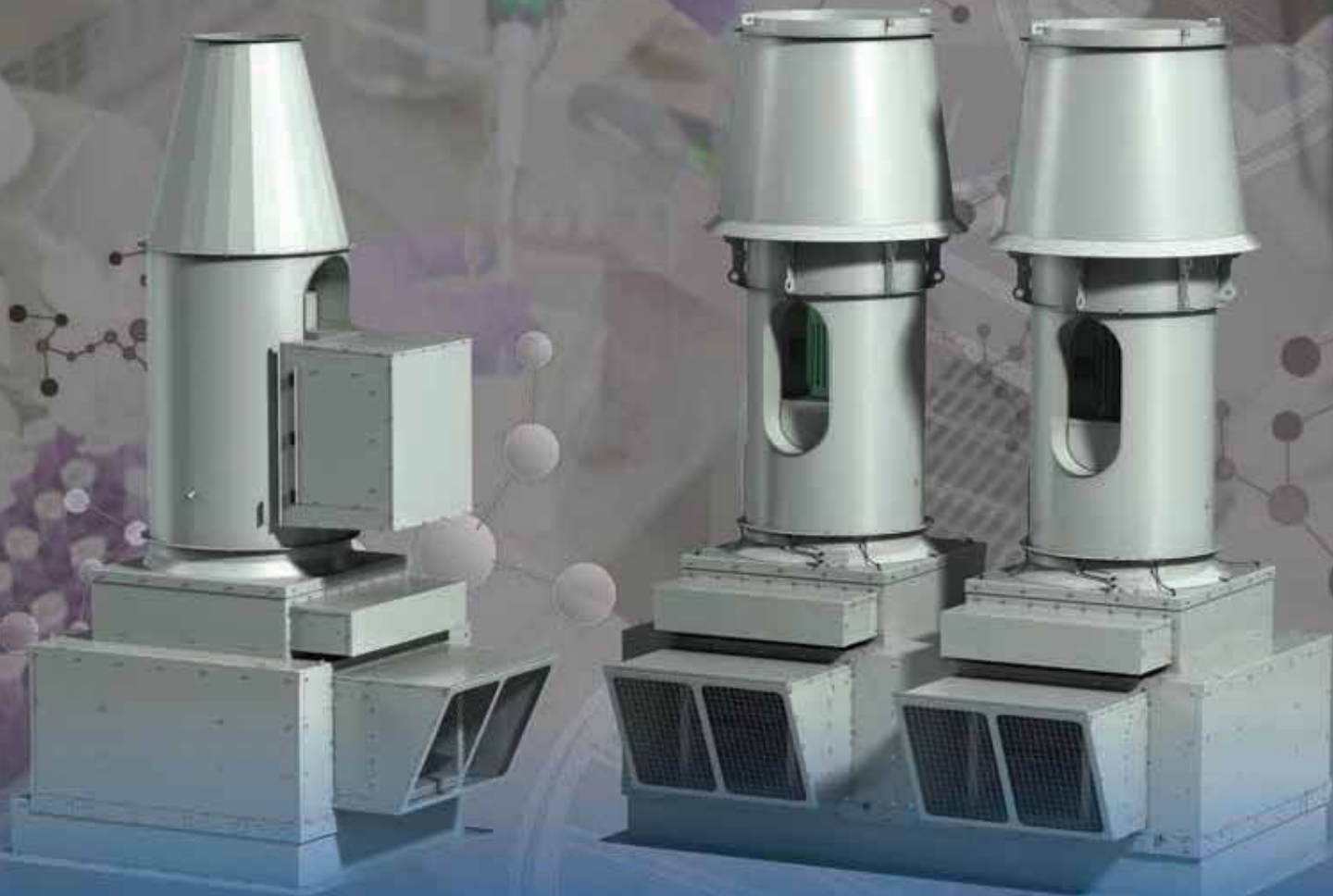


Laboratory Exhaust Systems

Vektor[®]-MH and Vektor[®]-MD

Mixed Flow High Plume and High Plume Dilution Blower

 **VEKTOR[®]**



 **GREENHECK**
Building Value in Air.

August
2013

Vektor-MH High Plume and Vektor-MD High Plume Dilution Blower



Greenheck's Vektor-MH high plume and Vektor-MD high plume dilution blowers are designed to efficiently exhaust laboratory fumes and odors high above any air intakes on the same or surrounding buildings. Utilizing a patented mixed flow wheel design, the space saving configuration of the Vektor-MH and -MD maximizes air movement with reduced sound and energy.

