



LeBreton Flats Phase 2:
LEED Green Building Case Study (under review)

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About Claridge Homes



Since 1986, Claridge Homes has been dedicated to ensuring that the expectations of our customers are not only met, but exceeded. Our passion for building homes is not limited to construction. While our craftsmanship and attention to detail is second to none, we believe that our strongest asset is our ability and willingness to work with our customers, to listen to their needs, and to make sure that the home they have been dreaming of becomes a reality.

We have built over 12,000 homes in communities across the Ottawa-Carleton region, making sure each one is built with exceptional quality and design innovation. We are also concerned with making the buying process easier for you, the client, by building value and energy saving innovation into our homes. We want your home to work for you.

In recent years, Claridge Homes has forged ahead to become the leading high-rise condominium developer in Ottawa. With over 30 residential buildings to its credit, Claridge Homes is re-defining the Ottawa skyline with innovative projects such as 700 Sussex, Claridge Plaza, Tribeca and LeBreton Flats.

As a family company with its roots in hard work, integrity and customer satisfaction, Claridge Homes has become a major force in the industry, with gross sales exceeding \$2 billion. As Claridge Homes continues to grow, it firmly maintains the values on which it was founded: delivering innovation, fine quality and commitment to perfection.



LeBreton Flats: Ottawa's New Urban Eco-Village

Claridge Homes is expanding its green building initiatives with the development of the LeBreton Flats Neighborhood. Claridge is working closely with both the National Capital Commission and City of Ottawa to reclaim for Canadians one of the last and most beautiful waterfront sites in the nation's

capital. With sustainable development as the driving force behind revitalizing the area, Claridge's vision is ensuring an inviting and complementary mix of residential, commercial and public spaces.

LeBreton Flats will be one of the first buildings and communities in Ottawa to be recognized under the Canadian Green Building Council's Leadership in Energy and Environmental Design program. A village within the city, LeBreton Flats is leading by example to show that buildings can be in harmony with the environment while promoting healthy living for those that work, live and play within them.

At LeBreton Flats, all of life's pleasures come together in one eco-friendly environment that promotes active living and sustainable transportation. With a strong commitment to preserving green spaces, the location is ideal for pedestrians and cyclists. The project is surrounded by favorite Ottawa destinations such as the Parliament Buildings, the Byward Market, and the Canadian War Museum.

In this central area of the Nation's Capital, a new way of life takes root that is comprised of distinct and different neighborhoods. Not only will it be a master-planned condominium community but an eco-friendly community...a riverfront community...and, best of all, a Claridge Homes community.





The Canada Green Building Council



Since being created in 2003, the Canada Green Building Council (CaGBC) has been transforming industry standards to promote healthy green buildings, homes and communities in Canada. The organization develops best design practices and guidelines to help change our built environment into a sustainable one. The CaGBC provides educational tools to support its members in implementing sustainable design and construction practices.

LEED Rating System

The Leadership in Energy and Environmental Design (LEED) Green Building Rating System® encourages and accelerates global adoption of green building and development practices through the creation and implementation of universally understood and accepted tools and performance criteria.

LEED is a third-party certification program and an internationally accepted benchmark for the design, construction and operation of high performance green buildings. It provides building owners and operators the tools they need to have an immediate and measurable impact on their buildings' performance.

LEED promotes a whole-building approach to sustainability by recognizing performance in the following six key areas of human and environmental health.

- **Sustainable Sites**
- **Water Efficiency**
- **Energy and Atmosphere**
- **Materials and Resources**
- **Indoor Environmental Quality**
- **Innovation In Design**

A summary of the LEED scorecard for LeBreton Flats Phase 2 is as follows:

Category	Points Pursued
Sustainable Sites	8
Water Efficiency	3
Energy & Atmosphere	6
Materials & Resources	6
Indoor Environmental Quality	8
Innovation in Design	5
Total	36

The levels for certification are: Certified 26-32 points Silver 33-38 points Gold 39-51 points Platinum 52-70 points. The Phase 2 project is pursuing LEED Silver Certification.

