

<<Prev Rule

Texas Administrative Code

Next Rule>>

TITLE 37

PUBLIC SAFETY AND CORRECTIONS

PART 9

TEXAS COMMISSION ON JAIL STANDARDS

CHAPTER 263

LIFE SAFETY RULES

SUBCHAPTER E

LIFE SAFETY AND EMERGENCY EQUIPMENT

RULE §263.51

Smoke Management

(a) General. Jails shall have a sufficient means of managing smoke from a fire to permit orderly movement of inmates from the area of a fire incident. Smoke management shall limit the exposure of staff to untenable conditions when responding to a fire emergency. The means of smoke management shall be a combination of compartmentation, control of smoke migration from the affected area, and means of removing smoke to the exterior of the building. The smoke management system shall include the consideration of:

- (1) automatic and manual fire detection;
- (2) automatic and manual fire alarm;
- (3) automatic and manual smoke control system activation;
- (4) automatic and manual fire suppression;
- (5) maintenance of safe means of egress;
- (6) movement of inmates from affected area to an area of safety;
- (7) containment of smoke to space of fire origin;
- (8) automatic and manual removal of smoke.

(b) Coverage.

(1) Smoke management shall be provided throughout all detention and support areas within the security perimeter.

(2) Mechanical smoke control systems and smoke removal systems shall be provided for all inmate housing areas, including cells, day rooms, dormitories, and special purpose cells.

(3) For the purpose of smoke control and smoke removal systems, the affected area shall be deemed to be the compartment consisting of a cell, day room, dormitory, or special purpose cell, in which the fire incident originates. Where open grating or mesh walls are used, the affected area shall be restricted to the cell(s) and the adjacent day room.

(c) Compartmentation. Smoke barriers shall be provided in accordance with the Life Safety Code, NFPA 101 14.3 concerning Subdivision of Building Spaces.

(d) Control of Smoke Migration.

(1) The fire detection system shall promptly detect smoke within the affected area.

(2) Upon detection, an alarm system shall automatically alert the control station(s) and initiate the automatic smoke control system.

(3) The smoke control system shall automatically, by pressure differential and/or air flow, contain smoke in the area of fire origin.

(4) Smoke control systems shall be designed so that smoke is restricted from entering the means of egress during the evacuation of inmates by providing sufficient air flow through exit access doors, when open.

(5) A manual override capability shall be provided in the event of detection failure and for testing purposes.

(e) Smoke Removal.

(1) All jails shall be provided with smoke removal capability, except as provided under subsection (g) of this section, relating to exceptions.

(2) The smoke removal system shall have the ability to remove smoke from the affected area to the exterior of the building using fixed mechanical equipment. Existing facilities (in operation prior to December 23, 1976) may be exempt from using fixed equipment when portable equipment is provided.

(3) During smoke removal, smoke shall not migrate from the affected area to other areas of the building.

(4) Smoke removal systems shall be designed to develop air flow patterns within the affected area which contribute to the dilution and removal of smoke. Air devices for supply and exhaust shall be separated by a distance of not less than 75% of the horizontal dimensions of the compartment and so arranged to provide air flow coverage of at least 50% of the vertical dimension of the compartment. Alternate air device configurations which have demonstrated effectiveness by field testing or mock-up testing may be approved.

(5) Capacity of the smoke removal system shall be sufficient to comply with subsection (f) of this section relating to smoke testing. Facilities in operation or initiated prior to March 31, 1991, which are not provided with a complete smoke management system (as required by this section) shall provide smoke removal capability, being automatically activated by the smoke detection system when utilizing fixed equipment, meeting the smoke testing criteria established by the commission on September 27, 1989. Designs for smoke removal systems which provide air change rates of less than 15 air changes per hour shall not be utilized. Design consideration shall be given to system configuration, friction loss, pressure drops and differentials, air leakage, and other construction characteristics, which may necessitate safety factors being included in design calculations.

(6) A manual override capability shall be provided in the event of detection failure and for testing purposes.

(f) Testing.

(1) General. Testing of the smoke management systems in all facilities shall be in compliance with the

requirements of this section.

(2) Functional Testing.

(A) Air Balancing Certification. Prior to any other testing of new smoke management systems, an air balance report prepared in accordance with nationally recognized practices shall be submitted to the county. Such report shall bear certification that the smoke control and removal systems meet the engineer of record's design requirements with respect to pressure differentials achieved and air flow rates necessary to meet the intended smoke management operation. A copy of the air balance report shall be maintained at the facility and made available to the commission's inspector during all tests and inspections. An air balance report on an existing system may be required by the Texas Commission on Jail Standards when there is evidence that the smoke management system has been impaired due to modifications to the system or inadequate maintenance.

(B) System Operation. A test of smoke management system's initiating devices and control systems' output shall be performed. Such testing shall verify that, upon activation of a smoke detector, water flow indicating device, manual fire alarm station, or other smoke management system initiating device, the smoke management system components will automatically commence operation. The engineer of record shall provide a "cause and effect" chart to indicate the appropriate smoke management operating mode for all affected equipment based on the operation of each initiating device. Acceptance of functional testing shall be predicated upon all input and output devices performing as indicated by the "cause and effect" chart.

(3) Smoke Testing.

(A) General smoke testing of the smoke management systems shall be accomplished in accordance with this section. The smoke management system shall be tested in both normal and emergency power modes.

(B) Smoke Detection. Artificial smoke shall be introduced into the space to be tested. The rate of introduction of smoke shall be two times the volume of the space to be tested. The commission may establish a minimum amount of smoke to be introduced into a space. The smoke detection system shall alarm and initiate the smoke control and removal system(s) within 60 seconds of the beginning of smoke introduction.

(C) Smoke Migration. The smoke management system shall be deemed to be controlling smoke migration if smoke from the detection test does not migrate from the affected area for a period of ten minutes from the time of detection and activation of the smoke control system. The inspector may conduct the smoke migration test with the compartment exit door open or closed.

(D) Smoke Removal. Utilizing the procedure for testing smoke detection, smoke removal shall be completed in the space to be tested within fifteen minutes from the time of system activation.

(4) Maintenance and Retesting. The smoke management systems shall be regularly maintained to assure consistent performance. The smoke management systems shall be operationally tested quarterly and may be tested by the commission's inspector on an annual basis utilizing the smoke testing procedures.

(g) Exceptions.

(1) Fully sprinklered, minimum security facilities may be exempt from these requirements if approved by the sheriff, the local fire marshal, and the commission; however, smoke detection and alarm systems shall be provided for all facilities. Approval shall be based on review of each facility, the degree of overall protection achieved, and a high degree of freedom of movement afforded the inmates. Such facilities shall be inspected by local fire protection authorities monthly.

(2) Single story, new construction, minimum security facilities whose exit doors are incapable of being locked from the inside and which provide direct exiting to the exterior of the building from the inmate sleeping area(s) and day room(s) may be constructed without smoke control, smoke removal, or sprinkler systems. However, these facilities shall provide proper compartmentation and smoke detection.

(3) Facilities that were in operation or initiated prior to March 31, 1991, and which comply with subsection (e) of this section, relating to Smoke Removal, may be exempt from other requirements of this section relating to smoke management.

