

How to Install an Attic Fan

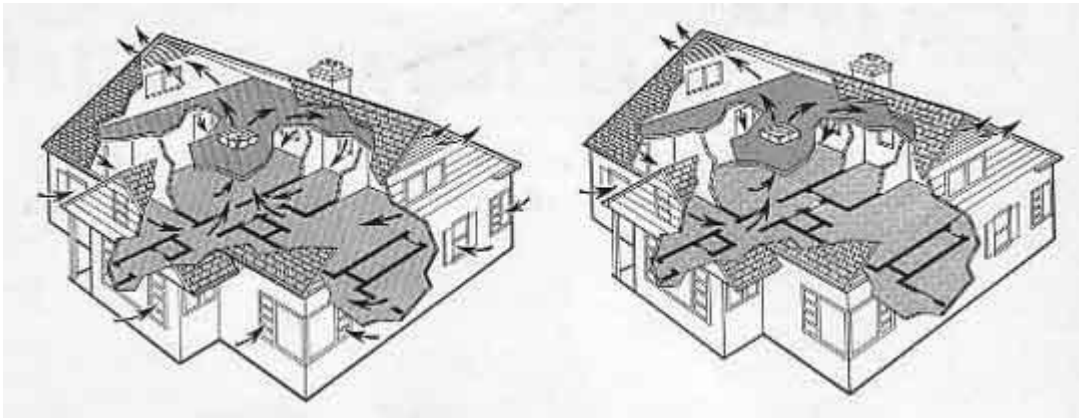
Why An Attic Fan Should Be Installed

Why ventilate the attic? For very good reasons! The hot summer sun beating down on the roof of the average home makes a veritable furnace of the space under the roof. Unless some means of dissipating this heat is provided, it radiates down through the ceiling into the rooms below. Long after the sun has set and outside temperatures have dropped many degrees, these rooms continue to receive this accumulation of heat.

The dark, composition roof coverings used on over two-thirds of the homes built today absorb a greater amount of the sun's heat than did the wood shingles used in the past century. While insulation retards the downward flow of this heat, it cannot prevent uncomfortable temperatures in the rooms below. And unfortunately, though insulation is an asset to every home, it is as effective at holding heat inside the home in summer as it is in winter. Natural ventilation of the attic space cannot keep pace with the heat load being absorbed by the roof.

As summer progresses, there is an increasing accumulation of heat in the roof, beams, attic, walls and furnishings of the home. While it is true that some lowering of temperature of the home occurs during the night, summer nights are too short to allow for anything like an equalization of temperature.

Therefore, forced ventilation! An attic fan or whole house fan provide a ready means of dispelling this heat, and not only that, it draws gentle breezes throughout the house whenever and wherever the home owner wants them. By the simple touch of a button, cooling breezes are wafted in through the windows, sweeping the heat and stagnant air up through the attic and out of the house. With an attic fan, the calm breezeless nights which weather bureau records prove to be the rule in many sections of the country, hold no threat of discomfort, no risk of tossing, sleepless nights.



More or less ventilation for the rooms of the average home is a simple matter of opening or closing doors and windows. At left, the entire house is being ventilated. At right, the closing of a hall door has made the entire capacity of the fan available for cooling the bedrooms.

What Is An Attic Fan?

The phrase "central heating" is commonly heard and understood. An attic fan is basically a central ventilating system having three major components.

First one must think of the unit it needs. This unit consists of the fan blade and its electric driving motor; an opening in which the blade revolves at slow, quiet speeds, and the necessary framework, shaft and bearings for mounting these parts. Fan units are made for both horizontal and vertical discharge, and will be described.

Since the fan unit is usually located in the attic and it is desired to draw fresh air into the house through the doors and windows in the lower floors or basement, the second essential is an opening between the living quarters of the house and the attic, through which the fan can draw this cooling air. This opening is usually located in the ceiling of the upper floor of the house, often directly under the fan unit in the attic. A grill which will match with the interior trim of the house or a suitably framed automatic shutter should be inserted in this opening.

Once the fan has drawn air through the house and up into the attic it must exhaust this air to the outdoors. If there are not sufficient ventilating louvers or windows already in the attic walls, an outlet louver of some type must be provided.

