

Codes, Standards and Rating
Systems
a path to sustainability



Who am I ?



SUSTAINABLE BUILDINGS CANADA

Founding Director and Current
Vice Chair – Sustainable Buildings
Canada



GREATER TORONTO

Founding Director and Past Chair
Canada Green Building Council –
Toronto Chapter – Member
Municipal Leaders Forum



Founding Co-Chair BILD Green
Committee and Green Builder
Award - Past Director



Current Director and Chair –
Evaluator Council



Larry Brydon
LEED AP BD+C

Presentation Content

- **Background**
- **Green building policy tools**
 - Codes, Standards and Rating Systems
- **International, Canadian, Provincial and Municipal context**
- **How they compare to each other**
- **Timelines for change**

Construction impacts

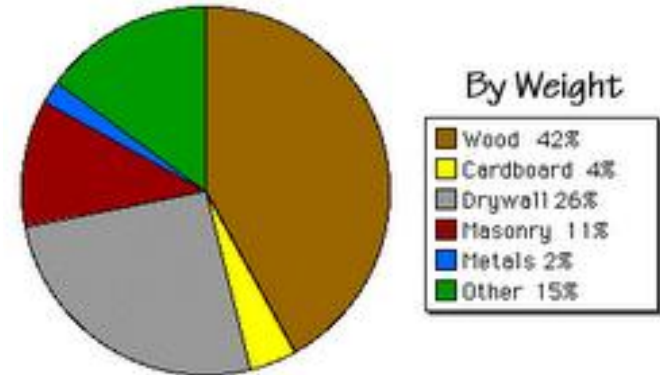
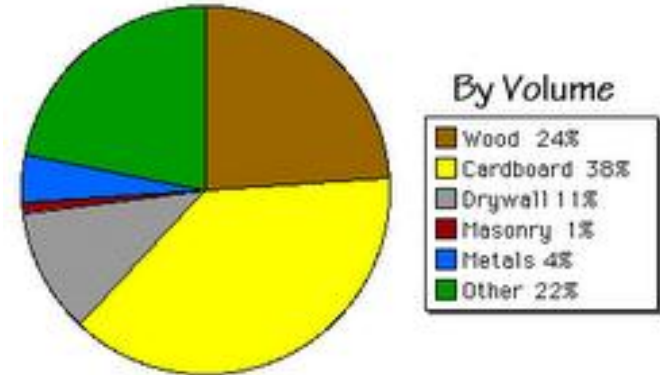
The Building Sector consumes:

- 40% of the raw materials used globally each year - over 3 billion tons!
- 40% of the energy consumed in the world
- 60% of the world's electrical consumption
- 25% of virgin wood

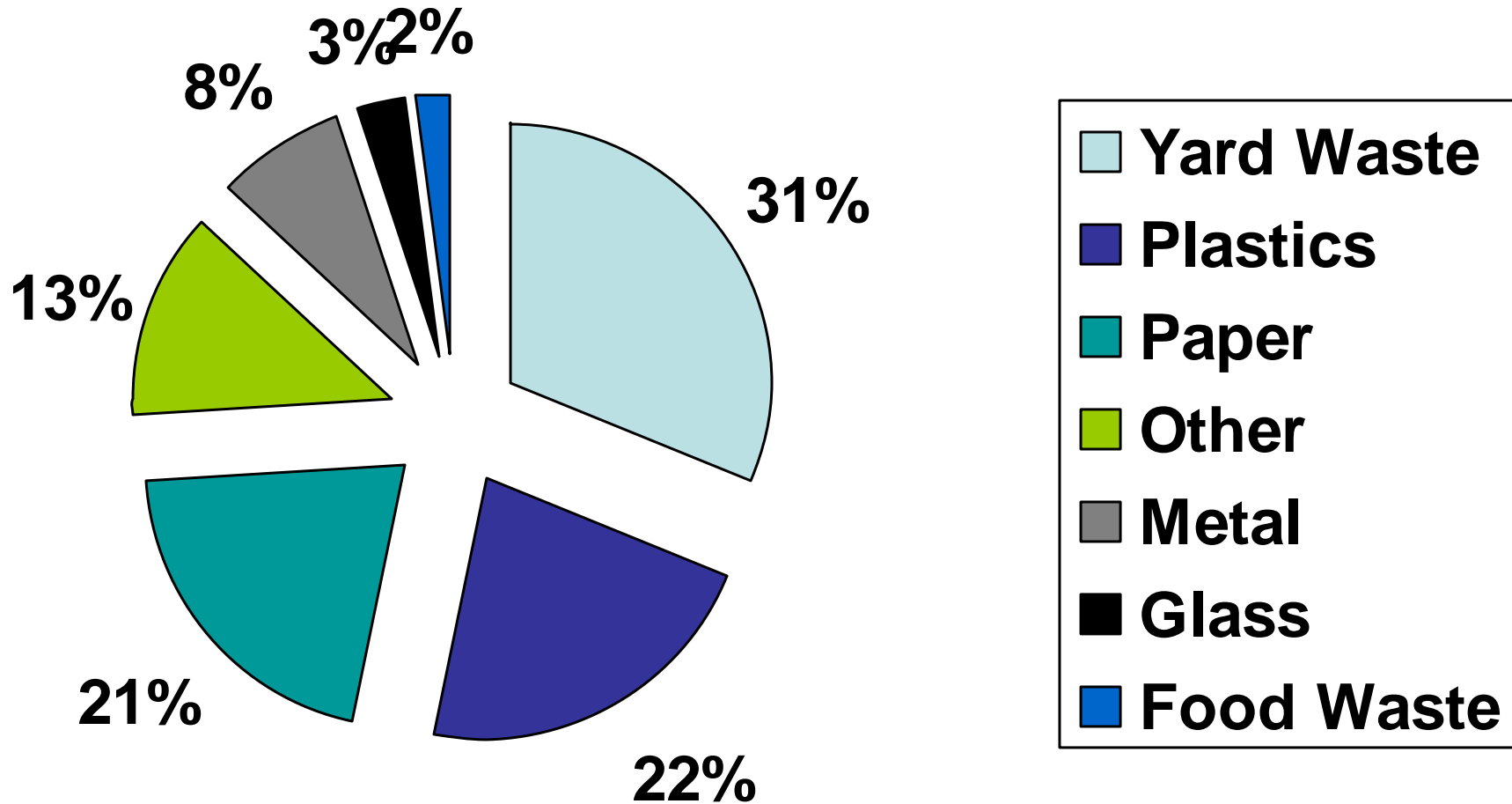
Other Impacts:

