

Kitchen Ventilation

Cooking in the kitchen generates a great deal of heat, steam, grease, smoke, and odors that need to be ventilated to clean the air and to prevent harm to the home.

Cooking generates heat, and modern professional-type ranges generate even more.

It is not uncommon for a range to have four burners going, each generating 15,000 btu's of heat (total 60,000 btu's), along with an oven or broiler adding even more.

Yet a typical four-ton residential air conditioner is only capable of removing 48,000 btu's of heat per hour from the home. Clearly, the air conditioner will be overtaxed without supplemental ventilation.

Cooking also vaporizes oil and water contained in food and forms an extremely tough film that sticks like glue to everything it touches. In fact, home cooking can produce over a gallon of vaporized grease per year, and this grease needs to be removed from the house.

Nitrogen oxides form when fuel is burned at high temperatures, and is one of the main ingredients involved in the formation of ground-level ozone, which can trigger serious respiratory problems. According to the [Environmental Protection Agency](#), the primary sources of Nitrogen oxides (NOx) are motor vehicles, electric utilities, and other industrial, commercial, and residential sources that burn fuels. The kitchen, with a gas oven, produced levels of 32 ppb, or twice that of outdoor concentrations.

Kitchen ventilators, commonly called range hoods or just plain "hoods," are among the most important appliances in the home. While they remove grease, heat, moisture, cooking odors and combustion gases from the air, they also help protect a family's health and make the kitchen cleaner, safer, and more comfortable. Some range hoods merely filter the air, but most are connected to ductwork behind a wall, ceiling, or floor and vented to the outside.

At one time, vent fans were simply a motorized fan mounted in a wall opening, but no more. Today, kitchen ventilation products are going high-tech. With features such as delayed shutoff timers, clean-filter indicators, and sensors that automatically adjust blower operations to the heat output of a range, the newest systems offer a wide array of features.

Customers may choose from a variety of styles and designs, but the only type that can be 100% effective in eliminating pollutants is an overhead canopy hood with a high-performance blower.

In order for a ventilation system to effectively remove all cooking byproducts, four things are required:

1. A canopy of sufficient size and design to hold contaminants prior to removal.
2. A blower system capable of removing heat, steam, and odors.
3. Filtration capable of liquefying and containing cooking grease.
4. Ductwork of the proper size and configuration to vent the byproducts outside.

Hundreds of models are available but custom-built models can be made to hold inserts. Most include lighting, and many offer additional accessories to make cooking easier.

Types of Systems Available

Updraft ventilation (overhead hood) This is the most effective type available. It collects and removes cooking vapors several feet above the cooking surface. Since cooking vapors naturally rise, updraft systems tend to be the most effective choices for ventilation. They are sold in a number of different configurations:

Wall-Mount

As with any major appliance, a range hood's location can greatly affect performance and ease of installation. An outside wall is the ideal location for a range hood because the duct work required will be short and straight. This allows the vent to work at optimum performance while minimizing the preparatory ductwork. There are a number of ways in which these units are mounted:



Under-cabinet wall-mount canopy

These are the most common variety. They are designed to mount over a conventional range below a short wall cabinet. They are typically simple designs, although some can be more elaborate. Best Hoods even produces a slim-line model that is extremely compact and is barely noticeable.

Specialty Wall-mount canopy with chimney

These are popular when a more dramatic look is desired. They are typically large units mounted on the wall above a professional range, with a chimney that rises to the ceiling. They are frequently custom-built on site to blend with the overall kitchen plan. They can be built out of a number of different materials. Some designers even build hoods that match the surrounding wall cabinets to give them a built-in look, and they effectively "disappear" into the wall.



Over the range microwave/hood combination wall-mount

When space is at a premium, these units offer a convenient alternative to a stand-alone range hood.

Most are sold as non-vented recirculating units, but many are convertible to vent through the wall. Because of their space-saving feature, these units are very popular. They are made by a number of appliance manufacturers.

None are recommended for use over professional type ranges and cooktops, however, because of their lower output.

Flush Mount Through-the Wall

These old-style vents are still being sold, but most fans of this type are not rated in areas where there may be excessive moisture. However, Broan-Nutone's Recessed Fan Light Combination unit that is UL rated for use over tubs and showers with a GFCI circuit, can also be used to provide additional ventilation in kitchens.



Ceiling Mount Canopy with chimney Free-Hanging or Specialty Island

These are the dramatic units hanging boldly in the center of many high-end kitchens. They share many of the characteristics of specialty wall-mount range hoods, but they are suspended from the ceiling rather than the wall.

