



# LEED® Canada for Homes and Provincial Energy Requirements

Prepared for the  
Canadian Home Builders' Association  
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Toronto • July, 2009

# LEED® Canada for Homes' alignment with provincial energy requirements

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## Summary

***After examining LEED® Canada for Homes' (LEED-H) energy efficiency (EA) section, it was found that, in many regions, LEED-H minimum or "prerequisite" requirements are at, or below, current and proposed provincial Code requirements.***

Building codes and new home labelling programs have different roles and intents making comparison of the two problematic. However, contrasting the requirements of codes with the measures included in labelling programs provides insight into where each fits within the home building continuum.

Building codes and their associated regulations and standards define minimum requirements, based on a disciplined and science-based decision-making process. Code compliance is mandatory. Voluntary new home labelling programs address many goals including: interior air quality, site use and education that are beyond the scope of building codes. Labelling programs can be scalable; reward ascending levels of achievement; and offer different paths to meet specific label requirements.

LEED® Canada for Homes (LEED-H) is a national residential building label launched in early 2009 by the Canada Green Building Council (CaGBC). CaGBC has stated that LEED-H "is targeting the top 25% of new homes with best practice environmental features"<sup>1</sup>. After examining LEED-H's energy efficiency section, it was found that, in many regions, LEED-H minimum or "prerequisite" requirements are at, or below, current and proposed provincial Code requirements. Specifically:

- Building Code requirements in British Columbia and Vancouver (and in Nova Scotia by the end of 2009) currently exceed the LEED-H performance path prerequisite for energy efficiency.
- Building Code requirements in British Columbia, Vancouver, most places in Ontario and Manitoba (and in Nova Scotia by the end of 2009) exceed the LEED-H prescriptive requirement for insulation.
- In British Columbia, LEED-H air infiltration prescriptive requirements represent Code minimum requirements. This will also be the case in Nova Scotia by the end of 2009, and Ontario by the end of 2011, if EnerGuide-derived requirements are adopted within a prescriptive framework.
- In British Columbia, Vancouver and Ontario (and in Nova Scotia by the end of 2009) the LEED-H window prescriptive requirement for both good and enhanced windows represents minimum Code requirements.
- In coastal British Columbia and southern Ontario (and all of Nova Scotia by the end of 2009), Code requirements are at the level of LEED-H space heating and cooling prescriptive requirements.

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<sup>1</sup> Canada Green Building Council, [LEED® Canada for Homes 2009, March 2009](#), page 6.

Comparison of provincial Code requirements with LEED® Canada for Homes is made more complex due to the CaGBC's use of American code and technical references (e.g., International Code Council, HERS rating system) in areas like thermal insulation requirements and performance rating.

## Introduction

In March 2009, the Canadian Home Builders' Association (CHBA) engaged M. Leslie Inc. (Leslie) to gather information on energy efficiency requirements in the provinces; and to compare these requirements to LEED® Canada for Homes 2009, March 2009. The list of requirements would include ....

1. Insulation
2. Air infiltration
3. Windows
4. Forced air duct tightness and the reduction of hydronic heat loss
5. Space heating and cooling
6. And domestic hot water systems

.... And they would generally conform to the optional pathways found in the "Energy & Atmosphere" section of LEED-H. The information on provincial requirements was gleaned from Acts and Regulations; discussion papers and presentations that have been released to the public; and interviews with officials. In the course of the interviews, Leslie also sought information on the energy efficiency direction that each provincial jurisdiction has contemplated following over the remainder of the present code development cycle.

## LEED Canada for Homes



LEED-H is based upon a program of the US Green Building Council, with some Canadian references; and is for single family homes and multiple residential buildings up to three storeys. LEED-H describes itself as: "the only national, third-party green homes certification in the country".<sup>2</sup> Credits are offered in eight categories along a 136-point scale for certain building practices, materials and/or products. In addition, 19 credits must be achieved to meet minimum "prerequisites" (mandatory measures) in seven of eight categories.<sup>3</sup> A minimum number of points must also be obtained in four categories. Finally, a "Home Size Adjustment" that .... "compensates for the overarching effect of home size on resource consumption" .... automatically takes into account the home's size and number of bedrooms<sup>4</sup>. A house can then be certified at one of the following levels: "certified" (45-59 credits);

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<sup>2</sup> There is more than one version of LEED® Canada for Homes 2009, March 2009 in circulation. Although they are not identified outwardly in any fashion, the version examined in this report was released on April 20<sup>th</sup>, 2009. The most recent LEED-H "Checklist" was released June 1<sup>st</sup>, 2009.

<sup>3</sup> On different pages, LEED-H states there are either 18 (page 7) or 19 (page 13) prerequisites, but this is an editing problem. There are 19 prerequisites in Canada; and 25 in the United States.

<sup>4</sup> The Home Size Adjustment has a sliding threshold. The "neutral" level for a 3 bedroom home is 2,200 square feet: any bigger and the point threshold rises; any smaller and the point threshold falls.

