A Better Way to Renovate

Highlights of seven

Renovation

Demonstration projects

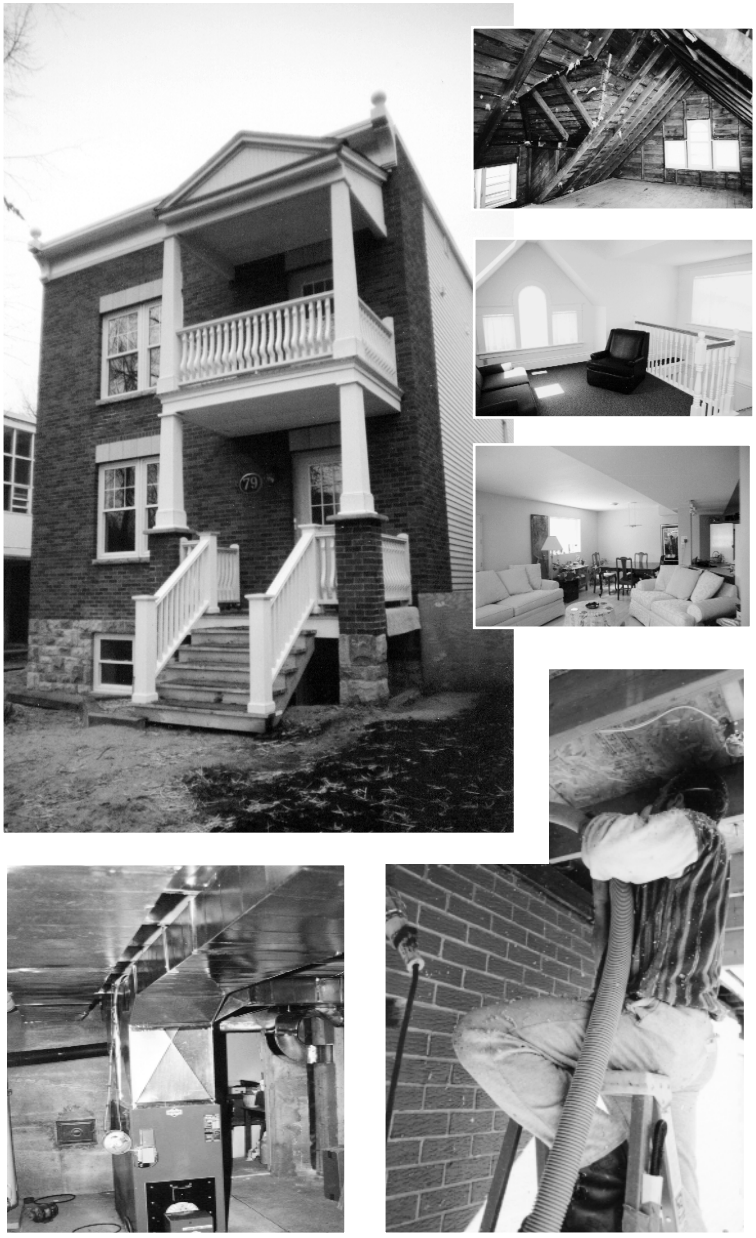
promoting

Healthy Housing,

energy efficiency and

the professional home

renovation industry



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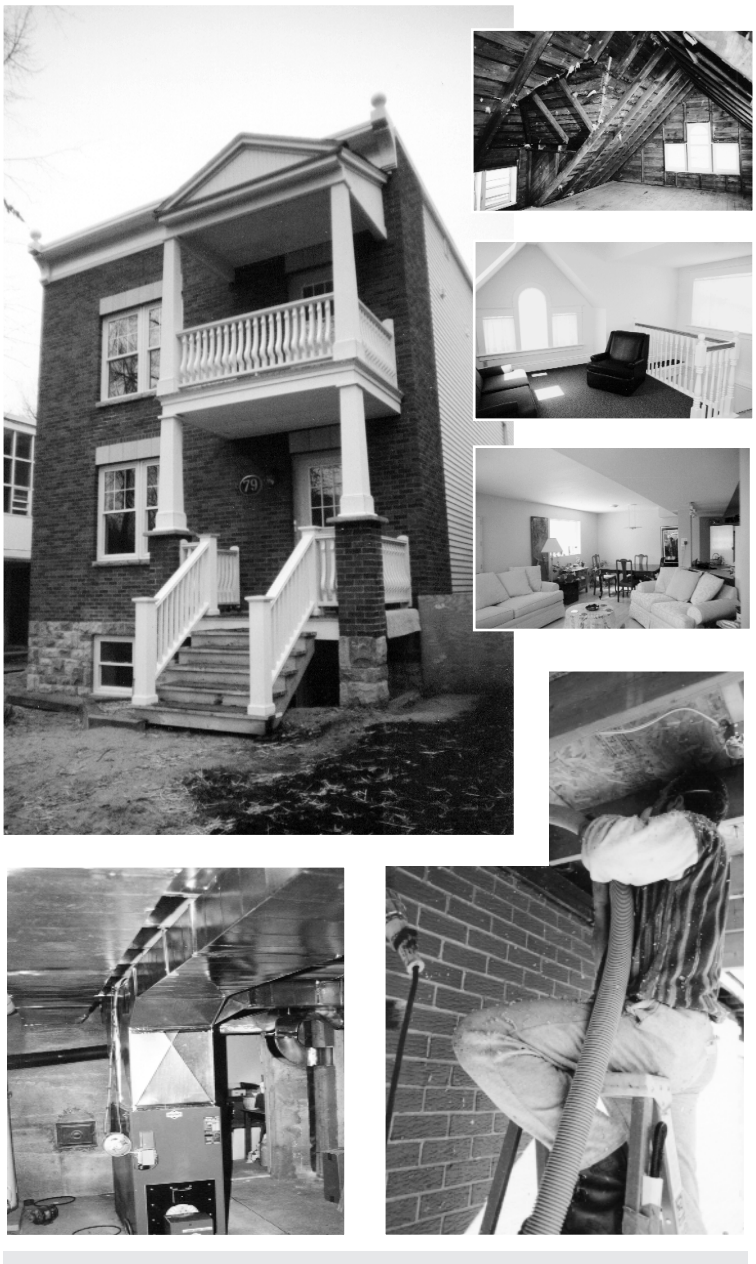

CMHC, NRCan, and the CHBA offer a wide range of housing information.
See For More Information, Page 37, for a list of titles.

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Table of Contents

Introduction

Every year, millions of Canadian householders renovate their homes. Most renovations have the same goal–to make homes more functional, more secure, more comfortable and more enjoyable.

Over the past two decades, architects, engineers, designers and builders have made tremendous improvements in designing and building homes. New homes today are far more energy-efficient and comfortable than in the past. We recognize the importance of clean, fresh air indoors and of keeping chemicals and other pollutants to a minimum. We have learned how to build homes by using fewer natural resources and reducing the negative impact of housing on the environment.

This booklet presents seven outstanding renovation projects that show a different set of renovation challenges and solutions. Together, they demonstrate how a house of any age can be turned into a healthy, comfortable and energy-efficient home.

About Renovation Demonstration

Any house, of any age, anywhere in Canada can have “new home” performance when modern building science and professional building skills are applied to renovation. Renovation Demonstration (Reno Demo) is the proof.

Canada Mortgage and Housing Corporation (CMHC), Natural Resources Canada (NRCan) and the Canadian Home Builders’ Association (CHBA) formed a partnership in 1993 setting up Renovation Demonstration.

Renovation Demonstration was based on a simple idea-houses can be better places to live if we make them healthier for the occupants and the environment.

The objectives of Renovation Demonstration were to:

- Promote and demonstrate CMHC’s Healthy Housing principles;
- Identify energy retrofit opportunities in renovation; and
- Promote CHBA members as professional renovators.

Renovation Demonstration was the first in-depth exploration of applying Healthy Housing principles to renovation, including energy retrofits.

About the partners

CMHC is Canada's national housing agency. CMHC helps Canadians meet their housing needs and supports an efficient and innovative housing industry. CMHC is a pioneer in measuring the impact of housing on both personal health and the environment. Based on more than a decade of research, CMHC’s Healthy Housing initiative is setting new directions in housing for Canadians.