Vektor MH and MD Benefits

- Complete system with single source supplier
- Conforms to standards and codes ASHRAE 45, ANSI Z9.5 and UL 705
- AMCA Licensed performance (Vektor-MD)
- Bifurcated housing for safe and easy maintenance
- Minimal roof deck space
- No guy wires up to 125 mph wind speed (201 km/h)



Vektor-MD Patents
Manufactured by Greenheck Fan Corp.
under the following patent numbers:

U.S. Patents:
No. 7048499, 7320636, 7682231

Mexico Patents:
No. 243465, 258949

China Patents:
No. 01813109.3, 200580006160.6,
200580006162.5

Singapore Patents:
No. 124106, 124135

Hong Kong Patent:
No. 1110926, 1114659

Indian Patents:
No. 253764

**Other U.S. and Foreign
Patents Pending**

Typical Installations

- Hospital laboratories and isolation wards
- College and university laboratories
- Pharmaceutical companies
- Biotech laboratories
- Research facilities

Vektor-MH

High Plume with High Velocity Discharge Nozzle

The Vektor-MH for high plume laboratory exhaust utilizes an engineered conical discharge to maximize the effective plume height. The Vektor-MH has a single fan capacity up to 60,000 cfm and 8 in. wg (28,317 l/s and 1,990 Pa)

- The nozzle has a smooth transition from fan to discharge minimizing pressure losses
- No abrupt changes in area maximizing fan efficiency
- Multiple discharge nozzles per fan size to custom-tailor discharge velocity and plume rise
- 3,000 ft/min. (15.2 m/s) minimum discharge velocity per ANSI Z9.5

Vektor-MD

High Plume Dilution with High Velocity Nozzle and Entrainment Windband

The Vektor-MD for high plume dilution entrains ambient air to assist in the dilution of contaminated laboratory exhaust. The Vektor-MD has a single fan capacity up to 80,000 cfm and 8 in. wg (37,756 l/s and 1,990 Pa)

- Increased dilution and safety while maintaining effective plume height
- Higher nozzle velocity creates higher dilution percentage
- Windband focuses and promotes mixing of exhaust and entrained ambient air
- 3,000 ft/min. (15.2 m/s) minimum nozzle discharge velocity per ANSI Z9.5
- Induced Flow Fan with AMCA 260 Sound and Air

Vektor-MH

High Plume

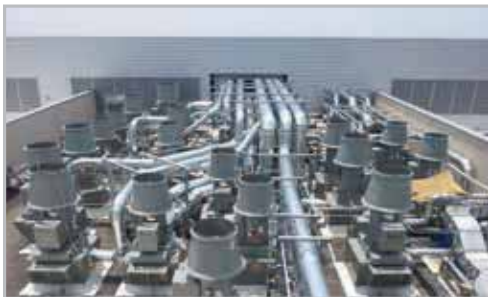
The Vektor-MH pulls hazardous exhaust air straight through the fan into an engineered and tested conical discharge. Multiple nozzles for each sized fan allow for the maximum plume height balanced with reduced energy requirements.



Vektor-MD

Dilution with Increased Safety

The Vektor-MD with high velocity nozzle accelerates exhaust air entraining additional outside air diluting any odors or contaminants in the exhaust before exiting out the top of the windband. Up to 300% dilution of lab exhaust.



