

## Green Renovations—Bathrooms

Renovations are a popular way to update the interior and exterior of a house, add more liveable space, improve performance and address any problem areas. Renovations can also provide homeowners with an opportunity to improve the energy efficiency and indoor air quality of their homes, reduce their environmental impact, and make their homes more comfortable and affordable to live in, operate and maintain.

The challenge in adding green features to a renovation is to understand what value-added options are available, and how they can be undertaken at a relatively modest cost. For example, you can upgrade your house with one green feature or you can fold a number of green features into a larger project with an affordable incremental cost. You can also choose to green your entire house or just focus on making one room or area a little healthier to live in and more energy and water efficient as well.

With a little advance planning, allowances can also be made now that will make it easier to add green features in your home at some point in the future, as your budget permits or as your family's needs change. In the end, it's your interests, lifestyle and budget

that will determine how your renovation proceeds, and how many green features you choose to incorporate.

This guide offers tips, features and advice on how to “green” your bathroom renovation.

### Healthy Housing™

While there are many different definitions of “green,” CMHC's five principles of Healthy Housing™ offer a well-rounded interpretation. A Healthy House™ promotes:

1. **Occupant Health and a Healthy Indoor Environment** – superior quality of indoor air, water, lighting and comfort;
2. **Energy Efficiency and Renewable Energy Production** – efficient heating and ventilation systems and the use of renewable energy systems where appropriate, to reduce the consumption of energy and lower utility bills in every season;
3. **Resource Efficiency** – the efficient use of water, energy and other natural resources, including during the construction or renovation process, as well as throughout the life of the home;
4. **Environmental Impact** – reduced environmental impact of both individual homes and broader communities through more effective land-use planning and a decrease in the emission of pollutants; and
5. **Affordability** – a focus on creating homes and communities that are both appealing and financially affordable to Canadian homeowners.

## BATHROOM RENOVATIONS

Bathroom renovations are some of the most popular home improvement projects in Canada. They also offer some of the best opportunities to add green features that can significantly improve the environmental performance of your home.

For instance, up to 75 per cent of the water used in most Canadian homes is used in the bathroom. Simply replacing older faucets, showerheads and toilets with more water-efficient fixtures can help you save thousands of litres of water a year, and

dramatically reduce the amount of energy needed for water heating.