“silver” (60-74 credits); “gold” (75-89 credits); or “platinum” (90-136 credits).<sup>5</sup> Credits towards certification must be verified by the “Green Rater” who has been engaged by the LEED-H regional provider to provide inspections, and/or the party that designed the house.

Below is a breakdown of LEED-H categories, the number of credits available in each category, and the goals of each category:

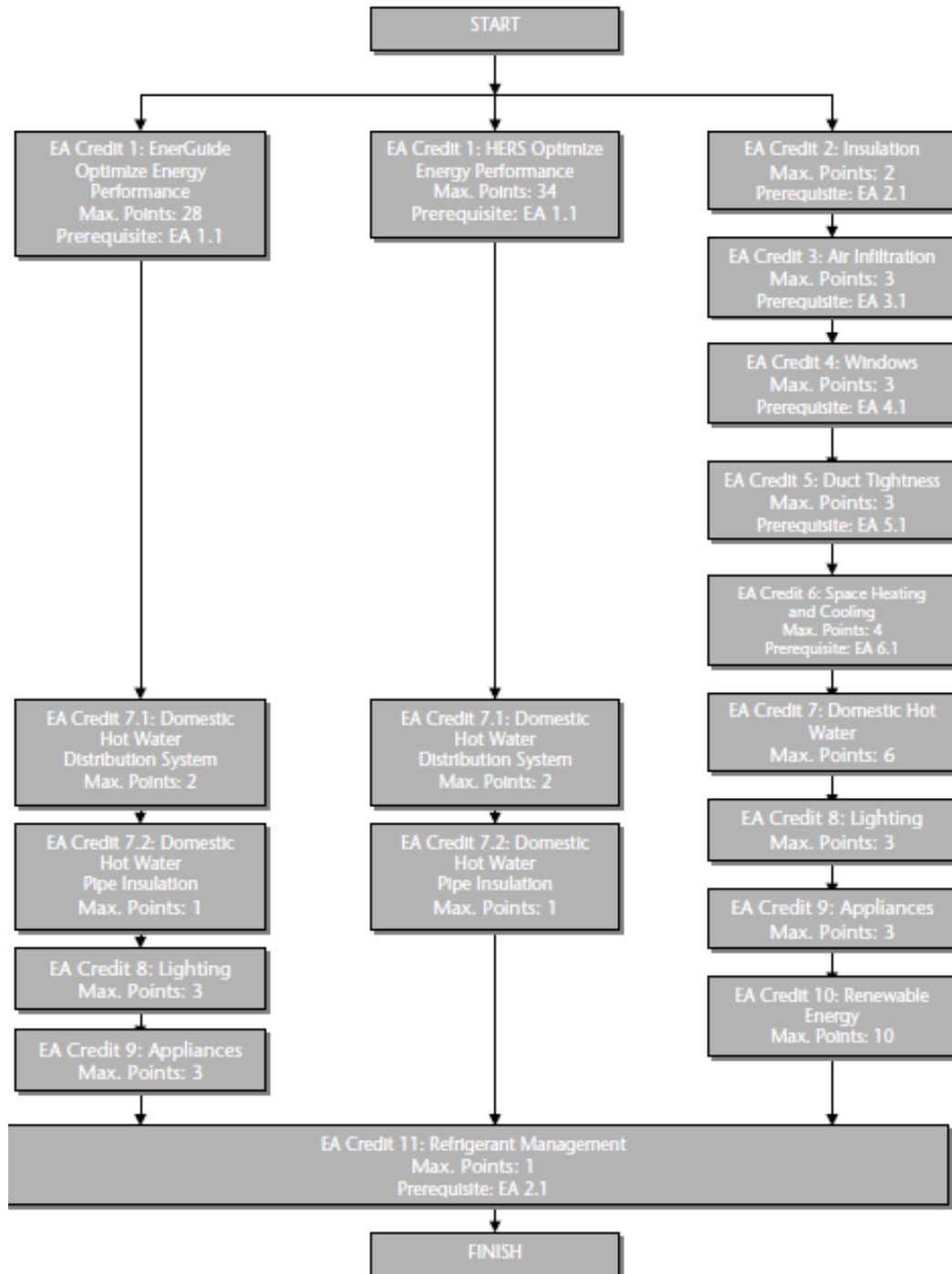
*Table 1 – LEED-H Credit Distribution*

Category	Credits	Goal
Innovation and Design Process	11	Special design methods, unique regional credits, measures not currently addressed in the Rating System, and exemplary performance levels.
Locations and Linkages	10	The placement of homes in socially and environmentally responsible ways in relation to the larger community.
Sustainable Sites	22	The use of the entire property so as to minimize the project's impact on the site.
Water Efficiency	15	Water-efficient practices, both indoor and outdoor.
Energy and Atmosphere	38	Energy efficiency, particularly in the building envelope and heating and cooling design.
Materials and Resources	16	Efficient utilization of materials, selection of environmentally preferable materials, and minimization of waste during construction.
Indoor Environmental Quality	21	Improvement of indoor air quality by reducing the creation of and exposure to pollutants.
Awareness and Education	3	The education of the homeowner, tenant, and/or building manager about the operation and maintenance of the green features of a LEED home.