- Building emit about 50% of global CO₂ through construction and operation
- Cement production alone accounts for 8% of global GHG's

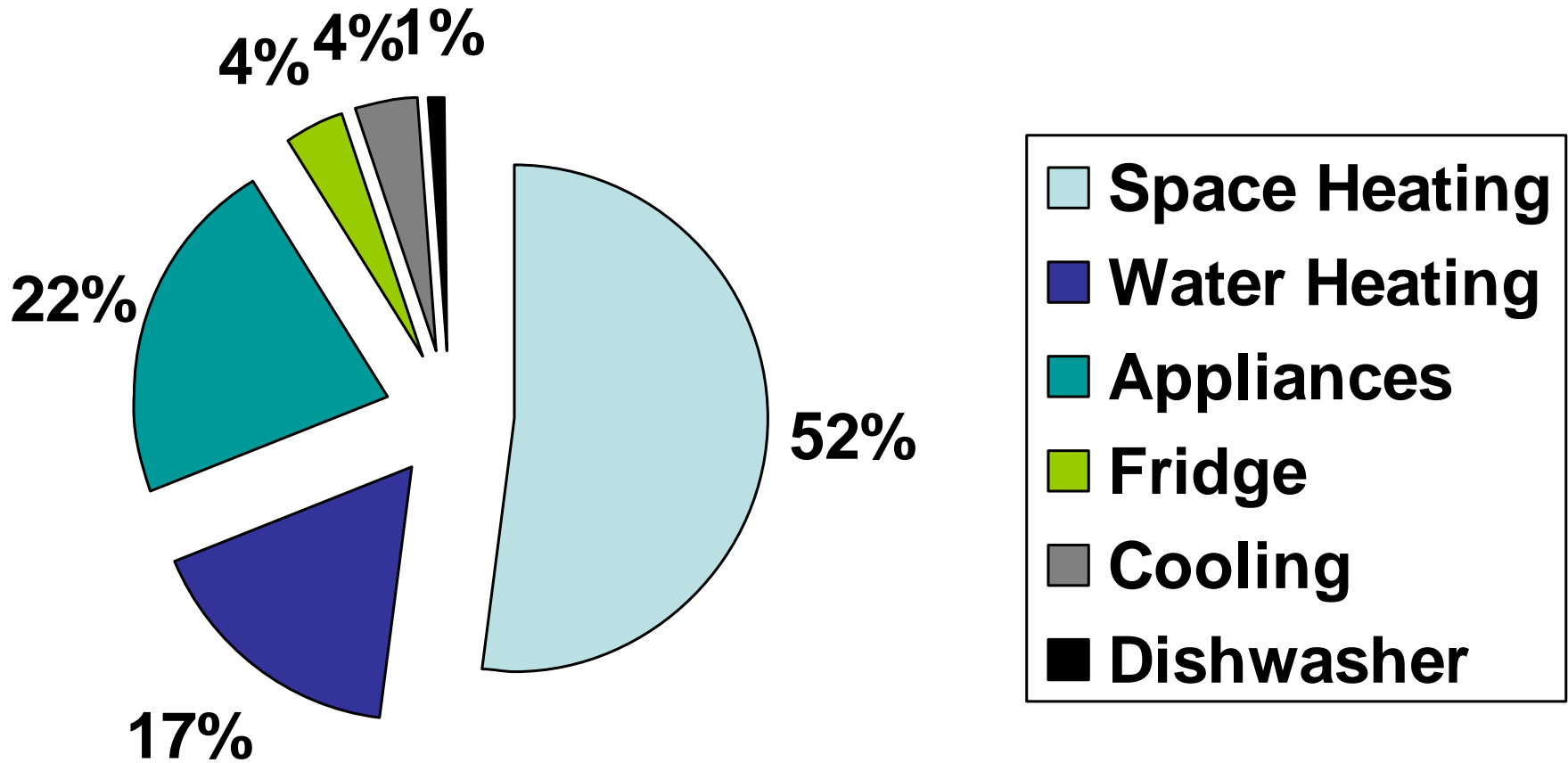
Construction Waste



Waste production from homes

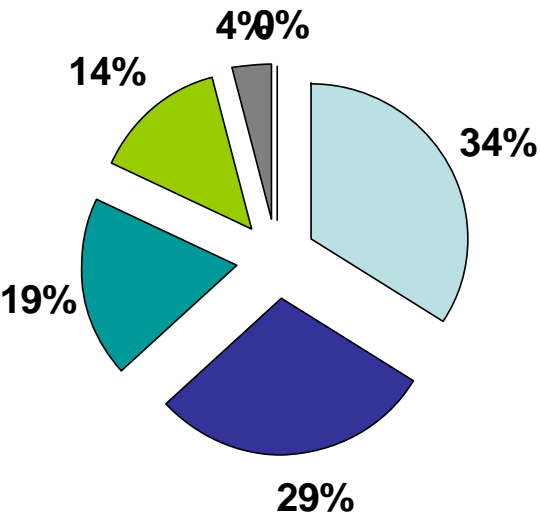


Energy use in homes

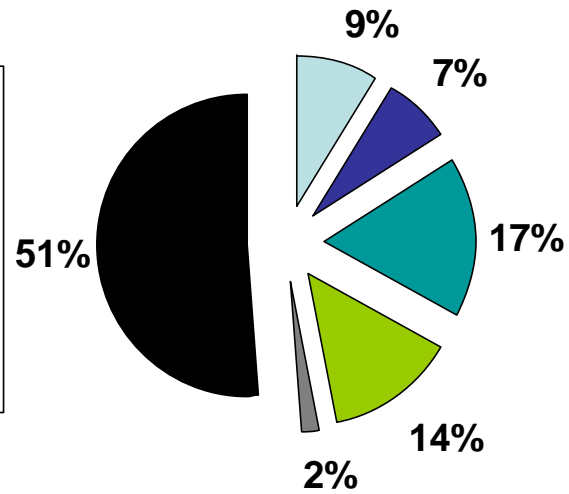


Water use in homes

Winter

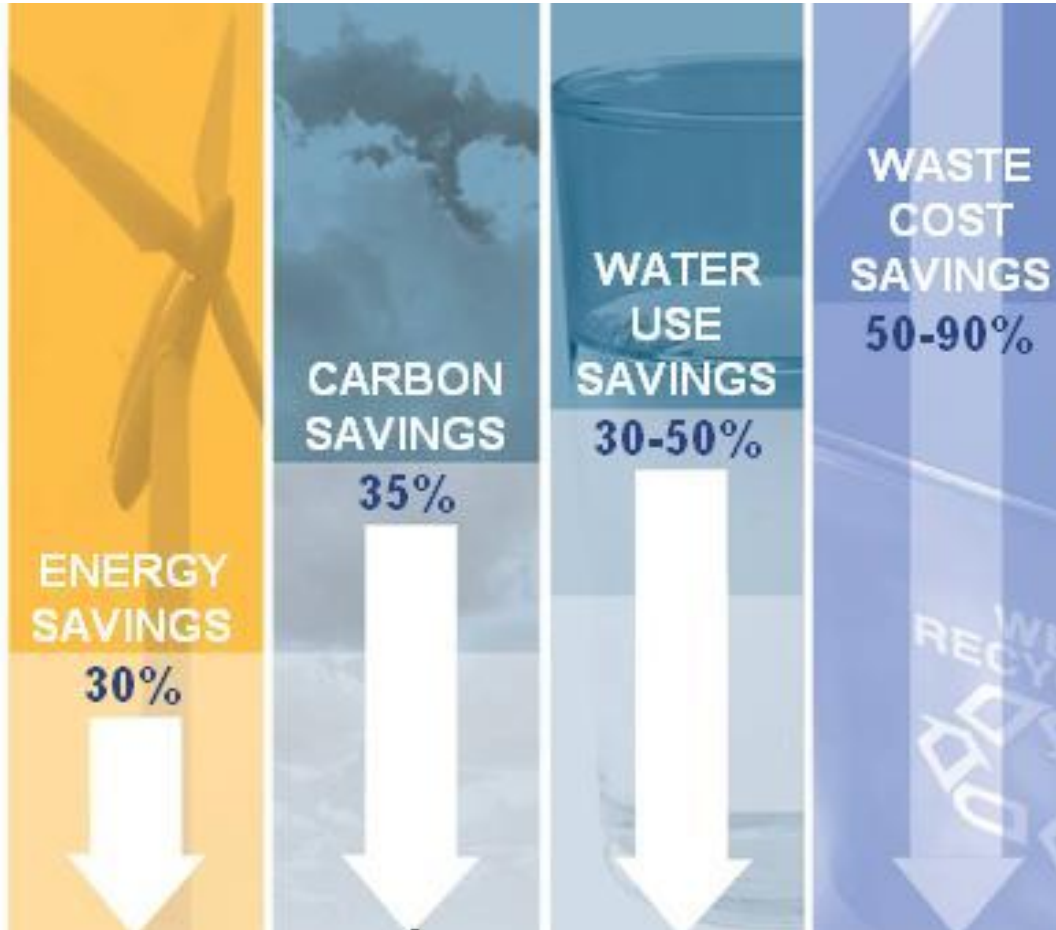


Summer



Green Building Resource Conservation

Average Savings of Green Buildings



Source: Capital E

Green Building 101

- **Codes**
- **Standards**
- **Rating Systems**

- **Though terms are used interchangeably, they are different but integral elements in building policy**

Canadian Sustainable Development Strategy

- **As of April 1, 2012, and pursuant to departmental strategic frameworks, new construction and build-to-lease projects and major renovation projects will achieve an industry-recognized level of high environmental performance**

Implementation Strategies for Federal Projects

Best Practice Implementation Strategies

- **8.1.2 Register projects, wherever possible**
- **8.1.2.1 Canada Green Building Council. (LEED)**
