



**BELT & DIRECT DRIVE
High Plume Dilution Blower
Laboratory Exhaust System**

Installation, Operating and Maintenance Manual

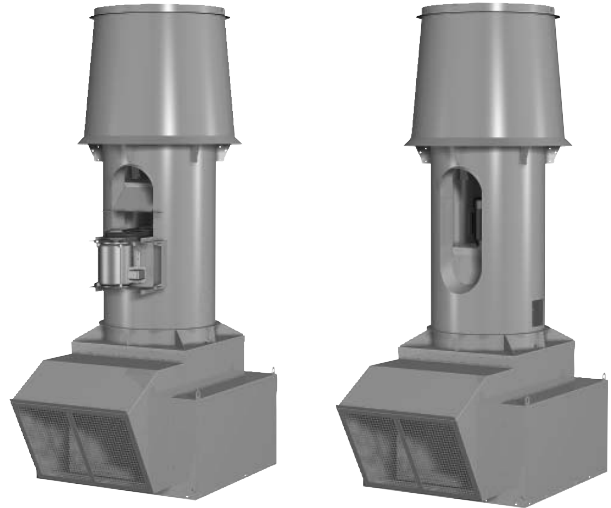


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Report any damaged equipment to the shipper immediately!

All Vektor systems are shipped on a skid or packaged to minimize damage during shipment. The transporting carrier has the responsibility for delivering all items in their original condition as received from Greenheck. The individual receiving the equipment is responsible for inspecting the unit for obvious or hidden damage, recording any damage on the bill of lading before acceptance and filing a claim (if required) with the final carrier.

UNIT IDENTIFICATION

The tag below is an example of an identification label on the fan. The information provides general details about the fan, as well as containing specific information unique to the unit. When contacting your Greenheck representative with future needs or questions, please have the information on this label available.



MODEL

S/N

MARK

Tags are mounted in an area which is clearly visible, usually on the side of the fan housing.

GENERAL INFORMATION

To ensure a successful installation, the instructions in this manual should be read and adhered to. Failure to comply with proper installation procedures may void the warranty.

HANDLING

Fans are to be rigged and moved by the lifting brackets provided or by the skid when a forklift is used. Location of brackets varies by model and size. Handle in such a manner as to keep from scratching or chipping the coating. Damaged finish may reduce ability of fan to resist corrosion. See coating repair section of this manual for details involving touch-up of damaged surfaces.

FANS SHOULD NEVER BE LIFTED BY THE SHAFT, HOUSING, MOTOR, BELT GUARD, WEATHERHOOD, OR ACCESSORIES.

STORAGE

When a fan is not going to be in service for an extended amount of time, certain procedures should be followed to keep the fan in proper operating condition.

- Rotate fan wheel monthly and purge bearings once every three months
- Cover unit with tarp to protect from dirt and moisture (Note: do not use a black tarp as this will promote condensation)
- Energize fan motor once every three months
- Store belts flat to keep them from warping and stretching
- Store unit in location which does not have vibration
- Motor weep holes should be checked to be clear of any obstructions or debris to permit drainage of condensation
- After storage period, purge grease before putting fan into service

If storage of fan is in a humid, dusty or corrosive atmosphere, rotate the fan and purge the motor and fan shaft bearings once a month. Improper storage which results in damage to the fan will void the warranty.

CAUTION!

When installing a fan, ensure the proper protective devices are used to protect personnel from moving parts and other hazards. A complete line of protective accessories are available from Greenheck including: weatherhoods, motor covers and electrical disconnects.

Check local codes to ensure compliance for all protective devices.

For further details on safety practices involving industrial and commercial fans, please refer to AMCA Publication 410.

ELECTRICAL DISCONNECTS

All fan motors should have disconnects located in close visual proximity to turn off electrical service. Service disconnects shall be locked out when maintenance is being performed.

MOVING PARTS

All moving parts must have guards to protect personnel. Refer to local codes for requirements as to the number, type and design. Fully secure fan wheel before performing any maintenance. The fan wheel may start "free wheeling" even if all electrical power has been disconnected. Before the initial start-up or any restart, check the following items to make sure that they are installed and secure.

GUARDS (Motor Cover, Weatherhoods)

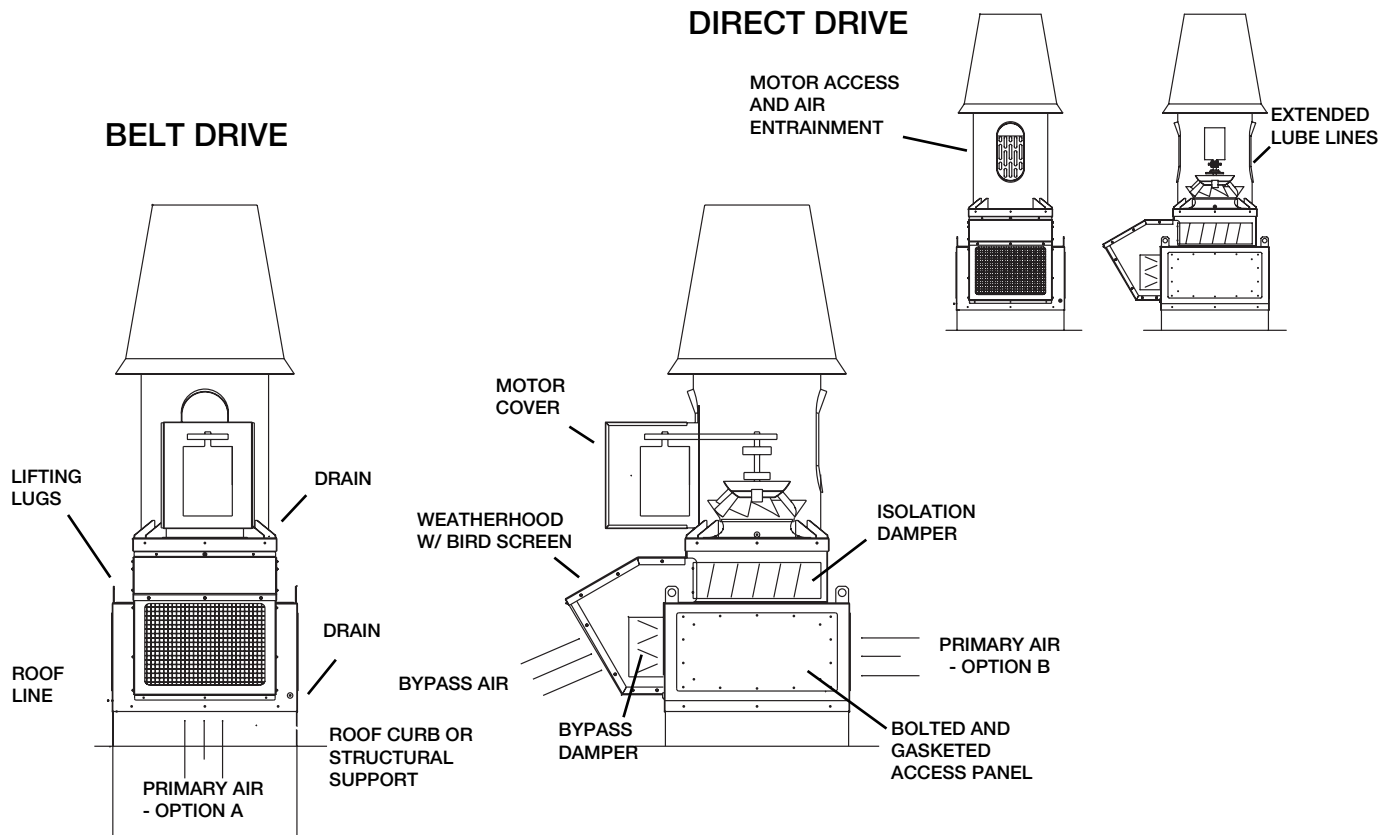
Do not operate fans without proper protective devices in place. Failure to do so may result in serious bodily injury and property damage.