When the attic fan is in operation, fresh air enters through any door or window which is opened. Therefore, the entire house may be ventilated equally, certain rooms may be closed off from ventilation, or ventilation may be concentrated in one or two rooms depending upon which windows and doors are opened or left closed. For example, in extremely hot weather it is often desirable to have the fan draw all its air through the one or two most used rooms in order to create a strong cooling breeze, rather than have a gentle circulation of air through the entire house.

During the winter months, the attic fan may be operated when needed to exhaust cigarette smoke or unpleasant cooking odors from the house. Having the exhaust on for one or two minutes can completely make your air fresh throughout the house without chilling.

Proper Planning Reduces Costs

The cost of an attic fan installation will naturally vary with the size of the house and the type of installation required for the particular structure. The cost is very moderate, however, when the resulting years of personal comfort are considered. When an architect's services are obtained in planning a new home, provision can easily be made for the installation of an attic fan, either at the time the house is built, or at any later date. Provision for an attic fan will entail little or no expense at the time the house is constructed, and will eliminate the need for any structural changes when the fan is installed.

How to Determine Size Required

When planning an attic fan installation, the first consideration should be the amount of air which will be needed to properly cool the house. The quantity necessary will depend on the size of the house, the climate of the area and even the topography in the immediate vicinity of the house. The absence of night time breezes or the existence of obstacles to the natural flow of wind currents will increase the amount of ventilation capacity that should be provided. No exact rule can be made governing allowances for the variables of climate and topography. Reason and experience must dictate these allowances, after cubical content of the house had been determined. To do this, multiply the floor area of the living quarters of the house by the height from floor to ceiling. For houses having more than one floor the volume of each floor should be computed and added together. Do not include cellars, closets, closed off garages or porches in this computation, since air will not be circulated through these areas.

Table I, below, will allow a quick approximation of the air-moving capacity which will be required for comfort, and indicates the fan diameter.

Table 1

Approx. Vol of House in Cu. Ft.	Minimum Fan Capacity Needed For Satisfactory Results (in CFM) Residential Locations								
	Mild Climate			Hot Climate			Hot & Humid Climate		
3000		1000			2000			3000	
4000		1320			2640		24"	4000	
5000		1650			3300			5000	30"
6000		2000			4000			6000	
7000		2310		24"	4620			7000	
8000		2540			5280			8000	30"
9000		3000			6000			9000	
10000		3330			6660	30"	36"	10000	
11000		3630			7260			11000	42"
12000		4000			8000			12000	
13000		4290			8580			13000	
14000	24"	4620			9240			14000	42"
15000		5000		36"	10000			15000	
16000		5280			10560			16000	
17000		5610			11220			17000	48"
18000		6000	30"		12000			18000	
19000		6270			12540			19000	
20000		6660			13320			20000	48"
21000		7000			14000			21000	
22000		7260			14520			22000	

A choice of fan diameters at many air-handling capacities will be noted. The factor of fan revolutions per minute enters here. For example, a 36" fan running at about 425 RPM delivers the same amount of air as a 42" fan running at only 270 RPM. Naturally, the slower speed fan will be quieter.

This rough approximation should be followed by consideration of allowances for local climate and topography.

How Attic Fan Capacity is Rated

Here, a word of warning should be injected. The most elaborately designed and carefully installed attic fan may prove to be of little value if its expected performance has been based on unreliable figures as to its capacity; that is, the amount of air which it will move each minute. All reputable manufacturers of attic fans have their blades tested and rated under exacting conditions. It is the standard method used throughout the air impeller industry for testing fan blades which are operating against various amounts of static pressure or resistance to air flow. Since attic fans must draw through windows, grills and other obstructions to air flow, they are operating against a small, but definite amount of pressure and therefore must be rated according to the provisions of the standard test.

Where To Locate The Attic Fan

Having determined the size of the unit which will be needed, the next problem is to find a good location for installation of the unit, for the ceiling opening which allows the fan unit to draw air from the house into the attic, and for the exhaust area to the outdoors. The architecture of the house will help decide whether a horizontal or vertical discharge unit is to be installed. The location of each of the three elements of an installation is determined with an eye first to thoroughness of ventilation, then ease and cheapness of installation.