### SITE CONSIDERATIONS:

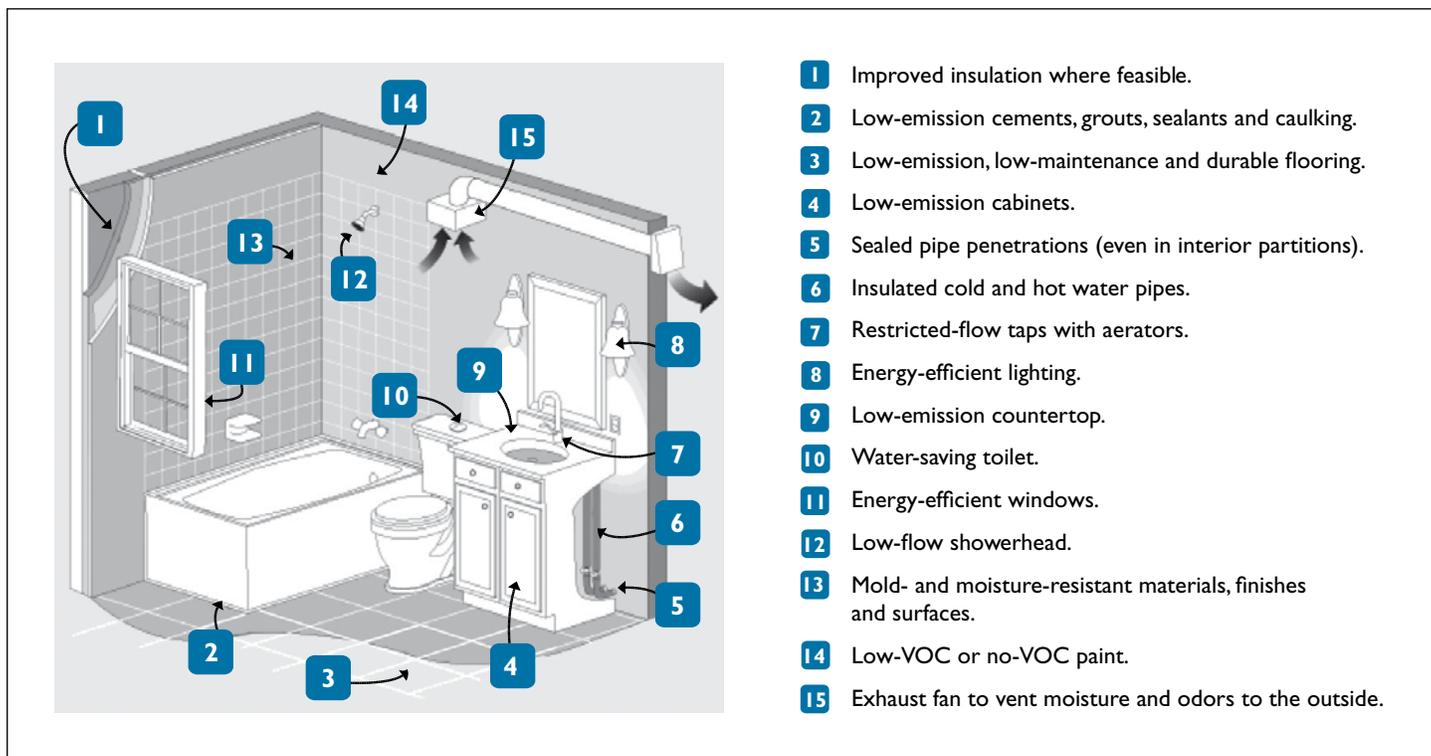
Before you begin your renovation, carefully assess the current condition of your bathroom to identify whether there are any pre-existing problems that could impact the success of your renovation, or even your family’s health and well-being. Depending on the age and features of your bathroom, the assessment could include:

#### 1. Structural considerations

- Check the condition and spacing of the floor joists and supporting beams under the

bathroom. They may need to be repaired, replaced or reinforced.

- Be aware that some of the bathroom walls may be structural load-bearing walls that have to be factored into your renovation plan.
- Check for signs of structural movement in the foundation, floors, walls and ceiling. Diagonal cracks around doorways and windows, bowed floors or cracked tiles could all indicate structural problems that need to be corrected before you proceed, or, as a part of the renovation project.



- 1 Improved insulation where feasible.
- 2 Low-emission cements, grouts, sealants and caulking.
- 3 Low-emission, low-maintenance and durable flooring.
- 4 Low-emission cabinets.
- 5 Sealed pipe penetrations (even in interior partitions).
- 6 Insulated cold and hot water pipes.
- 7 Restricted-flow taps with aerators.
- 8 Energy-efficient lighting.
- 9 Low-emission countertop.
- 10 Water-saving toilet.
- 11 Energy-efficient windows.
- 12 Low-flow showerhead.
- 13 Mold- and moisture-resistant materials, finishes and surfaces.
- 14 Low-VOC or no-VOC paint.
- 15 Exhaust fan to vent moisture and odors to the outside.

Figure 1 A healthy and efficient bathroom

## 2. Exterior walls and ceiling

- If your house was built before the 1950s, it may have little or no insulation in the attic, walls and ceilings. Houses constructed in the 1950s to 1970s likely have some insulation, but there could be opportunities to add more once the renovation is underway.
- Older houses also often do not have a continuous, well-sealed air barrier and this can cause higher heating costs and comfort problems.
- Check the attic above the bathroom for moisture damage in the ceiling, framing members, and on the underside of the roof sheathing. The presence of moisture in these areas could indicate that moist air is leaking from the bathroom into the attic above.
- Make sure the exterior walls of the house are correctly shedding water, and that there are no signs of water penetration through the walls or around the windows and doors.

## 3. High indoor humidity

- Note of any signs of high indoor humidity levels that could cause problems after the renovation.

