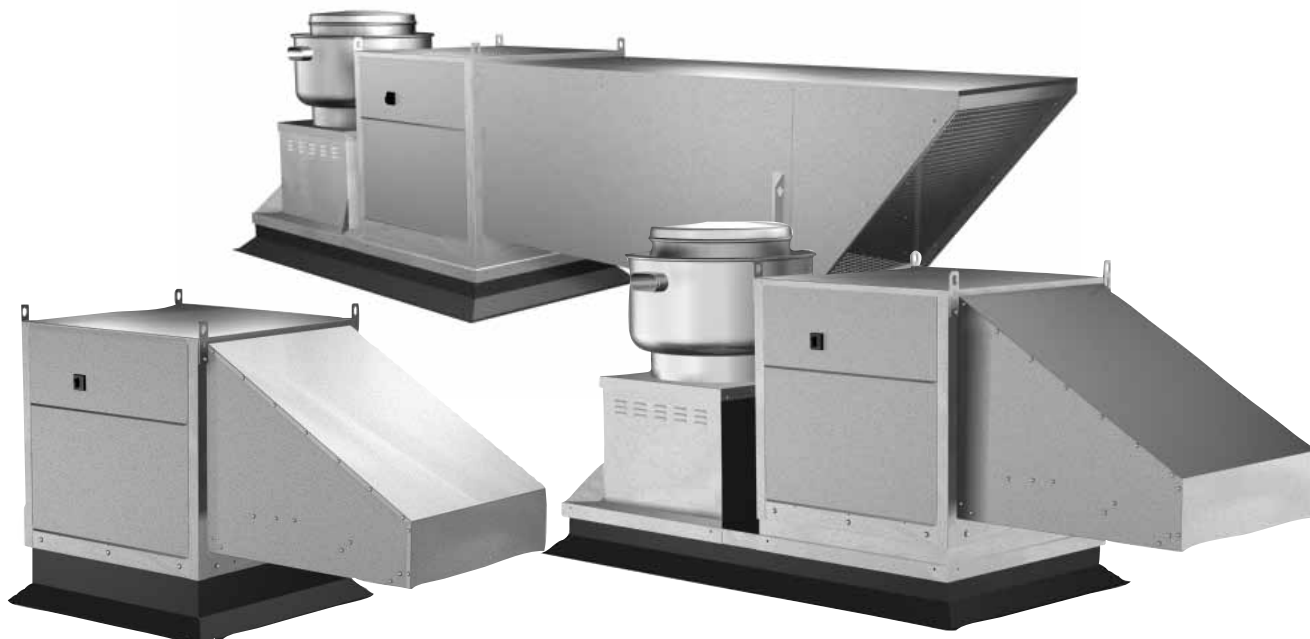


# ***Installation, Operation, and Maintenance Instructions for Untempered - MAKE-UP AIR UNITS***



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### **Warning!!**

Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read the installation, operating, and maintenance instructions thoroughly before installing or servicing this equipment.

This manual is the property of the owner, and is required for future maintenance. Please leave it with the owner when you complete the job.

### **Receiving and Handling**

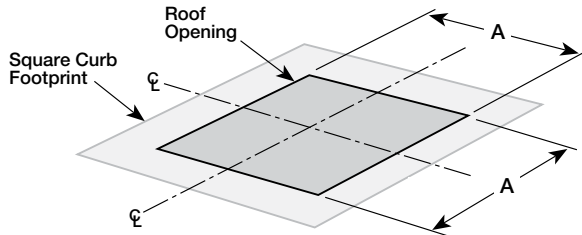
Upon receiving the equipment, check for both obvious and hidden damage. If damage is found, record all necessary information on the bill of lading and file a claim with the final carrier. Check to be sure that all parts of the shipment, including accessories, are accounted for.



# Installation without Fan Package:

## Before beginning this installation:

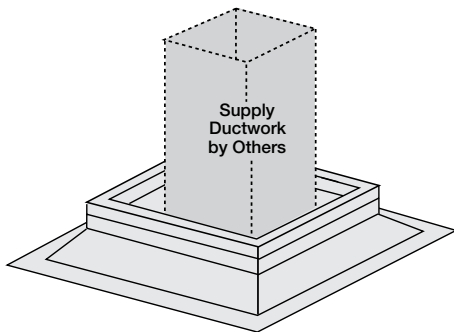
When locating this unit, make sure that there is room to access the unit from all sides. The inlet must be located at least 10 feet away from any exhaust vents.



## Step 1 Roof Opening

For down discharge units, the chart below shows the maximum recommended roof opening dimensions. These sizes can be smaller based on codes and ductwork sizes. See page 10 for curb dimensions.

A - Max Roof Opening (Square)	Housing Size		
	#1	#2	#3
	25 in.	35 in.	47 in.



## Step 2 Install Roof Curb

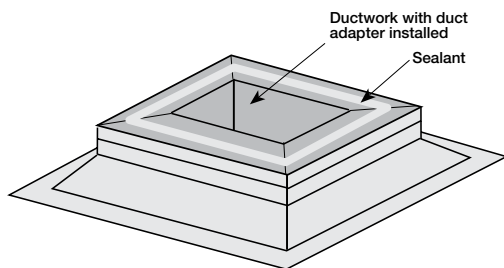
Center the curb over the roof opening as shown in first installation diagram at left.

Level the curb and shim if necessary. Attach curb to roof and flash in place.

Recommended Supply Ductwork Dimensions		
Blower Size	Duct Size	Straight Duct Length
108	13 x 13	37 in.
109	13 x 13	37 in.
110	14 x 14	47 in.
112	16 x 16	54 in.
115	20 x 20	68 in.
118	24 x 24	81 in.
120	26 x 26	96 in.