- **8.1.2.2 Green Globes. (Green Globes)**
- **8.1.2.3 Building Owners and Managers Association of Canada. (BOMA Best)**

NRCan Building Labeling Branch

Provide the tools and programs necessary to assess and verify building performance.

Develop voluntary rating systems to support the 33% market *leaders* who will adopt and lead market transformation and to signal direction of next code cycle.

Provide research and education that assists the 2nd tier 33% market *adapters* who will follow market leaders to remain competitive.

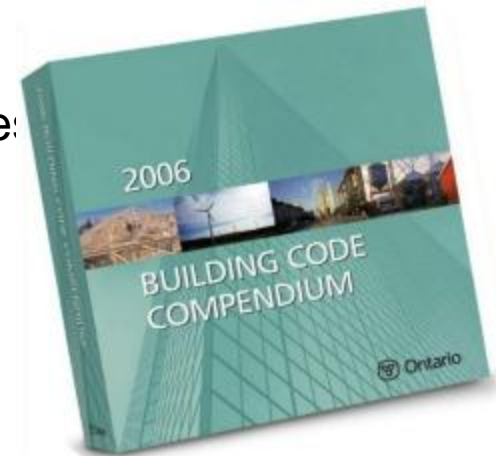
Implement mandatory codes to capture market *laggards* that require regulation to affect change - once majority of market participants have adopted change.

Building Codes in Canada

- **Constitution of Canada**
 - Provides regulatory framework for Building Codes
 - Appoints Provinces as Authority having jurisdiction
 - National Model Construction Code by National Research Council
- **Ontario Building Code Act 1992**
 - Ministry of Municipal Affairs and Housing develops and administers
 - Municipalities inspect and enforce through Chief Building Official.

