



Frequently Asked Questions
July 2009

The following pages are a resource guide with answers to commonly asked questions regarding the Rite-Hite Revolution high volume/low speed fans.

The questions are broken into categories of Design, Application, Electrical & Controls, and Installation, Maintenance & Warranty. After reading and understanding this information, you'll be ready to join the Revolution!

As always, updated information is available at www.ritehitefans.com.

While the pages that follow offer detailed information on the various aspects of the Revolution Fan, here are some of the key differences between the Revolution and other HV/LS fans:

Blade Design – The Revolution's unique Propell-Aire blade design has an ideal contour and twist that provides maximum air movement – up to 85 feet from the fan's center in all directions.

Blade/Hub Connection - Resilient blade to hub connection uses a vibration-absorbing material that reduces stress to the hub by 50 to 75%. Blades are secured with a precision machined bolt that is torqued to 200 ft-lbs. for solid connection.

Safety Connection - The Revolution has a three-way motor to hub safety connection.

- 1 - Hub attaches to motor with a reverse-threaded bolt and tapered aluminum bushing.
- 2 - Safety ring provides back-up motor to hub safety connection.
- 3 - Each blade arm is attached to the safety ring.

Local Service & Support – Installation of an HV/LS fan is critical to its proper operation. Placement, size, installation, electrical hook-up, and service after the sale should all be taken into consideration.

Design

Q: Why does the Revolution have fewer blades than other HV/LS fans?

A: It is the shape, not the number of blades that generates the large volume of air movement needed for an effective fan. Maximum air volume is delivered when there is a consistent amount of air movement across the entire diameter of the fan. Our Propell-Aire™ blade design has a complex contoured shape that varies along its length. This blade design is impossible to produce by extrusion. Extruded blades do not provide this efficient, consistent air movement and they require a greater number of blades to help compensate.

Q: Why are the blades tilted up when the fan is not rotating?

A: This tilt allows the fan to deliver the greatest amount of air over an area up to 85 feet from the fan's center in all directions. It creates a more conical air movement below the fan and raises the height of the horizontal air stream away from the fan's diameter to about four to six feet, providing more effective cooling.

Q: Why do the blades lift higher during operation?

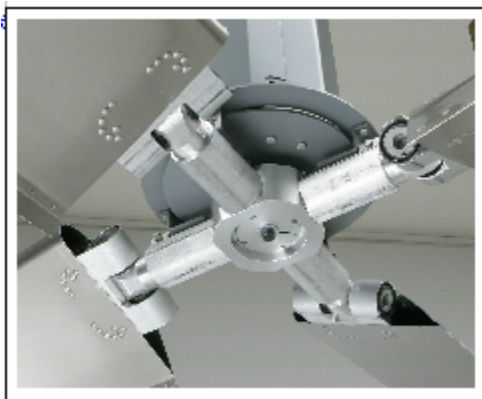
A: Like the blades of a helicopter, a combination of centrifugal force and air pressure causes the blades to move upward during operating.

Q: What does “rotationally balanced” mean?

A: This is similar to the tires on your vehicle. Revolution hubs and blades are “rotationally-balanced” at the factory. They are ideally suited for your fan application and will never require adjustment.

Q: What secures the blades to the hub of the Revolution Fan?

A: Each blade is attached to the hub in two specific ways. The blade is seated into a secure position on the hub arm and then locked in with a bolt that is tightened to 200 foot-pounds with a torque wrench.



Q: What is done to strengthen the connection between the blade and hub?

A: A vibration-absorbing material is used to reduce the stress by 50-75%. This design has been used for over 40 years in applications generating more than 10 times the stress of our Revolution Fan, and allows us to be confident providing the 10 year structural integrity warranty on the blade to hub connection. (See previous photos)

Q: How does air circulate below and outward from the Revolution Fan?

A: Air is pulled from above the fan and pushed down in a conical shape to the floor below. Air travels in this cone shape until it hits the floor and then moves in a horizontal stream away from the diameter of the fan. The fan will move air up to 85 feet from the fan's center in all directions.



Q: How is the Revolution Fan's airflow different than other large HV/LS ceiling fans?

A: With extruded blade designs, there is an area directly underneath fans where you feel little if any air movement. These "holes" exist because an extruded blade does not move air uniformly across the full diameter of the fan. These "holes" do not exist with the Revolution Fan, which is an important benefit for many applications.

Q: What is the advantage of an extruded and precision-milled aluminum hub vs. a cast aluminum hub?