Throughout the course of the project, the team worked together to implement green design and construction strategies that would contribute to LEED Canada NC v1.0 Certification. Strategies were reviewed from a LEED compliance perspective, from a feasibility perspective, and from a cost perspective. During construction, practices such as erosion control, indoor air quality management, and waste diversion management were implemented. The project team also collected information on materials and products supplied to the project, to verify that products met specific LEED criteria.

Green Building Features and Performance

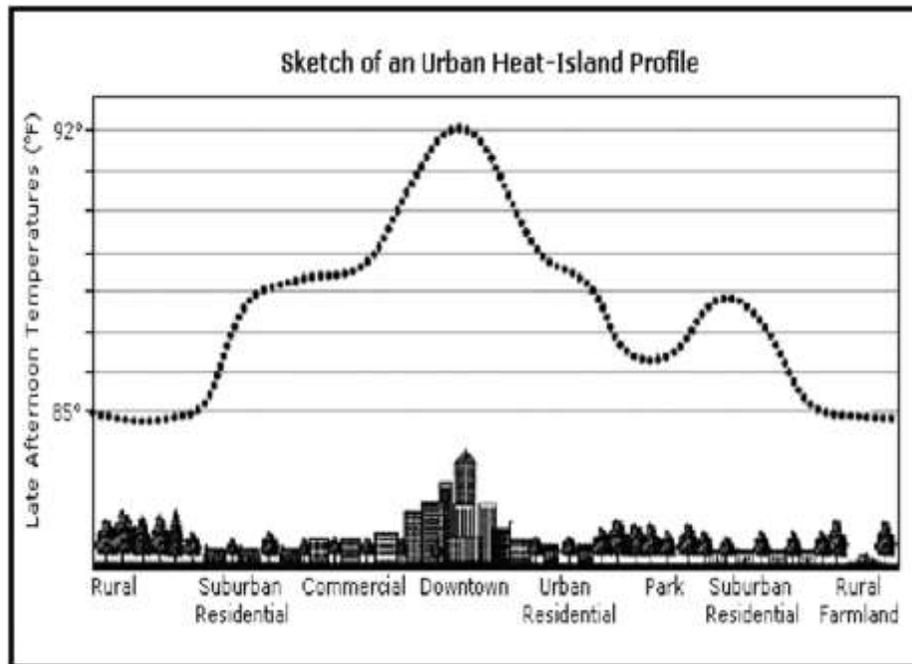
Sustainable Sites

The selection and development of a building's site are fundamental components of sustainable building practices. One of the most significant measures of site selection is developing on a brownfield, which is a previously contaminated site. This was the condition of the land at LeBreton Flats, until the National Capital Commission remediated the site of all soil contamination, with the contaminants being dealt with responsibly.

During construction, Erosion and Sedimentation Control (ESC) measures were implemented to reduce negative impacts on water and air quality as a result of construction. The erosion and sedimentation control measures installed were intended to prevent loss of soil, prevent sedimentation of storm sewer and prevent air pollution with dust and particulate matter. Some of the installed ESC measures include silt fence around the site perimeter, filter cloths installed in catch basins and manholes, mud mats installed at the construction entrance/exit, and removal of excess fill from site as well as tarping of soil left on site.

All parking is located underground, reducing the need to disturb existing green space and helping keep the surrounding area and the city cooler because of the reduction in heat absorbing asphalt, which can release large amounts of heat, and raise the air temperature several degrees. Surface parking lots, along with roads, are also often the principal source of water pollution in urban areas. Impervious surfaces contribute to stormwater runoff that is contaminated with multiple sources of pollution such as oil and de-icing salts. Underground parking helps to protect aquatic environments and reduce erosion by decreasing the surface area of impermeable surfaces.

