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Ceiling Fans

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This fact sheet is one of a series of fact sheets that focus on everyday energy usage. This series explores the various approaches that can help Arkansas households reduce their energy bills. Ceiling fans are an effective alternative to consider when attempting to reduce energy costs.

What is a ceiling fan?

A ceiling fan is a device hanging from the ceiling of a room. Ceiling fans utilize hub-mounted rotating paddles in order to produce a cooling effect as a result of air circulation. The circulation of air creates a wind-chill effect that makes a person feel cooler and, subsequently, can affect the energy bill.

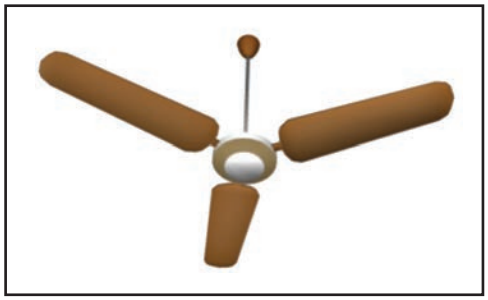

Figure 1. Standard ceiling fan.

Why do we need ceiling fans?

In temperate climates or during moderately hot weather, the use of ceiling fans can moderate the need for air conditioning. For hotter climates where air conditioning is required, a ceiling fan can allow the thermostat to be raised about 4°F with no reduction in comfort. Some research suggests that each 1.8°F increase in a summer thermostat setting can save 5.4% to 7.2% in cooling costs. Some researchers cited that winter use of ceiling fans that thoroughly mix indoor air can save 20-30% on heating costs.

What are the conditions that influence human comfort in homes?

There have been many attempts to determine the conditions that make a person feel comfortable. The factors that influence human comfort are as varied and as complex as the individuals themselves. However, the environmental factors that affect personal comfort in the home are air temperature, relative humidity and air movement.

A ceiling fan has no effect on the first two factors. Only the home air conditioner can affect both the temperature and the humidity in the house. The ceiling fan, on the other hand, can increase air movement in a room, thus creating a cooling effect that will help to increase comfort level.

Air movement helps to keep you cool primarily by increasing the rate of evaporation of moisture from your skin. Increasing the amount of air

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movement will allow you to feel comfortable at higher than normal temperatures. However, higher humidity levels will make it more difficult for the fan to have a beneficial effect.

Most people are aware of air velocities of around 200 feet per minute, which corresponds to a breeze of 2½ mph. Ceiling fans are capable of producing air velocities in the range of 200 to 700 feet per minute, depending on the speed setting. Of course, the comfort derived from air motion over the body is strictly an individual matter.

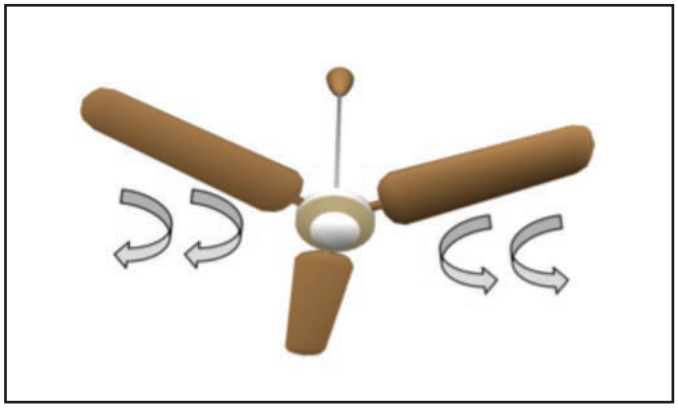

Figure 2. Air movement associated with ceiling fan.

Do I need to change the rotation direction of my ceiling fan?

Yes, follow the recommendation below to gain the most benefits from your ceiling fan. Set ceiling fans to go counter clockwise in summer and clockwise in winter. In summer, the air movement from the fan going in the forward direction cools you through a wind-chill effect and better circulates air conditioning. In winter, keep the fan on its lowest setting and on reverse. This will circulate the warm air that collects near the ceiling down to the occupied part of the room without creating a wind-chill effect.

Can a ceiling fan lower my utility bill?

Yes, a ceiling fan creates air movement, enabling room occupants to feel cooler and more comfortable. With a ceiling fan running, you can raise the thermostat setting up by 4°F during the cooling season with no reduction in comfort. Increasing the room temperature by 2°F can cut your cooling costs by 4 to 6%, especially if ceiling fans use efficient motor and blade designs. A major manufacturer recently introduced an improved design which consumes 40% less electricity. This alternative can produce a return on investment up to 30% and a simple payback in 3½ years.