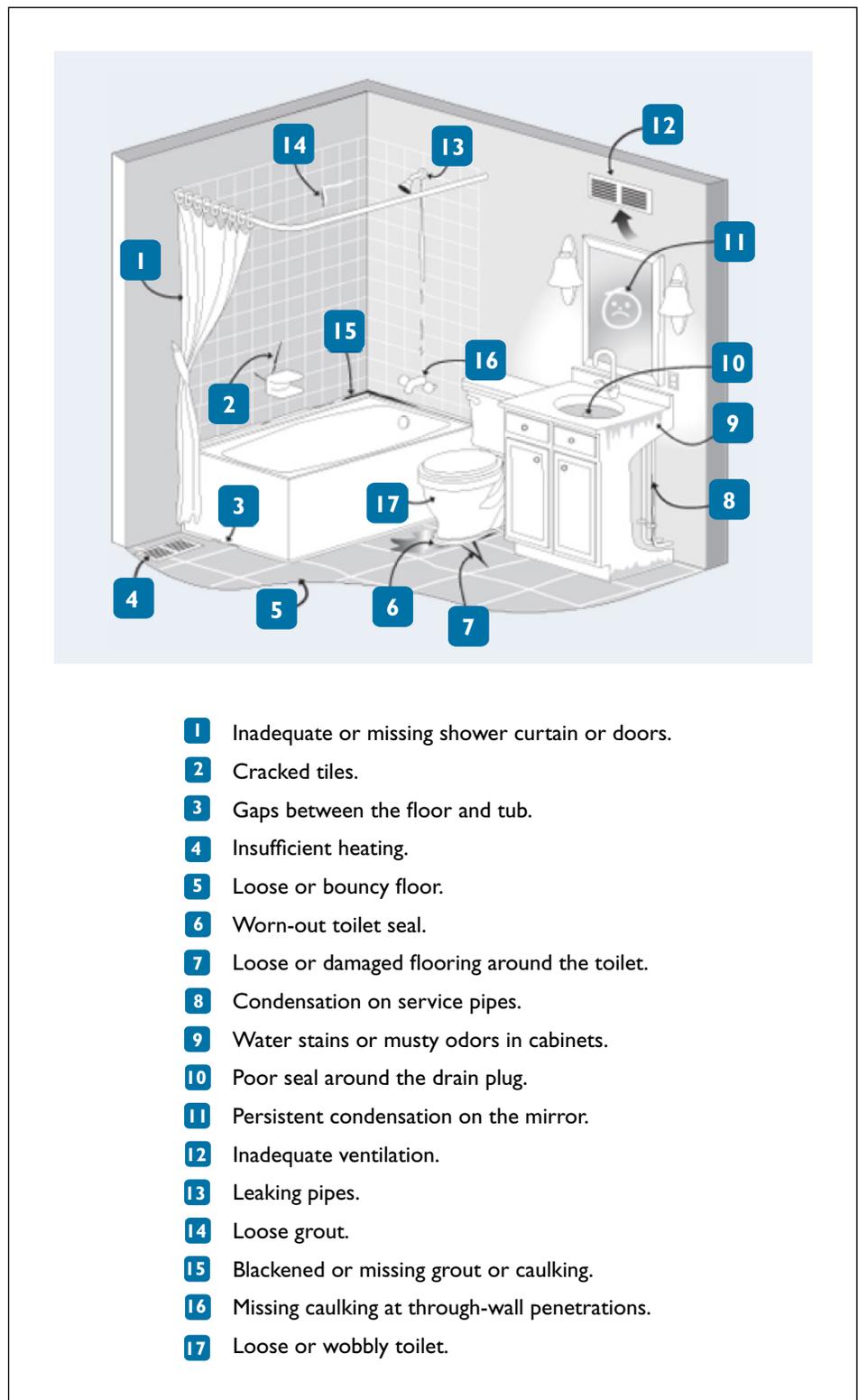


Figure 2 Warning signs for moisture-related problems in bathrooms

### 4. Indoor air quality

- Note any warning signs for indoor air quality problems. These could include lingering odours, persistent high levels of humidity or the storage of chemical cleaners and other pollutant-emitting materials in the bathroom.

