M.K. Plastics CORPORATION
SERVING THE NEEDS OF MODERN INDUSTRY

AXTC
Inline Tubular Centrifugal Fiberglass Fan

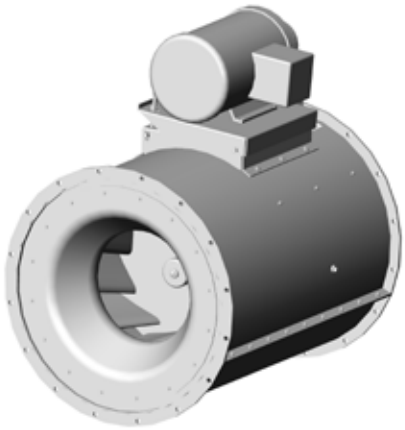
INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

Introduction
This bulletin contains the proper installation, operation and maintenance procedures for the standard AXTC Inline Centrifugal Fiberglass Fan, to ensure safe and trouble-free fan operation.

The M.K. Plastics catalog on the above corrosion resistant FRP fan, provides additional information describing the equipment, fan performance, available accessories, and specifications.

For additional safety information, refer to AMCA publication 410-96, Safety Practices for Users and Installers of Industrial and Commercial Fans.

For Information on special fan application requirements, contact M.K. Plastics corporate office at (514) 871-9999.



Receiving and Inspection
All M.K. Plastics fans are carefully inspected before leaving the factory. Compare all components with the bill of lading or packing list to verify that the proper unit was received. Check each unit for any damage that may have occurred in transit. Mishandled units can void the warranty provisions. If units are damaged in transit, it is the responsibility of the receiver to make all claims against the carrier. M.K. Plastics is not responsible for damages incurred during shipment.

WARNING
This unit has rotating parts. Safety precautions should be exercised at all times during installation, operation, and maintenance.
ALWAYS disconnect power prior to working on fan.

Handling
Fans are to be hoisted and moved by the lifting lugs or mounting brackets provided on the fan (see Figure 1). Location of lugs & brackets varies by fan size and application. Fans can also be hoisted with slings placed around the fan housing. When a single hoist is used, a “spreader” will keep the sling from slipping on the housing. Large units may have lifting lugs or holes which should be used only to stabilize the unit while using a sling to support the weight.

Chain or wire slings should be well-padded where they contact the fan as not to cause damage to the fiberglass surface. Fans should never be lifted by the shaft, fan housing, motor, belt guard, damper, weather hood, inlet & outlet flanges or any other accessories.

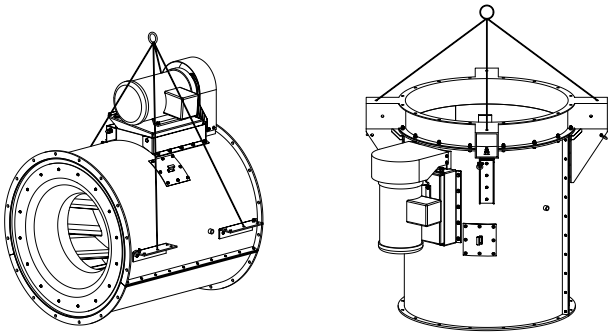


Figure 1.
Lifting Using the Mounting Brackets

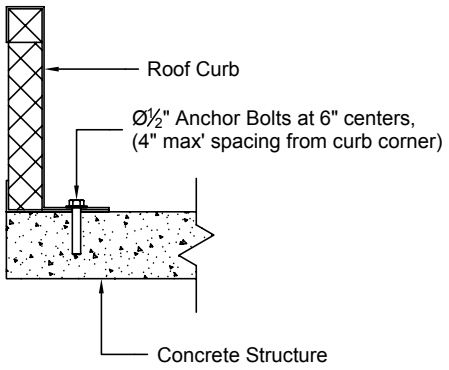
Storage
If the unit cannot be installed and operated immediately, precautions need to be taken to prevent deterioration of the unit during storage. The user assumes responsibility of the fan and accessories while in storage. M.K. Plastics will not be responsible for damage during storage.

Store in a dry, protected area being sure fan shaft, bearings and impeller are protected against dust and corrosion. If it is necessary to store outdoors or within a building under construction, special care must be taken to prevent moisture, dirt or dust accumulation. Coat the shaft with grease or rust preventative compound. Cover and seal bearings to prevent entrance of contaminants. Impeller should be rotated at least once a month to circulate the grease in bearings. If stored outdoors, cover completely with a tarp or heavy plastic wrap. Electrical connections and leads must be protected from moisture. Block impeller to prevent natural rotation. Do not allow material of any kind to be piled on top or inside of fan.

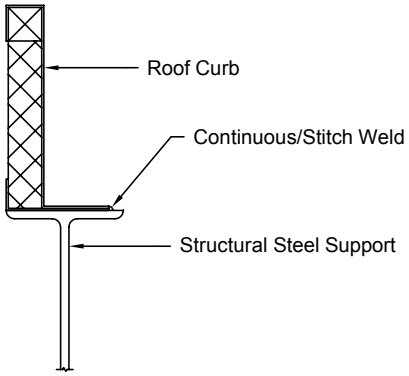
Exhaust & Supply Roof Installation

AXTC fans that are roof mounted with curbs should be securely attached to roof structure such as structural steel, concrete or wooden decks. Roof structure supports per structural engineer, in accordance with load requirements and applicable building codes.

