Building Green & The Benefits of Wood

naturally:**wood**

British Columbia Forest Facts

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Green products and whole building designs aim to make structures more efficient and reduce their impact on the environment and human health

BUILDING GREEN: ENVIRONMENTALLY, ECONOMICALLY & SOCIALLY RESPONSIBLE

Concern about the world's environment is encouraging the use of building materials and designs for structures which are more environmentally responsible, cost-efficient to operate, and are often healthier for occupants. This has led to a variety of codes, standards and rating systems to support green building implementation.

This fact sheet explores these developments – including a comparison of elements of three prominent green building rating systems in North America – and to examine the benefits of wood as a sustainable building material.

BASICS OF GREEN BUILDING

The choice of products used to build or renovate buildings of all types has a huge impact on the world's environment. The United States Department of Energy says building construction and operation consumes more energy than any other sector of that country's economy, including transportation and industry.

Green products and whole building designs can make structures more efficient and reduce their impact on human health and the environment at every stage – from choosing a location to maximizing passive solar energy to making sure materials can be easily removed and reused once the structure's useful life has ended. Green buildings are meant to be high performance. They use less energy, less water and fewer or smarter materials. They are easier to maintain and repair, are designed to be durable, and last even longer if they are adaptable and easy to renovate.

Green buildings are healthy places in which to live and work. They can be more comfortable, with fewer drafts, better humidity control and more natural light. They focus on materials that use and emit fewer chemicals.

SUSTAINABLE OLYMPICS

The carbon impact of the decision to use wood in place of other materials in venues for the 2010 Winter Olympic and Paralympic Games in Vancouver represented a total greenhouse gas reduction of 26,000 tonnes. The total potential carbon benefit for the Richmond Oval alone – resulting from carbon storage and avoided emissions – was an estimated 8,800 metric tonnes of carbon dioxide, or the equivalent of removing 1,600 cars from the road annually

GREEN BUILDING RATING SYSTEMS

As a result of the increased interest in green building concepts and practices, a number of organizations have developed standards, codes and rating systems that let government regulators, building professionals and consumers embrace green building with confidence. In some cases, codes are written so local governments can adopt them as bylaws to reduce the local environmental impact of buildings.

Green building rating systems help consumers determine a structure's level of environmental performance. They award credits for optional building features that support green design in categories such as location and maintenance of building site, conservation of water, energy, and building materials, and occupant comfort and health. The number of credits generally determines the level of achievement.

Examples of rating systems include:

Building Research Establishment Group Environmental Assessment Method (BREEAM) (www.breeam.org) is an environmental assessment method for buildings. It was established in the United Kingdom in 1990 as a tool to measure the sustainability of new commercial buildings by using a straight-forward scoring system supported by research. It is the basis for other rating systems that followed, such as those listed below. With more than 100,000 certified buildings, it is the most widely used green building system in the world.

Green Globes – operated in Canada by ECD Jones Lang LaSalle (www.greenglobes.com) and in the United States by the Green Building Initiative (www.thegbi.org) – is a web-based application that helps building professionals assess the environmental performance of new construction and renovation projects for commercial buildings. Based on information entered by a design team it provides feedback on how to reduce operating costs, create a more pleasant workplace, and minimize negative environmental impacts. This results in improved buildings and leads to a higher Green Globes rating once the site is inspected by a third-party certifier.

BOMA BESt (www.bomabest.com), operated by the Building Owners and Manufacturers Association, is Canada's national environmental certification program for existing commercial buildings. Formerly known as Go Green, Go Green Plus and Green Globes.

Green Building Assessment Protocol for Commercial Buildings (ANSI/CGI 01-2010) was derived from Green Globes by the Green Building Initiative (www.thegbi.org) and applies to new or existing structures. The standard was approved by the American National Standards Institute in 2010, and is currently being adapted for use as a web-based tool to replace Green Globes.

Leadership in Energy and Environmental Design (LEED 2009) was developed by the U.S. Green Building Council (www.usgbc.org). LEED has seven modules: New Construction, Commercial Interiors, Core & Shell, Schools, Retail, Healthcare, and Homes. *LEED Canada* is a parallel set of rating systems adapted by the Canada Green Building Council (www.cagbc.org) to Canadian climate, construction practices and regulations.