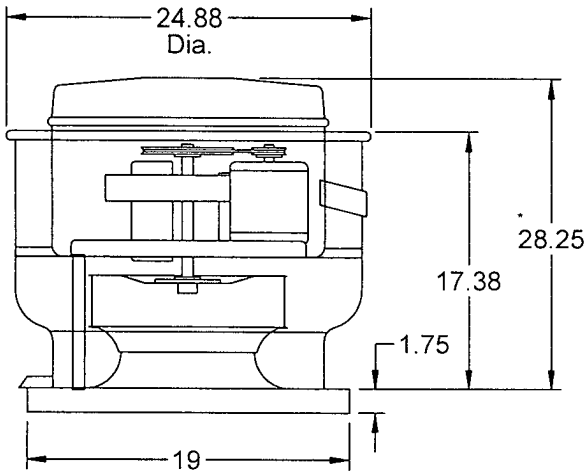
Source Note: The provisions of this §263.51 adopted to be effective December 19, 1994, 19 TexReg 9526; amended to be effective June 14, 1996, 21 TexReg 5003.

[Next Page](#)

[Previous Page](#)

[List of Titles](#) [Back to List](#)

[HOME](#) | [TEXAS REGISTER](#) | [TEXAS ADMINISTRATIVE CODE](#) | [OPEN MEETINGS](#) | [HELP](#) |



Reference assembly view drawings for actual dimensions with mounted accessories

*Overall height may be greater depending on motor

Model: CUBE-121-3

Belt Drive Upblast Centrifugal Roof Exhaust Fan

Standard Construction Features:

- Aluminum housing - Curb cap with prepunched mounting holes - Motor and drives isolated on shock mounts - Drain trough - Ball bearing motors - Adjustable motor pulley - Adjustable motor plate - Fan shaft mounted in ball bearing pillow blocks - Bearings meet or exceed temperature rating of fan - Static resistant belts - Corrosion resistant fasteners - Internal lifting lugs

Options & Accessories:

- Dual Drives
- UL Listed - Power Vents for Smoke Control Systems (500F/4hrs + 1000F/15 mins)
- Switch, NEMA-3R, Toggle, Junction Box Mounted & Wired
- Heat Baffle (Attached)
- Bearings with Grease Fittings, L10 life of 100,000 hrs (L50 avg. life 500,000 hrs)
- Steel Wheel Material

Dimensional

Qty	Weight w/o Accessories (lb)	Weight with Accessories (lb)	Roof Opening (in.)
1	63	67	14.5 x 14.5

Performance

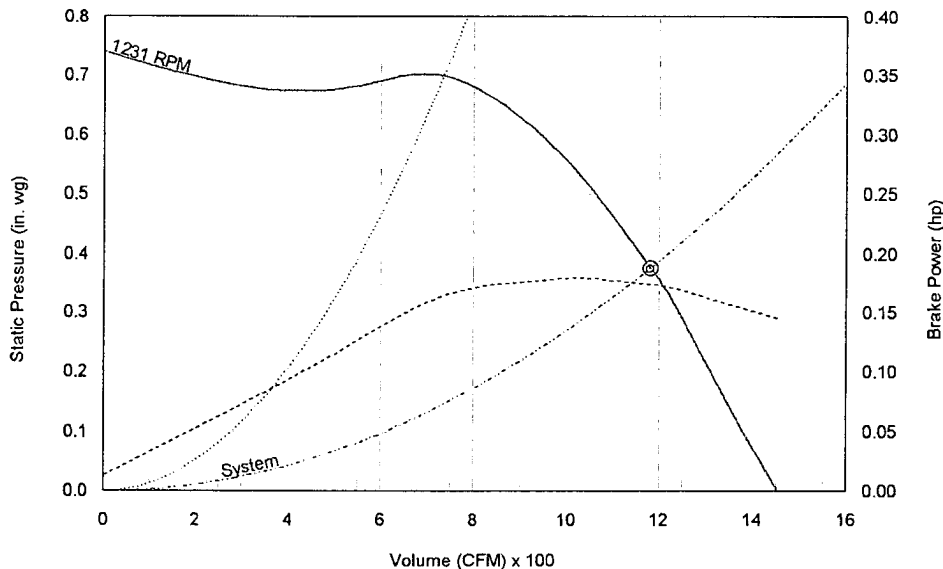
Requested Volume (CFM)	Actual Volume (CFM)	Requested SP (in. wg)	Actual SP (in. wg)	Fan RPM	Operating Power (hp)	Elevation (ft)	Airstream Temperature (F)	Drive Loss (%)	Tip Speed (ft/min)	SE (%)
1,180	1,180	0.375	0.375	1231	0.17	4,000	70	15.7	4,209	48

Motor

Motor Mounted	Size (hp)	V/C/P	Encl.	Motor RPM	Windings	NEC FLA* (Amps)
Yes	1/3	115/60/1	ODP	1725/1140	2	7.2

Sound Power by Octave Band

Sound Data	62.5	125	250	500	1000	2000	4000	8000	LwA	dBA	Sones
Inlet	72	74	76	64	60	62	52	45	71	59	9.6



Notes:

All dimensions shown are in units of in.
*FLA - based on tables 150 or 148 of National Electrical Code 2002. Actual motor FLA may vary, for sizing thermal overload, consult factory
LwA - A weighted sound power level, based on ANSI S1.4
dBA - A weighted sound pressure level, based on 11.5 dB attenuation per Octave band at 5.0 ft - dBA levels are not licensed by AMCA International
Sones - calculated using AMCA 301 at 5.0 ft

Belt Drive Upblast Centrifugal Roof Exhaust Fan

Model: CUBE-121-3

Mark: EF-04 SMOKE

Quantity: 1

Volume: 1,180 CFM
Total SP: 0.375 in. wg
FRPM: 1231 RPM
Motor Power: 1/3 hp
Voltage: 115
Phase: 1
Cycles: 60 Cycle

Product Summary

Fan Model: CUBE-121-3

Base - CUBE Fan

Motor - 1/3 hp, ODP, 115/60/1, 1725/1140 rpm - Factory Mounted

Drive - 1231 RPM - Factory Mounted

Motor and Drive Accessories

Dual Drives

Accessories

UL Listed - Power Vents for Smoke Control Systems (500F/4hrs + 1000F/15 mins)

Switch, NEMA-3R, Toggle, Junction Box Mounted & Wired

Heat Baffle (Attached)

Bearings with Grease Fittings, L10 life of 100,000 hrs (L50 avg. life 500,000 hrs)

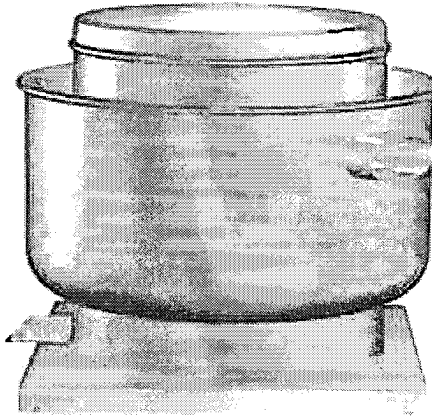
Steel Wheel Material

Installation, Operation and Maintenance Manual

Please read and save these instructions for future reference. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage!

Model CUE Direct Drive

Model CUE is a direct drive upblast centrifugal exhaust fan. These fans are specifically designed for roof mounted application. Performance capabilities range up to 6,400 cfm (10,874 m³/hr) and up to 3 in. wg (747 Pa) of static pressure. The maximum continuous operating temperature for fan sizes 098-200 is 400°F (204°C) and for fan sizes 060-095 is 160°F (71°C). CUE fans are available in fourteen sizes with nominal wheel diameter ranging from 9 to 20 inches (229 to 508 mm) (060 - 200 unit sizes). Each fan shall bear a permanently affixed manufacturers engraved metal nameplate containing the model number and individual serial number.