Codes

- Set minimum mandatory requirements
 - Health
 - Safety
 - Welfare of Occupants
 - And now...resource conservation (energy and water)
- Written in normative (thou shalt) language
- Incorporate regulatory and administrative procedure:
- Enforceable by Authorities having jurisdiction
- Model National Building Codes
- National Energy Code for Buildings
- Ontario Building Codes



Code Change Timelines



- **December 15th 2009** **Housekeeping Changes**
- **April 1st 2010** **Fire Sprinklers (hi rise only)**
- **January 1st 2011** **Low flow water closets/full height basements**
- **January 1st 2012** **Energy Efficiency Measures**

Ontario Building Code 2012



- **2006 OBC changed from a prescriptive to performance building code**
- **Sets performance objectives and provides prescriptive paths**
- **Final round of incremental performance increases that have come into effect since 2006**
- **Introduction of SB-12 Energy Performance in Buildings – New sections to the code**
 - *SB-10 describes requirements for commercial and multi res and minimum mechanical efficiencies.*
 - *SB-12 describes requirements for residential attached and detached (Part 9) and references SB-10 for minimum efficiencies*

Prescriptive vs. Performance

Prescriptive Code

- Specific details
- Outlines objectives
- Provides step by step direction
- Specifies materials and processes
- Deviation requires variance
- Change in 5 yr cycles
- “map and address with detailed, turn by turn directions”

Performance Code

- Specifies performance objectives – and ...
- Provides step by step guidance
- Recommends materials and process – and...
- Provides alternative compliance pathways
- Deviation requires simulation and proof of compliance with intents
- “map and address, recommendations on how to get there – you choose how”

Supplementary Standard SB-12 Energy Efficiency for Housing

“Provides prescriptive requirements to achieve an acceptable air leakage rate and energy efficiency level as an alternative to achieving a rating of 80 (Energuide 80) when using NRCan’s Energuide Rating System

Option 1 - Achieve a rating of 80 using NRCan’s Energuide for New Housing Administrative and Technical Procedures

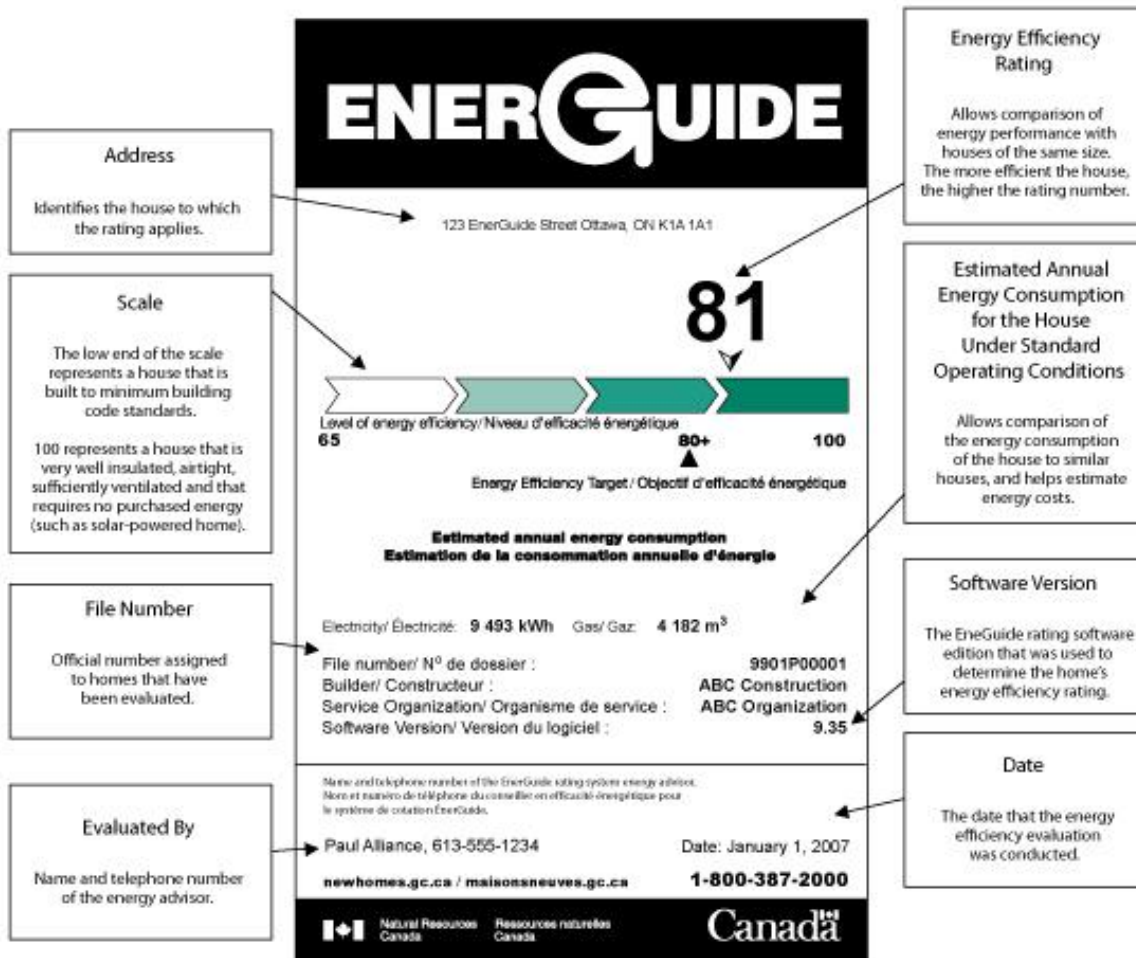
- **HOT2000 simulation model (ver. 9.34)**
- **Blower door test**

Option 2 – Select a prescriptive compliance package from 2.1.1 tables

- **Regional packages of measures by degree days**
- **Conform to Chapter 3 section on controlling air leakage**
- **No blower door test required, Air tightness inspection by CBO’s**

Option 2 (b) hybrid – model a package that is equal to, or better than prescriptive compliance using general mode of HOT2000