The National Green Building Standard (ANSI/ICC 700-2008) was developed by the National Association of Home Builders (www.nahbgreen.org) for residences.

Built Green is a voluntary program for residential construction that was started in the United States by local home builders. It is managed for Canadian home building associations by Built Green Canada (www.builtgreencanada.ca).

Green building codes and standards are sets of rules created by standards development organizations that establish minimum requirements for elements of green building such as materials or heating and cooling.

Examples include:

The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) (www.ashrae.org) has developed a set of minimum green building requirements (known as *ASHRAE 189.1*) written in language that can become part of a building code.

The American Society for Testing and Materials (ASTM) (www.astm.org) provides technical standards for materials, products, systems, and services, and is drafting guidance to U.S. federal agencies for meeting government requirements for green buildings.

The International Code Council (ICC) (www.iccsafe.org) has the draft *International Green Construction Code* to complement its International Building Code, which has been adopted as regulation in most of the United States. It is currently undergoing public review.

California Green Building Standards Code (CALGreen) (www.bsc.ca.gov/CALGreen) will become mandatory for new building in California in January 2011.

LIFE CYCLE ASSESSMENT

Life cycle assessment is a science-based process that examines the impact on the nature of a product or service throughout the phases of its life. For buildings and building products this includes resource extraction, manufacturing, on-site construction, occupancy, and eventual demolition and disposal or reuse.

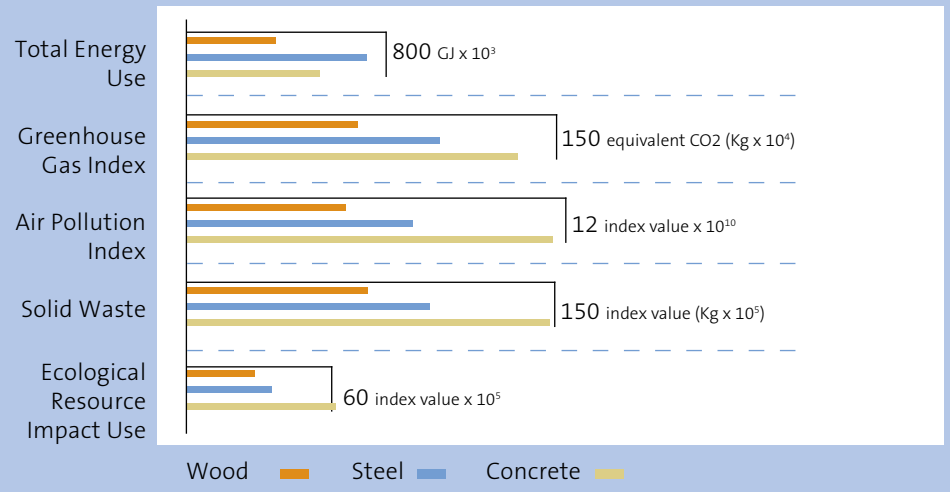
It provides an impartial comparison based on quantifiable indicators of environmental effects, such as global warming potential, resource use, air pollution, water pollution, solid waste and embodied energy – which includes all the energy, direct and indirect, required through the life of a product. Life cycle assessment is accepted internationally as a neutral evaluation technique.

Standards for life cycle assessment have been developed under the International Organization for Standardization (ISO 14040:2006 and ISO 14044:2006). Almost all green building systems specify explicit avenues for incorporating the use of life cycle assessment to guide the design of buildings in order to achieve minimum requirements or earn rating credits.

The best way to determine the full environmental impact of a building product or design is through life cycle assessment

The ATHENA Sustainable Materials Institute is a non-profit organization that provides life cycle assessment services and tools to support green building. It has developed a tool based on life cycle assessment that allows architects, engineers and others to assess and compare the environmental implications of hundreds of building assemblies that are commonly used for industrial, institutional, commercial and residential designs, both for new buildings and renovations. The tool – which in generic form is called the ATHENA® EcoCalculator for Assemblies – is available free from the ATHENA Institute at www.athenasmi.org.