In houses of two or more stories, if there is not already a stairway or hatch between the living quarters and the attic, the ceiling opening is usually located in the ceiling of the top floor hallway, allowing air to be drawn up the stairs from the lower floors. In this way any room may be cooled by opening its windows and a door leading to the stairs.

Houses which are built on one floor may have the opening in any convenient central location.

In either type of house a number of smaller openings in different locations may be used if desired, rather than one large central ceiling grill or shutter, providing the installation does not call for a vertical discharge fan or a suction box type of construction.

Once you have picked the fan, your salesperson will help you pick out the appropriate size shutter or register.

Installation Methods

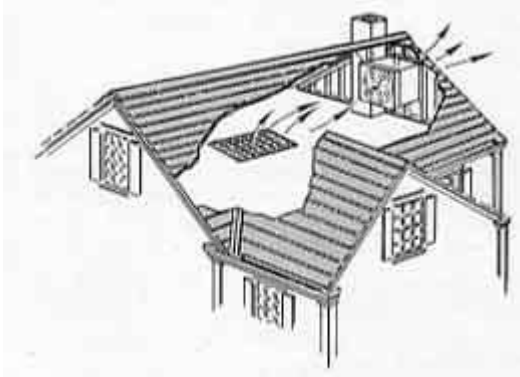
After the air has been drawn through the house and up into the attic through the ceiling opening it is drawn through the fan and exhausted outside of the house through an outlet opening. A number of different types of louvers may be used in this outlet opening, the selection depending on the general house construction and on the number and type of outlet openings that may already exist.

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It is recommended, however, that the fan be located so that it will not exhaust air out the side of the house which faces the prevailing winds. If the fan must blow air out against the wind it will be operating against additional resistance, and air delivery will be slightly reduced. The following locations may be used for installation of attic fans.

If there are no open spaces under the eaves, and the attic is in other respects reasonably air-tight, so that the fan will draw all its air from the house through the ceiling opening, and not directly from outdoors through these other openings, there are four choices as to how the installation can be made:

(1) In a house having a suitably sized window in an attic end wall or dormer, mounting an attic fan against such a window, presents the fewest construction problems. The window can be opened and the fan mounted in this opening. This type of mounting should also include louvers a few inches in front of the fan to keep rain out of the attic, though this is not absolutely necessary as long as the window is closed whenever the fan is not being operated.

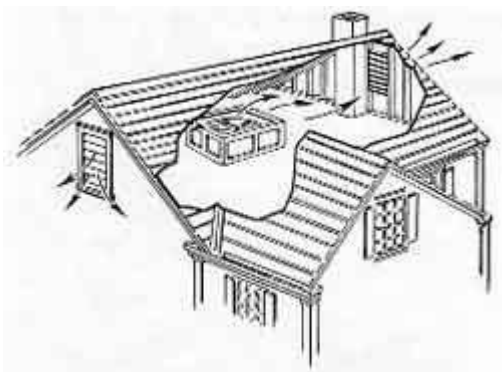


Horizontal discharge fan mounted in gable end; ceiling grill in central hallway

A louver of wood or metal may be used or an automatic type of shutter may be installed. These shutters are made by other manufacturers and are sold by Electric Trading Co. When the fan starts, the shutter is automatically opened by air pressure. When the fan stops, the shutter closes.

See our line of [Automatic gravity operated Wall Mount Shutters](#).

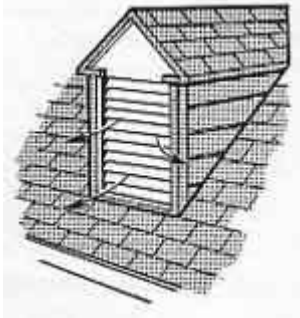
(2) If the house has no attic windows, or if the fan required is too large to be mounted in the window available, an opening can be cut in the end wall of the attic big enough to accommodate the unit and its outlet louver. If an opening must be cut through the end wall, it should be framed just like a window sash.



