

Guide to Green Building Products in North America

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List of Acronyms

ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
bEQ	Building Energy Quotient
BOMA	Building Owners and Managers Association of Canada
BREEAM	BRE Environmental Assessment Method
CCBFC	Canadian Commission on Building and Fire Codes
CEV	<i>Código de Edificación de Vivienda</i>
CMIC	<i>Cámara Mexicana de la Industria de la Construcción</i>
Conavi	<i>Comisión Nacional de Vivienda</i>
EPA	Environmental Protection Agency
GBI	Green Building Initiative
ICC	International Code Council
IEQ	Occupant Indoor Environmental Quality
IgCC	International Green Construction Code
Infonavit	<i>Instituto del Fondo Nacional de la Vivienda para los Trabajadores</i>
LBC	Living Building Challenge
LEED	Leadership in Energy and Environmental Design
NGBS	National Green Building Standard
NRCan	Natural Resources Canada
Sisevive	<i>Sistema de Evaluación de la Vivienda Verde</i>

Abstract

This short document provides an overview of various green building codes and standards, ratings and certification programs, and benchmarking systems used across North America. This initiative aims to increase knowledge and awareness of green building practices and materials, help stakeholders facilitate decision-making and thus greater uptake of green building practices and materials, as well as support innovative businesses to explore and expand opportunities within North America.

Introduction

In 2012, the Green Building Construction Task Force of the Commission for Environmental Cooperation received the mandate to support the construction of green buildings and the use of green building materials in North America by identifying opportunities and determining the best way to drive changes needed to decrease the environmental footprint of cities and buildings in North America. As part of this effort, an overview of various green building codes and standards, ratings and certification programs, and benchmarking systems used across North America was created with the aim to increase knowledge and awareness of green building practices and materials. This initiative aims to help stakeholders facilitate decision-making and thus greater uptake of green building practices and materials, as well as support innovative businesses to explore and expand opportunities within North America.

1. Codes and Standards

Codes consist of requirements and standards that a jurisdiction enforces through legislation, statutes, contracts, etc. A jurisdiction can adopt a model code without changing it, modify part of the code, or develop its own code. A model code is developed and maintained by private standards' development organizations independent of the jurisdiction responsible for enacting the code, but is not enforceable until a jurisdiction enacts the code through legislation or statute or it is included in a contract.¹

There are no nationally-mandated green building codes in North America, although model codes include a number of green features. In the US, many federal agencies, state governments and their agencies, city governments and their agencies, and public school districts adopted minimum and/or mandatory green building design standards and/or guidelines. For example, California has its own green building code, part or all of ten states use or have adopted the International Green Construction Code (IgCC) administered by International Code Council, and the Army Corp of Engineers adopted the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Standard 189.1.² Standard 189.1 serves as a compliance option in the 2012 IgCC published by the International Code Council, which regulates construction of new and remodeled commercial buildings.

In Canada, the model codes have a number of green features (e.g., indoor air quality, noise reduction, containment of hazardous materials, daylighting and outdoor view, water and sewerage protection of buildings, resource conservation, water conservation, energy conservation, and environmental integrity) that were incorporated by the various standing committees administered by the Commission on Building and Fire Codes (CCBFC). Energy efficiency design and construction features are included in the National Energy Code for Building 2011 and in the Canadian Standard Association's Supplementary Standard SB-10 "Energy Efficiency Supplement." Some provincial and territorial governments (e.g., British Columbia and Ontario) have more stringent green codes and standards.³

Mexico does not have green code for commercial buildings, but efforts to develop and regulate green provisions in the built environment are ongoing. Stakeholders, such as the National Housing Commission (CONAVI) and the Mexican Chamber for the Construction Industry (*Cámara Mexicana de la Industria*

¹ APEC (2013). APEC Building Codes, Regulations, and Standards: Minimum, Mandatory, and Green. Produced by Nathan Associates Inc. for review by the United States Agency for International Development. APEC#213-CT-01.8. August 2013, at 179. Available at: <http://publications.apec.org/publication-detail.php?pub_id=1442>.

² *Ibid.*, at 184.

