CANADIAN SUSTAINABLE DEVELOPMENT

Celebrating Canada's expertise in urban design, community planning, housing technologies and research

UNIVERCITY

Canada

CMHC SCHL

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CANADIAN EXCELLENCE IN SUSTAINABLE DEVELOPMENT

Since the concept of sustainable development entered the global arena, Canada has been on the front line.

In 1996, the federal government established the office of the Canadian Commissioner of Environment and Sustainable Development and by the end of 1997, 28 federal departments and agencies had tabled sustainable development strategies.

Today, the Government of Canada is developing a made-in-Canada approach to climate change emphasizing new technologies developed in concert with the provinces and in co-ordination with other major industrial countries.

As a country, we are working to improve the built environment and reduce the resource consumption of our buildings and communities, thereby managing our impacts on the environment.

As Canada's national housing agency, Canada Mortgage and Housing Corporation (CMHC) supports the Canadian housing industry and improves the living conditions of Canadians through its four pillars: housing finance, assisted housing, research and information transfer and the promotion of Canadian exports, including housing systems, products, services and technology. It is through these pillars that CMHC works to achieve healthy, high quality, energy-efficient housing, thereby making vibrant, sustainable communities a reality across the country.

CMHC is Canada's housing authority and one of the most all-inclusive housing agencies in the world. We are a research leader in a variety of topics relating to the health and sustainability of communities and buildings.

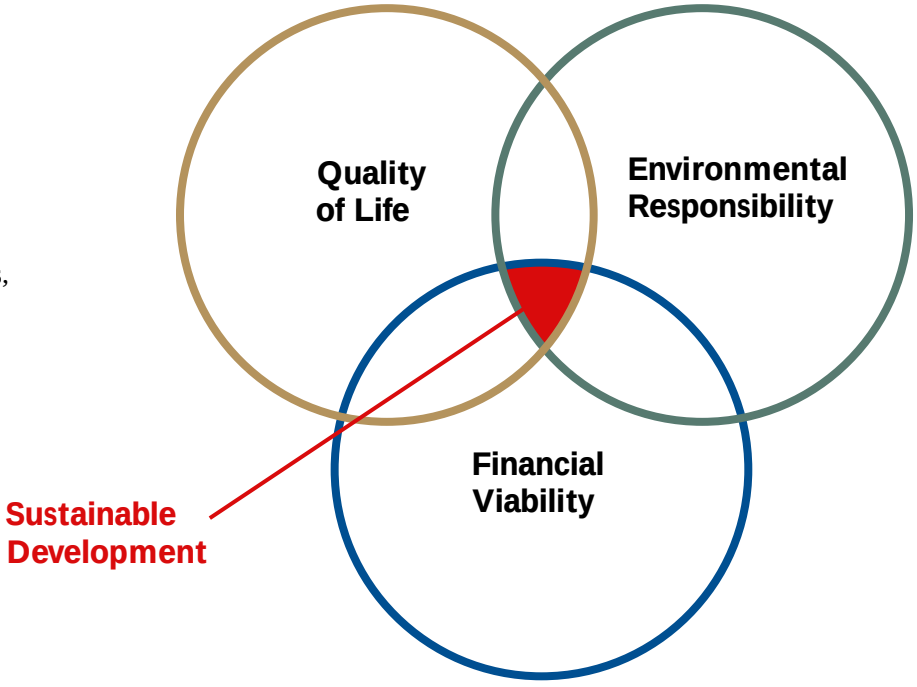
The Government of Canada, through CMHC, has established a Canadian Net Zero Energy Healthy Housing (NZEHH) initiative, a government-industry partnership to build a vision for a clean energy future and healthy communities. The goal is to implement a range of measures that will ultimately lead to housing that has annual zero net energy consumption for heating and electricity.

The Net Zero Energy Healthy Housing initiative is designed to help reduce the energy consumption of Canada's housing sector, support the growing renewable energy and sustainable housing industries and help Canada meet its goal of reducing greenhouse gas (GHG) emissions.

CMHC: ADVANCING COMMUNITIES & BUILDINGS

Recognizing that a truly effective definition requires universal agreement, CMHC defines sustainable development as the challenge of developing in ways that enhance the quality of life through environmentally responsible solutions that are financially viable in the long term.

Using the three interlocking circles of **Quality of Life**, **Environmental Responsibility** and **Financial Viability**, CMHC is working to address contemporary issues of sustainable development at both the broader community and the detailed building scales. In exploring change at these scales, CMHC has become a major contributor to shaping the sustainability of our developments.



ADVANCING COMMUNITIES

At the community scale, land use, urban form and community infrastructure are critical to sustainable development. CMHC has been working toward alternative development patterns and standards for community design, addressing quality of living, environmental responsibility and financial viability.

Through our research and in working with our partners, CMHC has explored communities that minimize their environmental impacts and resource demands. For example, promoting communities that provide opportunities for shopping and working close to homes reduces the need for driving. This results in less pollution from vehicles and a better quality of life because people have the option of living close to amenities and jobs.

	Quality of Life *contributing to better quality environments that are more liveable*	**Environmental Responsibility** *minimizing impact on natural resources and the environment*	**Financial Viability** *considering short-and long-term costs for individuals and society*
Community Characteristics	• Choice of housing types available • Mobility options including walking, cycling, transit • Safety • Access to nature and open spaces • Proximity to basic services, amenities • Investment in the public realm • Diversity of activities • Education • Cultural celebration • Local identity	• Stormwater management *• permeability for stormwater infiltration* *• utilizing stormwater runoff* • Protection of ecologically sensitive areas • Efficient land use — responsible use of land for development (compact urban form) • Developing on already disturbed areas–industrial land (brownfield development) • Limit greenhouse gases by encouraging public transit and non-vehicular transit such as walking and cycling, and • Mitigate pollution, hazardous and toxic materials	• Demographic *• diverse income groups in each community* • Supporting local service *• local job opportunities* • Restoration of existing buildings • Using existing infrastructure capacity • Resilient infrastructure systems that can withstand shocks and hazards over time • Buildings and spaces that can adapt over time and with changing needs • Contribution to economic health and well-being • Economic revitalization
Building Characteristics	• Flexible housing that adapts to changing lifestyles • Good indoor air quality with low-emission and non-toxic compounds • Natural building ventilation and lighting • Occupant control over indoor environment • Comfortable indoor temperature	• Efficient water use *• efficient appliances and fixtures* *• re-use* *• matching water quality to need* • Passive solar heating • Renewable energy sources — solar, wind • Recycled and recyclable building materials • Construction waste and solid waste management	• Durable building materials • Reduced operating costs • Reduced capital cost or life cycle costs.

Through research, CMHC explores how buildings and communities can contribute to the three interlocking circles of sustainable development.

ADVANCING BUILDINGS

Recognizing that every community is essentially a collection of buildings, and with buildings being one of the major users of resources in the built environment, we cannot build sustainable communities if we do not also address the buildings. Infrastructure and resource demands ultimately start at the building scale, and CMHC works to make buildings more sustainable.

