

# 15000 INC.

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July 25, 2019

To Whom It May Concern:

We have reviewed the attached odor mitigation plan, dated July 23, 2019, for SGI Santa Rosa LLC dba Authentic 707 of Santa Rosa, CA.

It is our understanding that the attached plan meets, or exceeds, the requirements of the City of Santa Rosa for cannabis odor mitigation.



Sincerely,  
Matthew Torre, Registered Professional Engineer  
15000 Inc

# **ODOR CONTROL & MITIGATION PLAN**

July 23, 2019

## **SGI Santa Rosa LLC dba Authentic 707**

3175 Range Avenue  
Santa Rosa, CA 95403

**Report prepared by**

15000 Inc.  
2901 Cleveland Avenue, Suite 204  
Santa Rosa, CA 95403

## **Policy**

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Document a process to limit objectionable odors from the project area utilizing building system components and adopted odor control plan.

Under California Occupational Health and Safety Act (“CalOSHA”) and Bay Area Air Quality Management District (“BAAQMD”) regulations, cannabis businesses do not have a specific set of regulations that govern their operations. However, Brian Mitchell of SGI Santa Rosa LLC dba Authentic 707 (the “Applicant”), will nonetheless maintain a high standard for the air quality plans for all aspects of its proposed Cannabis Dispensary Facility (Type-10) at 3175 Range Avenue, Santa Rosa, CA 05403 (“Facility”).

Generally, the Applicant will meet and/or exceed the standards set by the City of Santa Rosa (“City”) Cannabis Ordinance, the Sonoma County (“County”) Code (including sections 26-88-250 through 26-88-256), California Labor Code §§6300 et seq., and Title 8, California Code of Regulations §§ 332.2, 332.3, 336, 3203, 3362, 5141 through 5143, 5155, and 14301, as published in the CalOSHA Policy and Procedures Manual C-48, Indoor Air Quality as applicable to other facilities.

Pursuant to State of California (“State”) regulations [California Energy Code, Section 120.1(b)2], mechanical ventilation must meet 0.20 cubic feet per minute (“CFM”) per square foot of conditioned floor area in retail spaces, and 0.15 CFM for all other anticipated uses. Since existing State air quality regulations do not contain provisions specific to cannabis businesses, the Applicant will comply with these general State standards when designing the ventilation systems and air filtrations systems for the entire Facility. Each separate operation within the Facility building will have its own individual “air-scrubber” systems, as described below.

## **Purpose**

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To minimize and eliminate the off-site odor of cannabis caused by normal business practices.

## **Scope**

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Exterior of facility and surrounding areas.

## **Responsibilities**

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Business Owner/Operator (BO/O) is to provide, implement and supervise an odor mitigation plan.

## **General Procedures**

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Implementing and maintaining building systems to effectively minimize transmission of odor between building and surrounding areas.

- BO/O shall supervise installment and maintenance of an air treatment system to ensure there is no off-site odor of cannabis detectable from adjacent properties or the community. Air treatment systems consists of carbon filtration on the exhaust side of the ventilation system and negatively pressurizing the facility in relation to the exterior ambient condition.
- Staff members should immediately report odor problems to the BO/O, who will take corrective action, implement upgrades to the system, upgrades to the facility or to the internal handling process of product within the facility to further deter odors.
- If such upgrades require the approval of any Agency Having Jurisdiction (AHJ), the BO/O shall seek and gain such approval prior to implementing new systems and/or procedures.

It is critical to the success of our organization that our various plans remain transparent to the community, so all stakeholders are aware of the importance of mitigated cannabis odors.

This mitigation plan and all associated records will be made available to the public for review and documents can be requested at our facility. All requests for documentation shall occur via written request only (email is acceptable).

This facility will have the following onsite functions: Dispensary, Administrative Processing Areas, and Secure Storage. In accordance with California State Law all products brought into the dispensary will be in sealed packages. As such, the possibility for odor issues for adjacent properties is limited. Nevertheless, the handling of product will require a properly engineered odor control system in order to mitigate the release of odors to the surrounding properties and community.

## **Active Measures**

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All cannabis products will be securely stored in a security room. The security area will be provided with an exhaust air system for odor control. The exhaust system shall be provided with a carbon filter that will mitigate any odors which may emanate from the stored product.

## **Air Pressure & Carbon Filter Control**

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The facility will be kept under negative pressure by means of an exhaust system with carbon filters for odor mitigation. The exhaust discharge shall be designed with a high velocity outlet to eject the exhaust up and away from any neighbors or pedestrian traffic.

## **Best Available Technology**

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The combination of carbon exhaust air filtration and building pressure control represent the current best available technology, see Appendix A for Schematic Diagram and Appendix B for exhaust fan and filter sample specification sheet. This building is also provided with MERV-13 filters for particulate filtration of supply air into the building.

## **Air System Design**

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The facility shall have no operable windows and will be kept locked and sealed at all times. All doors shall be sealed with proper weather stripping, keeping circulating and filtered air inside the facility.

On site usage of cannabis products is strictly prohibited while on the property. This will assist in mitigating odors to the surrounding neighbors.

## **Monitoring, Detection and Mitigation: Method for Assessing Impact of Odor**

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The importance of cannabis odor mitigation is very well understood, and we shall make decisions that best to prevent the issue of odor to the surrounding areas. If odors are detected outside the facility this plan shall serve as a guideline to provide corrective action.

### **Monitoring**

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The manager/supervisor shall assess the on-site and off-site odors daily for the potential release of objectionable odors. The manager/supervisor on duty shall be responsible for assessing and documenting odor impacts on a daily basis.

The closest adjacent businesses include;

- Furniture 2000: 3170 Range Avenue, Santa Rosa, CA 95407
- El Brinquito Restaurant: 810 Piner Road, Santa Rosa, CA 95407
- Fastenal: 820 Piner Road, Santa Rosa, Ca 95407

### **Mitigation**

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Should cannabis odors outside of the building be detected by the public or staff and we are notified, the following protocols will take place immediately:

- Investigate the likely source of the odor.
- Utilize on site management practices to resolve the odor event.
- Take steps to eliminate the source of objectionable odors.
- Determine if the odor traveled off-site by surveying the perimeter and making observations of existing wind patterns.
- Document the event for further operational review.

If employees are not able to take steps to eliminate the odor-generating source, they are to immediately notify the facility manager, who will then notify the BO/O. All communication shall be documented and the team shall create a proper solution, if applicable. If necessary, we shall retain our certified engineer to review the problem and make recommendations for corrective action/s.

## **Staff Training**

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All employees shall be trained on how to detect, prevent and remediate odor outside our facility and all corrective options outlined herein.

## **Odor Detection Documentation**

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The Odor Detection Form (ODF) shall be provided to those who suspect objectionable odors emanating from inside the facility. ODFs are available per request, on-site.

We shall maintain records of all odor detection notifications and/or complaints that will include the remediation measures employed. The records shall be made available to the AHJ or the general public on request. All requests shall be in writing (email is acceptable).