## Step 3 Install Ductwork

If this unit is a horizontal discharge, skip to Step 4. The chart (left) shows the duct sizes and straight lengths recommended for optimal performance (AMCA Publication 201-90). Using duct sizes and lengths less the recommended will affect fan performance. Good duct practices should be followed for the remaining ductwork. The use of a duct adapter with the supply duct is strongly recommended to properly align the ductwork with the supply fan discharge. The duct adapter is only a guide and is not intended to be used as support for the ductwork.



## Step 4 Apply Sealant

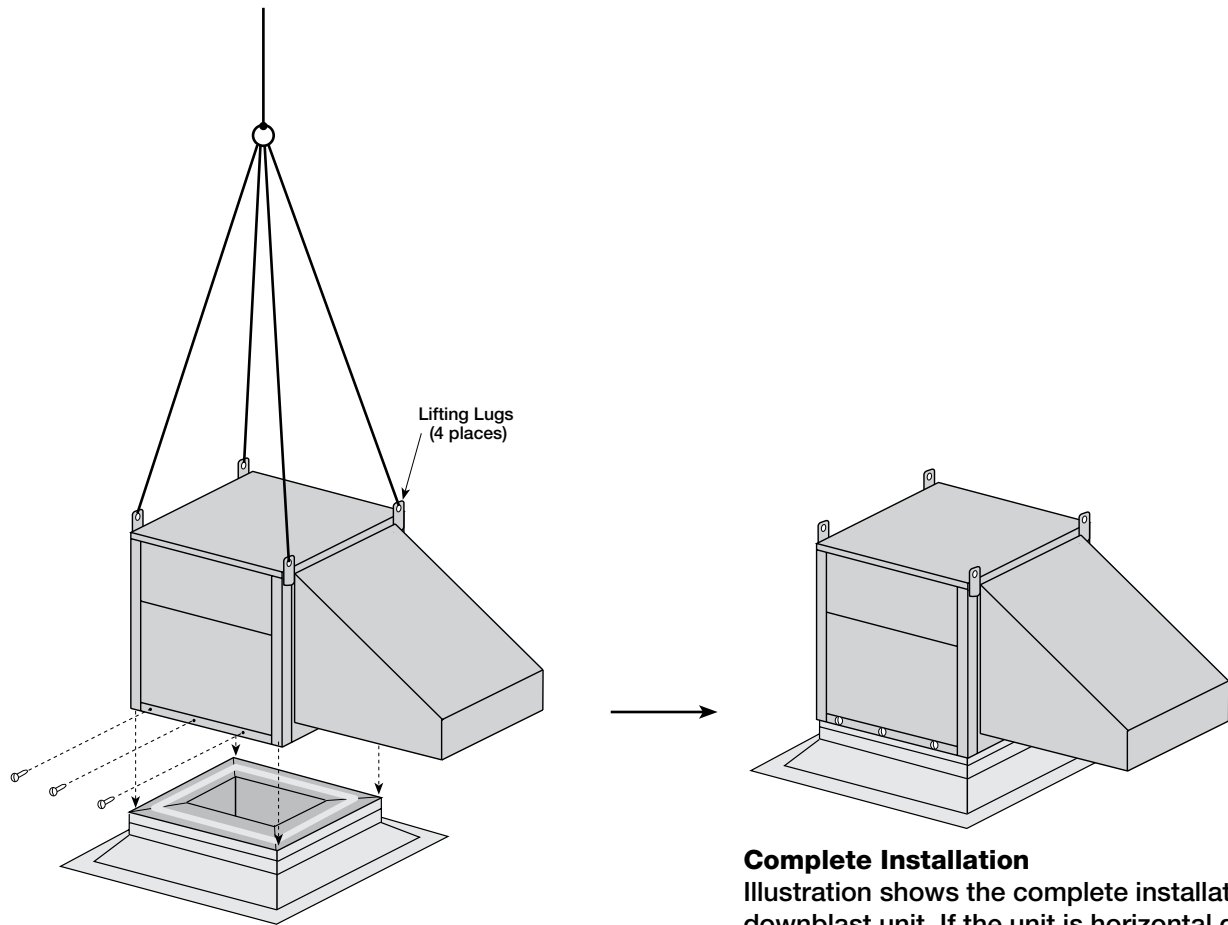
Before installing fan, apply a sealant around the perimeter of the supply duct adapter to isolate the fan and minimize vibration.

## Step 5 Install Supply Unit

Use a crane hooked to the factory lifting lugs (as shown in the diagram) to lift and center the unit on the curb. For larger units with 7½ to 10 horsepower motors, it is recommended to use a spreader bar to support the unit while lifting.

Use self-tapping sheet metal screws to fasten unit to the curb through the holes provided.

Electrical connections can be made at this time.



### Complete Installation

Illustration shows the complete installation of a downblast unit. If the unit is horizontal discharge, proceed to Step 6.

## Step 6 Attach Ductwork to Unit Discharge

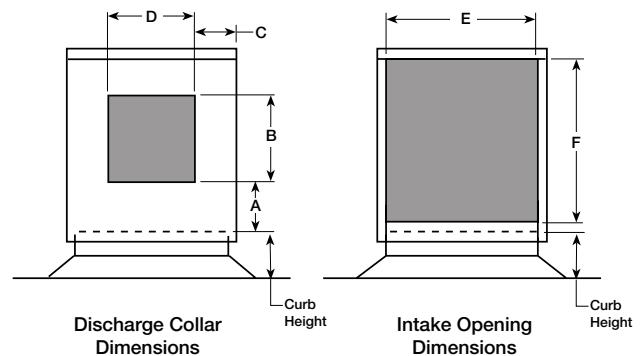
For horizontal discharge units: The chart and drawing show opening size and location for the 2 inch discharge collar. Also included is the recommended straight duct lengths for optimal performance. Greenheck recommends attaching ductwork to collar using a rubber duct section at the unit to eliminate vibration.

