



Healthy Indoors Partnership

products and services with low-chemical emissions

On average, Canadians spend more than 90 percent of their time indoors, where they are exposed to a variety of pollutants, including moulds, dust mites, fine particles, radiation and chemicals. This guide focuses on chemical pollutants, and how to reduce exposure to them.

what are indoor chemical emissions ?

Indoor chemical emissions are air pollutants that are released with the use of a wide range of products. These emissions may come from products brought into the building by occupants, for example, furnishings, cleaning products, personal care products and electronic equipment. Others may be released by products used by pest control, cleaning and maintenance services. Yet others may be released by building materials and finishes used in construction, renovation and maintenance. These chemical emissions can remain in the air for long periods of time after a product is used, and are typically found at higher concentrations indoors than outdoors.

This guide focuses specifically on **volatile organic compounds (VOCs)**. They are called volatile because they off-gas or vapourize at room temperature, and organic because they are carbon-based. VOCs are present in all buildings. They become part of the indoor air, and circulate freely throughout your building.

VOC emissions in typical buildings can be classified into two **exposure categories**:

- a) *high-concentration, short-term emissions* (from a recently painted wall, for example)
- b) *low-concentration, long-term emissions* (such as those that are released from most composite wood products and carpets).

In practical terms, these two categories overlap.

VOC emissions can also be classified by **how they originate**:

Primary emissions are released directly from new products, for example, from a cleaning product.

Secondary emissions are released when the chemicals in one product mix with other indoor chemicals, to create new chemicals. For example, when ozone reacts with the latex backing of carpets or with terpenes in air fresheners, various aldehydes, including formaldehyde, may be released.



health effects

Some VOCs have no known health effects. However, many are known to cause cancer in animals. Some are known or suspected to cause cancer or to have toxic effects in humans. Immediate symptoms from exposure to some VOCs may include breathing problems, fatigue, headaches, dizziness, nausea, blurred vision, and skin or eye irritation. The long-term effects of chronic exposure to VOCs at the levels found indoors are not well understood yet. In general, however, the higher the level of exposure to a potentially toxic chemical, or the more prolonged that exposure is, the greater the risk that adverse health effects may occur.

While we are all susceptible to the effects of exposure to harmful VOCs, certain groups of people are particularly vulnerable to harmful chemical exposures, including pregnant women and their fetuses, infants, the elderly and people with allergies or asthma. Furthermore, individual reactions to chemical exposures vary widely. Some people react immediately and severely to small amounts of VOCs which others may not even notice. People of any age or health status can develop such chemical sensitivities.

should I be concerned?

If you are an employer or a building owner, supervisor or manager, you may wish to minimize the sources of indoor emissions to improve the productivity and health of building occupants and reduce discomfort, sickness and absenteeism. You may also want to select low-emitting materials to qualify for a green or healthy

building designation.

Many chemical emissions can be harmful. While we should all be concerned about minimizing emissions, some situations offer particular opportunities to reduce health risks. Whenever you are specifying or buying new furnishings, cleaning or maintenance products or services, and whenever you are designing, building or renovating a building or workspace, there is an opportunity to specify or select products and services with low chemical emissions. With residential units, be especially careful with the bedrooms, since people spend over one third of their time there.

In addition, it is wise to pay particular attention if people develop symptoms within a few moments or hours after entering your building, especially if they feel better after leaving it.

what to look for and do

The main sources of indoor chemical emissions include:

- cigarette smoke
- non-vented (or poorly vented) stoves
- building materials and furnishings (these include curtains and wall coverings)
- cleaning products
- personal care products
- pest control products
- electronic equipment (such as computer printers and photocopiers)

The presence of a chemical odour is an indicator that one or more chemicals are being released into the air. However, don't rely on odour as a measure of the strength or danger of a chemical. For example, carbon monoxide is odorless, and can be deadly.

It may also be helpful to contain emissions so they don't spread throughout your building, for example by closing the door to a room that has been freshly painted. Another way to decrease your exposure to potentially harmful chemical exposures is to exhaust the emissions from the building as quickly as possible.

building materials and furnishings

By obtaining information on the emissions of potential new products you plan to use or install in your building, you can select lower emitting products when available. Be sure that the information you gather is for the specific products you plan to use. Do not rely on generic information on 'similar' products. If the information you need is not readily available, contact the manufacturer, ask about the emission levels of the product in question, and request a *Material Safety Data Sheet (MSDS)*.