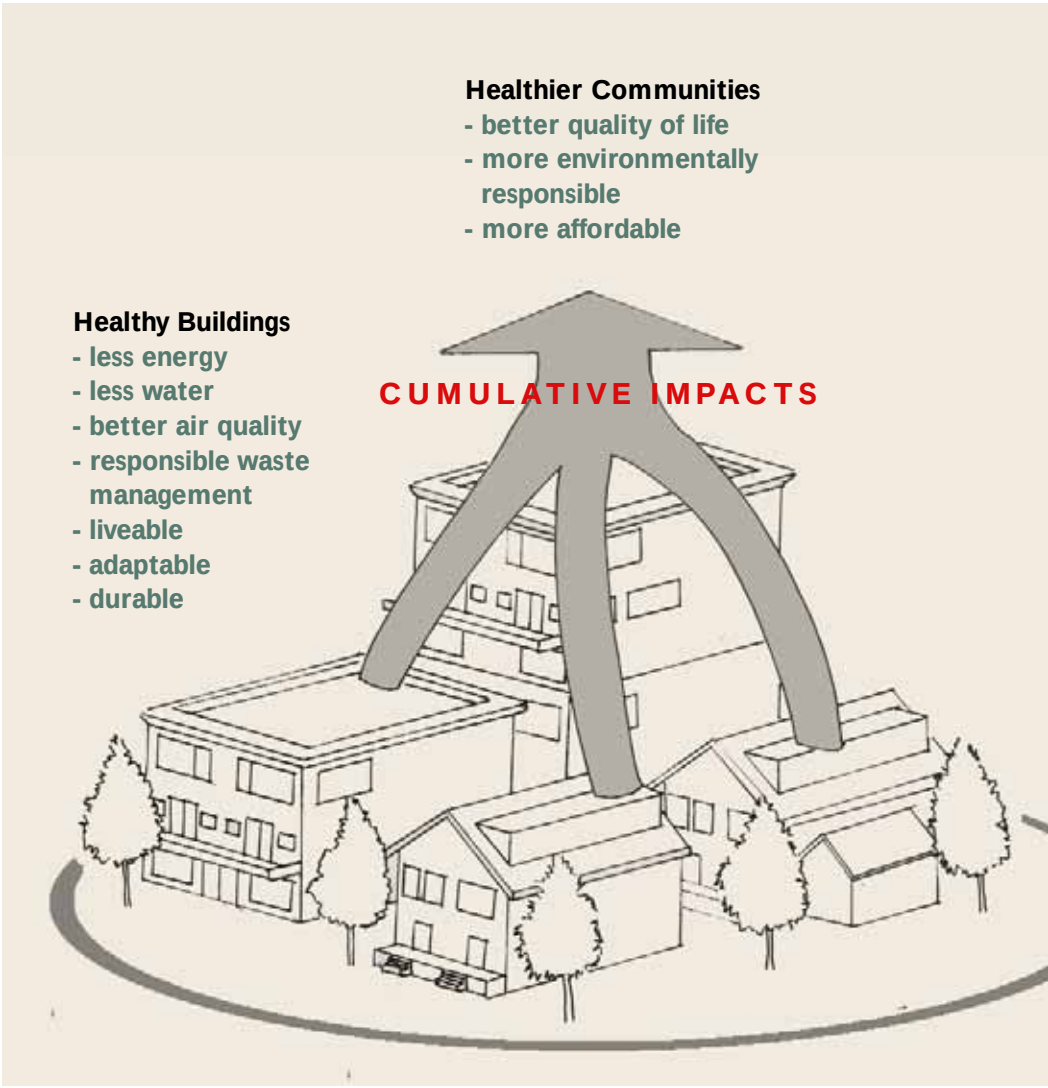
Through many years of research, the Canadian building industry has come to appreciate buildings not only as providers of shelter, but also as complex systems that contribute to sustainable development.

CMHC championed the "house-as-a-system" concept, which recognizes that all the systems in a building are interconnected and influenced by their environment. Changes to one system will affect other systems and the cumulative effect of the systems working together is greater than the effect of any single system.

For example, when changes are made to one system, such as the building envelope (for example, adding insulation or double-glazed windows) other systems, such as ventilation equipment, may require change to adjust to airflow changes and moisture levels. The building is also interconnected with the external built and natural environment. Changes to the environment (such as weather or sun exposure) affect the systems in buildings (such as the heating system). And changes to the building (such as size) can have an impact on the health of the environment (such as land consumption and stormwater runoff).

This is especially important when considering the cumulative impacts of grouping buildings together in communities and cities.

For more than a decade, CMHC has promoted the concepts of "Healthy Housing™" and "FlexHousing™" and planted the principles of sustainability in the housing market, creating buildings that adapt to changing lifestyles and needs, that provide healthier living and working environments, that are more affordable and that use resources more efficiently.



HEALTHY HOUSING™

Building on many years of research by CMHC and others, Healthy Housing™* is a vision of housing that promotes the health of occupants while considering the environment and preserving natural resources. A home built using Healthy Housing™ concepts looks the same as a regular home, but it is less expensive to operate and maintain. Five key elements characterize a healthy house: occupant health, energy efficiency, resource efficiency, environmental responsibility and affordability.

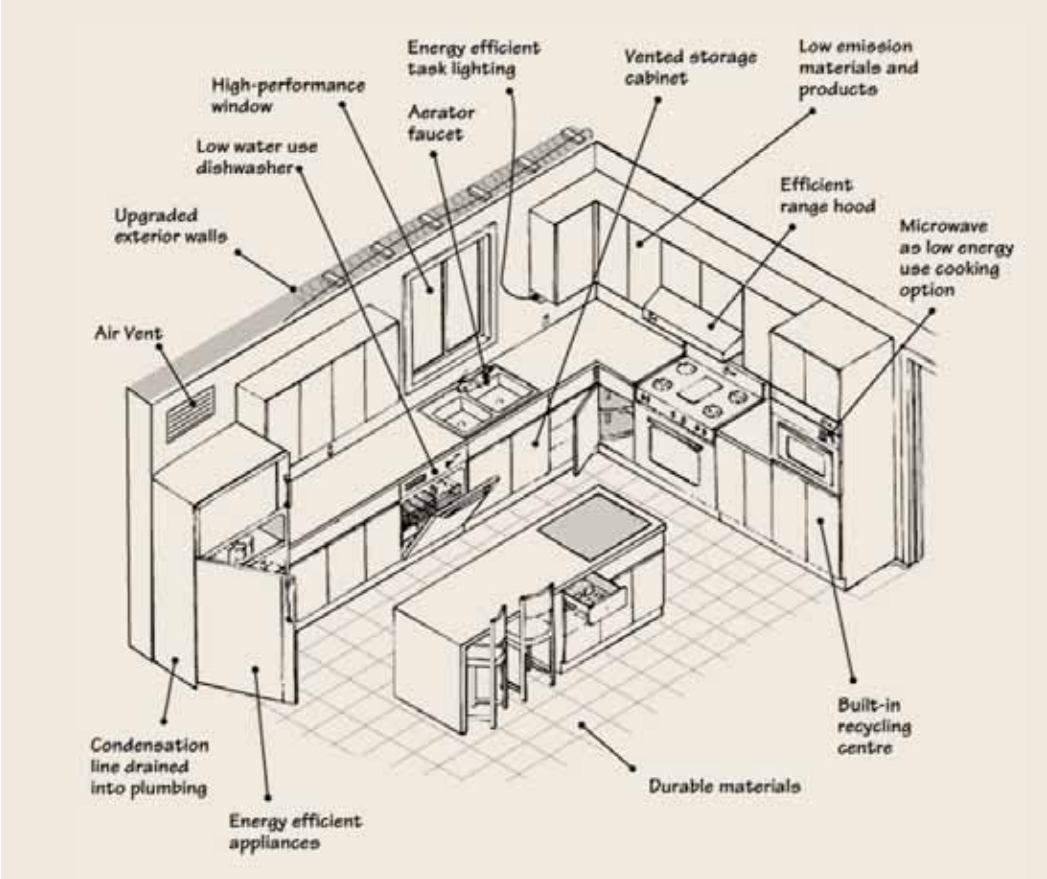
1. Occupant health — Healthy Housing™ supports occupant health by providing clean, fresh indoor air and water and reducing noise levels. Building materials are carefully selected to avoid negative impacts on occupant health and comfort.