Compact Footprint



High Volume Applications



Parapet Installations

Airflow and Effective Plume Height

The effective plume height is an important factor in designing exhaust systems servicing laboratories. The effective plume height needs to be high enough to avoid exhaust re-entrainment into the same or adjacent buildings. Fan discharge type, concentration levels and airflow volumes all affect the needed effective plume height. The effective plume height (h_e) is the physical height of the fan system (h_s) plus the plume rise (h_r). Plume rise is calculated using the Briggs equation below.

The plume rise from an exhaust stack, with no hinged rain cap, can be calculated using the following equation*:

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

$$h_r = \text{plume rise, ft (m)}$$

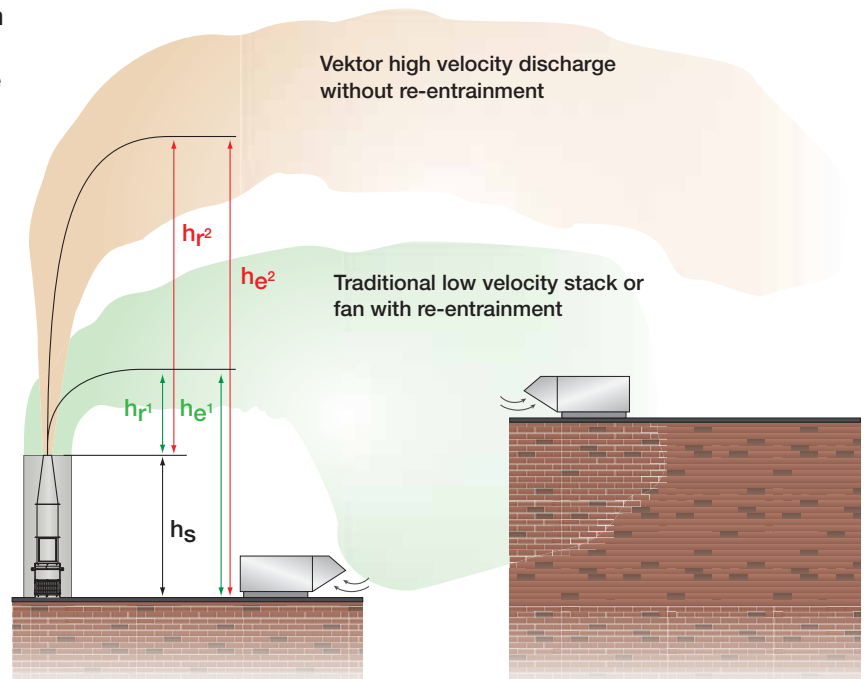
$$V = \text{Stack exit velocity, ft/min. (m/s)}$$

$$d = \text{stack diameter, ft (m)}$$

$$U = \text{wind speed, ft/min. (m/s)}$$

* From ASHRAE Laboratory Design Guide, 2001

Consult ASHRAE Handbook - HVAC Application for detailed design considerations of building air intake placement



Vektor-MH and Vektor-MD Value Added Features

Belt or direct drive flexibility – MH and MD models are available with belt or direct drive arrangements to suit owner / operator preferences. Direct drive configurations use an AMCA arrangement 2 for maximum motor bearing life and easy maintenance. Belt drive configurations have a 2.0 drive service factor with minimum of two belts maintaining the highest level of reliability.



Belt Drive

Bifurcated housing – Keeps serviceable components safe and accessible by dividing the airflow and isolating drive components completely out of the contaminated airstream.



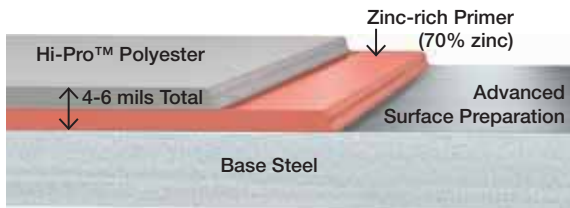
Mixed flow wheel – Specially configured blades move air with lower energy consumption and reduced sound generation. Additional blades on the back of the wheel create a vacuum, preventing contaminated exhaust from escaping through the shaft opening into the fan housing. Available with AMCA Spark C or B construction.