## Odor Detection Form

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Name of Reporting Party:

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Phone Number:

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Email Address:

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Date:

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Time:

---

Location of Odor:

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Weather Conditions:

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Date/Time of Notification:

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Notification Method:

☐ Email ☐ Online ☐ In Person

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## ***Administrative Use Only***

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*Mitigation Response Taken:*

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*Date/Time Measures Employed:*

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*Were Mitigation Measures Successful?*

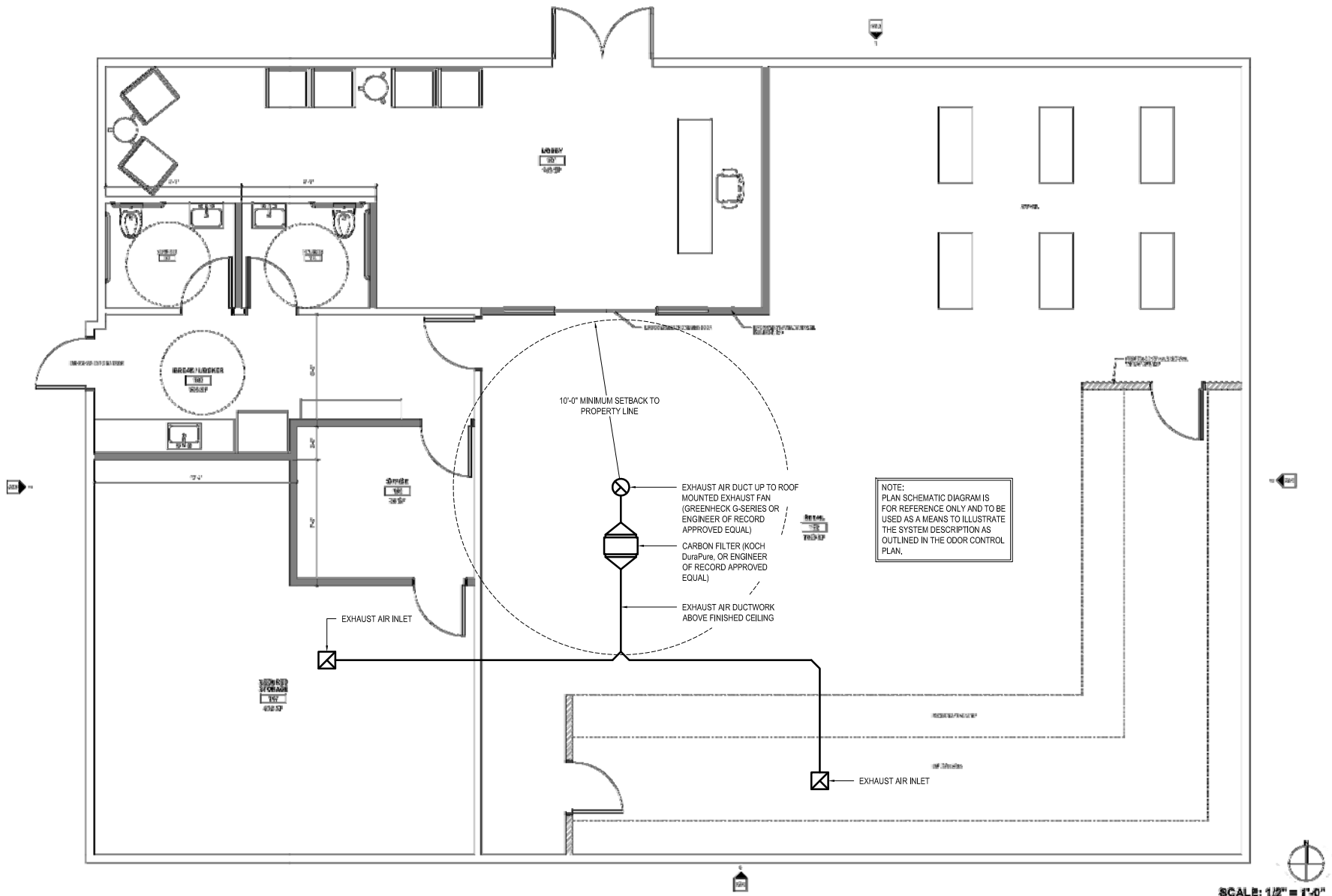
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*Signature/Date/Time:*

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## APPENDIX A – Schematic Exhaust Diagram





**A1.0**  
FLOOR PLAN

**3175 RANGE AVE.  
SANTA ROSA, CA 95403**

08/26/19

**RMW** experience  
think  
architecture & interiors

## APPENDIX B – Sample Carbon Filter and Fan Specification Sheet

## DuraPURE™ Extended Surface Activated Carbon Filter



- Provides effective removal of odors and Volatile Organic Compounds (VOC).
- Constructed with premium grade coconut shell carbon
- Available with specially impregnated adsorption medias

As worldwide Indoor Air Quality specifications become more demanding, gas phase adsorption is quickly becoming a major factor in commercial and industrial air filtration systems. The **DuraPURE** is an excellent high performance solution in applications such as airports, industrial facilities, chemical plants, office buildings, and a wide variety of other air filtration systems.

The Koch Filter **DuraPURE** is an extended surface carbon filter which utilizes premium grade granular 60% activated carbon. DuraPURE's unique V-shaped frame holds up to 26 pounds of activated carbon in a single 24x24x12 filter, which insures maximum VOC and odor removal in any commercial or industrial application.

### Two Capacity Levels and Three Standard Sizes

To meet the tough requirements of today's complex air filtration systems, DuraPURE is available in three standard sizes, and two media capacity levels, Standard Capacity and High Capacity.

### Specialized Carbon Media

DuraPURE is also available with specialized impregnated carbon media for removal of ammonia, hydrogen sulfide, and other difficult-to-remove compounds. Consult your Koch Filter representative to find the appropriate DuraPURE model for your system.

## Partial List of Contaminants Best Controlled by Activated Carbon

Acetic acid	Ethyl benzoate	Chloroctane	Tetrachloroethane	Methyl propyl ketone
Allyl acetate	Ethyl sulfide	Cineole	Toluene	Cyclohexanone
Benzyl acetate	Ethylene dichloride	Heptane	Trichloroethylene	Decane
Butyl acetate	Formic acid	Indene	Triethylhexane	Dichloroethane
Butyl ethyl ether	Octane	Isoamyl butrate	Mineral Spirits	Dimethyl disulfide
Butyric acid	Pentachloroethane	Limonene	Nitroethane	Ethanol
Carbon tetrachloride	Phenol	LimoneneMethylallyl alcohol	Vinyl Pyridine	Ethynl lactate
Chloroform	Styrene	Methylallyl Butanol	Acrylic acid	Ethynl oxalate
Chlorophenol	Thiophenol	Methyl ethyl ketone (MEK)	Benzonitrile	Ethylcyclohexane
Furan	Trichloroethane	Cyclohexanol	Bromoform	Ethylene glycol diethyl ether
Hexane	Trimethylpentane	Cymene	Butylbenzene	Nonane
Isoamyl alcohol	Methylsalicylate	Dibutylamine	Butyl sulfide	Octene
Isopropyl alcohol	Nitroanisole	Diethyl ketone	Carbon disulfide	Pentyl ether
Linalyl format	Valeric acid	Dodecane	2-Chloroethanol	Pyridine
Methyl benzoate	Xylene	Ethyl acetate	Chlorotoluene	Tetrachloroethylene
Methyl oxyethanol	Acetone	Ethyl methyl ketone	Cresol	Tributylamine
Cyclohexane	Benzaldehyde	Ethylbenzene	Heptene	Tridecane
Cyclohexylbenzene	Bezene	Ethylene glycol	Isoamyl acetate	Methyl pentanone (MIBK)
Decene	Butyl alcohol	Nitrogen dioxide<100ppb	Isobutyl propionate	Naphtha
Dichlorotoluene	Butyl mercaptan	Octanoic acid	Lynalyl acetate	Undecane
Dimethyl disulfide	Camphor	Pentylamine	Methyl acetylsalicylate	Vinyl toluene
Ethoxyethanol	Chlorobenzene	Propionic acid	Methyl cyclohexanol	

## DuraPURE Standard Capacity

Model	Nominal Size	Actual Size	Initial Pressure Drop (in w.g.)	Carbon Weight Per Filter (lbs.)	Total Weight Per Filter (lbs.)
DPC-442-SC	24x24x12	23.38 x 23.38x 11.50	.34	18	33
DPC-042-SC	20x24x12	19.38 x 23.38 x 11.50	.34	15	30
DPC-242-SC	12x24x12	11.38 x 23.38 x 11.50	.34	8	26

## DuraPURE High Capacity

Model	Nominal Size	Actual Size	Initial Pressure Drop (in w.g.)	Carbon Weight Per Filter (lbs.)	Total Weight Per Filter (lbs.)
DPC-442-HC	24x24x12	23.38 x 23.38x 11.50	.74	26	41
DPC-042-HC	20x24x12	19.38 x 23.38 x 11.50	.74	24	36
DPC-242-HC	12x24x12	11.38 x 23.38 x 11.50	.74	12	32

### Additional DuraPURE Information

Solvent Capacity of Standard Capacity DuraPURE: 5 lbs.

