum, stack extensions) shall be coated with LabCoat, a two-part electrostatically applied and baked, sustainable, corrosion-resistant coating system; or Heresite P-413C.

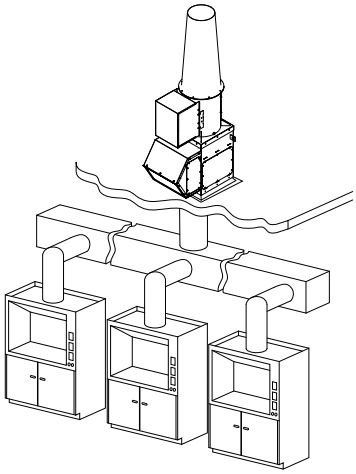
All parts shall be cleaned and chemically prepared for coating using a multistage wash system which includes acid pickling to remove oxide, increase surface area and improve coating bond to the substrate.

The first powder coat applied over the prepared surface shall be a zinc-rich epoxy primer (no less than 70% zinc). After application, the coating shall be heated to a gelatinous consistency (partial cure) at which time the second powder coat of Hi-Pro Polyester resin shall be electrostatically applied and then be simultaneously cured at a uniform bake temperature of 400ºF *(204ºC).*

The coating system shall not be less than a total thickness of 6 mils, shall not be affected by the UV component of sunlight (does not chalk), and have superior corrosion resistance to acids, alkalis, and solvents. Coating system shall exceed 4000 hour ASTM B117 Salt Spray Resistance.

Note that 10-20 mil thick wet coating systems pollute the environment (air and water), and that these manually applied coatings are not uniform over the impeller surface and can cause fan imbalance and vibration.





Performance Ranges

Vektor-H models use an efficient tapered outlet nozzle to accelerate the exhaust to a high velocity, giving the exhaust additional momentum to be displaced high above the roof. The Quick Select Chart at the right indicates the typical performance ranges by size with the corresponding effective plume rises.

Design Versatility

The Greenheck Vektor-H laboratory exhaust system can be applied to single as well as multiple manifolded fume hoods.

Unit Size	Performance Range (cfm)		Nozzle Size Range	
	Minimum	Maximum	Minimum	Maximum
9	270	1,705	4	9
10	420	1,960	5	10
12	600	2,640	6	13
13	810	3,160	7	14
16	1,050	7,080	8	18
18	1,320	7,880	9	19
22	1,650	10,560	10	22
24	2,760	14,760	13	27
30	3,690	19,640	15	30
36	5,310	24,000	17	38

Nozzle Data		Effective Stack Height*		
Size (in)	Outlet Area (ft^2)	Outlet Velocity (ft/min.)		
		3000	3500	4000
4	0.0873	13.4	14.0	14.5
5	0.1364	14.3	15.0	15.7
6	0.1963	15.1	16.0	16.8
7	0.2673	16.0	17.0	18.0
8	0.3491	16.8	18.0	19.1
9	0.4418	17.7	18.9	20.2
10	0.5454	18.5	19.9	21.4
11	0.6600	19.4	20.9	22.5
12	0.7854	20.2	21.9	23.6
13	0.9218	21.1	22.9	24.8
14	1.0690	21.9	23.9	25.9
15	1.2272	22.8	24.9	27.0
16	1.3963	23.6	25.9	28.2
17	1.5763	24.5	26.9	29.3
18	1.7671	25.3	27.9	30.5
19	1.9689	26.2	28.9	31.6
20	2.1817	27.0	29.9	32.7
22	2.6398	28.8	31.9	35.0
24	3.1416	30.5	33.9	37.3
26	3.6870	32.2	35.9	39.5
27	3.9761	33.0	36.8	40.7
28	4.2761	33.9	37.8	41.8
30	4.9087	35.6	39.8	44.1
32	5.5851	37.3	41.8	46.4
34	6.3050	39.0	43.8	48.6
36	7.0686	40.7	45.8	50.9
38	7.8758	42.4	47.8	53.2

* Effective stack height values assume system height of 10 feet, wind speed of 10 mph. Plume rise calculated assuming a 10 mph crosswind. (3,000 ft/min. is the minimum recommended outlet velocity per ANSI Z9.5.) For a full range of fan performance, consult the Laboratory Exhaust Systems, Vektor-H Performance Manual, 00.LAB.NB002 R2 1-2012

