Kitchen Ventilation

By Carol Lamkins, CID, CMKBD

An increasing number of stylized and contemporary hoods are being offered to match kitchen motifs. Trends drive much of the design. The use of pot racks and railings under vent hoods are replacing warming shelves. New colors increasing in popularity are faux metallic/ textured enamel, oil rubbed bronze, pewter, gun smoke and custom colors to match ranges. Hood liners in custom hoods have reduced the amount of standard and custom colors used. However, the important concern today is based upon health from environmental cleanliness.

Efficient cooking ventilation ensures indoor air quality by removing cooking contaminants before they mix with the rest of the air in the home. Vaporized water or steam acts as a "carrier" and smoke contains carbon particles, sulfuric acid, and irritants. Removing of these contaminates protects against the deterioration of household furnishings.

Air in a house is four times more polluting that exterior air. The heat from a four burner cooktop is equivalent to one ton air conditioning. The odor will cling and linger in the home. And if that is not enough, hazardous gases such as nitrogen dioxide and carbon monoxide are generated by gas appliances. And the most alarming statistic is that cooking generates over one gallon of grease per year that acts as sticky film on the cooler surfaces of walls, ceilings and cabinets. These deposits condense and cause discoloration and dulling of paint work. The deposits also become rancid, growing fungus and attracting insects. The continued presence of cooking fats, grease, steam and odors are an ongoing problem in every kitchen.

EFFECTS OF COOKING CONTAMINATES

TYPE	PERSONAL	HOUSE OR DWELLING
HEAT	• DISCOMFORT • HIGHER UTILITY COST	• DISCOLORATION AND PREMATURE AGING OF WOOD AND TEXTILES
GREASE	• ANNOYANCE • HIGHER MAINTENANCE COST	• FUNGUS GROWTH • RANCID ODORS • INFESTATION (INSECTS) • FIRE HAZARD
SMOKE	• IRRITATION TO EYES, THROAT AND SINUS • HIGHER MAINTENANCE COST	• DISCOLORATION OF ALL FURNISHINGS • SULFURIC ACID TOXIC TO HOUSE PLANTS
ODOR	• DISCOMFORT	• DESTROYS THE NATURAL FRAGRANCE OF ALL CLOTH, WOOD AND FLORAL FURNISHINGS
*STEAM	• DISCOMFORT • HIGH HUMIDITY	• SOOT AND GREASE DEPOSITS ON ALL FURNISHINGS • DECOMPOSITION OF ALL UNPROTECTED WOOD, VINYL SURFACES, AND TEXTILES
HAZARDOUS FUMES	• BY-PRODUCTS OF GAS APPLIANCES; NITROGEN DIOXIDE, CARBON DIOXIDE AND CARBON MONOXIDE ARE DANGEROUS TO GOOD HEALTH	• POLUUTION

* CONTAMINANT CARRIER

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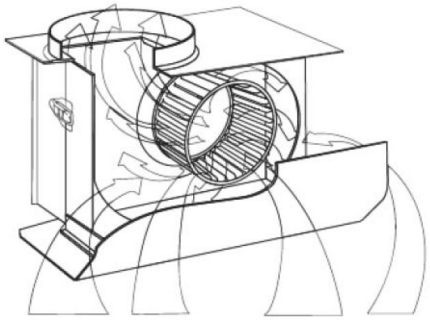
VENTILATION REQUIRED FOR COOKING EQUIPMENT					
Cooking Equipment Rating			Kitchen Ventilation		
BTU Rating 4–6 Burner Cooktop	BTU Rating B.B.Q., Wok or Griddle	Watts	Hood Type	CFM Rating Fan/Blower No Filters	CFM Rating Fan/Blower w/ Mesh/Baffle Filter
30,000	20,000	12,000	Wall Mount	300	450
60,000	40,000	24,000	Wall Mount	600	900
60,000	40,000	24,000	Island	600	900
120,000	80,000	48,000	Island	1200	1800
30,000	20,000	12,000	Remote		450
60,000	40,000	24,000	Remote		900