Vertical discharge fan mounted above ceiling grill, twin exhaust louvers

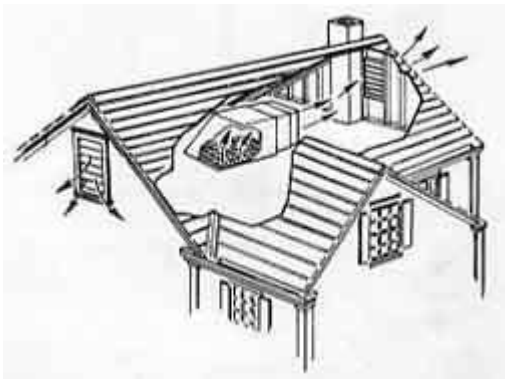
(3) Houses having extremely low attics may not have sufficient height to permit the mounting of a horizontal discharge unit through an end wall. In such a case a vertical discharge unit may usually be mounted directly over the ceiling opening. Vertical discharge units are similar to standard horizontal discharge attic fans, but are equipped with motors which can be operated in a vertical position. Since they have a minimum of depth, vertical discharge units can be successfully installed in most low attics.

However, the distance between the fan blade of the unit and the nearest portion of the roof must be at least equal to the diameter of the fan blade. Operation at closer distances will result in excessive air noise and an increased load on the fan's motor.



(4) If there is not sufficient clearance for a vertical discharge unit it may be necessary to construct a dormer of sufficient size to house the proper horizontal discharge unit. The height and width of the dormer will be determined by the dimensions of the attic fan and of fans in dormers discussed later.

In houses having attics with open spaces under the eaves, or otherwise not airtight, there are three commonly used types of installations. In each, the installation should be made directly over the ceiling opening. Either a vertical or a horizontal discharge unit may be installed.

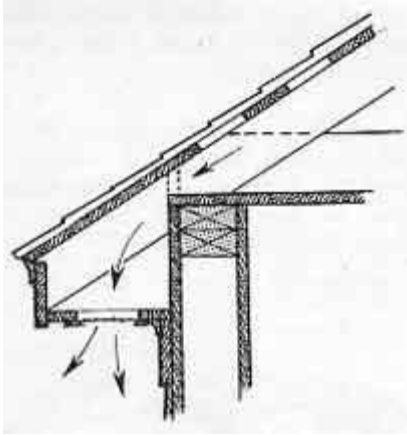


Horizontal discharge fan mounted in suction box over ceiling grill; twin exhaust louvers

(1) The horizontal discharge unit will require construction of a suction box to insure that the fan will exhaust air only from the rooms below rather than draw air into the attic from the open spaces under the eaves, etc.

In installations which include a ceiling opening into living quarters below provision should be made for closing the opening during cold weather. Numerous trapdoor arrangements are possible, but the best treatment of the problem is the installation of an automatic shutter. Such shutters are readily available, and are effective. They open automatically whenever the fan is started, and close when it is shut off, sealing off the attic from the rooms below.

(2) If there is an existing stairway to the attic, use a horizontal discharge type unit mounted in a suction box built around the stair-head, with a door in the end of the suction box for access to the attic is the most satisfactory means of drawing air into the attic.



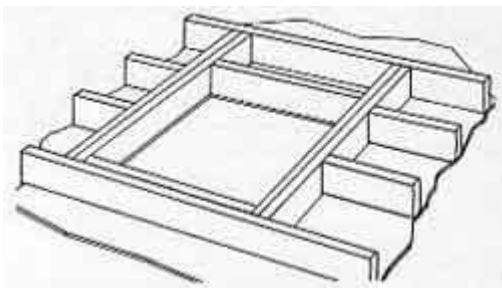
(3) In houses with hip roof construction, either a vertical or horizontal discharge unit may be installed directly over the ceiling grill. Provision of "strip louver".....a narrow slot in the soffit of the cornice all around the house is an excellent, pleasing and inconspicuous means of providing exhaust area.

Size of Ceiling Opening

The ceiling opening, and its accompanying grill or shutter must be of a size that will not cause excessive resistance to air flow, and will allow the air stream to pass through at a moderate, quiet velocity. The area of the ceiling grill determines both these factors.

Therefore, determination of the size of the ceiling opening is the next step. The area needed must be shaped to the physical dimensions of the ceiling, since a narrow hallway may require a rectangular opening and a large hall may make a square opening equally practical. Even ceiling joist spacing may be a factor, since it is wiser to elongate the opening slightly than to cut out another joist to gain an inch or two of width.