COMPARATIVE LCA, THREE CONSTRUCTION SYSTEMS



Source: Comparing the Environmental Effects of Building Systems. Canadian Wood Council

FEATURES OF GREEN BUILDING RATING SYSTEMS

Green building codes and standards have only recently been introduced. Rating systems are currently the most popular schemes for implementing green building concepts. The table on the next page gives a summary and some of the key elements of three prominent green building rating systems in North America – the Green Building Assessment Protocol for Commercial Buildings, LEED and the National Green Building Standard.

All three systems award credits for design, materials and techniques. Each also has four levels of achievement, but the number of credits required to achieve a particular level varies. The table shows both the number of credits available and the percentage this contributes to the minimum level of certification for each system as follows:

- 350 points to achieve *Level 1* of the Green Building Assessment Protocol for Commercial Buildings
- 40 points to achieve the *Certified* level for LEED (commercial/industrial buildings)
- 222 points to achieve the *Bronze* level for the National Green Building Standard (residential)

COMPARISON OF PROMINENT GREEN BUILDING STANDARDS

This summary provides examples of elements of the *Green Building Assessment Protocol for Commercial Buildings*, *Leadership in Energy and Environmental Design*, and the *National Green Building Standard*, using information that was publicly available in 2010. Readers wishing more detailed information should visit the web sites listed.

Note: The National Association of Home Builders National Green Building Standard specifies credit requirements for green subdivisions or green buildings. Required credits for green buildings are reported here.