### Duct Size/Location and Intake Dimensions:

Housing Size	Blower Size	A	B	C	D	E	F	Straight Duct Length*
1	108	9	13	8½	13	26	27	37
	109	9	13	8½	13	26	27	37
	110	9¼	14	8	14	26	27	47
2	112	10½	16	12	16	36	33	54
	115	12⅞	20	10	20	36	33	68
3	118	15¼	24	14	24	48	43	81
	120	14¼	26	13	26	48	43	96

\*AMCA recommended minimum straight duct lengths for optimum performance.

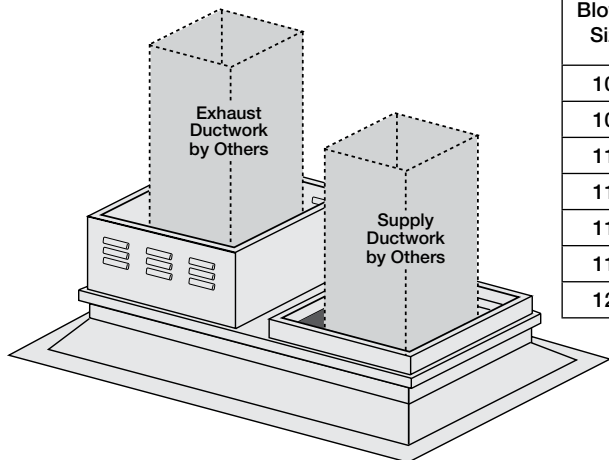
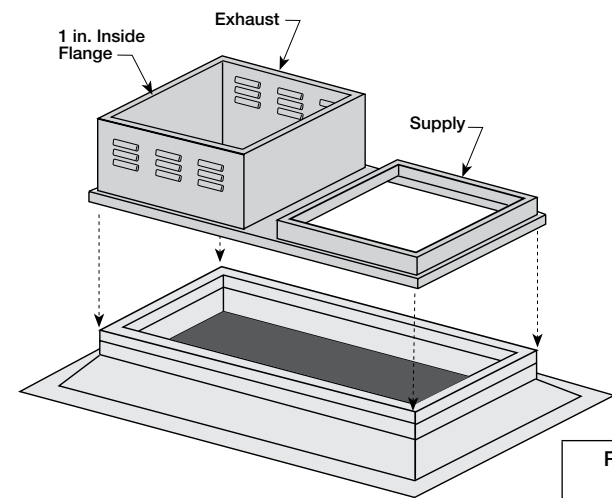
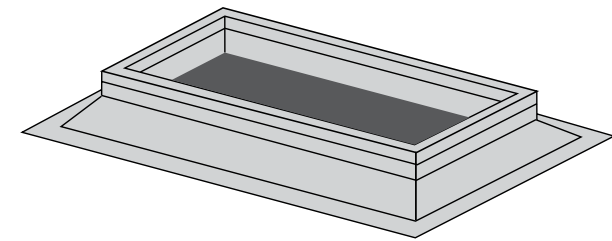
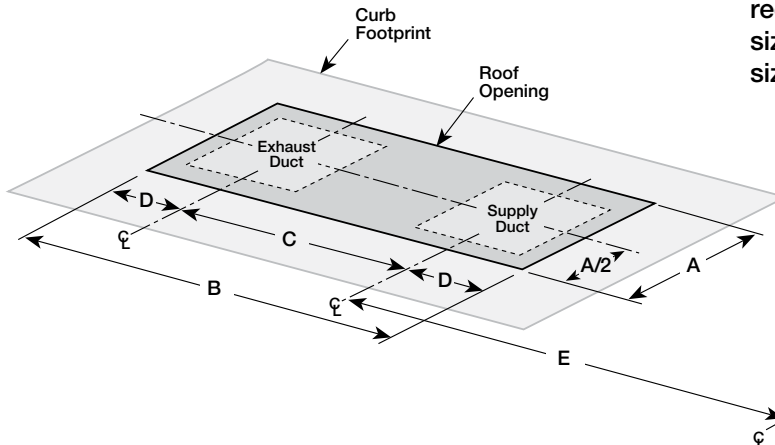
All dimensions are shown in inches.



# Installation with Fan Package Extension:

## Before beginning this installation.

When locating this unit, make sure that there is room to access the unit from all sides. The inlet must be located at least 10 feet away from any exhaust vents.



## Step 1 Roof Opening

Determine the center of the exhaust and supply duct roof openings. The chart below shows the maximum recommended roof opening dimensions. These sizes can be smaller based on codes and ductwork sizes.

	Housing Size		
	#1	#2	#3
A - Max. Roof Opening	25	35	47
B - Max. Roof Opening	61	83	105
C - $\Phi$ to $\Phi$ of ducts	36	48	58
D - Duct $\Phi$ to Edge of Opening	12½	17½	23½
E - Supply Duct $\Phi$ to Support Legs $\Phi$	96	89½	80½

All dimensions in inches.

## Step 2 Install Roof Curb

Center curb over roof openings and place on the roof. Level the curb and shim if necessary. Attach curb to roof and flash in place.