<sup>5</sup> Credits can also be obtained through two other means: a form of appeal called a Credit Interpretation Request (CIR); and a type of bonus called the Innovative Design Request (IDR) awarded for identifying and implementing a new technique or process.

The Energy and Atmosphere (EA) section has 11 topic areas in which credits can be earned as Graph 1 (below) indicates. They are arrayed along different paths – performance and prescriptive. (Anecdotal

**Graph 1 – LEED-H Energy & Atmosphere Optional Pathways<sup>6</sup>:**



<sup>6</sup> Canada Green Building Council, LEED® Canada for Homes 2009, March 2009, page 68.

comments from the field report that more than 80% of the registered LEED-H units in Canada to date are following the performance path).

The “performance” approach in the LEED-H EA section has two paths that describe for the builder what levels must be reached to achieve the desired number of credits. And it leaves the decisions on how to get there (in most cases) to the builder. Their intent is to: “Improve the overall energy performance of a home by meeting or exceeding the performance of ERS (EnerGuide) 76 or HERS 80”<sup>7</sup>.

The “prescriptive” approach describes the exact approach that the builder must take. This involves how to install insulation, reduce air infiltration, which windows and furnaces to choose, and may take a “good or better” approach to certain topics like air infiltration. This approach can already be found in existing building codes. Please note a small number of further opportunities can be found to add credits, by linking to other sections and then employing optimum-value engineered (OVE) framing to allow more insulation and fewer thermal breaks.

## Provincial regulation of energy efficiency in new homes



The provinces provide different examples of achieving the policy goal of energy efficiency (where regulations are in place, or pending). Some use a provincial building code to give direction (occasionally supplemented by equipment regulations maintained by another department); some adopt the National Building Code of Canada (NBC) by regulation (albeit different versions) in whole or in part; some have specific energy efficiency legislation that prescribes thermal values; some “charter” municipal legislation extends the reach of building codes for low-rise new residential construction; and some do nothing. Here is a short cross-country survey ....

Newfoundland and Labrador does not have a provincial building code (or plumbing code for that matter), although all municipalities in the province have (or are) adopted the 2005 National Building Code (NBC). The Department of Government Services has led the province-wide adoption of the National Fire Code (NFC) and parts of the NBC pertaining to fire and life safety that are cross-referenced in the NFC. The province’s Department of Natural Resources provides incentives that match the Government of Canada’s ecoACTION initiatives. An informal discussion of energy-efficiency measures in new home construction has begun among builders, Newfoundland Hydro, and the Province, that is closely watching developments in Nova Scotia; and may become formalized at a summer 2009 meeting of Building Canada participants in St. John’s.

Prince Edward Island has never adopted the NBC (although Charlottetown and Summerside have both adopted the 2005 version). The Department of Communities, Cultural Affairs and Labour however has responsibility for province-wide adoption of the NFC, boilers and elevators. The Office of Energy Efficiency in the Department of Environment, Energy and Forestry has launched an 18 month-long

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<sup>7</sup> Canada Green Building Council, LEED® Canada for Homes 2009, March 2009, page 70. LEED-H uses the 10.3 version of HOT 2000.

process leading to the adoption of the 2010 NBC and the Model National Energy Code for Buildings (MNECB) – which will take place either by regulation or an Act of the Legislature.

In Nova Scotia, both a provincial building and plumbing code have been adopted into law by the Nova Scotia Building Code Act effective July 1, 2006 (and some municipalities adopt the NFC). In 2008, the Building and Equipment Safety Branch of the Department of Labour and Workforce Development postponed the prescription of proposed amendments to the building code Regulation and asked for further public input. This process is nearing completion and will be complete by the end of 2009. The Nova Scotia measures in the tables presented below contain many draft recommendations that were gratefully received by Leslie, but they must be prefixed with the description: “draft” (although their intent is to achieve performance equivalent to ERS 80).

The New Brunswick Department of Public Safety is responsible for adoption of the NFC and the National Plumbing Code (NPC), but it is left to municipalities to adopt the NBC (where most still use the 1995 version).<sup>8</sup> Efficiency New Brunswick (a crown corporation) has created a voluntary checklist for new home construction that it is preparing to turn into regulation by 2011. Meanwhile, the government has announced that it will adopt the 2005 NBC; and create an office of Chief Building Inspector; by the end of 2009.