Can my ceiling fans replace my air conditioning?

No, ceiling fans can't replace your air conditioning because ceiling fans do not lower humidity. Therefore, ceiling fans are best used in combination with air conditioning. Operating ceiling fans without air conditioning is most effective only when the relative humidity is less than 50%.

How can I choose my ceiling fan?

Ceiling fans are available in various types, sizes and styles to suit individual needs. As mentioned earlier, the use of a ceiling fan will allow you to operate your air conditioner at a higher thermostat setting than usual. However, many people make the mistake of choosing a ceiling fan that is too small for their room.

Ceiling fan sizes are determined by the diameter of the fan blades. You can find fans ranging in diameter from 24 inches up to 60 inches, with several sizes in between. The most common and readily available fan sizes are 36 inches and 52 inches. A larger fan will be able to move more air than a smaller fan and thus would be suitable for larger rooms. Table 1 provides a rough guideline of suitable fan diameters for specific sized rooms.

Table 1. Guidelines for choosing a fan

Room Size (ft^2)	Fan Size (diameter)
Up to 75	29-36"
76-144	36-42"
144-225	44"
225-400	50-54"

Source: ENERGY STAR – Ceiling Fan Basics - Choosing the Right Size [http://www.energystar.gov/index.cfm?c=ceiling_fans.pr_ceiling_fans_basics#1]

Choosing the proper size ceiling fan for a space in your home requires a little thought about the particular application. Do you want a centrally located fan to help keep you cool in a large family or living room? If so, then a 52-inch fan should be your choice. If you only wish to provide breezes for a small 10- by 10-foot bedroom, then a 36-inch fan should do just fine. Remember that the larger fan will move more air than the smaller one. Therefore, it is more efficient to run a larger fan on a slower speed than a smaller fan on a high speed.

A 36-inch fan operating at high speed moves the same amount of air as a 52-inch fan operating at a lower speed. A lower operating speed reduces both the operating cost and the noise level. Remember that the faster the fan needs to turn to move the air, the more noise it will make (usually blade noise). In addition, five-bladed fans are usually considered to be more efficient than four-bladed fans.

The previous guidelines are based on rooms with ceiling heights of 8 feet. For rooms with higher ceilings, a drop rod should be used to lower the fan down to 8 feet above the floor. If the room is abnormally warm, choose a fan that is one size larger than that recommended for the space.

Most ceiling fans are reversible, allowing you to set the direction in which you wish the air to move. In general, during the summer, you would have the fan set to blow downward to create a cooling effect on the skin. This setting may also help exhaust heat from the space. In winter, when the area is more sealed, set the fan to blow upwards. This allows warm air near the ceiling to mix with cooler air near the floor, thus improving distribution of heat in the space.

Should I leave ceiling fans running all the time?

No, ceiling fans cool people and not rooms. Run the fan only when someone is in the room. Ceiling fans may be less costly than air conditioning, but they still use electricity. Running several fans all day can raise your energy bill. This is an unnecessary expense if no one is in the room to benefit from the cooling effects of the fans.

Do combination fans/lights save energy?

Ceiling fan/light combination (Figure 3) units that have the ENERGY STAR logo are about 50% more efficient than conventional fan/light units. This can save you more than $15 per year on utility bills. It will benefit all of us to be as energy efficient as possible.

Figure 3. Ceiling fan/light combination.

Lights can also be purchased separately as an add-on to a ceiling fan. Consider purchasing an ENERGY STAR-qualified light kit. These can lower energy costs and improve convenience by reducing frequency of bulb changes. Most fans accept add-on light kits, though a number of them are only compatible within brands. Check the package for compatibility information.

Can I use a fan in damp areas?

Yes, you can use a fan in humid areas. However, if you're installing a fan in a humid location, make sure it is UL-listed with a "humid" rating. (Underwriters Laboratories is the trusted resource across the globe for product safety certification and compliance solutions.) If mounting a fan where it will come into direct contact with water – such as a porch or patio – be sure it has a UL "wet" rating. These fans have features such as sealed or moisture-resistant motors, rust-resistant housings, stainless steel hardware and all-weather blades.

What ceiling fan features should I look for?