Model Number Code

VEKTOR - H - 24 - A15 - X

Lab Exhaust
Belt Drive

High Plume Blower

Fan Size
9, 10, 12, 13, 16, 18, 22, 24, 30, 36

Motor RPM
A = 1800
M = 3600
J = 1500
R = 2900

Motor Horsepower

7 = ¾	50 = 5
10 = 1	75 = 7½
15 = 1½	100 = 10
20 = 2	150 = 15
30 = 3	200 = 20

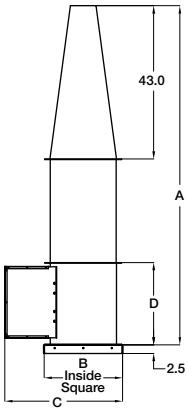
UL Listing
G = UL 762 (Restaurant Exhaust)
X = UL 705 (Power Ventilator)

Dimensional Data

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1x1 System - Fan Only

Size	A	B	C	D	G
9	122	22	32½	23	56
10	122	22	32½	23	56
12	122	22	32½	23	56
13	122½	24	35½	24½	55
16	122½	28	39½	28½	51
18	122	34	45½	31	48
22	121¼	40	54	35¼	43
24	122	46	59½	42	37
30	131½	52	68¼	48½	40
36	143	58	74½	54	46

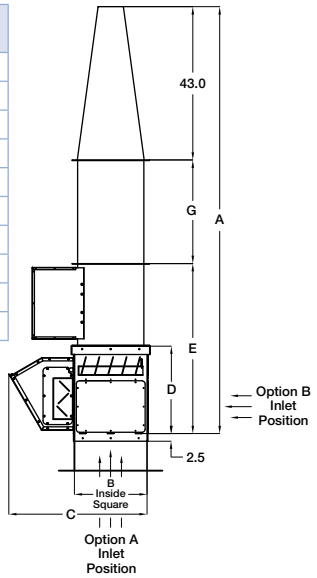


All dimensions are in inches.

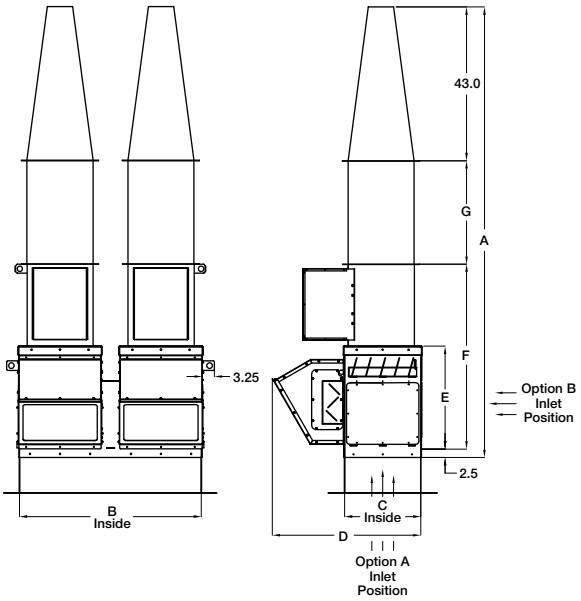
A = Overall system height (less curb)
B = Length of curb cap (inside dimension)
C = Width of curb cap (inside dimension)
D = Width of plenum (including weatherhood)
E = Height of plenum
F = Height of plenum and fan (less curb cap)
G = Height of stack extension

1x1 System with Plenum

Size	A	B	C	D	E	G
9	122	21⅝	40	27	50	29
10	122	21⅝	40	27	50	29
12	122	21⅝	40	27	50	29
13	122½	23⅝	45	28	52½	27
16	122½	27⅝	50	30	58½	21
18	122	33⅝	57	31	62	17
22	121¼	39⅝	64	34	69¼	9
24	122	45⅝	71	37	79	—
30	131½	51⅝	79	40	88½	—
36	143	57⅝	87	46	100	—

