



Vertical Direct Fired Gas
MODEL VSU MAKE-UP AIR UNIT



Model VSU

Vertical Direct Fired Gas Make-Up Air Unit

The Greenheck model VSU provides a 100% efficient direct fired gas heating and ventilating unit in a vertical configuration. This configuration removes the equipment weight load from the roof and offers an easier means of installation. Ground level filters, dampers, and controls also simplify servicing.

The VSU is specifically designed for providing heating and make-up air for manufacturing facilities and warehouses. Air flow volumes up to 60,000 cfm and heating capacities up to 6,050,000 BTU/Hr are offered.

Durable Construction

Designed for maximum weather resistance, VSU Housings are constructed of heavy gauge G90 galvanized steel. Lifting lugs are standard.

Direct Fired Gas System

- Maxon cast iron burners with stainless steel mixing plates
- Maxitrol burner modulation control
- Flame safeguard with digital fault indicator capability
- 25:1 turn down ratio



Control Center

The control center includes the following standard components:

- Magnetic motor starter with solid state overload protection
- Control transformer with fusing
- Integral door interlocking disconnect switch
- Separately fused motor
- Distribution terminal strip



Premium grade control components are selected for reliable operation. All electrical components are UL Listed, recognized or classified and factory prewired for single point power connection.

Vibration Isolators

The entire fan and motor assembly is mounted on vibration isolators to minimize noise transmission into the building.



Access Doors and Panels

Large access doors and panels are provided for easy inspection and maintenance of motors, drives, fan wheels, filters, and heater controls.

Centrifugal Blowers

Double width, double inlet forward curved wheels for high efficiency and low sound levels are constructed of heavy gauge steel. Wheels are statically and dynamically balanced to ensure vibration free operation.

Factory Wired and Tested

All units are tested prior to shipment. Units are checked for vibration and proper operation.



100% Make-Up Air

The 100% Make-Up Air system is recommended when outdoor air is required to replenish a constant volume of exhaust air. This system provides efficient heating of the make-up air and minimizes unwanted infiltration. Some of the most popular applications include paint

booths, warehouses, kitchens and factories. Benefits of this system include low operating cost, low initial cost, simplicity and reliability. See page 5 for a wide range of factory supplied accessories.

Variable Volume System

The variable volume option is recommended when a building's exhaust volumes are variable. This option enables the make-up air volume to track with the exhaust volume, providing only the amount of make-up air that is required.

The variable volume VSU saves energy in two ways. First, the fan power is reduced whenever make-up air requirements are less than the maximum. Second, whenever lower air volumes are sufficient, the VSU requires less gas to heat the outdoor air.

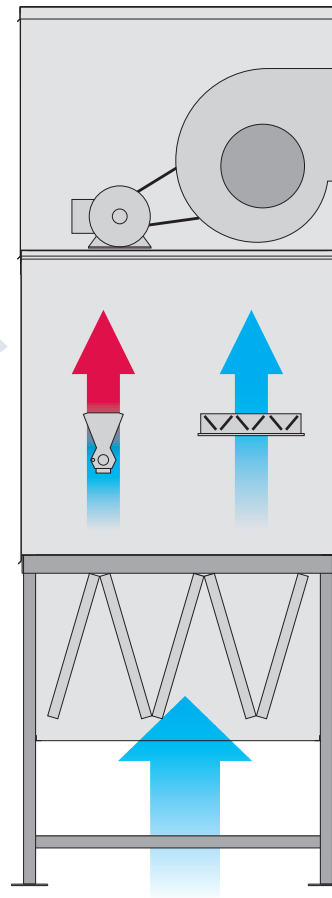
Airflow Control Strategies

Greenheck offers three methods of controlling the make-up air volume. All three vary the fan speed for maximum energy savings.

- Variable Frequency Drive controlled by building pressure.
- Variable Frequency Drive controlled manually with a remote potentiometer.
- 2 speed motor controlled manually with a remote switch.

