# Ventilation 101

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#### VENTILATION 101

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Proper kitchen ventilation will provide a more comfortable living space and a healthier home environment.

#### FACT:

IT'S ESTIMATED THAT THE AVERAGE FAMILY OF FOUR PRODUCES UP TO ONE GALLON OF GREASE EVERY YEAR DURING THE PROCESS OF COOKING.



## Benefits of Proper Kitchen Ventilation

# WHERE DOES ALL THAT GREASE GO IF NOT VENTED PROPERLY?

- cooking contaminants mix and stick onto your cabinets
- absorb into the walls and draperies
- saturate clothes
- build up in your carpet



### **GOOD VENTILATION**

will remove any airborne particles that may adversely affect the health of you and your family.



### **Benefits of Proper Kitchen Ventilation**



A properly ventilated kitchen will:

REDUCE THE BUILD UP OF MOLD AND MILDEW

PROVIDE A BETTER QUALITY OF AIR IN THE HOME

REMOVE ODORS AND COOKING CONTAMINANTS SUCH AS CARBON MONOXIDE (CO), HEAT, AND GREASE

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### **Benefits of Proper Kitchen Ventilation**

Research has indicated that people spend 90% of their time indoors

MANY RISKS TO HEALTH MAY BE GREATER DUE TO POOR INDOOR AIR QUALITY



Air in homes with gas cooking appliances don't meet EPA standards for outdoor air quality standards and they don't regulate indoor air quality.

Homes exceed standards for:



#### SOURCES OF INDOOR AIR POLLUTION:

- Pollutants from cooking such as gas, moisture, NO2, formaldehyde, CO, CO2 and ultrafine particles.
- Environmental tobacco smoke. Secondhand smoke is a major indoor air pollutant.
- Radon; a colorless, odorless gas which has been identified as a leading cause of lung cancer, second only to cigarette smoking.
- Volatile organic compounds (VOCs) from wood products, adhesives, glues, preservatives, insulation materials, fabrics, paints, cleaning products and pesticides.
- Ozone from electric motors, copiers and electrostatic air cleaners.
- Biological contaminates such as mold, dust mites, pet dander, viruses and rodents.

### **Benefits of Proper Kitchen Ventilation**



Kitchen ventilation removes contaminants directly from the room

- Kitchen and bath exhaust fans reduce levels of organic pollutants vaporized from hot water usage via dishwashers and showers
- Gas cooktops/ranges can be adjusted to decrease the amount of emissions (improper adjustment indicated by a persistent yellow tipped flame increases pollutant emissions; gas companies can adjust burner so the flame tip is blue)

### **Benefits of Proper Kitchen Ventilation**

RECAP



Proper ventilation decreases mildew, peeling and discoloration of wall finishes due to moisture and contaminants.

Minimizes build up of cooking odors and grease in draperies, walls, cabinets and clothes.

Prevents cabinet damage by reducing condensation of acidic contaminants.

Removes excess cooking heat and household chemical vapors.

Reduces mold and bacteria build-up on countertops and cooking areas.



### The Anatomy of a Range Hood



## 5 Most Common Range Hood Installation Types



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### **Common Terms**

### CFM

A range hood's performance is measured in Cubic Feet per Minute (CFM). This is a measure of how much air can be removed from a given space in a single minute. Another way of thinking of CFM is horse power in a car. It's really a measure of performance.

#### BTU

A British Thermal Unit is the amount of heat energy needed to raise the temperature of one pound of liquid water by one degree from 60 to 61 degrees Fahrenheit. More importantly, BTUs is the performance measurement of all gas ranges. A typical range BTU measurement is 60,000 BTU.

#### Sones

A sone is an internationally recognized measurement of loudness. It is a unit of loudness as perceived by a person with normal hearing. This is the level and quality of noise your range hood will emit in a kitchen environment when properly ducted.

#### **Capture Area**

The range hood's required footprint to properly capture and extract airborne pollutants.

Soft whisper	0.5 sones
Refrigerator	1 – 2 sones
Normal conversation	4 – 5 sones
Traffic noise	8 sones

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The power of your cooktop or range is the most important factor in DETERMINING YOUR CFM NEEDS.



## Common Terms – CFM & BTU Pairing

You will need at least 1 CFM per 100 BTUs

If you have a 60,000 BTU cooktop or range you will need at least 600 CFM

Formula: gas range or cooktop BTU ÷ 100

Formula is a max estimate and assumes that all burners are being used on high at the time.