Before installing one of these units, the ceiling may require extra reinforcement. Local building codes will dictate. Custom chimney extensions are often available for ceilings up to 10 ft. tall

Downdraft Ventilation Systems

These units are often selected when overhead types are impractical to install. They conserve overhead space by venting the fumes downward rather than up.

Their fans are located at the surface of the range or cooktop and draw steam and grease downward and out of the kitchen via ductwork placed through the back of a base cabinet or under the floor.



Because of the need to install the blower in the base cabinet and for the ductwork to go through the base cabinet, valuable space is lost. How much space will be lost depends on the model chosen.

Downdraft ventilators integrate well in island or peninsula installations because they're unobtrusive and don't interfere with the overall kitchen plan. They are only available for use on drop-in cooktops.



If the unit is installed on an outside wall, the ductwork can be channeled through the wall above floor level. However, on island installations where the duct must pass under the floor, this system presents an additional challenge.

If the home is built on floor joists, the ductwork under the flooring will usually follow the joists, thereby limiting where it can be vented to the outside.

If the home is built on a concrete slab, the ductwork must be installed before the concrete is poured. It is very difficult to install a new downdraft system for an island in an existing home built on a slab.

While these types of vents are great for exhausting air around island cooktops and avoiding the problems of an overhead hood, they are less efficient in removing the steam from taller pots and pans, and they won't capture cooking vapors that aren't close to them. In addition, they are generally not recommended for professional type cooktops.

A typical downdraft system requires a minimum of 25 1/8" of flat counter space, front to back. A countertop with a raised lip and/or backsplash may not allow enough space for proper installation. In addition, 2 3/8" of flat countertop is required behind the cooktop and an additional 1 3/4" is needed between the back edge of the cooktop and the inside of the cabinet back.



Flush-mount downdraft

These models are recessed into the countertop and lie flush with the cooking surface. They are often incorporated into the cooktop itself, such as in the case of Jennair or Amana.

They have the disadvantage of being less efficient than overhead or the newer pop-up types, can disrupt the cooking process by pulling fumes away from the heat source.

Countertop-level downdraft (Pop-Up's)

These models are retractable and will lie flush with the countertop until needed.

Many are even motorized. For example, units such as Dacor's Epicure Raised Ventilation System (ERV) disappear out of sight when not in use.

They are an improvement over flush-mount designs because of the location from which they draw the air. Downdraft ventilators can disrupt the cooking process by pulling fumes away from the heat source. Some models, however, such as the Thermador Cook'n Vent downdraft system telescopes up a full 10" from behind the cooking surface, drawing heat and fumes from the cooking vapors, not at the heat source. But when not in use, this unit can still be retracted flush with the countertop.



Recirculating and Non-vented (Ductless)

These hoods recycle the air through a filter and return it to the kitchen. While they trap some of the grease and odors from normal cooking, the moisture, smoke, and heat will all be recirculated back into the home.



These units tend to be much less expensive to purchase and install than vented hoods but there are trade-offs. They're much harder to keep clean and will clog up if the filter isn't changed frequently. They are often noisier than vented fans.

Recirculating means that ductwork must be installed but does not vent to the outside, while ductless hoods require absolutely no ductwork. Recirculating hoods rely on activated charcoal filters to attract and capture odors. While it is impossible to predict an exact life span for these filters because cooking habits vary, they generally must be changed every six months or so under normal use.

Their performance is rated on a RHP (Range Hood Performance) scale, which measures how efficiently the hood is able to move the air through the filter. The higher the rating, the better the performance.

Some vented models are convertible to recirculating. [Best by Broan](#) sells several models, including island range models, that can be converted in this way.



Non-vented units should not be used with high BTU equipment such as professional ranges.

What Size and Type of Blower to Choose

Range hoods use different types of devices to move the air. Some use blowers, in which a squirrel cage wheel produces a high-efficiency air flow with low resistance in the duct, and relatively quiet performance. Others use a propeller-like fan that is more turbulent and noisy with high resistance in the duct, resulting in a huge loss in CFM output.

Most hoods are available with several different sized fans or blowers. Many models offer fans of multiple or variable speeds. Vent-a-hood's Sensa-source system automatically adjusts ventilation power to match heat and cooking output. Best's PIK Pro-Style Insert hood filters feature Heat a Sentry function that detects excessive heat and automatically adjusts the blower speed to high. The designer must choose the size that is appropriate for the installation, based on a number of factors.

Ventilation performance is measure in Cubic Feet of evacuated air per minute, or CFM. While conventional residential ranges require 300 to 1000 CFM of ventilation, professional cooktops and ranges with their increased heat and grease output, typically call for 1000 to 1400 CFM of ventilation power. The presence of a barbeque grill, griddle, or wok may require additional cfm to ensure proper ventilation.