NRCan's Office of Energy Efficiency administers the federal government's energy-efficiency initiatives. Their aim is to reduce the impact of energy use on the environment. NRCan has worked closely with industry to set a standard of excellence for energy efficiency in new houses and apartments through the R-2000 Program. Recently, NRCan established the EnerGuide for Houses Program to improve the energy efficiency of existing homes.

The **CHBA** represents the residential construction industry in Canada. Members include builders and renovators, as well as product manufacturers and suppliers, financial institutions and service providers. The Association has long been a leader in environmental initiatives affecting housing and Canadian homeowners.

A better way to renovate

Renovation Demonstration was based on important concepts that have emerged over the past 20 years.

1) The House-As-A-System

A house is made up of many different components and systems. Together, they determine how the house performs and stands up over time. Renovation can affect how the house operates and what it is like to live in. If the work is not done properly, renovations can have a negative effect on the structure, the air quality or the comfort of the house.

The House-As-A-System renovation approach answers a series of "what-if" questions. For instance: What if we add a big family room–will the heating system be adequate? What if we install a whirlpool–will we need additional mechanical ventilation to reduce moisture?

2) Energy retrofitting

The energy efficiency of most existing homes lags far behind that of new homes. Renovations are usually the best time and most cost-effective way to improve energy efficiency.

The R-2000 Program sets performance standards for design and construction of energy-efficient new homes. The Program has uncovered a wealth of experience, improved building products and new construction techniques that are highly effective for retrofitting homes. The results of these retrofits can be dramatic, with tremendous savings in heating costs and sharply reduced air leakage.

3) Healthy Housing

Healthy Housing includes healthy, sustainable construction and renovation. The approach promotes a healthy environment for the occupants and encourages an environmentally conscious lifestyle, as well as the use of construction methods and materials that have a less-negative impact on the environment.

From the simplest repair job to the most complex home renovation, choices that homeowners and renovators make when planning and carrying out renovations are based on five principles:

1) Occupant health: A home should be a healthy place to live. This means protecting the quality of indoor air and water by keeping chemicals and other pollutants to a minimum, and controlling light and noise. Healthy indoor air can make a tremendous difference in the quality of life, especially for people with allergies or respiratory problems.
2) Energy efficiency: Conventional energy use is linked to environmental problems such as global warming and acid rain. Modern construction techniques and energy-efficient appliances and systems reduce the energy used for heating, cooling, ventilation and other household operations, and reduce the impact of energy use.
3) Resource efficiency: “Sustainable renovation” makes efficient use of building materials and resources, conserves water, considers the durability and longevity of building components and minimizes wastes going to landfill.
4) Environmental responsibility: Renovations can reduce the impact of a house on the environment. For instance, low-maintenance landscaping saves water, which is increasingly scarce and expensive to treat. High-efficiency furnaces reduce air pollution.
5) Affordability: Renovations that are good for homeowners and the environment do not have to be expensive. Many measures come at little or no extra cost-they may even reduce future energy and maintenance costs. And a professional approach to planning keeps costs under control.

The Renovation Demonstration competition

In 1993, Renovation Demonstration's three partners, CMHC, NRCan and CHBA, challenged Canada's professional renovation industry to demonstrate a full range of healthy, energy-efficient measures to bring an older home up to modern standards. The challenge was to completely renovate a poorly maintained, turn-of-the century home in Red Deer, Alberta. The property was ideal for the demonstration (see page 8 for details) and drew an enthusiastic response.

When the pilot was completed, the partners called for proposals for the second round of Renovation Demonstration. They selected six new projects.

Selection guidelines

Renovation Demonstration was a "real-life" project reflecting the marketplace and the concerns of homeowners and renovators.

- The renovation had to be appropriate to, and typical of, the community.
- Projects had to demonstrate renovations in at least four of the seven most popular categories:
  - kitchen
  - bathroom
  - addition
  - conversion or development of basement
  - conversion of development of attic
  - interior or exterior finishing, and
  - heating/ventilation.
- Renovation Demonstration was a "here and-now" initiative. Projects had to use "off-the-shelf" materials and products that were relatively easy for renovators and homeowners to find in their communities.
- Every project had to be a team effort, headed by the local Home Builders' Association. Each team had to include at least one member renovator to manage the project on site and be the main contractor if there were owners.
- Each project offered a unique opportunity for everyone–from renovators and homeowners to governments and manufacturers–to work and learn together in a hands-on setting. Projects also offered an ideal opportunity to demonstrate to the public that there is "a better way to renovate".

Keeping track

Renovation teams documented each project in detail for evaluation and sharing with the rest of the industry. This was particularly important in the Red Deer pilot project, which was the testing ground for the entire initiative.

Getting the message to the public

Promoting professional renovations and awareness of health and energy efficiency was an important part of every project. The teams had to develop a promotional plan for media relations, public open houses, industry workshops and printed information.

"From a public relations viewpoint, the Red Deer pilot was an overwhelming success. For the people in Red Deer, it became a source of pride. It also raised awareness throughout and beyond the community. The entire process was documented on film, and progress reports were shown regularly on local cable television. Open houses drew hundreds of visitors, and the official opening was a major community event."

– Boman Husted, Red Deer Home Builders' Association

Succeeding together

Renovation Demonstration was a team effort. It succeeded largely because of the extensive involvement and contributions of local individuals, companies and organizations, staff and volunteers at Home Builders' Associations; contractors and tradespeople; manufacturers and suppliers; financial institutions; inspectors; designers; media; government officials; and, many others.

The projects

The following pages outline some of the elements common to all the projects, and provide a summary of each project. Special features unique to each renovation are highlighted.

Common elements of the projects

Home inspection and analysis

Each renovation began with a comprehensive assessment of the house-essential for good planning and effective results.

1) **The building inspection** established the condition of the house and determined if other renovation work should be done. Some of the projects showed that an inspection by a trained, qualified home inspector is crucial in identifying problems that could be serious. Such problems could include a plugged chimney; moisture problems in the basement or faulty wiring that could be a fire hazard.

   "We would recommend that an inspection become standard procedure prior to starting any large renovation. From a contractor's point of view, it backs up our position and allows homeowners to understand the state of their home."

   – Ken Dahlen, Canadian Home Builders' Association of North Okanagan

2) **Audit 2000 analysis** is a computer simulation program that estimates a home's energy use. The program bases energy use on insulation levels, mechanical systems, air leakage data from blower-door testing and other variables. The teams used the program to establish energy use before renovation and to evaluate opportunities for improving a home's energy efficiency. Many performed audits after renovations to verify energy savings.

   The EnerGuide for Houses Program, launched recently by NRCan, uses a simplified version of Audit 2000 to help homeowners and renovators get a clear understanding of a home's energy use, retrofit opportunities and potential energy savings.

3) **Separate environmental inspections** helped some teams determine contaminants and health-risk factors. Inspections were done with varying degrees of sophistication and complexity. For instance, visual inspections looked for signs of moisture; "sniff" tests detected chemical off-gassing, mold or gas leaks; and metered readings detected radon levels.

Products and approaches

Products and approaches used to demonstrate healthy, energy-efficient renovations included:

Energy retrofitting

Window replacement, with energy-efficient, high-performance units (usually with low-E coating and argon fill)

Insulation

Air sealing (air barriers and caulking)

High-efficiency heating systems, lighting and appliances

Occupant health

Canadians spend almost 90 per cent of their time indoors. Protecting indoor air quality is very important. The most common approaches were:

- Low- or no-emission paints, finishes, cements, sealants and adhesives–no or few Volatile Organic Compounds (VOCs)
- Low- or no-emission building materials and products (for instance, cabinetry with no formaldehyde)
- Hardwood, ceramic and linoleum flooring, instead of carpeting, to reduce chemical emissions and dust
- Direct-vent heating appliances to prevent combustion gases from entering the home
- Basement treatment (cleaning, sealing, dampproofing, insulating) to eliminate moisture problems and mold
- A heat-recovery ventilator (HRV)–a whole-house ventilation system that continuously draws fresh air into the house and exhausts stale air

"It's possible to create a safe and healthy indoor area and then pollute it with cleaning agents, furnishings, hobby and craft materials and so on. Activities and stored materials should be confined to a well-ventilated space, preferably isolated from the rest of the living space [not in the basement]."