PLENUM ACCESS DOORS

Before opening access doors ensure the fan wheel has stopped moving and that the wheel has been secured from being able to rotate. Do not operate fan without access door in its fully closed position.

AIR PRESSURE AND SUCTION

In addition to the usual hazards associated with rotating machinery, fans also create a dangerous suction at the inlet. Special caution needs to be used when moving around a fan, whether it is in operation or not. Before start-up, make sure the inlet area is clear of personnel and loose objects.



PRE-INSTALLATION FAN CHECKS

Prior to fully assembling and installing the Vektor fan and system components, inspect the fan assembly to make sure it is in working order.

- 1) Check all fasteners, set screws and locking collars on the fan, wheel, bearings, drive, motor base and accessories for tightness.
- 2) Rotate the fan wheel by hand and assure no parts are rubbing. Access to the wheel is obtained through a bolted panel located on the side of the fan housing.
- 3) Ensure proper wheel settings for radial gap and alignment (see page 15)

INSTALLATION

Installations with inlet or discharge configurations that deviate from this standard may result in reduced fan performance. Restricted or unstable flow at the fan inlet can cause pre-rotation of incoming air or uneven loading of the fan wheel yielding large system losses and increased sound levels.

SYSTEM IDENTIFICATION TAGS

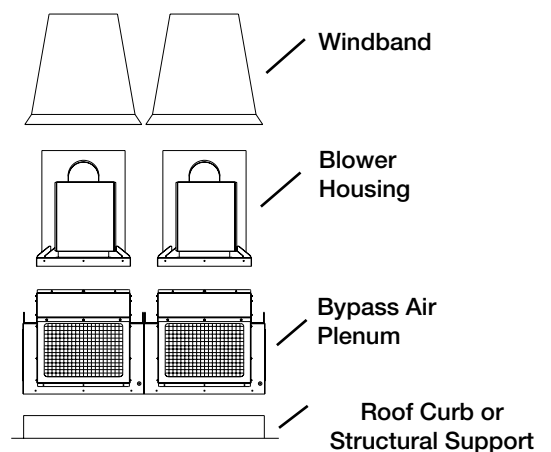
Vektor fan systems may arrive in component pieces due to shipping restrictions. Individual components of a system have matching identification tags which should be used to identify and assemble the complete system. Assembling systems with different identification tags can cause reductions in the fan(s) performance.

RIGGING / ASSEMBLY INSTRUCTIONS

Rigging Instructions

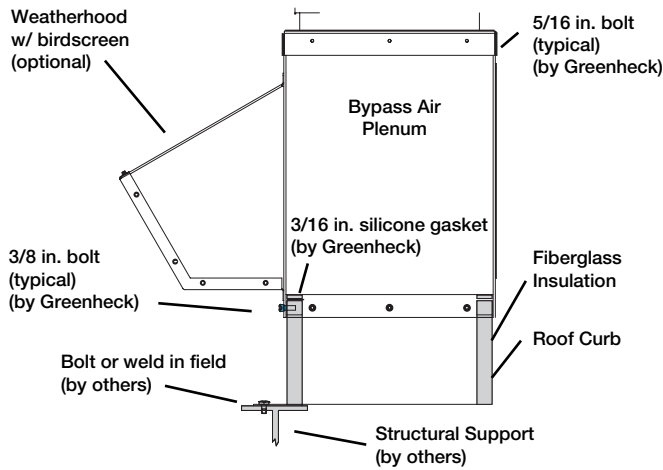
- Use standard lifting and rigging practices
- **All** lifting lugs on each component must be utilized at the same time
- Plenum, Blower, and Windband are to be kept level during installation

System Component Parts

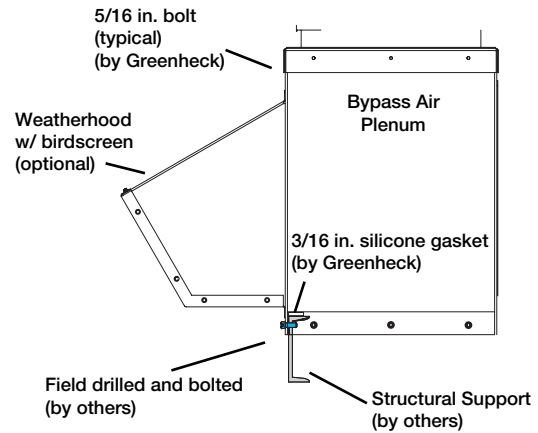


VEKTOR INSTALLATION (CONTINUED)

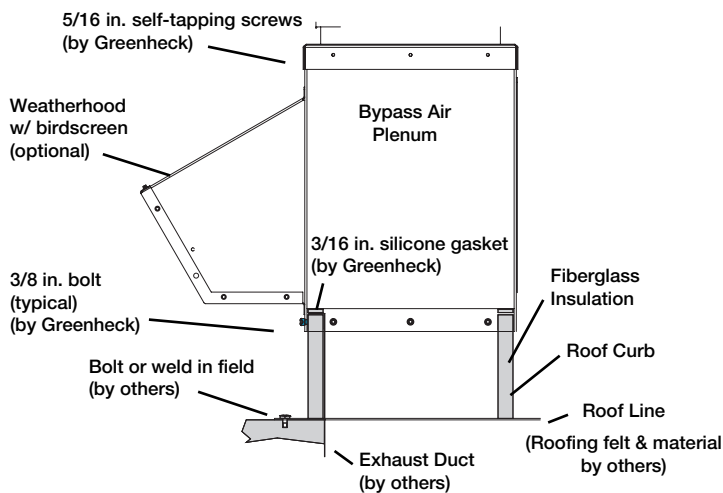
The figures below illustrates four common methods used to install Vektor systems. Methods used to attach a Vektor unit are dependent on local codes, roof construction design and roof construction materials. Consult an architect or structural engineer for proper means of attachment.



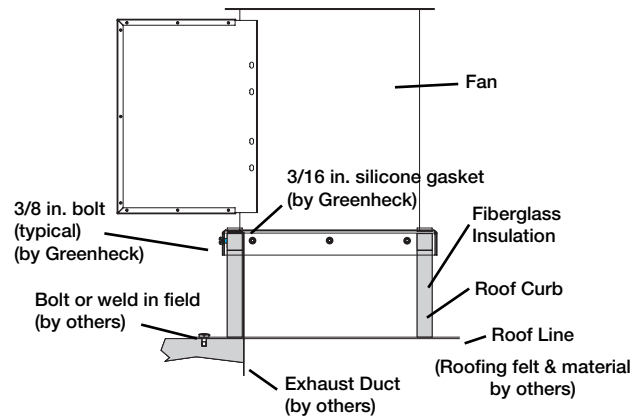
Fan, Plenum, and Curb to Structural Steel



Fan and Plenum (no Curb) to Channel Base



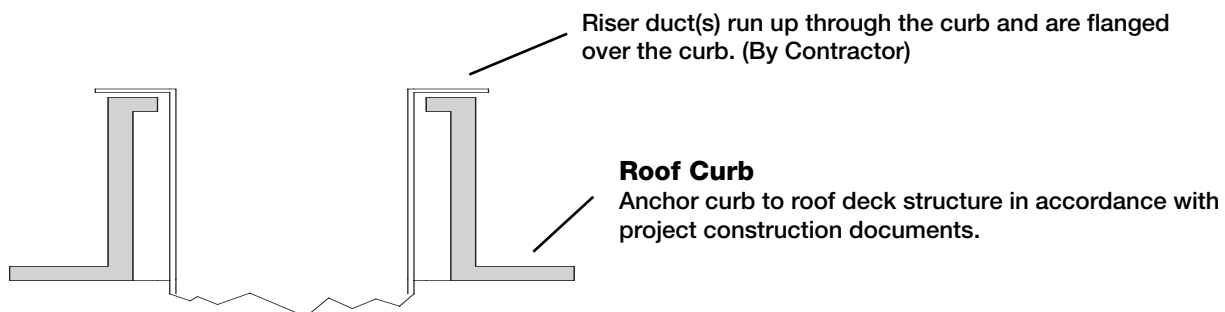
Fan, Plenum, and Curb to Roof Deck



Fan and Curb (no Plenum) to Roof Deck

VEKTOR RISER INSTALLATION

Check curb or structural supports for levelness. Both must be level to ensure proper drainage from plenum and fan(s).