### 5. Lead and asbestos

- Lead can be found in old house paint, solder, plumbing pipes and the service connections into homes (especially homes that were built before the 1950s) and can be a health hazard.
- Asbestos may be found in vinyl asbestos floor tiles and adhesive, appliance wiring, vermiculite insulation, as well as pipe and boiler coverings. Asbestos can become a health concern if it becomes airborne as demolition work is undertaken.
- If you think you may have lead or asbestos in your home, hire a qualified professional to assess and fix the problem. A qualified contractor will follow all applicable safety requirements, building codes, regulations and bylaws to protect their workers and your family.

### 6. Plumbing

- Older homes often contain galvanized steel, cast iron or lead pipes, which can complicate the installation of new water pipes. If you have corroded or leaking pipes or pipe joints, more extensive repairs may be required.
- Run water in the sink to check the drainage in your bathroom. Poor drainage is a sign that you may need to have the drain cleaned from the bathroom to the main building drain, or even as far as your municipal sewer connection or septic system. Also, check the slope on your drain pipes to see if they have to be adjusted.
- If you have odours coming from your plumbing system, you may need to improve the venting in your bathroom to ensure your new fixtures will drain properly. You may also need to fix problems with the traps or venting problems elsewhere in your house.
- Check on and around pipes for signs of condensation and moisture damage that should be fixed as part of the project.

Pipes located in exterior walls should be moved to prevent them from freezing in the winter, and to improve the performance of your insulation and air barrier systems.

- Check if the pipes running to and around the bathroom have insulation; it may have to be added.
  - Check to see whether or not there are shut-off valves on the water service pipes.
- ### 7. Space heating and cooling
- If your bathroom is uncomfortably cold in the winter, it could mean the walls, ceiling and floor are poorly insulated, or there could be a problem with the space heating system not getting heat to where it is needed. Ask your renovation professional to help you identify and fix the problem, and make sure it works with your new design. This may involve consulting with a mechanical contractor.

## GREENING YOUR BATHROOM RENOVATION

After you've assessed your bathroom's current condition, there are a number of different features and options you can consider for virtually every aspect of your renovation, to improve the energy- and water-performance of your bathroom:

### Walls and ceilings

If you are removing drywall or making any structural changes during the renovation, take advantage of the opportunity to improve or upgrade the insulation and airtightness around your bathroom.

If the original plaster or drywall is in good condition, you can simply blow extra insulation into the empty walls. If the plaster or drywall is damaged, you can apply new rigid insulation, framing and drywall directly over the old finishes, if space permits.

If you are removing the drywall, you may want to install new, more efficient insulation with a vapour diffusion retarder and continuous air barrier, such as a polyethylene sheet used either on its own or in combination with drywall, vapour-barrier paint and caulking.

You may be able to improve the insulation levels in your walls by 40% just by upgrading the insulation.

Another option is closed-cell sprayed foam insulation, which provides insulation, an air barrier and a vapour diffusion retarder all in one. When properly installed, sprayed foam insulation will fill the wall cavity and adhere to the wood, creating an airtight barrier. Sprayed foam insulation is also effective in difficult-to-insulate areas, such as the header space above and below the exterior wall, around window frames, and at gaps around the plumbing, wiring and HVAC components.

For extra energy savings, replace older windows with ENERGY STAR® models that have low-emissivity coating on the glass and argon gas and insulated spacers between the panes. Make sure the gap between the wall and the new windows is well-insulated, sealed, and protected from moisture on both the interior and exterior.

By including solid lumber or plywood backing in the walls surrounding toilets, tubs and showers, you can easily add grab bars and other supportive aids either now, or in the future when you may need them.

### EnerGuide and ENERGY STAR®

Natural Resources Canada's EnerGuide rating system allows consumers to compare the energy performance of different models of common household products, including windows, appliances, and heating and cooling equipment. The United States Environmental Protection Agency's ENERGY STAR® system identifies products that meet or exceed premium levels of energy efficiency. To choose the most energy-efficient products available, read the EnerGuide label, or look for the ENERGY STAR® symbol on the product, its packaging, or in the product literature.