³ *Ibid.*, at 49.

de la Construcción—CMIC), are documenting green practices and defining criteria for green buildings and homes. Mexico has many national technical standards and other documents that can serve as a foundation for a green code such as the complementary technical norms of the Mexico City Building Code, which addresses aspects of sustainability (water and energy efficiency). Development of a green code or standard for commercial buildings is just the beginning of a process that above all needs a strong system for compliance. Compliance and enforcement, in fact, need to be strengthened for the economy's building code system overall.⁴

International Green Construction Code (IgCC)

The International Green Construction Code (IgCC) was developed by the International Code Council as the first model code to include sustainability measures for the entire construction project and its site—from design through construction, certificate of occupancy and beyond. The code acts as an overlay to the existing set of International Codes, including provisions of the International Energy Conservation Code and ICC-700, the National Green Building Standard, and incorporates ASHRAE Standard 189.1 as an alternate path to compliance.

<i>Countries</i>	US
<i>Organization(s)</i>	The International Code Council (ICC)
<i>Type of program and construction</i>	Voluntary; New and retrofit constructions
<i>Building Sectors</i>	Commercial, institutional, healthcare, homes and multifamily housing
<i>Performance areas</i>	Sustainable site development, energy efficiency, water efficiency, material selection, indoor environmental quality, emissions effluents & other impacts and renewable energy systems
<i>Website</i>	< http://www.iccsafe.org/cs/IGCC/ >

⁴ *Ibid.*, at 118.

Código de Edificación de Vivienda (CEV)

CEV is a voluntary building code written by the National Housing Commission (*Comisión Nacional de Vivienda—Conavi*). This code addresses the sustainability aspects of building construction from fire protection to structural design, and including energy efficiency, materials, and water management.

<i>Countries</i>	Mexico
<i>Organization(s)</i>	<i>Comisión Nacional de Vivienda (Conavi)</i>
<i>Type of program</i>	Voluntary
<i>Building Sectors</i>	Homes
<i>Performance areas</i>	Energy efficiency and water efficiency
<i>Website</i>	< http://www.cmic.org/mnsectores/vivienda/2008/CONAVI/CEV.htm >

ASHRAE 189.1 Standard

Standard 189.1 provides a “total building sustainability package” by addressing site sustainability, water use efficiency, energy efficiency, indoor environmental quality, and the building’s impact on the atmosphere, materials and resources. The standard serves as a compliance option in the 2012 IgCC published by the International Code Council.

<i>Countries</i>	US
<i>Organization(s)</i>	American Society of Heating, Refrigeration, and Air Conditioning Engineers
<i>Type of program and construction</i>	Voluntary; New and major renovations
<i>Building Sectors</i>	Commercial, institutional, healthcare and multifamily housing
<i>Performance areas</i>	Sustainable site development, energy efficiency, water efficiency, materials selection, indoor environmental quality, project/environmental management and emissions, effluents & other impacts
<i>Website</i>	< https://www.ashrae.org >

2. Rating systems and certification programs

Rating systems are not standards and are not intended to be mandatory even though some jurisdictions have made them so. They are used for establishing criteria beyond minimum codes to address specific goals that might not be already covered in codes. Such guidelines and systems are assembled by experts to help industry professionals achieve the intent of the requirements found in the codes and standards (USAID 2013).

LEED

The Leadership in Energy and Environmental Design (LEED) program was launched in 1999 to provide third-party verification of green buildings. As of April 2013, nearly 45,000 projects were registered and certified in North America (44,270 in the US, 4,212 in Canada, and 322 in Mexico).

<i>Countries</i>	Canada, US and Mexico
<i>Organization(s)</i>	US Green Building Council, Canada Green Building Council, Consejo de Edificación Sustentable
<i>Type of program and construction</i>	Voluntary; New and retrofit constructions
<i>Building Sectors</i>	Neighborhood development, commercial, institutional, healthcare, homes and multifamily housing
<i>Performance areas</i>	Sustainable site development, energy efficiency, water efficiency, material selection, indoor environmental quality and project/environmental management
<i>Verification method</i>	Calculated
<i>Website</i>	< http://new.usgbc.org/ >

Green Globes system

In 2005, the Green Building Initiative (GBI) became the first green building organization to be accredited as a standards developer by the American National Standards Institute (ANSI). The GBI ANSI technical committee was formed in early 2006 and the official Green Globes ANSI standard was published in 2010. Green Globes is operated by the Green Building Initiative (GBI) in the US, and the version for existing buildings in Canada is operated by BOMA Canada under the name 'BOMA BEST'. The Green Globes system is used by large developers and property management companies, including, the Canadian federal government, which has adopted the program for its entire real estate portfolio.