Solvent Capacity of High Capacity DuraPURE: 8 lbs.

Carbon Activity Rating: Minimum 60% on carbon tetrachloride (CCL4) at 25 ° C.

## DuraPURE Construction and Technical Data

**Activated Coconut Shell Carbon**  
Premium grade 60% activated carbon provides maximum adsorption of VOC's and odors (other specially impregnated medias are also available).

**Individual Media Cells**  
Moisture resistant honeycomb carbon cells offer high efficiency contaminant removal, with relatively low resistance to airflow.

**Plastic and Metal Frame Components**  
Rugged components make the DuraPURE extremely rigid and easy to install. Single or double header available.

**Thermoplastic Hot-Melt Adhesive**  
Specialized sealant eliminates air bypass and secures the individual carbon cells within the frame.

**Qualifies as a Koch Green Product**  
The Koch Green icon identifies the DuraPURE as a product that meets or exceeds our criteria in one or more of the following categories: Earns LEED Points, Reduces Energy Costs, Extends Filter Lifecycles, Conserves Resources and/or Improves Indoor Environmental Quality.



**KOCH FILTER**  
PURE PERFORMANCE

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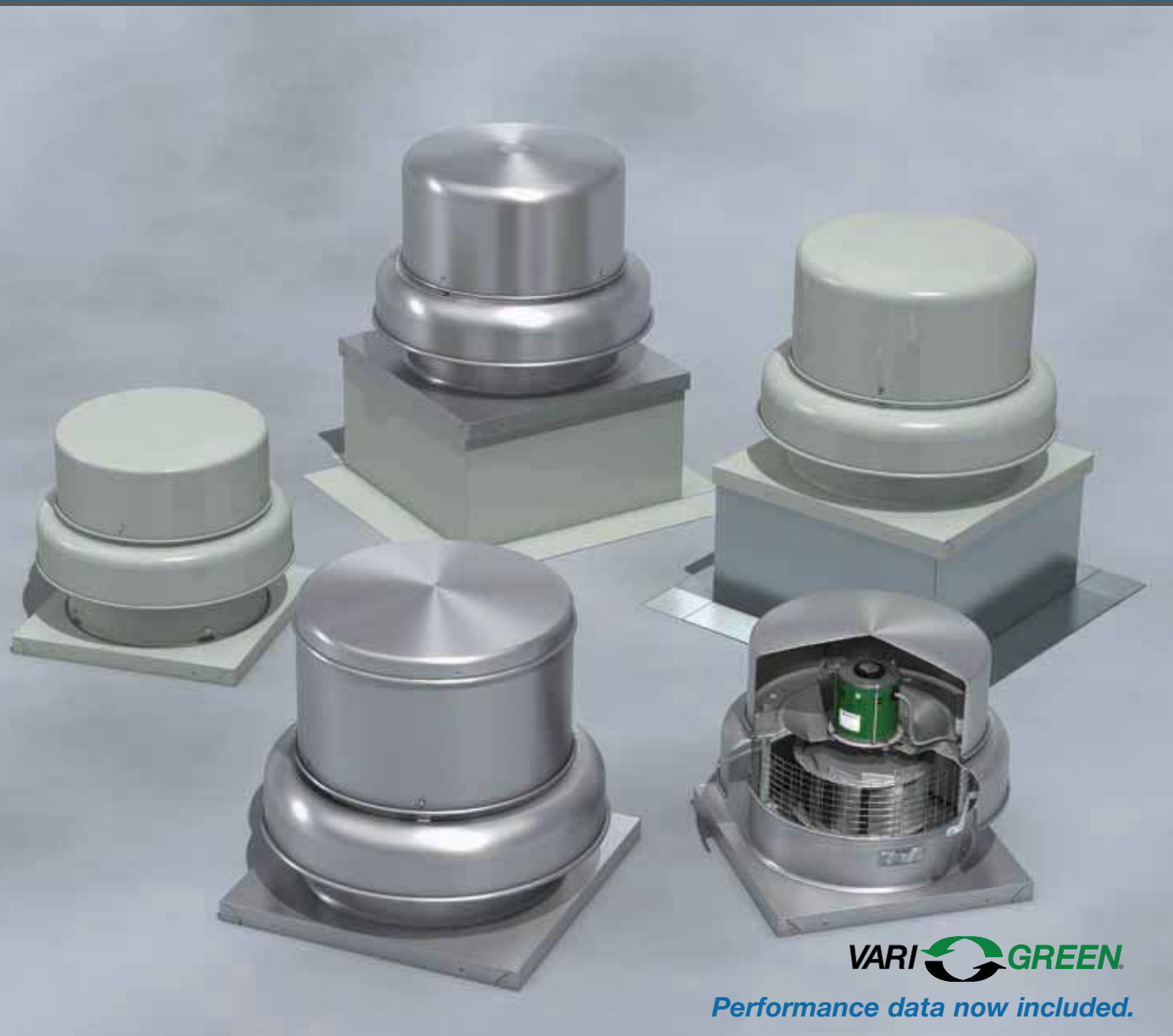
# Centrifugal Roof Downblast Exhaust Fans

## Models G and GB

- General Clean Air • Light Contaminants
- Seismic • High Wind • Variable Volume



BUILDING VALUE IN AIR.



March  
2013



# Models G and GB

## Spun Aluminum • Downblast Centrifugal Roof Exhaust Fans



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## Codes and Certifications



Greenheck Fan Corporation certifies that the Models G and GB 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. The certified ratings for Models G and GB are shown on pages 14 - 46.



G and GB models are listed for electrical (UL/cUL 705) File no. E40001

GB models for Emergency Smoke Control Systems (UL/cUL Listed for 500°F (260°C) for 4 hours and 1,000°F (538°C) for 15 minutes) File no. MH17511

***\*UL/cUL is optional and must be specified***

### High Wind Certification

Miami-Dade NOA No. 12-0120.13 for high wind and hurricane zones

### Seismic Certification

OSHPD No. 0148-10 - Office of Statewide Health Planning and Development (California)

IBC 2009 and 2012 - International Building Code



### Enjoy Greenheck's extraordinary service, before, during and after the sale.

Greenheck offers added value to our wide selection of top performing, energy-efficient products by providing several unique Greenheck service programs.

- Our Quick Delivery Program ensures shipment of our in-stock products within 24 hours of placing your order. Our Quick Build made-to-order products can be produced in 1-3-5-10- or 15-day production cycles, depending upon their complexity.
- Greenheck's free Computer Aided Product Selection program (CAPS), rated by many as the best in the industry, helps you conveniently and efficiently select the right products for the challenge at hand.
- Greenheck has been Green for a long time! Our energy-saving products and ongoing corporate commitment to sustainability can help you qualify for LEED credits.
- Our 3D service allows you to download at no charge lightweight, easy-to-use AutoDesk® Revit™ 3D drawings for many of our ventilation products.

Find out more about these special Greenheck services at [greenheck.com](http://greenheck.com)

# Models G and GB

## Spun Aluminum • Downblast

## Centrifugal Roof Exhaust Fans

### Model Comparison

Model	Location		Mounting				Airflow				Application						Drive Type		Impeller Type			Performance		Relative Cost		
	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**	Continuous High Temp (above 200°F)	Belt	Direct	Centrifugal	Propeller/Axial	Mixed Flow		Maximum Volume (cfm)	Maximum Static Pressure (in. wg)
G	✓		✓					✓				✓		✓			✓		✓	✓				6,308	1.75	\$
GB	✓		✓					✓				✓		✓		✓	✓		✓	✓				44,700	3.25	\$

\* Smoke Control available on models: 101, 101HP, 121, 131, 141, 141HP, 161, 161HP, 200, 240, 300, 360, 420 and 480.