Vent-a-hood claims that their Magic lung blower models are so efficient as to produce a 50% equivalent increase in performance over standard models, meaning that a unit rated at 1200 CFM will have the equivalent output of a standard model rated at 1800 CFM. This is because this blower uses centrifugal filtration instead of mesh or baffle filtration, and thus has less air-flow resistance.

Noise level of vent fans is measured in sones, which is a subjective unit of volume, equivalent to the sound of a pure tone of 100 hertz at 40 decibels. The higher the sone rating, the louder the fan. One sone is the equivalent of a quiet refrigerator in a quiet room. Typical sone ratings run from 2 at low speed to 6 at high speed. The Home Ventilating Institute (HVI) recommends that kitchen vent fans should not be louder than 9 sones.

Integral vs. Remote ventilation: A ventilator system's motor and fan may be located adjacent to the intake (integral) or on the outside roof or wall of the home (remote). Integral ventilators are installed with the least disruption to the exterior structure of the home.

Remote ventilators There are two reasons for installing a remote blower; to save space inside the kitchen and/or for more power. For downdraft installation, this provides extra space in the cabinet where an internal blower would take up much of the room. External fan housings typically have a galvanized finish that can be painted to match the home's exterior.

Remote ventilators tend to be less noisy because the motor is removed from the inside of the house. But installing a remote blower will not eliminate most of the noise caused by the air ventilating. The majority of the noise generated by high capacity range hoods is not caused by the blower itself, but by the air moving through the filters and ductwork.

A remote ventilator may be able to be purchased separately to replace the blower, if there is one already installed in the range hood. For example, Best Chimney hoods will accept several optional blowers that can be mounted on the roof or exterior wall, depending on homeowner preference and the ducting situation.

What Size Canopy to Chose

The size of the hood is determined by the appliance to be vented. For cosmetic and economic reasons, most range hoods are selected to match the cooktop in width. This lines up the range hood with the cooktop for a cleaner look, especially where cabinetry will be abutting the cooking area. This is considered to be the minimum width.

Where space is not restricted, a wider hood can be used to increase the capturing area. Islands require a greater capturing area; therefore, the hoods used in these installations should overlap the appliance by a minimum of 3 to 6 inches on either side.

Measure available ceiling height before selecting an updraft hood to verify that there is sufficient available installation space. Required height is determined by adding the floor-to-countertop height, plus the manufacturer's recommended clearance space between the appliance and the bottom of the hood, plus the height of the hood. The minimum clearance between cooktop and fan is 18 inches, but more common clearances are 24 to 30 inches.

Liner Inserts

A "Liner" is a range hood that is mounted inside the canopy and "lines" a decorative hood that the designer may create out of wood, plaster, tile, or metal.

Liners provide an inner canopy, complete with a blower system, switches, and lighting, and enable the designer to be totally creative in building a one-of-a-kind focal point for a signature kitchen. Liners come pre-wired and pre-assembled and are ready to install. They are usually available in stainless steel or powder coat finishes, and may offer fluorescent or halogen lighting.

The outside canopy of the decorative hood can be made to any desired shape. Some dimensions of the canopy can be larger than the liner, such as the height and the top dimensions, but where the outside canopy and the liner meet is at the bottom edge of the metal liner both must match in width and depth.

Liners are sold in standard pre-fabricated sizes, but they can be made to order to fit almost any custom hood.

Color and Style Options

Range hoods, more than any other kitchen appliance, contribute to an overall sense of style to a kitchen, while performing a necessary function. Hoods may reflect a traditional or contemporary look. Many people prefer a clean, built-in look, while a professional style kitchen calls for stainless steel.

Stainless steel says "high end." This look has pervaded the professional style kitchen and is growing stronger in the Euro style trend. It is easy to clean and easily hides accidental scratches. Still, some people feel that a combination of an oversized professional range with a large stainless steel range hood is a little too imposing and prefer to soften the look with a contrasting material for the hood.

Range hoods are commonly available in black, white, bisque, or almond. For those with more daring taste, hoods are available in custom colors and textures. The only limit is the designer's imagination. Some high end models, such as by Abbaka, are sold in copper and brass in a choice of finishes, a wide array of powder coated enamel, or metallic colors.

Plaster or tile hoods are commonly fabricated using plywood and are covered with the finish material. Some designs are quite exotic. Best Hoods even sell several models that combine stainless steel with glass to create modern works of art. Some models, such as Vent-a-hood offer decorative bands or lips to set off the canopy.