Back pressure blades

LabCoat™ corrosion resistant coating – Electrostatically powder coated with corrosion resistant Hi-Pro™ Polyester topcoat with zinc-rich epoxy primer, protects against a wide spectrum of acids, alkalies and solvents.

LabCoat™ Cross Section



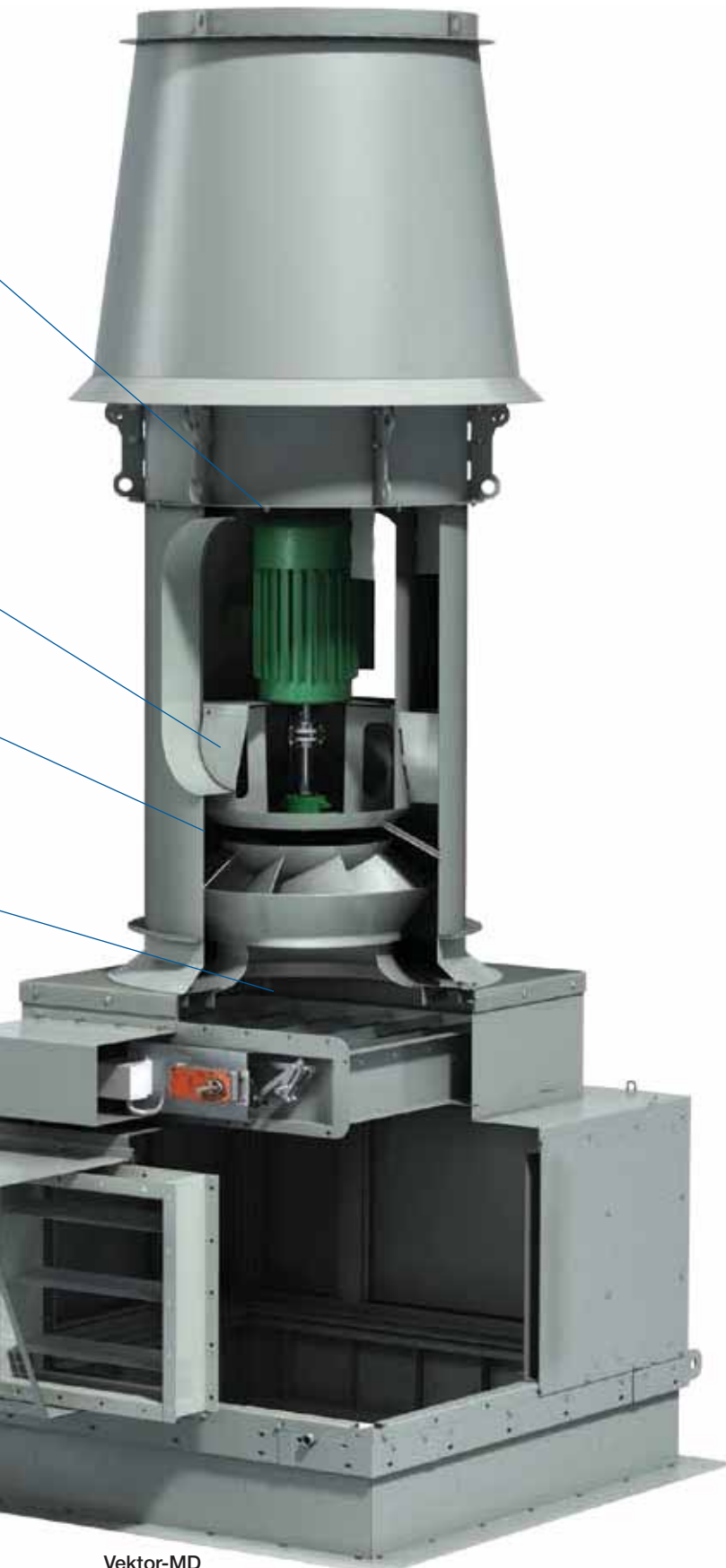
Isolation damper – Parallel airfoil blade dampers isolate individual fans from the plenum when not in operation. Slide out design allows for service and inspection of damper and actuators without entering into the confined, contaminated plenum. The damper's low leakage design prevents back spin of the wheel. Dampers are constructed for the exhaust system's pressure and volume.