## Step 3 Install Curb Extension

Install curb extension over curb, use wood screws to lag in place. Prepunched holes are provided. Locate extension so the tall, louvered side is over the exhaust opening, as shown in illustration.

## Step 4 Install Ductwork

### Exhaust:

Exhaust ductwork must be built in accordance with NFPA 96 and any local codes. Ductwork terminating at the fan should be square in shape or of smooth transition so as not to affect the fans performance.

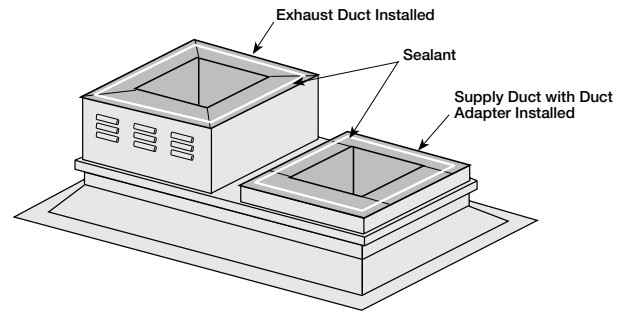
### Supply:

The chart at left shows the duct sizes and straight lengths recommended for optimal performance (AMCA Publication 201-90). Using duct sizes less than the recommended lengths will affect fan performance. Good duct practices should be followed for the remaining ductwork.

Recommended Supply Ductwork Sizes		
Blower Size	Duct Size	Straight Duct Length
108	13 x 13	37 in.
109	13 x 13	37 in.
110	14 x 14	47 in.
112	16 x 16	54 in.
115	20 x 20	68 in.
118	24 x 24	81 in.
120	26 x 26	96 in.

### Step 4 (continued)

The use of a duct adapter with the supply duct is strongly recommended to properly align the ductwork with the supply fan discharge. The duct adapter is only a guide and is not intended to be used as support for the ductwork.

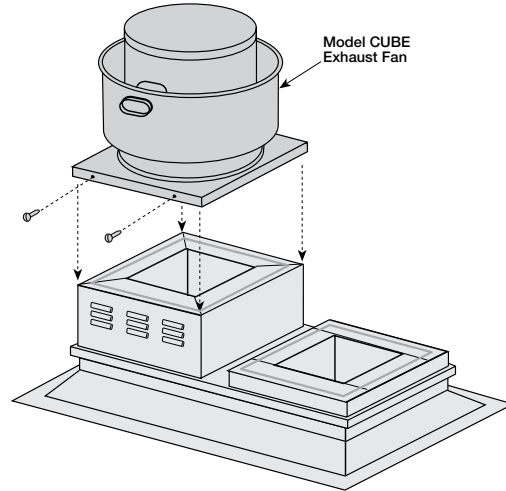


### Step 5 Apply Sealant

Before installing fans, apply a sealant around the perimeter of the exhaust and supply duct adapter to isolate the fan and minimize vibration.

### Step 6 Install Exhaust Fan

Install CUBE exhaust fan on curb extension. Fasten with self-tapping sheet metal screws through existing holes in curb cap. NFPA 96 requires the exhaust fan be hinged. Greenheck offers an optional hinge kit with restraining cables and a grease trap with drain connection. Install these options at this time.



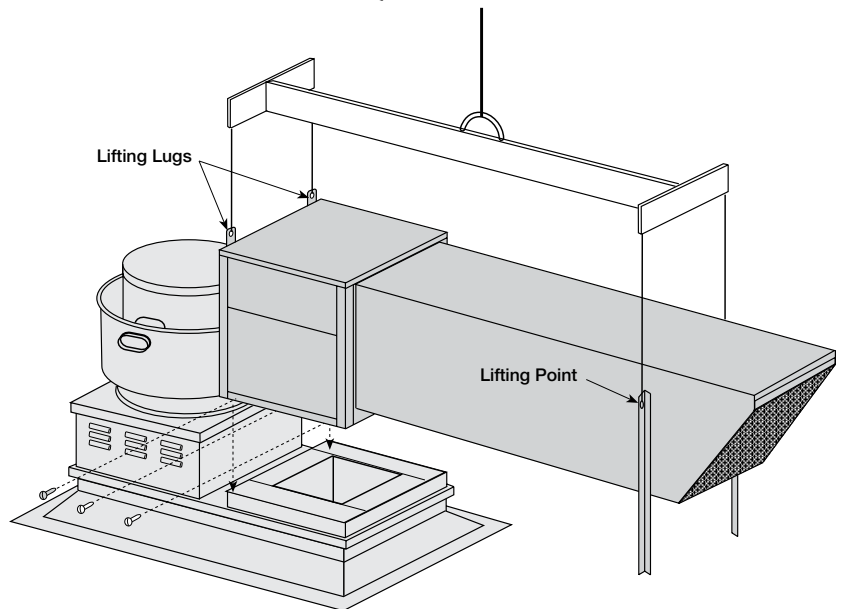
**NOTE:** Installing the exhaust fan prior to the supply unit will allow for easier installation of options.

### Step 7 Install Supply Unit

Use a crane and a spreader bar hooked to the factory lifting lugs (as shown in the diagram) to lift and center the unit on the curb and equipment support. Use self-tapping sheet metal screws to fasten unit to the curb and equipment support through holes provided.