At the high end of hoods is Abbaka, priced from just below \$3,000. These hoods can be completely customized and serve as a dramatic focal point for the kitchen. Samples of their designs are below:

Lighting Options Most standard hoods and liners are available with integral lighting, either fluorescent or halogen. Heat lamps may be added to others. Custom hoods and liners may be limited in lighting options due to minimum required dimensions.

Halogen lighting has become more and more popular since its inception. The number of halogen bulbs corresponds directly to the width of the hood.

Lights may also include dimmer switches.

Best Hoods offers an optional variable speed slide control or wall mounted control panel are also offered that can control lighting and blower speed. Activating switches should never be installed directly behind a burner or element.

Accessory Options

Several options are available to customize the hood to suit each customer's needs.

- **Backsplashes** provide dramatic and functional backdrop for wall-mounted hoods. When protection is needed, a stainless steel backsplash is easier to clean than materials such as tile and stone. Many professional type ranges include a backsplash as a required accessory, but when they do not, they often can be purchased separately from the hood manufacturer.
- **High Ceiling Chimney kits** extend the chimney to accommodate high ceilings.
- **Flu extensions** are available for most chimney, wall, and island range hoods to extend their reach to up to a 10 ft. ceiling.
- **Wall Controls** are available for many models to provide remote light and blower control away from the cooking area.
- **Ductless Kits** are available for a few vented models to convert them to recirculating units.
- **Pot racks** are sold for as optional accessories for some models for overhead storage of pots and pans
- **Wire Racks and Hangers** for storage of utensils
- **Warming shelves** are sold with some models to keep food warm after cooking.

Sizing and Safety Considerations

The American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) and the Home Ventilating Institute (HVI) recommend a minimum rangehood capacity of 100 CFM. The National Kitchen and Bath Association recommends a minimum of 150 CFM for all cooking appliances. However, modern cooktops are producing ever-increasing amounts of heat and odors, and quite often a much more powerful fan is called for.

However, bigger is not always better. Ventilation systems should always be sized by professionals. High-powered hoods that are oversized for the home in which they are installed could pose a health hazard. Fans that remove internal air at a rate of over 1000 CFM are powerful enough to pull exhaust fumes out of a fireplace, woodstove, water heater, or furnace.

Most modern heating equipment provides for independent sources of outside air for their combustion chambers, but a powerful ventilation fan could overwhelm them. The resultant "backdrafting" could expose occupants to carbon monoxide, oxides of nitrogen, and other pollutants.

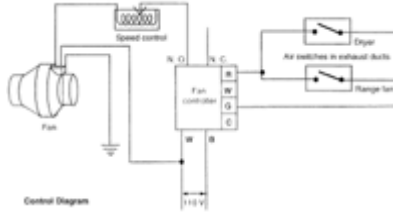
A simple test to see if this is happening is to use a stick of incense or a smoking match. Close all interior doors except those between the kitchen and combustion device. While the exhaust fan is running, watch to see whether the smoke rises up the flue. If the smoke moves toward the kitchen, backdrafting is occurring. (Try to perform the test while the furnace blower is operating because unbalanced air flows in ductwork can contribute to depressurization problems.)

To prevent backdrafting, a reliable source of make-up air must be provided to replace air that's being exhausted. Note: opening a window will not satisfy this need. It's impractical in all weather, and it may not be large enough to satisfy the hood's draw.

Building codes may soon require this. Canada's national building code today requires that a separate fan be wired to blow outside air into the same space when any exhaust device, including fans and clothes dryers, exceed 160 CFM. This fan-forced air can be introduced to the ductwork of the heating system or to an adjacent living space not blocked by a closable door. In cold climates, it should be pre-heated to avoid cold drafts.

Range hood manufacturers do not provide integrated solutions for make-up air, so the installer has to provide a means of activating the supply fan when the exhaust fan starts. A relay can be wired to the ventilator switch, but that could void the warranty. Another possibility is to install an "air switch" in the exhaust duct that senses when air is flowing.

This schematic from the R-2000 Make-up Air Guidelines shows how air switches can trigger the make-up air fan



Ducting Considerations Resistance Ductwork adds resistance to a ventilation system. This resistance will affect the performance of the blower and must be considered when sizing a unit. This is not something that should be left to guesswork.

A qualified service technician, installer, or ventilation engineer will calculate the resistance in the system based on a number of factors as noted below. He will also ensure that all local building codes are satisfied. He should always refer to the specific installation instruction for each specific ventilation product.

First, the hood selected should always be checked to make sure it's compatible with the existing ductwork. The minimum size duct allowed on most range hoods is 3 1/4" by 10", which is equivalent to 6" round. Vent pipes should be no smaller than 6" in diameter.

