

How to Reduce Chemical Contaminants in Your Home

Our homes can contain many contaminants. Some come from living organisms and are grouped as biological contaminants, for example, bacteria, viruses, dust mites, animal dander and molds.

Other contaminants, which are not associated with living organisms, are classified as chemical contaminants. Contaminants, whether biological or chemical, can be in the form of particles (e.g. dust, fibres) or gases.

Good indoor air quality is achieved when there are very low levels of contaminants. This document focuses on reducing your exposure to chemical contaminants in the home.

Other publications by Canada Mortgage and Housing Corporation (CMHC) can provide you with additional information. The *Clean Air Guide: How to Identify and Correct Indoor Air Problems in Your Home* contains comprehensive checklists for a preliminary assessment of your home. As their titles indicate, *Clean-up Procedures for Mold in Houses* and the *About Your House* fact sheet *Fighting Mold—The Homeowners' Guide* deal with mold.

Most people assume that contaminants can be removed by filtration. Typical residential furnace filters are designed to filter particles, not gases. Gases can be filtered only by special filter media, such as activated charcoal or activated alumina. These filter media require special installation and, like furnace filters, must be replaced frequently. Filtration as a means of removing airborne contaminants throughout the house is inefficient. The most effective way to remove chemical contaminants, whether particles or gases, is to stop or capture them at the source before they are dispersed over a large area. This means getting rid of the sources, and when this is not possible, isolating or encapsulating them.

Some pollutants are easier to eliminate than others. Those that you bring into your home are easier to remove than those that originate from the materials used to build your house.

EFFECTS ON YOUR HEALTH

The health effects of some chemicals, including many used in the workplace, are well known. Tolerable concentrations for short-term exposure (up to one hour) and long-term exposure (eight hours) to these chemicals have been set by health agencies, such as the Canadian Centre for Occupational Health and Safety (CCOHS) and provincial departments of labour. However, occupational exposure levels cannot be applied to homes, since concentration levels in the workplace are typically greater than those found in a home. Furthermore, populations affected in the home include more vulnerable individuals who may never leave the environment, in contrast to the normal eight hours per day for occupational exposure.

In 1987, Canada's Federal-Provincial Advisory Committee on Environmental and Occupational Health published residential exposure guidelines for a number of substances, including formaldehyde (reviewed in 2006), carbon monoxide, carbon dioxide, nitrogen dioxide, ozone, sulphur dioxide and radon (reviewed in 2007).

The current document focuses on the reduction of exposure to chemical contaminants at home, but does not emphasize the measurement of pollutant concentrations. Since it is generally known that the health impact of a substance increases with the exposure dose, reducing concentrations will make adverse health effects less likely.

SHOULD THE AIR IN YOUR HOME BE TESTED FOR CHEMICAL CONTAMINANTS?

For some chemicals, measurement of concentrations is recommended.

Carbon monoxide

Immediate steps must be taken to protect occupants as soon as the presence of carbon monoxide is suspected in a home. Open a window or get out of the house. For a more long-term solution, you may want to install a sensor to monitor carbon

monoxide levels. See CMHC's *About Your House* fact sheet *Carbon Monoxide*.

Radon

Adverse health effects normally come from long-term exposure and do not reflect acute symptoms. Radon is a naturally occurring radioactive gas that is formed from the breakdown of uranium in the ground. Radon can escape from the ground into homes and accumulate to high levels, often in the lower levels of the home such as basements. All homes should be tested for radon to be sure the exposure level is below the Canadian guideline of 200 Bq/m³. You can have someone do the radon test for you, or you can purchase a testing kit which you subsequently send to a laboratory for analysis. Measuring over a long period is more likely to give representative results than short-term measurements.

It is not recommended that homeowners test for other chemicals. While there are specific tests for gases like formaldehyde, carbon dioxide, nitrogen dioxide, ozone and sulphur dioxide, such tests are rarely needed.

Furthermore, a test for a particular chemical is limited to that contaminant alone. For example,

a particular analytical method to sample the air for volatile organic compounds (VOCs) may reveal gaseous contaminants, but it will not show if formaldehyde is present.