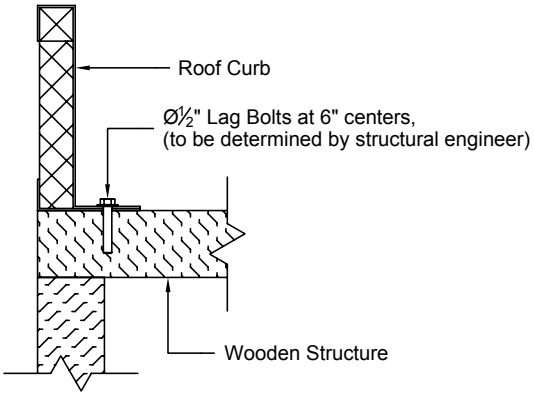
Concrete Roof Deck



Structural Steel Support



Wood Roof Deck



Roof Curb Attachment

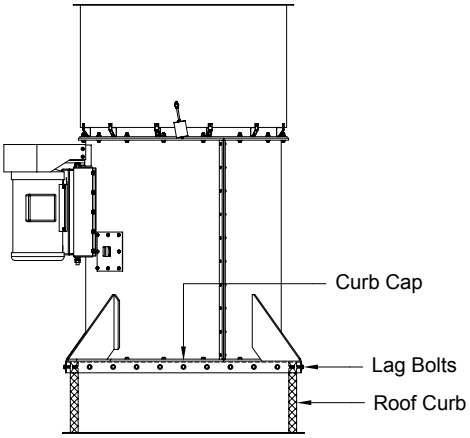


Figure 2.
Roof Mounted AXTC Fan

1. Lift the fan onto the roof curb. Make sure the fan securely sits on the curb and level.
2. It is recommended to secure the fan in place on the curb with lag bolts spaced at minimum 6” centers.
3. Pre-drill pilot holes through the side of the fan curb cap and into the curb wood nailer strip.
4. To prevent any possible water penetration, fill the entire pilot hole or bolt thread with exterior grade, waterproof silicone caulking.
5. Secure into place through the pilot holes with stainless steel, lag bolts. Some caulking will be forced out of the hole to form a better barrier around the fixing.

Vibration Isolators

To prevent vibration and noise from being transferred to the building, vibration isolators are recommended. Isolators should be located between the fan system and the support structure. M.K. Plastics supplies three main types of isolators for FRP fans:

- Floor Mounted Spring Isolators (floor mounting)
- Floor Mounted Rubber-In-Shear Isolators (floor mounting)
- Hanging Spring Isolators (ceiling mounting)

Refer to the M.K. Plastics submittal for isolator installation and adjustment instructions. In applications where seismic isolators are required, contact M.K. Plastics directly for further details.

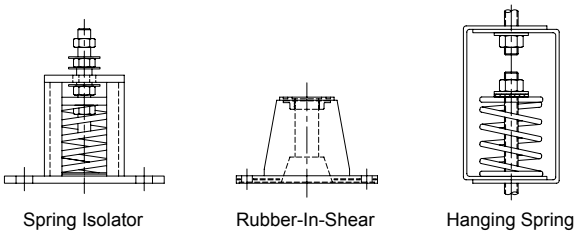


Figure 3.
Vibration Isolators (Typical)

Ducted Installations

Efficient fan performance relies on the proper installation of inlet and discharge ducts. Installations with poor inlet or discharge configurations may result in reduced performance. Make sure the following recommendations are followed.

Non-Ducted Inlet

If the AXTC has an open inlet (no duct work) that is too close to a wall or bulkhead, this may cause performance problems. The fan needs to have a minimum of two effective wheel diameters away from inlet to the wall.

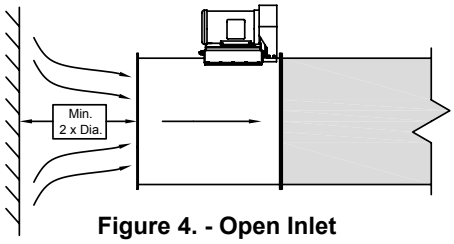


Figure 4. - Open Inlet

Free Discharge

If possible, avoid a free discharge into a plenum which could result in lost efficiency because the effect of discharge static regain is not allowed.

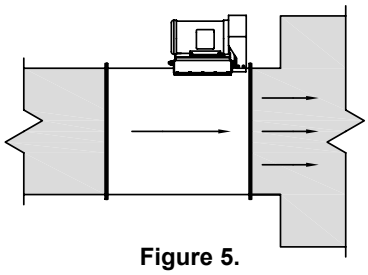


Figure 5.
Free Discharge

Inlet Duct Turns

Installation of a duct turn or elbow too close to the fan inlet reduces fan performance. To achieve full fan performance, there should be at least two effective wheel diameters between duct turns or elbows and the fan inlet.