\*\* High wind limited to sizes 300 and smaller

Greenheck models G and GB centrifugal roof exhaust fans provide the industry's best performance and durability for general clean air applications where air is discharged downward, toward the roof surface.

- Broadest performance in the industry, up to 3.25 in. wg (810 Pa) and 45,000 cfm (76,500 m<sup>3</sup>/hr).
- Most advanced motor cooling of any fan in its class.
- Performance as cataloged is assured. All fan sizes are tested in our AMCA Accredited Laboratory, and all models are licensed to bear the AMCA Sound and Air Performance seals.
- UL Listed for electrical.
- Greenheck subjects these products to extensive life testing, assuring you that the fans will provide years of reliable performance.

#### Direct Drive, G

- Use for short and/or low resistance ductwork

#### Belt Drive, GB

- For average length and/or average resistance ductwork
- High volume/average pressure

#### High Pressure, GB-HP and G-HP

- For long and/or high resistance ductwork
- Low volume/high pressure



# Construction Features

## Models G and GB

### Standard Construction Features

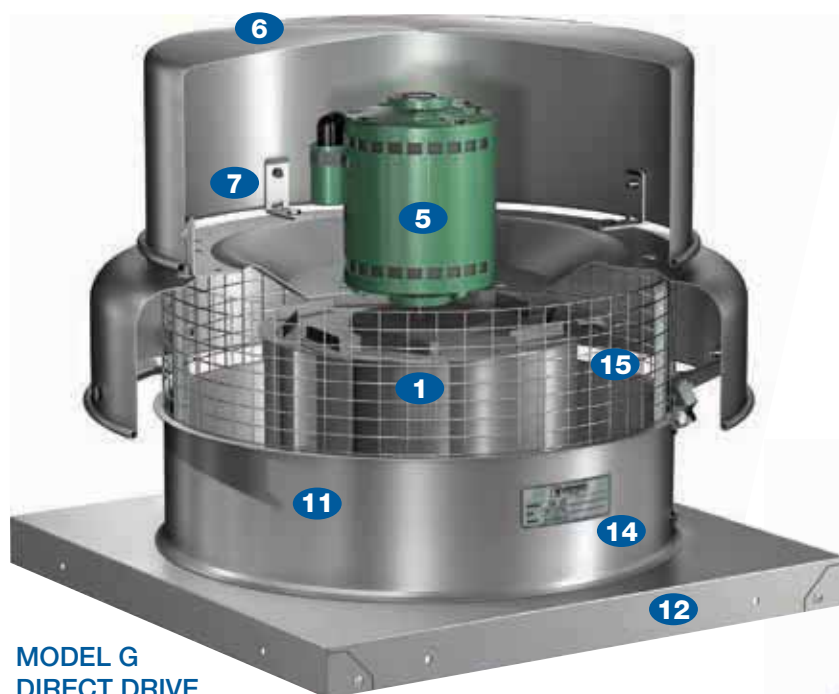
<b>1</b>	<b>Wheel</b>	An aluminum, backward-inclined, non-overloading centrifugal wheel is utilized to generate high-efficiency and minimal sound. Wheel cones are carefully matched to the venturi for maximum efficiency. Each wheel is robotically welded and statically and dynamically balanced for long life and quiet operation.
<b>2</b>	<b>Disconnect Switch</b>	NEMA-1 switch is factory mounted and wiring is provided from the motor as standard (other switches are available). All wiring and electrical components comply with the National Electrical Code® (NEC) and are either UL Listed or Recognized.
<b>3</b>	<b>Fan Shaft</b>	Precisely sized, ground and polished so the first critical speed is at least 25% over the maximum operating speed. Where the shaft makes contact with bearings, tight tolerances result in longer bearing life.
<b>4</b>	<b>Bearings</b>	100% factory tested and designed specifically for air handling applications with a minimum L <sub>10</sub> life in excess of 100,000 hours (L <sub>50</sub> life of 500,000 hours).
<b>5</b>	<b>Motor</b>	Carefully matched to the fan load and is mounted out of the airstream.
<b>6</b>	<b>Motor Cover</b>	Constructed of aluminum and attached with fasteners that provide for easy removal and access to motor compartment and drive assembly.
<b>7</b>	<b>Motor Cooling</b>	Cooling fins located on top of the fan wheel draw outside air through a large space between the fan shroud and the motor cover directly into the motor compartment. Positive motor cooling with fresh air results in maximum motor life.
<b>8</b>	<b>Lifting Points</b>	Various lifting points are located on the drive frame and bearing plate (on select sizes).
<b>9</b>	<b>True Vibration Isolation</b>	Vibration isolators, with no metal-to-metal contact, support the drive assembly and wheel for long life and quiet operation.
<b>10</b>	<b>Drive Assembly</b>	Belts, pulleys, and keys are oversized 150% of driven horsepower. Machined cast pulleys are adjustable for final system balancing. Belts are static-free and oil-resistant.
<b>11</b>	<b>Lower Windband</b>	Heavy-gauge aluminum with formed edges for added strength and provides weather resistance.
<b>12</b>	<b>Curb Cap</b>	Curb cap (with integral deep spun venturi) is constructed of aluminum and is one-piece for a weather-tight fit.
<b>13</b>	<b>Internal Conduit Chase</b>	A large diameter conduit for installing electrical wiring through the curb cap into the motor compartment.
<b>14</b>	<b>Nameplate</b>	Permanent stamped aluminum plate for exact model and serial number identification.
<b>15</b>	<b>Galvanized Birdscreen</b>	Rigid wire protects the fan discharge from birds and small objects.
<b>16</b>	<b>Fan Shroud</b>	One-piece, heavy-gauge aluminum with a rolled bead for extra strength directs exhaust air downward.
<b>17</b>	<b>Mounting Holes</b>	Curb cap has prepunched mounting holes to ensure correct attachment to the roof.

### High Wind Construction Features

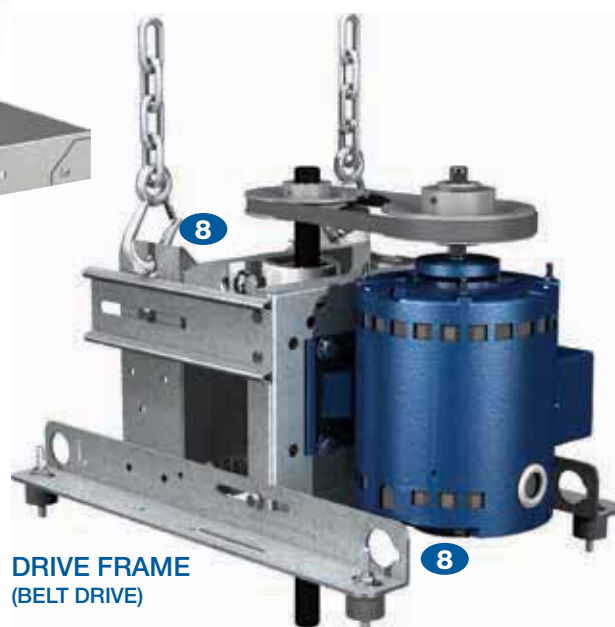
<b>18</b>	<b>Internal Supports</b>	Heavy-gauge supports and bracing are added for additional strength to withstand a load of 75 psf.
<b>19</b>	<b>Reinforced Wind Band</b>	High wind fans include additional reinforcement for maximum strength.
	<b>Roof Curb (page 10)</b>	High wind-load fans are certified for use with Greenheck model GPFHL, GPFHD, GPF or equivalent in high wind applications. Roof curbs ship separate for field installation with attachment details provided.