A: Strength. An extruded and milled aluminum hub is much stronger because of its design. The initial extrusion is a solid block of aluminum. A computer-controlled milling machine is used to precisely remove material, producing the highest quality component possible.

A cast hub is created by pouring molten aluminum into a mold. It is difficult to regulate the consistency of a casting due to variances in the materials and manufacturing process. The end result is a material that is cheaper to produce, more susceptible to cracking, and potentially porous.



The Revolution's precision-milled hub.



A cast aluminum hub.

Q: What is the wing on the end of the blade?

A: The vortex technology (VT) tips reduce the noise of the fan. These tips also create more air movement at the perimeter of the fan.



Q: How much air does the Revolution Fan move?

A: Airflow is measured in cubic feet per minute (CFM). This lets you know how much air can be moved by a fan operating at full speed. The Revolution Fan has the following ratings.

	4-blade fans	2-blade fans
Fan Diameter	Full Power CFM* Tested to ANSI/AMCA standard 230-07^	
24' (7320 mm)	428,000	255,000
20' (6100 mm)	400,000	240,000
16' (4880 mm)	365,000	225,000
12' (3660 mm)	357,000	210,000
8' (2440 mm)	295,000	190,000
	*With a mounting height of 17' 10" from the ground ^ CFM is determined by a math formula that incorporates the thrust and size of the fan.	

Note: These results are from tests conducted in a typical warehouse by measuring thrust per the ANSI/AMCA 230-07 Standard. They are not AMCA certified ratings. We are unaware of any HV/LS fans that are AMCA certified.

Q: What does AMCA stand for?

A: The Air Movement and Control Association.

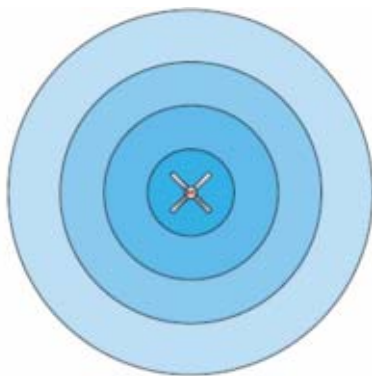
Q: Does each size of the Revolution Fan utilize the same components?

A: Each diameter of the Revolution Fan has a unique design. While the components are similar, the blade shape, hub angle, and motor speed vary for each size to optimize performance.

Application

Q: How do I know what size fan and how many blades are needed?

A: Size does matter when placing Revolution Fans. Larger diameter fans will move air further down rack aisles and over some obstructions. Smaller diameter fans can be most effective in specific work areas or where installation space is limited.



- Zone 1 – 20' from fan center (1,250 sq. ft.)
- Zone 2 – 40' from fan center (5,000 sq. ft.)
- Zone 3 – 60' from fan center (11,000 sq. ft.)
- Zone 4 – 85' from fan center (22,000 sq. ft.)

Air velocity will vary throughout the zones depending on the fan's diameter and speed setting.

When used for cooling people, choose a Revolution Fan that moves air at a minimum of 2 miles per hour in the targeted zone.

The minimum air speed needed for destratification is one half mile per hour.

4-blade Revolution Fans

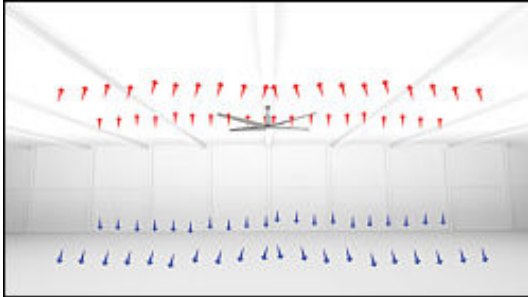
	24'		20'		16'		12'		8'	
	Full Power	Half Power	Full Power	Half Power	Full Power	Half Power	Full Power	Half Power	Full Power	Half Power
Zone 1	6.8 miles per hour	2.8	5.7	2.8	5.9	3.1	4.8	3.1	4.5	2.3
Zone 2	4.4	1.9	3.4	1.7	4.0	1.7	2.8	1.1	2.3	.8
Zone 3	2.9	1.4	2.7	1.4	2.7	1.1	2.3	.8	2.0	.6
Zone 4	2.3	.8	2.1	.8	2.1	.6	2.0	NA	1.6	NA