	GREEN BUILDING ASSESSMENT PROTOCOL FOR COMMERCIAL BUILDINGS (ANSI/CGI 01-2010) Credits required for *Level 1*: 350	**LEED FOR NEW CONSTRUCTION** (LEED 2009 NC) Credits required for *Certified*: 40	**NATIONAL GREEN BUILDING STANDARD** (ANSI/ICC 700-2008) Credits required for *Bronze*: 222
ENERGY	**Credits Available: 300 (86% of *Level 1*)** ▪ Comply with building energy-efficiency standard ASHRAE 90.1 ▪ Use on- and off-site renewable energy ▪ Choose building energy fuels that minimize carbon dioxide emissions ▪ Verify building-operating equipment is installed and properly functioning throughout the building life	**Credits Available: 35 (68% of *Certified*)** ▪ Comply with building energy efficiency standard ASHRAE 90.1 ▪ Use on- and off-site renewable energy ▪ Verify building-operating equipment is installed and properly functioning throughout the building life	**Credits Required: 30 (14% of *Bronze*)** ▪ Meet or exceed requirements of the International Code Council International Energy Conservation ▪ Code or other established standards ▪ Meet additional in-standard requirements for insulation, air sealing, use of solar energy, and more ▪ Optionally meet ENERGY STAR Qualified Home requirements to achieve *Bronze* level
WATER	**Credits Available: 130 (37% of *Level 1*)** ▪ Reduce water consumption beyond requirements of U.S. Energy Policy Act ▪ Irrigate landscape vegetation with collected rainwater; follow Irrigation Association best management practices for irrigation ▪ Recycle wastewater for non-drinking uses	**Credits Available: 10 (25% of *Certified*)** ▪ Reduce water consumption beyond requirements of U.S. Energy Policy Act ▪ Reduce or eliminate the use of potable water for landscape irrigation through choice of vegetation and use of rainwater and wastewater ▪ Treat wastewater for non-drinking purposes or on-site disposal	**Credits Required: 14 (6% of *Bronze*)** ▪ Reduce indoor and outdoor water use by meeting in-standard specifications for plumbing and installing ENERGY STAR appliances and low-flow fixtures ▪ Install a low-volume landscape irrigation system ▪ Collect and use rainwater
POLLUTION	**Credits Available: 45 (13% of *Level 1*)** ▪ Install low-emission heating equipment ▪ Use refrigerants in cooling equipment that have zero or near-zero ozone depletion potential and low global warming potential *Other pollution credits are integrated in other categories through such practices as reduction of building energy consumption, promoting alternatives to the automobile, use of life cycle assessment to support design choices, etc.*	*Pollution credits are integrated in other categories through such practices as reduction of building energy consumption, use of regional materials, promoting alternatives to the automobile, etc. Examples of these measures are:* ▪ Minimize dangerous emissions by avoiding refrigerants that are chlorofluorocarbon-based ▪ Adhere to Section 608 of U.S. Environmental Protection Agency Clean Air Act of 1990 when using and recycling ozone-depleting compounds	*Pollution credits are integrated in other categories through such practices as reduction of building energy consumption, promoting alternatives to the automobile, use of life cycle assessment to support design choices, etc. Some examples of these measures are:* ▪ Install wood stoves and fireplace inserts that meet Environmental Protection Agency or State of ▪ Washington emission standards Select site that is close to mass transit or community resources and essential services
MATERIALS & RESOURCES	**Credits Available: 145 (41% of *Level 1*)** ▪ Use wood products that have been third-party certified according to the American Tree Farm System (ATFS), CSA, FSC, PEFC and SFI forest certification programs ▪ Select materials with least environmental burden based on life-cycle assessment ▪ Re-use existing building structures ▪ Recycle or re-use construction waste	**Credits Available: 14 (35% of *Certified*)** ▪ Use wood products that have been third-party certified to the FSC forest certification program ▪ Re-use existing building structures ▪ Recycle or re-use construction waste ▪ Use materials that are locally extracted or manufactured, salvaged, or contain recycled or rapidly renewable content.	**Credits Required: 45 (20% of *Bronze*)** ▪ Use wood products that have been third-party certified according to the ATFS, CSA, FSC, PEFC and SFI forest certification programs ▪ Select materials with least environmental burden based on life-cycle assessment ▪ Build small homes ▪ Re-use existing building structures ▪ Recycle or re-use construction waste
INDOOR ENVIRONMENT	**Credits Available: 160 (46% of *Level 1*)** ▪ Ventilate buildings according to selected requirements of ASHRAE Standard 62.1, International Code Council Mechanical Code, the Association of Plumbing and Mechanical Officials Uniform Mechanical Code, or the local code ▪ Control emissions of volatile organic compounds by using indoor materials such as paint, flooring, furnishings, etc. that have been certified by specified established standards ▪ Provide thermal and acoustic comfort and optimal lighting, including daylight and outside views ▪ Assess the presence of radon and control if necessary	**Credits Available: 15 (38% of *Certified*)** ▪ Ventilate buildings according to selected requirements of ASHRAE Standard 62.1, the Carbon Trust *Good Practice Guide 237*, or the Chartered Institution of Building Services Engineers Applications Manual 10:2005 ▪ Develop an indoor air quality management plan for construction and pre-occupancy phases of a building ▪ Control emissions of volatile organic compounds by using indoor materials such as paint, flooring, furnishings, etc. that have been certified by specified established standards ▪ Provide thermal and acoustic comfort and optimal lighting, including daylight and outside views	**Credits Required: 36 (16% of *Bronze*)** ▪ Ventilate buildings according to selected requirements of ASHRAE Standard 62.1; install exhaust fans that are ENERGY STAR compliant ▪ Control emissions of volatile organic compounds by using indoor materials such as paint, flooring, furnishings, etc. that have been certified by specified established standards ▪ Control radon where necessary
SITE/ TRANSPORT	**Credits Available: 120 (34% of *Level 1*)** ▪ Locate building on site close to public transport, bicycle path, community services, and existing utility services or that is commercially zoned ▪ Provide facilities and parking for bicyclists ▪ Minimize construction-related disturbance through control of erosion, sediment, and dust and restricting area of construction activity ▪ Minimize hot surfaces (heat islands) such as roofs, sidewalks, and pavement by using reflective materials and shading	**Credits Available: 26 (65% of *Certified*)** ▪ Locate building on site close to public transport, bicycle path, community services, and existing utility services or that is previously developed ▪ Provide facilities and parking for bicyclists and incentives for the use of fuel-efficient vehicles, such as preferred parking and access to such vehicles themselves ▪ Minimize construction-related disturbance through control of erosion, sediment, and dust and restricting area of construction activity ▪ Minimize hot surfaces (heat islands) such as roofs, sidewalks, and pavement by through reflective materials and shading	**Credits Required: 39 (18% of *Bronze*)** ▪ Locate building near or on a site close to public transport, bicycle path and community services or that is previously developed and under-used ▪ Minimize construction-related disturbance through "no disturbance" zones and controlling sediment and soil erosion ▪ Install utilities using alternate means, such as tunnelling instead of trenching or low ground pressure equipment. ▪ Design landscaping to minimize need for irrigation ▪ Minimize hot surfaces (heat islands) by using reflective materials or shading with vegetation