VOC test results would list chemicals in the air originating from many sources. Though the chemical emissions from different materials continue to be a subject of research, the sources of the chemicals are difficult to determine without additional testing of the air in various locations or testing of different samples of materials in the house for comparison. So other than for research purposes, it is generally not recommended that homeowners have their houses tested for chemical contaminants.

Professional help

You may be interested in hiring a professional to investigate indoor air problems in your home. A trained Indoor Air Quality (IAQ) investigator will not only determine whether the concern in your home is due to chemical contaminants or mold, but will also recommend solutions to correct the problems. Consult the Yellow Pages™ of your phone book under Indoor Air Quality, Consultants. Before you hire an investigator, ask about the person's training or procedure he or she follows.

A PRACTICAL APPROACH

The best way for you to reduce chemical contaminants in your home is to screen the substances you bring into your home and to select building materials carefully when you are building or renovating (see CMHC's *Building Materials for the Environmentally Hypersensitive*).

Take an inventory of the products and materials used in the home and avoid or minimize those known to have chemical emissions (also called off-gassing). First, you must know what the product is made of and if it releases chemical emissions.

Unfortunately, you can expect only a few products—such as glass, ceramic tile, metal, stone and other hard and inert materials—not to release any emissions. You will have to look at books, magazines or websites that provide reliable information about them, or consult individuals who have the training to understand the materials.

If you intend to use a product you know nothing about, you must first obtain a Material Safety Data Sheet

(MSDS) for that product from the supplier or manufacturer. Many materials have an MSDS that can be downloaded from the Web. The next step is to learn how to read an MSDS (see CMHC's *About Your House: How to Read a Material Safety Data Sheet*). It will tell you whether the product has hazardous ingredients. You may need further help to find out what the names of the chemicals signify or the hazard involved. At the very least, the health effects from exposure during their application would tell you the nature of the product and the precautions to follow. If these precautions appear daunting, you may decide to use another product.

Unless it is in some way impaired, you can often use your sense of smell as a guide. But remember that while odour indicates the presence of emissions, the absence of odour does not rule out chemical contaminants. The concentration may be lower than you can detect. Furthermore, some pollutants (like carbon monoxide, carbon dioxide and radon) have no odour.

The recommendations provided here will help you control known chemical emissions, hazardous ingredients or odours from typical products found in the home. The most important sources of chemical emissions are products that you use frequently and in large quantities, building materials inside your house that are present in large amounts or have large surface areas and new materials you bring into your house. Emissions from new materials generally decrease with time. Some products, such as paints, varnishes and glues, release emissions in the beginning, but these decline over time to low or non-detectable levels. In addition, materials subjected to higher temperature (such as a carpet over a heated floor) and high moisture levels (for example, particleboard furniture in a humid place) can be important sources of chemical emissions.

AVOIDING CHEMICAL CONTAMINANTS IN YOUR HOME

Smoking

Cigarette smoke contains numerous chemical contaminants.

- Do not smoke indoors
- Do not allow visitors to smoke in your home

Burning candles

By-products of combustion include carbon monoxide, VOCs, polycyclic aromatic hydrocarbons and soot.

- Do not burn candles, liquid fuel or incense in the home

Pesticide use

Pesticides may affect more than just the target pests.

- Use non-chemical pest control methods, such as baits, traps or fly swatters
- To control cockroaches, refer to CMHC's publication *Farewell to Cockroaches—Getting Rid of Cockroaches the Least-Toxic Way*
- Get rid of spiders and clusters of insects by vacuuming
- Seal likely entry points
- Control moisture to discourage moisture-loving insects (such as sowbugs and silverfish)
- Find other ways than pesticides to deal with fleas on your pets and insects in your houseplants

- Avoid pesticides on your lawn or garden
- Do not allow any fungicide or biocide (including natural oils touted to have antimicrobial properties) to be applied in the ducting system of your house

Cleaning and household chemicals

- Select unscented and less toxic cleaning products (for example, unscented detergent instead of bleach to clean mold, and baking soda instead of ammonia-based cleaners to clean countertops)
- Use detergent and water instead of disinfectants
- Eliminate the need for deodorizers by taking the garbage out daily, managing kitchen waste and perishables
 - Take out compostable materials regularly (composting also helps the environment by reducing the volume of garbage)
 - Rinse packaging (wrappers for meat or fish) before throwing them into the garbage
 - Freeze perishable wastes (meat, fish scraps) until garbage collection day
- Avoid plug-in or aerosol deodorizers, or air fresheners; instead, deal with the causes of odours, including that of mold