– Steve Crowell, Renovator, Annapolis Valley Home Builders' Association

Resource efficiency

Renovation teams selected materials and products according to environmental criteria. Each renovator also developed a demolition and waste management plan. Approaches included:

- Materials with recycled content (insulation, flooring, shingles)
- Materials from sustainable resources (cork flooring, engineered wood products)
- Water-conserving products (toilets, showerheads, faucets)

- Durable, long-lasting products (flooring, siding, shingles)
- Reuse and refinishing of existing materials (flooring, siding, doors, trim)
- Use of demolition waste in the renovation (lumber, masonry)
- Sale, trade or give-away of demolition materials (taking material to the landfill only if there was no other choice)

Environmental responsibility

Installing high-efficiency heating equipment is one of the most effective ways of minimizing the environmental impact of an existing house. High-efficiency heating equipment reduces emissions and fossil fuel pollutants. It was installed in many of the projects.

Renovation itself can be an environmentally responsible act. It prolongs the life of a building and helps keep it in good operating condition.

Affordability

In general, the Renovation Demonstration features did not significantly increase renovation costs. Higher costs can be offset by extensive reuse of building components and lower waste-disposal fees. In the long run, lower costs for energy, water, maintenance and replacement will pay for many additional renovation costs.

Pilot: The Red Deer Home Builders' Association

The Pilot Reno Demo project involved a 1,200-sq. ft. (112-sq. m), two-storey house built around 1904. The house had a full basement, detached garage and storage shed. Located in the oldest part of Red Deer, the poorly maintained home needed a substantial upgrade and facelift.

Parkland Community Living and Support System (CLASS), owned the house. CLASS is a non-profit organization that helps house special-needs clients. After the renovations, the house became a group home.

Scope of renovation

Work included:

- replacing a rear porch with an 18 ft. x 23 ft. (5.5 m x 7 m) addition, consisting of a family room, laundry, bathroom and a rear deck;
- upgrading an enclosed front porch;
- installing a new kitchen and new windows;
- insulating and air sealing; and,
- upgrading the mechanical systems.

The renovation kept the original character of the home inside and out.

Red Deer Reno Demo features

- Heat recovery ventilator
- Low- or no-VOC paints
- Engineered wood products (joists and sheathing)
- High-heel trusses for higher insulation levels above exterior walls
- 90 per cent efficiency, sealed combustion, natural gas furnace
- Natural gas, induced-draft hot water heater
- Energy-efficient windows
- Energy-efficient appliances and lighting
- Low-flow toilets showerheads and faucets
- Refinished hardwood flooring, stairs and mouldings
- Linoleum made from natural raw materials
- Reuse of bricks from back of house in the front
- Low-emission, durable ceramic tiles
- Low-emission kitchen and bathroom cabinets
- Central vacuum
- Accessible bathroom
- Proper disposal of hazardous wastes
- No-smoking-on-site policy

Energy facts

Air leakage was reduced from 18.7 air changes per hour at 50 pascals to 4.1 air changes–an improvement of more then 75 per cent. Heating costs dropped 50 per cent, while the house became 25 per cent larger.

Points of interest

- In the pre-planning assessment, the renovation team identified several hazardous materials-asbestos siding shingles, and lead paint and water pipes-that pointed to the need for extra care in removal and disposal. (The team hired specialists to remove and dispose of the asbestos.)
- Debris completely plugged the venting system from the natural gas hot water tank leading to the chimney. That meant that exhaust fumes had been leaking into the basement and the house for some time. The inspection also revealed a high rate of air leakage in the home. Installing new triple-glazed, high-performance windows, insulated metal-clad doors, air barriers, air sealing and insulation improved the energy efficiency of the building. The renovators used cellulose from recycled newspaper in the attic and exterior walls, and installed fibre batts with recycled content in the new front and rear additions and the basement.
- The renovation team poured a new concrete floor slab and sealed the new front and back crawlspaces with polyethylene sheeting to eliminate infiltration of soil gases, moisture and a musty odour in the basement. To eliminate mold growth the renovators washed the concrete basement walls with bleach before insulating. To improve drainage, the team sloped the exterior finished grade away from the house.

- To further improve indoor air quality, both the new furnace and the hot-water tank draw air for combustion from the outside and exhaust gases to the outside.
- A heat recovery ventilator (HRV) moves tempered, outside fresh air into the home and exhausts stale. Every room in the house has a supply register and a return register to balance the flow of air.
- Renovators removed all old carpeting to eliminate and prevent trapping of dust, mold, pollens and other pollutants and to cut down on maintenance. The existing hardwood floor was refinished, and recycled hardwood strip flooring salvaged from a racquetball court was used on the second floor. In high-traffic areas, the renovation team installed linoleum flooring made from natural materials.
- Cabinets, countertops and ceramic tile were selected with indoor air quality in mind. Paints were water-based with low- or no- VOCs. Furnishings were chosen for low emissions, durability and easy maintenance.
- The renovators salvaged and re-used, when possible, materials from demolished areas of the house-bricks from the back of the building were used to restore the front facade, and vermiculite insulation from the attic was used as a soil additive.
- The designers made the bathroom in the new main-floor addition wheelchair-accessible, and a ramp was built at the back of the house.

Interview with the team

Boman Husted, Bowood Renovation, Renovator and Project Manager:

"For me, as a professional renovator, the most interesting part of the project was the technical aspects-learning about Healthy Housing, finding the right products and the right information, understanding all the little things you can do, from sniffing around the basement to see if there is mold present to stapling mesh fabric to the framing members and then blowing in recycled cellulose insulation.

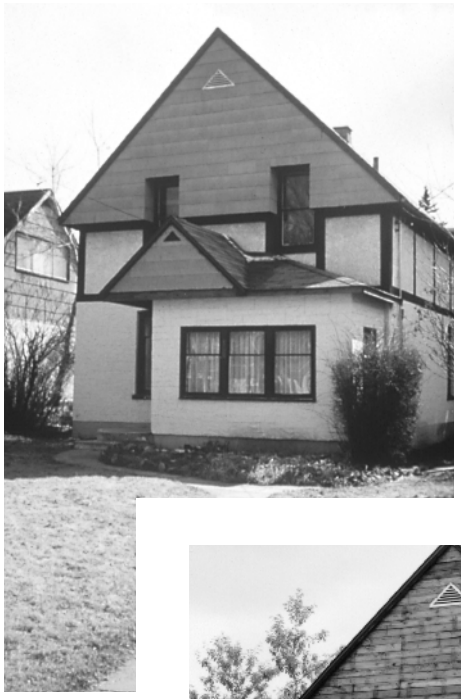
"I had never done any of that before. It was really unique. It has also totally changed the way I approach renovation now. When I first walk through a potential client's home, I now bring a Healthy Housing perspective to my evaluation and suggestions.

"I try to make my clients understand how their home works and the impact of renovation: If you do this to your house, then that will probably happen. It is really the idea of the House-As-A-System where everything works together. For instance, if the homeowners want to install new energy-efficient windows and doors, they may end up with uncomfortably high humidity levels and condensation on the windows in the winter because the home is more airtight. However, a heat-recovery ventilator will reduce the humidity, eliminate fan noises and generally improve the air quality. Once homeowners understand that an HRV is better for them and better for their home in the long run, they seldom have trouble saying, "Go ahead". For a lot of people, money is not the issue. They want to do it right.

"As soon as we had finished the Renovation Demonstration pilot, I got a call from a homeowner who had followed the project closely and was sold on the whole concept of healthy, energy-efficient renovation. The type of house and the scope of work were quite different, but we ended up using many of the same products and approaches, from low-emission paints and cabinets to water-conserving fixtures.

"This shows how important it is to get information out there, to communicate with homeowners so they know what's available and what's possible."

Red Deer, Alberta



Before, in mid-renovation and after

The Fraser Valley Home Builders' Association

This project focused on two turn-of-the-century heritage buildings–the Plant Manager's House and the Accountant's House. The houses were originally part of a building complex that made up a former brick plant in Clayburn Village, B.C.'s first company town.

Scope of renovation

Renovations to the Plant Manager's House included a new heating system, a basement upgrade, a new front verandah and steps, new roofing and an upgraded bathroom. The work was part of an ongoing effort to restore the home and maintain its historical features. A sunroom was added to the "Accountant's House".