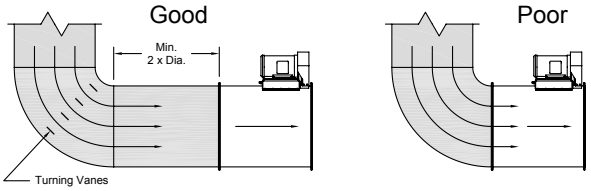


Figure 6 - Inlet Ducting

Discharge Duct Turns

Where possible, allow minimum two duct diameters between duct turns or elbows and fan outlet.

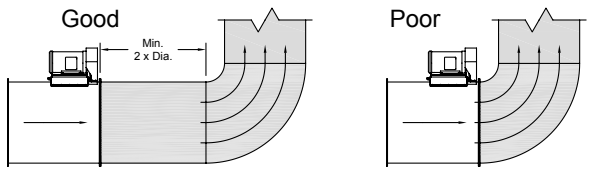


Figure 7 - Discharge Ducting

Duct Connections

To reduce possible vibration transmission through the ductwork, M.K. Plastics recommends the use of flexible connectors instead of a rigid duct connection (e.g. flange-to-flange connection). Companion flanges are standard accessories for flexible connection.

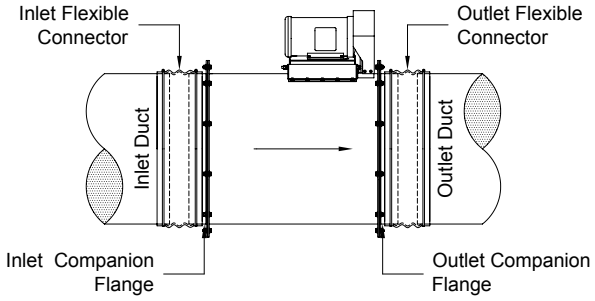


Figure 8. - Inlet/Outlet Flexible Duct Connection

Wheel-Inlet Overlap

Efficient performance is achieved by having the correct wheel to inlet overlap and uniform radial gap. This should always be verified before initial start-up and if possible after the fan has been in operation for 24 hours.

The overlap is adjusted by loosening the wheel hub on the shaft and moving the wheel to the correct position - refer to Table 1. for values. A uniform radial gap (between the edge of wheel inlet and edge of inlet cone) is achieved by loosening the bolts on the inlet cone and centering it on the wheel. In both cases, a trim balance maybe required.

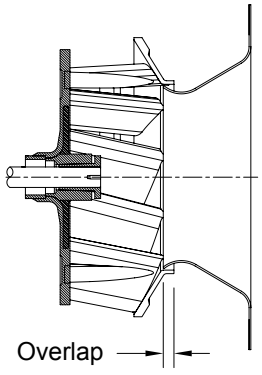


Figure 9.
Wheel/Inlet Overlap

Size	Overlap [inches]
1825	0.75
2225	0.94
2450	1.00
2700	1.06
3000	1.31
3300	1.38
3650	1.50
4025	1.63
4450	1.81
4900	2.00
5425	2.13
6000	2.38

Table 1.
Wheel/Inlet Overlap

Drive Maintenance and Installation

V-belt drives need periodic inspection, retensioning, and occasional belt replacement. When inspecting drives, look for dirt buildup, burrs or obstructions that can cause premature belt or drive replacement. If burrs are found, use fine emery cloth or a stone to remove them. Be careful that dust does not enter the bearings.

Check sheaves for wear. Excessive slippage of belts on sheaves can cause wear and vibration. Replace worn sheaves with new ones. Carefully align sheaves to avoid premature sheave failure.

Belt tension is determined by the sound the belts make when the fan is first started. Belts will produce a loud squeal which dissipates after the fan is operating at full capacity. If the belt tension is too tight or too loose, lost efficiency and possible damage can occur. The proper tension for operating a V-belt is the lowest tension at which the belts will not slip at peak load conditions. For initial tensioning, the proper belt deflection half-way between pulley centers is 1/60" for each inch of belt span.

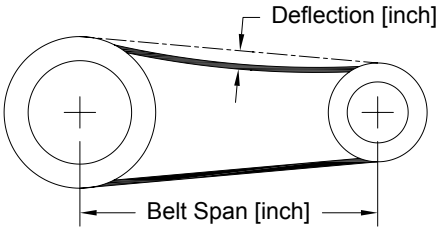


Figure 10. - Belt Tension

Refer to the following procedure for belt tensioning -

1. Loosen motor plate adjustment bolts and move motor plate in order that the belts can easily slip into the grooves on the pulleys. Never pry, roll, or force the belts over the rim of the pulley.
2. Adjust the motor plate until proper tension is reached. For proper tension, a deflection of approximately 1/60" per inch of center distance should be obtained by firmly pressing the belt. Refer to Figure 10.
3. Lock the motor plate adjustment nuts in place.
4. Ensure pulleys are properly aligned.