Model CUBE Belt Drive

Model CUBE is a belt drive upblast centrifugal exhaust fan. These fans are specifically designed for roof mounted applications. Performance capabilities range up to 30,000 cfm (50,970 m³/hr) and up to 5.0 in. wg (1240 Pa) of static pressure. The maximum continuous operating temperature is 400°F (204°C). CUBE fans are available in fourteen sizes with nominal wheel

diameter ranging from 9 to 48 inches (229 to 1219 mm) (098 - 480 unit sizes). Each fan shall bear a permanently affixed manufacturers engraved metal nameplate containing the model number and individual serial number.

General Safety Information

Only qualified personnel should install this fan. Personnel should have a clear understanding of these instructions and should be aware of general safety precautions. Improper installation can result in electric shock, possible injury due to coming in contact with moving parts, as well as other potential hazards. Other considerations may be required if high winds or seismic activity are present. If more information is needed, contact a licensed professional engineer before moving forward.

DANGER

Always disconnect, lock and tag power source before installing or servicing. Failure to disconnect power source can result in fire, shock or serious injury.

CAUTION

When servicing the fan, motor may be hot enough to cause pain or injury. Allow motor to cool before servicing.

CAUTION

Precaution should be taken in explosive atmospheres.

1. Follow all local electrical and safety codes, as well as the National Electrical Code (NEC) and the National Fire Protection Agency (NFPA), where applicable. Follow the Canadian Electrical Code (CEC) in Canada.
2. The rotation of the wheel is critical. It must be free to rotate without striking or rubbing any stationary objects.
3. Motor must be securely and adequately grounded.
4. Do not spin fan wheel faster than max cataloged fan RPM. Adjustments to fan speed significantly affects motor load. If the fan RPM is changed, the motor current should be checked to make sure it is not exceeding the motor nameplate amps.
5. Do not allow the power cable to kink or come in contact with oil, grease, hot surfaces or chemicals. Replace cord immediately if damaged.
6. Verify that the power source is compatible with the equipment.
7. Never open access doors to a duct while the fan is running.

Receiving

Upon receiving the product, check the bill of lading to ensure all items were received. Inspect each crate for shipping damage before accepting delivery. All damage should be noted on all the copies of the bill of lading and a claim should be filed with the carrier. Any physical damage to the unit after acceptance is not the responsibility of Manufacturer.

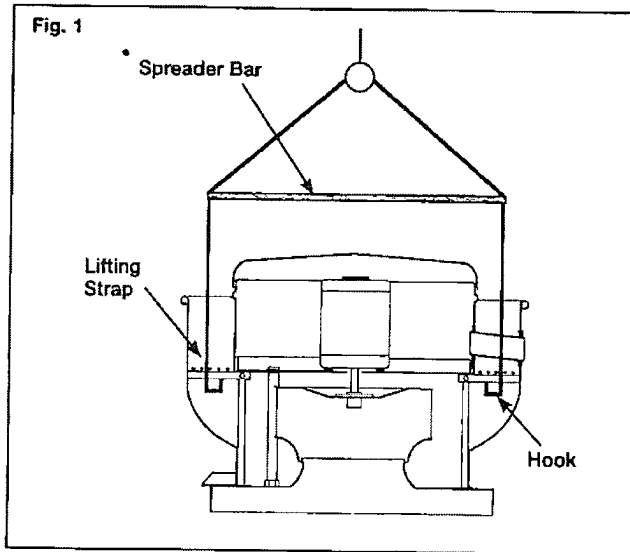
Unpacking

Verify that all required parts and the correct quantity of each item have been received. If any items are missing, report shortages to your local representative to arrange for obtaining missing parts. Sometimes it is not possible that all items for the unit be shipped together due to availability of transportation and truck space. Confirmation of shipment(s) must be limited to only items on the bill of lading.

Handling

CUE Direct Drive

Lift unit on to the roof utilizing hooks under the horizontal supports. Evenly space the hooks using a minimum of four lifting straps. Use a spreader bar to ensure the straps do not come in contact with the unit (see figure 1).



CAUTION

Do not lift by the fan hood. Avoid lifting fans in a way that will bend or distort fan parts. Never pass slings or timbers through the venturi of fan. Fans with special coatings or paints must be protected in handling to prevent damage.

Fig. 2

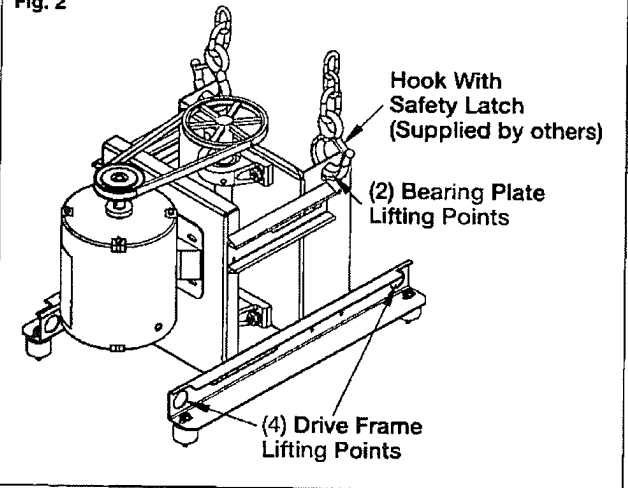
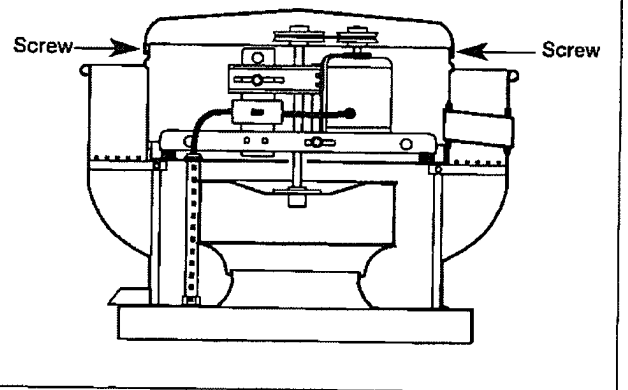


Fig. 3



CUBE Belt Drive

When lifting the unit onto the roof, use either the four lifting points on the drive frame or the two lifting points on the bearing plate if present (see figure 2 for lifting points). Access to the drive frame is accomplished by removing the screws pointed out in figure 3. The cover can then be removed and placed on a flat surface in an area protected from strong winds.

When CUE/CUBE unit is on the roof, move fan to desired location using lifting points and fasten securely through mounting holes in base. Shimms may be necessary depending upon roofing material thickness.

The motor amperage and voltage ratings must be checked for compatibility to supply voltage prior to final electrical connection. For CUE/CUBE installations, the electrical supply should be routed through the conduit chase located between the curb cap and the bottom of the motor compartment or through the motor cooling tube. Wiring must conform to local and national codes.

Storage

Fans are protected against damage during shipment. If the unit cannot be installed and operated immediately, precautions need to be taken to prevent deterioration of the unit during storage. The user assumes responsibility of the fan and accessories while in storage. The manufacturer will not be responsible for damage during storage. These suggestions are provided solely as a convenience to the user.