### **MATCHING CFM TO COOKING STYLES**

Small kitchen	250 – 450 CFM
Medium kitchen	450 – 715 CFM
Large kitchen	600 – 1,000 CFM

### Common Terms – Capture Area



- The width of the hood should be equal to the width of the cooktop or range.
- For every 3 inches beyond recommended mounting height, increase the width of the range hood by 3" on each side to prevent the smoke and contaminants from escaping the ventilation zone.
- Additionally, you can increase the CFM levels to make sure contaminants are within the air stream if the range hood does not offer a wider version.
- Use hoods that cover the rear burners and at least half of the front burners.



Although every application is different there are **SOME GUIDELINES YOU CAN FOLLOW** to make sure that the hood dimensions are adequate to provide good capture area

### **Blower Types**

### There are 3 types of blowers:



Internal Blower A blower that is mounted inside the hood.



### **External Blower**

A blower that is mounted to the exterior of the home.



#### **In-Line Blower**

A blower that is mounted within the interior of the home but away from the hood.

### **Basics of Ducting**

# DUCTING IS THE MOST IMPORTANT COMPONENT OF VENTILATION.

Ensure optimal performance by following these simple rules of thumb:

- Keep duct run as short and straight as possible
- Always use the appropriate duct size for your application
- Always use smooth wall ducting, the ridges inside flexible ducting can reduce airflow performance



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For satisfactory air movement, the total duct length SHOULD NOT EXCEED 100 EQUIVALENT FEET

### Basics of Ducting, continued

- If elbows are needed, a certain amount of deduction will be considered from the 100 equivalent feet for each elbow, transition or outside cap used.
- Many manufacturers include a matrix indicating how much of a reduction to add to each duct component
- Another solution for duct runs is to increase the diameter of the duct.

For example if your range hood requires 6" round ducting but your duct run will exceed 100 feet you can increase the diameter to 7" or 8" round.

Duct pieces		Equivalent number length x used =				Total	Duct pieces		Equivalent number length x used =				Total
	3-1/4" x 10" Rect., straight	1 Ft.	×(	)	=	Ft.		6"- 8" Round wall cap with damper	30 Ft.	x (	)	=	Ft.
	7" Round, straight	1 Ft.	×(	)	=	Ft.		6"- 8" Round, roof cap	30 Ft.	x(	)	=	Ft.
	8" Round, straight	1 FL	×(	)	=	Ft.		6" round to 3-1/4" x 10" rect.	1 Ft.	×(	)	=	Ft
	3-1/4" x 10" Rect.90° elbow	15 Ft.	× (	)	=	Ft.		6" round to 3-1/4" x 10" rect. transition	16 Ft.	×(	)	=	FL
	3-1/4" x 10" Rect.45° elbow	9 Ft.	× (	)	=	FL		90° elbow 7° or 8° Round, 90° elbow	15 Ft.	× (	)		Ft
	3-1/4" x 10" Rect.90" flat elbow	24 Ft.	×(	)	=	Ft.		7" or 8" Round, 45" elbow	9 Ft.	× (	)	=	Ft.
	3-1/4" x 10" Rect. wall cap with damper	30 Ft.	x (	)	=	Ft.		7" or 8" Round wall cap	30 Ft.	x (	)	=	Ft.
<b>6</b> .	3-1/4" x 10" Rect.to 6" round transition	5 Ft.	× (	)	=	Ft.	8	7" or 8" Round, roof cap	30 Ft.	×(	)	=	Ft.
6.	3-1/4" x 10" Rect.to 6" round transition 90" elbow	20 Ft.	× (	)	-	Ft.	۵.	7" round to 3 1/4" x 10" rect. transition	8 Ft.	× (	)	=	Ft
02	6" Round, 90 <sup>1</sup> elbow	15 Ft.	×(	)	=	Ft.	<b>G</b> .	7" round to 3-1/4" x 10" rect. transition 90" elbow	23 Ft.	×(	)	=	Ft.
Ø	6" Round, 45° elbow	9 Ft.	×(	)	=	Ft.			Subtotal co	lum	n 2	=	Ft
9			0		-				Subtotal co	lum	n 1	=	Ft.
Subtotal column 1 =			=	FL	Total ductwork =					=	Ft.		