2. Energy efficiency — homeowners are increasingly concerned about the amount of energy they consume in operating their homes. Not only are energy prices increasing, but the exploration for energy, its extraction, processing and uses all have profound environmental impacts. Homes built using Healthy Housing™ concepts typically use between one-quarter and one-half the energy of conventionally constructed homes of the same size, resulting in less environmental pollution and lower operating costs.

3. Resource efficiency — Healthy Housing™ uses resources efficiently by ensuring building materials and construction waste are responsibly managed. Houses are also designed to conserve resources, especially water and energy.

4. Environmental responsibility — Healthy Housing™ benefits the homeowner and the community by being environmentally responsible. When alternative water and waste water systems are considered, so are broader community issues. Site planning that reduces land requirements is also encouraged.

5. Affordability — Healthy Housing™ need only cost the same, or marginally more, to build than a conventional home. Many features, such as extra insulation and energy-efficient windows, reduce operating costs and may increase resale value. Healthy Housing™ materials are durable, ensuring a longer life for the home and reduced maintenance costs over the lifetime of the building.
For more information see: **www.cmhc.ca**



** Healthy Housing is an official mark of Canada Mortgage and Housing Corporation*

FLEXHOUSING™

FlexHousing™* is a concept that provides residents with solutions for adapting their homes to suit their changing lifestyles. The three basic principles of FlexHousing™ are adaptability, accessibility and affordability.

1. Adaptability — an adaptable home is designed to cater to a variety of living arrangements. Incorporating adaptive features during initial construction saves time, money and inconvenience down the road. Examples of adaptive features include:

- reinforcing bathroom walls during construction for future installation of grab bars
- installing modular kitchen counters and cabinets that can be adjusted vertically on brackets.

2. Accessibility — accessible homes are user-friendly and designed without barriers, making it easier to move furniture or drive a wheelchair from room to room. Features that promote accessibility make homes more practical and convenient for residents. Accessibility features include:

- wider-than-usual doorways that allow greater access for moving furniture, carrying an armful of groceries or mobility for a wheelchair or walker
- ground-level access that provides convenient and safe entrance to the home
- non-slip flooring in kitchens, bathrooms and laundry areas.

3. Affordability — cost is a concern for most homeowners. FlexHousing™ features are less expensive to change in the future. Although the initial costs of installing these features may be more than building a conventional home, the cost of future renovations is reduced. FlexHousing™ provides homeowners with opportunities to:

- reduce moving costs — families are less likely to move from a house that caters to their changing needs, thereby saving fees for real estate and moving services
- reduce renovation costs — savings could include installing suitable doors and windows during construction that makes the creation of two bedrooms from one less expensive in the future
- reduce the cost of office space — FlexHousing™ makes it easy to create a home office, which could reduce office rental fees, travel costs to and from the workplace and parking costs.

For more information see: **www.cmhc.ca**

** FlexHousing is an official mark of Canada Mortgage and Housing Corporation*

BUILDING A BETTER FUTURE

Delivering more sustainable houses and communities to all Canadians requires municipalities, municipal planners, non-profit organizations, the private sector and government agencies to work in partnership. This allows people and organizations with different expertise and strengths to come together to explore creative, innovative, integrated solutions.

CMHC provides its partners with the research required to help plan and build sustainable communities. CMHC also offers partners innovative new strategies for the development of healthy and flexible housing solutions and a wide range of ideas and best practices to overcome regulatory hurdles. CMHC sponsors research and demonstration work in all regions of Canada - a country that is extremely diverse geographically and culturally - and in many other locations worldwide.

There are many examples of buildings and neighbourhoods that have reduced life cycle costs while enhancing environmental performance, comfort, safety, health, flexibility and liveability.

The following pages detail projects that relied on Canadian expertise to make their dream a reality.

GRANVILLE ISLAND

Vancouver, British Columbia

Type: Non-residential brownfield redevelopment

Size: 15 ha (37 acres)

Construction type: Refurbished, wood-frame, some concrete

Completed: 1979

Sustainability features: Cultural enhancement, economic revitalization, land redevelopment.

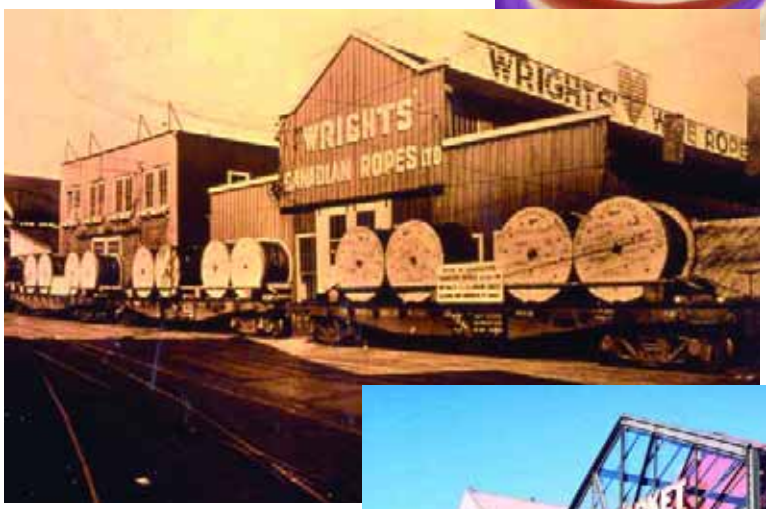
Granville Island is a mixed-use urban development and one of Vancouver's main tourist destinations. Each year more than 12 million locals and tourists visit Granville Island, which recently ranked number one in the Ten Best North American Neighbourhoods, by the New York-based *Project for Public Spaces.*

Granville Island was originally a centre for sawmilling, ironwork, slaughterhouses and other activities. It was valued for its close proximity to barge traffic. A series of fires and relocation of manufacturing activity to the suburbs areas resulted in eventual abandonment of the site.
As time passed, it became evident that Granville Island had the potential to be redeveloped for alternate use. The central location of the site and its access to water views suggested that it could become a popular gathering place.

CMHC guided the redevelopment process and plans to revitalize Granville Island began with the vision to create a place that would provide a heart for the City of Vancouver, comprised of commercial, industrial, cultural and educational land uses. The design focused on retaining elements of the Island's industrial past through features such as tin and stucco siding, rail tracks and industrial doorways.