In Québec, the Régie du bâtiment du Québec (RBQ) is responsible for province-wide building and plumbing codes that are substantially the same as the NBC 2005 (and the NPC). Municipalities are responsible for adopting a building regulation for new single family housing (and industrial buildings); and thus are permitted to go beyond code, but none has ever done so. The RBQ is in the midst of a process that will soon bring all municipalities under its authority and that of a province-wide building code. In 1983, the Loi sur l'économie de l'énergie dans le bâtiment prescribed thermal values for the building envelope in new construction that were advanced at the time, but have since remained unchanged. There is now another government office - the Agence de l'efficacité énergétique (AEE) - that is preparing regulations for new home construction based upon Novoclimat – a Québec energy efficiency label. (The AEE has the authority to advise the government on legislative and regulatory measures for energy efficiency, but has no power to regulate). The AEE has suggested that by 2012 it would like to introduce regulations that would approximate the current versions of R-2000, or ENERGY STAR.

Ontario has a set of province-wide provincial codes that are based upon the national model, but with variations in content and scope. The Ministry of Municipal Affairs and Housing administers the Building Code Act (BCA) and the Ontario Building Code (OBC) and provides advice and information to other levels of government. Ontario's OBC also references the Model National Energy Code for Buildings (MNECB) and EnerGuide. This became very evident when a new Part 12 was introduced into Division B of the 2006 OBC containing goals for both energy and water efficiency. The 2006 OBC also included enabling provisions to promote the use of green technologies like solar photovoltaic systems; and changes

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<sup>8</sup> The seeming tardiness to update the NBC in New Brunswick is greatly mitigated by the Atlantic Home Warranty program's requirement to use the 2005 NBC; and the significant market penetration in the province of a manufactured housing industry that is itself a leader in energy efficiency.

related to the energy efficiency of Part 9 residential buildings – some of which came into effect immediately and some at a later date.

Manitoba adopts the NBC, NFC and NPC on a province-wide basis with some modifications and additions. This is done under the direction of the Office of the Fire Commissioner, at the Department of Labour and Immigration. Energy efficiency requirements are governed under the Manitoba Buildings and Mobile Homes Act (BMHA). Public consultations are taking place led by the Department of Science, Technology, Energy and Mines on a standard that will see boilers regulated, and a proposed minimum annual fuel utilization efficiency (AFUE) rating of 92% for furnaces.

Saskatchewan adopts the NBC, NFC and NPC on a province-wide basis with modifications and additions (and has just adopted the 2005 NBC at this writing). This is done under the direction of the Building Standards Office of the Department of Corrections and Public Safety; and under the Uniform Building and Accessibility Standards Regulations and the Building and Accessibility Standards Administration Regulations. Saskatchewan officials recently spent several months preparing energy efficiency regulations for new buildings and houses in advance of the introduction of new regulations; however, these were put aside to await changes in the NBC.

The Building and Fire Standards Branch of Alberta's Department of Municipal Affairs is responsible for the Alberta Building Code 2006 (ABC) - which in turn is based upon the NBC 2005 – and includes additional requirements such as minimum insulation levels. The Department has recently retained a consultant to examine the issue of energy efficiency in its codes.

The BC Building Code 2006 (BCBC) is the responsibility of the Office of Housing and Construction Standards at the Ministry of Housing and Social Development of British Columbia. The Office maintains the province-wide building, fire, and plumbing codes – which are based upon the national model codes with additions – but there are several other parties involved in energy efficiency. The Energy Efficiency Branch of the Ministry of Energy, Mines and Petroleum Resources is responsible for the regulation of windows, doors, skylights, boilers and furnaces under the BC Energy Efficiency Act. (It is also responsible for LiveSmart BC, an agency that provides building sustainability incentives). The Homeowners' Protection Office has issued advisory notes to local governments on green roofs; and to builders on airtightness in new homes<sup>9</sup>. And in 2008 the City of Vancouver introduced a building by-law(#9691) under the 2004 Vancouver Charter that created a "Green Homes Program". The by-law regulates several energy efficiency features with the objective of reducing greenhouse gases.<sup>10</sup>

## Performance Paths

The EA section of LEED-H has two optional performance pathways that are tied to the ERS and HERS energy rating indices. Performance paths are already familiar to builders that follow R-2000, EnerGuide

<sup>9</sup> The HPO is a provincial Crown Corporation formed in 1998 that also carries out research and education and monitors the performance of third-party home warranties.

<sup>10</sup> Vancouver Charter [SBC 1953] Chapter 555, Part IX Buildings - 306. (1) The Council may make by-laws - (a) for regulating the construction of buildings .... (v) where the conservation of energy or water is concerned; (vi) where the reduction of greenhouse gas emissions is concerned;

or ENERGY STAR. The proven popularity of performance paths is based upon the flexibility they grant to use cost effective measures; opportunity for innovation; the house-as-a-system approach; and, computer programs that can be employed to model results.<sup>11</sup> (Use of performance paths in R-2000 is universal and it is believed that more than 90% of ENERGY STAR homes employ this method). The two LEED-H EA requirements are .....