When replacing belts, replace the entire set. After initial replacement and tensioning, recheck belt tension after a few days. New belts require a break-in period. Never use belt dressing on any belts.

Drive Alignment

Pulley alignment is adjusted by loosening the motor pulley setscrew and by moving the motor pulley on the motor shaft. Fig. 11 illustrates correct and incorrect pulley alignment.

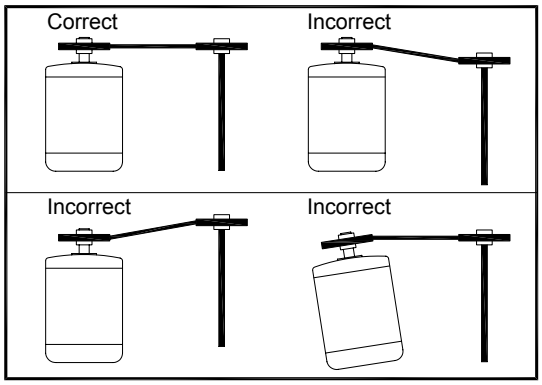


Figure 11. - Pulley Alignment

A recommended method of inspecting the pulley alignment is shown in Figure 12. With the shorter leg of a carpenter's square or other straight edge lying along the case of the motor, adjust the position of the motor pulley (or the motor) until the longer leg of the square is parallel to the belt.

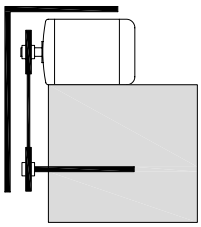


Figure 12.

Motor Maintenance

The three basic rules of motor maintenance are:

1. Keep the motor clean.
2. Keep the motor dry.
3. Keep the motor properly lubricated.

Blow dust off periodically (with low pressure air) to prevent motor from overheating.

Some smaller motors are lubricated for life. Lubrication requirements are normally attached to the motor. Use the motor manufacturer's recommendations for relubrication. If this information is not available, the following schedule may be used. Motors less than 10 HP running about eight hours a day in a clean environment should be lubricated once every five years; motors 15 to 40 HP, every three years. For motors in dusty or dirty environments or running 24 hours a day: divide the service interval by 4. Do not over lubricate.

Wheel and Shaft Maintenance

Periodically inspect the shaft and wheel for dirt buildup, corrosion, and signs of excess stress or fatigue. Clean the components. If the wheel is removed for any reason, make sure that it is securely attached to the shaft before restarting the fan.

Wheel Rotation

Test the fan to ensure the rotation of the wheel is the same as indicated by the arrow marked Rotation. One of the most frequently encountered problems with centrifugal fans is motors which are wired to run 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. Figure 13. shows the wheel rotation as viewed from the fan inlet.

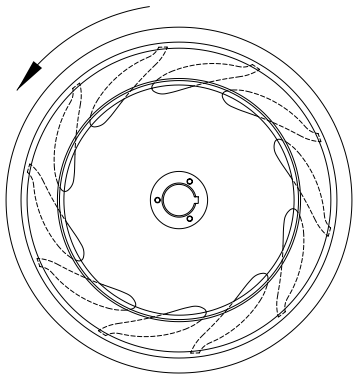


Figure 13. - Wheel Rotation

Relubrication Schedule [Months]						
Speed [rpm]	**500**	**1000**	**1500**	**2000**	**2500**	**3000**
Size						
1825	6	6	5	3	3	3
2225	6	6	5	3	3	-
2450	6	6	5	3	-	-
2700	6	6	5	3	-	-
3000	6	5	4	-	-	-
3300	6	5	4	-	-	-
3650	6	5	-	-	-	-
4025	5	4	-	-	-	-
4450	5	4	-	-	-	-
4900	5	4	-	-	-	-
5425	5	4	-	-	-	-
6000	4	3	-	-	-	-

Table 2. - Relubrication Schedule [Months]

Fan Bearing Lubrication

Proper lubrication of the fan drive bearings helps assure maximum bearing life. All AXTC bearings are lubricated through a grease fitting on the outer housing and should be lubricated by the schedule, Table 2. However, every installation is different and the frequency of relubrication should be adjusted accordingly.

On high moisture applications, the lubrication frequency may need to be doubled or tripled to adequately protect the bearings. Double the relubrication frequency on fans with vertical shafts.

Observation of the conditions of the grease expelled from the bearings at the time of relubrication is the best guide as to whether regreasing intervals and amount of grease added should be altered.

Greases are made with different bases. There are synthetic base greases, lithium base, sodium base, etc. Avoid mixing greases with different bases. They could be incompatible and result in rapid deterioration or breakdown of the grease. All bearings are filled with a lithium-based grease before leaving the factory. When the fans are started, the bearings may discharge excess grease through the seals for a short period of time. Do not replace the initial discharge because leakage will cease when the excess grease has worked out. Sometimes the bearings have a tendency to run hotter during this period. There is no reason for alarm unless it lasts over 48 hours or gets very hot (over 200°F). When relubricating, use a sufficient amount of grease to purge the seals. Rotate bearings by hand during relubrication.