Indoor

The ideal environment for the storage of fans and accessories is indoors, above grade, in a low humidity atmosphere which is sealed to prevent the entry of blowing dust, rain or snow. Temperatures should be evenly maintained between 30° to 110°F (-1° to 43°C) (wide temperature swings may cause condensation and "sweating" of metal parts). All accessories must be stored indoors in a clean, dry atmosphere. Remove any accumulations of dirt, water, ice or snow and wipe dry before moving to indoor storage. To avoid "sweating" of metal parts allow cold parts to reach room temperature. To dry parts and packages, use a portable electric heater to get rid of any moisture buildup. Leave coverings loose to permit air circulation and to allow for periodic inspection.

The unit should be stored at least 3½ in. (89 mm) off the floor on wooden blocks covered with moisture proof paper or polyethylene sheathing. Aisles between parts and along all walls should be provided to permit air circulation and space for inspection.

Outdoor

Fans designed for outdoor applications may be stored outdoors, if absolutely necessary. Roads or aisles for portable cranes and hauling equipment are needed.

The fan should be placed on a level surface to prevent water from leaking into the fan. The fan should be elevated on an adequate number of wooden blocks so that it is above water and snow levels and has enough blocking to prevent it from settling into soft ground. Locate parts far enough apart to permit air circulation, sunlight and space for periodic inspection. To minimize water accumulation, place all fan parts on blocking supports so that rain water will run off.

Do not cover parts with plastic film or tarps as these cause condensation of moisture from the air passing through heating and cooling cycles.

Fan wheels should be blocked to prevent spinning caused by strong winds.

Inspection and Maintenance During Storage

While in storage, inspect fans once per month. Keep a record of inspection and maintenance performed.

If moisture or dirt accumulations are found on parts, the source should be located and eliminated. At each inspection, rotate the wheel by hand ten to fifteen revolutions to distribute lubricant on motor. If paint deterioration begins, consideration should be given to touch-up or repainting. Fans with special coatings may require special techniques for touch-up or repair.

Machined parts coated with rust preventive should be restored to good condition promptly if signs of rust occur. Immediately remove the original rust preventive coating with petroleum solvent and clean with lint-free cloths. Polish any remaining rust from surface with crocus cloth or fine emery paper and oil. Do not destroy the continuity of the surfaces. Thoroughly wipe clean with Tectyl® 506 (Ashland Inc.) or the equivalent. For hard to reach internal surfaces or for occasional use, consider using Tectyl® 511M Rust Preventive, WD-40® or the equivalent.

Removing From Storage

As fans are removed from storage to be installed in their final location, they should be protected and maintained in a similar fashion until the fan equipment goes into operation.

WARNING

Installation, troubleshooting and parts replacement is to be performed only by qualified personnel. Consult and follow all applicable national, state and local codes. They will supercede this document.

WARNING

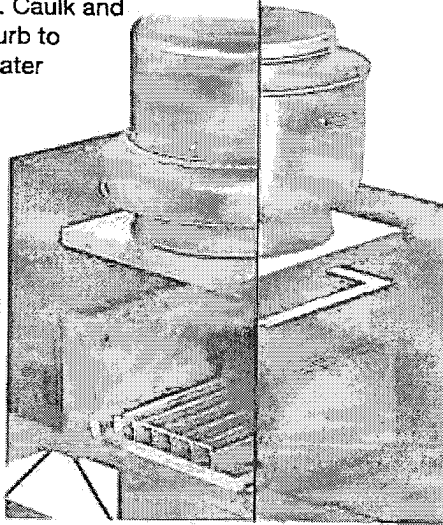
Disconnect power before installing or servicing.

Installation

Typical Roof Mounting Installation

1. On the roof surface, cut an appropriate sized hole and follow manufacturer's instructions on curb installation. Caulk and flash the curb to ensure a water tight seal.

Roof Curb Installation



2. If unit is equipped with a backdraft damper, it should be installed now.
3. Remove motor cover. Access to the motor compartment is accomplished by removing the screws as shown in figure 3.
4. For CUBE Belt Drive fans only. On the drive frame use the lifting lugs to lift and place the unit on top of roof curb. (Refer to figure 2 on page 2).
5. Secure fan to curb using a minimum of eight lag screws, metal screws or other suitable fasteners. Shims may be required depending upon curb installation and roofing material.
6. Verify power line wiring is de-energized before connecting fan motor to power source.
7. Connect power supply wiring to the motor as indicated on the motor nameplate or terminal box cover. Check the power source for compatibility with the requirements of your equipment.
8. Check fan wheel for free rotation, re-center if necessary.
9. Check all fasteners for tightness.
10. Mount and wire safety disconnect switch under motor cover. Wire control switches at ground level, refer to figure 4.

Typical Wiring Diagram

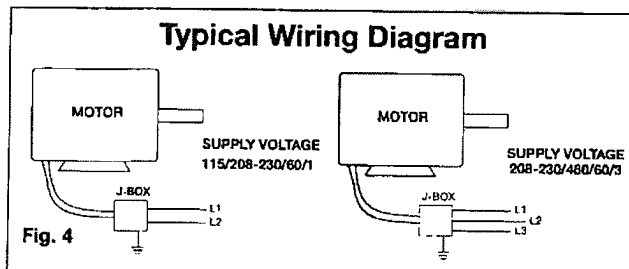


Fig. 4

11. Replace motor cover.
12. For restaurant and UL Listed for smoke evacuation applications, the electrical supply must enter the motor compartment through the breather tube. For other non-flammable applications the electrical supply can be routed through the conduit chase between the curb cap and the bottom of the motor compartment.

IMPORTANT



Power Ventilator 565L

ELECTRICAL - If fan motor is **NOT** thermally protected, remote overload protection must be installed having adequate rating as to voltage, frequency, horsepower, and full load current per phase. Where connected to a circuit protected by fuses, use time delay fuses. For supply connection use wires rated for at least 194°F (90°C).

INSTALLATION - When connecting electrical power to this fan, do not restrict motor movement for possible future belt or wheel adjustment.

CAUTION - Mount with the lowest moving part at least 8 ft (2.5m) above floor or grade level. Not required on roof mounted ventilators or duct mounted ventilators provided with belt guards.

CUE - Direct Drive

Model	Curb Cap	Damper	Roof Opening	*Approx. Weight
CUE 060, 065, 070, 075	17 (432)	8 (203)	10½ (267)	26 (12)
CUE 080, 085, 090	19 (483)	10 (254)	12½ (318)	33 (15)
CUE 095	19 (483)	10 (254)	12½ (318)	36 (16)
CUE 098, 099, 101, 121, 131	19 (483)	12 (305)	14½ (368)	67 (30)
CUE 141, 161	22 (559)	16 (406)	18½ (470)	85 (39)
CUE 180-200	30 (762)	18 (457)	20½ (521)	142 (64)