PLENUM ASSEMBLY

The Vektor plenum is modular in design. Each fan on a system has its own plenum section. This modular approach allows for flexibility in the field to allow for on-site lifting capacity. The plenum sections can either be assembled all together into one single piece and then fitted on the roof curb / support structure or each section can be placed on individually. The method used would be dependent on the lifting capacity for the equipment on-site. If moving each piece separately onto the roof curb or support structure, each section should be joined to its mating part before moving another section into place.

For a 1 X 1 system there is only a single plenum section and no multiple plenum assembly would be required.

Determine the placement of the plenum sections relative to each other

When looking at the individual section one will notice that each plenum section is missing at least one side panel. These areas are the locations where the sections are to be joined together. If you have two plenum sections, then each one would be missing a side panel. If you have a three-fan system, there are three plenum sections. The two end plenum sections would each be missing one side panel and the middle section would not have panels on two sides. Please refer to the submittal drawing for the orientation of any Bypass Air Plenum (BAP) dampers or air inlet locations.

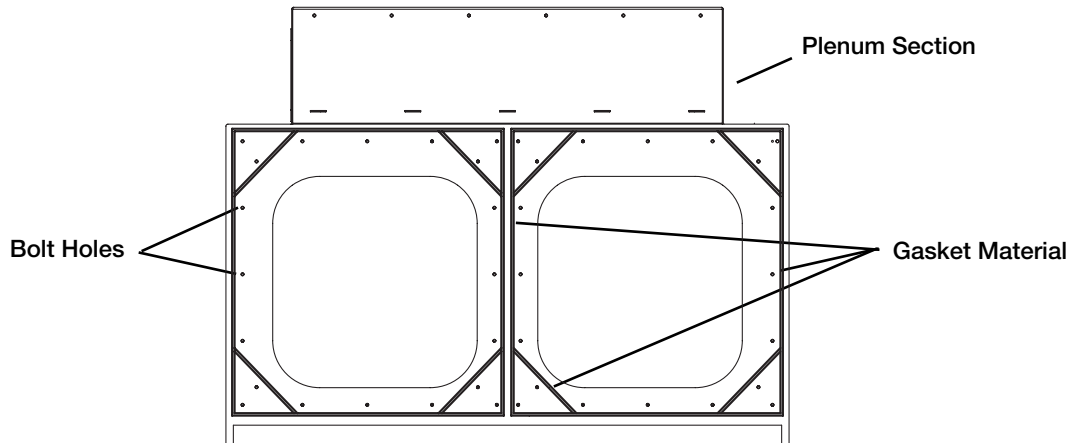
Putting the Plenum together

After identifying the plenum sections arrangement order, one of the two mating sections has weld nuts on the inside of the plenum. The assembly hardware (stainless steel bolts) required to join the sections is located here for shipping purposes. These bolts should be removed and set-aside prior to placing the mating sections together. The bolts are located every 6 – 10 inches to provide the best seal between the mating sections.

Before moving the sections into position, gasketing must be installed to seal the plenum sections against leakage. This silicone gasketing is supplied with the fans and only needs to be applied to one of the two mating plenum sections. The bands or strips of gasketing should be attached around the perimeter of the joining face and with an additional strip making a triangular area in each corner. If there are two openings in the side access panel (as shown in the figure below) then an additional strip of gasketing and triangular area are made for each.

Note: Gasketing material (shipped with fan) should be placed on the top edge of already installed roof curb prior to placing the plenum or individual plenum sections on the curb.

After the gasketing has been attached and the hardware has been removed, place the two mating sections together. The



stainless steel bolts, which were set aside earlier, are now run first through the holes of the plenum section without the weld nuts and tighten into the weld nuts on the other plenum section. An additional side (or access) panel may need to be removed in order to gain access to the inside of the plenum assembly. The bolts should be tightened in a manner as to pull the two sections together and compress the gasketing.

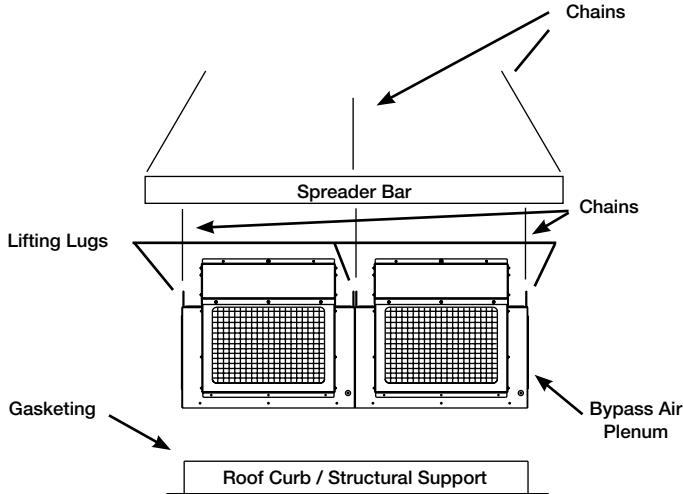
After the plenum is assembled

Use all provided hardware to tighten and join the mating sections together. Any side panels removed to gain access to the interior of the plenum should be reattached. The assembled plenum has holes in the curb cap to fasten the plenum to the already installed roof curb.

The plenum is now ready to have gasketing placed in the mounting location between the plenum and the fan. After the gasketing has been attached the fans can be lifted into place.

RIGGING / ASSEMBLY INSTRUCTIONS

Plenum Installation



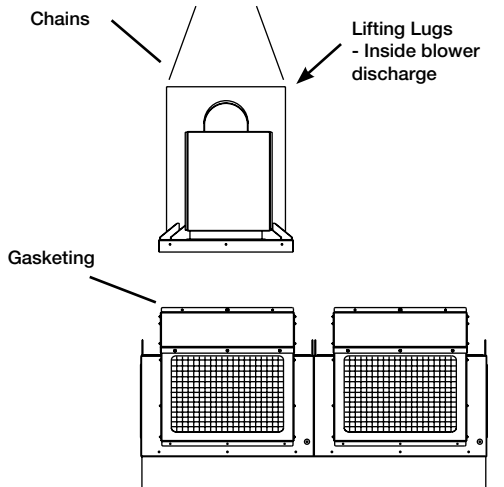
Place 1/2 in. thick x 1/2 in. wide silicone gasket around the perimeter of top edge of curb, adhesive side down (gasket provided).

To align holes properly, the plenum needs to be centered on the curb.

When holes are provided in the curb, install 316 stainless steel screws (provided) in all holes. Use ANTI-SEIZE gel (provided) to prevent galling / welding of all stainless steel fasteners.