The heat island effect is a serious problem in urban areas. The use of dark, non-reflective surfaces for parking lots and roofs can lead to temperature differences of up to 10 degrees between urban areas and the surrounding suburban or rural areas. This warming effect increases the intensity and length of heat waves that can negatively affect one's health, especially the young and elderly. With increased temperatures comes increased smog production and demand for the energy required for air conditioners and refrigeration.



A depiction of the varying degree of the urban heat island effect as a function of land use. (Gill et al. 2007)

LeBreton Flats has taken two major steps towards reversing this negative urban trend. Using a combination of a high albedo white membrane roofing cover, white ballast and vegetated areas, over 80% of the building's rooftop works to reduce the heat island effect. Vegetation helps to cool the roof by evaporative cooling, while the white membrane and ballast reflect solar radiation back into space. The combination of these materials helps to keep the site and its surrounding area and city cool. Vegetated or green roofs also help to conserve energy by insulating the building envelope, reducing the need for heating in the winter and cooling in the summer. Air filtration is yet another benefit of a vegetated roof, as contaminants in the air can be absorbed by the plant life.

Exterior lamps were selected to minimize light spill and to reduce light pollution. All interior lamps are controlled such that they are turned off during non-occupied hours. Through careful selection of light fixtures and controls, light pollution is minimized as is the impact on nocturnal life.



Green Roof at LeBreton Phase 2

Vehicle emissions and the need for vehicle infrastructure can have a negative effect on our environment. Emissions contribute to climate change and air quality problems while parking lots contribute to the stormwater runoff and the heat island effect. LeBreton Flats has gone above and beyond to address these issues by providing occupants with close access to mass transit bus routes 88 and 105, bicycle storage infrastructure and Vrtucar's car sharing program.

- VRTUCAR members help reduce harmful emissions into the environment by over 50% per member on average by car-sharing. Every shared VRTUCAR replaces 6-8 private cars on our roads. VRTUCAR's fleet of cars is newer, and more fuel efficient, as well. For the community, car-sharing means cars will take up less space on streets, fostering more pedestrian-friendly and child-friendly areas in which to live. Car-sharing also provides access to a safe, reliable car for those in our community who may not be able to afford the cost of car ownership. At LeBreton Flats, one hybrid vehicle will be present for all occupants to use should they choose to.



The preservation of green space and wildlife habitat is an important initiative, especially within an urban setting. Green spaces contribute to healthy lifestyles and biodiversity. That is why Claridge Homes has committed to protecting as much of the green space throughout the development at LeBreton as possible. All plants used for landscaping are native or adaptive plants. These plants are accustomed to

the precipitation patterns in Canada's climate vastly reducing the need for irrigation and eliminating the need for pesticides or chemical fertilizers.



These Dianthus x allwoodii 'Frosty Fire' perennials on the rooftop are resistant to high levels of sun and humidity, and thrive in rocky, dry soil.

Water Efficiency

The world's most precious resource is quickly becoming a scarce one. Water, vital for all forms of life, covers over 70% of the world's surface but only 0.007% is readily accessible for direct human use. Over 1 billion people lack access to safe drinking water. Water reserves in every continent are under pressure due to rising population growth, economic development and lack of appropriate water conservation practices.

Canada is one of the most fortunate nations when it comes to available fresh water. Canada has only 0.5% of the world's population, but its landmass contains approximately 9% of the world's renewable water supply. Canadians consume the second highest amount of water on a per capita basis among the 34 Organization for Economic Co-operation and Development nations. A typical Canadian uses 343 litres of water per day which is twice as much as the average person from France and fifteen times as much as a person from Haiti.