In 1979, the redeveloped site was opened to the public and Granville Island is now a financially self-supporting development that includes more than 300 operations employing more than 2,500 people. The focus is the Public Market, which offers diverse foods, flowers and crafts. Surrounding the Public Market are alley-ways leading to buildings that house a mix of studios, restaurants, theatres and facilities such as the Emily Carr Institute of Art and Design.

CMHC continues to manage the site and pursue the sustainability of Granville Island by exploring innovative uses for materials and heating and cooling energy that may be otherwise lost or wasted. CMHC aims to close material and energy loops on Granville Island to mutually benefit local businesses and the environment.



HOME 2000

Burnaby, British Columbia

Type: Flexible housing

Size: 186 m2 (2,000 sq. ft.) building

Construction type: Two-storey wood frame.

Completed: 2001

Sustainability features: Adaptablility to changing needs, energy efficiency, water efficiency, durable and healthy materials, affordability, and indoor air quality.

Home 2000 was constructed to showcase innovative and practical ideals in housing. It was the result of a team effort by CMHC, British Columbia Institute of Technology (BCIT), Greater Vancouver Home Builders' Association (GVHBA), Canadian Plywood Association, UBC (University of British Columbia) School of Architecture and a host of other product and service providers.

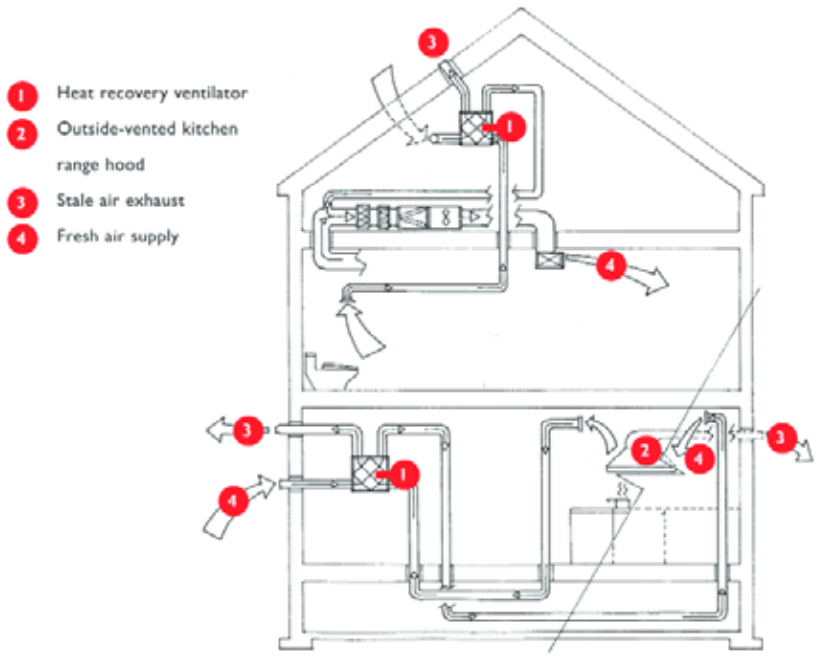
The home has two storeys plus an attic. With six distinct modules, Home 2000 was designed for quick assembly and Britco Structure Ltd. built it in just over a month.

The home is designed to fit a typical Vancouver lot - 10x37 m (33x122 ft.) with a rear lane. In order to accommodate residents' needs over the long term, Home 2000 can be easily converted from a four-bedroom, single-family house into a code-compliant duplex. This design allows greater flexibility that enables a family to remain in their home as needs change.

Home 2000 was also designed to provide a comfortable, healthy environment. Low-volume toilets and energy-efficient appliances, lighting and windows are all featured. The building envelope is air-tight and well-insulated, ensuring that the home is comfortable throughout the year. When compared to a conventional home, these features reduce energy consumption costs. Long-lasting materials, such as fibre-reinforced cement siding and pressure-treated wood, prevent mold, mildew and wood rot.

The FlexHousing™ and Healthy Housing™ features incorporated into Home 2000 make it affordable and comfortable. While these features can slightly increase construction costs, homeowners can expect to recover costs and begin saving from the reduced energy and maintenance costs.

The demonstration home debuted at the 2001 BC Home Show and then was moved to its permanent location at the BCIT campus, where it was open for public tours until the end of 2004. Tours are now available by appointment. The home was recently featured on CMHC's first Green Home Tour.



SEABIRD ISLAND

Near Agassiz, British Columbia

Type: Rural community development

Size: 7 units, 1.5ha (3.7 acre) site

Construction type: Wood-frame townhouses, duplexes and single-family housing

Completed: 2004

Sustainability features: enhanced liveability, adaptability to changing needs, energy efficiency, healthy building materials, heritage preservation.

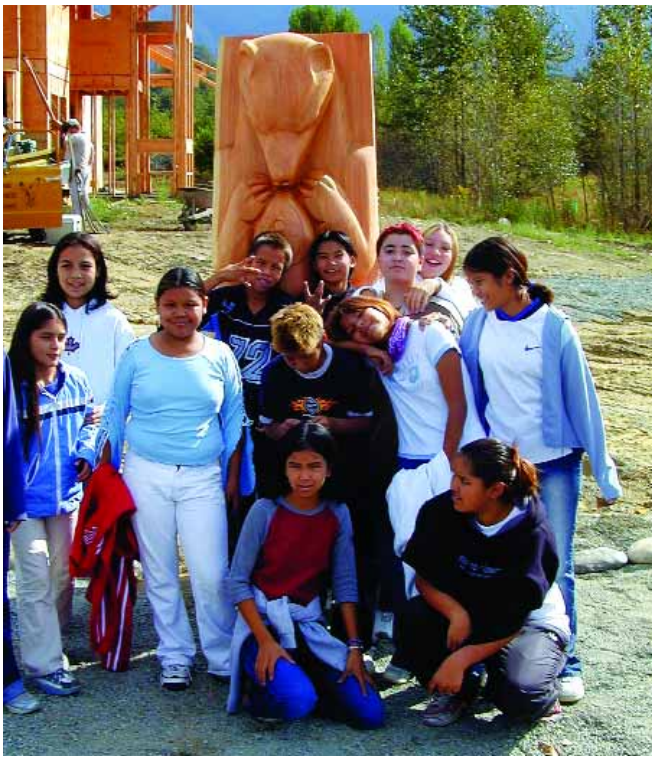
The Seabird Island Sustainable Community Demonstration Project is the first sustainable aboriginal community development of its kind in the world.

The community built seven homes (triplex, duplex and two single-family homes) on its reserve near Agassiz, B.C. in partnership with CMHC and Indian and Northern Affairs Canada, with the generous support of a host of product and service providers.

The challenge for this project was to address key housing issues facing aboriginal people living on reserves in Canada while designing sustainable housing that reflected the community's heritage and culture. As the leader in Healthy Housing™ and FlexHousing™, CMHC contributed research and expertise to the design of the homes.

Healthy Housing™ features incorporated in Seabird Island reduce energy costs, conserve natural resources and minimize pollution and wastes. For example, rainscreens prevent water from being trapped in the exterior and interior walls. In addition, three wind generators were constructed on the reserve, providing 15 per cent of the total energy required by the homes.