CFM – Cubic feet of air per minute leaving kitchen
BTU – British Thermal Unit, a measurement of heat output



So how do we achieve good ventilation? Vent hoods filter out the kitchen grease saving hours of cleaning, extending the time between repainting and resulting in a cleaner, fresher kitchen. The first step is to choose the correct size of canopy that will collect the vented gases and particles. Then the number of blower units must be matched to the cooking equipment. And finally, the correct sized ducting must be installed properly.

Types of ventilation

A fan or a centrifuge blower (shown above) are the two most common methods for ventilation systems to draw steam and odors from the cooking surface. Fans come in a traditional rotary version or a centrifugal that moves more air and is quieter. Most fans have at least two speed settings, one designed for operation during cooking, and one that is much quieter to be used during meals.

Some advanced models have an automatic fan feature that turns the fan on when temperatures get too high. This feature is a signal to the fan that steam or smoke might be present in the air and the fan should be operating. Vent hoods can also feature automatic shut-off timer options.

Noise

Vent hood noise levels are most commonly measured in Sones. As a point of reference, normal conversation levels are measured at around 4 Sones. Vent hood sound increases with the increase of CFMs. This table gives an example of Sone levels from one manufacturer as generated by a certified independent industry testing lab.

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SONE LEVELS	
300 CFM Blower	5.4 Sones (At High Speed)
600 CFM Blower	6.5 Sones (At High Speed)
900 CFM Blower	6.3 Sones (At High Speed)
1200 CFM Blower	6.6 Sones (At High Speed)

Sone – a subjective unit of loudness, equal to the loudness of a pure tone having a frequency of 1000 hertz at 40 decibels above the threshold of audibility.

Noise can be reduced using a variable control to vary the speed which in turn varies the sound. Remote blowers installed in the attic or on top of the roof may help reduce noise, but some opinions are that they may be noisier, especially when mounted on a side wall. They may also require more service and are not easily accessible. Fire safety could be an issue as there is a longer grease trail, extending to outside wall and roof. The longer ducting may not be as efficient and the installation may be more expensive.

Selection of the right vent hood

Critical questions to ask when selecting a vent hood are:

1. What is the type of cooking appliance – range, rangetop, cooktop, etc.?
2. What style or shape is best suited to the kitchen design?
3. What is the width of the cooking appliance?
4. If gas, what is the heat output (British Thermal Units or BTU rating)?
5. Where will the range, rangetop or cooktop be placed in the kitchen? - Against a wall, in a peninsula or in an island?
6. Is the ventilation going to be hidden, integrated (blended) or a focal point in the kitchen?
7. How much airflow (CFMs) is needed to exhaust 100% of the heat and pollutants?
8. What is the size recommended for the appropriate ventilating hood - height, width and depth?
9. What color and finish is desired?
10. List all accessories: lighting, utensil rails, decorative bands, etc.

The type of vent hood depends on the layout and structure of the kitchen, the local building codes, and the style preferences. There are five major categories of ventilation placement.

1. **Under-cabinet vent hoods:**
   Traditional and usually the least expensive type of vent hood, under-cabinet vent hoods are usually mounted under a wall cabinet and attached to an exterior wall. In many models, air is pulled out of the kitchen through an exhaust duct in the exterior wall. Slide-out vent hood systems fit under cabinets and slide out easily when needed. Many times they automatically begin the ventilation process when pulled out. The extension

may have a “window” inserted to allow upper light to illuminate through to the cooking surface.

2. **Wall mount vent hoods:**
   Stylish, and professional in appearance, wall mount vent hoods continue to gain popularity. Often used on exterior walls when a cabinet is not available. A stainless steel finish with a commercial look is common on wall mount vent hoods. There are many stylish designs available.