Reno Demo features

- New energy-efficient, natural gas boiler connected to the original hot water registers
- Upgraded electrical system
- Improved structural strength in basement
- Protection against infiltration of water and soil gases in basement
- Low-flow plumbing fixtures
- Low-VOC paints and varathanes
- Low-emission caulking, sealants and adhesives
- Cork floor tiles
- Refinished hardwood flooring
- Finger-jointed studs
- Restored old siding
- Re-used wainscoting from another site
- Refurbished existing claw-foot tub and pedestal sink
- Reused timbers from crawlspace in foundation and rear steps

Energy facts

Heating cost reduction was estimated at 81 per cent in the Plant Manager's House once the house had been completely retrofitted in subsequent renovations. A recent, similar renovation of the Accountant's House reduced heating costs by about 65 per cent.

Points of interest

- Improvements to energy efficiency and air quality began in the basement. The crawlspace was dug out by hand. The ground was leveled, a vapour barrier was installed to reduce soil gas and moisture entry into the basement, and a concrete floor poured. Then a new natural gas boiler and a heat exchanger were installed and connected to the original hot water registers for heat distribution. The dirt from the excavation was used in flowerbeds and a raised terrace at the rear of the house.

- The house was made more earthquake-resistant by strapping a series of 2 in. x 6 in. (5 cm x 15 cm) framing members together, setting them in concrete around the inside basement walls and anchoring them to both the foundation and the floor joists above.
- The foundation had settled considerably and the weight of the central fireplace had caused the floors to sag. Bricks were removed from the base of the fireplace and the entire hearth and chimney jacked up almost two inches (5 cm) to level the floor. New 6 in. x 6-in. timbers (15 cm x 15 cm), set in concrete pads, were placed under the floor joists for reinforcement.
- Two chimneys needing repairs were dismantled down to the roofline and the bricks used to rebuild them.
- The old wooden roof shingles were replaced with pressure-treated shakes to maintain the character of the home.
- The exterior cladding was the original brick veneer on the ground floor and vinyl siding on gable ends and dormers. The vinyl was removed, and the cedar siding underneath refinished and repainted in the original colours.
- Soffit vents were installed and fascia boards were repaired.
- The sunroom addition in the Accountant's House, created by enclosing an existing rear porch, was a prime example of environmental responsibility through reuse of materials. Beechwood flooring was salvaged from a local gymnasium; antique glass from another site was combined with twin-sealed insulated glass units for attractive and energy-efficient windows; and hand-hewn barn beams and an old door with leaded glass sidelights were salvaged from another house.

Sometimes, old houses have pleasant surprises for their renovators. Amazingly, the siding underneath the vinyl was in such good shape that it did not have to be removed. The team also found many small treasures, such as old hand-blown whisky bottles, an intriguing reminder of the house's long history.

Interview with the team

Bud Saunders, Executive Officer, Fraser Valley Home Builders' Association:

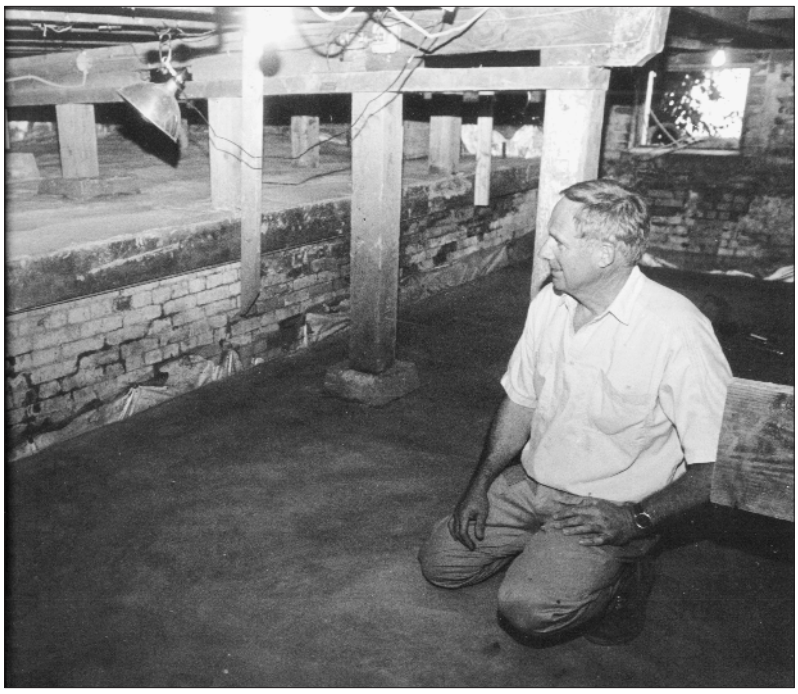
"One of the most important things that homeowners can keep in mind when they want to renovate or upgrade a heritage home is to hire a professional renovator.

"Typically, the weak points in older homes are the basement, chimneys, roofs and mechanical systems. There are technical aspects that could be complex, engineering calculations that are needed. At the same time, it's important to keep the original feel of the house despite the modern upgrades. It takes more than a handyman or someone who just works things out on the corner of the kitchen table.

"A professional renovator has the experience, the training and the knowledge to do it right."

Clayburn Village, British Columbia

Restored in style



Surveying the finished crawlspace

The Canadian Home Builders' Association of North Okanagan

The Sullivan house was one of the first houses built in the 1950s in a subdivision overlooking Lake Okanagan. It is now one of the most desirable areas of Vernon. Generally in good shape, the house–which is set on a sloping lot–needed renovations to bring it up to modern standards of comfort and energy efficiency.

Scope of renovation

The owners wanted to add more space. This involved upgrading the basement/ground level and extending it with a 16 ft. x 22-ft. (4.9 x 6.7 m), two-storey addition, with a bathroom and two bedrooms on the lower level and an extended living room upstairs. The project also included a new roof and upgraded electrical, heating and ventilation systems.

Reno Demo features

- Upgraded insulation and air sealing
- Energy-efficient windows and skylights
- High-efficiency gas furnace
- Power-vented, energy-efficient gas hot water tank
- Energy-efficient light fixtures and appliances
- Direct-vent, 70 per cent efficiency gas fireplace
- Mason fireplaces capped and sealed
- Increased soffit ventilation
- Kitchen and bathroom exhaust fans
- Low-flow toilets, showerheads and faucets
- New roofing with added roofing vents
- Materials with recycled content
- Engineered wood products (joists, sheathing)
- High-heel trusses
- Demolition materials reused as drywall backing forms, backfill, and so on
- Old windows, skylights, wood stove, and so on, sold or traded
- Low-VOC water-based paints
- Removed carpeting and refinished hardwood floor
- New living room carpet made from 80 per cent recycled plastic pop bottles
- Cork flooring

Energy and water facts

Air leakage was reduced by 30 per cent and a new furnace reduced heating bills by 15 per cent. Toilet water consumption was cut in half.

Points of interest

- To increase the comfort of the entire lower level (old and new), the wood panelling was removed, insulation and a vapour barrier were installed throughout, and the walls were finished with drywall.
- Downspouts from the eavestroughs were redirected to keep water away from the foundation.
- Because a gas leak was discovered during the inspection, along with severe pitting and rusting, the old furnace was replaced with a new energy-efficient unit. The ductwork was extended to the new addition. At the same time, changes were made to the ductwork to ensure better heat distribution and airflow throughout the entire house.
- Windows, doors and skylights were upgraded, but existing windows were kept wherever possible. If the frames were in good shape, only the failed sealed units were replaced and new weather stripping applied–a cost-effective way to reduce heat loss. The new energy-efficient windows included a reflective coating to prevent overheating inside due to excessive heat from the sun.
- Weather stripping was also used around doors to reduce air leakage.
- A number of existing standard skylights were replaced with new energy-efficient skylights that can be opened for ventilation.
- Cork flooring replaced tile or linoleum. Cork flooring is warm and comfortable underfoot, durable, sound absorbing and has good thermal value. It is also a renewable resource–a cork tree can be harvested every nine years and, like a sheep whose wool is sheared, the tree is not harmed and will regrow its cork.
- The project made good use of B.C. Hydro's energy conservation program and energy-saving kit. The kit includes an insulating blanket for hot water tanks, weather stripping, draft-proofing and low-flow water products, and a computer-generated home energy plan.