Preparing Ceiling Opening



Typical framing for ceiling grill or installation of vertical discharge fan

Be sure that the area selected for the ceiling opening is not crossed by plumbing, electrical lines or other obstructions. Then proceed to cut an opening four inches greater in each dimension than is actually required for inlet area or for insertion of the automatic shutter if one is to be installed. This additional area provides room for insertion of short lengths of 2" wide material, or "headers" to restore the structural strength of the ceiling.

At this point the rough opening offers an easy means of getting the attic fan unit into the attic. Finish lumber may then be applied around the opening, if desired and allowed for and the automatic shutter or grill fastened in place and trim applied to cover the crevice between grill and ceiling.

It should be noted here that in any case where the home owner prefers a decorative metal grill for appearance sake, yet likes the convenience of the automatic shutter, that both may be used by positioning the shutter two inches or more higher inside the opening.

Installation of the attic fan may not be completed before proceeding to make the exhaust opening. In fact, the moment the opening has been cut, the fan may be used to cool the attic and makes possible the finishing of the opening in greater comfort.

Non-Rigid Mounting Recommended

Although an attic fan is inherently quiet, due to its low speed and carefully balanced blades, there may be some slight vibration of the unit. If the unit were rigidly mounted to the framework of a house, this vibration could be amplified by the wall and ceiling panels (which act as sounding boards) until it became objectionable.

The fan unit should, therefore, be hung on springs from the rafters or mounted on rubber, felt, cork or some other sound deadening material which will absorb rather than transmit vibration. Small blocks of this material one inch or more in thickness should be sufficient if placed under each corner of the unit.

If a vertical discharge type of unit has been used, setting the fan in position over the ceiling opening completes that phase of the work, and electrical connections may be made at once. The illustration below shows the details of a vertical installation.



Detail of a vertical discharge fan installation

The subject of suction boxes for horizontal discharge fans will be treated later.

Electrical Installation

Wiring of the attic fan unit should be done only by a competent electrician who is familiar with the local electrical code. For convenience, a switch for the attic fan should be located in the living quarters of the house. This may be a time switch, which will automatically turn the fan off a pre-determined hour each night, or a simple manual switch.

If manual switching is to be used, in a two story house, use of a "three way" system is desirable, locating the switches on the first and second floors.

A thermostatic control or simple time switch may be used in a similar manner to turn off the fan during the night when the house has been cooled to the desired temperature.

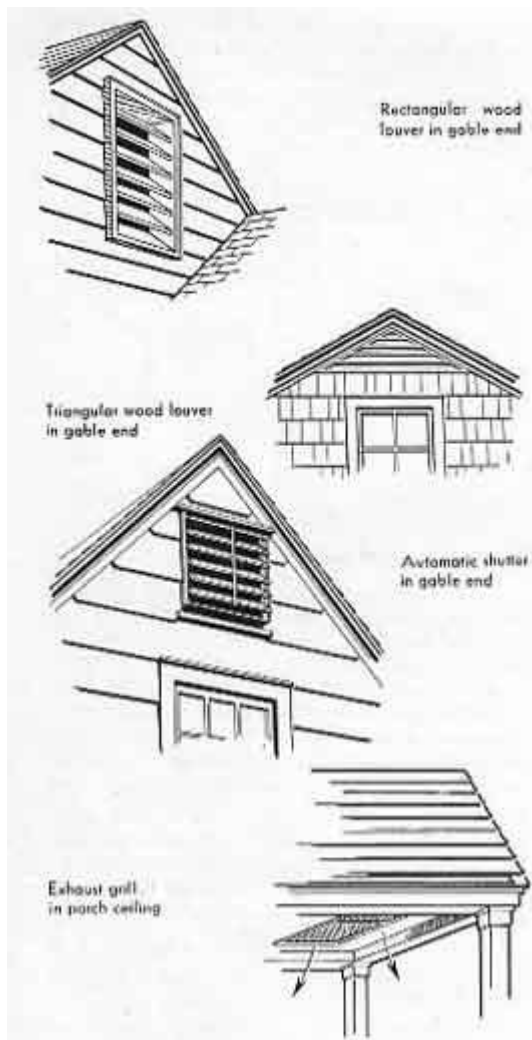
When purchasing an attic fan unit it is advisable to select one having some type of overload protection on the motor. This overload switch will stop the motor in cases of overheating caused by the operation of the attic fan with the ceiling opening blocked off, or with the outlet louver closed by a winter panel.