When selecting your ceiling fan, you will find that there are many available features from which to choose. Some of these features are functional and some are decorative. Many features may be available only at extra cost. Determine which features are the most important to you so that you can make intelligent shopping comparisons.

- **Motor Specifications** – To ensure long life and quiet operation, purchase fans with motor housings constructed of heavier materials such as die-cast metal. These models tend to have less vibration and provide better stability for down rods. Also look for models with heavy-duty windings, sealed, precision-engineered ball bearings and shock-absorbent internal components. Look for a more powerful motor. Typically, they range from $^{1}/_{60}$ hp to $^{1}/_{3}$ hp.

- **Motor Speed** – You will need different speeds in order to obtain a comfortable setting under varying conditions. At least three speeds are desirable. Continuously variable speeds offer maximum control.

- **Motor Type** – The motor should be of the ball bearing type and may be permanently lubricated or require periodic lubrication.

- **Blades** – Most residential fans have four blades of plastic, metal or wood construction. Metal blades may have sharper edges and can sometimes be noisy in operation. If used near salt water, metal blades can corrode. Wood blades must be treated to resist absorbing moisture and warping. Blades should be sealed or finished to prevent moisture-caused damage such as warping, peeling or tarnishing, especially if the fan will be used in high-humidity conditions.

  Both blade length and blade pitch affect performance. Less expensive fans have short blades with a shallow pitch (10° or less). To move more air, select a fan with longer blades and a pitch of 11-16°. Check the manufacturer's literature or specifications for this information.

- **Sound** – Operate the fan in the store, using all settings, to determine if the sound is too high or annoying for you. If it is, try a different brand or a model with blades made of a different material. Also, fans with sealed, precision steel bearings, a rubber flywheel and maintenance-free motors are generally quieter.

- **Reverse Air Flow** – This feature allows the direction of air flow to be reversed. Such a feature may be desirable when fans are located over beds or dining tables, since these are areas in which you may not want to have air blowing directly on you. The frequently quoted winter benefits of reverse air flow are probably not significant in southern climates.

- **Controls** – Although pull-chain switches are standard with ceiling fans, they wear out quickly. Consider installing a wall-mounted switch, or two switches for a combination fan/light to control the fan and light separately. For greater convenience, some manufacturers offer remote controls.

- **ENERGY STAR Labeled** – Ceiling fans with an Energy Star rating are typically 20% more efficient than standard ceiling fans.

- **Warranty** – A warranty may cover a period from one year up to the lifetime of the fan. Investigate the terms of the warranty to find out exactly what is covered and where the warranty claims will be serviced. Some warranties cover the entire fan while others cover only the motor. Also, some fans must be returned to the manufacturer rather than the dealer for service.

Is my ceiling fan efficient?

The efficiency of a fan may be determined if the power consumption in watts and the airflow rating in cubic feet per minute (cfm) are known. This information is usually contained in the manufacturer's literature that accompanies the fan. For fans with variable speeds, efficiencies depend upon the speed setting [fan efficiency = airflow (cfm)/power required (watts)]. When comparing fans, be sure to use the efficiency calculated at the same fan speed (usually the highest speed).

It is essential to know that the higher the air flow per watt, the higher the efficiency of the fan. Higher efficiencies relate directly to lower operating costs. Typical figures for fan efficiency should range from 150 to 200 cfm per watt, when calculated at the highest fan speed. In general, a larger diameter fan will be more efficient than a smaller diameter fan.

What is the operating cost of ceiling fans?

Ceiling fans require very little energy to operate. For example, a typical ceiling fan uses only about as much energy as an incandescent light bulb (regular light bulb). Operating your ceiling fan for 10 hours daily will cost only about 6 to 8 cents per day. By comparison, a typical 3-ton air conditioning unit operated for 10 hours daily could cost about $3.00 to $5.00 per day. This example is not meant to imply that a ceiling fan can replace an air conditioning unit.

In order to achieve a savings through use of the fan, you must raise the air conditioning thermostat setting while using the fan. Raising the thermostat setting will cause the air conditioner to operate less, thus saving you money. The ceiling fan will provide gentle air movement to cool you so less air conditioning is required.

What are the some hints for installing a ceiling fan?