2-blade Revolution Fans

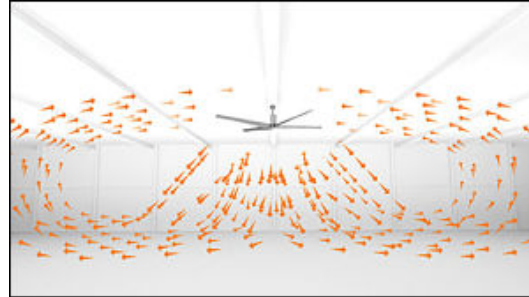
	24'		20'		16'		12'		8'	
	Full Power	Half Power	Full Power	Half Power	Full Power	Half Power	Full Power	Half Power	Full Power	Half Power
Zone 1	4.7 miles per hour	1.6	3.6	1.5	3.4	1.4	3.0	1.4	2.3	1.1
Zone 2	2.5	1.1	2.4	1.1	1.6	1.1	1.5	1.1	1.1	.8
Zone 3	2.3	1.1	2.3	1.1	1.5	.9	1.5	.6	.8	.6
Zone 4	1.1	.6	1.1	.6	1.1	.6	.8	NA	.6	NA

Q: What is the return on investment for the colder months?

A: The fans equalize the temperature in a building by moving warmer air trapped at the ceiling down to the floor, making the building’s temperature more uniform. This process is called de-stratification, and makes it easier for the heating system to keep the air warmer at the floor, saving up to 30% in heating costs. A typical payback period is 6 months to 2 years.



Before



After

Q: What is the benefit of using Revolution Fans during warmer months?

A: The increased air movement caused by a Revolution Fan and its evaporative cooling effect can make the air feel up to 15 degrees cooler. Many studies prove that comfortable employees are more productive, and have better morale.

Based on just a 10% improvement in productivity, work normally taking 40 hours can be completed in 36 hours.

Using a \$20/hour burdened cost and a 13 week cooling season, the potential savings are:
 4 hours/week x \$20/hour x 13 weeks
 = **\$1,040 per employee/year**

Estimated ROI Calculator	Example	Your Operation
# of Weeks	13	
Savings per Employee	\$80	
Total Savings per Employee	\$1,040	
# of Employees	10	
Total Savings	\$10,400	

NASA Report CR-1205-1 on Heat Stress							
Effective Temperature	75	80	85	90	95	100	105
Loss in Work Output	3%	8%	18%	29%	45%	62%	79%
Loss in Accuracy	--	5%	40%	300%	700%	--	--

Air speed produces a wind chill factor, which lowers the effective temperature, giving a person the sensation of being exposed to a lower temperature than the actual measured temperature.

Example: The effective temperature corresponding to 84 degrees Fahrenheit is and an air speed of 3.3 miles per hour is 73 degrees Fahrenheit.*

* Health & Safety Executive, United Kingdom

Q: How does the Revolution Fan help with drying moist environments?

A: Moving air over moist floors or products will help to dry them. The amount of moisture removed depends on the humidity of the air flowing over it.

Q: Should the Revolution Fan be run backwards in the wintertime like my ceiling fan at home?

A: No. The Revolution Fan will not be efficient when operating backwards. The reason ceiling fans in homes are run backwards is to avoid “wind chill.”

Q: What is the recommended spacing for the Revolution Fan?

A: Refer to the application guidelines sheet or request a site survey from your Rite-Hite Revolution Representative.

Q: What is the minimum distance to the ceiling deck?

A: Because the Revolution Fan uses the air from above it, there is a minimum clearance required between the fan blades and the ceiling. Revolution Fans have different minimum clearance requirements based on diameter.

If the ceiling support structure is an open-web design, all hanging dimensions can be taken from the underside of the ceiling. If the ceiling's support structure is a solid beam or solid channel, all measurements must be taken using the bottom of the beam as the basis point for the hanging dimension. If the roof is pitched, this must also be accounted for above the tips of the blades. Failure to follow these guidelines will result in limited air movement by the fan.

Fan Diameter	Minimum Clearance To Blade Tips at Full RPM
8' (2440 mm)	2' (60.9 cm)
12' (3660 mm)	3' (91.4 cm)
16' (4880 mm)	4' (121.9 cm)
20' (6100 mm)	5' (152.4 cm)
24' (7320 mm)	5' (152.4 cm)

The 30" drop tube will help when installing 20' or 24' fans in applications with a 24" open-web ceiling support. By using the 30" drop tube, you will have at least 63" clearance for full air delivery. Be aware that other hanging dimensions are possible by using the field adjustable 31" to 84" drop tube assembly.