Temperature Control

A Room Temperature Control package is included with the Variable Volume systems. The space temperature is controlled by a room mounted thermostat. A factory supplied remote control panel is required.

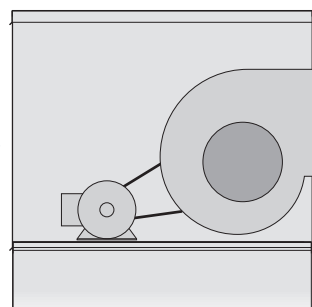


Burner By-Pass Damper

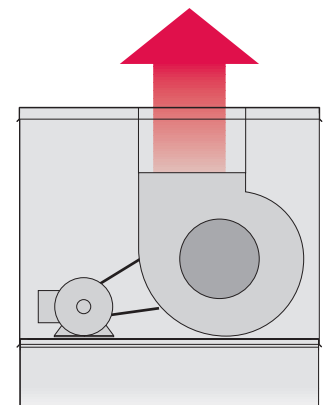
The variable volume option includes a patented burner by-pass damper, which maintains the pressure drop across the burner as air volumes change. This assures that complete and proper combustion occurs. The by-pass damper is self-adjusting, designed for minimal maintenance, and requires no controls.

Discharge Arrangements

For installation flexibility, fan discharges are available in either Horizontal or Upblast Discharge.



Horizontal Discharge



Upblast Discharge

80/20 Recirculation

The 80/20 Recirculation option is recommended when the ventilation equipment provides the primary source of heating for the space.

This option recirculates up to 80% of the supply air and efficiently heats it to maintain the desired space temperature. A minimum of 20% outdoor air is mixed with the recirculated air to provide a continuous source of fresh air.

Only outdoor air is used for combustion. This eliminates the possibility of contaminants in the recirculated air from crossing the burner.

Airflow Control Strategies

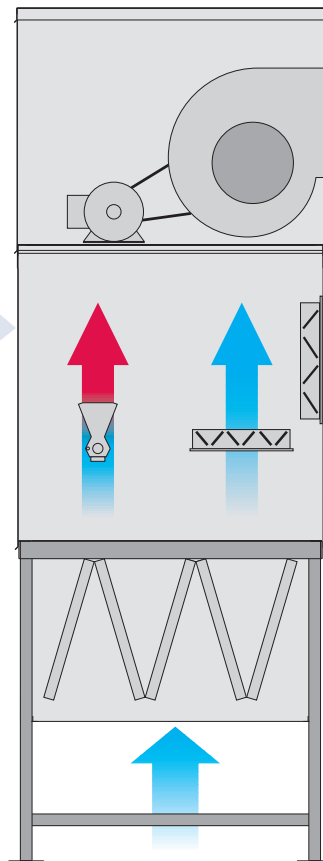
Greenheck offers four methods of controlling the recirculated air to outdoor air ratio. The ratio is determined by the outdoor air and recirculated air damper positions. The methods for adjusting damper positions are outlined below:

- **Modulating actuator controlled by building pressure.**
- **Modulating actuator controlled manually with a remote potentiometer.**
- **Two position actuator controlled manually with a remote switch.**
- **Manually operated damper quadrants set to a fixed position.**

In all cases, the fan provides a constant volume of supply air.