Option 1 - Energuide 80 Performance Path



ENERGUIDE

123 EnerGuide Street Ottawa, ON K1A 1A1

81

Level of energy efficiency / Niveau d'efficacité énergétique: 65, 80+, 100

Energy Efficiency Target / Objectif d'efficacité énergétique

Estimated annual energy consumption
Estimation de la consommation annuelle d'énergie

Electricity / Électricité: 9 493 kWh Gas / Gaz: 4 182 m³

File number / N^o de dossier: 9901P00001
 Builder / Constructeur: ABC Construction
 Service Organization / Organisme de service: ABC Organization
 Software Version / Version du logiciel: 9.35

Name and telephone number of the energy advisor:
 Note et numéro de téléphone du conseiller en efficacité énergétique pour le système de notation EnerGuide:
 Paul Alliance, 613-555-1234 Date: January 1, 2007
 newhomes.gc.ca / maisonsneuves.gc.ca 1-800-387-2000

Address
Identifies the house to which the rating applies.

Scale
The low end of the scale represents a house that is built to minimum building code standards.
100 represents a house that is very well insulated, airtight, sufficiently ventilated and that requires no purchased energy (such as solar-powered home).

File Number
Official number assigned to homes that have been evaluated.

Evaluated By
Name and telephone number of the energy advisor.

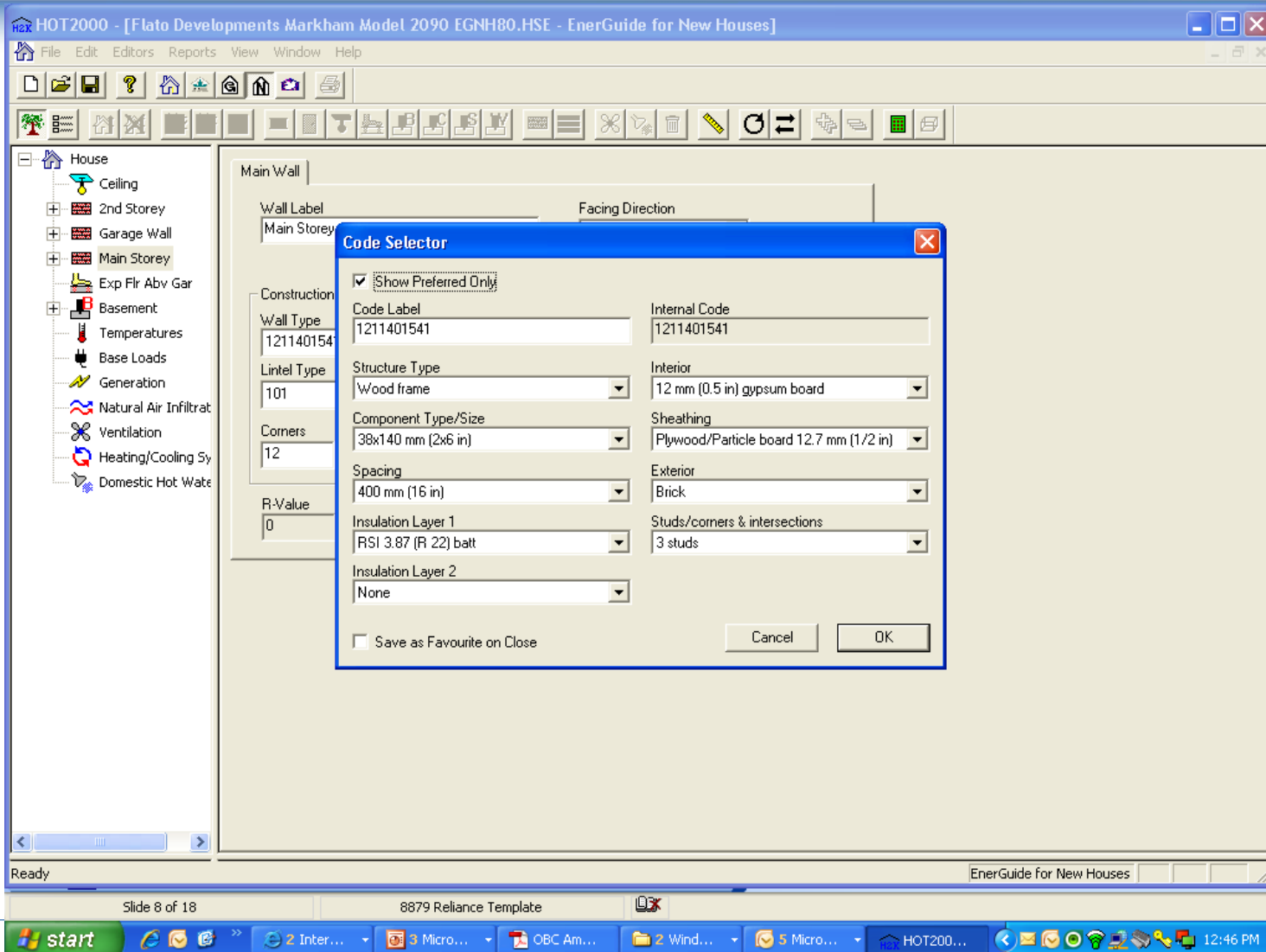
Energy Efficiency Rating
Allows comparison of energy performance with houses of the same size. The more efficient the house, the higher the rating number.

Estimated Annual Energy Consumption for the House Under Standard Operating Conditions
Allows comparison of the energy consumption of the house to similar houses, and helps estimate energy costs.

Software Version
The EnerGuide rating software edition that was used to determine the home's energy efficiency rating.

Date
The date that the energy efficiency evaluation was conducted.

HOT2000 – Energuide software



The screenshot displays the HOT2000 software interface. The main window title is "HOT2000 - [Flato Developments Markham Model 2090 EGNH80.HSE - EnerGuide for New Houses]". The interface includes a menu bar (File, Edit, Editors, Reports, View, Window, Help), a toolbar, and a left-hand navigation pane showing a tree view of the house components: House, Ceiling, 2nd Storey, Garage Wall, Main Storey, Exp Flr Abv Gar, Basement, Temperatures, Base Loads, Generation, Natural Air Infiltrat, Ventilation, Heating/Cooling Sy, and Domestic Hot Wate.