- Use unscented biodegradable detergents
- Avoid perfumed fabric softeners which leave residual chemical odours on your clothes and bedding and pollute the air outside your home when the clothes dryer is in use
- Minimize the use of bleach—it gives off noxious fumes and is not environmentally friendly
- Do not use mothballs; these release poisonous gases into the air in your home and leave persistent odours on your clothes and furnishings
- Avoid the use of aerosol sprays of any kind inside the house
- Learn about the hazardous ingredients in products before using them (see *About Your House: How to Read a Material Safety Data Sheet*)
- Do not allow soil-repellent treatments to be applied on carpet or furnishings

Personal products

- Use unscented soaps, shampoos, deodorants and lotions
- Discontinue wearing perfume
- Air dry-cleaned clothing in a sheltered place outside the house until you can no longer detect the odour of dry-cleaning solvents
- Screen products that you bring into your house for odours

Activities in the home

- Avoid tracking in dust and contaminants by not wearing outdoor footwear inside the house
- Use a dedicated exhaust fan for hobbies that generate fumes or particles
- Avoid using solvent-based markers and craft materials indoors
- Choose lead-free solders—these are available but may be hard to locate; ask your hardware, electronics or craft store to carry lead-free solder, if they don't have it
- Purchase only what you need to avoid having to store excess amounts of paints, solvents and hazardous chemicals inside the house
- Turn on the range hood while cooking and use the bathroom exhaust fan to remove moisture and residual odours (fans are effective only if they are vented outside—see *About Your House: The Importance of Bathroom and Kitchen Fans*)
- Ventilate the kitchen very well when you use the self-cleaning mode of the oven by using your range hood and opening windows

- Deal with a chemical spill immediately by using a sponge, rag or absorbent material (e.g. kitty litter) and taking these outside right away. The MSDS of the material, if available, provides information on what to do when a spill occurs

BUILDING-RELATED CONTAMINANTS

Fuel-related sources of contaminants

- Have your heating system maintained by a qualified heating contractor (see *About Your House* fact sheets *Combustion Gases in Your Home—Things You Should Know About Combustion Spillage and Carbon Monoxide*)
- Keep your woodstove or fireplace from spilling gases and smoke into the house
- Check that your chimney and vents are not blocked
- Do not use unvented fuel-based appliances, such as kerosene space heaters
- Monitor carbon monoxide (CO) levels in your home with a direct reading detector with memory capability
- Use the range hood every time a gas stove is used, or switch to an electric stove

- Do not store gas- or diesel-powered equipment (chain saws, lawn mowers) inside the house
- Guard against spillage of fuel inside the house, for example a leaking oil tank or oil accidentally pumped into a disconnected pipe
- Ensure that the wall between the house and the garage is airtight (see *About Your House: Attached Garages and Indoor Air Quality*)
- Monitor CO infiltration from the attached garage
 - Air seal the door to the garage
 - Install an exhaust fan and run it for half an hour after driving your car into or out of the garage

Building materials and furnishings

- When possible, select low-emission or low-odour building materials (refer to CMHC's *Building Materials for the Environmentally Hypersensitive*)
- Select water-based, low-odour adhesives, finishes and paints, and apply them only when you can ventilate the house
- Test caulking for odours before using it—odours can be strong and persistent
- Before purchasing new materials to bring into or install in the house, test them for odours

To test carpets and other floor coverings, underpads, wood and plastic materials:

- Get a small sample of the material
- Place it in a clean glass jar
- Cover the jar and allow to sit in a warm place, such as a sunny window
- Open the jar and test for the presence or intensity of odours

Bear in mind that you are testing a small piece of sample. Expect a proportionate increase of the odour from much more material.

To test sealants, varnishes or paints:

- Apply the finish onto a small piece of the substrate (drywall or wood)
- Allow a reasonable length of time (a week) for the finish to cure
- Continue testing in a glass jar as above

If the odour is still strong or noticeable, allow for a longer curing time or choose another finish.