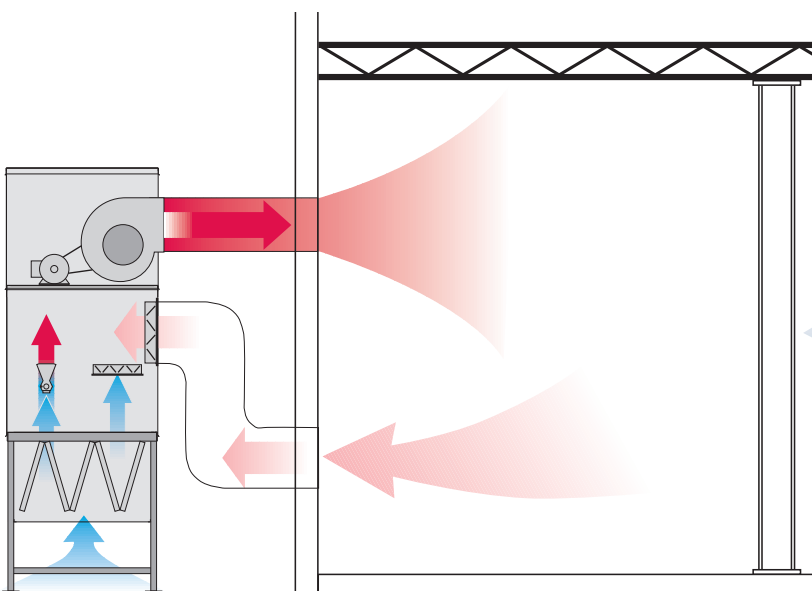
Temperature Control

A Room Temperature Control package is included with the 80/20 Recirculation system. The space temperature is controlled by a room mounted thermostat. A factory supplied remote control panel is required.



Burner By-Pass Damper

The 80/20 recirculation option includes a patented burner by-pass damper, which maintains the pressure drop across the burner as air volumes change. This assures that complete and proper combustion occurs. The by-pass damper is self-adjusting, designed for minimal maintenance, and requires no controls.



Benefits vs Air Turnover

The 80/20 Recirculation system provides the space heating function with several advantages over indirect gas fired air turnover units.

More Efficient - The 80/20 Recirculation direct fired burners are 100% efficient, compared to 80% efficient (maximum) for air turnover units.

Fresh Air - The 80/20 Recirculation system provides a continuous source of fresh outdoor air and positively pressurizes the building.

Outdoor Installation - Since the 80/20 Recirculation system is installed outdoors, valuable floor space is not lost.

Remote Control Panels

A wide variety of remote control panels are available. Specify the desired combination of switches, thermostats, temperature selectors and indicator lights (see examples at right). A terminal strip within the remote control panel makes connection to the VSU control center simple.



Basic remote control panel with thermostat for room temperature control option.



Remote panel with circuit analyzer and thermostat for room override option.

Temperature Controls

Discharge Temperature Control

Control of discharge air temperature is accomplished with a factory installed sensor located at the fan discharge. A Maxitrol 14 system controls the gas valve to provide the desired discharge temperature.

Room Override

This option, available with the Maxitrol 14 system, enables a room thermostat to increase the VSU supply temperature above its discharge temperature set point. Discharge sensor is factory installed. Room sensor may be wall/beam mounted or included on a remote control panel.



Room Temperature Control

Specify this option when the VSU has the primary responsibility for controlling the room temperature. A room mounted thermostat (shown below) senses the room temperature and provides feedback to the Maxitrol 44 control system. The gas valves are then modulated to satisfy the selected room temperature.

The thermostat is manually adjustable to the desired room temperature. The room thermostat may be wall/beam mounted or included on a remote control panel.



Additional Accessories

V-Bank Filters

Washable 2 in. aluminum mesh filters or 2 in. 30% efficient disposable filters are available.

Motorized Dampers

Intake or discharge dampers are available to prevent backdrafts when the fan is not in operation. Intake dampers are factory mounted and wired.

Fiberglass Insulation

Fiberglass insulation is used to line the housing to prevent the formation of condensation and to form an acoustical barrier.

Freeze Protection

An on/off type discharge duct stat (with a timer) prevents the discharge of cold air into the building when the burner is not providing adequate tempering.

115 Volt GFCI Service Receptacle

A 115 volt GFCI outlet is mounted externally in a NEMA 3R box for the convenience of field service personnel. A separate 115 volt power source is required.

Service Platform

A stable platform that provides easy access for servicing the unit.

Equipment Stand

The equipment stand raises the VSU intake above the ground to prevent debris, rain and snow from being drawn into the unit. The standard stand height is 24 in., with other heights available.