CUBE - Belt Drive

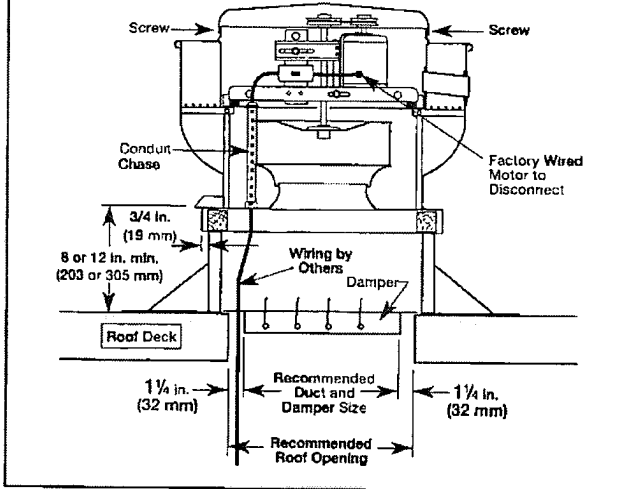
Model	Curb Cap	Shaft Bearings	Damper	Roof Opening	*Approx. Weight
CUBE 098, 099, 101, 101HP, 121, 131	19 (483)	½ (19)	12 (305)	14½ (368)	66 (30)
CUBE 141, 141HP, 161, 161HP, 161XP	22 (559)	½ (19)	16 (406)	18½ (470)	87 (39)
CUBE 180	30 (762)	¾ (19)	18 (457)	20½ (521)	126 (57)
CUBE 180HP	30 (762)	1 (25)	18 (457)	20½ (521)	126 (57)
CUBE 200	30 (762)	¾ (19)	18 (457)	20½ (521)	142 (64)
CUBE 200HP	30 (762)	1 (25)	18 (457)	20½ (521)	142 (64)
CUBE 220, 220HP	34 (864)	1 (25)	24 (610)	26½ (673)	174 (79)
CUBE 240, 240HP, 240XP	34 (864)	1 (25)	24 (610)	26½ (673)	175 (79)
CUBE 300, 300HP, 300XP	40 (1016)	1 (25)	30 (762)	32½ (826)	313 (142)
CUBE 360, 360HP, 360XP	46 (1168)	1¼ (32)	36 (914)	38½ (978)	440 (200)
CUBE 420	52 (1321)	1¼ (32)	42 (1067)	44½ (1130)	578 (262)
CUBE 480	58 (1473)	1½ (38)	48 (1219)	50½ (1283)	675 (306)

* All dimensions are in inches (millimeters). *Approximate weight shown in lbs. (kg) is the largest cataloged Open Drip Proof motor.

* The roof curb should be ½ in. (38 mm) less than the curb cap to allow for roofing and flashing.

General Ventilation Installation

Fig. 5 - Typical Roof Mounting Installation



Kitchen Roof Mounting Installation

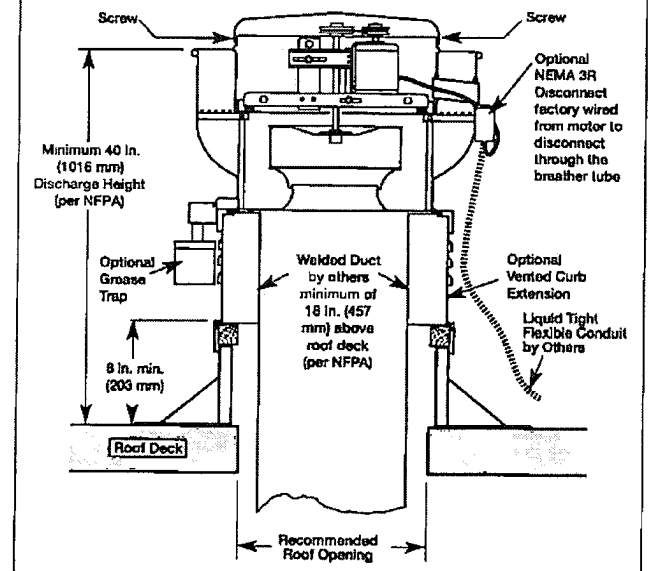
1. The size of the duct must be equal or larger than inlet opening.
2. Secure the fan to curb at all four corners using a minimum eight anchor bolts, lag screws or other suitable fasteners.
3. Area codes may require a continuous weld between duct and inlet.
4. To comply with NFPA 96 the fan discharge has to be a minimum 40 in. (1016 mm) above the roof surface and a minimum of 10 ft. (3048 mm) from any building air intake.
5. Ductwork to an upblast discharge exhaust fan is constructed of carbon steel not less than 16 MSG (1.6 mm) and extend a minimum of 18 in. (457 mm) above the roof surface.
6. Ensure that a minimum of 500 ft/min of air velocity through the fan is maintained per NFPA 96, clause 8.2.1.1, 2008 edition and UL 762, Issue #5, December 19, 2003, clause 6.2.
7. The following accessories may be required by NFPA-96 depending upon installation; Grease Trap, Hinge Kit or Hinged Base, Clean-out Port, and Vented Curb.

WARNING

Minimum duct velocities must be maintained in kitchen exhaust applications. If a speed controller is used, ensure compliance with all applicable codes.

Commercial Kitchen Installation

Fig. 6 - Typical Roof Mounting Installation



IMPORTANT



Power Ventilator
Restaurant Exhaust Appliances 13G3
Maximum Operating Temperature 400°F

ELECTRICAL - If fan motor is **NOT** thermally protected, remote overload protection must be installed having adequate rating as to voltage, frequency, horsepower, and full load current per phase. Where connected to a circuit protected by fuses, use time delay fuses. For supply connection use wires rated for at least 194°F (90°C).

INSTALLATION - When connecting electrical power to this fan, do not restrict motor movement for possible future belt or wheel adjustment.


Must be installed in accordance with the requirements of NFPA 96 or must have minimum clearances of zero inches to non-combustibles, 3 inches to limited combustibles, 18 inches to combustibles.

CAUTION - Mount with the lowest moving part at least 8 ft (2.5m) above floor or grade level. Not required on roof mounted ventilators or duct mounted ventilators provided with belt guards.

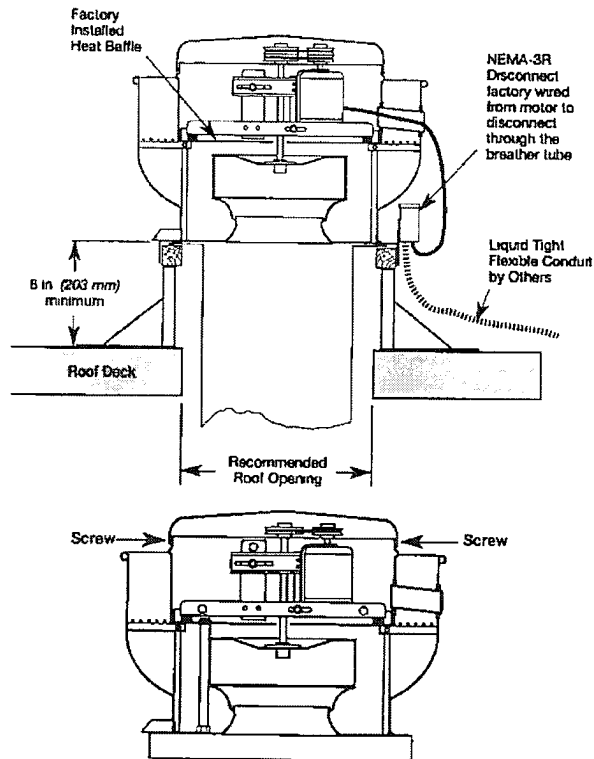
Electric Connection Emergency Smoke Control

The motor's amperage and voltage rating must be checked for compatibility to the supply voltage prior to final electrical connection. Also, the motor itself cannot have thermal overload.