Claridge Homes is doing its part to construct buildings at LeBreton Flats that conserve water and manage its use efficiently. A number of strategies have been implemented to reduce the use of potable water and relieve stress on the municipal water systems. All landscaping activities have been based on the principal of xeriscaping, which eliminates the need for supplemental water for irrigation. LeBreton Flats uses 50% less water for irrigation than a typical building of approximately the same size. As mentioned, all plants are able to survive in Canada's climate. Not only do these plants require no permanent irrigation system, but they also live in harmony with the natural world around them. Exotic plants species tend to require more water, more maintenance, and could have a negative effect on their surrounding environment (i.e. invasive species).



Claridge Homes recognizes that the type of bathroom and kitchen fixtures along with some appliances we use can waste significant amounts of water. That is why at LeBreton Flats all appliances are high efficiency, reducing energy and water consumption. All bathroom and kitchen fixtures are low flow and use 25% less water than baseline fixtures. All the toilets are dual flush and meet the Energy Protection Act 1992 criteria, under the WaterSense program.

Fixture	Flow/Flush Rate
Dual Flush Water Closet	6 lpf high / 3 lpf low
Low flow lavatory	1.9 lpm
Low flow kitchen sink	8.4 lpm
Low flow shower	8.3 lpm

Energy and Atmosphere

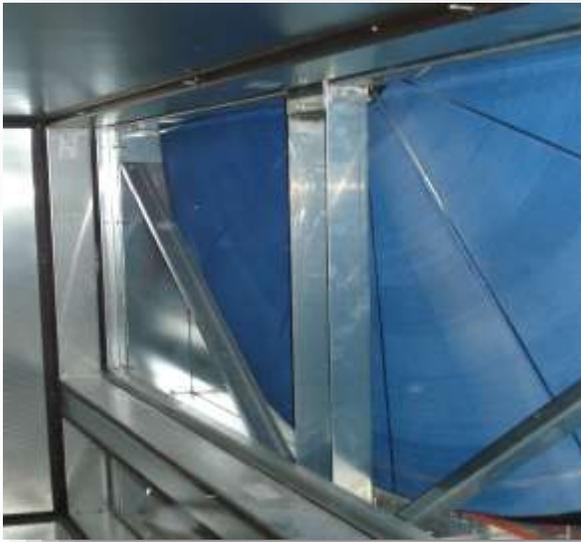
In Canada, buildings account for approximately 30% of energy use and 28% of greenhouse gas emissions. These percentages confirm that there is significant room for improvement. Improving energy performance lowers operational costs, enhances the comfort of building occupants, reduces pollution generated by power plants and the demand to flood land for hydro dams.

The design of LeBreton Flats Phase 2 was focused on energy efficiency such that over the life of the building, energy use, energy cost, and greenhouse gas emissions are minimized. An energy model was developed to evaluate the effect on energy saving features, the results are described below.

The Phase 2 building consumes 48% less energy than a conventional building based on the Model National Energy Code for Buildings (MNECB). The following is a summary list of key design characteristics which provide for superior energy performance when compared to the MNECB 1997 Baseline:

- Lighting power density coupled with on/off daylight controls where applicable
- High efficiency condensing boilers
- Make Up Air unit (MUA-2) provides fresh air to each suite. Heat recovery system to capture heat from the exhaust air has been incorporated into the MUA-2.
- High performance building envelope systems.

At LeBreton Flats, hot water is supplied from natural gas boilers with the highest available efficiencies that use less energy and produce fewer greenhouse gases than conventional oil systems. An enthalpy wheel is installed within the high efficiency make up air unit which exchanges heat and humidity from one air-stream into another. Rather than discard used building air, an enthalpy wheel salvages useful energy and transfers it to incoming, fresh air. This saves energy by reducing the need for cooling in the summer and heating in the winter.



Enthalpy Wheel:

All the health and productivity benefits of increased outdoor air ventilation without the drawbacks of excessive energy consumption and moisture problems

The release of chlorofluorocarbons (CFCs) from refrigeration equipment destroys ozone molecules, decreasing the Earth's natural ability to shield from incoming ultraviolet radiation. CFCs also absorb infrared radiation which contributes towards global warming. Due to the harmful effects of these compounds, Claridge Homes has actively installed equipment that does not use CFC-based refrigerants.