3. **Built-in blower and lighting packages for custom hoods:**
   A custom vent hood is usually made of wood to match the cabinetry. However it could be constructed of any material. All exposed wood is covered with a metal liner for fire separation. The blower and lighting package insert and the liner are purchased first and then the hood is constructed as per specifications.

4. **Downdraft ventilation:**
   This type of ventilation is used when attaching to a wall is not an option. The cooking steam is pulled against gravity into stationary vents on the top or vents in the back of the range or countertop in order to pull air into exhaust ducts set below floor level. Retractable downdraft vent systems slide up and down from behind the cooking surface. The better designs periscope the intake vents to the top level of the pans. The advantage is that the ventilation system does not overhang the cooking surface and interfere with sight lines or views.

5. **Microwave oven/vent hood combination:**
   Combination units save space, but they are not very efficient. This type of unit is NOT recommended due to the lower mounting distance from the cooking surface limiting the size of pots on the back burners or elements.

Sizing the canopy of the vent hood

The canopy or shell is the physical exterior portion of the hood. The purpose of a vent hood canopy is to collect cooking vapors as they rise up from the cooking surface. Manufacturers recommend that the vent hood is sized 6” wider than the cooking surface for better capture. This is especially important for island hoods. However sizing the vent hood to match the cooking surface is also acceptable for wall mount units. The front of the canopy should extend to the front of the burners or elements.

The inside hood height must be at least:

- 9-inches tall for cooktops
- 12-inches tall for indoor barbecues
- 18-inches tall for commercial cooking equipment

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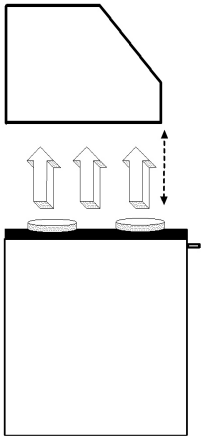
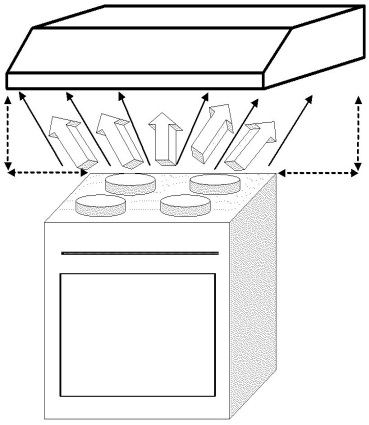




Determining the cubic feet per minute (CFM) or draw of air.

The rate at which the kitchen hood can extract air from the kitchen should be matched to the size of the room. Larger rooms will need more powerful extractor fans in order to prevent bad odors. CFM is a measurement of the volume of air that is flowing into or out of a space. Calculating the CFMs starts with the volume of your kitchen by multiplying its height by its length and width. Choose a vent hood that is capable of completely replacing or cleaning the air in the kitchen at least eight times every hour. The more powerful fans that can replace the air at least twelve times an hour are even better.

Some considerations are:

- Cooktops require 300 CFMs of air per four burners (450 CFMs of free air)
- Indoor barbecues require 600 CFMs of air (900 CFMs of free air)
- Commercial cooking equipment needs 600 CFMs for every two burners, barbecue or griddle (900 CFMs of free air)

Ducted or re-circulating vent hoods (non-ducted)

Vent hoods can be ducted to either the outside or set up to re-circulate the air within the kitchen. However, the most effective choice is to vent to the outside either horizontally through the wall or vertically through the roof. Re-circulating air back into the kitchen requires that the air be cleaned, usually with a carbon or charcoal filter.

Vent hood filters

All vent hoods have some type of filter to trap oil and grease from cooking. Most have reusable, metal mesh filters that will go in the dishwasher. Because the filters are quite large they may not easy to wash in a standard sink.