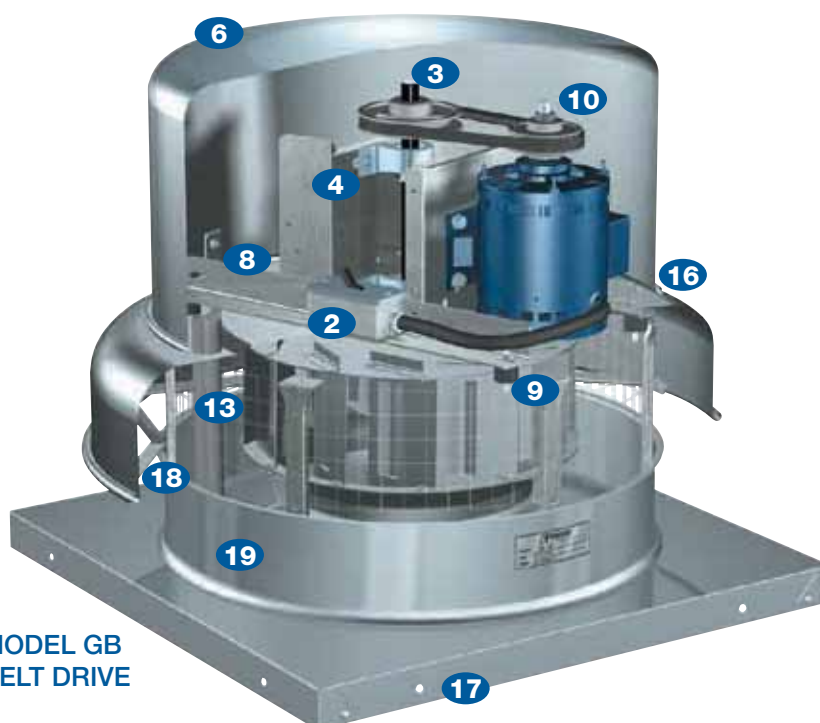
# Construction Features Models G and GB



MODEL G  
DIRECT DRIVE



DRIVE FRAME  
(BELT DRIVE)



MODEL GB  
BELT DRIVE



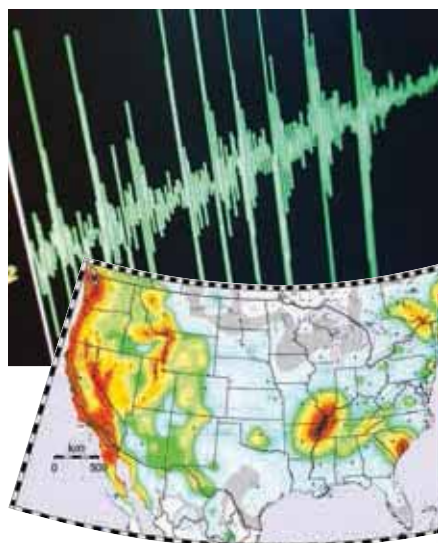
## Emergency Smoke Control - GB

When you buy a Greenheck model GB with the smoke control option, you receive a fan with the industry's best performance and durability for smoke control applications (as found in emergency smoke control systems).

**GB smoke control models are:**  
 101, 101-HP, 121, 131, 141, 141-HP,  
 161, 161-HP, 200, 240, 300, 360,  
 420, 480

- UL/cUL Listed for 500°F (260°C) for 4 hours and 1,000°F (538°C) for 15 minutes.
- Half the weight of traditional smoke control fans, ideal choice for roof load concerns.
- Low profile, height is less than half of traditional smoke control fans, maximum of 52½ inches (1334 mm) from curb cap to top of fan.
- Multiple applications, capable of exhausting general clean air and satisfying emergency smoke control regulations.

## Seismic - G and GB



With changes in building codes and standards, more equipment is being required to be seismically certified in areas of the country not commonly thought of as being in seismically active zones.

The International Building Code (IBC) is designed to provide model code regulations that safeguard public health and safety in all U.S. communities. This code is intended to improve the performance and design of non-structural systems subject to seismic events.

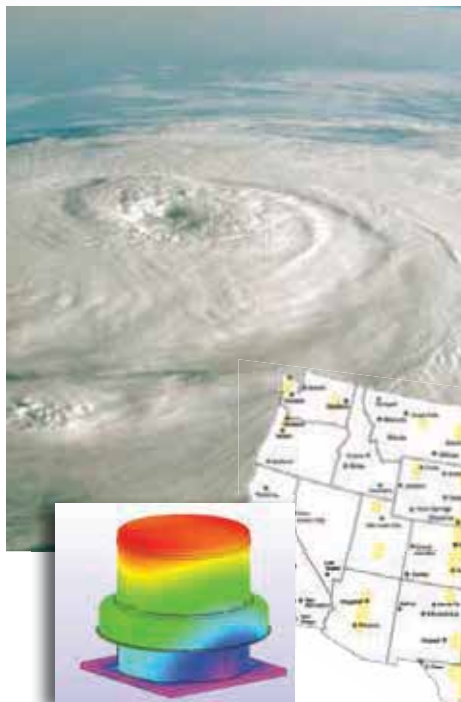
The State of California, one of the most active seismic areas in the United States, has the Office of Statewide Health Planning and Development (OSHPD) to regulate the design and construction of healthcare facilities to ensure they are safe and capable of providing services to the public after a seismic event.

OSHPD developed their own unique certification process to incorporate the IBC and ASCE testing standards to ensure equipment remains operable after a seismic event.

**Note:** All G and GB models meet seismic requirements.

## Protocols designed for seismic standards:

<b>Seismic Testing Criteria</b>	All Greenheck seismically certified models have been tested using the most severe seismic event that is found on the Spectral Response Map per IBC Figures 1613.5 (1-2). Our testing is performed under the worst case scenario using the highest mapped seismic load, highest level occupancy category, worst case site class, and highest code mandated importance factor, thereby allowing Greenheck's seismically certified fans to be used anywhere in the United States under any conditions
<b>California OSHPD Test Protocols</b>	The California Office of Statewide Health Planning and Development (OSHPD) requires all certified models be shake table tested in accordance with ICC ES AC-156, in which the fans are physically subjected to the same or greater forces than they will see during a seismic event. Subjecting Greenheck model G and GB fans to this type of testing ensures the fans will operate without problems after a seismic event.
<b>OSHPD Certification No. 0148-10</b>	The OSHPD certification numbers and supporting documents can be viewed on OSHPD's website ensuring that the fan has been subjected to and passed rigorous testing standards.
<b>State Licensed P.E. Calculations</b>	When using the fans in applications which are not covered by California OSHPD standards, Greenheck models G and GB have been certified by a third party engineering firm to IBC 2009, 2012 and ASCE 7-05 standards. These engineers hold professional engineering (P.E.) licenses in all 50 states, so no matter where your job is located, you are backed by a P.E. signature for your state.
<b>Certified Independent Third-Party Testing</b>	All Greenheck seismically certified fan models have gone through extensive testing procedures. Greenheck models G and GB have been certified to IBC 2009, 2012, ASCE 7-05 and California OSHPD standards through both engineering calculations and shake table testing of all models by independent third party engineering firms.



## High Wind and Hurricane - G and GB

Greenheck is leading the High Wind Standard for roof top fans and ventilators. Forceful winds and wind-borne debris are the cause of most hurricane damage. Hurricane winds start at 75 mph. and can exert a force of 75 pounds per square foot of pressure—or over 900 pounds on a fan and curb. Forceful winds are not the only problem, wind-borne debris can also cause detrimental effects to objects and structures. High winds and extreme forces are the cause of most storm damage. By analyzing calculations, computer simulations, actual testing, and other standards—Greenheck developed the High Wind Standard.



Atlantic, Gulf and Pacific history of major hurricane tracks.