<i>Countries</i>	US and Canada
<i>Organization(s)</i>	Green Building Initiative, BOMA Canada, ECD Energy and Environment Canada
<i>Type of program and construction</i>	Voluntary; New, existing, and retrofit constructions
<i>Building Sectors</i>	Commercial, institutional and healthcare
<i>Performance areas</i>	Sustainable site development, energy efficiency, water efficiency, material selection, indoor environmental quality, project/environmental management, emissions, effluents and other

	impacts and life cycle assessment
<i>Verification method</i>	Calculated and measured
<i>Website</i>	< http://www.greenglobes.com >

ENERGY STAR

ENERGY STAR is a voluntary labeling program established by EPA in 1992, under the authority of the Clean Air Act Section 103(g). The program was designed originally to identify and promote energy-efficient products to reduce greenhouse gas emissions. The ENERGY STAR label is now on major appliances, office equipment, lighting, home electronics, new homes and commercial and industrial buildings and plants.

<i>Countries</i>	US and Canada
<i>Organization(s)</i>	US Environmental Protection Agency (EPA), Natural Resources Canada
<i>Type of program and construction</i>	Voluntary; New and retrofit constructions
<i>Building Sectors</i>	Commercial, institutional, healthcare, homes and multifamily housing
<i>Performance areas</i>	Energy efficiency and indoor air quality
<i>Verification method</i>	Measured
<i>Website</i>	< http://www.energystar.gov/ >

Living Building Challenge

Living Building Challenge (LBC) was launched in 2006. The Cascadia Green Building Council founded the International Living Building Institute in 2009 as an umbrella organization for the Living Building Challenge and its auxiliary programs. The Institute certified the first projects in 2010. At the beginning of 2011, the Institute was renamed as the International Living Future Institute, with a mission to lead the transformation to a world that is socially just, culturally rich and ecologically restorative.

<i>Countries</i>	US and Canada
<i>Organization(s)</i>	International Living Building Institute, International Living Future Institute partners and Canada Green Building Council
<i>Type of program and construction</i>	Voluntary; New and retrofit constructions
<i>Building Sectors</i>	Neighborhood development / village / campus / city, commercial, institutional, homes and multifamily housing
<i>Performance areas</i>	Sustainable site development, energy efficiency, water efficiency, material selection, health, equity, beauty, renewable energy systems and life cycle assessment
<i>Verification method</i>	Measured
<i>Website</i>	< http://living-future.org/lbc >

Net Zero Energy Building Certification

The Net Zero Energy Building Certification is a branch of the LBC that offers certification for buildings that supply on-site renewable energy for one hundred percent of the building's energy needs on a net annual basis.

<i>Countries</i>	US and Canada
<i>Organization(s)</i>	International Living Building Institute, International Living Future Institute partners and the Canada Green Building Council
<i>Type of program and construction</i>	Voluntary; New and retrofit constructions
<i>Building Sectors</i>	Commercial, institutional, homes and multifamily housing
<i>Performance areas</i>	Sustainable site development, energy balance, rights to nature, beauty, renewable energy systems and life cycle assessment
<i>Verification method</i>	Measured
<i>Website</i>	< http://living-future.org/netzero >

Passive House

The Passive House certification is a rigorous quality assurance process that determines whether a building meets all of the requirements of the Passive House standard. More importantly, it confirms that the building has been designed to achieve high levels of occupant comfort and health and energy performance.

<i>Countries</i>	US and Canada
<i>Organization(s)</i>	Passive House Institute US and Canadian Passive House Institute
<i>Type of program and construction</i>	Voluntary; New and retrofit constructions
<i>Building Sectors</i>	Institutional, homes and multifamily housing
<i>Performance areas</i>	Energy efficiency
<i>Verification method</i>	Calculated and air leakage testing
<i>Website</i>	< www.passivehouse.us > and < www.passivehouse.ca >

National Green Building Standard

The ICC 700 National Green Building Standard was published by the National Association of Home builders in January 2009, as the only residential green building rating system approved by ANSI as an American National Standard. This rating system was prepared and marketed to homebuilders and provides practices for the design and construction of all types of green residential buildings, renovations, and land developments.