For emergency smoke removal application, the electrical supply must enter the motor compartment through the breather tube. Disconnect must be mounted outside the fans motor compartment. Consult local code authorities for your specific requirements. Shown below is the UL Listed label that the fan will bear.

IMPORTANT	
 LISTED Power Ventilator For Smoke Control Systems 76Y9	<p>ELECTRICAL - If fan motor is NOT thermally protected, remote overload protection must be installed having adequate rating as to voltage, frequency, horsepower, and full load current per phase. Where connected to a circuit protected by fuses, use time delay fuses. For supply connection use wires rated for at least 194°F (90°C).</p> <p>INSTALLATION - When connecting electrical power to this fan, do not restrict motor movement for possible future belt or wheel adjustment.</p> <p>CAUTION - Mount with the lowest moving part at least 8 ft (2.5m) above floor or grade level. Not required on roof mounted ventilators or duct mounted ventilators provided with belt guards.</p>

Recommended Emergency Smoke Control Installation



For belt drive units in emergency smoke removal installations, the electrical supply must be kept out of the airstream. They may also require an isolated power supply so that if power is cut to the building in the event of a fire, the fan will continue to operate. Check the local and national electrical codes for emergency smoke removal fans.

Grease Trap Installation

Polypropylene trap designed to collect grease residue to avoid drainage onto roof surface. Follow all local codes, as well as the National Fire Protection Agency (NFPA) where applicable.

NFPA 96: Upblast fans shall have a drain directed to a readily accessible and visible grease receptacle not to exceed 1 gal. (3.8L)

Refer to Document 476370 - Grease Trap Installation, Operation and Maintenance Manual for parts listing and specific instructions.

Grease Trap Maintenance

Regular inspection of grease trap is recommended. Depending on the amount of grease discharged through the fan, the grease trap should be changed accordingly to ensure proper operation.

- Check grease absorber (if included) every month. Replace grease absorber after every cleaning and/or as needed between cleanings.
- Replacement grease absorbers (P/N 476084) can be ordered from your local Representative.

Hinged Base

NFPA 96: A hinged base is required on upblast fans and in conjunction with grease trap accessory.

Refer to Document 462865 - Hinge Kit Installation, Operation and Maintenance Manual for parts listing and specific instructions.

Pre-Starting Checks

1. Check all fasteners and set screws for tightness. The wheel should rotate freely and be aligned as shown in figure 7.
2. Wheel position is preset and the unit is test run at the factory. Movement may occur during shipment and realignment may be necessary.

CUE unit - Centering height alignment can be accomplished by loosening the set screws in the wheel and moving the wheel to the desired position.

CUBE unit - Centering can be accomplished by loosening the bolts holding the drive frame to the shock mounts and repositioning the drive frame.

CUBE unit - Wheel and inlet cone overlap can be adjusted by loosening the set screws in the wheel and moving the wheel to the desired position.

3. Check wheel rotation (viewing from the shaft side) by momentarily energizing the unit. Rotation should correspond to the rotation decal on the unit, see figure 8. If wheel rotation is incorrect, reverse two of the wiring leads or check motor wiring for single phase.

Wheel Overlap and Gap Dimensions

Model	G - Overlap in (mm)	H - Gap in (mm)
CUE 060-095	-	3/32 (2)
CUE 098-161	1/4 (6)	-
CUE 180-200	1/2 (13)	-
CUBE 098	-	3/32 (2)
CUBE 099-161	1/4 (6)	-
CUBE 180-300	1/2 (13)	-
CUBE 360-480	3/4 (19)	-

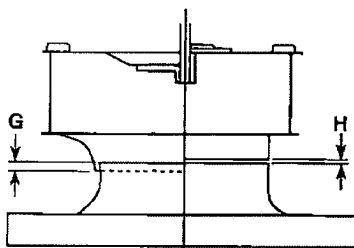


Fig. 7

Wheel Rotation

All CUE Models
All CUBE Models

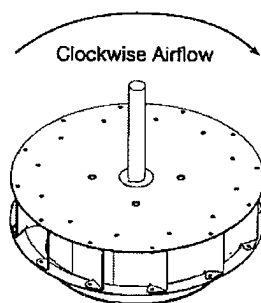


Fig. 8

WARNING

Correct direction of wheel rotation is critical. Reversed rotation will result in poor air performance, motor overloading and possible burnout.

Model CUBE

Pre-Starting Belt Tension Checks

4. Always loosen tension enough to install belts without stretching, see figure 9.

Belts

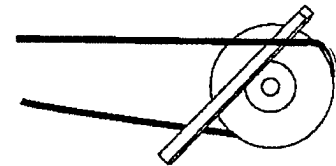
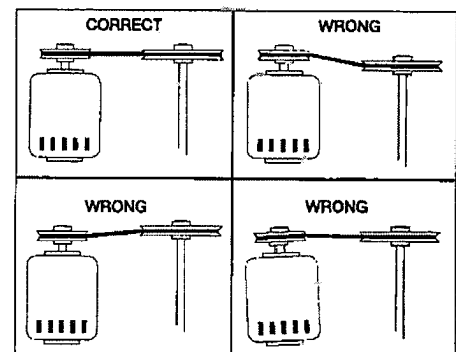


Fig. 9

Do not force belt(s). Forcing the belt(s) will break the cords and cause belt failure

5. For units with two groove pulleys, adjust so the tension is equal in both belts.
6. If adjustments are made, it is very important to check the pulleys for proper alignment. Misaligned pulleys lead to excessive belt wear vibration, noise and power loss, see figure 10.

Fig. 10



WARNING

The fan has been checked for mechanical noises at the factory prior to shipment. If mechanical noise should develop, suggested corrective actions are offered in the Troubleshooting section.

IMPORTANT

Over tightening will cause excessive bearing wear and noise. Too little tension will cause slippage at startup and uneven wear.

7. Belt tension can be adjusted by loosening four fasteners on the drive frame, see figure 11. The motor plate slides on the slotted adjusting arms and drive frame angles in the same manner.

Fasteners

(4) *Fasteners

*Identical fasteners on opposing side must also be loosened.

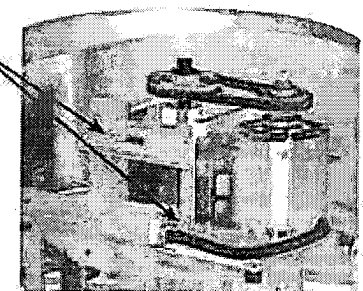
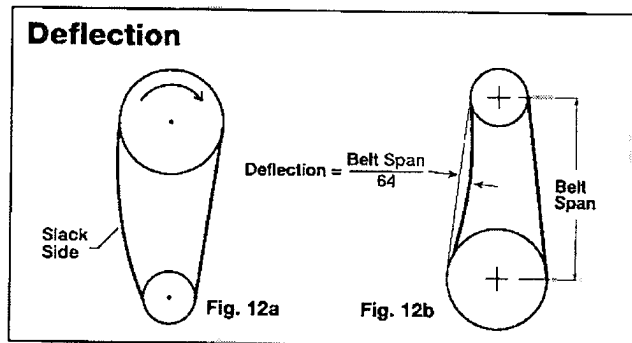


Fig. 11

- 8a. Sizes 071-161: Belts should be tensioned just enough to prevent slippage at full load.
 Note: Belts should have a slight bow on the slack side while running at full load (see figure 12a).
- 8b. Sizes 180-540: Belt tension should be adjusted to allow 1/64 in. (0.397 mm) of deflection per inch of belt span. For example, a 15 in. (381 mm) belt span should have 15/64 in. (0.234 mm) (or about 1/4 in. (6 mm)) of deflection with moderate thumb pressure at mid-point between pulleys (see figure 12b).