Bypass damper – Opposed airfoil blade dampers provide for full airflow control throughout the damper's operating range. Dampers are sized specifically for volumes and pressures required on the application providing superior system control. Heavy duty construction up to 15 in. wg (3736 Pa). Factory provided and mounting available.

Roof curb – Reinforced heavy duty insulated roof curb provides full perimeter and cross support for multiple fan plenums up to 125 mph (201 km/h) windload without the use of guy wires.





Options and Accessories



Inline
Attenuating
Silencer

Attenuating
Windband

Attenuating
Nozzle

Attenuating options - Reduce total sound levels. No loss of discharge velocity. Tested as an assembly.



Sure-Aire™

Sure-Aire airflow monitoring - Without invasive probes, provides airflow measurement accuracy within 3%.

Stack extension - For projects that require additional discharge height or effective plume height.



Vektor-MD or Vektor-MH
with Energy Recovery

ERS

Single source energy recovery system (ERS) - Pre-engineered energy recovery system that uses 100% safe coil loop system. Contaminated exhaust and fresh air supply airstreams are always separated. The ERS system is matched to the Vektor system plus coil and filter pressure drops are automatically included in fan sizing.

Vektor-MD
Direct Drive

With over 65 years of experience in the HVAC industry, Greenheck is the world's largest manufacturer of commercial, institutional and industrial air movement and control equipment. We provide cost-effective, value-added solutions with facilities and representatives around the world.

Value for Owners

- Finding solutions for unique applications
- Focus on energy saving solutions
- Safe serviceability
- AMCA Certified Products
- Reliability
- Ease of maintenance

Value for Engineers/Architects

- Quick and accurate information
- Design flexibility
- Laboratory expertise
- Revit™ models
- AMCA Certified Products
- Computer Aided Product Selection - CAPS

Value for Contractors

- Complete system available for easy installation
- Flexible on-time delivery
- Prior shipped curbs
- Troubleshooting / answering installation questions

Complete fan system AMCA Licensed

- AMCA certified performance as a complete assembly including discharge nozzle and windband
- Performance testing of air movement, energy consumption, and sound levels



Vektor-MD AMCA 260 Testing



Vektor-MD

Computer Aided Program Selection

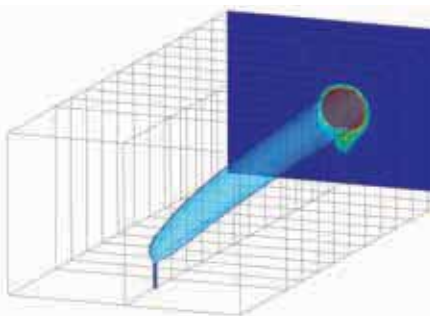
- CAPS provides needed information for an informed decision and streamlines the design process
- Selection wizard filters models by features important to the project
- Size options presented for side-by-side comparison
- Sort sizes by criteria such as fan rpm, energy consumption, sound levels and effective plume height
- Full submittal information, drawings, weight, fan curves and component details, print, or PDF
- Revit® and scaled AutoCad® drawings are downloadable as configured.



CAPS Configuration



Revit Drawing



Computational fluid dynamics model of a traditional low velocity exhaust stack

Vibration Testing

- Vektor fans are vibration tested as a complete assembly and must pass AMCA 204 vibration standards
 - Belt drive - 0.10 in./s (2.5 mm/s) filter in.
 - Direct drive - 0.08 in./s (2.0 mm/s) filter in.
- Tri-axial accelerometers take measurements at the bearings in three planes
- Test results for each fan are stored as permanent record and are available upon request



Single Source Supplier

- Manufacturer of the fans, wheels, housings, plenums, dampers, and coils
- All system components are designed and integrated for laboratory exhaust
- Control of the manufacturing process and maintaining high quality standards
- Single source responsibility