Fan Bearing Replacement

Replacement of bearings requires disassembly of internal components. For this procedure access must be available to both the inlet/outlet ends and the lower fan casing half, although it possible on smaller fans for bearing replacement without access to the fan inlet. The following procedure assumes belts have already been loosened and removed. (Belts are removed by adjusting the motor pivot plate).

AXCT fans have split-pillow block type bearings on horizontal applications and the addition of a flange-type bearing on vertical applications. Replacement is similar for both. Refer to the fan parts list on Page 8.

1. Unbolt and remove the lower casing section, belt and shaft guards.
2. Remove the inlet cone by removing the bolts around the perimeter.
3. Remove the wheel hub cover, loosen the wheel bushing and slide the wheel off the shaft. Note, on smaller fans it may be possible to leave the wheel on the shaft and remove the wheel/shaft/bearing assembly as one piece out of the fan housing.
4. Note the location of the fan sheave on the end of the shaft and remove the sheave.
5. Note the distance from the bearing to the end of the shaft.
6. Unbolt both sets of bearings from the support plates and remove the shaft/bearing assembly out the fan casing.
7. Reinstall components in reverse order of removal and reference the Overlap, Radial Gap and Alignment sections on Page 3. and 4.
8. Test run the fan and retighten all hardware, trim balance if necessary.

Changing Shaft Speed

All belt driven fans with motors up to and including 5 HP are equipped with variable pitch pulleys. To change the fan speed, perform the following:

1. Loosen setscrew on driver (motor) pulley and remove key, if equipped.
2. If the pulley has multiple grooves, all must be adjusted to the same width.
3. After adjustment, inspect for proper belt tension.
4. To reduce speed, open the pulley in order that the belt rides deeper in the groove (smaller pitch diameter).
5. To increase speed, close the pulley so that the belt rides higher in the groove (larger pitch diameters). Make sure the maximum fan RPM and motor HP is not reached.

Size	Pillow Block Bearing	Bearing Cap Bolt Torque	Mounting Bolt	304 SS Bolt Torque	316 SS Bolt Torque
1825	NSK,SNN,1-7/16	389 in-lbs	1/2-13UNC	517 in-lbs	542 in-lbs
2225	NSK,SNN,1-7/16	389 in-lbs	1/2-13UNC	517 in-lbs	542 in-lbs
2450	NSK,SNN,1-11/16	389 in-lbs	1/2-13UNC	517 in-lbs	542 in-lbs
2700	NSK,SNN,1-11/16	389 in-lbs	1/2-13UNC	517 in-lbs	542 in-lbs
3000	NSK,SNN,2-3/16	673 in-lbs	5/8-11UNC	1110 in-lbs	1160 in-lbs
3300	NSK,SNN,2-3/16	673 in-lbs	5/8-11UNC	1110 in-lbs	1160 in-lbs
3650	NSK,SNN,2-3/16	673 in-lbs	5/8-11UNC	1110 in-lbs	1160 in-lbs
4025	NSK,SNN,2-7/16	673 in-lbs	5/8-11UNC	1110 in-lbs	1160 in-lbs
4450	NSK,SNN,2-15/16	1682 in-lbs	3/4-10UNC	1530 in-lbs	1582 in-lbs
4900	NSK,SNN,2-15/16	1682 in-lbs	3/4-10UNC	1530 in-lbs	1582 in-lbs
5425	NSK,SNN,2-15/16	1682 in-lbs	3/4-10UNC	1530 in-lbs	1582 in-lbs
6000	NSK,SNN,3	1682 in-lbs	3/4-10UNC	1530 in-lbs	1582 in-lbs

Table 3. - Fan Bearing Torque

Tapered Bushing	Cap Screw	Torque
P1-P3	5/16-18UNC	80 in-lbs
Q1-Q3	3/8-16UNC	143 in-lbs
Q1-Q3	1/4-20UNC	45.6 in-lbs
JA	No.10-24UNC	60 in-lbs
QT	1/4-20UNC	108 in-lbs
SH-SDS-SD	1/4-20UNC	108 in-lbs
SK	5/16-18UNC	180 in-lbs
SF	3/8-16UNC	360 in-lbs
E	1/2-13UNC	720 in-lbs
F	9/16-12UNC	1320 in-lbs
J	5/8-11UNC	1620 in-lbs
M	3/4-10UNC	2700 in-lbs
N	7/8-9UNC	3600 in-lbs
P	1-8UNC	5400 in-lbs
W	1-1/8-7UNC	7200 in-lbs
S	1-1/4-7UNC	9000 in-lbs

MSK Bushing	Cap Screw	Torque
H	1/4 x 3/4	95 in-lbs
P	5/16 x1	192 in-lbs
Q	3/8 x 1-1/4	348 in-lbs
R	3/8 x 1-3/4	348 in-lbs
S	1/2 x 2-1/4	840 in-lbs
U	5/8 x 2-3/4	1680 in-lbs
W	3/4 x 3	3000 in-lbs

Table 4. - Bushing and Pulley Torque

Operational Checklist

Final Installation

- ☐ Inspect fasteners and setscrews, particularly fan mounting and bearing fasteners, and tighten according to the recommended torque shown in Tables 3 & 4.
- ☐ Inspect for correct voltage with voltmeter.
- ☐ Ensure all accessories are installed.