FlexHousing™ features in the homes allow them to adapt to the changing needs of growing families and elders in the community: each unit in the triplex and each detached home can be easily converted into two, self-contained suites to create five more housing units.



GOVERNMENT OF CANADA BUILDING

Charlottetown, Prince Edward Island

Type: Government office building

Size: 12,305 m2 (132,450 sq. ft.)

Construction type: Concrete slab

Completed: Ongoing, anticipated completion 2007

Sustainability features: energy efficiency

The federal government anticipates that the Charlottetown Government of Canada building will be the most environmentally friendly building ever constructed by Public Works and Government Services Canada (PWGSC). Using sustainable design features, the building will strive to meet Canada Green Building Council's (CaGBC) Leadership in Energy and Environmental Design (LEED™) gold rating certification.

The building will blend advanced environmental design features and technologies with the architecture that is evident throughout downtown Charlottetown. Energy-efficient design features include photovoltaic cells to capture sunlight and convert it into electrical power. The building design will maximize natural lighting opportunities, reducing artificial light requirements by 80 per cent. A green roof will also be constructed to cool the building during the summer. Water conservation measures will include the use of rainwater to operate the building's septic system as well as to water plants.

Overall, it is expected the environmental design features will result in an 80 per cent reduction in potable water use and a 60 per cent reduction in energy consumption. The building is predicted to raise the bar for green building construction in Canada and throughout North America.

Government of Canada

ANGUS

Montréal, Quebec

Type: Mixed-use brownfield redevelopment

Size: 50.6 ha (125 acres)

Construction type: Refurbished commercial buildings, new wood-frame apartments and townhouses, new concrete-slab apartments

Completion: 2006

Sustainability features: Mixed-uses incorporating open space, residential, commercial, and industrial; land redevelopment.

Former industrial lands and brownfield sites redeveloped for residential and commercial use facilitates increased housing densities and re-use of existing infrastructure. In turn, this can enable the creation of affordable housing. Angus exemplifies this type of redevelopment.

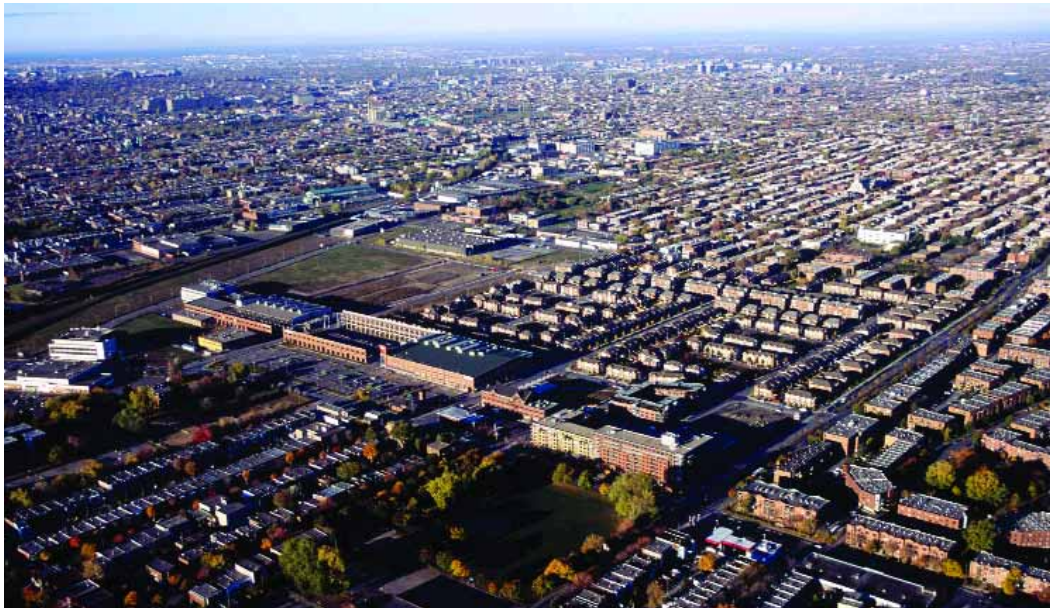
The 50.6-hectare (125-acre) site in Montreal is just five km (three miles) from the central downtown business district. The site was previously used as a manufacturing yard and industrial lands. When these operations closed in 1992, Canadian Pacific Railway Real Estate Group planned to redevelop the lands as a mixed-use site incorporating residential, commercial and industrial zones. The location is optimal for downtown employees, young couples or first-time buyers looking for a relatively inexpensive alternative to a single-family home, with the convenience of being near downtown.

Initial stages of re-development focused on site clean-up as heavy metal deposits and other subsoil contaminants had accumulated during the site's years as a rail yard. There were community consultations to gather feedback on neighbours' concerns and it was determined they wanted the re-development to include commercial and light industrial areas to provide jobs.

The final development consists of 1,200 housing units comprising townhouses, condominium apartments and seniors' apartments. The site also includes shopping in a commercial district as well as a significant portion of land set aside for light industry. Small parks and grassy areas are also incorporated.

This project has resulted not only in new housing but also jobs through the inclusion of a commercial district. In addition, entire buildings and parts of building were preserved and re-used, thus contributing to a better overall environment.

ANGUS



GARRISON WOODS

Calgary, Alberta

Type: Mixed-use brownfield redevelopment
Size: 1,600 residential units, 71 ha (176 acre)
Construction type: Refurbished housing, new wood-frame single family houses, apartments, townhouses
Completed: 2005
Sustainability features: Mixed-uses, refurbished housing, pedestrian friendly, transit accessible, diversity of homes, land redevelopment.

Garrison Woods is a redeveloped brownfield site in suburban Calgary. Until 1998, the site was part of a Canadian Forces Base that included 565 military homes. When the military left, the Canada Lands Company bought the land and redeveloped the site into a mixed-use community with 1,600 residential units.

A key component of the development is new and re-furbished housing. Of the original 565 houses, 400 were refurbished as semi-detached and single-family homes. In addition, former military buildings were used for community amenities, such as schools.

At the onset of the project, the Canada Lands Company wanted to use the principles of smart growth and sustainable development to design the community. A diversity of housing types was developed, drawing from traditional architectural styles. Garrison Woods was designed as a pedestrian-friendly community where most residents live within a five-minute walk to a bus stop, a two-minute walk to a park and have shopping and businesses within walking distance. A large grocery store is also located within a 10-minute walk from all residences and downtown Calgary is only a short drive away.

The rate at which homes were sold in Garrison Woods indicates a successful development. Residents appreciate the diversity of homes, which allows for a range of buyers and income levels. Residents' reactions to the design, landscaping and character of the community have also been favourable.

GARRISON WOODS

C.K. CHOI BUILDING

Vancouver, British Columbia

Type: Non-residential building
Size: 3,000 m2 (32,300 sq. ft.) building
Construction type: Three-storey concrete slab
Completed: 1996
Sustainability features: Natural daylight and ventilation, energy-efficient technologies, water conservation, recycled and recyclable material use.

The C.K. Choi Building on the University of British Columbia (UBC) campus used sustainable design principles to reduce the impacts of construction and occupancy on the environment. Recycling and re-using materials to build the structure cut down on the energy required to transport, extract, refine and produce new materials. Heavy timbers from an armoury across the street were re-used for the post-and-beam structure, while red brick cladding from old Vancouver streets provided materials for the building's exterior.