When holes are not provided in the curb (non Greenheck curb): Drill 0.28 in. diameter holes in curb using Bypass Air Plenum holes as a template. Install 5/16 in. self-tapping screws (provided) in all the holes.

Fan Housing Installation



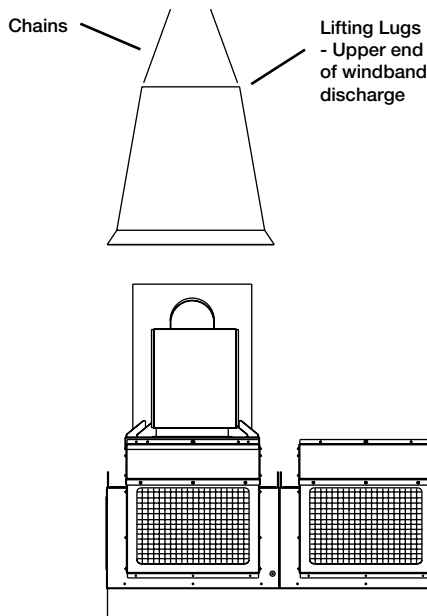
Place 1/2 in. thick x 1/2 in. wide silicone gasket on Bypass Air Plenum, adhesive side down (provided).

Lower Vektor fan housing into place. Allow gasket to become compressed before securing to plenum.

Install 316 stainless steel screws (provided) in all holes in plenum cap. Use ANTI-SEIZE gel (provided) to prevent galling / welding of all stainless steel fasteners.

**** If the windband is shipped attached to the fan housing or if the windband is secured to the fan housing prior to mounting to the plenum, the fan / windband assembly should be lifted by the lifting lugs located on the fan housing. Do not lift this assembly by the lifting lugs located on the windband.**

Windband Installation



Using Windband lifting lugs, place Windband over blower discharge, aligning Windband support bracket holes with bolt holes in Blower Housing. Attach Windband to blower discharge using 316 stainless steel bolts (provided) through support brackets welded to the inside of the windband. Use ANTI-SEIZE gel (provided) to prevent galling / welding of all stainless steel fasteners.

DUCT CONNECTIONS TO THE BYPASS AIR PLENUM (BAP)

Connecting primary exhaust air ducts is allowed through the roof curb or through one or more of the side access panels. To reduce the potential for system effects in the plenum, the duct connection should be sized to have a maximum air velocity of 1500 fpm when entering. When attaching ductwork to the plenum, care should be taken to ensure a tight fit and proper seal to prevent leakage from the contaminated airstream.

Ductwork that has a different size than the removable access panel can either have a transition to the plenum's opening size or the access panel can be field modified by cutting an opening to the size of the ductwork.

VEKTOR FIELD COATING TOUCH-UP PROCEDURE FOR SCRATCHED AREAS

Standard coating and color for the Vektor laboratory exhaust system is Greenheck's Hi Pro Polyester – Gray (041). The procedure below details the correct method for repairing minor scratches in the coating. Each Vektor unit will have been supplied with a repair kit for after the initial installation. The kit includes: 1 pint Kem Kromik primer, 1 pint Industrial enamel (Industrial 041 Gray), 4 disposable foam brushes, 1 sheet of sandpaper, 2 tech data sheets for the two paints, and 1 repair procedure.

- 1) Scuff affected area to be repaired using medium sandpaper (provided) or medium scotch brite pad. Feather the edges.
- 2) Clean affected area to be touched up using an alkaline based cleaner and rinse.
- 3) Apply Kem Kromik primer using 1 inch foam brush (provided). Follow technical data sheet instructions.
- 4) Allow primer to dry a minimum of 2 1/2 hours before top coating.
- 5) Topcoat with Industrial enamel using 1 inch foam brush (provided). Follow technical data sheets instructions. Allow painted units to air-dry and cure before putting into service. See enclosed Technical Data sheets for detailed drying and cure schedules at different temperatures.

To order additional coating repair kits please reference Greenheck's part number HAZ2037 HI-PRO GRAY FIELD DAMAGE REPAIR KIT. Please contact factory with your fan's serial number for colors other than our standard Gray (041)..

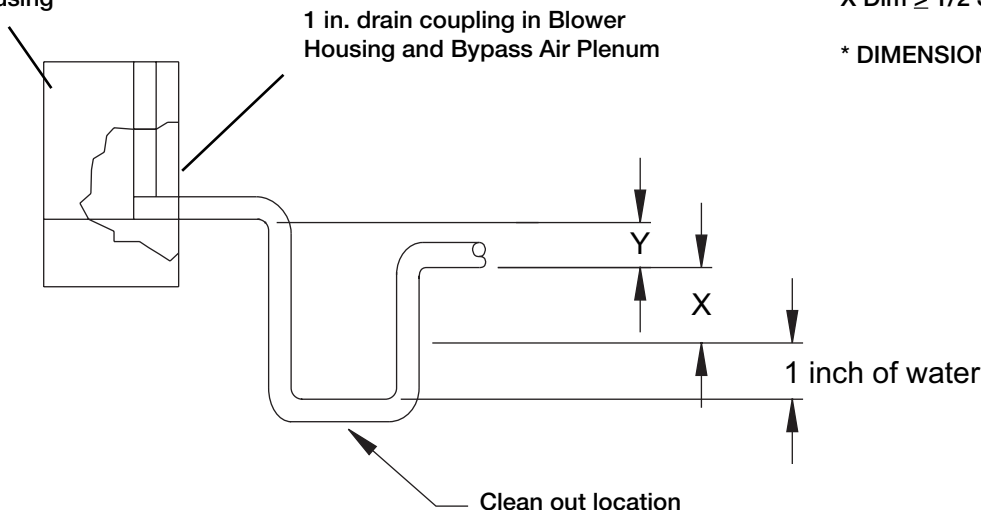
PLENUM DRAINAGE PIPING / TRAP DETAIL (By Others)

There are multiple locations for pipe connections, one on each plenum section and another on each tubular fan housing. Each drain should be properly connected to a drainage system to ensure proper disposal of any water or condensate that may occur.

- Installed piping to have a downward angle to allow for drainage
- Fill trap to recommended level before start-up