CSA Canadian Standards Association's Sustainable Forest Management Standard

FSC Forest Stewardship Council

PEFC Programme for the Endorsement of Forest Certification schemes

SFI Sustainable Forestry Initiative

THIRD-PARTY FOREST CERTIFICATION

Third-party forest certification can improve forest practices and promote sustainable forest management by offering assurance that wood products come from legal and responsible sources.

British Columbia and Canada are world leaders in third-party certification. The majority of its forests are certified to at least one of three globally recognized forest certification programs – the Canadian Standards Association's Sustainable Forest Management Standard (CSA), the Forest Stewardship Council (FSC) and the Sustainable Forestry Initiative (SFI). The CSA and SFI programs are recognized internationally by the Programme for the Endorsement of Forest Certification schemes (PEFC). All these programs offer chain-of-custody certification, a mechanism used to track wood from certified sources through all phases of manufacturing to the buyer.

All major forest certification programs in North America are recognized by companies and governments around the world.

Only 10 per cent of the world's forests are certified. Consumers can promote responsible forest management around the world by buying wood and paper products from certified forests. British Columbia has more certified forest land than any other jurisdiction in the world, with the exception of Canada as a whole.

Green building rating systems offer credits for the use of wood products that are third-party certified. Most – including the Green Building Assessment Protocol and the National Green Building Standard – allow credits for products certified to any of the globally recognized forest certification programs used in Canada and the United States. LEED offers credits for the use of products certified only to the FSC program (this policy is currently under review).

Credits available for the use of wood range from one for LEED (2.5 per cent of its *Certified* rating), up to four for National Green Building Standard (two per cent of its *Bronze* rating) and six for the Green Building Assessment Protocol (two per cent of its *Level 1* rating).

Green building schemes developed by ASHRAE, American Society for Testing and Materials, International Code Council and the Green Building Initiative recognize all of the certification programs used in Canada as meeting their requirements.

Forestry Innovation Investment has posted a search tool on its website www.naturallywood.com for customers who want to identify suppliers in the province with chain-of-custody certification or learn more about British Columbia's certified lands.

Wood is an excellent environmental choice for any construction project – and third-party forest certification shows it is from a responsible and legal source

WOOD AS A GREEN BUILDING MATERIAL

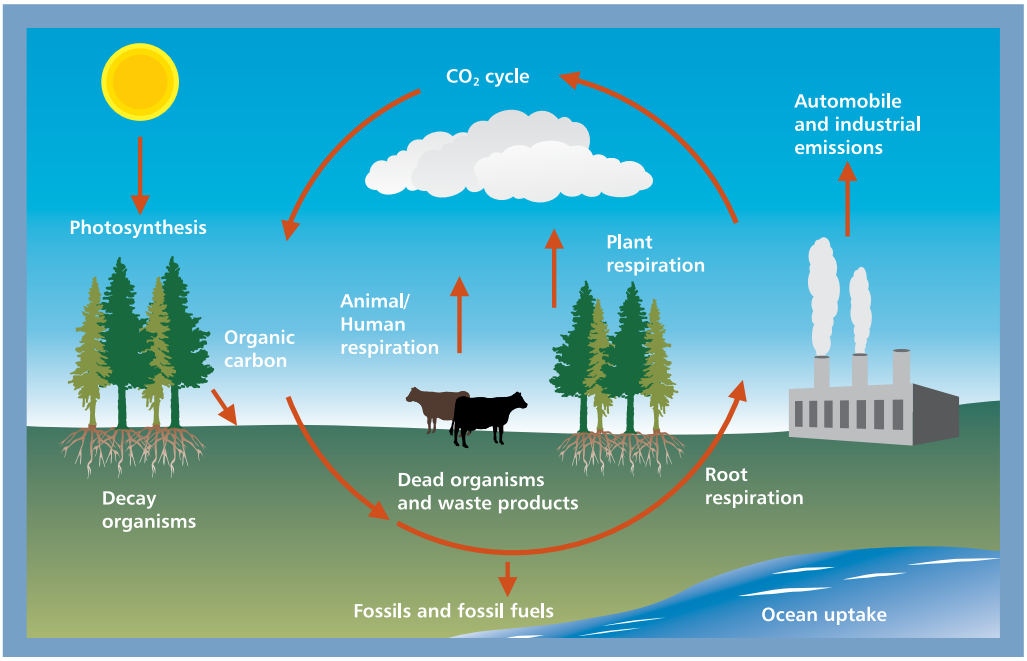
Wood is an excellent environmental choice for any new construction or renovation as long as it is from a sustainable source. It grows naturally, using solar energy. It is renewable and recyclable.

