



# ABOUT YOUR HOUSE

## YOUR FURNACE FILTER

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### What a furnace filter can do for you

Traditionally, furnace filters were designed to protect the furnace and fans. With increased air quality awareness, some filters are now being installed to reduce exposure to particles which can affect your health.

There is a wide variety of furnace filters available. However, you may find it confusing to select one which is suitable. The purpose of this document is to provide you with guidance when selecting your furnace filter.

### What airborne particles are found in your home?

The particles you breathe in your home come from a variety of sources including:

- Dust on floors or other surfaces that is disturbed by activity in the house
- Dust generated by smoking, burning candles, cooking, doing laundry, etc.

- Hair and skin flakes from humans or pets
- Particles from the outside air which come into your home with infiltrating air

Some particles are so small that they are inhaled and then exhaled without being trapped in your lungs. Some larger particles are trapped in your nose and throat and never reach your lungs. Still other particles are too large to be inhaled. The particles most dangerous to you are those that enter your lungs and lodge there.

You can see the particles of dust which accumulate on your television screen, shelves, and furniture. But you can't see the respirable particles. Respirable particles can be easily inhaled into your lungs and provoke respiratory illness. Although you would probably like to keep visible dust out of your home, the main health risk comes from respirable particles, which include tobacco smoke, spores, bacteria, and viruses.

The activity levels of the people in your home can affect the air you breathe. Activity such as vacuuming and cooking can create or stir up particles. On the other hand, during periods of inactivity such as the middle of the night, particle concentrations tend to be much lower.

### Filter research

CMHC conducted a study to verify filter manufacturer claims and to determine whether good filters will significantly reduce your exposure to airborne particles. All results are compiled and discussed in the research report: *Evaluation of Residential Furnace Filters* (1999). You can obtain a copy of this report by calling the Canadian Housing Information Centre (CHIC) at 1 800 668-2642. A summary of the results of this study follows.

## Research program

The CMHC study first tested ten filter types in a single home and then the following filters in 5 additional homes:

- i) 25 mm (1") premium media filter
- ii) Charged media type electronic
- iii) 100 mm (4") pleated media filter
- iv) High efficiency bypass filters, such as a HEPA (high efficiency particle arrestor)
- v) Electronic plate and wire (ESP)

Air in the houses was tested when these higher efficiency filters were in use. The results were compared to when no filter was used.

The electronic plate and wire filter (ESP) produces some ozone during its operation. Exposure to elevated ozone can irritate your lungs. Separate testing was done to verify whether the amount of ozone produced by the ESP could affect the occupants of the home.

## Testing limitations

Each filter was in use in each house only for one or two days. The effects of dust accumulation on filter performance could not be evaluated in these tests. If a filter actually cleaned dust out of a house by cleaning house air, these tests were too brief for such effects to be seen.

Filter Results		
Filter	% improvement during active periods in the home	% improvement during non-active periods in the home
25 mm premium	21	57
Charged media	9	29
100 mm pleated	9	13
HEPA bypass	23	38
ESP	31	71

## Research results

The research showed that exposure of the house occupants to airborne particles appears to be directly linked to their activities when they are in the home. The furnace filter appears to have only a moderate effect on the exposure of an individual to respirable particles in the home.

Consider each member in your home to be followed by a cloud of dust—like "Pig Pen" in the "Peanuts" comic strip by Charles Schulz. When occupants are moving around, they stir up the dust. The dust in this cloud is usually not affected by the quality of the furnace filter because the filter is far away down a duct.

The table (top of page) shows the percentage of improvement provided by each filter versus having no filter. The improvements are greater when there is no activity in the home, but particle levels were quite low in the test houses during these periods whether or not the air was being filtered.

## The cost of clean air

For a furnace fan filter to be effective, your furnace fan would have to run almost all the time. Unless you already have your furnace fan operating all the time, this additional fan use can add \$200 or more per year to your electric bill, unless you have a high efficiency furnace fan motor. The following table shows the cost, including maintenance, of each filter over a period of 15 years compared to the cost per unit of clean air they provided.

The table shows that filters which cost the least produced very little clean air. The 25 mm pleated filter actually had the greatest cost per unit of clean air. The ESP filter was the most cost effective because it produced the most amount of clean air, and cost very little to do so.

Filter	Maintenance and capital cost, per year, over 15 years (\$)	Amount of clean air produced (litres/second)	Cost of clean air per year (\$/litres/second)
25 mm pleated	48	17	3.36
25 mm premium	100	97	1.13
Charged media	43	44	1.25
100 mm pleated	93	60	1.71
HEPA bypass	240	175	2.03
ESP	67	298	0.26

### What about ozone?

Despite being the most effective filter in the tests, the ESP produces small amounts of ozone during operation. In the research project, a survey of fifteen homes with ESP filters showed that all ESP's created ozone in the air stream of the duct. None of these raised ozone levels in the house air above the safe concentrations recommended by health guidelines. During the test period, ozone levels were always higher in the outside air than in house air, despite the ozone production by the ESP filters.

### Conclusions

This research showed that the particles in the duct air can be reduced when an upgraded filter is installed. The results also showed that this reduction will only moderately reduce indoor exposure to respirable particles.

Since the research was undertaken, the filter industry has developed a new testing standard and rating system. Look for the "MERV" rating on the filter; the higher the MERV rating, the better the filtration. Make sure that your furnace technician approves a change to a high efficiency filter. Some of the filters with higher MERV ratings will reduce the amount of air passing through the furnace and affect its performance.

### So... how do you reduce levels of respirable particles?

Our best current guess is to reduce dust entry by:

- Removing footwear on entry
- Keeping major dust generators (smoking, pets, etc.) out of the house
- Reducing dust collecting surfaces (open shelves, carpets, upholstered furniture, etc.)
- Diligent and frequent vacuuming with an efficient vacuum cleaner
- Reducing the entry of particle-laden outdoor air by closing windows, improving house airtightness, and installing an intake filter on the air supply
- Using a good furnace filter

Most of these recommendations will also reduce the amount of visible dust in your house.

## About Your House

Your Furnace Filter

The EnerGuide for Houses™ service provides a thorough home energy analysis. It has been developed by Natural Resources Canada (NRCan) and is delivered by local service organizations across Canada for a fee. Retrofits may be eligible for grants until 2007.

To find a local service organization or grant information, visit [www.energuideforhouses.gc.ca](http://www.energuideforhouses.gc.ca) or call 1-800-387-2000.

To find more About Your House fact sheets plus a wide variety of information products, visit our website at [www.cmhc.ca](http://www.cmhc.ca). You can also reach us by telephone at 1 800 668-2642 or by fax at 1 800 245-9274.

### Priced Publications

*The Clean Air Guide: How to Identify and Correct Indoor Air Problems in your Home* Order No. 61082

### Free Publications

#### About Your House *fact sheets*

*CMHC Garbage Bag Airflow Test* Order No. 62288

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