During construction of the building, materials and construction practices were carefully chosen to ensure a high level of indoor air quality, including low-emission products and solvent-free finishes.

Features to reduce water consumption were also incorporated. The composting toilets reduce waste water by 90 per cent and water consumption by over 5,680 L (1,500 gal.) of potable water per day. Rainwater is collected from the roof and held in a reservoir to be used for irrigation.

Each room in the C.K. Choi Building was designed to maximize the amount of natural light entering the room to reduce electricity consumption. Light sensors continuously measure the amount of available daylight and adjust the output of the electrical lighting systems. In addition, each washroom is equipped with sensors to turn lights on only when the washroom is occupied. Operable windows and fresh air vents under each window gives a continuous stream of fresh air throughout the building.

Overall, the building consumes approximately 40 per cent less energy than if it had been constructed using conventional building technologies.

MIKE SHERMAN

DOCKSIDE GREEN

Victoria, British Columbia

Type: Mixed use development on a former brownfield site
Size: 5 ha (12 acre) site
Construction type: apartments and commercial space, community facilities
Completed: Project breaks ground in 2006; Phase One completion anticipated by 2007
Sustainability features: LEED™ Canada certification commitments; greenhouse gas neutral; biomass energy cogeneration; on-site greywater and blackwater treatment; Wise Energy Co-op bio-diesel facility; no potable water use in irrigation; potable water reduction in buildings; alternative modes of transportation*

Dockside Green is a 4.7 ha (11.6 acre) brownfield site in the heart of the City of Victoria, adjacent to the Upper Harbour and downtown. The City of Victoria owns the site.

The development concept prepared by the city envisions one million square feet of mixed-use and sustainably developed buildings on a newly remediated site. It emphasizes the creation of jobs, economic opportunities and physical structures that support a healthy and vibrant environment, high quality public open space and other key amenities that will enhance the liveability of the development.

Developers Vancity and Windmill Development Group Ltd. incorporated a "triple bottom line" (TBL) approach: social, economic and environmental components working together to enhance each other's attributes, such as waste from one use can be turned into energy for other uses.

The developer has made a commitment that all buildings, with minor exceptions such as restaurants and pubs, will be certified to LEED™ Canada 1.0 Platinum level.

A wide range of sustainable features will be incorporated into the development. There will be no net greenhouse gas (GHG) emissions. Sufficient renewable energy will be produced on site for the entire development's heating, cooling and electrical needs. Solar water heating and various other renewable energy products will be demonstrated with emphasis on local and Canadian products. Biomass energy cogeneration will generate heat and electricity for Dockside Green: wood waste (from mills, woodworking shops and tree trimming) will be the primary biomass energy producer. All sewage will be treated on site. A bio-diesel manufacturing location is being explored. The bio diesel will be used for the harbour ferry, mini-transit and car-share vehicles. There will be no potable water use in irrigation and treated blackwater will be used to irrigate green roofs, water features and ponds. There will be potable water reduction in buildings.
Treated blackwater will be used to flush toilets and all sewage will be treated. Alternative modes of transportation will include a car-sharing co-op and mini-transit system. Other environmental commitments include stormwater treatment; organic waste collection and environmental reporting to outline accomplishments and areas for improvements.

VANCITY AND WINDMILL DEVELOPMENT GROUP LTD.

** Greywater is waste water from household baths and showers, handbasins and kitchen sinks. Blackwater is waste water that contains animal, human or food waste.*

THE SILVA

North Vancouver, British Columbia

Type: High-rise residential building with ground-level retail component

Size: Site area 1,755 m2 (18,900 sq. ft.); total gross building floor area 8,188 m2 (88,140 sq. ft.)

Site coverage: 70 per cent

Construction type: Sixteen storey, concrete-slab apartments and commercial space

Completed: 2005

Sustainability features: Indoor air quality, energy efficiency, water efficiency, construction waste management

Environmental sustainability was a key consideration in the design of The Silva building in North Vancouver. The developer envisioned The Silva as a high-rise residential building that would provide residents with a healthy environment and allow efficient use of resources and built The Silva to meet LEED™ certification.

To achieve this certification, The Silva's integrated design incorporated benefits in energy efficiency, water efficiency, enhanced liveability, indoor air quality, conservation of materials and resources, waste management and sustainable site planning.

Water and energy efficiency is achieved through features such as high-performance windows, efficient lighting and water-saving appliances that reduce energy use by 20 per cent and water use by 33 per cent. A green roof manages stormwater and reduces heat island effects in the summer. Landscaping surrounding the building includes drought-tolerant vegetation to reduce water demands for landscape maintenance.

In order to fulfil the mandate of a healthy living environment, The Silva was finished using non-toxic paints and adhesives and operable windows that allow natural ventilation. Further commitment to improved air quality is evident through a construction air-quality management plan to prevent building materials from adding pollutants to the air. The Silva promotes environmental sustainability through the developer's commitment to use local green building materials and the creation of a construction management program to recycle more than 80 per cent of construction waste.

Public reaction to The Silva has been positive and the environmentally sensitive design has been a major selling feature. All of the units were sold before completion of construction.

THE SILVIA

UNIVERCITY

Burnaby, British Columbia

Type: Suburban community development

Size: 4,500 units at completion

Construction type: Wood-frame

Completed: Ongoing

Sustainability features: Integrated design process, on-site stormwater management, energy-efficient appliances, pedestrian-oriented, mixed housing.

Simon Fraser University (SFU) is developing UniverCity, an on-campus community with an expected population of 11,000. On completion, UniverCity will consist of 4,500 homes. This new community will provide a lifestyle in which homeowners and residents will be able to take courses, use the library, enjoy cultural facilities and use the many on-campus recreational facilities. UniverCity is planned as a sustainable community with energy- and water-efficient features integrated into building operation and design.

The first neighbourhood to be developed will be the UniverCity Highlands. When completed, this neighbourhood will have 1,800 homes and a mixed-use area featuring shops, offices and services to residents.

One of the sustainable community design components of UniverCity Highlands is the layout, which promotes walking and cycling to shopping, transit and parks. To accommodate non-motorized transit, UniverCity Highlands has been designed with wider sidewalks and a network of paths connecting the neighbourhood with the campus. There is a shuttle bus to a nearby light rail station. At the entrance to the neighbourhood, a roundabout serves as a community gateway and controls vehicle speeds.

A broad mix of housing will be available. Apartments and townhouses of various sizes will be available to accommodate students and families. Rental housing will ensure that residents from diverse economic backgrounds will be able to afford to live in UniverCity.

UniverCity reflects many visions for a sustainable community. During development almost 50 people were engaged in a design workshop to discuss sustainable options for the site and many of these design elements, such as treed and riparian areas, are already visible in the community.

UNIVERCITY

REGENT PARK

Toronto, Ontario

Type: Urban community development
Size: 2,087 units, existing 28 ha site (69 acres), 5,115 units, future development 28 ha site (69 acres)
Construction Type: new and existing concrete-slab apartments and wood-frame townhouses
Completion: 2018
Sustainability features: Neighbourhood revitalization, water efficiency, stormwater management, construction and solid waste management, energy efficiency, air quality management.