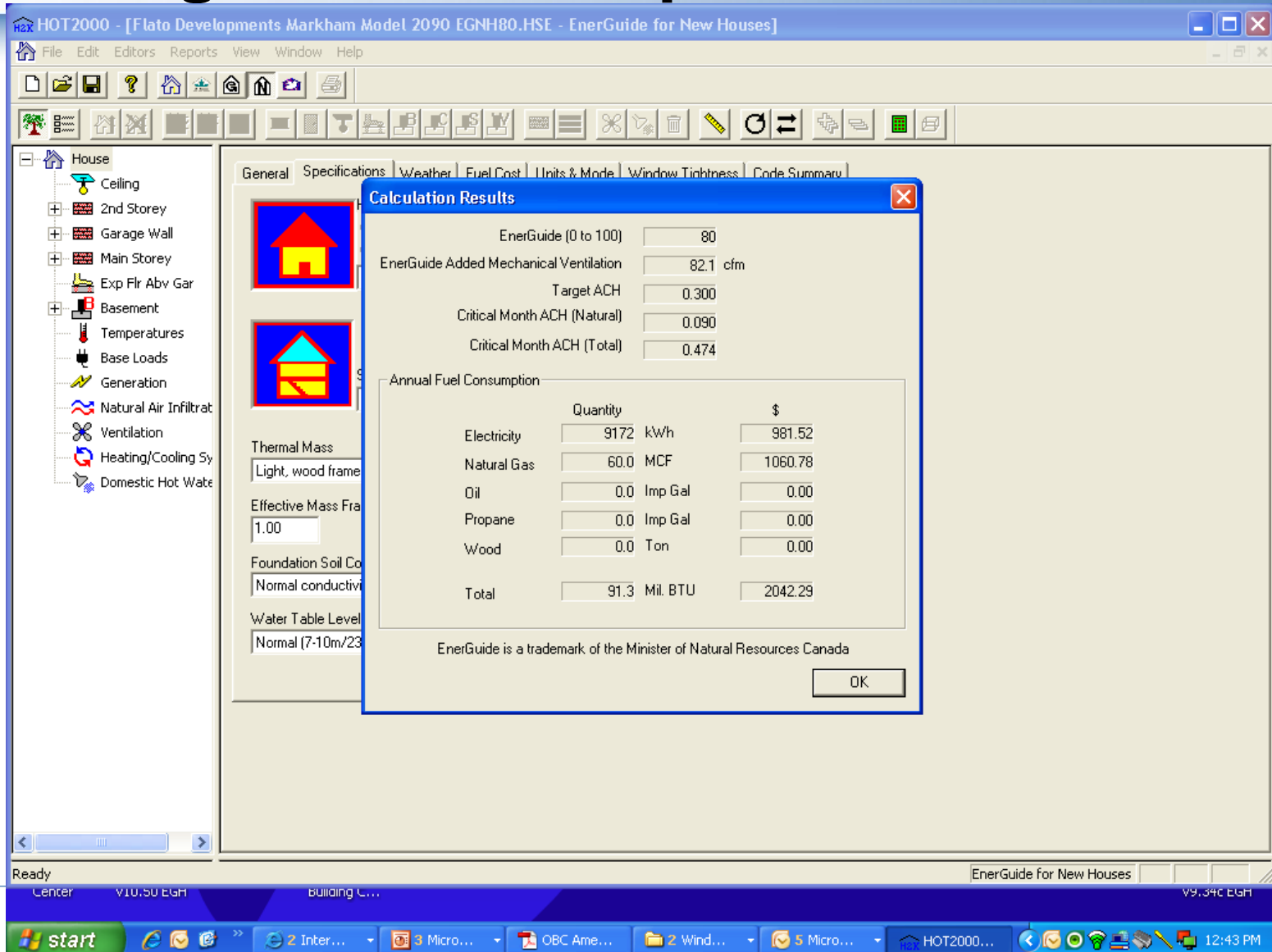
The main workspace shows the "Main Wall" configuration. A "Code Selector" dialog box is open, displaying the following details:

Code Label	Internal Code
1211401541	1211401541
Structure Type	Interior
Wood frame	12 mm (0.5 in) gypsum board
Component Type/Size	Sheathing
38x140 mm (2x6 in)	Plywood/Particle board 12.7 mm (1/2 in)
Spacing	Exterior
400 mm (16 in)	Brick
Insulation Layer 1	Studs/corners & intersections
RSI 3.87 (R 22) batt	3 studs
Insulation Layer 2	
None	

Additional options in the dialog include "Show Preferred Only" (checked), "Save as Favourite on Close" (unchecked), and "Cancel" and "OK" buttons.

The Windows taskbar at the bottom shows the system tray with the time 12:46 PM and the text "call. Guaranteed." on the right.

Energuide 80 – Output from HOT2000



The screenshot shows the HOT2000 software interface with a 'Calculation Results' dialog box open. The dialog box displays the following data:

Parameter	Value
EnerGuide (0 to 100)	80
EnerGuide Added Mechanical Ventilation	82.1 cfm
Target ACH	0.300
Critical Month ACH (Natural)	0.090
Critical Month ACH (Total)	0.474

Annual Fuel Consumption		
	Quantity	\$
Electricity	9172 kWh	981.52
Natural Gas	60.0 MCF	1060.78
Oil	0.0 Imp Gal	0.00
Propane	0.0 Imp Gal	0.00
Wood	0.0 Ton	0.00
Total	91.3 Mil. BTU	2042.29

EnerGuide is a trademark of the Minister of Natural Resources Canada

OK

Performance Path – Big Decisions

- **Reduced window to wall ratios**
- **Improved air tightness – OBC requires 3.1 ACH for detached, 3.6 for attached**
- **Higher performing walls, ceilings and windows**
- **96 - 98 AFUE furnaces and boilers with ECM motors in air handler**
- **96 % efficient tankless and condensing hot water heaters**
- **Drain water heat recovery and/or renewable energy**