<i>Countries</i>	US
<i>Organization(s)</i>	National Association of Home Builders Research Center
<i>Type of program and construction</i>	Voluntary; New and retrofit constructions
<i>Building Sectors</i>	Land development, homes and multifamily housing

<i>Performance areas</i>	Lot and site development, energy efficiency, water efficiency, material selection, indoor environmental quality and home owner education
<i>Verification method</i>	Calculated
<i>Website</i>	< http://www.nahb.org/generic.aspx?genericContentID=194088 >

BOMA BEST

BOMA BEST (Building Environmental Standards) is a national program launched in 2005 by Building Owners and Managers Association of Canada (BOMA) to address an industry need for realistic standards for energy and environmental performance of existing buildings based on accurate, independently verified information. BOMA BEST evolved from the United Kingdom's BRE Environmental Assessment Method (BREEAM).

<i>Countries</i>	Canada
<i>Organization(s)</i>	BOMA
<i>Type of program and construction</i>	Voluntary; New, existing and retrofit constructions
<i>Building Sectors</i>	Light industrial, commercial, institutional, and multifamily housing
<i>Performance areas</i>	Sustainable site development, energy efficiency, water efficiency, indoor environmental quality, project/environmental management, emissions and effluents & other impacts
<i>Verification method</i>	Calculated and measured
<i>Website</i>	< http://www.bomabest.com/ >

EnerGuide

The EnerGuide rating is a Canadian program that gives a measure of a home's energy performance and efficiency. The rating is calculated based on standard operation assumptions to compare energy performance between homes.

<i>Countries</i>	Canada
<i>Organization(s)</i>	Natural Resources Canada
<i>Type of program and construction</i>	Voluntary; New and retrofit constructions
<i>Building Sectors</i>	Homes and multifamily housing
<i>Performance areas</i>	Energy efficiency
<i>Verification method</i>	Calculated
<i>Website</i>	< http://oee.nrcan.gc.ca/residential/new-homes/upgrade-packages/4998 >

Sistema de Evaluación de la Vivienda Verde

Sisevive, Mexico's rating system for green housing, was designed to inform on home energy efficiency and environmental performance, and aims to compare evaluation criteria in the Mexican housing sector. The national institute for workers housing (*Instituto del Fondo Nacional de la Vivienda para los Trabajadores*—Infonavit) requires Sisevive for all new homes and their registration in the housing registry (*Registro Único de Vivienda*), starting in January 2013.

<i>Countries</i>	Mexico
<i>Organization(s)</i>	Infonavit
<i>Type of program and construction</i>	Mandatory; New constructions
<i>Building Sectors</i>	Homes
<i>Performance areas</i>	Energy efficiency and water efficiency
<i>Verification method</i>	Calculated
<i>Website</i>	< http://www.cmic.org/comisiones/sectoriales/vivienda/2012/Infonavit/muns_y_pres/comision_mixta/sesion_112/6.%20SISEViVE_general.pdf >

Novoclimat

Novoclimat is a voluntary home program available to Canadian consumers residing in Quebec interested in buying a home with a high-energy efficiency rating. It helps consumers reduce their heating costs by at least 25 percent and guarantees superior comfort to its future occupants. The Novoclimat program encourages the home construction industry to continually improve its building techniques.

<i>Countries</i>	Canada
<i>Organization(s)</i>	Office of energy efficiency and innovation, Ministry of Natural Resources, Province of Quebec
<i>Type of program and construction</i>	Voluntary; New and retrofit constructions
<i>Building Sectors</i>	Home and multifamily housing
<i>Performance areas</i>	Energy efficiency and indoor air quality
<i>Verification method</i>	Calculated and air leakage testing
<i>Website</i>	< http://www.efficaciteenergetique.mrnf.gouv.qc.ca/en/my-home/novoclimat/ >

R-2000

R-2000 is a voluntary standard administered by Natural Resources Canada (NRCAN) that is delivered through a network of service organizations and professionals across Canada. Developed in partnership with Canada's residential construction industry, R-2000 is one of the initiatives offered by NRCAN's Office of Energy Efficiency. This initiative aims to promote the use of cost-effective energy-efficient building practices and technologies.