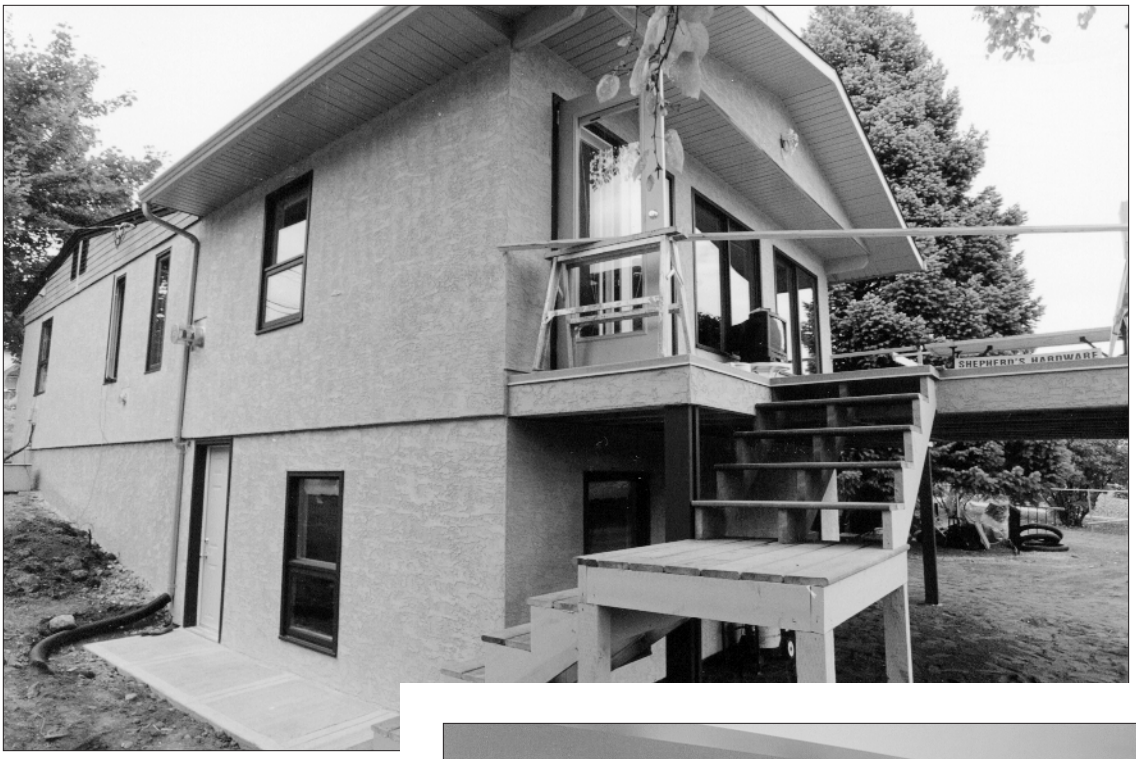
Interview with the team

Ken Dahlen, Keith Construction, Renovator and Project Co-Chair:

"Renovation Demonstration was a great learning experience. It taught us to take an in-depth look at a renovation job, to look carefully at the whole structure to see what can be done to make the house better from a health and energy-efficiency perspective, and not just providing what's necessary. It has definitely made me a better renovator.

"Many of the extra measures may not be that big and can be quite cost-effective. For instance, during the work we discovered that there was no insulation in parts of the basement walls, just wood panelling on concrete walls. Well, the extra insulation will quickly pay for itself in lower energy costs. On the other hand, when you find out that the old furnace should be replaced, that's when the homeowner sometimes has to decide what gets priority when the budget is limited. Perhaps they need to postpone some of the more cosmetic work which can easily be done later. Our job is to give them the best possible information so that they can make the right decision."

Vernon, British Columbia



The new addition looked good from the outside even before work was completed. The completed interior is healthy and comfortable to live in.

The Kitchener-Waterloo Home Builders' Association (K-WHBA)

This renovation of a deteriorating older home was linked to Kitchener-Waterloo's efforts to revitalize its downtown area and to the Association's partnership with K-W Habilitation Services, its charity of choice for more then five years. The house is now home to four developmentally challenged adults and one full-time staff member.

Scope of renovation

The 2 1/2-storey house had been vacant for several years. It needed a complete interior demolition and renovation. A dormer was added in the attic to create an extra bedroom.

Reno Demo features

- High-efficiency furnace (90 per cent) with no standing pilot light
- Heat recovery ventilator (HRV)
- Upgraded insulation and vapour barrier
- Air barrier and sealing
- Energy-efficient windows, doors and skylights
- Vented range hood
- Central vacuum exhausts to outside
- Low VOC paints
- Low-flow showerheads and toilets
- New and refinished hardwood flooring
- Flooring made of natural, durable and biodegradable materials
- Formaldehyde-free cabinets and sealed countertops

Energy facts

After renovation, energy consumption for space and hot water heating was estimated at only one-third higher than for a brand-new R-2000 home of similar size.

Points of interest

- The first step toward creating a healthy, energy-efficient environment was to gut the entire house. The renovation team assessed what could be reused and disposed of the rest. Items in decent shape were saved for the annual K-WHBA Recycle Sale. Others, such as the old asphalt shingles, were taken to recyclers.
- There were extensive moisture problems in the basement and the walls and ceiling were treated to eliminate mold.

- The house was solid masonry (double-wide brick) construction. To provide room for insulation and a base for applying drywall, renovators framed the exterior walls on the inside to create a three-inch cavity. Urethane foam was sprayed on the inside surface of the walls and the sloped ceilings to achieve maximum insulation value within the available space-R-20 (RSI 3.5) in the walls and R-32 (RSI 5.6) in the ceilings. The foam also sealed any cracks in the masonry.
- Fibreglass batts of R-40 (RSI 7.0) were used in the flat ceilings.
- Kiln-dried framing lumber was used for most new construction because of its lower moisture content.
- Electrical switches and receptacles were installed on interior walls when possible, to protect the air barrier on exterior walls. Lights were connected to dimmer switches.

Interview with the team

Bruce Hutchings, Executive Officer, Kitchener-Waterloo Home Builders' Association and Project Coordinator:

"Our project was a community event. The house had been neglected for years; it had been a 'crack house' at some point and had been boarded up for several years. There was water in the basement, pigeons in the attic, broken windows and garbage everywhere.

"The project generated a lot of interest and media coverage, both television and newspaper. Because the house was so run down, people had a unique chance to see just how much of a difference renovation can really make. It acted as a small catalyst in the community. This is not a wealthy neighbourhood, but since work began on the Reno Demo project, at least three homes in the immediate area have undergone facelifts.

"We received a lot of community support from the very beginning. A zoning variance related to group homes went through without problems. We got a strong endorsement from our local neighbourhood committee, from the Mayor, and so on.

"Now that it's all done, no one can quite believe the difference. The common opinion is that this is more than a renovation. This charming four-bedroom home with its country decor is nothing short of a miracle."

Kitchener, Ontario

From the worst house on the block to the most attractive.

Before, the attic was "fit for pigeons only". Now it is a pleasant living area.

The Ottawa-Carleton Home Builders' Association

The Ottawa-Carleton Home Builders' Association renovated a 1927 two-storey home in an area of Ottawa when there has been a lot of renovations. The owner lived in the ground floor and rented the second floor. The objectives of the renovation were to bring the building up to modern standards, and to increase the floor space and income potential for the owner. The project also promoted the City of Ottawa's goal of residential intensification.

Scope of renovation

There had been few improvements to the house since it was built. The attic and exterior walls were not insulated, and severe foundation settlement had cracked the brickwork. Windows were single-glazed. Renovations consisted of a new foundation; extensive interior and exterior improvements; a two-storey addition in the back, and, the creation of a new, second rental unit in the finished basement.

Reno Demo features

- Innovative basement ventilation system
- Upgraded insulation and exterior air barrier
- High efficiency, direct-vent boiler HRV with air handlers
- Natural gas stoves and clothes dryers
- Energy-efficient windows and doors
- Glass blocks in the basement for more natural light
- Heat recovery ventilator in each apartment
- Anti-scald valves on hot water tank and bathroom faucets
- Upgraded soundproofing
- No-and low-emission caulking and paints
- Materials with recycled content
- Repaired existing plaster walls
- Porch railings commissioned from heritage carpentry students
- Hardwood and linoleum flooring
- Low-emission cabinets and shelving
- Old bricks to recyclers

Energy facts

Before renovation, it cost $1,500 a month for heat for the whole house and hot water heating for one unit. After renovation–which increased space 1,800-sq. ft. (167-sq. m)–costs for heating, hot water and stoves and dryers for three units were calculated at $1,200.