*Prerequisites*

*1.1 Meet performance of ERS 76 or HERS 80.*

*Credits*

*1.2 Exceptional Energy Performance in ERS (EnerGuide) (maximum 28 points). Exceed the performance of ERS 76. Use table 151 below relating the EnerGuide Rating System (ERS) index to the appropriate number of LEED® points. This path can also pursue EA8 and EA9 and must meet the prerequisites.*

*OR*

*1.2 Exceptional Energy Performance in HERS (maximum 34 points). Exceed the performance of HERS 80. Use the table 15b below relating the Home Energy Standards (HERS) Index to the appropriate number of LEED® points.<sup>12</sup>*

*Table 2 – Performance Paths Found in Provincial Acts and Regulations*

Province/Region	Ref.	Performance Path
Newfoundland and Labrador	n.a.	x
Prince Edward Island	n.a.	x
Nova Scotia	NSBCA 2006	EnerGuide 80 by 2009.12.31
New Brunswick	n.a.	X
Québec	1983 Law	x
Ontario ('til 2011)	OBC 2006	EnerGuide 80 in 2011
Manitoba	BMHA	x
Saskatchewan	NBC 1995	X
Alberta	ABC 2005	x
British Columbia	BCBC 2008	EnerGuide 77
Vancouver	By-law 9691	EnerGuide audit required

.... And while R-2000, ENERGY STAR and EnerGuide for Houses (EGH) all provide a performance path for energy efficiency, it is only the latter - developed by Natural Resources Canada (NRCan) as a tool for comparative evaluation – that is referenced in Canadian legislation. Please note that the only legislative requirement for a third party – “green rater” audit in Canada (indeed in North America) is the City of

<sup>11</sup> LEED-H uses HOT2000 version 10.3 to chart its performance path. The Ontario ENERGY STAR program uses HOT2000 version 9.34c in its program. The two HOT2000 versions do not treat houses with different fuel sources in the same way.

<sup>12</sup> Canada Green Building Council, LEED® Canada For Homes 2009, March 2009, page 70.

Vancouver By-law #9691. A design evaluation and inspection is required by: Built Green™, EnerGuide's ERS, ENERGY STAR, Manitoba Power Smart, Novoclimat, R-2000, Yukon's GreenHome and LEED-H.

## Insulation

The LEED-H prescriptive requirement for insulation is intended to minimize heat transfer and thermal bridging and it requires that the following be met:

### *2.1 Basic Insulation. Meet all the requirements*

*a) Install insulation that meets or exceeds the R-value requirements listed in Chapter 6 of the 2004 International Energy Conservation Code (Table 602.1) or the local building codes, whichever is more stringent. Alternative wall and insulation systems, such as structural insulated panels (SIPs) and insulated concrete forms (ICFs), must demonstrate a comparable R-value, but thermal mass or infiltration effects cannot be included in the R-value calculation.*

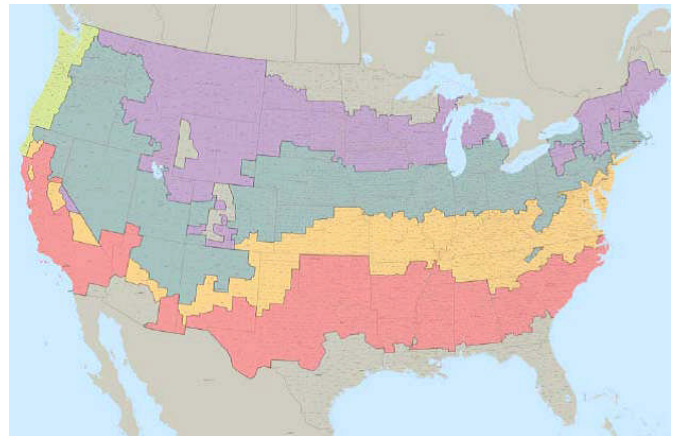
*b) Install insulation to meet the provincial or local standards. Installation must be verified by a Green Rater conducting a pre-drywall thermal bypass inspection, as summarized in Figure 3.*

### *2.2 Enhanced Insulation (2 points). Meet the following requirements:*

*a) Install insulation that exceeds the R-value requirements listed in Chapter 6 of the 2004 International Energy Conservation Code (Table 602.1) or the local building code, whichever is more stringent, by at least 20%. Alternative wall and insulation systems, such as structural insulated panels (SIPs) and insulated concrete forms (ICFs), must demonstrate a comparable R-value, but thermal mass or infiltration effects cannot be included in the R-value calculation.*

*b) Install insulation to meet grade I standards (Table 16). Installation must be verified by a Green Rater conducting a pre-drywall thermal bypass inspection, as summarized in Figure 3<sup>13</sup>.*

Many readers will not be familiar with the effective minimum insulation level described in the preceding paragraphs - the "2004 International Energy Conservation Code Supplement" published by the International Code Council (ICC). However, the CaGBC's decision to import the language of a US model code organization is significant - whether the reader considers the presence of US code references in the middle of a Canadian document to be relevant, or not. In 2004, amendments to this model code reduced the number of climatic zones in the US; and increased the amount of wall insulation from R-19 to R-21 in climate zones 4 Marine through 6 - shown in purple and blue in the accompanying map. The reader will recognise that several points in these zones are similar to and also close to populated regions of Canada's Maritime provinces, Québec, Ontario, the southern tier of the Prairies and the Interior of BC. The R-21 value prescribed for these regions is lower than that prescribed by some Canadian jurisdictions, as we will see below.