Pre-Start Checks

- ☐ Shut off all primary and secondary power sources.
- ☐ Ensure fasteners and setscrews are tightened.
- ☐ Inspect belt tension and pulley alignment.
- ☐ Inspect motor wiring.
- ☐ Ensure belt touches only the pulleys.
- ☐ Ensure fan and ductwork are clean and free of debris.
- ☐ Inspect wheel-to-inlet clearance.
- ☐ Close and secure all access doors.
- ☐ Restore power to the fan.

Start Up

Turn the fan on. In variable speed units, set the fan to its lowest speed and inspect for the following:

- ☐ Direction of rotation.
- ☐ Excessive vibration.
- ☐ Unusual noise.
- ☐ Bearing noise.
- ☐ Improper belt alignment or tension (listen for squeal-ing).
- ☐ Improper motor amperage or voltage.

If a problem is discovered, immediately shut the fan off. Lock out all electrical power and check for the cause of the trouble. See Troubleshooting.

Inspection

Inspection of the fan should be conducted at the first **30 minute, 8 hour and 24 hour** intervals of satisfactory operation. During the inspections, stop the fan and inspect.

- ☐ 30 Minute Interval: Inspect bolts, setscrews, and motor mounting bolts. Adjust and tighten as necessary.
- ☐ 8 Hour Interval: Inspect belt alignment and tension. Adjust and tighten as necessary.
- ☐ 24 Hour Interval: Inspect belt tension. Adjust and tighten as necessary.

General Fan Maintenance

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

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. Wheel, housing, bolts and set screws on the entire fan should be checked for tightness.
3. Any dirt accumulation on the wheel or in the housing should be removed to prevent unbalance and possible damage.
4. Isolation bases should be checked for freedom of movement and the bolts for tightness. Springs should be checked for breaks and fatigue. Rubber isolators should be checked for deterioration.
5. Inspect fan impeller and housing looking for fatigue, corrosion or wear.
6. Check V-belt drives on a regular basis for wear, tension, alignment and dirt accumulation.

Troubleshooting

Excessive Noise or Vibration

- Damaged wheel.
- Wheel rubbing inlet; adjust wheel or inlet cone.
- Verify wheel balance, rebalance if necessary.
- Belts misaligned.
- Belts too loose; worn or oily belts.
- Loose fasteners.
- Speed too high.
- Incorrect direction of rotation. Make sure the fan rotates in same direction as the arrows on the motor or belt drive assembly.
- Bearing collars or hardware loose.
- Bearings need lubrication or replacement.
- Debris in impeller; clean all dirt off wheel, check wheel balance and rebalance if necessary.
- Fan surge.
- Check alignment of shaft and motor drives.

Low Volume or Pressure

- Incorrect direction of rotation. Make sure the fan rotates in same direction as the arrows on the motor or belt drive assembly.
- Poor fan inlet or outlet conditions. There should be a straight clear duct at the inlet or outlet.
- Improper wheel alignment.
- Check duct system, see Page 3. For recommendations.