Points of interest

- To create adequate ceiling height in a basement apartment, and to solve the foundation problem, renovators had to raise the house more than 1.5 ft. (0.5 m) and pour a new concrete foundation. As work began, they discovered that the house had been built on a ravine filled with ashes and other debris. That made it necessary to excavate 12 ft. (4 m) from grade level in certain places to reach stable ground.
- An innovative system of depressurized stud walls and sub-floor was constructed in the basement to keep mold, odours and radon gasses out, and to improve the air quality in the whole building. To do this, the walls and subfloor are kept at a constant slight negative pressure.
- Humidity that is normally trapped in basement walls and subfloors is removed by continuous ventilation. As a result, moisture or water leakage will not damage hardwood flooring. The whole house can also be ventilated in summer without concerns about humidity in the basement.
- A new natural gas combination heating/hot water system was installed. From a high-efficiency hot-water tank in the basement, separate water pipes run to each apartment, where an "air handler" in each apartment extracts the heat from the water. The water is returned to the tank for reheating (a closed-loop system). The air handler looks and functions like a small furnace complete with ductwork and ceiling diffusers to distribute the heat. This approach meets fire-code regulations for separate ducting in each unit. In addition, the water tank handles the hot water needs for all three units.
- With the basement apartment and the addition, the house grew from 2,400-sq. ft. (225-sq. m) to approximately 4,200-sq. ft. (392-sq. m) over three floors. The new apartment consists of a kitchen, living room, dining room, bathroom and two bedrooms. The basement also contains a mechanical room and a home office. The entrance to the office is through the ground floor unit.

Interview with the team

Lynn Schmidt, Owner, Renovator and Project Manager:

"The public's interest was terrific. The turnout at open houses was great. Many people followed the whole project from beginning to end, through the newspaper, and they would be back for every open house.

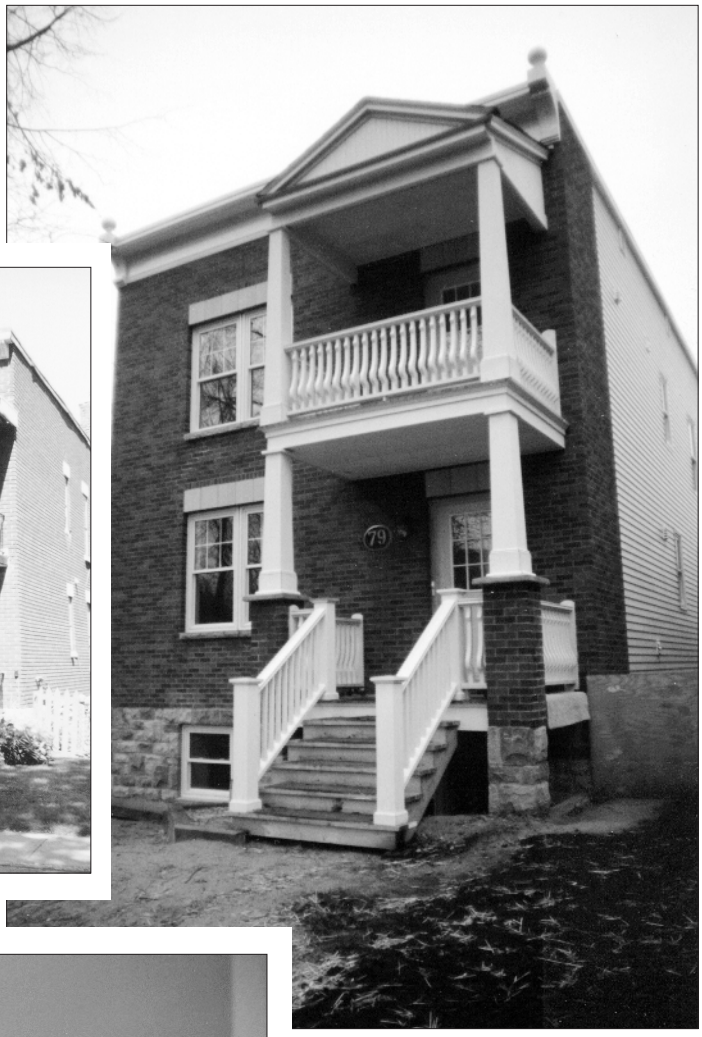
"We had some set-backs, which resulted in delays and additional costs but we had a great team. My advice to homeowners who might be thinking about doing this kind of renovation is to plan the project in as much detail as possible, and to make sure that you have good people working with you–people who know what they are doing. And be ready to accept the unexpected if it happens. You never know.

"My family and I are happy with the changes. The house looks great, the kitchen is open and bright, and the air is much nicer. It's hard to quantify but it seems we're sick a lot less now.

"With the new apartment in the basement, we have extra money coming in. We are finding that the quality of the apartments and the living environment means that we can ask, and get, a very favourable rent."

Ottawa, Ontario

Extensive renovations provided additional space, lower energy bills and greater comfort.



The basement became a high-quality rental unit.

APCHQ Région de l'Estrie

This Reno Demo team renovated and converted a two-storey building in the Sherbrooke area of Quebec. The renovation converted a building with two residential units and a ground-floor convenience store into a four-unit residential building.

Scope of renovation

The work consisted of extensive interior renovations including new kitchens and bathrooms. Mechanical systems were upgraded and a comprehensive energy retrofit was undertaken. Special attention was paid to indoor air quality.

Reno Demo features

- Upgraded insulation and air sealing
- High-performance windows
- Energy-efficient doors
- Energy-efficient hot water tank
- Energy-efficient lighting
- Electric baseboard heaters
- High-efficiency and quiet bathroom fans ventilation system
- Upgraded sound resistance with acoustic ceiling panels made from recycled wood fibre and paper
- Low-flow toilets, showerheads and faucets
- Low-emission paints
- Prefinished hardwood flooring
- Plastic water pipes

Energy facts

Air leakage was reduced by about 50 per cent. Just one improvement–installing programmable thermostats for the electrical baseboard heaters-reduced heating costs by 10 per cent.

Points of interest

- Because its exterior was masonry veneer, the building was retrofitted from the interior, and stripped completely on the ground floor. The existing 2-in. x 4-in. (5 cm x 10 cm) exterior walls were strapped to add more room for fibre batt insulation. An air barrier was installed to prevent air leakage.
- To insulate the unvented flat roof, cellulose fibre insulation made from recycled newsprint was blown into the entire cavity at high density. This provided a high insulation factor and also helped reduce air leakage.

- To deal effectively and easily with the rough and uneven surfaces of the stone foundation, the interior surfaces of the crawlspace walls were sprayed with polyurethane insulating foam, which also reduced air infiltration.
- New baseboard heaters were installed in each apartment to provide individual unit heating. As part of its contribution to the project, Hydro Quebec provided programmable set-back thermostats for the baseboard heaters, which allow precise individual room control for optimum comfort and reduced energy use.
- Indoor air quality was improved by installing ventilation systems in individual units. The systems consisted of a bathroom fan linked to a dehumidistat in the hallway. When the relative humidity exceeds a pre-set level, the fan is activated and expels the humid, stale air.
- The fresh-air-intake system has a motorized damper that introduces fresh air into the residence and an electrical coil for pre-heating the air. A fan moves the air into adjacent rooms where it is distributed through grilles located high on the walls. This system is efficient and virtually silent.

Interview with the team

Mr. André Gagné, Technical Manager, Association provinciale des constructeurs d'habitations du Québec (APCHQ):

"The building was owned by a cooperative building society which manages a number of rental units. The main focus of the project was to update a multi-unit building to be energy efficient and have good indoor air quality, and to do so in a cost-effective and realistic way.

"The project provided an ideal opportunity for trying an alternative approach to ventilation. When you have several units in a building, it doesn't make sense to have a heat recovery ventilator (HRV) in the basement for the whole building, for instance. But it may be too expensive to install an HRV in each unit and there may not be enough room for the system. Instead, we opted for a smaller innovative system, which took up much less room.

"Many of the other things we did to improve the indoor air quality can be cost-effective for rental properties, or at least they won't add to the cost of improving the unit. Ceramic tile, which off-gasses less, can last for 10 to 15 years, whereas cushion flooring may have to be replaced every three to five years in a rental property. In the kitchen cabinets, the edges of the particleboard were sealed to reduce emissions.