<sup>13</sup> LEED® Canada For Homes 2009, March 2009, Canada Green Building Council, page 74.

Current provincial insulation values – and even their description – range from the minimum assumptions of the 1995 NBC Section 9.25 employed in Prince Edward Island, to the more far ranging recommendations that could take effect in Nova Scotia before the end of 2009, for as many as fourteen (14) elements of the residential building envelope shown here:

*Insulating Element Check List (based upon NSBCA proposal)*

- Ceiling below attic or roof space [R-40]
- Roof assembly without attic or roof space [R-31]
- Wall other than foundation wall (including walls between heated and unheated spaces) [R-24]
- ICF wall above grade [R-21.3]
- ICF wall below grade enclosing heated space (full height insulation) [R-21.3]
- Foundation walls enclosing heated space (full height insulation) [R-20]
- Floors over unheated spaces including Overhanging (cantilevered) Floors [R-31]
- Floor joist header space [R-24]
- Frost Wall (with slab-on-ground) [R-10]
- Slab-on-ground perimeter insulation [R-10]
- Under Slab-on-ground containing heating pipes, tubes, ducts or cables [R-10]
- Under Slab-on-ground not containing heating pipes, tubes, ducts or cables [R-10]
- Basement floor slabs located not more than 1m below grade [R-10]
- Basement floor slabs located more than 1m below grade [nil]

The following Table 3 describes the prescriptive and performance paths for the three most common elements of the residential building envelope currently required by the provinces (and Vancouver) – now and in the future, where a future regulation has been announced:

*Table 3 – Insulation Levels in Provincial Acts and Regulations*

Province/Region	Ref.	Exterior Wall	Basement	Roof
Newfoundland and Labrador	n.a.	x	x	x
Prince Edward Island	n.a.	x	x	x
Nova Scotia by 2009.12.31				
all	NSBCA 2006	24	20	40
all Performance path	NSBCA 2006		EnerGuide 80	
New Brunswick	n.a.	x	x	x
Québec	1983 Law	19.2	12.5	30.5
Ontario ('til 2011)				
south gas/oil	OBC 2006	19	12	40
south electric	OBC 2006	29	19	50
north gas/oil	OBC 2006	24	12	40
north electric	OBC 2006	29	19	50
2011 Performance path			EnerGuide 80	
Manitoba				
South	BMHA	20	12	40
North	BMHA	26	24	50
Saskatchewan	NBC 1995	x	x	x
Alberta	ABC 2005	12	8	34

British Columbia				
<4500HDD	BCBC 2008	20	12	30
>4500HDD	BCBC 2008	22	12	51
Performance path			EnerGuide 77	
Vancouver	By-law 9691			
All		22	22	40
All			EnerGuide audit required	

## Air Infiltration

The LEED-H prescriptive requirement for air infiltration/leakage supports its other energy efficiency requirements. Specific reference is made to performance requirements in Table 17 that are measured in air changes per hour (ACH) @50p for three climatic zones with ranges between values of 1.5 and 3.5 for all Canadian zones and all the available credits. The text reads:

### *Prerequisites*

*3.1 Reduced Envelope Leakage. Meet the air leakage requirements shown in Table 17. The air leakage rate must be tested and verified by a Green Rater.*

### *Credits*

*3.2 Greatly Reduced Envelope Leakage (2 points). Meet the air leakage requirements shown in Table 17. The air leakage rate must be tested and verified by a Green Rater.*

### *OR*

*3.3 Minimal Envelope Leakage (3 points). Meet the air leakage requirements shown in Table 17. The air leakage rate must be tested and verified by a Green Rater<sup>14</sup>.*

There are few provincial requirements about air infiltration other than references to the continuity and placement of air and vapour barriers.<sup>15</sup> However, one should assume that when there is an alternative offered in legislation to a province's prescribed insulation requirements, and that computer modelling that makes use of programs like Hot2000 is requested, that the intent exists. The provinces that do so are shown in Table 4:

## *Table 4 – Air Infiltration Requirements in Provincial Acts and Regulations*

<sup>14</sup> LEED® Canada For Homes 2009, March 2009, Canada Green Building Council, page 77.

<sup>15</sup> However the R-2000 2005 standard section 4.3 "Airtightness Requirements" states: "The building envelope shall be constructed sufficiently airtight such that either the air change rate at 50 Pascals is no greater than 1.5 air changes per hour, or the Normalized Leakage Area at 10 Pascals does not exceed 0.7 cm<sup>2</sup>/m<sup>2</sup> (1.0 in<sup>2</sup>/100 ft<sup>2</sup>), when measured in accordance with CAN/CGSB-149.10-M86 (*Determination of the Airtightness of Building Envelopes by the Fan Depressurization Method*)".