Detail of Bypass Air Plenum and Blower Housing



Y Dim \geq SYSTEM PRESSURE
X Dim \geq 1/2 SYSTEM PRESSURE

* DIMENSION OF X AND Y ARE INCHES

BYPASS AIR PLENUM (BAP) AND ISOLATION DAMPER ACCESS AND ACTUATOR MOUNTING

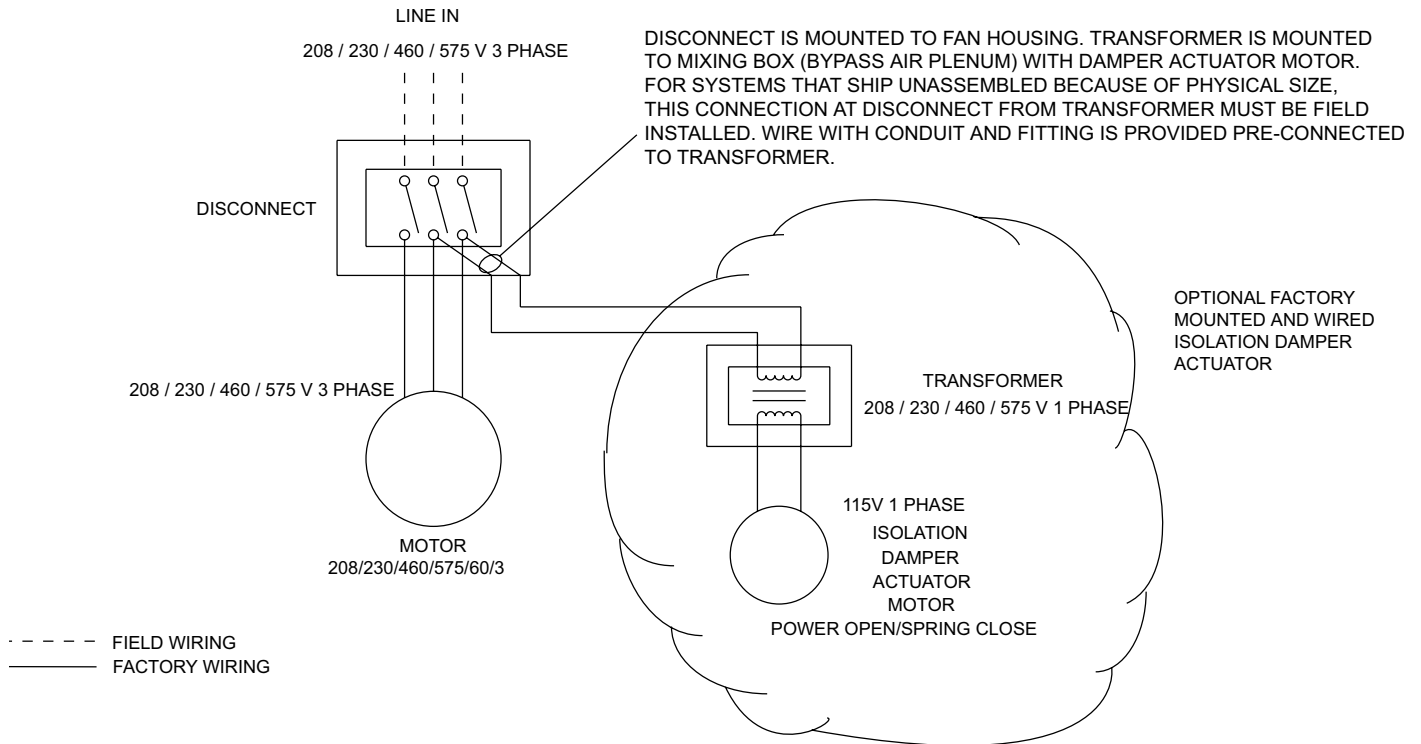
Depending on the configuration and intended operation of the system supplied, every Vektor plenum section may not have a weatherhood and bypass air damper. Typically systems that include a fan which is on standby will have one less weatherhood and BAP damper assembly than plenum sections. Refer to submittal drawings for additional information. The appropriate guard / cover needs to be removed for installation, inspection and maintenance.

For Vektor fans with weatherhood - Access to the BAP damper and the isolation damper, actuator(s) (optional from factory) and voltage transformer (optional from factory) mounting location, is gained through the removal of the weatherhood guard / cover. The isolation damper assembly can be removed from its location by sliding it through the opening.

For Vektor fans without a weatherhood - A guard / cover is located on the side of the plenum section. Removal of the guard / cover gains access to the damper linkages, actuator (optional from factory) and transformer (optional from factor). The entire isolation damper assembly can be removed through this opening.

If the Vektor units were not supplied with optional actuators, the dampers have an extended jackshaft for field mounting a customer supplied actuator.

MOTOR - DISCONNECT WIRING / ISOLATION DAMPER WIRING DIAGRAM



APPLICATIONS WITH VARIABLE FREQUENCY DRIVES (VFD)

For Vektor systems with single-point, three-phase wiring per blower, the isolation damper actuator will be powered via a step-down transformer, which is wired to the fan disconnect, as shown in the diagram above.

If fan flow (motor speed) is to be controlled using a variable frequency drive with this wiring, the reduced voltage and frequency supplied to the fan will cause control problems with the isolation damper actuator.

When a project's Vektor control sequence requires the use of a VFD, it is suggested that the control contractor supply the isolation damper actuator voltage — independent of the power supplied to the Vektor fan motor.

UNIT START-UP

- 1) Disconnect and lock-out all power switches to fan. See warning below.
- 2) Check for bearing alignment and lubrication.
- 3) Check the V-belt drive for proper alignment and tension (belt drive).
- 4) Check rigid coupling for proper alignment and connect between motor shaft and fan shaft (direct drive).
- 5) Check all guarding to ensure that it is securely attached and not interfering with rotating parts.
- 6) Check operation of isolation and bypass dampers (if supplied) for freedom of movement.
- 7) Check all electrical connections for proper attachment.
- 8) Check housing and ductwork, if accessible, for obstructions and foreign material that may damage the fan wheel.
- 9) Fill drainage piping trap.

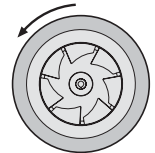
WARNING

Disconnect and secure to the “Off” position all electrical power to the fan prior to inspection or servicing. Failure to comply with this safety precaution could result in serious injury or death.

ADDITIONAL STEPS FOR INITIAL START-UP

- 1) Check for proper wheel rotation by momentarily energizing the fan. Access to the wheel can be gained through the bolted access panel located on the side of the fan’s tubular housing. Rotation is always determined by viewing the wheel from the drive side and should correspond to the rotation decal affixed to the unit (CCW) rotation is correct as viewed from the fan inlet). One of the most frequently encountered problems are motors that are wired to rotate the wheel in the wrong direction. This is especially true with 3-phase installations where the motor will run in either direction, depending on how it has been wired. To reverse rotation of a 3-phase motor, interchange any two of the three electrical leads. Single phase motors can be reversed by changing internal connections as described on the motor label or wiring diagram.
- 2) Fans with multi-speed motors should be checked on low speed during initial start-up.
- 3) Check for unusual noise, vibration or overheating of bearings. Refer to the “Troubleshooting” section of this manual if a problem develops.
- 4) Grease may be forced out of the bearing seals during initial start-up. This is a normal self-purging feature for the type of bearing used on this product.

CCW ROTATION



Mixed Flow Wheel

Viewed from the inlet side.