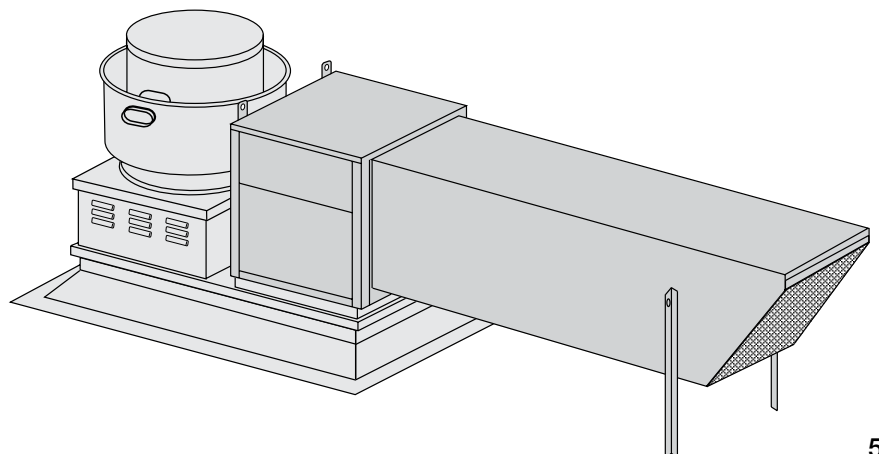
Electrical connections can be made at this time.

Use caution to avoid damaging exhaust fan when installing supply unit.



See page 3 for lifting unit with short weatherhood option.

### Complete Installation

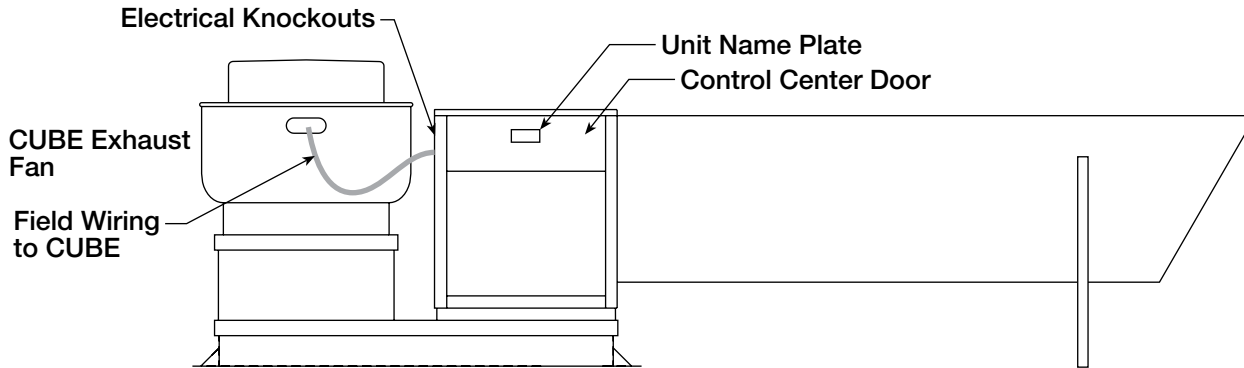


# Electrical Instructions:

Before connecting power to the unit, read and understand the following instructions and wiring diagrams. Complete wiring diagrams are attached inside the door(s) of the unit.

All wiring should be done in accordance with the National Electrical Code ANSI/NFPA-70 latest edition and any local codes that may apply. In Canada, wiring should be done in accordance with the Canadian Electrical Code. The equipment must be properly grounded.

**DANGER !**  
High voltage electrical input is needed for this equipment. This work should be performed by a qualified electrician.



**NOTE:** Any wiring running through the unit in the airstream must be protected by flexible metal conduit, metal clad cable or raceways.

## Notes for wiring units:

### For units *without* control centers:

The motor nameplate is to be used for determining the voltage and amperage required by the unit.

### For units *with* control centers:

1. The units nameplate states the voltage and total amperage required. The main feeder supplying power to the unit should be sized for the labels voltage and amperage.
2. The main power line should be connected to the disconnect switch. Make sure that the disconnect lugs are securely tightened.
3. Connect control panel wiring to terminal strip in the control center. Greenheck's standard control voltage is 24/60/1.
4. When an optional convenience outlet is provided, a separate power supply must be provided to the receptacle. This circuit must be on a ground fault breaker.

### For units with fan package extension:

1. Wire power lead for CUBE through side breather tube.
2. The power lead should be of sufficient length as to allow the CUBE fan to hinge open.

**CAUTION**  
Any wiring deviations may result in personal injury or property damage. Greenheck is not responsible for any damage to, or failure of the unit caused by incorrect final wiring.

# System Startup:

For proper unit function and safety, follow everything in this startup procedure in the order presented.

## Special Tools Required

- Voltage meter
- Tachometer
- Amperage meter

### 1. Check Voltage

Before starting the unit compare the supplied voltage with the units nameplate voltage and the motor voltage.

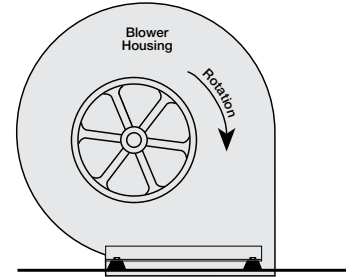
### 2. Check Blower Rotation:

If the blower is rotating in the wrong direction, the unit will move some air but not perform properly.

To check the rotation, open the blower access door and run the blower momentarily to determine the rotation.

To reverse the rotation, turn the power off and use the following procedure:

- For single phase units, rewire the motor per the instructions on the motor.
- For three phase units, interchange any two power leads. This can be done at the motor starter.



### 3. Air Volume Check and Measurement

Along with the building balance, the units air volume (cfm) should be measured and compared with its rated air volume. This unit is flexible for varying air volume, but the actual air volume should be known for making final adjustments. The most accurate way to measure the air volume is by using the pitot traverse method in the ductwork away from the blower. Other methods can be used but should be proven and accurate. To adjust the air volume, change the fan rpms or the system losses. See Troubleshooting Section in this guide.