Regent Park is a public housing development in downtown Toronto. Built in the 1950s, it contains 2,087 units that accommodate a population of about 7,500 on a 28-hectare (69-acre) site. Over time, the buildings in Regent Park deteriorated, prompting a plan to revitalize the neighbourhood. In 2001, a comprehensive redevelopment study recommended a sustainable design.

The sustainable design followed an integrated approach that considered water, stormwater, solid waste, construction waste, transportation, landscaping and energy. The design will achieve significant targets for environmental protection including 75 per cent reduction in energy use and a 60 per cent reduction in greenhouse gas emissions. Key components in achieving these targets are the energy features. A district heating system from an energy plant in Regent Park will provide the heating and electrical needs of buildings. This system will have radiant heating and cooling, central ventilation and centrally heated hot water. Building envelope specifications will also achieve energy efficiency.

Housing units will have high-performance windows to prevent cold air from entering buildings in winter and cool air from escaping in summer, reducing heating and cooling requirements and the potential for condensation.

New housing will be designed to optimize natural daylight for lighting and solar heating. Five per cent of construction materials will be recycled products, reducing energy demands for new construction materials.

It is anticipated that the increased initial costs of developing new housing in Regent Park will be recovered in less than 10 years.

MARKSON BOROOAH HODGSON ARCHITECTS

CITIES[PLUS]

Vancouver, British Columbia

Type: Regional long-term planning
Size: Region with population of 2 million
Completed: 2003
Sustainability features: Integrated infrastructure, land preservation, resource efficiency, shock resiliency, collaborative planning.

In June 2003, Tokyo was the site of a remarkable event in the history of urban planning. As a centrepiece to the triennial World Gas Conference, eight countries participated in a competition on sustainable urban systems planning. All teams were challenged to focus on an existing urban area and address issues such as energy and climate change in a 100-year sustainability planning process.

Led by The Sheltair Group Inc., the Canadian team was awarded the Grand Prix with its submission of cities[PLUS]: *A Sustainable Urban System Design for Greater Vancouver*. Experts from the academic, private and public sectors together explored environmental, social and economic aspects of the region to develop the plan.

The project allowed visions and goals to be set for Greater Vancouver for the next 100 years along with strategies, actions and targets to meet them.

Through forecasting, the cities[PLUS] team recognized future problems and determined what changes could be made to prevent resource shortages. A key element of cities[PLUS] was examining the flow of resources such as water, materials and energy through the region. The plan explored ways to avoid added strain on regional resources over the next 100 years, despite the increased demands from twice as many residents in Vancouver by 2101.

The project also recognised the importance of resilient systems and explored how to plan for uncertainty and unexpected events. This involved identifying forces that could change the built environment over the next century, such as technological change, climate change, globalization, demographics, resource scarcities and changes in worldview.

The long-term plan for Greater Vancouver adopted a “one systems approach” that recognised the region as one integrated system. Potential strategies were evaluated in this context, giving priority to those generating the most impact.

THE SHELTAIR GROUP INC.

CMHC INTERNATIONAL: YOUR PARTNER IN SUSTAINABLE DEVELOPMENT

Through CMHC International, Canadians are sharing experience and expertise in sustainable, efficient, affordable and healthy housing and communities with the world.

CMHC International offers access to Canadian housing systems, products, services and technologies, all under one roof. Whether you need an introduction to a Canadian company or information about Canadian housing technology, CMHC is your partner. We can connect you to the Canadian housing industry and the people and technology that can help fulfil your demand for quality housing and sustainable communities. Here are some of the ways that CMHC's International team is helping to bring international and Canadian interests together.

EDUCATION & PROMOTION

- Providing interviews about Canada's housing system and technologies to media in your market
- Offering technology seminars and building demonstration projects in your market
- Providing continued education for planning and design professionals
- Providing trades and construction training and education

RESEARCH

With Canada's largest library of housing information, CMHC can help you research sustainable housing and communities, and provide a variety of information to assist you with your research project.

ACCESS TO CANADIAN SERVICES

CMHC International is your doorway to a large network of Canadian professionals who are working to make buildings and communities more sustainable. CMHC International can introduce you to specific Canadian companies and professionals who can help you with everything from planning your city and addressing your urban issues and challenges, to designing or renovating your building projects to build a more sustainable future.

Canadian planning and design services include:

- Urban design
- City and community planning
- Resource and environmental planning
- Architecture
- Landscape architecture
- Civil and structural engineering
- Mechanical engineering
- Electrical engineering
- Interior design
- Construction contracting

ACCESS TO CANADIAN PRODUCTS AND TECHNOLOGIES

CMHC International can also help you tap into the extensive network of Canadian companies providing products and technologies for resource-efficient, healthy buildings and communities. These Canadian products and technologies include:

- High-performance windows and doors
- Recycled content insulation
- Insulating concrete forms
- Advanced air and weather barriers
- Advanced envelope construction
- Heat recovery ventilation systems
- Passive–active solar technology
- Geothermal heat technology
- Biomass energy technology
- Innovative water management products
- Low VOC paints, cabinetry and adhesives
- Eco-concrete
- Photovoltaics
- Systems experts
- Energy-efficient appliances
- Fuel cell technology
- Engineered wood products
- Healthy building products
- Prefabricated housing

ACCESS TO OTHER GOVERNMENT DEPARTMENTS INVOLVED IN SUSTAINABLE DEVELOPMENT

CMHC is one of many Canadian government agencies working to advance sustainable development. Our partners in sustainable development include National Resources Canada, Environment Canada, Industry Canada and the National Research Council.

NATURAL RESOURCES CANADA (NRCAN)

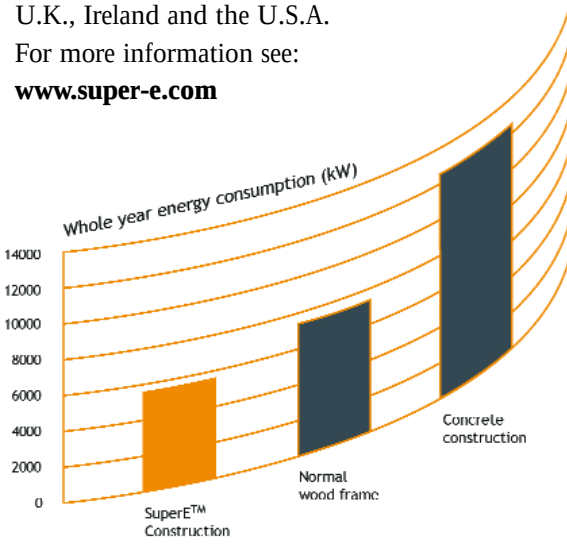
Natural Resources Canada is an economic and science-based department specializing in sustainable development and use of natural resources, energy, minerals and metals, forests and earth sciences.