Q: What if the minimum distance to the ceiling deck is not available?

A: Certain applications do not allow for our standard blade tilt. We offer an optional Low-Headroom design utilizing flat blades. With this option, the air stream will be lower to the floor as it moves away from the perimeter of the fan.

Q: Will obstructions disrupt the air flow created by the Revolution Fan?

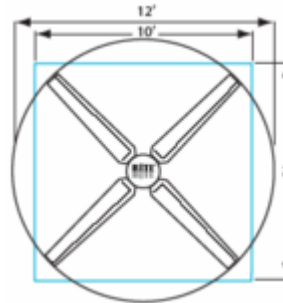
A: Yes. Air movement is blocked by solid objects. The more open the area is around the fan, the better the air flow will be.

Q: How close can you mount a fan to obstructions like mezzanines or racking?

A: The closer you are to obstructions, the more turbulent the air is. Air will bounce off things in close proximity and cause turbulent air movement that will affect the fan's performance. When possible, keep blade tips at least two fan blade lengths from walls or solid obstructions.

Q: What size Revolution Fan can fit between lights or sprinklers in a grid?

A: A light or sprinkler grid can use a fan with a larger diameter than the grid itself. See example below, a 12' diameter fan fits into a 10' grid.



Q: How do HVLS fans interact with a fire sprinkler system?

A: The National Fire Protection Research Foundation coordinated fire testing using ESFR sprinklers and HVLS fans. The researchers concluded that the fans did not affect the performance of the sprinklers to a level that would be considered unacceptable.

Key points to be aware of are:

- The Revolution Fan meets the requirements of NFPA 13 (National Fire Code for Sprinklers) in regards to blocking obstructions below sprinkler heads.
- The Revolution Fan meets the air velocity requirements of FM Global's 2-2 data sheet for ESFR sprinklers.
- In some cases, a local fire prevention authority may require the fans to be tied into a building's fire suppression system so that the fans shut off as soon as a fire is detected. The Revolution Fan's control box includes a variable frequency drive that facilitates this. The low voltage wire and relay needed to accomplish this are readily available locally. The instructions for installation are outlined on page 13 in the Revolution Owner's Manual.
- When the Revolution Fan is shut off upon fire detection as described above, the Revolution Fans come to a complete stop in less than 30 seconds, which is another common requirement.

Q: Can the Revolution HV/LS Fans work with a VESDA or other aspirating smoke detection equipment?

A: Yes. The standard Revolution Fan is capable of receiving a stop command from the fire panel, a VESDA, or any number of smoke, flame or heat detectors. Rite-Hite and its distribution network would not typically supply this equipment since it should be installed, tested, and serviced by a local fire safety professional.

Electrical and Controls

Q: What are the electrical requirements for the Revolution Fan installation?

A: Please see chart below.

Voltage	Recommended Incoming Service	Recommended Branch Circuit Protection
220 1 Phase	30 AMP	20 AMP
230 3 Phase	20 AMP	15 AMP
400 3 Phase	15 AMP	10 AMP
460 3 Phase	15 AMP	10 AMP
575 3 Phase	10 AMP	6 AMP

Q: Can the Revolution Fan use 110 volt incoming power?

A: No. The amp draw of the 2 HP motor requires high voltage with either single or three phase power.

Q: What other critical things must you know when wiring the fan?

A: Stranded cable must be used to eliminate interference and provide a good connection from the variable-frequency-drive to the motor. Route incoming and outgoing power of the control box through separate conduits to reduce electrical noise. The control box should not be greater than 200 feet from the fan it is controlling. The fan should be visible from where the control box is mounted.

Q: What direction does the Revolution Fan rotate when it is wired properly?

A: The Revolution Fan should turn clockwise when you are standing below the fan looking up. Please be aware there is a 50/50 chance of wiring the motor incorrectly during installation, causing the Revolution to rotate counterclockwise. If the fan is running counterclockwise, turn the fan off, lock out the main power and reverse two of the wires from the control box to the motor. The fan is not harmed by running it backwards; it simply is not effective.

Q: What are the switches on the control box of the Revolution Fan?

A: There is a disconnect switch to shut down power the variable-frequency drive. There is an ON/OFF switch to turn on and shut off the fan's motor, leaving the variable-frequency drive running. The potentiometer controls the speed of the fan.



Q: What are the components inside of the control box?