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### Basics of Ducting, continued

You may lose efficiency by allowing the airborne contaminants to escape the air stream before they reach the hood's filters.

#### MOUNTED TOO HIGH



You risk causing heat damage to the unit and obstructing your view of the cooktop.

Check the range hood spec sheet or installation manual for the appropriate mounting height range.



### **THE MOUNTING HEIGHT AND SIZE OF THE HOOD** plays a critical role in the performance of the hood.



### Basics of Ducting, continued

### **Ductless Recirculating Option**

- A recirculating kit is used when venting air to outside of the home is not possible.
- It works by using charcoal (carbon) filters to filter out impurities such as smoke and odors before recirculating the air back into the kitchen.
- The standard hood filters are still used to filter grease and the charcoal filters are typically installed above the primary filters.
- Some hoods will include an air diverter plate to direct the air back into the kitchen. Other hoods have air diverter plates already built into the hood.





It is always recommended to vent the hood to the outside for maximum performance but a recirculating kit is a good alternative if venting out of the home is not possible.

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### **Filter Options**

### **Mesh Filter**

The mesh filter is the most popular and costeffective filter design which consists of multiple layers of aluminum mesh stacked on top of each other. Smoke and particulates are filtered through the mesh layers while grease is collected in tiny holes within the mesh itself. Due to the nature of mesh, grease will build up over time reducing performance if not frequently cleaned. Most mesh filters are dishwasher safe on the low setting.



### **Filter Options**

### **Baffle Filter**

The baffle filter is found in most professional-style range hoods. As air passes through the baffles it is forced to change direction which separates the grease from the air. Because grease droplets cannot change direction as rapidly as the air, they end up collection inside the baffles and draining into the frame of the filter or into a residue tray. Most baffle filters can be placed in the dishwasher. This filtration method drastically reduces the risk of spreading flames should a fire breakout on the cooking surface.



### **Filter Options**

### Hybrid Baffle Filter

The hybrid baffle filter is a cross between baffle and mesh filters. These baffle filters offer a professional, aesthetically pleasing design and the aluminum mesh behind the baffle filters out cooking contaminates. Most hybrid baffle filters can be placed in a dishwasher for easy cleaning.



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### **Filter Options**



Some manufacturers have filter-less systems, or systems that can self clean. In this case typically removable residue cups capture grease expelled directly from the blowers. These cups can be emptied, rinsed and reused.



### **Filtration Method**

### **Perimeter Aspiration Systems**

This form of ventilation moves air-flow away from the central area and evenly distributes it around the perimeter of the hood. This technique increases air velocity and improves the capture of cooking contaminates.





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### Make Up Air – What is it?

Over the years homes have become more tightly sealed due to improved construction techniques and range hoods have become more powerful.

While better-sealed homes is good for energy savings there is one major drawback, NEGATIVE AIR PRESSURE.

When negative air pressure occurs the air back drafts in through naturally vented combustion devices such as fireplaces and water heaters which can bring in harmful gases, smoke and particulates. Or through windows and doors which can cause mold, mildew and uncomfortable drafts. All of these factors can cause your range hood to not perform effectively.





#### **NEGATIVE AIR PRESSURE**

occurs when you exhaust air more quickly than you can <u>replace</u> it.

### Make Up Air – What is it?

Pulling air in through naturally vented combustion devices can bring in harmful gases, smoke and particulates.

It can also cause mold and mildew when brought in through windows and doorways.



Finally, negative air pressure AFFECTS YOUR RANGE HOOD'S PERFORMANCE.



### Make Up Air – What are the Regulations?

Regulations will vary based on different regions of the country

### 2009 International Residential Code, section M1503.4:

"Exhaust hood systems capable of exhausting in excess of 400 cubic feet per minute (0.19m<sup>3</sup>/s) shall be provided with makeup air at a rate approximately equal to the exhaust air rate. Such makeup air systems shall be equipped with a means of closure and shall be automatically controlled to start and operate simultaneously with the exhaust system."

The above regulation is the minimum requirement but some local municipalities call for more stringent codes such a requiring make-up air for range hoods over 300 CFM.

### Make Up Air – Solutions

There are two primary types of Make Up Air Systems

PASSIVE ACTIVE



### Passive Make Up Air Systems

Typically consists of a mechanized damper and a sensor. The purpose of a passive make up air system is to balance air pressure in the home.