Exhaust Openings

Table II was prepared to aid in determining the correct outlet area necessary for each standard size of attic fan. This table shows the minimum free area which must be available between the fan and outdoors for satisfactory operation. Extensive tests have shown that for best results the outlet area for an attic fan should be one and one-half times the area of the fan. Satisfactory results will, however, be obtained as long as the area is at least equal to the blade area. The table is a compromise between optimum outlet areas and ones of practical size.

Table II shows dimensions of square outlet louvers of different types of construction which are recommended for the standard sizes of attic fan. Construction features of these types of louvers can be seen on below.

This table also gives the dimensions for triangular wood slat outlet louvers, as shown below, which may be used with standard attic fans.

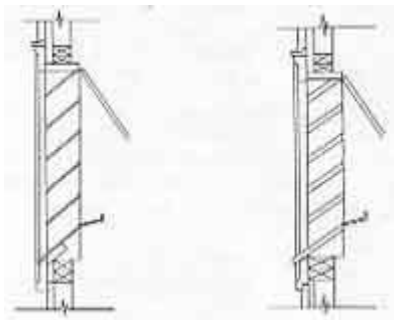


To determine the dimensions of the louver, it is necessary to know the pitch of the roof. Opposite the diameter of the fan you have selected you will find correct dimensions for the height of the triangular louver for roof pitches of 5, 6, 7 or 8 inches to the foot. With roof pitch and triangle height established, sides and base of the triangle are automatically correct.

When the attic fan unit is installed in an end wall, or in a window, the space between the fan unit and the outlet louver should be made airtight with some material that will also prevent vibration from being transmitted from the unit to the frame of the house. A strip of felt or rubber will be sufficient. If the front of the opening (in which the blade rotates) cannot be mounted within an inch or two of the outlet louver, a short canvas duct can be used to carry the air from the fan to the louver. This duct should be attached to the outer edges of the fan opening and to the edges of the outlet louver in order to keep its area considerably larger than that of the fan opening. All connections should be made as airtight as possible.

If the suction box type of installation is used it may be possible to locate the outlet opening under the eaves of the house or in a porch ceiling (if the attic extends over these areas.)

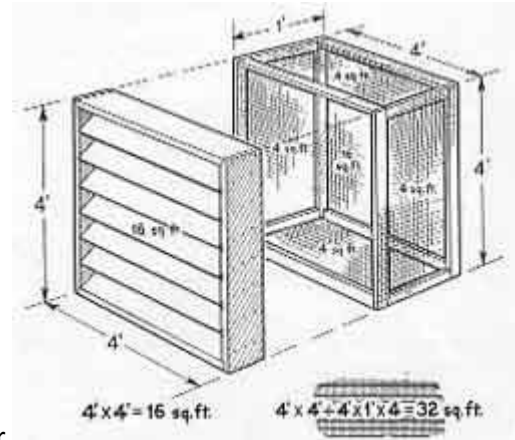
Generally speaking, outlet louvers should be constructed of metal if possible, as the shutters of metal louvers are thinner than those of comparable wooden louvers, and do not obstruct the flow of air as much. The result, as can be seen below, is that metal outlet louvers do not need as much overall area as do wooden louvers to provide the equivalent free area (the actual open area through which air can pass).



Metal slats in exhaust louvers allow maximum area for air to pass *Wood slats in exhaust louvers are thicker, restrict air flow*

In order to keep birds, squirrels, etc., from entering the house through the outlet of the attic fan, a wire mesh screen should be placed across the interior face of all fixed louvers. On-half or one inch mesh wire is recommended. One inch mesh hardware cloth is figured as having 90% free area; on-half inch mesh as having 80% free area. If it is desired to make the attic proof against insects as well, this can be done by "boxing" the screen as shown below. Since conventional fly screening has but 50% free area this must have an area twice that of the inlet opening.

Frequently, architectural design considerations and the practical convenience of an automatic shutter are



combined by mounting the automatic shutter back of the outlet louver.

How an exhaust louver is "boxed" with fly screen

Table II has been computed with an allowance for 1" mesh wire over the openings. No screening is necessary for automatic or motor driven shutters, as they close when the fan is not in operation.