## Protocols designed to protect against wind-borne debris and severe wind-loads:

<b>Structural Performance Load</b>	A static load that is 1.5 times the design load (91.5 pounds per square foot of pressure) is applied both positively and negatively to simulate wind force loads in each direction. Structural Performance per Dade County Protocol TAS-202 (ASTM-E330).
<b>Miami-Dade County Test Protocols</b>	Greenheck worked with Miami-Dade County to outline a High Velocity Hurricane Zone standard for rooftop fans. Greenheck model USGF was the first rooftop fan certified and approved by the Miami-Dade Building Code Compliance office and Texas Department of Insurance for use in hurricane zones. Models G and GB have been certified by an independent third party to the ASTM E-330 Static Pressure Difference Standard, Florida Building Code Test Protocol TAS-201 (large missile impact), 202 (static pressure difference) and 203 (cyclic pressure) Static Pressure Difference.
<b>Miami-Dade NOA Numbers</b>	The certifications can be viewed on the Miami-Dade County website under the NOA numbers listed here. Models G and GB are the first downblast aluminum fans in the industry that have received a Miami-Dade NOA for high wind and hurricane zones. Miami-Dade NOA 12-0120.13 for models G and GB.
<b>Florida Product Approval</b>	Florida Product Approval ensures that products which have been approved can be used anywhere in the State of Florida which are not governed by the Miami-Dade County high wind regulations. More information can be found on the Florida Building Code website. Florida Product Approval FL13225.1 for models G and GB
<b>State Licensed P.E. Calculations</b>	Structural calculations performed by a licensed Professional Engineer (P.E.) on models G and GB include Finite Element Analysis (FEA) and a stamped P.E. report of the fans compliance to ASCE 7-05 Minimum Design Loads for Buildings and Other Structures Standard and the Florida Building Code. The ASCE 7-05 Standard meets the IBC, Florida and Miami-Dade codes.
<b>Computational Fluid Dynamics (CFD)</b>	All Greenheck high wind models have been analyzed using Computational Fluid Dynamics (CFD). CFD is computer software designed to simulate the flow of high speed winds over the surface of objects. The software records the force profile exerted on the fan so it can be utilized in Finite Element Analysis (FEA).
<b>Finite Element Analysis (FEA)</b>	Utilizing the results from CFD analysis, Greenheck can accurately predict the stress, strain, and deflection resulting from high wind loads. Greenheck high wind units have been proven to withstand high winds through Finite Element Analysis utilizing CFD results.



## Model G VARI GREEN

Greenheck's electronically commutated (EC) Vari-Green (VG) motor combines motor technology, controllability and energy-efficiency into one single low maintenance unit and is the industry's first fully controllable motor. When combined with Greenheck's G fans, all the CFM and static pressure ranges of a belt drive can be attained with the benefits of a direct drive.

Motor Information			
HP	RPM	Voltage	HZ
1/6	1725	115, 208-240	50/60
1/4	1725	115, 208-240	50/60
1/2	1725	115, 208-240	50/60
3/4	1725	115, 208-240	50/60
1	1725	115, 208-240	50/60
2	1725	208-240	50/60
Extended RPM Motors			
1/2	2500	115	50/60
3/4	2200	115	50/60

## Benefits

Operates on AC power that's converted to DC—providing a more efficient motor operation as compared to an AC operation.

- The motor can attain up to 85% efficiency and reduce energy consumption.
- Watt savings of 30-70% depending on RPM.  
Note: As motor speed is turned down, efficiency stays high as compared to an AC motor that decreases dramatically.
- Operates cooler than a standard AC motor at lower RPMs. A cooler motor has longer motor life and reduces energy consumption.
- 80% usable RPM turndown versus 30%, see Motor Turndown Comparison chart at right.
- G fans with Vari-Green motors can provide all the CFM and static pressure ranges of a comparable belt drive.
- Maintenance costs are reduced as there are no belts or bearings to replace and no pulleys to adjust.
- Direct drive fans are often preferred where maintenance access is difficult.
- Provides a solution for demand controlled ventilation applications.

## Vari-Green Advantages

- Initial cost is similar to a belt drive
- Lower operating cost
- No maintenance, no belts, pulleys or bearings
- Easy RPM adjustment

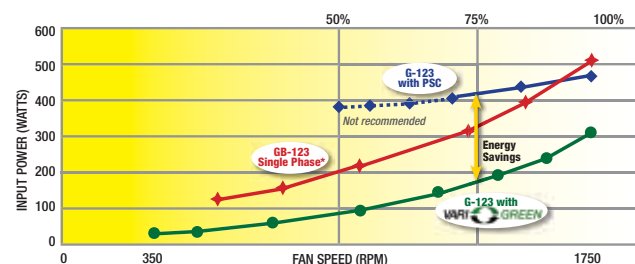
## Features

1. **Dial on Motor Control** - a potentiometer (dial on motor control) is mounted on the motor for easy speed adjustment for system balance. Simply turn the dial. There are no belts and pulleys to adjust.
2. **Control Wire Inputs** - the motor accepts a 0-10V DC signal from Building Automated Systems or other controls to adjust motor speed.



## Comparisons: Belt, Direct Drive with PSC and Direct Drive with Vari-Green

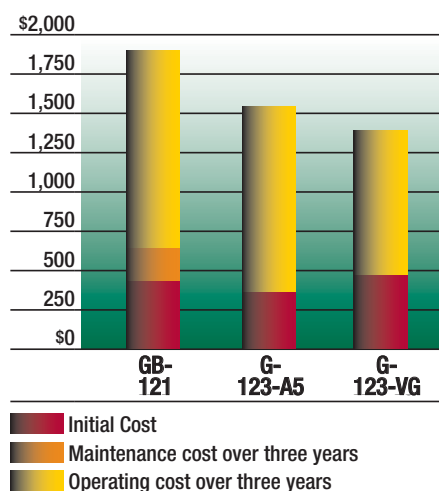
### Motor Turndown Comparison



The length of each curve indicates the practical turndown range. Data is for 1/2 hp motors with load of 0.35 Bhp at full speed

## Constant Volume Life Cycle Analysis

### Three Year Cost Comparison



Analysis is based on operating costs for a period of three years where the fans operate continuously at 1725 rpm, 24/7, with an energy rate of \$0.10/kWh. Maintenance on the GB-121 is estimated at \$65/yr.

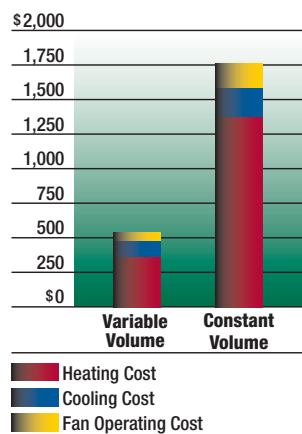
Note: Example is based on a relative cost. Use and installation variables may produce different results.

## Demand Control Ventilation for Multistory Buildings



Applications requiring constant pressure or variable volume can utilize G fans with Vari-Green motors and Vari-Green controls. Demand control ventilation systems reduce the amount of energy used by decreasing the speed of the fan when demand is low. This in turn lessens the amount of conditioned air exhausted and further reduces total operating costs associated with air conditioning and heating in multistoried buildings such as hotels, multifamily complexes, institutional facilities, and high rise commercial buildings.

### Variable Volume Operating Cost Analysis

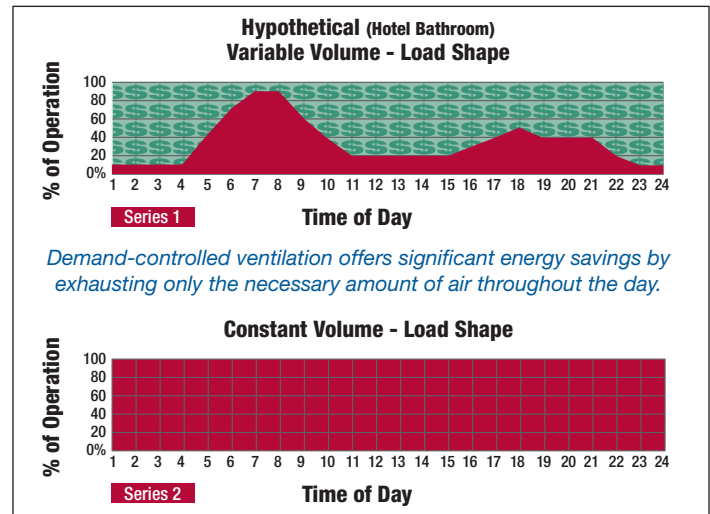


*Example of potential savings based on a northeast city in the USA using Vari-Green components for variable volume.*

The Vari-Green constant pressure control is preprogrammed and easy to install for applications that include venting dryers, bathrooms, residential type kitchen space or industrial process exhaust.