Whenever possible, specify materials with no/low chemical emissions for interior surfaces of a building (i.e., all ceiling coatings, wall coverings, paints and floor coverings). Partitions and wall coverings made of polyvinyl chloride (PVC) or plastics contain a wide range of VOCs. These should be replaced by products with less off-gassing potential.



Consider all of the materials required for use in a project, not just the major ones. For example, grouts, adhesives, sealants and sealant primers as well as other products, all need to be evaluated. In general, it is prudent to choose water-based paints, sealants and finishes for indoor use — they tend to emit lower levels of VOCs than oil-based products. Be mindful, though, that water-based products may also contain solvents.

Solid wood tends to release lower emissions than composite wood products. The glues in composite wood products such as particleboard, fiberboard, chipboard and plywood often contain high levels of VOCs including formaldehyde. When selecting solid woods, it is helpful to know that pine and cedar contain higher levels of natural VOCs called terpenes that are released into the air.

It's worth paying attention to little things — they add up. For example, you can reduce emissions by choosing solid wood trim, rather than trim made from plastic or manufactured wood (such as medium density fiberboard, known as MDF) or by selecting low VOC caulking.

In addition to selecting low-emission materials, you can reduce emissions by airing out products in a well-ventilated space prior to installation, for example by unrolling flooring materials or opening cupboard doors. This can reduce the initial surge of off-gassing from the surface of the materials, although it will not eliminate ongoing, longer-term emissions.

Renovation and painting activities are best conducted when the building is least occupied and can be opened up for ventilation. Whenever new products with the potential for off-gassing are installed, allow extra time for ventilation before you reoccupy the area.

cleaning and laundry products

Common cleaning and laundry products can be a significant source of indoor pollutants. These include ammonia, chlorine bleach, floor sweeping products, air fresheners and deodorizers, scented detergents, fabric softeners, mothballs, and many others.

Look for low-emission, unscented alternatives (see the *Guide to Less Toxic Products*, listed in the table on page five). The use of microfibre cleaning cloths can reduce the need for harsh chemical-based cleaners. If you choose to use bleach, buy products that contain no more than 0.02 % (200 ppm) sodium hypochlorite.

When hiring janitorial services specify the use of unscented, less toxic cleaning products, and schedule their use so as to reduce exposure to occupants — including janitorial staff. Eliminate the use of plug-in, liquid or aerosol deodorizers or air fresheners. These products don't remove the cause of unpleasant odors. They mask them and at the same time add hazardous chemicals to your indoor air.

Fungicides or biocides are another significant source of pollutants. They are sometimes used, among other applications, for duct cleaning. Do not allow the use of chemical sprays in your ducts.



personal care products

Support the implementation of a “No Scents” Policy in your building (for guidance on creating one, see the reference at the end of this guide, from the Canadian Centre for Occupational Health and Safety.)

pest control

Use non-chemical methods of pest control whenever possible. These include making pest nesting places less attractive, using baits and traps, and mechanically removing the pests themselves. Controlling moisture and sealing likely entry points can prevent some pests from entering your building.

If you must bring in professional pest control services, take time to request information from a number of services. Inquire about options that are least toxic to humans, and then select the service that employs the least toxic materials and methods (for example, the use of baits and traps rather than chemicals). Ensure that the pest control service identifies the source of the problem, so it can be corrected.

products of combustion

Ensure that no one smokes in your building, and that all combustion equipment is properly maintained, and vented to the outside.

when to get professional help

If you are designing a new building or renovating extensively, it may be helpful to engage the assistance of a professional such as an architect, builder, registered industrial hygienist or interior designer,

who has a special interest in indoor air quality and experience in selecting low-emission products.

testing

A wide range of tests is available for chemical emissions, from very simple and inexpensive do-it-yourself ones to very complex and expensive laboratory testing.

One simple do-it-yourself test is the “jar test”, used to compare products (carpet samples, or brands of water-based paints, for example) to determine the most tolerable product for use in a particular application. This test may help you to identify some problematic chemicals, though it may not reveal the presence of all potentially toxic VOCs. (The jar test is described by CMHC in its on-line brochure, “How to Reduce Chemical Contaminants in Your Home” — see the *Additional Guides and References* section on page six.)

Even before you attempt a jar test, however (to minimize the risk of exposing yourself or others to a particularly noxious toxin), it is prudent to first inform yourself about what a particular product is made of and the toxins it emits. A good place to start this type of research is to review a product’s *Material Safety Data Sheet (MSDS)*, which is generally available from the product manufacturer.