In winter, installations having automatic or motor driven louvers may be used to exhaust smoke or cooking odors. Fixed grill installations, however, require installation of a winter panel over the outlet louver to keep cold air out of the attic, which would make fan operation impossible.

Table II

Recommended Dimensions of Attic Fan Outlet Louvers

Fan Diameter	Air Delivery Range CFM	(1) Free Outlet Area Needed
24"	3500	4.70 sq. ft.
	5000	
30"	4500	7.35 sq. ft.
	8500	
36"	8000	10.06 sq. ft.
	12000	
42"	10000	14.40 sq. ft.
	15500	
48"	12000	18.85 sq. ft.
	20000	
Fan Diameter	(2)Dimensions For Square Outlets	

	(3)Metal Automatic	(4)Metal Fixed	(5)Wood Slat Fixed
24"	26 x 26	32 x 32	34 x 34
30"	32 x 32	39 x 39	42 x 42
36"	38 x 38	45 x 45	49 x 49
42"	44 x 44	54 x 54	60 x 60
48"	50 x 50	62 x 62	68 x 68

(1) 1.5 Times Fan Area

(2) Computed to include 1" Mesh Wire Screen over Metal Louvers - If Wood Slat Louvers are installed use next largest height shown

(3) 90% Open Area

(4) 70% Open Area

(5) 60% Open Area

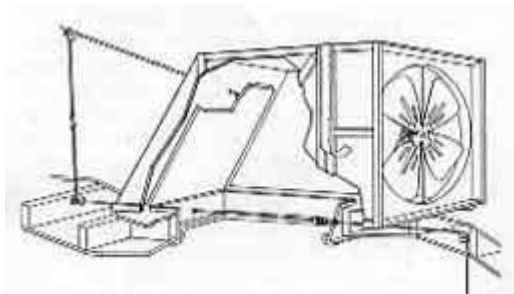
Fan Diameter	Height of Triangular Louvers (For Different Roof Pitches)			
	5/12 Pitch		6/12/Pitch	
	One Louver	Two Louvers	One Louver	Two Louvers
24"	2' 0"	1' 8"	2' 2"	1' 10"
30"	2' 6"	2' 1"	2' 9"	2' 4"
36"	3' 0"	2' 6"	3' 3"	2' 9"
42"	3' 3"	3' 0"	3' 9"	3' 3"
48"	3' 10"	3' 4"	4' 3"	3' 7"

Fan Diameter	Height of Triangular Louvers (For Different Roof Pitches)			
	7/12 Pitch		8/12 Pitch	
	One Louver	Two Louvers	One Louver	Two Louvers
24"	2' 4"	2' 0"	2' 6"	2' 1"
30"	3' 0"	2' 6"	3' 3"	2' 8"
36"	3' 6"	3' 0"	3' 9"	3' 4"
42"	4' 1"	3' 6"	4' 4"	3' 9"
48"	4' 7"	4' 0"	4' 9"	4' 3"

Suction Boxes

Dimensions of suction boxes for 24" through 48" attic fan units are given in Table II. The "A" dimensions given are not critical. Usual construction procedure is to make the height and width of the box to conform to the outside dimensions of the attic fan unit. Remember, however, that part of the suction box will be directly over the ceiling opening, and its width must be at least as great as the smallest dimension of the opening.

The suction box can be constructed of masonite, or any sound absorbent wall board nailed to a reinforcing frame of 1" x 2" lumber. The framing should be placed on the outside of the box as shown below, in order to have the smoothest possible interior. If the framing were on the inside it would cause turbulence of the air flow, and noise might possible result. Sides and top of the box should be stiffened with 1" x 2" material as found necessary to prevent sagging and unnecessary vibration of these panels.



Detail of horizontal discharge fan installation with suction box, including fusible link for grill cover.

The inside of the suction box may be painted black so that it will not be visible from below the ceiling opening.

In order to prevent transmission of vibration from the fan unit to the suction box, a strip of canvas two or three inches wide should be used to connect the two, as shown. Connections between the canvas, fan unit and suction box should be airtight.

In some locations, local fire codes require that an automatic fire door be installed in a suction box. The illustration shows a simple method of installing a trap door connected to a 135 degree fusible link. In case of a fire that fusible link will melt, the fire door will close and the fan will stop. When the fan is not being operated, this trap may be closed to seal off the attic from the house.