<i>Countries</i>	Canada
<i>Organization(s)</i>	Natural Resources Canada
<i>Type of program and construction</i>	Voluntary; New and retrofit constructions
<i>Building Sectors</i>	Homes
<i>Performance areas</i>	Energy efficiency, water efficiency, material selection and indoor environmental quality
<i>Verification method</i>	Calculated and air leakage testing
<i>Website</i>	< http://oee.nrcan.gc.ca/residential/new-homes/r-2000/7334 >

3. Benchmarking programs

Benchmarking is a process for obtaining a measure—a benchmark—in order to track and compare performance and processes within a sector. In the green building sector, benchmarking programs allow the identification of best practices and innovative approaches, and performance tracking over time.

Occupant Indoor Environmental Quality Survey

The Occupant Indoor Environmental Quality (IEQ) Survey provides a standardized methodology for studying and benchmarking building performance and comfort from the occupants' standpoint. The survey must be completed online by occupants, who thereby provide feedback to building designers, owners, and operators.

<i>Countries</i>	US and Canada
<i>Organization(s)</i>	Center for the built environment, University of California Berkeley
<i>Type of program and construction</i>	Voluntary; existing constructions
<i>Building Sectors</i>	Commercial and institutional
<i>Performance areas</i>	Indoor environmental quality
<i>Website</i>	< http://www.cbe.berkeley.edu/research/survey.htm >

ENERGY STAR Manager Portfolio

The ENERGY STAR Manager Portfolio is an interactive energy management tool that allows building owners to track and assess energy performance, water efficiency, and carbon emissions from their buildings. The program helps users set investment priorities, identify under-performing buildings, verify efficiency improvements, and receive EPA recognition for superior energy performance. Statistically representative models are used to compare a user's building against similar buildings from a national survey conducted by the Department of Energy's Energy Information Administration.

<i>Countries</i>	US and Canada
<i>Organization(s)</i>	US Environmental Protection Agency
<i>Type of program and construction</i>	Voluntary; Existing constructions
<i>Building Sectors</i>	Commercial, institutional, healthcare, homes and multifamily housing

<i>Performance areas</i>	Energy efficiency and water efficiency
<i>Website</i>	< http://www.energystar.gov/index.cfm?c=evaluate_performance.us_portfolio >

Building Energy Quotient

Building Energy Quotient (bEQ) is a building energy labeling program that provides opportunities for commercial building owners to lower building operating cost and make informed decisions to increase value. The bEQ label is actually two labels in one: an “In Operation” label that rates a building’s energy performance by using actual measured energy use, and an “As Designed” label that rates the as-built conditions of the building by using modeled energy use under standardized conditions.

<i>Countries</i>	US
<i>Organization(s)</i>	ASHRAE
<i>Type of program and construction</i>	Voluntary; Existing constructions
<i>Building Sectors</i>	Commercial
<i>Performance areas</i>	Energy efficiency
<i>Website</i>	< http://buildingenergyquotient.org >

GREEN UP

GREEN UP is a national building performance database that lets building owners compare their building’s energy performance and water use against the national building performance database and benchmarking platform in Canada. Building owners and managers can view data, compare results, plan improvements and implement strategies to achieve specific goals.

<i>Countries</i>	Canada
<i>Organization(s)</i>	Canada Green Building Council
<i>Type of program and construction</i>	Voluntary; Existing constructions
<i>Building Sectors</i>	Commercial, institutional, healthcare and multifamily housing
<i>Performance areas</i>	Energy efficiency and water efficiency
<i>Website</i>	< http://www.cagbc.org/Content/NavigationMenu/Programs/GREENUP/default.htm >

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USAID 2013. APEC Building Codes, Regulations, and Standards: Minimum, Mandatory, and Green. Produced by Nathan Associates Inc. for review by the United States Agency for International Development. August 2013, Publication #213-CT-01.8. Available at: <http://publications.apec.org/publication-detail.php?pub_id=1442>.