"The open houses generated a lot of interest and drew hundreds of visitors, both people in the industry and the public. They were particularly interested in the ventilation system. Many are aware of air quality issues and are concerned about making mistakes in their own renovations."

Estrie, Québec

New energy-efficient windows provide lots of light and energy savings.

Insulating and air sealing for better energy savings.

The Annapolis Valley Home Builders' Association (AVHBA)

This project was different from the others. Rather than demonstrating a number of different renovations under one roof, the AVHBA renovated seven homes throughout Nova Scotia's Annapolis Valley. The AVHBA describes the work as real-world renovations–the homeowners lived in the houses during the renovations.

Windsor

Exterior air barrier being installed

The owners wanted to give the outside of their 1955 bungalow a facelift and reduce maintenance while improving energy efficiency. The original siding had been replaced with cedar shingles after 10 years; later, cellulose insulation had been blown in. The energy retrofitting in this renovation was done from the outside of the home.

Points of interest

- Once the old siding was removed, expanded polystyrene (beadboard), made without CFC (chlorofluorocarbon) or HCFC (hydro chlorofluorocarbon), was used as an insulating sheathing to boost the existing insulation value.
- The walls were made airtight by installing a house-wrap air barrier and sealing it at the seams, to the foundation, to window and door frames, and to the underside of the soffit with tape and caulking. This reduced air leakage by approximately 30 per cent. The new vinyl siding, along with vinyl trim and eavestroughs, is durable and will require little maintenance.

Kingston

The open wood-burning fireplace in the living room of this 1992 bungalow was replaced with a high-efficiency, direct-vent gas fireplace. This was part of a larger and lengthier renovation job dealing with moisture problems and indoor air quality.

Points of interest

- Wood-burning fireplaces are more for aesthetic pleasure than heating. In fact, when in operation, they tend to draw heat out of a home rather than add heat.
- A direct-vent, or sealed-combustion, gas fireplace draws the air for combustion from outside. It is also vented to the outside. This eliminates the potential for chimney backdrafting. Chimney backdrafting causes by-products of incomplete combustion, including carbon monoxide (CO), to get into the house. This can have potentially serious health effects on the people in the home. “Zero clearance” indicates that the fireplace required no extra clearance for fire codes and could be placed inside the existing wall opening.

Wolfville

Modern comfort and heritage style can go hand in hand.

This Victorian home, built in 1860, had become a dilapidated rooming house and needed a complete overhaul, inside and out, to transform it into four units. The owner also wanted to increase the energy efficiency of the structure, while maintaining the historical character of the building, such as the original mouldings and arched windows.

Reno Demo features

- Upgraded insulation (fiberglass with 50 per cent recycled content)
- High-performance window inserts
- Air sealing
- Low-emission caulking, sealants and glues
- No-VOC, water-based paints
- Refinished hardwood flooring
- Reuse of interior and exterior doors
- Low-flow toilets, showerheads and faucets
- Materials with recycled content
- Upgraded fire separations

Points of interest

- The single glazing in the windows was replaced with high-performance window inserts, and foam insulation was applied around the original frames to reduce air leakage and heat loss. This was an affordable way of increasing energy efficiency without disturbing the original character of the home.
- Old chimneys no longer in use were taken out, as they were a major source of heat loss (typical of the Victorian era, almost every room had a fireplace). One chimney, used as a flue for the oil furnace, was refurbished.
- New drywall was installed on top of the old lath and plaster. This was not only less expensive, but it also reduced the amount of waste going to landfill and covered up lead paint used on the original walls.

Woodville

Renovation of this three-storey, 1890 Victorian house was a long-term project, with extensive energy retrofitting begun a few years earlier. The Reno Demo work focused on the living room where the owners wanted to restore the original character of the house while increasing the comfort of the room.

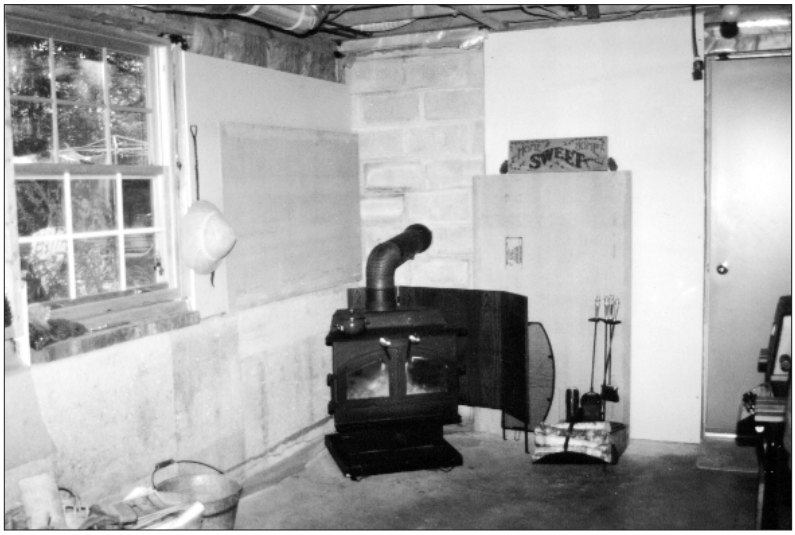
The historical style is maintained with a new plaster arch.

Points of interest

- The walls of the living room were stripped, and a wall shared with a small adjoining room was taken out. A secondary frame was built inside the exterior walls to allow for higher-than-normal levels of insulation (R-26 or RSI 4.6). The drywall was sealed with caulking, tape and gaskets to create a rigid air barrier (known as the Airtight Drywall Approach, or ADA).
- The renovation was designed for optimal resource efficiency. Insulation and framing from the demolition were reused in the exterior wall reconstruction. Construction techniques were used to facilitate future renovations or demolition without destruction. For instance, galvanized screws were used instead of nails, and sub-flooring was laid without glue.
- Local white pine and hardwoods were milled on site for period-style trim, window seats and the mantelpiece.
- The original floor was sanded and refinished.
- Old-fashioned lime plaster was used in arches and ceiling medallions. The walls were finished in darker, historically appropriate colours using low-emission water-based paints.

Kentville I

The owners of the two-storey house, built in 1990, wanted to turn their typical Nova Scotia walk-out basement into a comfortable, energy-efficient living space.



Typical Nova Scotia unfinished basement

Points of interest

- The inspection showed a few minor problems common in homes with an unfinished basement. The flat grade along the house did not encourage drainage of rainwater away from the foundation. There were no rain gutters or downspouts. Condensation dripped from the cold water supply pipes in the ceilings. The floor above vibrated when the washing machine was in the spin cycle. Each of these problems had a clear solution.

- The project was the starting point for a demonstration of retrofit options for windows.
- Rather than replacing the standard double-glazed windows throughout the house, the renovator worked with a window manufacturer to develop a less expensive option such as a coating that can be added to the existing glazing.

Kentville II

The renovation challenge in this 1950s, well-maintained house was to create a healthy, comfortable space, or "refuge", for a family member with environmental sensitivities.

Reconstructing the ceiling and walls with aluminum foil over insulation

Points of interest

- The "refuge" room was gutted down to the framing. The exterior walls were strapped to increase the space in the wall cavities, and insulation and air sealing were applied to the ceiling and walls. Instead of plastic, renovators used aluminum foil as an air-vapour barrier to minimize off-gassing, and sealed it with standard construction tape rather than acoustical caulking.
- All building materials had to pass the "sniff" test by the owner. This is important because every individual has a different tolerance level to the chemicals commonly found in building products.
- The client was also affected adversely by lack of sunlight during winter and on cloudy days, so extra windows were installed to flood the "refuge" with natural sunlight.
- Mold in the basement contributed to the owner's health problems, so a whole-house ventilation system was installed to reduce humidity levels. The system was designed to maintain an adequate level of humidity during winter months.
- To minimize dust, drywall finishing was "sponge sanded" rather than dry sanded. A dry compound mix was used to avoid the fungicide commonly found in pre-mixed compounds.

Annapolis Royal

Inside, this home provides a healthier living environment.

The interior renovations to this 1983, two-storey home were part of a continuing effort to improve the indoor air quality to provide a better living environment for a child with asthma. Previously, an HRV with an additional filter had been installed.

This renovation involved many new finishes throughout the house: factory-finished hardwood flooring; new trim and moulding produced locally from clear spruce and painted off-site; new sealed plywood shelving and so on.