A: The NEMA 12/13 (standard interior usage, dust sealed) control box is UL listed to U.S. and Canadian safety standards. Our European design has CE approval. We have used all Touch-Safe components and a solid state variable-frequency drive.



Q: What does the variable-frequency-drive do?

A: The variable-frequency drive allows you to control the fan's speed. It also transforms single phase power to 3 phase power if needed.

Q: Will there be feedback from the variable-frequency drive?

A: Electrical noise is present with any variable-frequency drive. This can be minimized by changing the frequency on the program after the product is installed. Please note that the fan will not be completely silent when operating. There will be some motor and wind noise from the fan when in use.

Q: Will the variable-frequency drive need to be reprogrammed if the power is interrupted?

A: Like any computer, all logic is loaded into the memory chip so it is not necessary to reprogram. However, the fan will need to be reset. This is done by turning the on/off switch to off, waiting for 5 seconds, and then turning the switch back on. This resets the variable-frequency drive.

Q: What is the range of RPM for the Revolution Fan?

A: Each Revolution Fan diameter has a different range of RPM for optimum efficiency. See charts below for details.

4-blade fans		
Fan Diameter	Full Power CFM* Tested to ANSI/AMCA standard 230-07^	Speed (RPM)
24' (7320 mm)	428,000	10-48
20' (6100 mm)	400,000	12-58
16' (4880 mm)	365,000	15-72
12' (3660 mm)	357,000	18-100
8' (2440 mm)	295,000	30-152

2-blade fans		
24' (7320 mm)	255,000	
20' (6100 mm)	240,000	Same
16' (4880 mm)	225,000	As
12' (3660 mm)	210,000	4-Blade
8' (2440 mm)	190,000	

*With a mounting height of 17' 10" from the ground
^ CFM is determined by a math formula that incorporates the thrust and size of the fan.

Q: What if there are surges in the local power supply?

A: To address the inconsistencies that exist in local power supply, we include a line reactor as a standard feature in the control box. The line reactor helps temper spikes in power that may cause operational problems with the fan.

Q: I have an application where I need a remote-mounted control box. Can this be done?

A: Yes. With this option, you will receive an additional 8"w x 10"h x 7" deep control box with an on/off switch and a speed control dial for remote-mounting. A locally supplied low voltage wire (24 volt) connects that control box to the variable frequency drive in the standard product control box. Use this option when you need a control station further away from the fan than the recommended maximum of 200'.

This option can also be used to control the on/off and speed of up to 4 fans in one area. You may also wish to consider this as a way to save money on the installation cost of multiple fans by limiting the length of conduit required.

We also offer the Fan Commander, a touch screen control box that can control up to 30 fans independently from one station.

Q: What if there is frequency interference from other sources in the plant?

A: You can order the control box with EMC filters. This optional control box feature helps to limit interference from electromagnetic sources. Some sources to consider prior to installation are power lines, electric motors, radio receivers, wireless and radio frequency transmissions like RFID scanners. This option ships independent of the control box for easy field installation.

Installation, Maintenance & Warranty

Q: How much does the Revolution Fan weigh?

A: The hanging weight of the fan varies from 276 to 300 pounds.

It is important to verify that the beam is capable of carrying the load. If a mounting beam is not available, it is most common to span two joists with steel angle. The owner's manual provides details for different installations.

Q: What's the overall shipping weight and class.

A: One (1) to three (3) fans will ship on one (1) 48" X 144" pallet. Total shipping weight is roughly 375 to 450 pounds depending on the Revolution Fan's size.

Q: What planned maintenance is required?

A: Minimal planned maintenance is required. Please see the Revolution Installation and Owner's Manual.

Q: What is the warranty?

A: The Revolution Fan warranties are:

- 1-year Customer Satisfaction Money-back Guarantee

- 10-year structural integrity warranty

- Lifetime warranty on the workmanship of the blades and hub

- 3 years parts and 1 year labor on all components

Q: What safety features are built-in to the design and installation of the Revolution Fan?

A: There are several safety features included with every Revolution Fan:

1. Cable(s) that wrap around the bolted brackets at the ceiling and the top of the extension tube; and around the bottom of the extension tube and the top of the motor housing. Depending on the installation, this is achieved by using one (1) to three (3) cables.
2. Four stabilization cables from the motor housing to ceiling limit vibration and provide added safety.
3. The hub is attached to motor with a reverse-threaded bolt and tapered aluminum bushing.
4. A unique safety ring is provided for back-up security for the motor to hub connection. Each hub “blade arm” is connected to the safety ring.