If there is a chance of anyone being near the attic fan when it is operating, install a wire mesh guard before the air intake side of the unit to prevent close contact with the moving parts of the unit.

One fan unit is usually used in a suction box installation. If very high air delivery is required and insufficient clearance is available for the installation of a large-sized unit, two smaller units may be used whose combined output equals the desired volume of air. The two units should be of the same type and size. They should be mounted in opposite ends of the suction box, equally spaced from the ceiling opening.

Dimensions of the ceiling opening should of course be based on the combined air deliveries of the two fans.

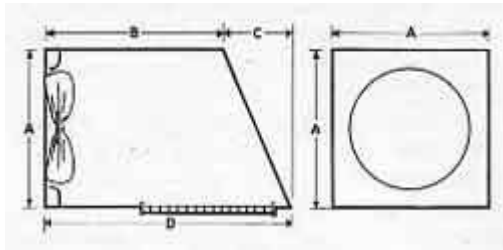
If the attic has pellet or granular type insulation between the joists, a strip of building paper should be nailed in front of the suction box so that the insulation will be not blown out of place.

Motor driven shutters in the outlet louvers are often preferred when suction boxes are used, and when the outlet is located at some distance from the suction box. These shutters have an electrically driven motor connected to the vanes. This motor is connected in the same circuit as the motor of the attic fan. When the fan is started the shutters are opened and remain open until the fan is stopped, when they are automatically closed again.

It is desirable to face the opening in the suction box away from the outlet louver in order to create the maximum possible air circulation through all parts of the attic. The outlet louver should be placed as far from the suction box as is convenient.

Since vertical discharge units and suction box installations actually create a small amount of pressure in the attic, as opposed to other types of mounting which create a mild vacuum, several outlet louvers, located wherever desired may be used.

Suction Box Dimensions



Fan Diameter	Dimensions			
	A	B	C	D
24"	32"	40"	24"	64"
30"	38"	48"	24"	72"
36"	44"	56"	24"	80"
42"	50"	64"	24"	88"
48"	56"	72"	24"	96"

Dormer Installation

When clearance for installation of a horizontal or a vertical discharge unit is not available, a dormer may be constructed, or a penthouse added to the roof of buildings such as apartment houses, which have flat roofs.



The style and location of the dormer should be such as to match with the exterior of the house. Its size should be determined by the size of the outlet louver necessary and of the unit itself. The sides and top of the unit should be insulated from the dormer with rubber, felt, etc., to prevent transmission of vibration and should be made air-tight. Automatic or motor driven shutters are preferred with dormer construction, so that the fan will not have to be removed in the fall to allow installation of a winter panel.

The fan should not discharge air directly at a wall, chimney, etc. A distance of 6 to 8 feet should be maintained between the fan and any such obstruction.

Operation and Maintenance

The major point that must be remembered is to open a door or window before the fan is turned on. Otherwise, if there is a fireplace, air will be drawn down the chimney along with any loose soot, and this dirty air will be circulated throughout the house.

Once installed, an attic fan should require a minimum of maintenance, and should give many years of dependable service.

As a precautionary measure, the fan should be inspected occasionally during its operating season. Points to be checked are:

- (1) Lubrication instructions on the motor should be followed.
- (2) Bearings through which the fan shaft passes should be lubricated in accordance with the manufacturer's recommendations.
- (3) Check drive belt for frayed edges or other signs of wear. Replace belt when necessary. Check belt for tension - adjust if necessary. A V belt should be tightened just enough to stop slippage.
- (4) Once a year wipe dust, dirt and spilled oil from entire unit, including the fan blades. Use care in cleaning the blades, as they have been accurately aligned and balanced at the factory, and bending will cause serious vibration.

This inspection should be made only after the unit has been disconnected from the electric mains. This can be done by removing the fuse in the attic fan circuit, or by throwing the switch if the fan has its own fuse box.

The information presented in this instructional should be sufficient to cover most problems encountered in any normal attic fan installation.

Note: Information was obtain from multiple sources and has been checked for suitability. However, a successful solution depends on individual accuracy, skill, and caution. For this reason, Electric Trading Company does not guarantee the result of procedure compliance or assume responsibility for personal injury or property damage to persons following these procedures.