NRCan's mandate includes providing Canadians with knowledge and technologies by conducting leading-edge science and technology research; maintaining a national knowledge infrastructure with regard to Canada's land and resources; ensuring that federal policies and regulations on environmental, trade and economic issues enhance the natural resources sector's contribution to the economy while protecting the environment, health and safety of Canadians; and, partnering with provincial/territorial governments and co-operating with international agencies and other nations to promote Canada's international interests and keeping global market access open for Canadian products, services and technology. For more information see:
www.nrcan-rncan.gc.ca

The Canadian Forest Service (CFS)
NRCan's Canadian Forest Service promotes the sustainable development of Canada's forests and the competitiveness of the Canadian forest sector. The CFS plays a pivotal role in building consensus on key forest issues, in shaping the national and international forest agenda and in generating and transferring knowledge through its network of world-class forestry research centres. For more information see:
www.nrcan-rncan.gc.ca/cfs-scf

CANMET Energy Technology Centre (CETC)
The CANMET Energy Technology Centre is a key research arm of NRCan and is one of Canada's premier organizations in the field of energy, science and technology. CETC's mandate is to focus on science and policy linkages for the sustainable development and use of Canada's resources through its partnerships and strategic alliances. CETC works with private and public sector partners to develop and deploy leading-edge technologies in residential, commercial and industrial energy efficiency and alternative, renewable and transportation energy technologies to reduce environmental impacts, increase productivity and generate economic growth in Canada. For more information see:
www.nrcan.gc.ca/es/etb/cetc/cetchome.htm

Super E®
Super E® is an international standard developed by Natural Resources Canada and supported by CMHC. Super E® is based on the R-2000 standard, adapted for local climates. Each Super E® home is registered, tested and recognized by the Government of Canada with a certificate of recognition. This program provides support in construction, regulatory acceptance and marketing of Canadian-sourced, high-quality housing for Canadian exporters. Super E® houses have been built in Japan, China, the U.K., Ireland and the U.S.A.
For more information see:
www.super-e.com



ENVIRONMENT CANADA

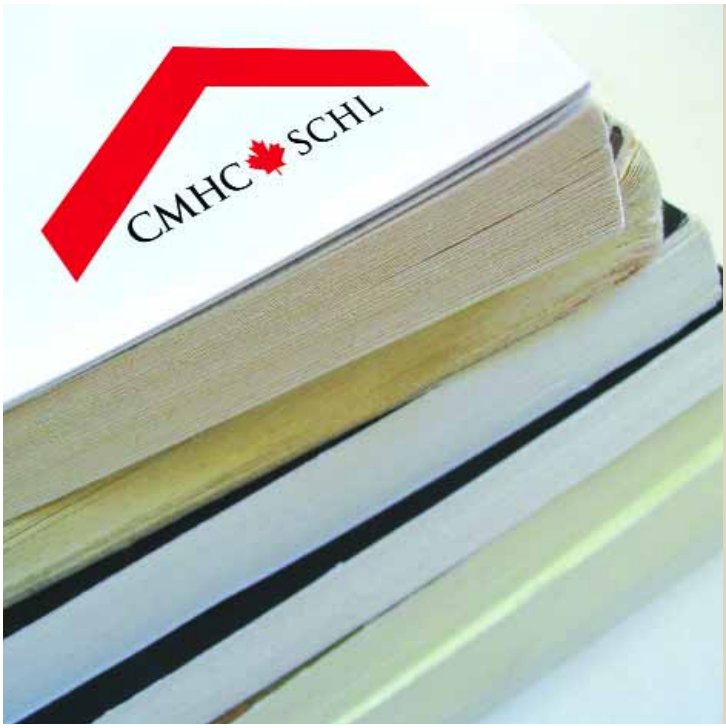
Environment Canada's mandate is to preserve and enhance the quality of the natural environment, including water and soil quality; conserve Canada's renewable resources, including migratory birds and other non-domestic flora and fauna; conserve and protect Canada's water resources; carry out meteorology; enforce the rules made by the Canada/United States International Joint Commission relating to boundary waters; and coordinate environmental policies and programs for the federal government. For more information see: **www.ec.gc.ca**

INDUSTRY CANADA

Industry Canada's mandate includes three strategic objectives:
1. to maintain a fair, efficient and competitive marketplace that creates a business environment that supports innovation and economic growth;
2. to promote an innovative economy by fostering innovation in science and technology to ensure that the social and economic benefits of these innovations contribute to Canadian's standard of living and quality of life;
3. to stimulate investments through which increased productivity and capacity of the economy lead to innovations that create competitive advantages and provide capital for industry to achieve its sustainable development and environmental goals.
For more information see: **www.ic.gc.ca**

NATIONAL RESEARCH COUNCIL (NRC)

The National Research Council (NRC) is the Government of Canada's premier organization for research and development. NRC's mandate includes undertaking and promoting scientific and industrial research; maintaining a national science library and distributing such scientific information as deemed necessary; standardizing and certifying technical apparatus and instruments and materials used by Canadian industry; operating and administering astronomical observatories maintained by the Government of Canada; administering NRC's research and development activities; and, providing vital scientific and technological services to the research and industrial communities. For more information see: **www.nrc-cnrc.gc.ca**



SUGGESTED READING & WEBSITES

As Canada's largest publisher of housing information, CMHC offers a comprehensive selection of publications, videos, software, data and analysis on a wide range of sustainability topics. These publications can be downloaded or ordered from the CMHC website at www.cmhc.ca:

PUBLICATIONS

Best Practice Guides

- Brick Veneer Steel Stud
- Brick Veneer Concrete Masonry Unit Backing
- Flashings
- Wood-frame Envelopes in the Coastal Climate of British Columbia
- Wood-frame Envelopes
- Glass and Metal Curtain Walls
- Architectural Precast Concrete Walls
- Fire and Sound Control in Wood-frame Multi-family Buildings
- Exterior Insulation and Finish Systems

Building Communities: First Nations Best Practices for Healthy Housing and Sustainable Community Development. *2001*

Building Materials for the Environmentally Hypersensitive. *1995*

Clean Air Guide: How to Identify and Correct Indoor Air Problems in Your Home. *1993*

FlexHousing™: Homes That Adapt to Life's Changes. *1999*

FlexHousing™: The Professional's Guide. *2000*

Healthy High-Rise: A Guide to Innovation in the Design and Construction of High-Rise Residential Buildings. *1995*

Healthy Housing Renovation Planner. *1999*

Healthy Housing in the North: Towards a Northern Healthy House Demonstration Project. Research Highlights. Technical Series. *2002*

Healthy Indoors: Achieving Healthy Indoor Environments in Canada. Research Highlights. Technical Series. *2002*

Practices for Sustainable Communities. *2000*

Promoting Healthy Housing and Energy Efficiency Approaches in Major Home Renovations: A Case Study Analysis. Research Highlights. Technical Series. *1998*

Tap The Sun: Passive Solar Techniques and Home Designs. *1998*

Your Next Move: Choosing a Neighbourhood with Sustainable Features. *2001*

WEBSITES

Canada Mortgage and Housing Corporation
www.cmhc-schl.gc.ca

Canadian Forest Services, Natural Resources Canada
www.nrcan-rncan.gc.ca/cfs-scf

CANMET Energy Technology Centre, National Resources Canada
www.nrcan.gc.ca/es/etb/cetc/cetchome.htm

Environment Canada
www.ec.gc.ca

Industry Canada
www.ic.gc.ca

Institute for Fuel Cell Innovation, National Research Council
http://ifci-iipc.nrc-cnrc.gc.ca

Office of Energy Efficiency, National Resources Canada
http://oee.nrcan.gc.ca

Super E® House Program
www.super-e.com

Canada Green Building Council
www.cagbc.com

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