- When renovating, isolate the area to minimize exposure to dust and chemicals (see CMHC's *Healthy Housing™ Renovation Planner* for additional tips)
- Carefully select materials used to cover areas surrounding heat sources, such as window coverings (sun), radiant floor or mantelpiece (fireplace)

- Minimize the use of furniture made of particleboard, medium-density fibreboard or hardwood plywood, which are potential sources of formaldehyde, especially in the bedroom
- Control moisture in your home to reduce chemical emissions from composite wood products—keeping the house dry also prevents mold and dust mites
- If you buy furniture made of composite wood, choose furniture that is sealed on all sides and edges
- Seal the underside of particleboard counters in the kitchen with 0.15 mm (6 mil) polyethylene, securing edges with aluminum foil tape
- Seal exposed edges and surfaces of furniture made with particleboard, medium-density fibreboard or hardwood plywood with polyethylene and aluminum foil tape as above
- Seal exposed cut edges of subfloor at the forced air-vent openings with aluminum foil tape
- Ensure that all air ducts are cleanable, metal ducts
- Limit the amount of pine and cedar in the house, especially if members of the household have allergies—both contain natural aromatic resins that can be released into the air

- Seal all exposed insulation with polyethylene
- Do not cut pressure-treated wood indoors and do not burn it, even outdoors, to avoid releasing poisons into the air

There may be many more sources of chemical contaminants in the home. These are typically from activities or items you bring into the house. Some can be minor, but others can be serious. For instance, it might be several hours before the odour of nail polish disappears from inside a house, but days or weeks might be required to clean the disastrous effects of soot from even a small fire.

Occasionally, poor air quality can arise from things you don't expect. Strong, unpleasant odours have sometimes been traced to overheated plastic sockets in receptacles for light bulbs. Never use a higher wattage than recommended. Some light fixtures may require a ceramic socket.

If you notice that the quality of the air in your house has deteriorated, examine what you have brought into the house recently. You can verify your suspicions by removing the substance, isolating it in another room or encapsulating it temporarily with polyethylene, then noting whether the quality of the air improves.

VENTILATION

After you have reduced as many known sources of contaminants as possible, you can enhance the quality of the air with ventilation. This may mean airing out the house by briefly opening the windows or by installing a heat recovery ventilation system. See CMHC's *About Your House* fact sheet *How to Get the Ventilation That You Need in Your House* for more information.

A properly installed and balanced Heat Recovery Ventilator (HRV) improves the indoor air quality of your house by providing outside air (typically less polluted than indoor air) and exhausting an equivalent amount of stale air from the house. This helps to control moisture and mold growth during the cold months of the year. Ventilation also reduces the concentration of airborne contaminants by dilution. Bear in mind, however, that ventilation is only a secondary strategy to removing the sources.

To find more *About Your House* fact sheets plus a wide variety of information products, visit our website at 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

<i>Building Materials for the Environmentally Hypersensitive</i>	Order No. 61089
<i>Clean Air Guide: How to Identify and Correct Indoor Air Problems in Your Home</i>	Order No. 61082
<i>Clean-Up Procedures for Mold in Houses</i>	Order No. 61091
<i>Healthy Housing™ Renovation Planner</i>	Order No. 60957

Free Publications

<i>Farewell to Cockroaches— Getting Rid of Cockroaches the Least-Toxic Way</i>	Order No. 60948
<i>Radon: A Guide for Canadian Homeowners</i>	Order No. 61945

About Your House fact sheets

<i>Attached Garages and Indoor Air Quality</i>	Order No. 66343
<i>Carbon Monoxide</i>	Order No. 62046
<i>Combustion Gases in Your Home— Things You Should Know About Combustion Spillage</i>	Order No. 62028
<i>Fighting Mold—The Homeowners' Guide</i>	Order No. 60516
<i>How to Get the Ventilation That You Need in Your House</i>	Order No. 66348
<i>How to Read a Material Safety Data Sheet (MSDS)</i>	Order No. 62038
<i>The Importance of Bathroom and Kitchen Fans</i>	Order No. 62037
<i>Should You Test the Air in Your Home for Mold?</i>	Order No. 63911

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