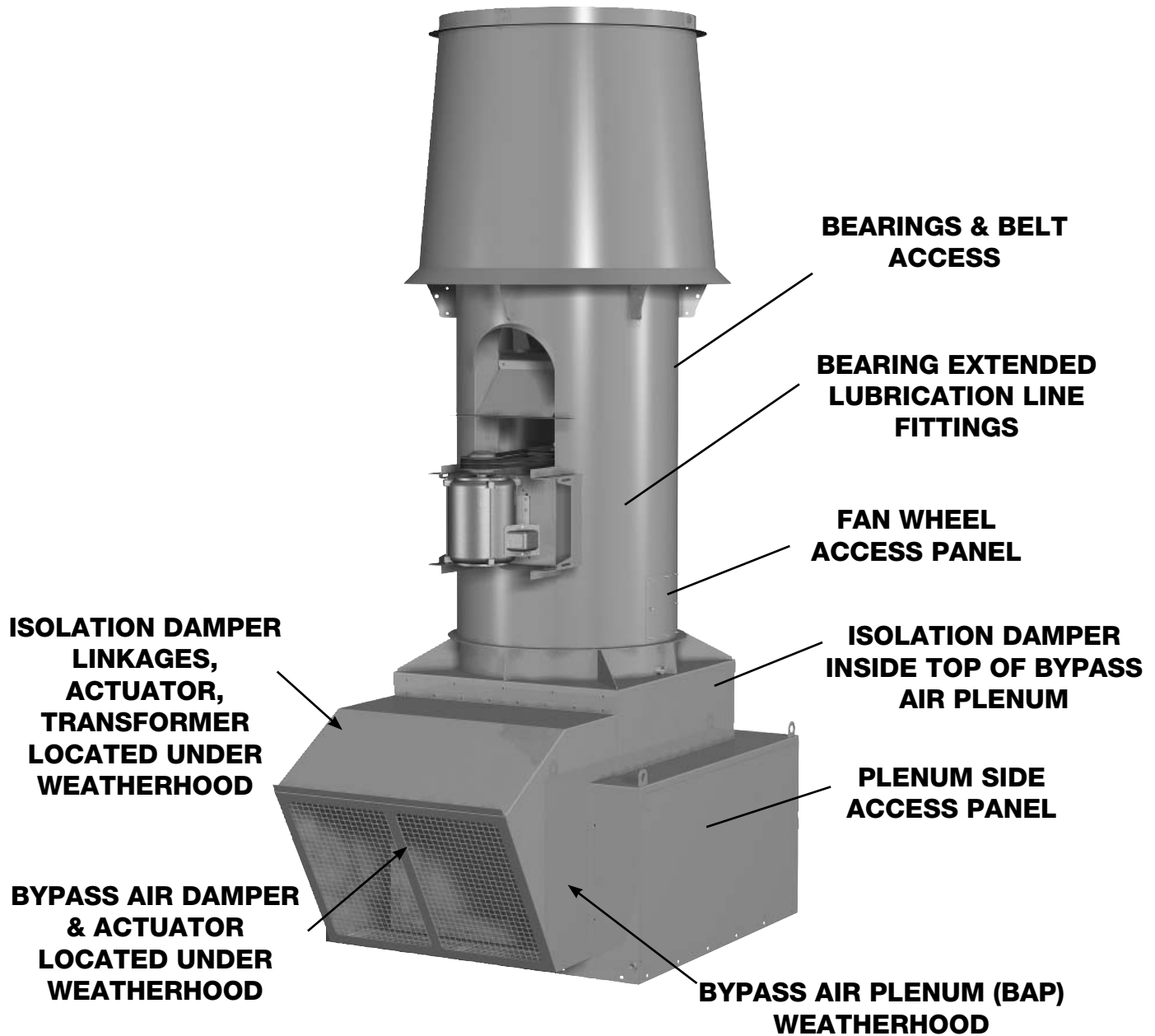
VIBRATION

Excessive vibration is the most frequent problem experienced during initial start-up. Left unchecked, excessive vibration can cause a multitude of problems, including structural and/or component failure. The most common sources of vibration are listed below.

1. Wheel Unbalance
2. Drive Pulley Misalignment
3. Incorrect Belt Tension
4. Bearing Misalignment
5. Mechanical Looseness
6. Faulty Belts
7. Drive Component Unbalance
8. Poor Inlet/Outlet Conditions
9. Foundation Stiffness

Many of these conditions can be discovered by careful observation. Refer to the troubleshooting section of this manual for corrective actions. If observation cannot locate the source of vibration, a qualified technician using vibration analysis equipment should be consulted. If the problem is wheel unbalance, in-place balancing can be done through the access panel located on the side of each fan’s tubular housing. Any correction weights added to the wheel should be welded to either the wheel back (single-plane balance) or to the wheel back and wheel cone (two-plane balance).

SERVICEABLE COMPONENTS



ROUTINE MAINTENANCE & OPERATION

Once the unit has been put into operation, a routine maintenance schedule should be set up to accomplish the following:

- 1) Lubrication of bearings and motor.
- 2) Bypass air dampers should be checked for freedom of operation and wear.
- 3) Wheel, housing, bolts and set screws on the entire fan should be checked for tightness.
- 4) Any dirt accumulation on the wheel or in the housing should be removed to prevent unbalance and possible damage.
- 5) Inspect fan impeller and housing looking for fatigue, corrosion, or wear.

When performing any service to the fan, disconnect the electrical supply and secure fan impeller.

FAN OPERATION

All fans should be run every thirty (30) days, or at least “bumped” every thirty days. It is preferred that each fan is run as this causes all electrical and mechanical components to get up to temperature, displacing any formed condensation, redistributes load on bearings, and redistributes grease in the bearings (motor and shaft bearings).

CAUTION:

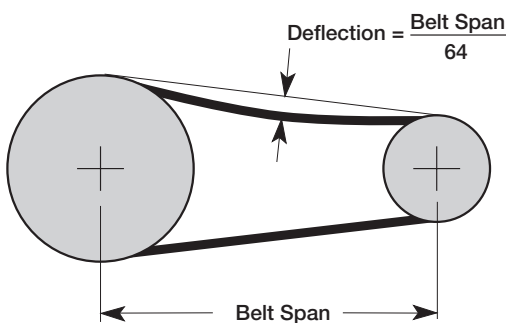
When operating conditions of the fan are to be changed (speed, pressure, temperature, etc.) consult Greenheck to determine if the unit can operate safely at the new conditions.

V-BELT DRIVES

V-belt drives must be checked on a regular basis for wear, tension, alignment and dirt accumulation. Premature or frequent belt failures can be caused by improper belt tension (either too loose or too tight) or misaligned sheaves. Abnormally high belt tension or drive misalignment will cause excessive bearing loads and may result in failure of the fan and/or motor bearings. Conversely, loose belts will cause squealing on start-up, excessive belt flutter, slippage and overheated sheaves. Either excessively loose or tight belts may cause fan vibration.

When replacing V-belts on multiple groove drives all belts should be changed to provide uniform drive loading. Use a set of matched belts whenever possible. Do not pry belts on or off the sheave. Loosen belt tension until belts can be removed by simply lifting the belts off the sheaves. After replacing belts, ensure that slack in each belt is on the same side of the drive. Belt dressing should never be used.

Do not install new belts on worn sheaves. If the sheaves have grooves worn in them, they must be replaced before new belts are installed.



The proper tension for operating a V-belt drive is the lowest tension at which the belts will not slip at peak load conditions. Belts are adjusted by raising or lowering the motor pivot plate. For initial tensioning, the proper belt deflection halfway between sheave centers is $\frac{1}{64}$ inch for each inch of belt span. For example, if the belt span is 64 inches, the belt deflection should be 1 inch using moderate thumb pressure at mid-point of the drive. **Check belt tension two times during the first 24 hours of operation and periodically thereafter.**

MOTORS

Motor maintenance is generally limited to cleaning and lubrication. Cleaning should be limited to exterior surfaces only. Removing dust and grease buildup on the motor housing assists proper motor cooling. Never wash-down motor with high pressure spray.

Greasing of motors is only intended when fittings are provided. Many fractional motors are permanently lubricated for life and require no further lubrication. Motors supplied with grease fittings should be greased in accordance with the manufacturer's recommendations. When motor temperature does not exceed 104°F (40°C), the grease should be replaced after 2000 hours of running time.

Direct drive systems have extended grease lines to lubricate the motor without removal of any guarding.

BEARINGS

The bearings for Greenheck fans are carefully selected to match the maximum load and operating conditions of the specific class, arrangement, and fan size. The instructions provided in this manual and those provided by the bearing manufacturer will minimize any bearing problems. Bearings are the most critical moving part of the fan, therefore, special care is required when mounting them on the unit and maintaining them.

Refer to the following chart and the manufacturer's instructions for grease types and intervals for various operating conditions. Never mix greases made with different bases. This will cause a breakdown of the grease and possible failure of the bearing.