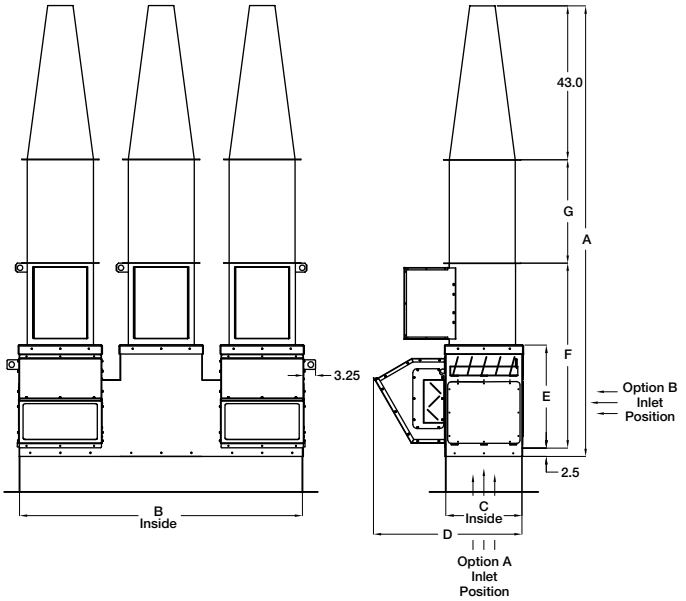


2x1 System with Plenum



Size	A	B	C	D	E	F	G
9	122	48½	21⅝	40	27	50	29
10	122	48½	21⅝	40	27	50	29
12	122	48½	21⅝	40	27	50	29
13	122½	52½	23⅝	45	28	52½	27
16	122½	60½	27⅝	50	30	58½	21
18	122	72½	33⅝	57	31	62	17
22	121¼	84½	39⅝	64	34	69¼	9
24	122	96½	45⅝	71	37	79	—
30	131½	108½	51⅝	79	40	88½	—
36	143	120½	57⅝	87	46	100	—

3x1 System with Plenum



Size	A	B	C	D	E	F	G
9	122	75⅜	21⅝	40	27	50	29
10	122	75⅜	21⅝	40	27	50	29
12	122	75⅜	21⅝	40	27	50	29
13	122½	81⅜	23⅝	45	28	52½	27
16	122½	93⅜	27⅝	50	30	58½	21
18	122	111⅜	33⅝	57	31	62	17
22	121¼	129⅜	39⅝	64	34	69¼	9
24	122	147⅜	45⅝	71	37	79	—
30	131½	165⅜	51⅝	79	40	88½	—
36	143	183⅜	57⅝	87	46	100	—

Vektor Products

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Vektor-H



Vektor-HS



	Vektor-H	Vektor-HS
Housing Style	Inline Centrifugal	Inline Centrifugal
Stack Style	High Plume Nozzle	High Plume Variable Nozzle
Minimum Flow	270 cfm (459 m^3/hr)	270 cfm (459 m^3/hr)
Maximum Flow	24,000 cfm (40,776 m^3/hr)	24,000 cfm (40,776 m^3/hr)
Maximum ESP	Up to 3.5 in. wg (875 Pa)	Up to 3.5 in. wg (875 Pa)
Underwriters Laboratories	UL/cUL Listed for Electrical 705 (File no. 40001) and UL Listed for Grease Removal 762 Power Ventilators for Restaurant Exhaust Appliances (File no. MH11745)	UL/cUL Listed for Electrical 705 (File no. 40001)
AMCA Certification	Sound and Air Performance	-
Warranty	1 Year	1 Year
Patents	—	Patent Pending

Vektor-MD



Other Patents Pending

Vektor-CD



Other Patents Pending

	Vektor-MD	Vektor-CD
Housing Style	Inline Mixed Flow	Centrifugal
Stack Style	High Plume Dilution Nozzle	High Plume Dilution Nozzle
Minimum Flow	1,500 cfm (2,549 m^3/hr)	500 cfm (850 m^3/hr)
Maximum Flow	80,000 cfm (135,921 m^3/hr)	140,000 cfm (237,862 m^3/hr)
Maximum ESP	Up to 8 in. wg (2000 Pa)	Up to 14 in. wg (3500 Pa)
Underwriters Laboratories	UL/cUL Listed for Electrical 705 (File no. 40001)	UL/cUL Listed for Electrical 705 (File no. 40001)
AMCA Certification	Induced Flow Fan Air and Sound Performance	Induced Flow Fan Air and Sound Performance
Warranty	1 or 3 Years	1 Year
Patents	United States: 7320636, 7682231, 7048499 Singapore: 124135, 124106 Mexico: 258949, 243465 P.R. China: 20058006160.6, 01813109.3 Hong Kong: 1114659	United States: 7547249 Singapore: 124105

Our Warranty

Greenheck warrants this equipment to be free from defects in material and workmanship for a period of either 1 or 3 years from the shipment date depending on the model and warranty period selected. 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.

U.S. GREEN BUILDING COUNCIL MEMBER

Prepared to Support Green Building Efforts

P.O. Box 410 • Schofield, WI 54476-0410 • Phone (715) 359-6171 • greenheck.com

00.LAB.1001 R5 1-2012

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