For safety, fans should be mounted at least 7 feet above the floor to prevent individuals from coming in contact with the moving blades. In places where this is not practical, you might want to consider arranging

the furniture so that occupants cannot stand directly under the fan. Placing a fan over the bed, dining room table or large coffee table can frequently solve fan height problems. "Ceiling hugger" and low profile fans (ceiling fans are set flush with the ceiling) that attempt to solve this problem by eliminating the down rod do not move air as efficiently as conventionally hung fans.

Ceiling height is the most important parameter when installing a ceiling fan. If your ceiling is 9 feet or higher, you'll need an extension down rod (Figure 4). Some ceiling fans are specially designed for low ceiling applications. The motor housing fits flush to the ceiling. Most ceiling fans come with the "installer's choice three-position mounting system" for installation versatility. It is recommended that an electrician install ceiling fans.

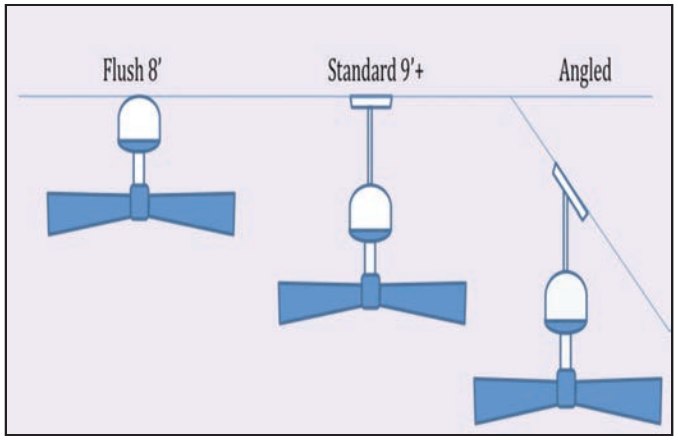

Figure 4. Ceiling fans installed to various ceiling heights and types.

Ceiling fan installation kits generally come in two types. The first type of installation kit is one that mounts the fan to an electrical outlet box overhead. These types of mountings frequently take the place of an existing light fixture. One advantage of this type of installation is that it can reduce wiring costs. However, be careful when using electrical boxes since they are not usually adequately braced to support the weight of a ceiling fan. If the electrical box is a UL-listed metal box designed for ceiling fans and it has been well secured with additional bracing, this is an excellent method of mounting. Remember that you may have to add a light kit to the fan in order to replace any light fixtures that were removed.

A second method of mounting a ceiling fan is with a large wood screw that has a hook on the end. These screws are specially designed to hold the weight of the fan. The screw is long enough so that it can pass through the ceiling panels and be secured in the wooden joists that support the ceiling. Since these screws serve a special function, you should never substitute a hardware store replacement. Use of this type of mounting requires that a joist be located where you wish to hang the fan. Fans are frequently hung in this manner in apartments and other housing where there is no access to the attic. If there is no electric junction box in the ceiling, swag kits allow you to power the ceiling fan from a nearby wall receptacle.

If the location of the ceiling joist doesn't permit the fan to be centered in the room, install a special fan mounting bracket or 2 x 4 bracing between joists to support the fan.

For effective, quiet operation, be sure that the fan is properly balanced after installation. Although fans are pre-balanced at the factory, they may become misaligned. Check installation instructions for ways to fix wobbly fans. Most manufacturers also provide balancing kits if simple fixes don't work.

What are the safety tips related to ceiling fans?

Following are the safety tips related to ceiling fans:

- Keep bunk beds and other furniture away from ceiling fans.
- Install ceiling fan protectors or guards in areas frequented by children.
- Use wall-mounted switches instead of pull-chain switches for ceiling fans in children's rooms.
- Do not allow children to stand on or jump off furniture near a ceiling fan.
- Do not place children on the shoulders of adults or playfully throw children up in the air around ceiling fans.
- To change rotation of a ceiling fan, turn off the fan, find the little switch on the side (usually below the blades) and flip it.

Is there a standard for ceiling fans?

Yes, as required by the Energy Policy Act of 2005 (EPACT 2005), the U.S. Department of Energy (DOE) has established test procedures and energy conservation standards for ceiling fans and for ceiling fan light kits.

Links for more information:

- http://leon.ifas.ufl.edu/FYCS/House%20&%20Home/Energy%20Efficient%20Homes/Energy%20Efficient%20Homes_Ceiling%20fans.pdf
- http://www.p2pays.org/ref/08/07623.pdf
- http://www.chw.edu.au/parents/kidshealth/safety_factsheets/pdf/ceiling_fans.pdf
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