Contact [fans@greenheck.com](mailto:fans@greenheck.com) for more information.

### Daily Operating Comparison: Variable Volume and Constant Volume



Note: A standard VFD compatible motor can also function within a Variable Volume system.

## Vari-Green® Controls

**Transformer** - Provides 24V power from the existing line voltage at the fan to the Vari-Green motor and controls. Dual voltage primary (120/240V) transformer provided with the fan.

**Remote Dial** - Allows for remote, manual airflow adjustments. Wall plate with dial may be mounted in a standard 2x4 inch electrical junction box.

### Two Speed Control with Integral Transformer

Control allows motor rpm to be set at two independent speeds (high or low). Meets minimum airflow requirements with the ability to bump up to high speed in an emergency or meet maximum airflow requirements, or reset down to low for energy conservation.

**Constant Pressure Control - Indoor** - Control Vari-Green motor via static (variable volume) or velocity (constant CFM) pressure on the inlet or outlet side of the fan. Optional one or two duct or room probes for use in:

- Multifamily structures - Apartments, condos, hotels; clothes dryers, residential kitchens and bathrooms.
- Institutional facilities - Schools, prisons, multistory office buildings; bathrooms.

### Constant Pressure Control - Outdoor

Control a Vari-Green motor via static pressure on the inlet side of the fan. Includes one duct probe and transducer for use in:

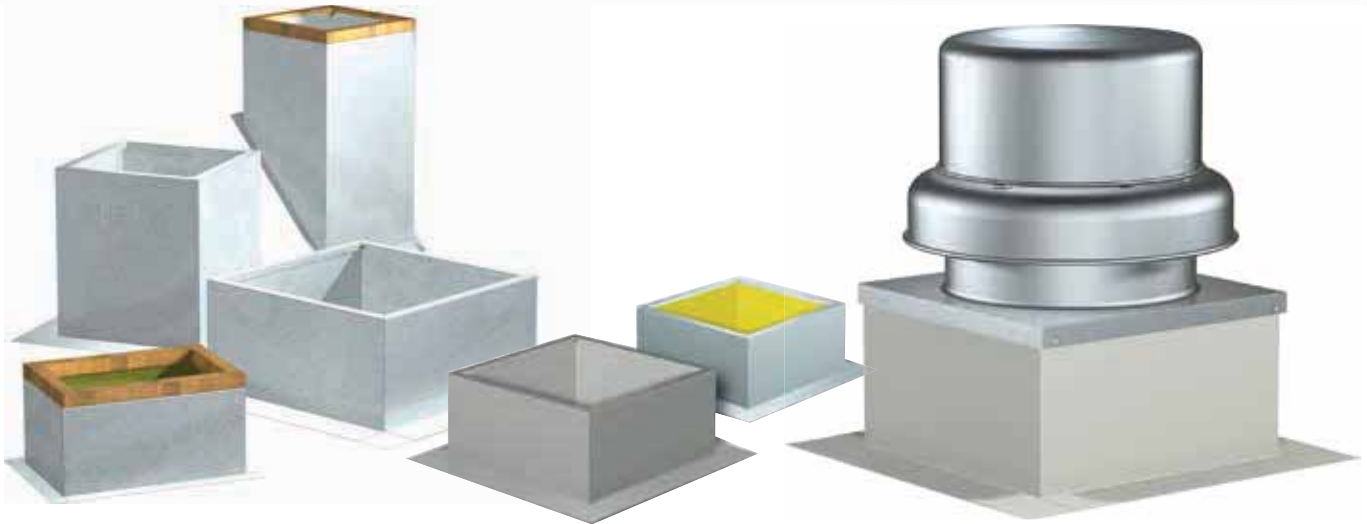
- Multifamily structures - Apartments, condos, hotels; residential kitchen, dryer facilities and bathrooms.
- Institutional facilities - Schools, prisons, multistory.

**Air Quality - VOC** - Control a Vari-Green motor via changes in volatile organic compounds (VOC's). VOC's are gasses that are emitted from humans, building materials, perfumes, foods, and furniture off-gassing. Range is 0-2000 CO<sub>2</sub> PPM equivalent.

- Institutional facilities - Schools, court house, hospitals; bathrooms, waiting rooms, cafeteria.
- Commercial buildings - Office space, conference rooms, bathrooms, break room.

**Air Quality - Temperature and Humidity** - Control Vari-Green motor via changes in temperature, humidity, or both. Range is 32 to 120°F and 0 to 100% relative humidity.

- Multifamily structures - Apartments, condos, hotels; bathrooms, utility rooms.
- Commercial buildings - Office buildings, office space, conference rooms, utility rooms, bathrooms.



## Roof Curbs

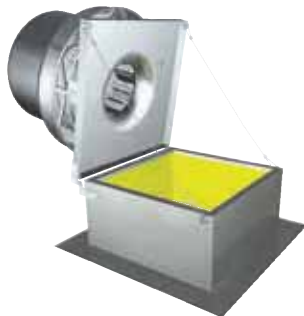
Prefabricated roof curbs reduce installation time and costs by ensuring compatibility between the fan, the curb and roof opening. All curbs are insulated with fiberglass. A wide variety of roof curbs are available, including: flanged, pitched and sound-absorbing.

## Hinged Curb Cap with Cables (Field Installed)

Mounted to the curb cap, allows entire fan to tilt away from curb for access to wheel and ductwork. Includes restraint cables.

## Hinged Base (Factory Mounted)

Allows for easy maintenance. Hinge and restraining cables are factory mounted to a subbase attached directly to curb without additional height added.



## Curb Seal

Rubber seal between fan and curb to assure proper sealing when attached to a curb.

## Curb Extensions

Extensions raise the fan discharge above the roofline and provide an accessible mounting location for dampers. Insect screen bases, constructed with a removable fine mesh, are recommended for applications where insect entry must be prevented.



## High Wind and Severe Duty Roof Curbs

**GPF/GPFP/GPFR** – Approved for high wind applications up to a 75 psf wind-load rating. Constructed of 18 gauge steel, formed and welded sides, and a 5-inch flashing flange. GPF is available up to 42 inches in height. GPFP and GPFR are available up to 24 inches in height.

**Severe Duty Curbs** – Designed for heavy compression loads exceeding 1,000 lbs. and carry a 130 psf wind-load rating.

**GPFHL (Heavy Load)** - 14 gauge galvanized steel with internal vertical support members and a 5-inch flashing flange.

**GPFHD (Heavy Duty)** - 12 gauge galvanized steel with internal vertical support members and a double thick 5-inch flashing flange.

**GPFHL and HD** are available up to 24 inches in height. Note: Maximum 24 inch height restriction on all curb models certified for high wind.

*For detailed curb information refer to Roof Curbs, Extensions and Equipment Supports catalog.*

Mounting details for the roof curb to the roof substrate and the fan to the curb are included with each model G and GB installation manual.

*For additional severe duty information, refer to the Greenheck High Wind brochure.*

## Tie-Down Points

Four brackets located on the shroud for securing the fan in high wind applications. Cables and anchors by others.



## Speed Controllers for Standard Motors

Available for use with shaded pole and permanent split capacitor (PSC) open motors on model G fans. They provide an economical means of system balancing with direct drive fans.