Air Filter Gauge

Indicates when filters become dirty. An indicator light may be wall/beam mounted or provided with a remote control panel.

Inlet Air Sensor

An on/off type duct stat automatically de-energizes the gas system and interrupts the flow of gas to the burner when the inlet air temperature is above the desired setting.

Gas Pressure Regulator

Required if building gas line pressure exceeds VSU maximum inlet gas pressure.

Special Coatings

Greenheck's Permator coating is available for a durable, long lasting finish. Decorative paints are also available in a variety of colors to match existing building fixtures. Consult your Greenheck representative for paint selections.

Housing Size 20

| MODEL | CFM | | TOTAL STATIC PRESSURE in inches of WG | | | | | | Maximum MBH |
|---------|-------|-----|---------------------------------------|------|------|------|------|------|-------------|
| | | | 0.75 | 1.00 | 1.25 | 1.50 | 1.75 | 2.00 | |
| VSU-112 | 2,600 | RPM | 761 | 853 | 934 | 1009 | | | 310 |
| | | BHP | 0.7 | 0.9 | 1.0 | 1.2 | | | |
| | 3,500 | RPM | 839 | 920 | 993 | 1065 | 1133 | 1195 | 420 |
| | | BHP | 1.3 | 1.5 | 1.7 | 1.9 | 2.1 | 2.3 | |
| | 4,400 | RPM | 939 | 1006 | 1073 | 1137 | 1197 | | 530 |
| | | BHP | 2.1 | 2.4 | 2.6 | 2.9 | 3.1 | | |
| VSU-115 | 4,000 | RPM | 681 | 756 | 822 | 892 | | | 480 |
| | | BHP | 1.3 | 1.5 | 1.8 | 2.1 | | | |
| | 5,250 | RPM | 757 | 823 | 884 | 943 | 998 | 1049 | 630 |
| | | BHP | 2.2 | 2.5 | 2.8 | 3.2 | 3.5 | 3.8 | |
| | 6,500 | RPM | 850 | 906 | 960 | 1013 | 1062 | | 780 |
| | | BHP | 3.5 | 3.9 | 4.3 | 4.7 | 5.1 | | |

Housing Size 30

| MODEL | CFM | | TOTAL STATIC PRESSURE in inches of WG | | | | | | Maximum MBH |
|---------|--------|-----|---------------------------------------|------|------|------|------|------|-------------|
| | | | 0.75 | 1.00 | 1.25 | 1.50 | 1.75 | 2.00 | |
| VSU-118 | 6,500 | RPM | 609 | 668 | 724 | 777 | | | 850 |
| | | BHP | 2.1 | 2.5 | 2.8 | 3.2 | | | |
| | 8,000 | RPM | 668 | 721 | 772 | 819 | 864 | 910 | 1,045 |
| | | BHP | 3.3 | 3.7 | 4.2 | 4.6 | 5.0 | 5.5 | |
| | 9,500 | RPM | 736 | 783 | 827 | 872 | 914 | | 1,240 |
| | | BHP | 4.9 | 5.4 | 5.9 | 6.4 | 6.9 | | |
| VSU-120 | 9,000 | RPM | 559 | 608 | 657 | 703 | 747 | 792 | 1,170 |
| | | BHP | 3.2 | 3.7 | 4.2 | 4.6 | 5.2 | 5.7 | |
| | 10,500 | RPM | 606 | 648 | 691 | 734 | 775 | 813 | 1,375 |
| | | BHP | 4.5 | 5.0 | 5.6 | 6.1 | 6.7 | 7.3 | |
| | 12,000 | RPM | 655 | 695 | 732 | 770 | 807 | 844 | 1,375 |
| | | BHP | 6.2 | 6.8 | 7.4 | 8.0 | 8.6 | 9.2 | |