Interview with the team

Terry Watters, S.H.E. Consultants, Energy Assessment Specialist and Project Coordinator:

"We [The Annapolis Valley Home Builders' Association] elected to do many smaller projects rather than one project because it got more of our renovators involved. It also gave people throughout the Valley, not just one or two communities, a chance to see the projects.

"These were real-world renovations. The homeowners actually lived in the houses during the renovations. Every job was unique, and this gave the public a real opportunity to see the full scope of what is involved in a healthy, energy-efficient renovation. It reinforced the importance of assessing what can and should be done in a renovation, and it showed them that tools and the people are available to do this. In the end, it comes down to knowing how to spend your renovation dollars most wisely."

Checklist for planning a healthy, energy-efficient renovation

Renovation offers many opportunities to make a home healthier and more energy-efficient and to improve its overall comfort. The time to consider these options is during the planning process, before buying materials or starting work.

This checklist presents the most common Healthy Housing and energy-efficient approaches and features. If you are a homeowner, go over the list with your renovator. If you are a contractor, use it to present options to your customers. Additional information sources are listed on the back cover of this publication.

Pre-renovation inspection

Goals: Determine the condition of the home and what needs doing, and setting priorities.

- q Homeowner inspection
- q Renovator inspection
- q Building inspection by certified home inspector
- q Energy assessment
- q Environmental assessment
- q Equipment inspection: heating, cooling, ventilation, hot water, etc.
- q Electrical/fire inspection

Kitchen

Goals: Save water and energy. Improve air quality. Think recycling.

- q Restricted-flow taps (aerator)
- q Energy-efficient windows, doors and skylights
- q Energy-efficient appliances
- q Energy-efficient lighting
- q Task lighting
- q Low-maintenance, durable flooring (tile, linoleum, hardwood, ceramic)
- q Low-emission cabinets (hardwood, sealed particle board)
- q Low-emission countertop (solid surface, laminates)
- q Low- or no-VOC paints
- q Low-emission cements, grouts and caulking
- q Range hood vented to the outside
- q Area/whole-house ventilation
- q Built-in recycling centre

Bathroom

Goals: Save water. Control moisture and air quality. Be resource-efficient. Save energy.

- q Low-flow toilet, showerhead and faucets
- q Low-maintenance, durable, non-slip flooring (tile, linoleum)
- q Low-emission cabinets (hardwood, sealed particle board)
- q Low-emission countertop (solid surface, laminates)
- q Waterproof wall finish
- q Low- or no-VOC paints
- q Low-emission cements, grouts and caulking
- q Energy-efficient windows and skylights
- q Energy-efficient lighting
- q High-efficiency exhaust fans
- q Protection against scalding
- q Safety and accessibility features (grab bars)

Living, dining and bedroom areas

Goals: Save energy. Improve the air quality and reduce dust. Be resource-efficient. Think low maintenance. Increase comfort.

- q Energy-efficient windows and exterior doors
- q Programmable thermostats
- q Energy-efficient lighting
- q Area lighting
- q Automatic timers and dimmer switches
- q Low-emission, easy-maintenance flooring (hardwood, cork, marble, ceramic)
- q Carpeting and area rugs from natural or recycled material
- q Low-emission trim and mouldings
- q Low-emission solid wood doors
- q Low- or no-VOC paints and varnishes
- q Low-emission cements, grouts and caulking
- q Low-emission furniture and drapery (hardwood frames, natural fabrics)

Making the right choice is sometimes a matter of trade-offs.
For instance, smooth flooring is easier to keep clean than carpeting and less prone to harbouring mold and dust. However, each type of flooring offers a different mix of benefits and drawbacks. Pre-finished hardwood has low offgassing, but a higher price. Cork, at a comparable cost, is harvested from a fast-growing renewable resource, but is still relatively unknown. Synthetic flooring may release more chemicals into the air, but is easier to clean and wears well.

Basement

Goals: Control moisture and air quality. Eliminate mold. Save energy. Think comfort if basement is living space.

- q Determine and deal with sources of mold (repair, replacement, etc.)
- q Mold treatment with bleach
- q Air and moisture sealing of walls
- q Moisture and soil gas sealing of floors
- q Upgraded insulation
- q Ventilation
- q Reduce concrete floor dust with water-based wax sealer
- q Energy-efficient lighting
- q Natural light with high-performance windows
- q Low-emission finishing materials

Mechanical room or area

Goals: Save energy. Control air quality. Minimize water contaminants.

- q Energy-efficient, sealed-combustion and correctly sized heating equipment
- q Energy-efficient hot water tank
- q Energy-efficient furnace fan motor
- q Separate, direct air supply for equipment
- q Insulated hot water pipes
- q Non-lead pipes
- q Air filtration and humidification/dehumidification
- q Whole-house ventilation system (heat recovery ventilator)
- q Effective, balanced, sealed ductwork or distribution system
- q Water purification system
- q Central vacuum exhausted outdoors

Attic

Goals: Save energy and increase the comfort of the whole house.

- q Upgraded insulation
- q Air sealing and vapour barrier
- q Weather stripping and insulating attic hatch
- q Ventilation

The structure, or what you do not see

Goals: Save energy. Prevent moisture infiltration. Improve air quality. Increase comfort. Be resource-efficient. Reduce noise and dust.

- q Insulation (recycled content)
- q Air sealing (windows, doors, electrical outlets)
- q Vapour barrier
- q Framing, sheathing, underlay: low-emission, resource-efficient
- q Drywall with recycled content

The exterior

Goals: Reduce maintenance and replacements. Reduce moisture problems.

- q Low-maintenance, durable exterior finishes
- q Low-maintenance trim, soffits and fascia
- q Air and moisture sealing
- q Long-lasting roofing
- q Eavestroughing
- q Drainage away from the foundation
- q Chimney flashing (no leaking)
- q Properly located air intakes and exhausts for systems and appliances
- q Effective lighting for safety
- q Roof overhang for shading
- q Ice dam prevention

Landscaping

Goals: Conserve water. Reduce use of chemicals. Enjoy low maintenance.

- q Drought-resistant native plants (xeriscaping)
- q Reduced lawn area (less water and fertilizer)
- q Cistern or rain collection system
- q Composter for organic wastes
- q Organic garden
- q Trees for windbreak and shade

For more information

Whether you are a homeowner or a renovator, lots of information is available to help you plan a successful, healthy and energy-efficient renovation.

Canada Mortgage and Housing Corporation (CMHC)

CMHC is Canada's national housing agency, helping to provide safe and affordable housing for Canadians. Get information about the following topics:

- Healthy Housing–the links between our homes, our health and the environment
- Indoor air quality and moisture–remedies for controlling mold and pollutants
- Accessible housing–how to accommodate people's special needs
- Home repair, maintenance and security–how to ensure your home's long life
- Home renovation–where to start and ways to do it
- ...and more

Call us at 1 800 668-2642 for publications, reports and other printed materials.

Write to us at Canadian Housing Information Centre, Canada Mortgage and Housing Corporation, 700 Montreal Road, C1-200, Ottawa, ON, K1A 0P7

Visit our Web site at www.cmhc-schl.gc.ca

Natural Resources Canada, Office of Energy Efficiency (OEE)

The OEE is the federal organization responsible for helping Canadians to improve energy usage. Ask us about:

- *Keeping the Heat In*, a comprehensive guide to improving the energy efficiency of your home
- *Buying Energy-Efficient Windows and Doors*
- *Air Leakage Control*
- *The EnerGuide Directory of Household Appliances*
- plus a series of consumer guides on heating, cooling, lighting, appliance selection and use, and many other topics
  ...and more

Call us at 1 800 387-2000, or write to us at Energy Publications, c/o Canada Communication Group, Ottawa, ON, K1A 0S9.

Fax your orders to 819 994-1498, or visit our Web site at http://oee.nrcan.gc.ca and order your publications directly on line.

Canadian Home Builders' Association (CHBA)

The CHBA represents the professional renovation industry in Canada, with members in communities from coast to coast. Contact the local Home Builders' Association in your area for information. Ask about:

- A list of professional renovators
- Brochures and other printed information–ask for *Thinking About Renovating Your Home?* and *What Should We Ask A Renovator?*
- Visit our Web site at www.chba.ca

Visit us on our Web site at: www.cmhc-schl.gc.ca

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