Claridge Homes has engaged in a contract to purchase green power to offset 100% of the building's electricity use for 2 years. The purchased power is Green-e certified, which means that it is cleaner and greener than the utility provided electricity. Green-e is an independent consumer protection program for the sale of renewable energy and greenhouse gas reductions in the retail market.

The mechanical and electrical systems installed in Phase 2 have been commissioned to verify installation and functioning of equipment. Commissioning begins with the development of the Owner's Project Requirements (OPR), followed by additional steps that include creation of a formal commissioning plan, verification of equipment installation, functional performance testing and submission of a final report.



Materials and Resources

In a finite world, the way we use materials and resources needs to be sustainable. The construction and operation of a building can generate large amounts of waste. At LeBreton Flats, two main waste concerns were addressed: the environmental impact of materials brought into the project and the minimization of landfill and incinerator disposal for materials that leave the site.

Space is dedicated in the parking garage for storage and collection of recyclables including glass, paper, cardboard, metals, and plastics. The space dedicated to collection and storage of recyclables will encourage occupants to recycle materials over the course of normal building operation. This will reduce the amount of waste sent to landfill over the life of the building. Claridge Homes has made a significant effort to maximize the life cycle of materials used by selecting products with environmentally responsible procurement policies. From the structural steel framing to the kitchen and bathroom cabinets, approximately 16% of the total construction costs were a combination of post-consumer and pre-consumer recycled materials. Similarly, approximately 26% of the total construction cost represented the cost of materials that were extracted and manufactured regionally. These initiatives help to reduce transportation emissions, support local businesses and encourage recycling by reducing the need for virgin resources.

The following materials contributed to over 15% recycled content by cost of all construction materials for the Phase 2 building:

Material	Post-Consumer Recycled Content	Pre-Consumer Recycled Content
Reinforcing Steel	64%	16%

Concrete	0%	24%
Carpet	0%	10%
Aluminum	22%	40%
Fiberglass Insulation	60%	10%
Steel Stud & Tracks	50%	33%

The following locally sourced materials contributed to nearly 27% regional materials by cost of all construction materials for the Phase 2 building:

Material	Distance Between Project & Manufacturer (km)	Distance between Project and Extraction site (km)	Mode of Transport
Cabinets	400	700	Road
Reinforcing Steel	250	1000	Road
Concrete	4	4	Road
Fiberglass Insulation	214	214	Road
Ceiling Suspension Grid	486	517	Road

Construction and demolition wastes constitute approximately 12% of the total solid waste stream in Canada. During the construction of LeBreton Flats Phase 2, an impressive 77% of waste (over 320 metric tonnes), was diverted from landfills. By implementing a construction waste management plan from the beginning, the project team had the foresight to recycle and reuse materials that would otherwise end up in a landfill. Waste that was diverted from landfill includes the following materials:

Type of Waste	Amount of Waste (MT)	Diversion Rate (%)	Amount Diverted (MT)
Gypsum	76.70	100%	76.70
Metals	17.14	100%	17.14
Concrete / Rubble	45.31	100%	45.31

Wood	98.69	100%	98.69
Cardboard	82.93	100%	82.93
Residual Waste	91.23	0%	0
Total quantity of waste diverted from landfill			320.77
Total quantity of waste taken offsite			412.00
Percentage of waste diverted			77.86%



Indoor Environmental Quality

The indoor environment in which people work and live has a significant influence on their well-being, productivity and quality of life. Since Canadians spend close to 90% of their time indoors, it is important that certain strategies are implemented to ensure that occupants have the highest possible indoor environmental quality.