SB12

Whole House Performance Tables

The “new” Prescriptive Path

Option 2 SB12 Table 2.1.1.1

Component	Zone 1 Compliance Package												
	A	B	C	D	E	F	G	H	I	J	K(4)	L(5)	M(6)
Ceiling with Attic Space minimum RSI (R) value (1)	8.81 (R50)	8.81 (R50)	8.81 (R50)	8.81 (R50)	8.81 (R50)	8.81 (R50)	8.81 (R50)	8.81 (R50)	8.81 (R50)	8.81 (R50)	8.81 (R50)	8.81 (R50)	8.81 (R50)
Ceiling without Attic Space minimum RSI (R) value (1)	5.46 (R31)	5.46 (R31)	5.46 (R31)	5.46 (R31)	5.46 (R31)	5.46 (R31)	5.46 (R31)	5.46 (R31)	5.46 (R31)	5.46 (R31)	5.46 (R31)	5.46 (R31)	5.46 (R31)
Exposed Floor minimum RSI (R) value (1)	5.46 (R31)	5.46 (R31)	5.46 (R31)	5.46 (R31)	5.46 (R31)	5.46 (R31)	5.46 (R31)	5.46 (R31)	5.46 (R31)	5.46 (R31)	5.46 (R31)	5.46 (R31)	5.46 (R31)
Walls above grade minimum RSI (R) value (1)	4.23 (R24)	4.75 (R27)	4.75 (R27)	4.23 (R24)	4.23 (R24)	4.23 (R24)	4.23 (R24)	4.23 (R24)	3.87 (R22)	3.87 (R22)	3.87 (R22)	4.23 (R24)	4.23 (R24)
Basement Walls minimum RSI (R) value (1)	3.52 (R20)	3.52 (R20)	3.52 (R20)	3.52 (R20)	3.52 (R20)	2.11 (R12)	2.11 (R12)	2.11 (R12)	3.52 (R20)	2.11 (R12)	3.87 (R22)	3.87 (R22)	3.52 (R20)
Below Grade Slab Entire Surface > 600mm below grade minimum RSI (R) value (1)	0.88 (R5)												
Edge of Below Grade Slab <600mm below grade minimum RSI (R) value (1)	1.76 (R10)	1.76 (R10)	1.76 (R10)	1.76 (R10)	1.76 (R10)	1.76 (R10)	1.76 (R10)	1.76 (R10)	1.76 (R10)	1.76 (R10)	1.76 (R10)	1.76 (R10)	1.76 (R10)
Heated Slab or Slab <600mm below grade minimum RSI (R) value (1)	1.76 (R10)	1.76 (R10)	1.76 (R10)	1.76 (R10)	1.76 (R10)	1.76 (R10)	1.76 (R10)	1.76 (R10)	1.76 (R10)	1.76 (R10)	1.76 (R10)	1.76 (R10)	1.76 (R10)
Windows and Sliding Glass Doors Maximum U-value (2)	1.6	1.6	1.8	1.8	1.8	1.8	1.8	2	1.8	1.8	1.8	1.8	1.8
Skylights Maximum U-value (2)	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Space Heating Equipment Minimum AFUE	90%	90%	94%	94%	90%	94%	92%	94%	92%	94%	90%	94%	90%
HRV Minimum Efficiency					55%	60%	60%	70%	55%	60%			
Domestic Hot Water Minimum EF	.57(3)	.57(3)	0.62	0.67	.57(3)	.57(3)	0.62	0.67	0.62	0.67	.57(3)	.57(3)	0.8

Prescriptive Tables - Big Decisions

- **Main Wall Assembly – R-22, R-24 or R-27**
- **Basement Wall Assembly – R-12, R-20 or R-22**
- **Sub slab insulation or not - walk outs and shallow grade.**
- **Windows – 1.6 (.28), 1.8 (.32) or 2.0 (.35) U-factor (B, C, or D zone)**
- **Furnace – 90, 92 or 94 A.F.U.E**
- **HRV – yes or no, 55, 60 or 70% efficiency**
- **Water Heater – Standard PV50, tankless or condensing storage.**
- **Air test or not ?**

“Hybrid” performance path

- **Requires 2 simulation modeling runs per house**
- **Requires that air tightness field be set at**
 - 3.1 ACH for attached houses
 - 3.6 ACH for detached houses
- **Model the home using general mode in HOT2000 or equivalent (HERS)**
 - Note gigajoules of energy consumed
- **Model the home using one of the packages of measures in SB12 prescriptive path tables**
 - Note gigajoules of energy consumed
- **Ensure that total energy consumed is equal to or better than the SB12 prescriptive path simulation model**
- **Builder can do themselves, no evaluator or blower test required.**

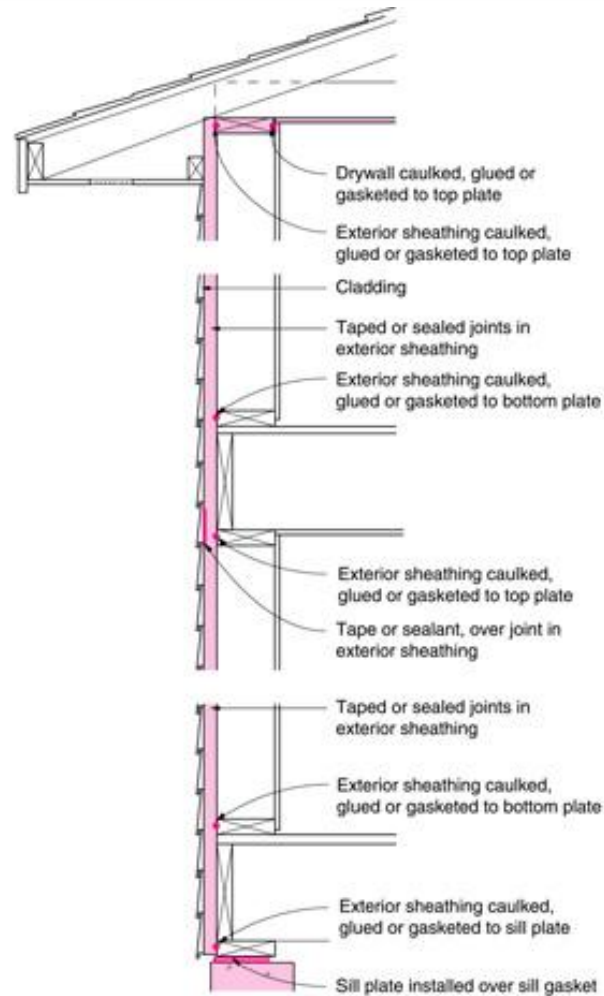
9.25.3.3 Continuity of Air Barrier

Still in Part 9...