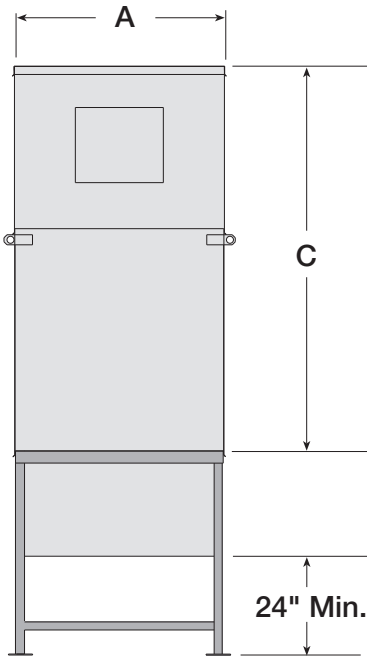
Housing Size 40

| MODEL | CFM | | TOTAL STATIC PRESSURE in inches of WG | | | | | | Maximum MBH |
|---------|--------|-----|---------------------------------------|------|------|------|------|------|-------------|
| | | | 0.75 | 1.00 | 1.25 | 1.50 | 1.75 | 2.00 | |
| VSU-218 | 14,000 | RPM | 612 | 672 | 726 | 779 | | | 1,830 |
| | | BHP | 5.0 | 5.7 | 6.5 | 7.4 | | | |
| | 18,000 | RPM | 691 | 738 | 788 | 836 | 881 | 923 | 2,350 |
| | | BHP | 8.7 | 9.6 | 10.6 | 11.6 | 12.6 | 13.6 | |
| | 22,000 | RPM | 787 | 825 | 865 | 902 | 944 | 985 | 2,875 |
| | | BHP | 14.3 | 15.4 | 16.5 | 17.5 | 18.8 | 20.0 | |
| VSU-220 | 20,000 | RPM | 575 | 621 | 667 | 711 | 752 | 791 | 2,610 |
| | | BHP | 8.3 | 9.3 | 10.3 | 11.4 | 12.5 | 13.7 | |
| | 24,000 | RPM | 636 | 677 | 716 | 755 | 792 | 830 | 3,135 |
| | | BHP | 12.6 | 13.9 | 15.1 | 16.3 | 17.5 | 18.9 | |
| | 28,000 | RPM | 703 | 739 | 774 | 809 | 841 | 875 | 3,300 |
| | | BHP | 18.4 | 19.9 | 21.3 | 22.8 | 24.2 | 25.6 | |

Housing Size 50

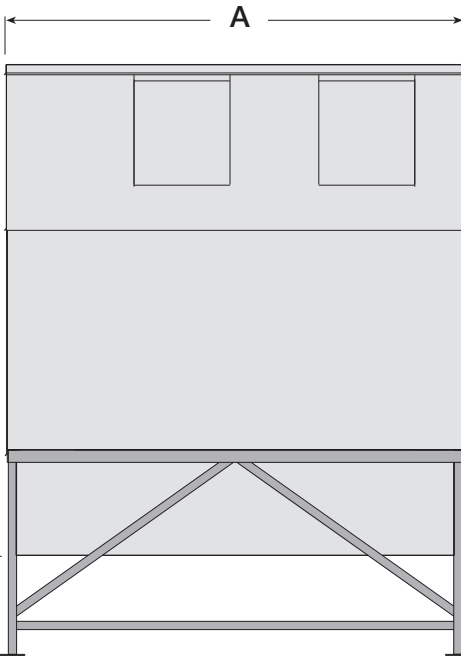
| MODEL | CFM | | TOTAL STATIC PRESSURE in inches of WG | | | | | | Maximum MBH |
|---------|--------|-----|---------------------------------------|------|------|------|------|------|-------------|
| | | | 0.75 | 1.00 | 1.25 | 1.50 | 1.75 | 2.00 | |
| VSU-225 | 32,000 | RPM | 446 | 482 | 515 | 548 | | | 3,830 |
| | | BHP | 12.1 | 13.8 | 15.4 | 16.9 | | | |
| | 38,000 | RPM | 491 | 523 | 553 | 582 | 610 | 638 | 4,550 |
| | | BHP | 18.0 | 19.8 | 21.9 | 23.9 | 25.7 | 27.5 | |
| | 45,000 | RPM | 547 | 575 | 603 | 629 | 655 | 679 | 5,390 |
| | | BHP | 27.4 | 29.5 | 31.6 | 33.9 | 36.3 | 38.7 | |
| VSU-230 | 44,000 | RPM | 401 | 429 | 456 | 483 | 509 | 535 | 5,270 |
| | | BHP | 16.8 | 18.9 | 21.2 | 23.7 | 26.3 | 29.0 | |
| | 52,000 | RPM | 446 | 470 | 494 | 516 | 539 | 562 | 6,050 |
| | | BHP | 24.9 | 27.3 | 29.8 | 32.2 | 35.0 | 38.0 | |
| | 60,000 | RPM | 494 | 514 | 535 | 556 | 576 | 596 | 6,050 |
| | | BHP | 36.2 | 38.3 | 40.9 | 43.9 | 46.7 | 49.5 | |