Recommended Bearing Lubrication Schedule for Greenheck Fans								
Relubrication Schedule in Months*								
Fan RPM	Bearing Bore (inches)							
	1/2 - 1	1 1/8 - 1 1/2	1 5/8 - 1 7/8	1 15/16 - 2 3/16	2 7/16 - 3	3 3/16 - 3 1/2	3 15/16 - 4 1/2	4 15/16 - 5 1/2
To 250	6	6	6	6	6	5	4	3
500	6	6	6	5	4	3	3	2
750	6	5	4	3	3	2	2	1
1000	6	4	3	2	2	1	1	0.5
1250	5	3	2	1	1	0.5	0.5	0.25
1500	5	2	1	1	0.5	0.5	0.25	0.25
2000	5	1	1	0.5	0.25	0.25	0.25	0.25
2500	4	0.5	0.5	0.25	0.25	0.25		
3000	4	0.5	0.25	0.25	0.25			
4000	3	0.25	0.25	0.25	0.25			
5000	2	0.25	0.25	0.25				

* Suggested initial greasing interval is based on 12 hour per day operation and 150 degree F. maximum housing temperature. For continuous (24 hour) operation, decrease greasing interval by 50%.

- If possible relubricate with grease while in operation, without endangering personnel.
- For ball bearings (operating) relubricate until clean grease is seen purging at the seals. Be careful not to unseat the seal by over lubricating.
- For ball bearings (idle) add 1-2 shots of grease up to 2 inch bore sizes, and 4-5 shots of grease above 2 inch bore sizes with hand grease gun.
- For roller bearings relubricate with 4 shots of grease up to 2 inch bore size, 8 shots for 2 to 5 inch bore size, and 16 shots above 5 inch bore size with hand grease gun.
- Adjust lubrication frequency based on condition of purged grease.
- A high quality lithium base grease conforming to NLGI Grade 2 consistency, such as those listed below, should be used.

MOBILITH SHC 220	TEXACO MULTIFAK AFB2	SHELL ALVANIA #2
MOBILITH AW2	TEXACO PREMIUM RB	EXXON UNIREX N2

WARNING: Lubricate bearings prior to periods of extended shutdowns or storage and rotate shaft monthly to aid in preventing corrosion. If the fan is stored more than three months, the bearings should be purged with new grease prior to start-up.

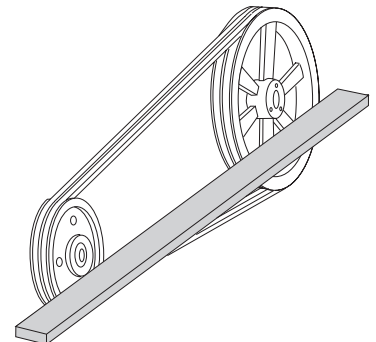
SERVICE

V-BELT DRIVES

The V-belt drive components, when supplied by Greenheck Fan Corporation, have been carefully selected for this unit's specific operating condition. **Caution:** Changing V-belt drive components could result in unsafe operating conditions which may cause personal injury or failure of the following components: 1. Fan Shaft, 2. Fan Wheel, 3. Bearings, 4. V-belt, 5. Motor.

V-BELT DRIVE INSTALLATION (Belt Drive)

- 1) Remove the protective coating from the end of the fan shaft using mineral spirits or another similar solvent. Check to ensure that the shaft is free of nicks and burrs.
- 2) Slide sheaves on shafts - do not drive sheaves on as this may result in bearing damage.
- 3) Align fan and motor sheaves with a straight-edge or string and tighten.
- 4) Place belts over sheaves. Do not pry or force belts, as this could result in damage to the cords in the belts.
- 5) Adjust the tension until the belts appear snug. Run the unit for a few minutes and allow the belts to "Set" properly.
- 6) With the fan off, adjust the belt tension by moving the motor pivot plate. When in operation, the tight side of the belts should be in a straight line from sheave to sheave with a slight bow on the slack side.



Aligning Sheaves with a Straight Edge

BEARING REPLACEMENT

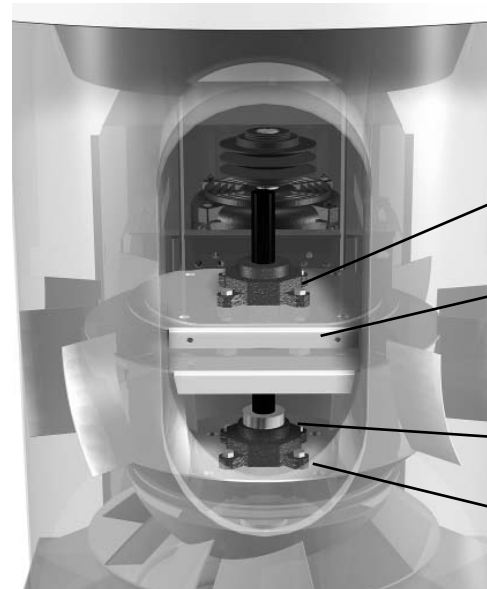
The intent of this Vektor fan design with its large side access openings is to allow a field service technician to replace bearings with the fan remaining in place in its intended application. All work can be conducted by accessing the bearings through the blower housing side access openings. However, replacement of a bearing or bearings may require the fan to be removed from the bypass air plenum, and even lowered to the roof or ground for access, depending on fan size and condition of bearing to be replaced. This procedure assumes power source has been locked out prior to removing guards and covers, belts and pulleys have been loosened and removed properly and extended lubrication lines have been disconnected at the bearing. In some cases it may be necessary to remove the motor and mounting plate. It may also be necessary to remove the fan inlet cone and wheel if the bearings cannot be removed due to corrosion or damage. See **RADIAL GAP & ALIGNMENT** section to realign wheel upon installation.



Belt Drive

The bottom (wheel side) bearing is a fixed type and carries the wheel and shaft weight and the negative system static thrust force. There is a shaft collar installed just above this bearing to help prevent the shaft from slipping inside this bearing. The top (drive side) bearing may be an expansion type that carries only belt load and no vertical weight and should be installed in the middle of its float range.

- 1) Mark or measure the location on the shaft for each bearing prior to removal.
- 2) Remove top bearing per disassembly procedure described in bearing instruction manual.
- 3) Install another shaft collar or other device to support shaft while removing bottom bearing.
- 4) Remove bottom shaft collar and bearing and slide up shaft to just under support device.
- 5) Reinstall shaft collar, where bottom bearing was, tight to bottom plate to support shaft again.
- 6) Remove top device and slide bearing through top opening and off shaft.
- 7) Reinstall bearings in reverse order in same locations as original.



TOP BEARING

**SUPPORT
PLATE**

**SHAFT
COLLAR**

**BOTTOM
BEARING**

Direct Drive

The bearing is a fixed type and carries the wheel and shaft weight and the negative system static thrust force. There is a shaft collar installed just above this bearing as an extra measure to help prevent the shaft from slipping inside this bearing.

- 1) Mark or measure the location on the shaft for the bearing prior to removal.
- 2) Remove coupling assembly from the shaft.
- 3) Open side access panel to position and secure extra support under the wheel while removing bearing.
- 4) Remove bottom shaft collar and bearing from shaft. *
- 5) Reinstall bearing and shaft collar in reverse order in same locations as original.
- 6) Reinstall coupling on fan shaft and attached to other coupling hub.
- 7) Remove support under wheel and close access panel.