1. **Aluminum (mesh) filters:**
   This is the most common type. Replacement filters are usually available. Most of the time they are installed horizontally, collecting the oil on the surface. If cleaning in the dishwasher, set the cycle to gentle.

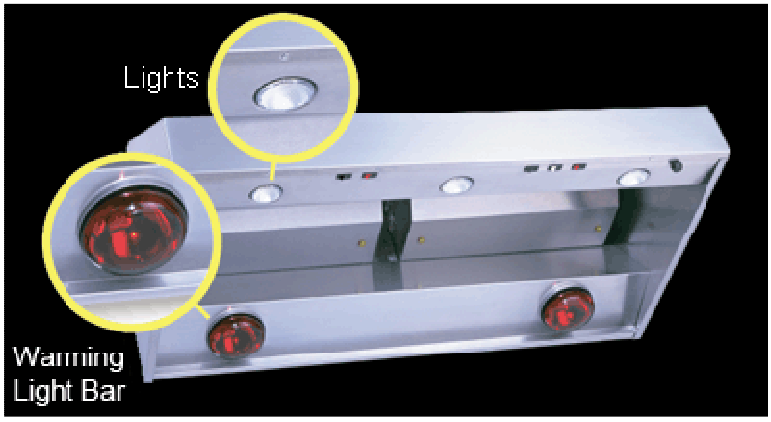
2. **Baffle filters:**
   These are among the best replaceable vent hood filters giving many years of performance. They are usually made of the same 304 stainless steel material as the vent hoods. In many cases the baffle filters come with grease trap as well, and the filters are sloped towards the back, so any collected grease and moisture will drip in the grease collector at the back of the hood. The baffles and the grease channel should be cleaned once a month or after every 30 hours of operation.

3. **Charcoal (carbon) filters:**
   Carbon filters provide better, cleaner ventilation and are an option for re-circulating vent hoods. The durability and effectiveness of carbon filters is considered far superior to that of conventional filters. Filters are replaced every four months for one-time use only and should be changed every four months for proper vent hood performance.

Vent hood controls
It is standard for hoods to have their controls in an easy-access position on the front. However, some older models have sliding switches that are a little tricky to set in the right position. Touch controls are easier to use. Depending upon the reach of the user, the control may also be wired to and placed on the wall beside the vent hood if it is mounted at maximum height.

Lighting options
A good vent hood will provide enough light over the cooktop for you to see into the pots. A single 40 watt lamp is usually not adequate. A 50-watt halogen lamp with dimming options to 25 watts is a better choice. Fluorescent lamps are also an option. Both options are energy-savers. Depending upon the size of the vent hoods will determine how many lamps are necessary. For examples, this manufacturer installs two lamps for hoods 24” to 41” wide, three lamps for 42” to 53” wide and three lamps for 54” to 66” wide.

A warming light bar may also be an option for keeping foods warm. This feature needs to be paired with a warming shelf assembly. These shelves are the same width as the hood and included mounted around 15” below the warming light bar.



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Installation of the vent hood

The recommended distance from the top of the cooking surface to any combustible material is 30" (always refer to manufacturers specifications and local codes for proper clearances). Tall people find this clearance an interference with the sight line to the cooking vessels. Manufacturers may allow and increase to 36” above the cooking surface. Make sure that this does not compromise the specific vent hood operation and warranty.

Here are some specific guidelines from one manufacturer:

- Hoods 19-inches deep and 6-inches longer than the cooktop should be 24-inches maximum above the cooktop
- Hoods should be 21-inches deep and 6-inches longer than the cooktop
- Hoods 24-inches deep and 6-inches longer than the cooktop should be 30-inches maximum above the cooktop
- Hoods 6-inches deeper than the cooktop and 24-inches longer than cooktop can be 42-inches above the cooktop

The backdraft damper

As air can travel out a ducted system, so can it travel in. To prevent this, most systems are equipped with backdraft flaps located at the fan box exhaust port. To stop cold air from coming in, these flaps need to be checked from time to time to make sure that they are not clogged with grease and stuck in position. The exhaust hood (outside vent) has either flaps or louvers that must be free of obstructions. Also confirm that the ducting joints are sealed with special tape to prevent condensed water from dripping into closed spaces between the walls and damaging the wood structural members and insulation.