### 4. Measure Motor Voltage, Amperage and Fan RPM

All access doors must be installed except the control center door. Measure and record the input voltage and motor amperage(s).

To measure the fan rpm, the blower door will need to be removed. Minimize measurement time because the motor may over amp with the door removed.

Compare measured amps to the motor nameplate full load amps and correct if over amping. See the troubleshooting section in this guide.

# Troubleshooting:

The following is a cause and correction list for common problems with the blower unit. Also see furnace section and the furnace manual for troubleshooting the furnace section of the unit.

Symptom	Possible Cause	Corrective Action
Blower fails to operate	Blown fuse or open circuit breaker	Replace fuse or reset circuit breaker and check amps
	Broken fan belt	Replace
	Defective motor or capacitor	Replace
	Motor starter overloaded	Reset starter and check amps
Motor overamps	CFMs too high	Check CFMs and adjust drives if needed
	Static pressures are higher or lower than design	If higher, ductwork should be improved If lower, fan RPMs should be lower
	Blower rotation is incorrect	Check rotation and correct
	Motor voltage incorrect	Check motor nameplate and supplied voltage
	Motor horsepower too low	See specifications and catalog for fan curves to determine if horsepower is sufficient
	Shorted winding in motor	Replace motor.
Insufficient airflow	Unit damper not fully open	Adjust damper linkage or replace damper motor
	System static pressure too high	Improve ductwork to eliminate losses using good duct practices
	Blower speed too low	Check for correct drives and RPMs with catalog data
	Dampers or registers closed	Open and adjust
	Dirty or clogged filters	Clean or replace
	Leaks in ductwork	Repair
	Elbows or other obstructions may restrict fan outlet	Correct or improve ductwork
	Belt slippage	Adjust belt tension
Too much airflow	Blower fan speed too high	Check for correct fan RPM
	Filter(s) not in place.	Install filters
	Insufficient static pressure (SP) (airflow resistance)	Induce SP into system ductwork.
Excessive noise or vibration	Wheel rubbing on housing	Center wheel
	Loose wheel on shaft	Tighten wheel setscrew
	Loose motor or blower sheave	Tighten sheave setscrew
	Belts too loose	Adjust belt tension after 24 hours of operation
	Belts too tight	Loosen to maintain 3/8 in. deflection per ft. of span between sheaves
	Worn belt	Replace
	Motor base or blower loose	Tighten mounting bolts
	Worn bearings	Replace
	Bearing and drive alignment	Realign
	Motor out of balance	Replace
	Wheel out of balance	Replace or rebalance
	Sheaves eccentric or out of balance	Replace or rebalance
	Accumulation of material on wheel	Clean wheel and housing



# Maintenance:

Greenheck recommends these procedures to ensure troublefree operation of this unit. Most unit failures can be attributed to poor setup or poor maintenance.

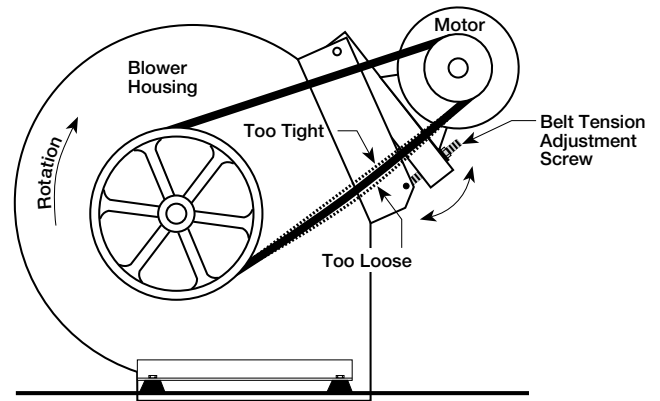
A record of maintenance performed on this unit should be kept. This information will provide essential information if problems are encountered. A section at the back of this manual is provided for recording the units maintenance history.

**CAUTION:** When performing any maintenance on this unit be sure that the power is disconnected and cannot be accidentally turned on. The control center disconnect can be locked in the off position.

## 2 weeks after startup

**Check belt tension** - Belts tend to stretch after a period of time. They should be periodically checked for wear and tightness. **Approximately 3/8 in. of deflection per ft. of span between sheaves is standard for belt tightness.** When replacing belts, use the same type as supplied with the unit. Matched belts should always be used on units with multigroove pulleys.

**Replacement of belts** - should be accomplished by loosening the tensioning device to the point where the belts can be removed by hand. Do not force belts on or off as this may cause breakage of cords leading to premature belt failure. Belts should be adjusted as above.



## Every 3 Months

The filter in the unit should be inspected at least every 3 months. Depending on the environment filters could require changing or cleaning more or less often. The filters can be slid out of the weatherhoods.

If **washable filters** are installed, they can be washed in warm soapy water. An adhesive spray can be applied to increase filter efficiency.

When reinstalling filters be sure to install with the airflow in the correct direction indicated on the filter and with any factory spacers that came with the unit.

## Yearly

All **bearings** are factory lubricated and require no further lubrication under normal use. Normal use being considered -20°F to 180°F and in a relatively clean environment.

**Motor** maintenance is generally limited to cleaning and lubrication (where applicable). Cleaning should be limited to the exterior surfaces only. Removing dust and grease buildup on motor housing assures proper motor cooling. Greasing of motors is intended only when grease fittings are provided. Many fractional motors are permanently lubricated and require no further lubrication. Motors supplied with grease fittings should be greased in accordance with manufacturer's recommendations. When motor temperature does not exceed 104°F (40°C), the grease should be replaced after 2000 hours of running time as a general rule.