Province/Region	Ref.	Requirement
Newfoundland and Labrador	n.a.	x
Prince Edward Island	n.a.	x
Nova Scotia	NSBCA 2006	EnerGuide 80 by 2009.12.31
New Brunswick	n.a.	X
Québec	1983 Law	x
Ontario ('til 2011)	OBC 2006	EnerGuide 80 in 2011
Manitoba	BMHA	x
Saskatchewan	NBC 1995	X
Alberta	ABC 2005	x
British Columbia	BCBC 2008	EnerGuide 77
Vancouver	By-law 9691	EnerGuide audit required

## Windows

The LEED-H prescriptive requirement for windows - which makes no distinction between operating and fixed types - is intended to maximize their energy performance and it requires the following:

### *Prerequisites*

*4.1 Good Windows. Install ENERGY STAR-certified windows according to the appropriate climate zone (see Figure 4), or of an equivalent Energy Rating (ER) level as determined by the CSA Standard A440.2.*

### *Credits*

*4.2 Enhanced Windows (2 points). Design and install ENERGY STAR-certified windows according to Table 18a or Table 18b, or of an equivalent Energy Rating (ER) level as determined by the CSA Standard A440.2.*

### *OR*

*4.3 Exceptional Windows (3 points). Design and install ENERGY STAR-certified windows according to Table 18a or Table 18b, or of an equivalent Energy Rating (ER) level as determined by the CSA Standard A440.2.<sup>16</sup>*

Provinces that have adopted measures since 2000 have all referenced “CSA-A440-00, Windows” as their standard. Most do not require products with energy ratings (ER) taken from “CSA A440.2-04, Energy Performance of Windows and Other Fenestration Systems”, or a thermal conductance (U value) rating. However, British Columbia, Vancouver, Ontario and Nova Scotia all do as Table 5 indicates:

### *Table 5 – Window Energy Ratings in Provincial Acts and Regulations*

<sup>16</sup> LEED® Canada For Homes 2009, March 2009, Canada Green Building Council, page 79.

Province/Region	Ref.	Requirement
Newfoundland and Labrador	n.a.	x
Prince Edward Island	n.a.	x
Nova Scotia	NSBCA 2006	U=1.8 W/m <sup>2</sup> C or ER operable=25 fixed =35
New Brunswick	n.a.	X
Québec	1983 Law	x
Ontario	OBC 2006 In 2011	U=2.0 W/m <sup>2</sup> C or ER operable=17 fixed =27 EnerGuide 80
Manitoba	BMHA	x
Saskatchewan	NBC 1995	X
Alberta	ABC 2005	x
British Columbia	BCEEA	Vinyl, fiberglass, wood U-2.0 metal U-2.57
Vancouver	By-law 9691	Minimum U=2.0 W/m <sup>2</sup> C

## Forced Air Duct Tightness and the Reduction of Hydronic Heat loss

In the “Heating and Cooling Distribution System” section, LEED-H requires forced air duct tightness and the reduction of heat loss in hot water/hydronic heat systems. There are no provincial requirements equivalent to this section (likely because Canadians install ducts within the envelope) although Vancouver’s by-law requires R-2.8/2.9 insulation on many ducts.

## Space Heating and Cooling

The LEED-H requirements for this section are intended to reduce energy consumption:

### Prerequisites

6.1 Good HVAC Design and Installation. Meet each of the following requirements:

- Design and size HVAC equipment properly using CAN/CSA-F280-M90 (R2004) “Determining the Required Capacity of Residential Space Heating and Cooling Appliances.”
- Install ENERGY STAR-rated HVAC equipment (Table 19).

### Credits

6.2 High-Efficiency HVAC (2 points). Design and install HVAC equipment that is equal to or exceeds the high-efficiency standard in Table 19 as appropriate for the climate zone (reference Figure 4 map).

### OR

6.3 Very High Efficiency HVAC (maximum 4 points). Design and install HVAC equipment that is equal to or exceeds the high efficiency standard in Table 19 as appropriate for the climate zone (reference Figure 4 map). Any piping designed as part of a heat pump system to carry water that is well above (or below) the thermostatic temperature settings in the home must have RSI 0.70 (R-4) insulation or greater.

Note: The maximum of 4 points is available only if a heat pump is installed. Furnace and boiler systems can earn a maximum of 3 points<sup>17</sup>

<sup>17</sup> LEED® Canada For Homes 2009, March 2009, Canada Green Building Council, page 83.

The provincial requirements are regulated either under a building code, or the BC Energy Efficiency Act (and Manitoba contemplates regulation under a separate act too). The measure is Annual Fuel Utilization Efficiency (AFUE) tested under the standard CGA P.2-913 as Table 6 indicates:

*Table 6 – Space Heating and Cooling Provision in Provincial Acts and Regulations*

Province/Region	Ref.	Requirement
Newfoundland and Labrador	n.a.	x
Prince Edward Island	n.a.	x
Nova Scotia	NSBCA 2006	Gas 90 oil hot air 83 oil hot water 85 AFUE
New Brunswick	n.a.	X
Québec	1983 Law	x
Ontario ('til 2011)	OBC 2006	Gas, oil 90AFUE
Manitoba	BMHA	x
Saskatchewan	NBC 2005	X
Alberta	ABC 2005	x
British Columbia	BCEEA	Gas, propane 90AFUE
Vancouver	By-law 9691	X

Readers should note that before the end of 2009, Natural Resources Canada has stated that it will publish regulations under the Energy Efficiency Act of Canada that increase minimum gas furnace AFUE to 90%, thus raising all of Canada to a point proximate to this LEED-H prerequisite.