The sensor (which allows the hood to communicate with the damper) tells the damper to open whenever the hood is turned on. When the damper opens it allows air to passively enter the home (passive means there is no fan pushing the air back in).

### Make Up Air – Solutions

#### Active Make Up Air Systems

Also called whole house ventilation, balance pressure in the home but have HRV and ERV qualities. These systems continuously monitor the air inside a home and activate when needed (when a range hood turns on, when pressure changes, etc.)

They have their own fan system inside to bring air in, condition it and then expel air from within the home. These systems are typically installed on a roof or inside an attic as they are much larger than passive make up air systems.

#### **HRV (Heat Recovery Ventilation)**

Conditions the air before it enters the home. This is very important in cold climates where freezing air must be conditioned first.

#### **ERV (Energy Recovery Ventilation)**

Does the same as HRV but also adds a level of humidity control.

### Make Up Air – Solutions

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**Passive Make Up Air systems** are generally less expensive than Active systems and are simply designed to balance pressure within the home. Outside air is not conditioned in any way with a Passive System. Local codes will determine which type of system will be needed for the home.

The most common Passive System is a Make-Up Air damper kit which consists of the following:



Make-up air damper



Transformer



Pressure Switch Components



### Make Up Air – Solutions

### 290 CFM Hoods

Due to the increase of Make Up Air regulations there are a variety of manufacturers that produce range hoods with low CFM settings.

### Make Up Air – Solutions

New technology is also available in the form of ACT<sup>™</sup> (AIRFLOW CONTROL TECHNOLOGY<sup>™</sup>)

ACT<sup>™</sup> is a feature offered that allow installers to limit the maximum blower CFM to meet local code requirements. This is available on more diverse product offerings which won't limit the design and style to only the 290 CFM range hoods.



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## How To Use the Range Hood – Getting Started

We recommend that you turn the range hood onto the lowest speed setting at least 5 minutes before you start cooking.

This will create an updraft that will guide the fumes directly into the stream of air the hood has created.

**Increase the range hoods** speed levels as fumes and odors increase during the course of cooking. Only use the range hood's max speed setting if you're using all burners at maximum BTU output.

When finished, leave the hood on for 5 – 10 minutes or on Delay Off to ensure all contaminants have been exhausted from the kitchen.

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Efficient ventilation of fumes from the kitchen also depends on the **CORRECT USE OF THE PRODUCT.** 



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### **ENERGY STAR Options**

### The Energy Policy and Conservation Act of 1975

Congress has passed a series of statutes establishing minimum energy conservation standards for consumer products and commercial and industrial equipment. The products regulated by the program represent about 90% of home energy use, 60% of commercial building energy use, and 29% of industrial energy use. Standards saved American consumers \$55 billion on their utility bills in 2013, and the annual carbon dioxide reduction will reach 265 million tons by 2020.

Certain builders or government building projects require all appliances to be Energy Star approved.

More manufacturers are providing design driven Energy Star alternatives as the demand increases.



### **ADA Requirements**

### **Americans with Disabilities Act**

More range hood products are being ADA compliant to adhere to new building and construction guidelines.

### Title 24 of the California Code of Regulations

California and Federal regulations provide a comprehensive set of standards covering almost all important areas of accessibility for persons with physical and sensory disabilities. California's Building Standards Codes (Physical Access Regulations) are found in Title 24 of the California Code of Regulations (CCR), and are designed to comply with the requirements of the <u>Americans with Disabilities Act (ADA) and State statutes.</u>

Range hoods with a wireless or wired remote control can be qualified as ADA compliant.



### Summary

A range hood is a prominent component of kitchen design. It sits at the center of the kitchen and can express the décor values of the homeowner or designer.

More than looking pretty, the range hood performs an important and relevant function: improves your indoor air-quality. It makes time at home more enjoyable and ultimately healthier.

When designing a kitchen, remember to think of the range hood first as it can inform decisions that affect looks and functionality. The critical things to remember:

- 1. Blower Type: internal, in-line or external
- 2. Sone Levels
- **3.** Ducting: Keep duct run as straight as possible
- 4. Capture Area: Match the width of the range hood to the width of the cooktop or range
- Mounting Height: Mount range hood within recommended height from cooktop or range
- 6. Timing: Proper usage of your range hood will increase efficiency
- 7. CFM: Match your range BTU output with appropriate CFM levels