**Housing Sizes
20 & 30**



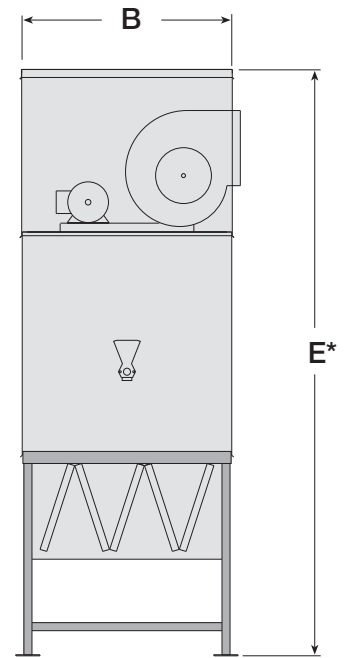
FRONT VIEW

**Housing Sizes
40 & 50**



FRONT VIEW

**Housing Sizes
20 thru 50**



SIDE VIEW

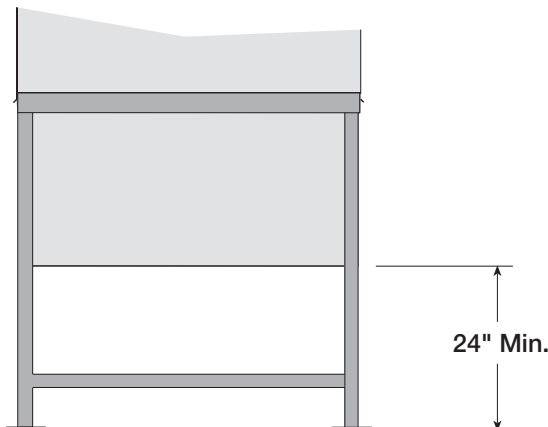
DIMENSIONS

| HOUSING SIZE | A | B | C | E* |
|--------------|-----|----|-----|-----|
| 20 | 40 | 40 | 78 | 128 |
| 30 | 52 | 53 | 92 | 146 |
| 40 | 111 | 54 | 95 | 144 |
| 50 | 156 | 63 | 107 | 162 |

*Minimum dimension

PRESSURE DROP DATA

| Housing | CFM | 2 in. 30% Filter | Inlet Damper | Gas Burner |
|---------|-------|------------------|--------------|------------|
| 20 | 2500 | 0.11 | 0.02 | 0.625 |
| | 6500 | 0.17 | 0.09 | |
| 30 | 6000 | 0.12 | 0.03 | 0.625 |
| | 12000 | 0.20 | 0.10 | |
| 40 | 14000 | 0.14 | 0.05 | 0.625 |
| | 28000 | 0.28 | 0.16 | |
| 50 | 30000 | 0.14 | 0.04 | 0.625 |
| | 60000 | 0.28 | 0.15 | |



Equipment Stand Height

The minimum distance from the ground to the filter intake is 24 inches. This minimizes debris and moisture from being entrained in the make-up air. In locations where heavy snow fall is common, this dimension may need to be 36 inches or more. Specify the minimum clearance dimension when ordering.