## Domestic Hot Water

LEED-H requirement for this section is to: “Reduce energy consumption associated with the domestic hot-water system, including improving the efficiency of both the hot water system design and the layout of the fixtures in the home” .....

### *Prerequisites*

*None.*

### *Credits*

*7.1 Efficient Hot-Water Distribution (2 points). Design and install an energy-efficient hot-water distribution system (see Figure 5). None of the branch length requirements below apply to cold-water demand loads (e.g., toilets), washing machines, or tubs without showerheads. Select one of the following designs:*

*a) Structured plumbing system. The system must meet all of the following:*

- i) The system must have a demand-controlled circulation loop that is insulated to at least RSI-0.70 (R-4).*
- ii) The total length of the circulation loop must be less than 12.2 linear metres (40 ft) of plumbing in one-storey homes. Add 2x the ceiling height for two-storey homes, and add 4x the ceiling height for three- or four-storey homes.*

- iii) Branch lines from the loop to each fixture must be  $\leq 3$  m (10 ft) long and a maximum of 13 mm ( $\frac{1}{2}$  inch) nominal diameter. iv) The system must be designed with a push-button control in each full bathroom and the kitchen, and an automatic pump shut-off.
- b) Central manifold distribution system. The system must meet all of the following:
- i) The central manifold trunk must be no more than 1.8 m (6 ft) in length.
  - ii) The central manifold trunk must be insulated to at least RSI-0.70 (R-4).
  - iii) No branch line from the central manifold to any fixtures may exceed 6 m (20 ft) in one-storey homes. Add 1x the ceiling height for two-storey homes, and add 2x the ceiling height for three- or four-storey homes.
  - iv) Branch lines from the manifold must be a maximum of 13 mm ( $\frac{1}{2}$  inch) nominal diameter.
- c) Compact design of conventional system. The system must meet all of the following:
- i) No branch line from the water heater to any fixtures may exceed 6 m (20 ft) in one-storey homes. Add 1x the ceiling height for two-storey homes, and add 2x the ceiling height for three- or four-storey homes.
  - ii) Branch lines from the central heater to each fixture must be a maximum of 13 mm ( $\frac{1}{2}$  inch) nominal diameter.

7.2 Pipe Insulation (1 point). All domestic hot-water piping shall have RSI-0.7 (R-4) insulation. Insulation shall be properly installed on all piping elbows to adequately insulate the 90-degree bend.

7.3 Efficient Domestic Hot-Water (DHW) Equipment (maximum 3 points). Design and install energy-efficient water heating equipment. If solar hot water is used, refer to the CAN/CSA-F383-87 Installation Code for Solar Domestic Hot Water Systems. Select one or more measures from Table 20 below<sup>18</sup>.

The LEED-H water heating section then goes on to provide sample schematics of a structured plumbing system, a central manifold distribution system, and a compact design. There is a table that describes water heaters and their efficiency requirements.

There is no current provincial act or regulation that addresses domestic hot water energy efficiency because this already falls within the scope of the Energy Efficiency Act of Canada. The City of Vancouver's green homes bylaw requires ....

#### 12.2.2.3. Hot Water Tanks

1) Electrically powered hot water tanks shall have insulation that provides a minimum RSI value of 1.76.

#### 12.2.2.4. Hot Water Tank Piping

- 1) The first 3m of non-recirculating hot water piping leading from both electrically powered and gas powered hot water tanks, and the last 1m of piping prior to connecting to the hot water tank, shall have insulation that provides a minimum RSI value of 0.35.
- 2) Despite Sentence 12.2.2.4.(1), the entire hot water piping system, if it is of constant recirculation design, shall have insulation that provides a minimum RSI value of 0.35.

<sup>18</sup> LEED® Canada For Homes 2009, March 2009, Canada Green Building Council, pages 86 to 90.

*Table 7 –Domestic Hot Water Provision in Provincial Acts and Regulations*

Province/Region	Ref.	Requirement
Newfoundland and Labrador	n.a.	x
Prince Edward Island	n.a.	x
Nova Scotia	NSBCA 2006	x
New Brunswick	n.a.	X
Québec	1983 Law	x
Ontario ('til 2011)	OBC 2006	x
Manitoba	BMHA	x
Saskatchewan	NBC 1995	X
Alberta	ABC 2005	x
British Columbia	BCBC 2008	x
Vancouver	By-law 9691	Sections 12.2.3/12.2.4

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