9. The adjustable motor pulley is factory set for the RPM specified. Speed can be increased by closing or decreased by opening the adjustable motor pulley.
10. Any increase in speed represents a substantial increase in the horsepower required by the unit.
11. Motor amperage should always be checked to avoid serious damage to the motor when speed is varied.

Operation: CUE / CUBE

- Before starting up or operating fan, check all fasteners for tightness. In particular, check the setscrews in wheel hub (and pulleys, if applicable).
- While in the OFF position or before connecting the fan to power, turn the fan wheel by hand to be sure it is not striking the venturi or any obstacle.
- Start the fan and shut it off immediately to check rotation of the wheel with directional arrow in the motor compartment, see figure 8.
- When the fan is started, observe the operation and check for any unusual noises.
- With the system in full operation and all ductwork attached, measure current input to the motor and compare with the nameplate rating to determine if the motor is operating under safe load conditions.
- Keep inlets and approaches to fan clean and free from obstruction.

IMPORTANT

Adjust (tighten) belt tension after the first 24-48 hours of operation.

Inspection: CUE / CUBE

Inspection of the fan should be conducted at the first 30 minute and 24 hour intervals of satisfactory operation.

30 Minute Interval

Inspect bolts, setscrews and motor mounting bolts. Adjust and tighten as necessary.

24 Hour Interval

Check all internal components. On CUBE unit only, inspect belt alignment and tension. Adjust and tighten as necessary.

Maintenance: CUE / CUBE

Installation and maintenance are to be performed only by qualified personnel who are familiar with local codes and regulations and who are experienced with this type of equipment.

Motor maintenance is generally limited to cleaning and lubrication (where applicable). Cleaning should be limited to exterior surfaces only. Removing dust buildup on motor housing ensures proper motor cooling.

Greasing of motors is only intended when fittings are provided. Many fractional horsepower motors are permanently lubricated and should not be lubricated after installation. Motors supplied with grease fittings should be greased in accordance with manufacturers' recommendations. Where motor temperatures do not exceed 104°F (40°C), the grease should be replaced after 2,000 hours of running time as a general rule.

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

All fasteners should be checked for tightness each time maintenance checks are performed prior to restarting unit.

A proper maintenance program will help these units deliver years of dependable service.

WARNING

Always disconnect, lock and tag power source before servicing. Failure to disconnect power source can result in fire, shock or serious injury.

CAUTION

Uneven cleaning of the wheel will produce an out of balance condition that will cause vibration in the fan.

WARNING

This unit should be made non-functional when cleaning the wheel or housing (fuses removed, disconnect locked off).

Belt/Bearing Maintenance CUBE Unit

- Belts tend to stretch after a period of time. They should be checked periodically for wear and tightness. When replacing belts, use the same type as supplied with the unit.
- Matched belts should always be used on units with multi-groove pulleys.
- For belt replacement, loosen the tensioning device enough to allow removal of the belt by hand.
- Once installed, adjust belts as shown in "Pre-Starting Checks."
- Shaft bearings can be classified in two groups: relubricating and non-relubricating. All non-relubricating bearings on standard Model CUBE fans are factory lubricated and require no further lubrication under normal use (between -20° to 180°F (-29° to 82°C) in a relatively clean environment).
- On CUBE belt driven fans, the standard cast pillow block bearings are factory lubricated and are provided with external grease fittings. Annual lubrication is recommended, or more frequently if needed, see Table 2. Do not over-grease. Use only one or two shots of lubricant with a hand gun. Maximum hand gun rating is 40 psi. Rotate bearings during lubrication where good safety practice permits. Caution should be employed to prevent over packing or contamination. Grease fittings should be wiped clean. Extreme care should be used around moving parts.
- Grease should be pumped in very slowly until a slight bead forms around the seal. A high grade lithium base grease should be used.
- When installing restaurant exhaust applications follow NFPA 70 for cleaning fans.
- Grease containers must be emptied at regular intervals to prevent overflow.
- To ensure tightness, check pulley setscrews. Proper keys must be in keyways.

- Fan RPM should not be readjusted. Only use pulleys of identical size and type when replacing pulleys.
- During the first few months of operation check bearing set screws periodically to ensure tightness.
- If unit is to be left idle for an extended period, remove belts and store in a cool, dry place to avoid premature belt failure.

Recommended Relubrication Frequency in Months

NOTE: If unusual environment conditions exist (extreme temperature, moisture or contaminants) more frequent lubrication is required.

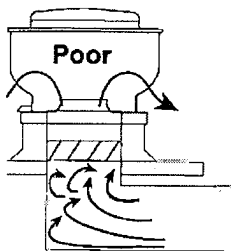
A good quality lithium base grease, conforming to NLGI Grade 2 consistency, such as those listed here may be used.

Interval (months)	Type of Service
1 to 3	Heavy duty in dirty, dusty locations; high ambient temperatures; moisture laden atmosphere; vibration.
3 to 6	12 to 24 hours per day, heavy duty, or if moisture is present
6 to 12	8 to 16 hours per day in clean, relatively dry atmosphere
12 to 18	Infrequent operation or light duty in clean atmosphere

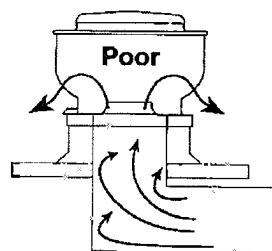
Manufacturer	Grease (NLGI #2)
U.S. Electric Motors	Grease No. 83343
Chevron U.S.A. Inc	Chevron SRI Grease #2
Mobil Oil Corporation	Mobilith
	Mobil 532
Texaco, Inc.	Premium BRB #2
	Texaco Multifak #2
Amoco Oil Co.	Rykon Premium #2
Exxon	Unirex N2
Shell	B Shell Alvania #2

Fan Inlet Connections

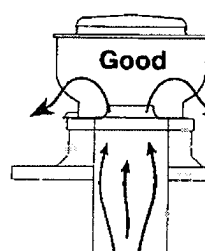
In order to assure proper fan performance, caution must be exercised in fan placement and connection to the ventilation system. Obstructions, transitions, poorly designed elbows, improperly selected dampers, etc. can cause reduced performance, excessive noise and increased mechanical stress. For performance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



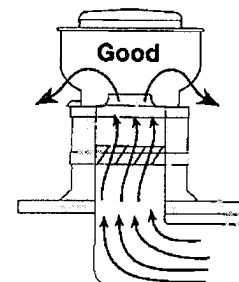
Poor
Dampers must open fully. Use motorized dampers in low airflow applications to reduce losses.



Poor
Avoid sharp turns or entrance conditions which cause uneven flow. Use turning vanes in elbows to reduce adverse effects.