**Wheels** require very little attention when moving clean air. Occasionally oil and dust may accumulate on the wheel causing imbalance. When this occurs the wheel and housing should be cleaned to assure smooth and safe operation.

Routinely check all **fasteners** for tightness.

# Dimensions:

## Curbs:

### Curb Selection (inches)

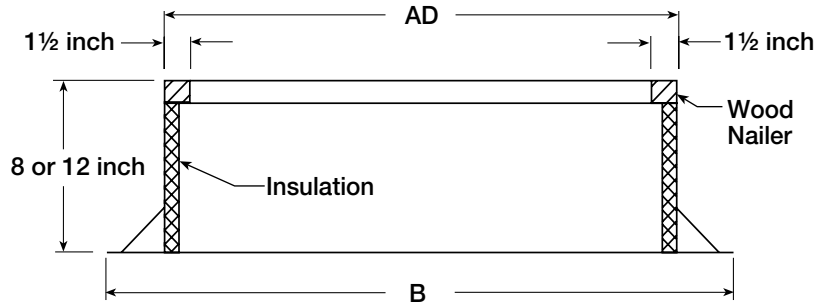
Housing Size	Curb Size (inches)
1	30 square
2	40 square
3	52 square
1 w/FPE	30 x 66
2 w/FPE	40 x 88
3 w/FPE	52 x 110

FPE = Fan Pack Extension

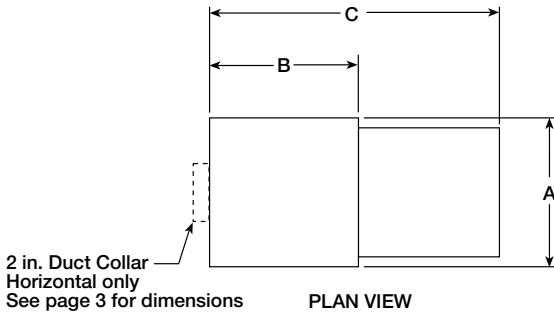
### Curb Dimensions (inches)

Curb Size	AD W x L	B W x L
30 square	28½ x 28½	36¼ x 36¼
40 square	38½ x 38½	46¼ x 46¼
52 square	50½ x 50½	58¼ x 58¼
30 x 66	28½ x 64½	36¼ x 72¼
40 x 88	38½ x 86½	46¼ x 94¼
52 x 110	50½ x 108½	58¼ x 116¼

### GPNS Curb

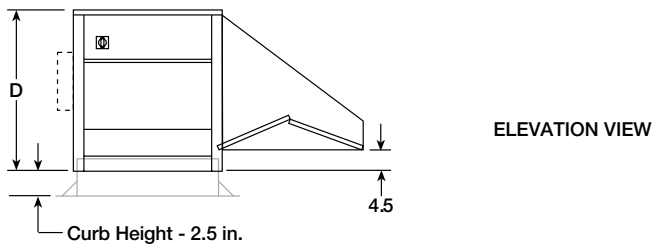


## Base Units:



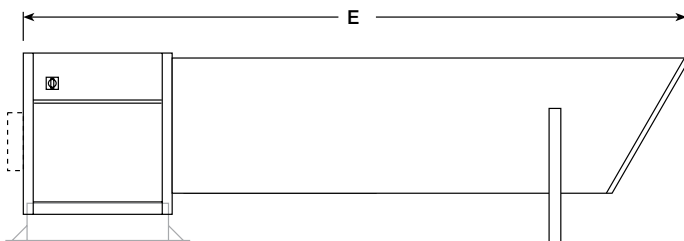
### Dimensions (inches)

Housing Size	1	2	3
A	30	40	52
B	30	40	52
C	58½	80	96¼
D	32½	37½	47½
E	136	139½	136



### 1- or 2-inch Mesh Filters (quantity) inches

Housing Size	1	2	3
Short Weatherhood	(2) 16 x 25	(1) 16 x 20 (1) 16 x 25 (1) 20 x 20 (1) 20 x 25	(1) 20 x 20 (1) 20 x 25 (2) 16 x 20 (2) 16 x 25
Extended Weatherhood	(2) 16 x 25	(2) 16 x 20 (2) 20 x 20	(3) 16 x 20 (3) 16 x 25



With Extended Weatherhood Option

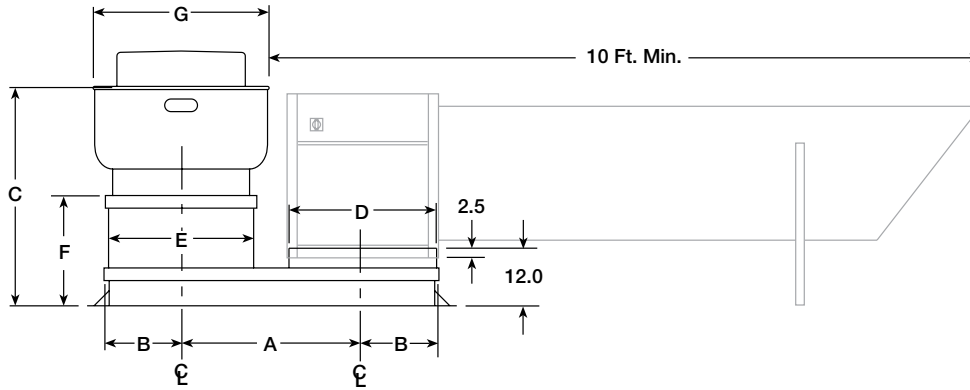
### Approximate Weight (lbs)

Housing Size	1	2	3
Short Weatherhood without Fan Pack	225	375	750
with Fan Pack	305	475	900
Extended Weatherhood without Fan Pack	390	560	940
with Fan Pack	450	660	1075

Weights will vary with horsepower and fan.  
CUBE and curb weight not included.