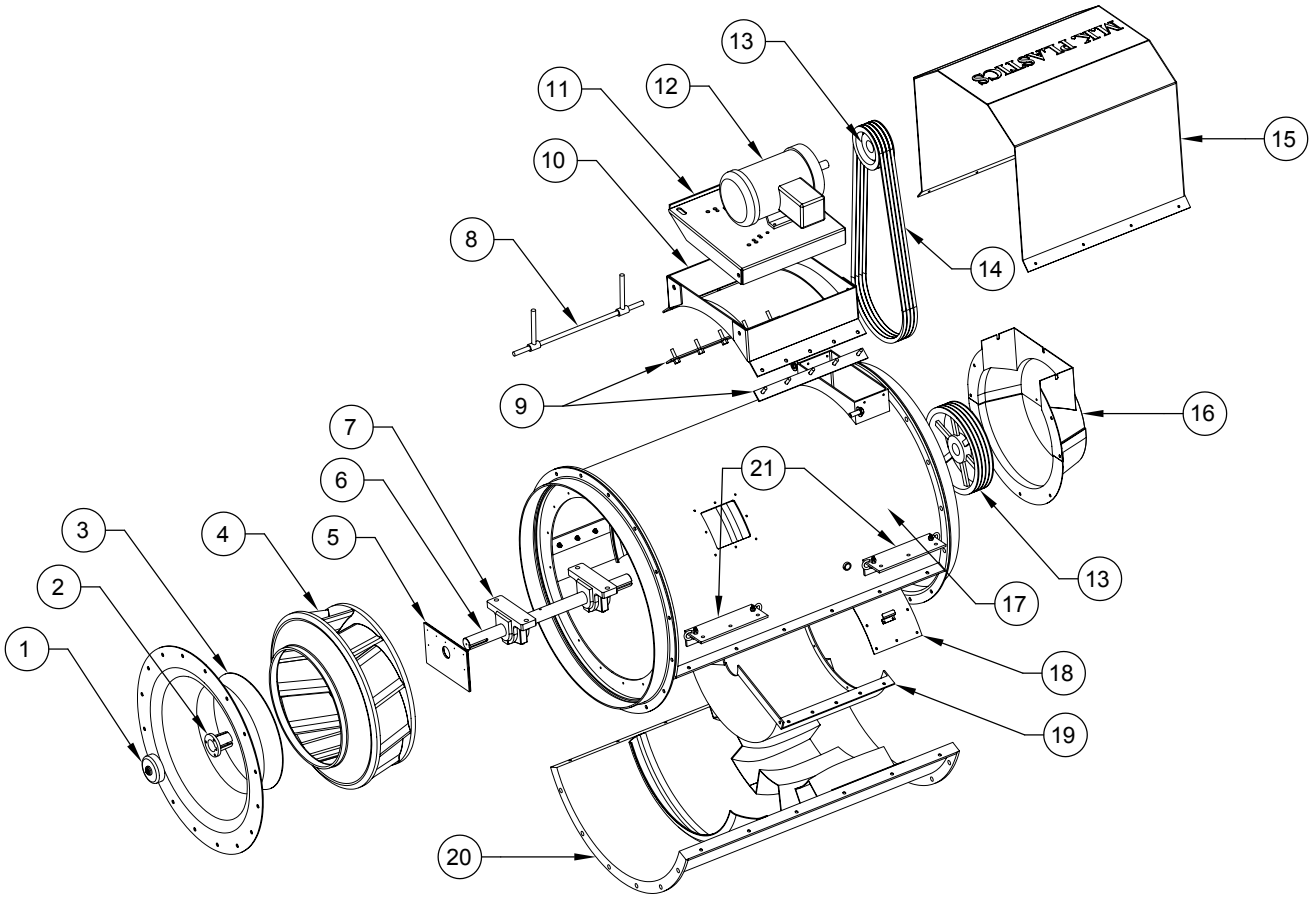
Motor Problems (Overheating)

- Motor improperly wired.
- Incorrect direction of rotation. Make sure the fan rotates in same direction as the arrows on the motor or belt drive assembly.
- High horsepower; resize the ductwork. Check proper operation of face and bypass dampers. Check filters and access doors.
- Cooling air diverted or blocked.
- Improper inlet clearance.
- Incorrect fan speed.
- Incorrect voltage.

Bearing Problems (Overheating)

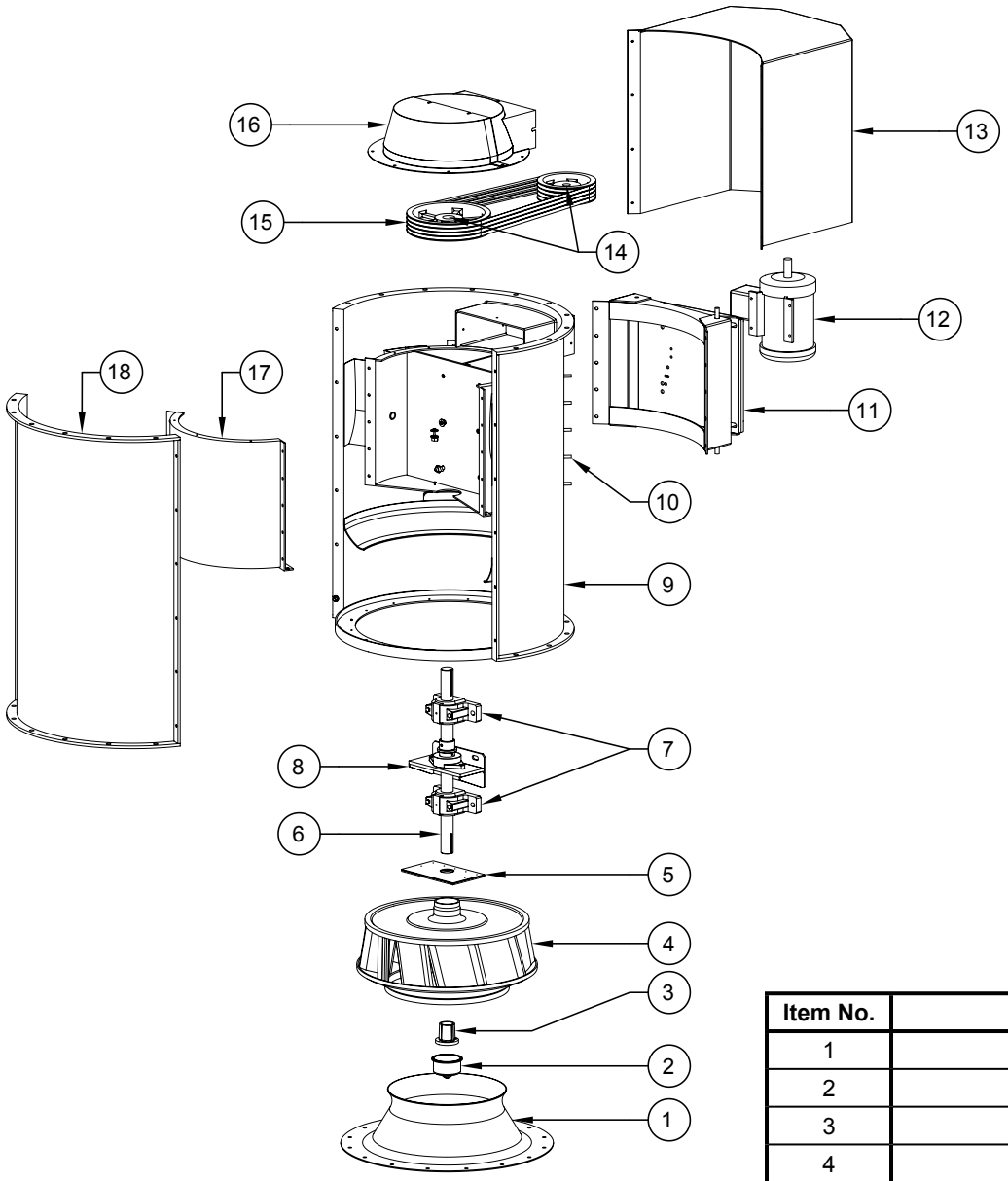
- Improper bearing lubrication; check for excessive or insufficient grease in bearings.
- Excessive belt tension.
- Check for bent shaft.
- Align bearings.