### Flooring

To reduce transportation-related greenhouse gas emissions, choose flooring materials that come from local sources or which have been manufactured nearby.

To minimize the off-gassing of pollutants into the indoor air, use flooring, adhesives, underlays and other products with low-pollutant emissions.

If an underlay is used, water-resistant materials such as cement board or other proprietary subfloor products can be more durable for high-moisture areas like bathrooms.

Running your new flooring under the tub, shower and sink cabinet can provide better moisture protection, while making it easier to install a new tub, shower or cabinets in the future.

### Paint, finishes and sealants

Choose paint, cement, caulking, finishes and sealants that are low-odour and low in pollutant emissions. This includes low-volatile organic compound (VOC) paints and water-based urethane coatings for wood. Plant- or mineral-based paints and coatings, or natural clay and lime plasters, can also be good choices for people who are very sensitive to pollutant emissions.

### Cabinetry

Solid hardwood is a great choice for bathroom cabinets, as it is highly durable and tends to emit very few pollutants. Formaldehyde-free medium-density fibreboard (MDF), exterior-grade plywood and formaldehyde-free hardwood plywood are also good options for minimizing off-gassing.

The particleboard and MDF used to make modular cabinets can contain urea formaldehyde glue, which could adversely affect the air quality in your home. If you use either of these materials, make

sure that all surfaces are sealed with a plastic skin or coated with waterborne urethane or low-toxicity acrylic sealer.

If possible, look for wood products that are Forest Stewardship Council (FSC), Canadian Standards Association (CSA) or Sustainable Forestry Initiative (SFI) certified. This ensures that the wood you choose comes from sustainably managed forests.

### Countertops

Natural stone countertops like granite often emit very few pollutants. Laminate countertops can also be good choices if formaldehyde-free MDF or hardwood plywood are used for the under-counter support – and the bottom of the countertop is sealed with a water-based sealant.

In general, countertops with integrated backsplashes are easier to maintain and provide better moisture protection, because there's no joint between the counter and backsplash. Countertops that come from local suppliers or manufacturers, or which are made from recycled materials, can also offer great moisture protection while helping to keep your environmental footprint to a minimum.

### Ventilation

Make sure the exhaust duct in your bathroom is properly sized, well insulated and vents directly to the outdoors (not into the attic, soffit or crawl space). Straight ducts have less airflow resistance than flexible ducts, which can help ensure proper airflow is provided and helps to prevent condensation from accumulating in the duct.

Choose an exhaust fan that has a low noise rating, of around two sones (the unit used to measure noise) or lower. Low-sones fans tend to be more energy-efficient. Many bathroom fans today also come with additional green features, such as a timer, humidity sensor or other automatic controls that allow the fan to operate long enough to remove any excess moisture or humidity, without wasting energy.

### Plumbing and fixtures

To save water and cut down on your energy bills, choose dual-flush or ultra-low flush toilets (toilets that consume 6 litres of water or less per flush) and low-flow faucets and showerheads. Check for a WaterSense® label, which certifies fixtures that are both water-efficient and high-performance.

Add shut-off valves to make future renovations easier, and insulate both the cold and hot water pipes to reduce condensation, save energy and prevent mold. Adding a drain water heat recovery unit to your shower can also reduce your family's water heating costs.

### Lighting

One of the simplest and easiest ways to improve your bathroom's energy efficiency is to install ENERGY STAR®-rated lighting and make use of natural light wherever possible. Light-coloured paint on the walls and ceilings can increase the impact of natural light, while also creating a brighter, more welcoming room for your family to enjoy.

Compact fluorescent and LED (light emitting diode) lighting offer long service life and lower energy consumption. However, be aware that both types of lighting should not be disposed of with your household garbage because of the materials they contain. Consult your local municipality for guidance on safe and environmentally disposal options.