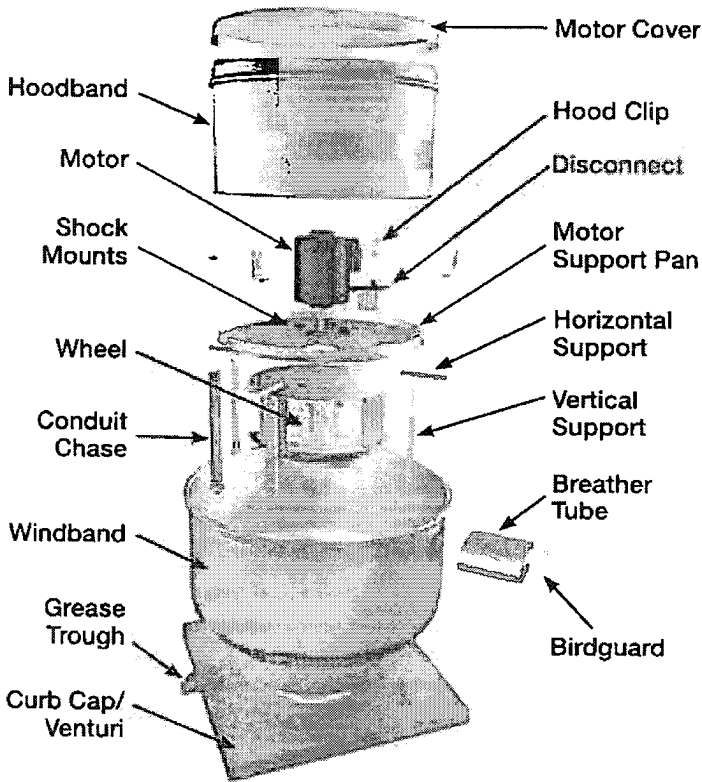


Good
Provide uniform airflow at fan inlet to assure optimum performance.



Good
Provide uniform airflow at fan inlet and through the damper to assure optimum performance. The curb cap should be three wheel diameters from the radius. Use turning vanes in duct when possible.

CUE Direct Drive Centrifugal Roof Exhaust Fan



Parts List

NOTE

Each fan bears a manufacturer's nameplate with model number and serial number embossed. This information will assist the local representative and the factory in providing service and replacement parts. Before taking any corrective action, make certain unit is not capable of operation during repairs.

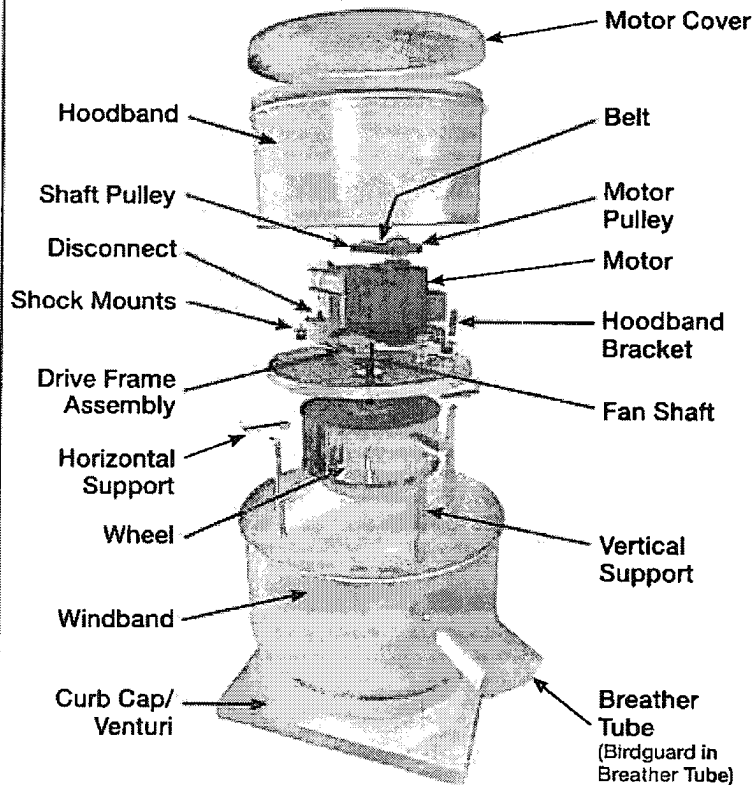
CAUTION

A fan manufactured with an explosion resistant motor does not certify the entire unit to be explosion proof.

Note:

For replacement, the windband, vertical supports, drain trough and curb cap/venturi come as one complete assembly.

CUBE Belt Drive Centrifugal Roof Exhaust Fan



Troubleshooting

WARNING: Before taking any corrective action, make certain unit is not capable of operation during repairs.

PROBLEM	CAUSE	CORRECTIVE ACTION
Excessive noise or vibration	Wheel rubbing inlet	Adjust wheel and/or inlet cone. Tighten wheel hub or bearing collars on shaft.
	V-belt drive	Tighten pulleys on motor/fan shaft. Adjust belt tension. Align pulleys properly, see page 7/figure 9-10. Replace worn belts or pulleys.
	Bearings	Replace defective bearing(s). Lubricate bearings. Tighten collars and fasteners.
	Wheel unbalance	Clean all dirt off wheel. Check wheel balance, rebalance in place if necessary.
	Bad bearings	Replace.
	Belts too tight or too loose	Adjust tension, see figure 12a-b.
	Wheel improperly aligned and rubbing	Center wheel on inlet, see figure 7.
	Loose drive or motor pulleys	Align and tighten. See "Pre-Starting Checks", see page 7-8.
	Foreign objects in wheel or housing	Remove objects, check for damage or unbalance.
	Fan base not securely anchored	Secure properly.
	Motor hood loose and rattling	Tighten fasteners to secure the motor hood.
	Defective or loose motor bearings	Replace motor with same frame size, RPM-HP
High horsepower	Fan	Check rotation of wheel, see figure 8. Reduce fan speed.
	Duct system	Resize ductwork. Check proper operation of face and bypass dampers. Check filters and access doors.
Fan does not operate	Electrical supply	Check fuses/circuit breakers. Check for switches off. Check for correct supply voltage.
	Drive	Check for broken belts. Tighten loose pulleys or belts.
	Motor	Assure motor is correct horsepower and not tripping overload protector.
Motor overloads or overheats	Lubrication	Check for excessive or insufficient grease in the bearing.
	Mechanical	Replace damaged bearing. Relieve excessive belt tension. Align bearings. Check for bent shaft.
	Belt slippage	Adjust tension or replace bad belts, see page 7-8.
	Over/Under line voltage	Contact power company.
	Incorrect wheel rotation	Check motor wiring. See figure 8.
	Wheel RPM too high	Check drives or slow down fan by opening variable pitch pulley on motor shaft.
	Undersized motor	Check motor ratings with catalog speed and air capacity chart.
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor.
Reduced airflow	System resistance too high	Check system: Proper operation of backdraft or control dampers, obstruction in ductwork, clean dirty filters.
	Unit running backwards	Correct as shown in figure 8.
	Excessive dirt buildup on wheels	Clean wheel.
	Improper wheel alignment	Center wheel on inlets, see Pre-Starting checks and figure 7.
	Dampers closed	Inspect and repair.
	Blocked duct/clogged filter	Clean or replace.
	Belt slippage	Replace and adjust tension.
	Speed too slow	Check for correct drives.

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.

Greenheck's Centrifugal Upblast and Sidewall Exhaust catalog provides additional information describing the equipment, fan performance, available accessories, and specification data.

AMCA Publication 410-96, Safety Practices for Users and Installers of Industrial and Commercial Fans, provides additional safety information. This publication can be obtained from AMCA International, Inc. at www.amca.org.



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