LeBreton Flats was designed and construction to enhance indoor environmental quality through careful selection of materials, careful construction practices, and improving the supply of ventilation. At LeBreton Flats, Claridge Homes has installed ventilation systems that provide optimal air quality. Our construction team adhered to the strict guidelines of the LEED Rating system to ensure that air contaminant levels are at a minimum. Strategies included following an air contaminant management plan during construction and using high quality filtration media to optimize occupant comfort and

health. More specifically, MERV 13 filters in the mechanical system were installed to help remove microbiological contamination and outside air contaminants.

Indoor air quality is enhanced as the design meets the minimum requirements of ASHRAE 62.1-2004, Ventilation for Acceptable Indoor Air Quality. The Ventilation Rate Procedure of the standard was used to design the mechanical ventilation systems. The Ventilation Rate Procedure prescribes outdoor air quality acceptable for ventilation; outdoor air treatment measures; and ventilation for several types of spaces.

The heating and cooling systems were designed to provide a thermal environment that exceeds the requirements of ASHRAE 55-2004. Conditions described below are determined by Local Codes and by ASHRAE 55-2004.

1. Temperature: 21°C – 23°C
2. Humidity 30-50%



One of the most harmful practices during the construction process is the use of materials (such as paints and adhesives) which contain harmful chemical compounds. Over time, these products can emit these chemicals into the air you breathe, a process called off-gassing. Claridge Homes has shown leadership in the selecting and usage of low-emitting materials that minimize the amount of volatile organic compounds that can affect occupants' well-being. Low emitting paints, coatings, adhesives, and sealants were selected to be used during the construction phase to reduce the quantity of air contaminants that are odorous, irritating, or harmful to the comfort and well-being of installers and occupants. Some examples of low VOC products that were used include:

Adhesive / Coating	Application	VOC Content (g/L)	VOC limit (g/L)
PS-30	Subfloor Adhesive	5	50
Ultrabond Eco 185	Subfloor Adhesive	14	50
Lo-VOC Flowguard	CPVC Welding	490	490
Devflex 4216 HP	Floor Sealant	100	150
Ultra 94500	Interior Paint	31	50
Lifemaster 59311	Interior Paint	0	150

Carpet was selected that meets the Carpet and Rug Institute’s Green Label Plus program requirements. This program set higher standards for Indoor Air Quality and ensure that customers are purchasing the very lowest emitting products on the market.

Claridge Homes has provided ample window space in each of the units at LeBreton Flats. Not only does this allow natural day light to enter the unit and reduce the need for electric lighting, studies have shown that it increases occupant comfort and productivity. The windows are double glazed, argon filled, and have a low-emissivity coating which helps to reduce glare and increase thermal performance. Calculations demonstrate that 92% of regularly occupied rooms have a direct line of sight to perimeter glazing, and 88% of rooms have a daylight factor of at least 2%.

An Indoor Air Quality (IAQ) management plan was developed and put in place during the construction and pre-occupancy phases of the building. As part of the IAQ plan, filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 were used at each return grill for air handlers used during construction. Absorptive materials stored on site or installed were protected from moisture damage. The IAQ plan was developed to meet the recommended Design Approaches of the Sheet Metal and Air Conditioning Contractor’s National Association (SMACNA) IAQ Guideline for Occupied Buildings under Construction, 1995, Chapter 3. All residential units were flushed-out prior to occupancy to remove any contaminants in the building that resulted from construction and fit-out.

Innovation in Design

Adhering to the LEED certification guidelines demonstrates that a builder cares about the environment and its occupants. But like many third party certifications, there is room to demonstrate a higher level of leadership. Claridge Homes understands the need to educate the public about the green initiatives at LeBreton Flats, and that is why this case study was created. It will be made available to occupants, the Canada Green Building Council and on the Claridge Homes website.



To further educate the residents of LeBreton Flats, a tasteful but comprehensive signage program will be installed throughout the building to allow occupants and visitors to better understand the green features of the building. The program will also act as a motivator, empowering occupants to do their part when it comes to protecting our environment.