All dimensions are shown in inches.

General: Vertical make-up air unit shall be as manufactured by Greenheck or approved equal provided all specifications are met. Greenheck Model VSU equipment is used as the basis of design. Performance to be as scheduled on plans.

Gas Train and Controls: Direct fired gas system shall have a draw through design, field adjustable burner baffles and Maxon type NP burner for optimal burning efficiency. Flame safeguard shall be Honeywell 7800 series with digital coded fault indicator capability. Fault indicator shall provide service history by storing codes for the last five faults. Safety shutoff valves shall be industrial duty and use 120 VAC control signals. Temperature control shall incorporate a Maxitrol electronic modulation control system.

Unit Casing and Frames: Unit shall be of internal frame type construction of galvanized steel. All frames and panels shall be G90 galvanized steel. Where top panels are joined there shall be a standing seam to insure positive weather protection. All metal-to-metal surfaces exposed to the weather shall be sealed, requiring no caulking at job site. All components shall be easily accessible through removable or hinged doors.

Insulation: Unit casing to be lined with 1 in. fiberglass insulation. Insulation in accordance with NFPA 90A and tested to meet UL 181 erosion requirements and secured to unit with water proof adhesive and permanent mechanical fasteners.

Fan Section: Centrifugal fans shall be double width, double inlet. Fan and motor shall be mounted on a common base and shall be internally isolated. All blower wheels shall be statically and dynamically balanced. Ground and polished steel fan shafts shall be mounted in permanently lubricated ball bearings (up to size 118) or ball bearing pillow blocks (size 120 and larger). Bearings shall be selected for a minimum (L10) life in excess of 100,000 hours at maximum cataloged speeds.

Motors and Drives: Motors shall be energy efficient, complying with EPACT standards, for single speed ODP and TE enclosures. Motors shall be permanently lubricated, heavy duty type, matched to the fan load and furnished at the specified voltage, phase and enclosure. Drives shall be sized for a minimum of 150% of driven horsepower. Pulleys shall be cast and have machined surfaces, 10 horse power and less shall be supplied with an adjustable drive pulley.

Electrical: All internal electrical components shall be prewired for single point power connection. All electrical components shall be UL listed, recognized or classified where applicable and wired in compliance with the National Electrical Code. Control center shall include motor starter, control circuit fusing, control transformer for 120 VAC circuit, integral door interlocking disconnect switch with separate motor fusing and terminal strip. Contactors, Class 20 adjustable overload protection and single phase protection shall be standard.

Filter Section: Filters shall be mounted in a V-bank arrangement such that velocities across the filters do not exceed 550 feet per minute. Filters shall be easily accessible through a removable access panel. Birdscreen shall be mounted at the filter section intake. Clearance from the bottom of the filter intake section and the ground shall be a minimum of 24 in.

Equipment Stand: Equipment stand shall be constructed of welded steel channels and coated with a Permator finish.

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.

Due to continuing research, Greenheck reserves the right to change specifications without notice.



Number one in air movement and control.



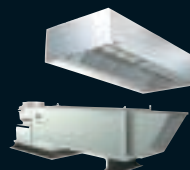
Centrifugal and Vane Axial Fans



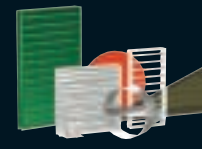
Fans and Ventilators



Energy Recovery Ventilators & Make-Up Air Units



Kitchen Ventilation Systems



Dampers and Louvers

Visit the Greenheck website for the most current information available
www.greenheck.com

Greenheck • P.O. Box 410 Schofield, WI 54476-0410 • Phone (715)359-6171 • Fax (715)355-2399 • www.greenheck.com