Research shows that wood products need the least amount of energy to manufacture, and that this process has the lowest impact on air and water quality. Using wood can offset climate change since trees absorb carbon dioxide as they grow, and the resulting products continue to store much of this carbon for decades or even centuries.

Wood has long been a popular building choice and engineered wood products are making it even better by reducing waste at every stage and increasing versatility and strength.

The warm and natural attributes of a wood design generate positive feelings, and evidence suggests this can contribute to an individual's overall sense of well-being. In an office or school, this can improve performance and productivity. Wood floors contribute to better air quality by minimizing the accumulation of dust and microbes.

The environmental benefits are further strengthened when the wood comes from a responsible jurisdiction like Canada that has advanced wood manufacturing technology and sustainable forest practices, backed by third-party forest certification.



CLIMATE CHANGE

Trees release oxygen into and remove carbon dioxide from the air and use it to create wood, leaves or needles, and roots. Carbon dioxide emissions are one of the main causes of climate change. When trees burn or decompose, they release the carbon they have stored back into the atmosphere in the form of carbon dioxide.

Trees absorb carbon dioxide as they grow, and wood products continue to store much of this carbon

When a tree is cut down, about half of its carbon remains in the forest and the rest is removed in the logs and stored in the resulting wood products. A typical North American timber-frame home captures about 28 tonnes of carbon dioxide; the equivalent of seven years of driving the family car or about 12,500 litres (3,300 US gallons) of gasoline.

Deforestation, which occurs largely in developing countries, is a leading contributor to climate change. British Columbia has roughly the same amount of forested land as it did before European settlement.

A stable demand for wood products encourages landowners to manage their land always as forest rather than converting them to other uses such as agriculture.

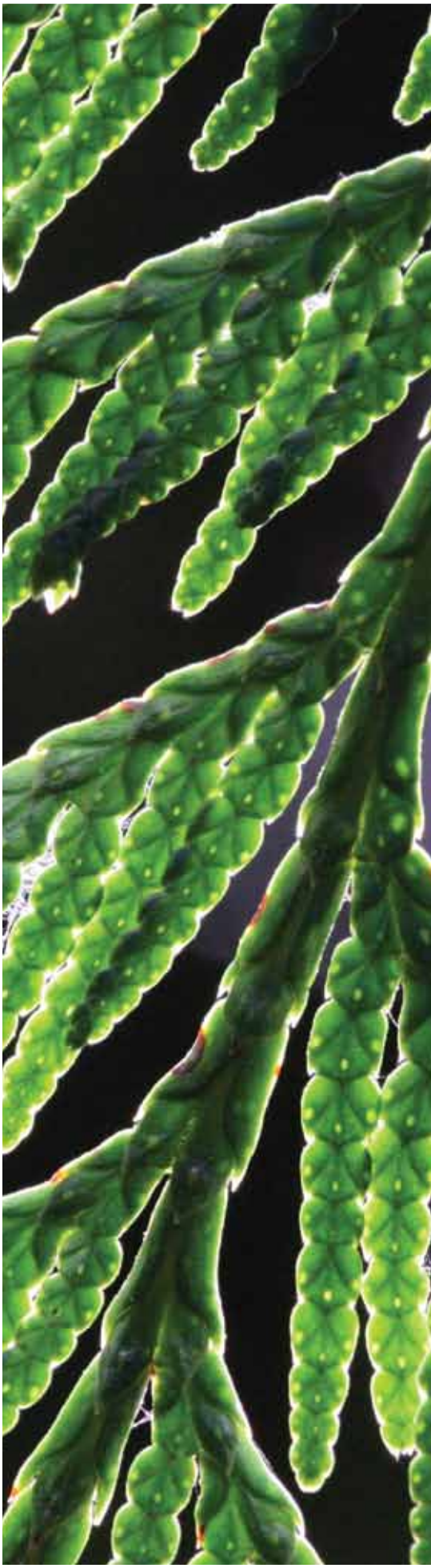
Less than half of one per cent of Canada's managed forests is logged in any year, and areas that are harvested are regenerated to become new forests – beginning the cycle of carbon absorption and storage over again.