## Fan Package Extension Model FPE:

For use with extended weatherhood option to meet NFPA 96.



Note: Dimensions are shown with an 8 in. Roof Curb

Model FPE	CUBE Sizes	A	B	C	D-Sq.	E-Sq.	F	G
19H01	98, 101, 121, 131	36	15	44.875	29.38	18.50	27.50	24.875
22H10	141, 161	36	15	46.875	29.38	21.50	27.50	28.875
30H10	180, 200	36	15	44.375	29.38	29.38	23.375	35.375
19H20	121	48	20	44.875	39.38	18.50	27.50	24.875
22H20	141, 161	48	20	46.875	39.38	21.50	27.50	28.875
30H20	180, 200	48	20	44.375	39.38	29.38	23.375	35.375
34H20	220, 240	48	20	48.50	39.38	33.50	23.00	42.75
40H20	300	48	20	52.00	39.38	39.38	23.00	50.00
30H30	180, 200	58	26	44.375	51.38	29.38	23.375	35.375
34H30	220, 240	58	26	48.50	51.38	33.50	23.00	42.75
40H30	300	58	26	52.00	51.38	39.50	23.00	50.00
46H30	360	58	26	56.875	51.38	45.50	23.00	58.625

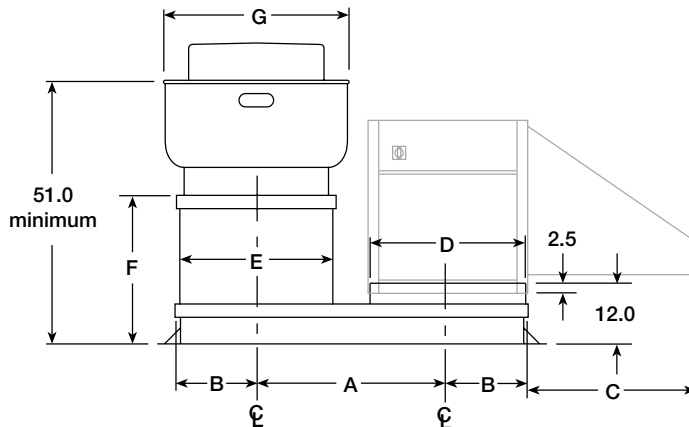
All dimensions are shown in inches.

FPE Model: Last digit is housing size.

See CUBE literature for complete dimensions and weights of CUBE fan.

## Fan Package Extension Model FPES:

For use with short weatherhood option to meet NFPA 96 Ch. 3-8.2.2.



Note: Dimensions are shown with an 8 in. Roof Curb

Model FPES	CUBE Sizes	A	B	C	D-Sq.	E-Sq.	F	G
19H01	98, 101, 121, 131	36	15	28.50	29.38	18.50	35.62	24.875
22H10	141, 161	36	15	28.50	29.38	21.50	34.50	28.875
30H10	180, 200	36	15	28.50	29.38	29.38	31.88	35.375
19H20	121	48	20	40.00	39.38	18.50	35.62	24.875
22H20	141, 161	48	20	40.00	39.38	21.50	34.50	28.875
30H20	180, 200	48	20	40.00	39.38	29.38	31.88	35.375
34H20	220, 240	48	20	40.00	39.38	33.50	27.38	42.75
40H20	300	48	20	40.00	39.38	39.38	23.75	50.00
30H30	180, 200	58	26	44.75	51.38	29.38	31.88	35.375
34H30	220, 240	58	26	44.75	51.38	33.50	27.38	42.75
40H30	300	58	26	44.75	51.38	39.50	23.75	50.00
46H30	360	58	26	44.75	51.38	45.50	23.38	58.625

All dimensions are shown in inches.

FPES Model: Last digit is housing size.

See CUBE literature for complete dimensions and weights of CUBE fan.

# Maintenance Documentation:

## Job Information

Job Name: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_  
 Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 Contact Person: \_\_\_\_\_

Service Organization: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_  
 Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 Work Done By: \_\_\_\_\_

## Name Plate Information

Model: \_\_\_\_\_  
 Volts: \_\_\_\_\_ Hertz: \_\_\_\_\_ Phase: \_\_\_\_\_  
 Amps: \_\_\_\_\_ Mark: \_\_\_\_\_  
 Supply Hp: \_\_\_\_\_ Exhaust Hp: \_\_\_\_\_  
 Serial Number: \_\_\_\_\_

## Field Start-Up Documentation

Actual Voltage: \_\_\_\_\_ Hertz: \_\_\_\_\_ Phase: \_\_\_\_\_  
 Actual Amperage: \_\_\_\_\_

Blower Rotation  Correct

Air Volume Design \_\_\_\_\_ CFM  
 Actual \_\_\_\_\_ CFM

## Maintenance

Date	Time	Notes:

### Warranty

Greenheck warrants this equipment to be free from defects in material and workmanship for a period of one year from the shipment date. Any units of parts which prove to be defective during the warranty period will be repaired or replaced at our option.

The motor is warranted by the motor manufacturer for a period of one year. Should the motor prove defective during this period, it should be returned to an authorized motor service station.

Greenheck will not be responsible for any installation or removal costs.

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