Ducting

The duct size is determined by blower diameter as specified by the manufacturer. The duct must never be restricted by the duct size. Flexible ducting is not permitted. Short and straight runs are best. Longer runs require a larger diameter duct. All joints must be sealed with duct tape. Turns must be smooth and gradual with 4 to 5 foot spacing between turns. Combining ducts must use angles as per drawing below.

As a guideline, 300 CFM requires a 6 inch round or 3-1/4 inch by 10 inch or 6 inch diameter vent duct and 600 CFM requires an 8 inch round or 3-1/4 inch by 14 inch vent duct. Every 48-inches of hood, requires an additional vent duct and motor. Sometimes a manufacturer provides a 3-1/4 inch by 10 inch (for fitting into the wall stud bay) or 6 inch vent collar on the hood. These vent dimensions are considered a minimum size. If the size is too small, more air will be created in the hood than can get to the end of the pipe. The contaminants will back up into the kitchen.

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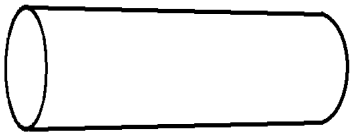
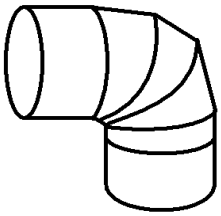
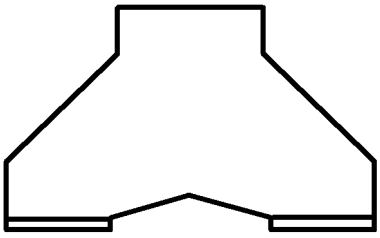


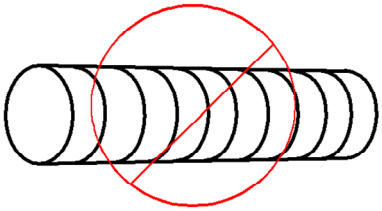
Smooth
Walled Duct



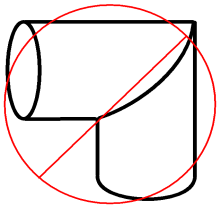
Smooth
Gradual Turn



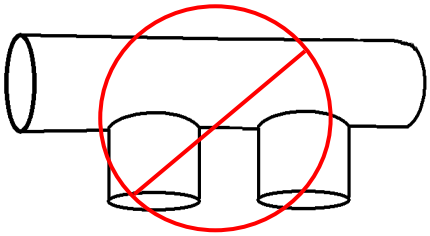
Proper Combining
of Two Ducts



Flexible Duct



Sharp
Angled Turn



Improper
Combining
of Two Ducts

Vent hood maintenance
Maintenance includes removing and washing the filter and cleaning the canopy of the hood. The ease of removing the filter is important to see demonstrated before purchasing the vent hood. Wipe the exterior and interior of the vent hood regularly following the manufacturer recommendations for cleaning agents.

Ventilation is the key to avoid spreading grease and odors from cooking surface that can damage the kitchen and those rooms opening into the kitchen space. Good ventilation systems remove stale, steamy air through ducts to eliminate problems. Interior designers owe it to their clients to be informed on this critical appliance that contributes to health and environmental cleanliness as well as to the aesthetics of the kitchen remodel.

Resources:
http://www.rangehoodsstore.com/articles/different-types-of-range-hoods/
http://www.vahmarketing.com/
http://www.ventahood.com/magiclung.jsp
http://www.kitchenhoods.ca/catalog/guide.php
http://www.newhomesource.com/HomeGuideArticle/article-whirlpoolkitchenventilation