## Disconnect Switches

A wide selection of NEMA rated switches are available for positive electrical shutoff and safety, including: dust-tight, rainproof, and corrosion-resistant. Switches may be internally or externally mounted.



## Dampers

Designed to prevent outside air from entering back into the building when fan is off. Includes gravity and motorized dampers. Damper sizes are shown on each performance data page.



## Motor Starters -

The fundamental function of a motor starter is to protect the motor from damage that can occur from overheating. With a Greenheck motor starter you will be provided with the best motor protection available.



Specific model components may include; SmartStart™ technology, physical interface, overload protection, disconnect, magnetic contactor, NEMA-1 or NEMA-3R steel enclosures and pre-engineered easy system integration. For complete information on specific Greenheck Motor Starter models refer to [greenheck.com](http://greenheck.com), Motor Starter page.

## Birdscreen

Galvanized mesh is standard, optional aluminum or stainless steel rigid wire are also available.



G and GB models are Listed for electrical (UL/cUL 705) File no. E40001

GB models for Emergency Smoke Control Systems (UL/cUL Listed for 500°F (260°C) for 4 hours and 1,000°F (538°C) for 15 minutes) File no. MH17511

**Note:** UL/cUL is optional and must be specified.

## Coatings

A wide variety of coatings and colors are available. Greenheck coatings and resistance charts can be found in the Performance Coatings Commercial and Industrial Fans catalog and in our Product Application Guide—Performance Coatings for Ventilation Products.



**Primer** is applied at the factory to allow for final finish in the field.



**Permatector™** is our standard coating. Typically used for applications that require corrosion resistance in indoor and outdoor environments.



**Hi-Pro Polyester** is resistant to salt water, chemical fumes and moisture in more corrosive atmospheres. Typically used for applications that require superior chemical resistance, excellent abrasion and outdoor UV protection. This coating exceeds protective qualities of Air Dried Heresite and Air Dry Phenolic.



**Baked Enamel Decorative Coatings** are heat cured enamels applied either as wet paints or electrostatic powders. Customers can choose from 16 standard decorative colors or color match any color.



## General Clean Air (figure 1)

Models G and GB exhaust fans are designed to meet the needs of general clean air applications. Tests were conducted to assure safe, rugged and reliable fans.

Due to the varying types of airstreams encountered in commercial ventilation, system designers must be aware of national, state, and local codes and guidelines governing these installations. Local code authorities should be consulted before proceeding with any ventilation project.

- When roofing materials extend to the top of the curb, roof curbs should be 1½ inches (¾ inch on each side) less than the unit curb cap to allow for roofing and flashing.
- For recommended duct size, damper size, and roof opening dimensions, refer to the performance data pages. (starting on pg. 14)
- Installation must include a means for inspecting, cleaning and servicing the exhaust fan.

## High Wind, Hurricane and Seismic (figure 2)

- Roofing materials can extend to the top of the curb, roof curbs should be 1 inch (25 mm) total, or ½ inch (13 mm) on each side, less than the unit curb cap to allow for roofing and flashing.

**Note:** The typical installations shown are recommendations based on national codes. Local authority may supersede these recommendations.

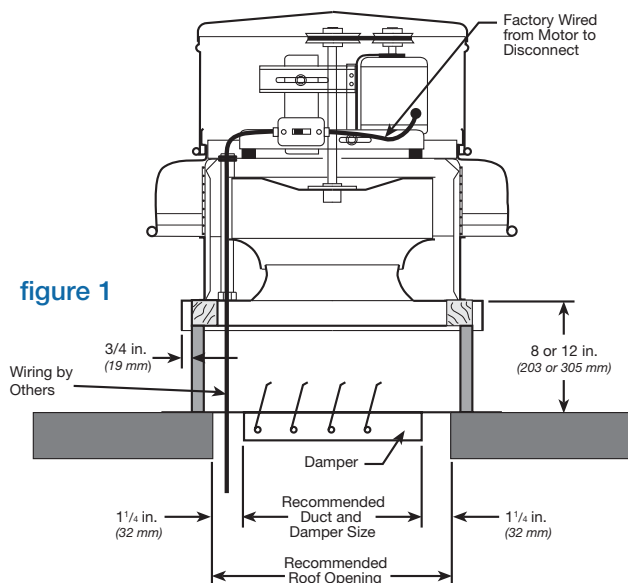


figure 1

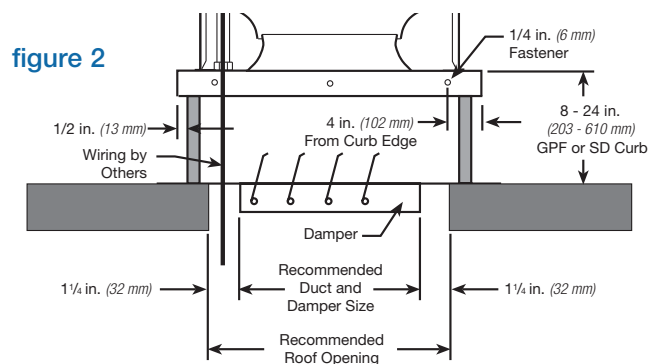
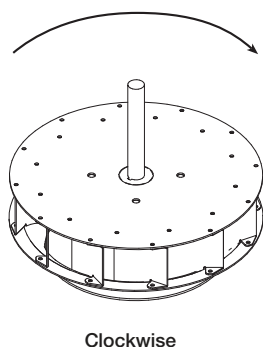


figure 2



## Wheel Rotation

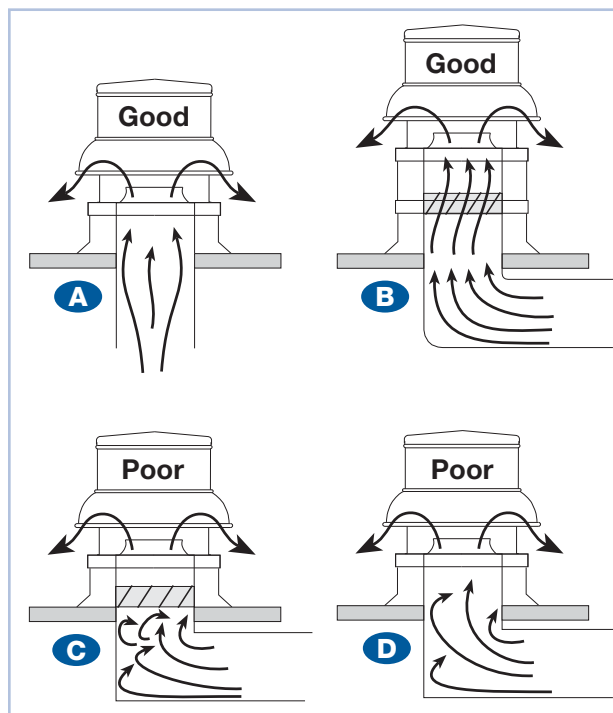
Direction of rotation is very critical. Rotation in the wrong direction will result in excessive horsepower, possible motor burnout, and increased noise levels. Check rotation by energizing the unit momentarily. The rotation should be the same as the rotation decals affixed to the unit and is clockwise when viewed from the top of the unit.



## Fan Inlet Connections

In order to assure proper fan performance, caution must be exercised in fan placement and connection to the ventilation system. Obstructions, transitions, poorly designed elbows, improperly selected dampers, etc., can cause reduced performance, excessive noise, and increased mechanical stress. For performance to be as published, the system must provide uniform and stable airflow into the fan.

- A** Provide uniform airflow at fan inlet to assure optimum performance.
- B** Provide uniform airflow at fan inlet and through the damper to assure optimum performance.
- C** Dampers must open fully. Use motorized dampers in low airflow applications to reduce losses.
- D** Avoid sharp turns or entrance conditions which cause uneven flow. Use turning vanes in elbows to reduce adverse effects.



## Model Number Code

The model number code system is designed to completely identify the fan. The correct code letters must be specified to designate belt or direct drive. The remainder of the model code is determined by the size and performance.