Vektor-MH and Vektor-MD Performance & Configuration

MH Fan Size	Inlet CFM		Effective Plume Rise (h _e) (ft.)	MD Fan Size	Inlet CFM		Discharge CFM	Effective Plume Rise (h _e) (ft.)
15	Min	2,000	22	15	Min	1,500	4,500	20
	Max	6,500	34		Max	5,500	11,700	34
18	Min	2,500	23	18	Min	2,000	6,160	23
	Max	9,000	39		Max	8,000	18,000	42
20	Min	3,500	26	20	Min	2,500	7,800	26
	Max	11,000	43		Max	10,000	22,600	47
22	Min	3,500	26	22	Min	5,000	11,000	28
	Max	13,500	45		Max	14,000	23,600	45
24	Min	4,500	28	24	Min	6,000	13,200	30
	Max	17,000	47		Max	17,000	28,700	49
27	Min	6,500	32	27	Min	7,500	16,500	33
	Max	20,500	52		Max	21,000	35,400	54
30	Min	7,000	33	30	Min	9,000	19,800	37
	Max	25,000	56		Max	25,000	42,200	58
33	Min	9,000	37	33	Min	8,000	17,200	32
	Max	30,500	62		Max	33,000	49,500	60
36	Min	9,500	37	36	Min	9,500	20,500	34
	Max	37,000	70		Max	36,500	60,200	66
40	Min	13,000	40	40	Min	12,000	25,800	37
	Max	60,000	91		Max	44,500	73,400	72
				44	Min	14,000	30,200	43
					Max	54,500	89,900	85
				49	Min	17,500	37,600	47
					Max	65,500	109,700	93
				54	Min	21,000	45,300	51
					Max	80,000	132,000	103

MH and MD performance certified is for installation type A, Free inlet, Free outlet. Performance ratings do not include the effects of appurtenances (accessories). Minimum inlet CFM based upon ANSI Z9.5 minimum discharge velocity of 3,000 ft./min. (15.2 m/s) Plume rise calculation based upon 10 mph (16 km/h) crosswind (see page 3).

Configurations

Fan Qty.	Fan Only	Inline	Side-by-Side
1	1	1 x 1	
2		2 x 1	
3		3 x 1	
4		4 x 1	2 x 2
5		5 x 1	
6		6 x 1	3 x 2



1x1 Inline System



3x1 Inline System



2x2 Side-By-Side System

Model Number Nomenclature

Vektor-MD - 15 - 9 - 70 - LV - HPW

Mixed Flow Wheel

High Plume Dilution

Fan Size

9 Belt Drive
2 Direct Drive

% Wheel Width

Nozzle Size

Windband Type

Vektor-MH - 15 - 9 - 70 - 12

Mixed Flow Wheel

High Plume

Fan Size

9 Belt Drive
2 Direct Drive

% Wheel Width

Nozzle Size

VEKTOR® Family of Lab Exhaust Systems



Vektor HS

- SAVVE discharge nozzle technology
- Variable volume flow – constant velocity discharge
- Centrifugal wheel
- Up to 24,000 cfm and 4 in. wg



Vektor H

- High Plume Discharge Nozzle
- Centrifugal wheel
- Compact design / sealed air-stream components
- Up to 24,000 cfm and 4 in. wg



Vektor CD

- High Plume Discharge Nozzle with Entrainment and Dilution
- Centrifugal wheel
- Highest efficiency / easy service design
- Up to 120,000 cfm and 14 in. wg



Vektor MH

- High Plume Nozzle
- Mixed flow wheel / bifurcated housing
- Compact design
- Up to 60,000 cfm and 8 in. wg



Vektor MD

- High Plume with Entrainment and Dilution
- Mixed flow wheel / bifurcated housing
- Compact design
- Up to 80,000 cfm and 8 in. wg



Vektor-MS

- SAVVE discharge nozzle technology
- Variable volume flow – constant velocity discharge
- Mixed flow wheel / bifurcated housing
- Up to 38,000 cfm and 8 in. wg

Our Commitment

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

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



Prepared to Support
Green Building Efforts