**RIGID
COUPLING**

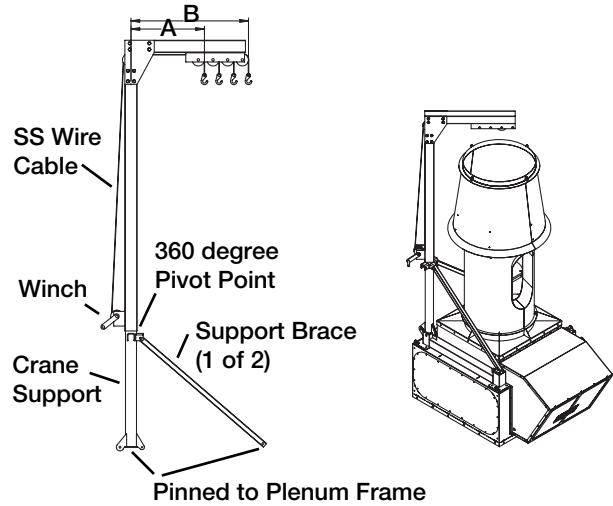
**SHAFT
BEARING**

* If the bearing does not fit between available gap, the motor will also need to be removed. See Motor Change-Out Procedure on page 14.

JIB CRANE ASSEMBLY (Optional Accessory)

The jib crane is mounted to sockets provided on the plenum housing. When assembling the jib crane, use the socket closest to the fan which is to be serviced (multiple sockets are on plenums consisting of three or more fans).

Jib crane is designed to lift windband and motor only. Any other use may result in serious injury. Jib crane must not be used to lift the fan from the plenum.



MOTOR CHANGE-OUT PROCEDURE (Direct Drive)

To remove the motor:

1. Install jib crane* in plenum mounting socket using Greenheck supplied hardware.
2. Position jib crane boom above windband.
3. Utilizing windband lifting lugs, rig windband to jib crane cable.
4. Remove all bolts used to secure windband to fan.
5. Lift off windband and lower to rooftop.
6. Reposition jib crane boom above fan.
7. Lower jib crane cable through center of fan until it reaches the motor.
8. Remove bolts securing the motor to its horizontal mounting plate.
9. Decouple motor shaft from wheel shaft by disassembling coupling.
10. Rig motor to jib crane cable.
11. Lift motor out of fan body and lower to rooftop.

To install the new motor:

- a. Rig new motor to jib crane cable.
- b. Attach coupling half to motor shaft. Make sure coupling hub is flush with the end of the motor shaft.
- c. Position motor above fan body and carefully lower to its intended mounting position.
- d. Ensure motor is positioned correctly so mounting bolts can be re-installed.
- e. Install all coupling bolts to attach the motor shaft to the fan wheel shaft.
- f. Install all bolts to attach motor to fan body mounting plate.

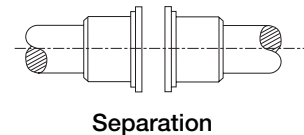
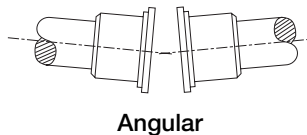
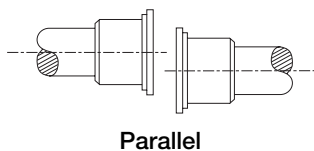
The Vektor fan was designed to ensure that when the new motor is installed, the relative angular alignment of the motor shaft to fan wheel shaft will be within +/- 1 degree.

* If jib crane was not supplied with the Vektor system, a portable crane or hoist can be used.

DIRECT DRIVE HIGH STRENGTH METAL DISC COUPLING - INSTALLATION AND ALIGNMENT (Direct Drive)

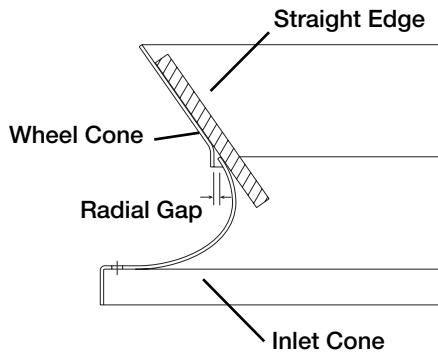
Check for misalignment between the two coupling hubs. The three types of misalignment (parallel, angular, and separation gap) are illustrated below. To minimize misalignment between the hubs, a straight edge can be used as a quick guide in aligning the shafts. The Vektor direct drive single shaft bearing permits the shaft to swivel and essentially eliminates parallel misalignment. But an excessive angle in the fan shaft will cause a higher degree of angular misalignment. It is best to have the motor shaft and fan shaft as close to parallel as possible. The coupling provided allows up to one degree of angular misalignment between the two joining hubs. No lubrication of the coupling is required.

Refer to the coupling manufacturer's information / installation instruction sheet provided with the fan for additional details. Coupling should not be installed to support the weight of the fan shaft and wheel.



RADIAL GAP & ALIGNMENT (wheel)

Efficient fan performance can be maintained by having the correct radial gap and alignment. These items should be checked before start-up when the unit has been disassembled.



RADIAL GAP

Adjust inlet cone position such that the radial gap between the wheel cone and inlet cone is evenly distributed around the wheel.

ALIGNMENT

If necessary, adjust wheel position by loosening the wheel hub from the fan shaft so that a straight edge held tight to the wheel cone just touches the inlet cone.

Fan Records

Notes

Mark No. _____

Fan Model No. _____

Fan Serial No. _____

Date Installed _____

Mark No. _____

Fan Model No. _____

Fan Serial No. _____

Date Installed _____

Mark No. _____

Fan Model No. _____

Fan Serial No. _____

Date Installed _____

TROUBLESHOOTING

Problem	Cause	Corrective Action
Excessive Noise	Wheel Rubbing Inlet	Adjust wheel and/or inlet cone. Tighten wheel hub or bearing collars on shaft.
	V-Belt Drive	Tighten sheaves on motor/fan shaft. Adjust belt tension. Align sheaves properly (see procedure). Replace worn belts or sheaves.
	Bearings	Replace defective bearing(s). Lubricate bearings. Tighten collars and fasteners.
	Wheel Unbalance	Clean all dirt off wheel. Check wheel balance, replace in-place if necessary.
Low CFM	Fan	Check wheel for correct rotation. Check blade position of BAP damper, increase fan speed.*
	Duct System	Higher pressure than design. Filters need replacement.
High CFM	Fan	Decrease fan speed.
	Duct System	Increase BAP damper blade open position. Resize ductwork. Access door, filters, dampers not installed.
Static Pressure Wrong	Duct system has more or less restriction than anticipated	Change obstructions in system. Use correction factor to adjust for temperature/altitude. Adjust set point used to control BAP damper modulation. Resize ductwork. Clean filters/coils. Change fan speed.*
High Horsepower	Fan	Check rotation of wheel. Reduce fan speed.
	Duct System	Resize ductwork. Check proper operation of isolation and bypass dampers. Check filters and access doors.
Fan Doesn't Operate	Electrical Supply	Check fuses/circuit breakers. Check for switches turned off or disconnected. Check for correct supply voltage.
	Drive	Check for broken belts. Tighten loose pulleys.
	Motor	Assure motor is correct horsepower and not tripping overload protector.
Overheated Bearing	Lubrication	Check for excessive or insufficient grease in the bearing.
	Mechanical	Replace damaged bearing. Relieve excessive belt tension. Align bearings. Check for bent shaft.
Excessive Vibration	Belts	Adjust tightness of belts. Replacement belts should be a matched set.
	System Unbalance	Check alignment of shaft, motor and pulleys. Adjustable pitch pulleys with motors over 15 hp are especially prone to unbalance. Check wheel balance, rebalance if necessary.

* Always check motor amps and compare to nameplate rating. Excessive fan speed may overload the motor and result in motor failure. Do not exceed the maximum cataloged rpm of the fan.

Warranty

Greenheck warrants this equipment to be free from defects in material and workmanship for a period of three years 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.

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