## Green Product Claims

There's a lot of misinformation and confusion about "green" products. Homeowners should beware of unsubstantiated or overstated claims. Manufacturers or suppliers should be able to produce independent test results to back up their claims, as well as a material safety data sheet (MSDS) to address any safety concerns.

To identify specific green products, you can also rely on independent third-party certification programs like Natural Resources Canada's EnerGuide, the Environmental Protection Agency's ENERGY STAR® ratings, the International Standards Organization (ISO) and the Canadian Standards Association (CSA). The following are a few other green product-labelling programs that can help you make an informed decision:

- **GreenSpec™ Product Guide:** an independent website that helps building-industry professionals and policy makers improve the environmental performance, and reduce the adverse impacts, of buildings. <http://www.buildinggreen.com/menus/>
- **GREENGUARD™ Environmental Institute:** an ISO-accredited third-party organization that certifies products and materials for low chemical emissions. <http://www.greenguard.org/en/QuickSearch.aspx>
- **EcoLogo™:** a program founded by the Government of Canada (now managed by TerraChoice) that certifies products and services based on their compliance with environmental criteria established by industry, environmental groups and independent experts. <http://www.ecologo.org/en/index.asp>
- **Green Seal™:** a non-profit organization that develops and certifies sustainability standards for products, services and companies. <http://www.greenseal.org/>
- **WaterSense®:** a U.S. Environmental Protection Agency-sponsored rating program that promotes water-efficient products, programs and practices that also offer consumers exceptional performance. <http://www.epa.gov/WaterSense/>

### Checklist: Green Bathroom Renovations

#### Occupant health/healthy indoor environments

- Ensure moisture and odours are vented outside.
- Reduce pollutant emissions by using low pollutant emission flooring (ceramic tile, natural stone, etc), cabinets (hardwood, low-emission or sealed particleboard), countertops (solid surface, laminates, sealed particleboard), paints, cement, grout, sealants and caulking.
- Prevent the growth of mold with moisture-resistant materials, proper detailing to prevent wetting, and resilient finishes and surfaces such as ceramic tile, natural stone and laminates.

#### Energy efficiency

- Improve wall and ceiling insulation where possible.
- Provide effective air barriers.
- Insulate cold and hot water pipes.
- Install energy-efficient lighting, and use task lighting and natural light.
- Install energy-efficient windows.
- Choose water-efficient fixtures and showerheads.
- Install energy-efficient exhaust fans with timers or other controls.

#### Resource conservation

- Select certified forest products for the flooring, cabinetry and millwork.
- Consider using recycled, locally-sourced and lightly-processed materials for the countertops, tiles and drywall.
- Purchase water-efficient taps, toilets and fixtures.
- Choose materials and products that are durable, resilient and easy to maintain.

#### Reduced environmental impact

- Where possible reuse or recycle old fixtures, cabinets and materials.
- Choose products and materials that are low-pollutant emitting.
- Select water-efficient toilets to reduce sewage waste.

#### Affordability

- Avoid expensive rework by identifying and addressing any concerns at the beginning of the project, and by planning for future retrofits of green features.
- Control maintenance and replacement costs by using quality, durable materials.
- Include energy- and water-saving features to reduce your monthly operating costs.
- Choose a timeless design that will extend the life of the bathroom and the time between renovations.
- Design for accessibility to allow you and your family to stay independent and in your home longer as you age.

## The House as a System

A key part of successfully carrying out a green renovation is to view the entire house as a an interactive, multi-component system. The major components of the “house-as-a-system” are:

- The **building envelope** (roof, walls, windows, doors and foundation) that separates the interior space from the exterior environment;
- The **mechanical systems** (heating and cooling, ventilation and exhaust, humidifiers and dehumidifiers, etc.) that provide, remove or regulate the heat, air and moisture; and
- The **occupants** (the number of people who live in the home, their lifestyle, and how the house is lived in).

Each of these components, as well as how the house interacts with its surrounding environment, can influence the performance of your home. By considering your house as a system, you can avoid potentially costly mistakes and unintended pitfalls that could work against your green objectives.

## About Your House

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Printed in Canada  
Produced by CMHC

27-02-15

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