ENERGY EFFICIENCY

As much as one third of the energy produced in North America is used to heat, cool and operate buildings.

The insulating properties of wood are 400 times better than steel and 15 times better than concrete. Concrete and steel are solid throughout where wood's cellular structure contains air pockets, which help to reduce the energy needed for heating and cooling. In terms of embodied energy, life cycle assessment studies show that wood significantly outperforms steel and concrete.

A study conducted by the Consortium for Research on Renewable Industrial Materials (CORRIM) used life cycle assessment to compare the environmental impact of homes framed with wood and steel in Minneapolis and wood and concrete in Atlanta – the framing types most common to each city. It found that the homes framed in steel and concrete would require 17 and 16 per cent respectively more embodied energy than their wood-framed counterparts.



WASTE AND DURABILITY

Comparative studies reveal that there is virtually no waste during the manufacture of wood products. Waste wood can be burned for energy, replacing the use of a fossil fuel.

Engineered wood products that bond together smaller pieces of wood or wood fibre offer a high-performance, consistent, reliable and environmentally responsible choice for any project, large or small, residential or commercial. By offering high strength and supporting wider roof spans, engineered wood products increase design opportunities.

The best environmental choice is to use construction materials that are durable enough to last the lifetime of the structure, and can be reused or recycled once its useful life has ended. In North America, this is usually about 50 years for a non-residential building, which means it is better to design buildings that can be easily adapted to new uses or deconstructed so materials can be reused or recycled.

Wood buildings can be easily redesigned to suit changing needs, whether this involves adding a new room or moving a window or door. A study for the Chartwell School in the United States found that wood offers the best opportunities for reuse – most concrete cannot be reused, and refabricating steel requires about half of the energy required to refine it from ore. Canada's CO_2 Neutral Alliance has created a website at dontwastewood.com listing resources aimed at keeping wood waste out of landfills.

FOR MORE INFORMATION

To learn more about the benefits of wood, see the following publications at www.naturallywood.com/resources:

Third-Party Forest Certification

Canadian Wood. Renewable by Nature. Sustainable by Design.

Tackle Climate Change, Use Wood

Wood Use in 2010 Olympic & Paralympic Venues.

The Gulf Islands National Park Reserve operations centre in Sidney, BC, is Canada's first LEED Platinum Building. The design maximized the use of local materials, chosen for their durability because of the harsh waterfront environment

SOURCES

American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
www.ashrae.org

American Society for Testing and Materials (ASTM)
www.astm.org

ATHENA Institute
www.athenasmi.ca

BOMA BESt
www.bomabest.com

Building Research Establishment Group Environmental Assessment Method (BREEAM)
www.breeam.org

Built Green Canada
www.builtgreencanada.ca

California Green Building Standards Code
www.bsc.ca.gov/CALGreen

Canada Green Building Council
www.cagbc.org

Canadian Forest Service
www.cfs.nrcan.gc.ca

Canadian Wood Council
www.cwc.ca

Consortium for Research on Renewable Industrial Materials (CORRIM)
www.corrim.org

Green Building Initiative (GBI)
www.thegbi.org

Green Globes
www.greenglobes.com

International Code Council (ICC)
www.iccsafe.org

National Association of Home Builders (NAHB)
www.nahbgreen.org

U.S. Green Building Council (USGBC)
www.usgbc.org

About 50% of wood products exported from Canada come from the Province of British Columbia's sustainably-managed forests. This publication is part of the 'Forest Facts' series, published by Forestry Innovation Investment. Visit www.naturallywood.com for details.

naturally:wood

British Columbia wood. Sustainable by nature. Innovative by design.