Laboratory testing is more expensive. It may be appropriate if you want to test specific materials of concern, for use in rooms that must have very low levels of off-gassing. For example, assessment rooms at health facilities must have very low levels of off-gassing, so that patients’ reactions to these emissions don’t interfere with accurate assessments.

where to purchase

An increasing number of low-emission products are available from traditional suppliers. Be informed; then ask your suppliers what low-emission products they offer.

You can use the following table to learn more about the low-emissions criteria that products meet, and to find out where the products are sold. Please note that this table represents only a sampling of products; note, too, that a product’s inclusion in the list does not necessarily mean that it is safe and harmless for everyone.



labeling systems and on-line resources for selecting products and services

The following table includes a range of labeling systems and websites which can help you locate products that have fewer chemical emissions. Please note that a number of these systems cover a range of environmental criteria. Not all give occupant health a high priority; in some cases, occupant health may be just one of

many criteria considered. Those systems that focus exclusively on indoor air quality are typically the most stringent and reliable in terms of emissions and occupant health.

It is advisable to carefully review product claims, and look for products that specify third-party testing or endorsement.

System/Resource	Scope	Criteria and URL
Clean Air Technologies	Adhesives, sealants and sealant primers; cleaning products; paints and other coatings	<i>Third-party rating system and on-line list specifically focused on air quality, including indoor air. Managed by California's South Coast Air Quality Management District.</i> http://www.aqmd.gov/tao Click on "Technology" at the top of the page.
Envirodesic Insulation	Insulation, cleaners	<i>Third-party verified labeling system and on-line list focused specifically on indoor air quality. Managed by Small and Rubin Ltd., an independent Canadian business.</i> www.envirodesic.com
EcoLogo	Adhesives, caulking, composite wood products, insulation, cleaning products, flooring products, personal care products, paints and finishing	<i>Third-party verified labeling system and on-line list, administered by TerraChoice for the Government of Canada. The only eco-labeling program in North America to be accredited by the Global Eco-Labeling Network. Air quality is one of many environmental factors considered. Certifies both consumer and industrial products that meet specific limits for chemicals of concern.</i> www.ecologo.org
Green Label	Carpets and carpet cushions	<i>Industry developed and administered labeling system focused specifically on off-gassing from carpets and carpet cushions. Products undergo third-party testing. Those that meet the U.S. Carpet and Rug Institute (CRI) emission test criteria bear a green and white CRI Indoor Air Quality Carpet Test Program logo. This program is supported in Canada by the Canadian Carpet Institute.</i> www.carpet-rug.com/ www.canadiancarpet.org
Greenguard	Building materials, interior furnishings, furniture, cleaning and maintenance products, electronic equipment, and personal care products	<i>Third-party verified labeling system and on-line list. Managed by the Greenguard Environmental Institute (GEI), an industry-independent, non-profit organization that focuses specifically on indoor air quality, and is authorized to develop standards by the American National Standards Institute (ANSI). Greenguard standards are incorporated into the Canada Green Building Council's LEED Program for new commercial interiors. More than 20,000 different products certified.</i> www.greenguard.org
GreenSeal	Aerosol adhesives, cleaners, paints, floor care products	<i>Third-party verified labeling system and on-line list. Managed by GreenSeal, an independent, science-based, non-profit organization. Air quality is one of many environmental factors considered.</i> www.greenseal.org
GreenSpec	Building products	<i>A subscription-based on-line resource for environmentally sensitive design and construction. Published by Build Green, an independent US-based business. It includes more than 2,000 environmentally preferable building products. "Release minimal pollutants" is one of many environmental attributes considered.</i> www.buildinggreen.com
Guide to Less Toxic Products	Personal care, baby care, household cleaning and pest control	<i>A free on-line resource on potential health risks of commonly used consumer products, with recommendations for less toxic alternatives. Published by the Environmental Health Association of Nova Scotia, a Canadian non-profit organization.</i> www.lesstoxicguide.ca
IA-Quest	Building materials and furnishings	<i>Free software from the National Research Council's Institute for Research in Construction that helps professionals predict indoor air concentrations of chemicals coming from building materials and furnishings.</i>
Low-Emitting Materials	Building insulation, adhesives, sealants, concrete sealers, gypsum board, acoustical ceilings, wall panels, wood flooring, composite wood boards, resilient flooring (includes rubber), carpet, wall coverings, paint	<i>Third-party rating system and on-line list of low-emission products that meet California requirements for use in school construction projects. Published by California's Collaborative for High Performance Schools.</i> www.chps.net/manual/lem_overvw.htm