Claridge Homes has also implemented a green cleaning program to reduce the building's use of harmful cleaning products and improve indoor environmental quality. A majority of the products used around the building are environmentally friendly, helping to ensure healthy living and minimal impact on water resources. Occupants have been made aware of this program and are encouraged to change their cleaning habits to include eco-friendly cleaning products.

Other innovation strategies include exemplary performance of SSc7.1 Heat Island Effect, Non Roof, and EAc6 Green Power. By placing all parking underground, and purchasing green power to offset 100% of the building's electricity consumption, the project is able to achieve an additional two points.

Finally, a LEED Accredited Professional was engaged on the project team to verify the team was aware of the submittal and specific credit requirements of the LEED Canada for New Construction v1.0 Rating System.

On to the Next Phase...

We at Claridge Homes believe that building better buildings builds better lives. With all the negative impact construction can have on natural resources, local ecology and the air we breathe, we have done our best to make sure the LeBreton Flats development is an exemplary model for sustainable development. At Claridge Homes, we are LEEDing the way to provide better living for you and your community.



Further Education

WEBSITES:

cagbc.org

A transformed built environment leading to a sustainable future.

Canada Green Building Council accelerates the design and construction of high-performing, healthy green buildings, homes and communities throughout Canada.

ec.gc.ca

Environment Canada's mandate is to preserve and enhance the quality of Canada's environment

greenbuilding.com

This website will help you learn more about how to build green, whether you are a homeowner or a building professional. We a variety of expertise and wealth of experience, GreenBuilding.com will bring you the best of what green really is and what are the best practices for building an environmentally friendly building.

environmentalchoice.com

As North America's most widely recognized certifier of environmental leadership, EcoLogo helps identify, trust, buy and sell environmentally preferable goods and services. Website lists more than 7,000 EcoLogo-certified products from hundreds of manufacturers.

greenguard.ca

The GREENGUARD Environmental Institute (GEI) is an industry-independent, non-profit organization that oversees the GREENGUARD Certification Program which is responsible for third-party testing for low-emitting products and materials.

BOOKS:

Green Building A to Z: Understanding the Language of Green Building by Jerry Yudelson

Green building is the fastest-growing trend to hit since the Internet, bringing with it an enormous range of new products, systems and technologies. Green Building A to Z is an informative, technically accurate and highly visual guide to green building, for both decision-makers and interested citizens. It begins with an introduction to the importance of green buildings and a brief history of the green building movement, outlines the benefits and costs of green buildings, and shows how you can influence the spread of green buildings. The book touches on key issues, such as enhancing water conservation, reducing energy use and creating a conservation economy.

Cradle-to-Cradle by William McDonough & Michael Braungart

This manifesto calls for the transformation of human industry through ecologically intelligent design. Through historical sketches on the roots of the industrial revolution; commentary on science, nature and society; descriptions of key design principles; and compelling examples of innovative products and business strategies already reshaping the marketplace.

The Healthy Home by Dave Wentz

Almost overnight, a toxic world has been built around us, slowly manipulating how we eat, sleep, work, play...how we *live*. And the consequences of these conveniences have never been documented together in one place, until now. This book is not only a comprehensive look at the dangerous poisons within your home but is a guidebook of simple solutions that will help you live a life free of the toxic burdens society has created, packaged, and sold to you as necessities of everyday life. As you read, you'll begin to learn about the science behind the positive choices you can make to improve you and your family's most important resource—your health.

The Weather Makers by Tim Flannery

In this groundbreaking and essential new book, Tim Flannery argues passionately for the urgent need to address - NOW - the implications of a global climate change that is damaging all life on earth and endangering our very survival. This book is unimpeachable in its authority, deftly and accessibly written in its vision for what each of us can do to avoid catastrophe. It is a global call to arms, laying out plainly if not controversially what we know, what we think might happen, and what tools we have available to us to make a difference.