AXTC - Parts List (Horizontal)



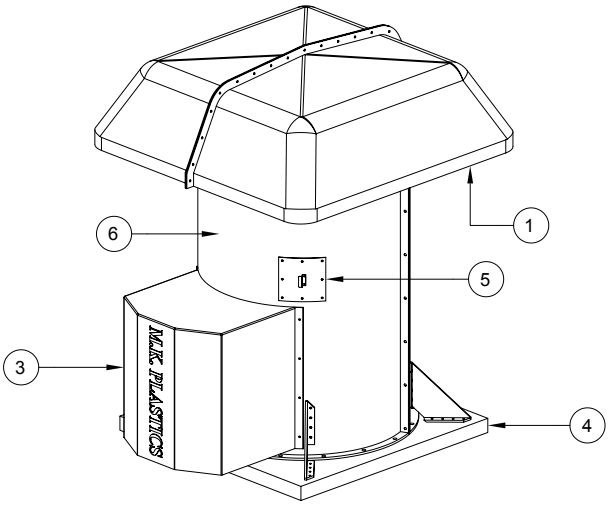
Item No.	Item Description
1	Hub Cover
2	Bushing
3	Inlet Cone
4	Impeller
5	Hub Seal
6	Shaft
7	Pillow-Block Bearing
8	Adjusting Rod
9	Motor Support Bracket
10	Motor Support
11	Motor Base
12	Motor
13	Drive Pulley
14	Drive Belts
15	Motor Cover
16	Belt Guard
17	Fan Casing (Top)
18	Access Door
19	Shaft Guard
20	Fan Casing (Bottom)
21	Mounting Brackets

AXTC - Parts List (Vertical)

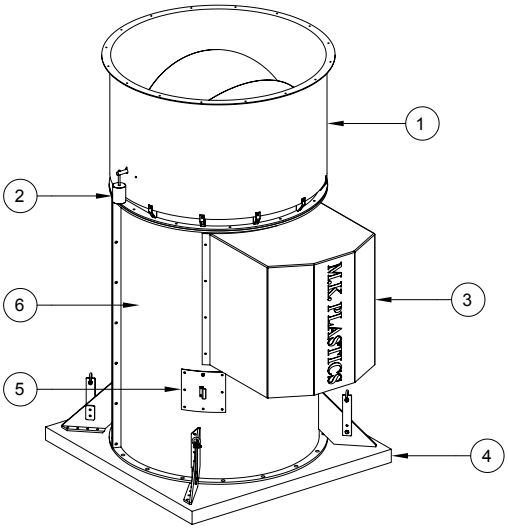


Item No.	Item Description
1	Inlet Cone
2	Hub Cover
3	Bushing
4	Impeller
5	Hub Seal
6	Shaft
7	Pillow-Block Bearing
8	Flange Bearing
9	Fan Casing (Top)
10	Motor Support Bracket
11	Motor Base & Support
12	Motor
13	Motor Cover
14	Drive Pulley
15	Drive Belts
16	Belt Guard
17	Shaft Guard
18	Fan Casing (Bottom)

AXTC - Parts List (Roof Mounted)



Roof Mounted Supply



Roof Mounted Exhaust

Item No.	Item Description
1	Butterfly Damper (Exhaust) / Weatherhood (Supply)
2	Damper Counterweight
3	Motor Cover
4	Curb Mounting Cap
5	Access Door
6	AXTC Fan Housing

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