additional guides and references

- Built Green Society of Canada, “Checklist” (for new homes in Alberta and British Columbia) www.builtgreencanada.ca/
- Canada Green Building Council, “LEED® Canada for Commercial Interiors Green Building Rating System” www.cagbc.org/
- Canadians Centre for Occupational Health and Safety, “Scent-Free Policy for the Workplace” www.ccohs.ca/oshanswers/hsprograms/scent_free.html#_1_7
- Citizens for a Safe Learning Environment (CASLE) www.casle.ca
- CMHC, “CMHC Residential Indoor Air Quality Investigator Program” www.iaq-qai.com
- CMHC, “Dealing with Pests” www.cmhc-schl.gc.ca/en/co/reho/reho_008.cfm
- CMHC, “Farewell to Cockroaches – Controlling Cockroaches the Least Toxic Way” www.cmhc-schl.gc.ca/en/co/maho/gemare/faco/index.cfm
- CMHC, “How to Reduce Chemical Contaminants in Your Home” www.schl.ca/en/co/maho/yohoyohe/inaiqu/inaiqu_006.cfm
- CMHC, “Painting: Walls, Ceilings and Floors” www.schl.ca/en/co/maho/gemare/gemare_005.cfm
- CMHC, “The IPM Five-Step Approach” www.cmhc-schl.gc.ca/en/co/maho/gemare/faco_002.cfm
- Environment Canada, “Residential Wood Heating” www.ec.gc.ca/cleanair-airpur/default.asp?lang=En&n=50E7D551-1
- Environment Canada, “Wood Heating” www.ec.gc.ca/cleanair-airpur/Wood_Heating-WSC1A217A6-1_En.htm
- Environmental Health Association of Nova Scotia, www.environmentalhealth.ca
- Federal-Provincial Advisory Committee on Environmental and Occupational Health (Revised 1995). “Indoor Air Quality in Office Buildings: A Technical Guide” www.hc-sc.gc.ca/ewh-sem/alt_formats/hecs-sesc/pdf/pubs/air/office_building-immuebles_bureaux/93ehd-dhm166_e.pdf
- Fragranced Products Information Network, “Web Site on the Health, Environmental, and Regulatory Aspects Related to Fragrance” www.fpinva.org/
- Health Canada, “Exposure Guidelines for Residential Indoor Air Quality” www.hc-sc.gc.ca/ewh-semt/pubs/air/exposure-exposition/index_e.html
- Health Canada, “Indoor Air Quality in Office Buildings: A Technical Guide” www.hc-sc.gc.ca/ewh-semt/pubs/air/office_building-immuebles_bureaux/index_e.html
- Health Canada (2003) “Indoor Air Quality – Tools for Schools Action Kit for Canadian Schools” www.hc-sc.gc.ca/ewh-semt/pubs/air/tools_school-outils_ecoles/index_e.html
- National Institutes of Health, National Library of Medicine (USA), “Household Products Database” <http://householdproducts.nlm.nih.gov>
- Natural Resources Canada, “R-2000 Indoor Air Quality ‘Pick List’” www.oe.nrcan.gc.ca/residential/personal/new-homes/r-2000/standard/indoor-air-quality.cfm?attr=4
- Public Works and Government Services Canada, “The Environmentally Responsible Construction and Renovation Handbook, Chapter 3 - Indoor Air Quality and Materials Selection” www.pwgsc.gc.ca/realproperty/text/pubs_ercr/chapter3-e.html

expert panel

Experts from the following organizations joined together to develop and review this Buyer's Guide, to provide balanced guidance in purchasing products and services with low chemical emissions. While this guide represents their assessment of the current state of knowledge on low-emission products and services, it does not necessarily reflect the view of any particular participating organization.

Allergy and Asthma Information Association
 Association of Registered Interior Designers of Ontario
 Asthma Association
 Beau Biology Institute of Canada
 Canadians for Properly Built Homes
 Concordia University
 Environmental Health Association of Nova Scotia
 Environmental Health Clinic, Ontario, Women's College Hospital, Toronto
 EcoSpex Canada
 Government of Canada
 Canada Mortgage and Housing Corporation
 Health Canada
 Statistics Canada
 Natural Resources Canada
 Public Works and Government Services Canada
 Healthy Indoors Partnership
 La Maison du 21^{ème} siècle
 Ontario College of Family Physicians, Environmental Health Committee
 Ontario Public Health Association
 Royal Architectural Institute of Canada
 Ryerson University
 TerraChoice / Ecologo
 Toronto Public Health
 Women's College Hospital Environmental Health Clinic