For most efficient airflow, the length of the run should be kept to a minimum, as well as the number of elbows and transitions. Also, remember that 45-degree turns are better than 90 degree turns. Elbows and transitions should not be installed back-to-back or they will cause a significant reduction in performance. A 15" straight section should be installed between transitions whenever possible.

Performance calculations are always made on the smallest duct size in the run. For maximum performance, no duct should be smaller than the manufacturer's recommended transition size from the hood. Always follow manufacturer's recommendations.

When configuring a system for high-altitude installations (above 5000 ft), estimate a 20% reduction in CFM performance. Otherwise, duct size should be increased.



Safety Range hoods may be connected either to round or rectangular ducts, but the ductwork must be metal. Smooth ducts are preferable to flexible style, as that is not recommended by the National Uniform Mechanical Code standards.

Plastic ductwork, especially 4" dryer duct should never be used on a range hood installation.

Never use butt joints. Vent pipes should always be joined and taped with duct tape, male to female, with the male end pointing in the direction of the flow.

Ducting must be vented to the outside, never into a closed area such as an attic or basement. Otherwise, they form a fire or safety hazard, as well as causing potential structural damage due to moisture.

Do not use external fans or booster fans. These should never be added to an existing system to increase performance of a range hood; may void the warranty and could cause problems with the electrical circuitry load.

Cold weather installations require an additional backdraft damper installed to minimize backward cold airflow. In addition, a non-metallic thermal break is needed to minimize conduction of cold airflow through the ductwork. The damper should be in the cold air side of the thermal break, and the break should be as close as possible to where the ducting enters the heated portion of the house.

Maintenance and Safety

- Enameled hoods should be cleaned by wiping down the interior and exterior of the hood as needed with a soft cloth and warm water. Do not use acids, abrasives, strong detergents, solvents, or scouring pads.

- Stainless steel hoods should be washed regularly with a clean cloth, warm water, and mild dish detergent. Do not use acids, abrasives, strong detergents, solvents, or scouring pads. They should be cleaned in the direction of the polish lines, rinsed well with clear water, and wiped dry immediately. A light coat of mineral oil may also be used.
- Copper or Brass hoods do not have any type of electroplating or coating; their finish may oxidize and/or tarnish. Use a quality copper or brass cleaner. Be sure to polish the hood in the same direction of the grain of the hood. Do not use acids, abrasives, strong detergents, solvents, or scouring pads.
- Wood canopies should be treated the same as fine cabinetry. Water should never be used to clean them.
- Aluminum mesh filters should be washed in the dishwasher once a month or so, depending on use, more frequently if a lot of fried foods are cooked. Baffle filters commonly used in professional style range hoods, are designed to operate longer in high grease conditions. These can be cleaned with soap and water when they start to look unsightly.
- On some models, such as Vent-a-hood Nouveau Pro NP9, the blowers are removable and can be cleaned in the dishwasher.
- Vent fans are for general purposes only. Do not use them to exhaust hazardous or explosive materials and vapors from the home. A spark in the blower motor could ignite the fumes.
- During the period of construction or remodeling, to avoid motor bearing damage, and noisy or unbalanced impellers, keep drywall spray, construction dust, etc. off the power unit.
- High performance models require a separate grounded 120V, 60Hz power supply. The service should have its own 15 am circuit breaker. A ground fault breaker is not recommended, however, and may cause interruption of operation.

Indoor Gas Grills:

Local codes may require a fire-rated construction for installation of open gas grill appliances. Please check with your local codes prior to installation.

Trouble-shooting

Insufficient airflow for the cooking load can cause smoke and grease-laden air to spill out from under the range hood. This is usually a sign that the unit has been undersized. Cross drafts in the kitchen can cause the same result, however, but it could also be a sign that inadequate make-up air is available to produce an efficient airflow.

If a fire flares up on the cooktop, turn the blower off until it is extinguished. An operating blower may spread the flames. Vent-a-hood's "Magic Lung" centrifuge blower is an exception to this rule, however, and will contain grease fires without letting flames into the exhaust duct.

Carbon monoxide

Faulty stoves, furnaces and gas dryers and grills will produce dangerous Carbon Monoxide levels. Carbon monoxide detectors are inexpensive and should be considered a necessity wherever fuel burning appliances are used.

A properly functioning burner will burn with a blue and well-shaped flame. If the flame is irregular and yellow, the gas is not being burned properly and the burner unit needs to be cleaned, repaired or replaced.

Routinely inspect pilot lights to make sure they are burning. If the appliance has not been disconnected and the pilot light is out, gas is escaping into the home.

See Also:

[Bathroom Ventilation](#)