- **9.25.3.3 (1) Where panel type (rigid code board) insulation is used, all joints will be sealed**
- **9.25.3.3 (2) Where flexible sheet type (poly) insulation is used all joints will be**
 - (a) sealed or
 - (b) overlapped by 4 inches and compressed as between framing members

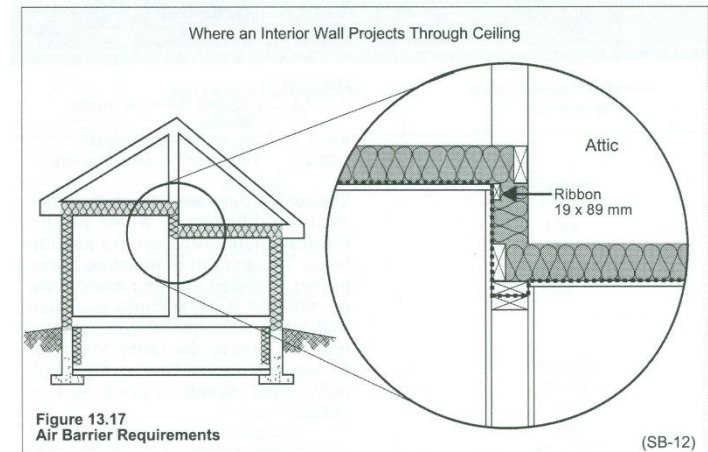
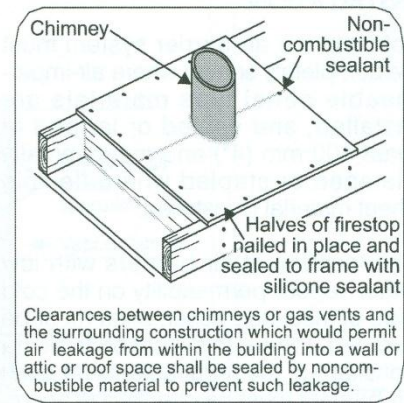
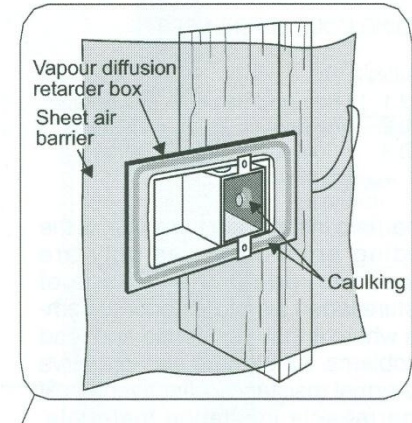
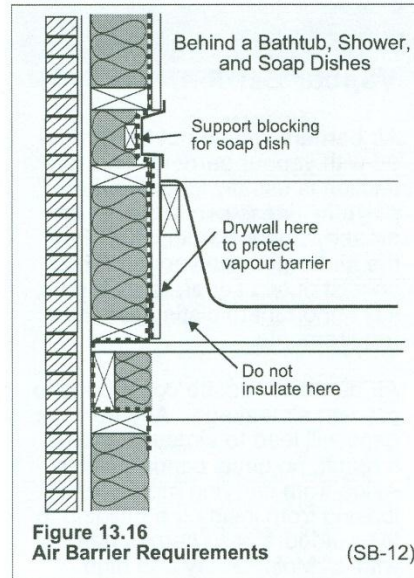
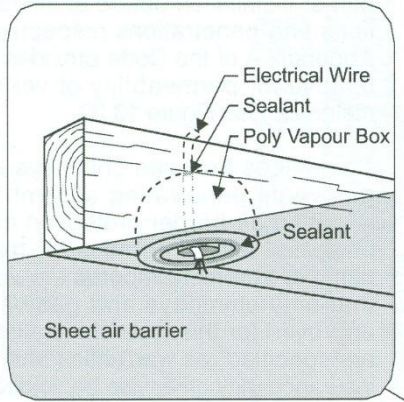
... with new prescriptive requirements in SB-12

What Building Inspectors will be looking for

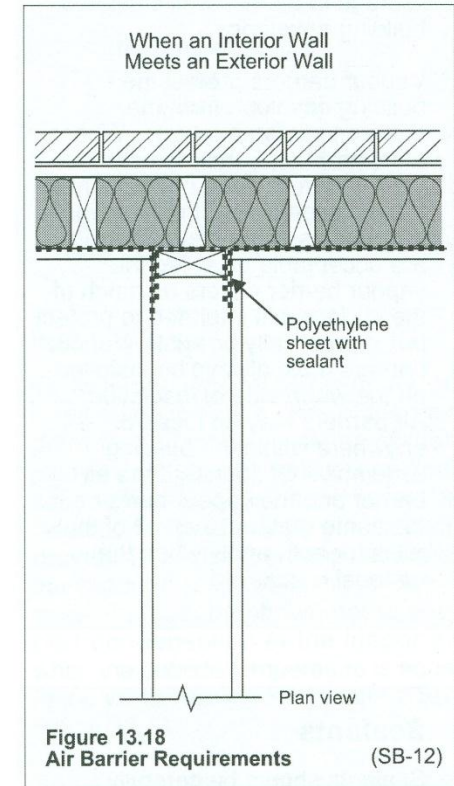
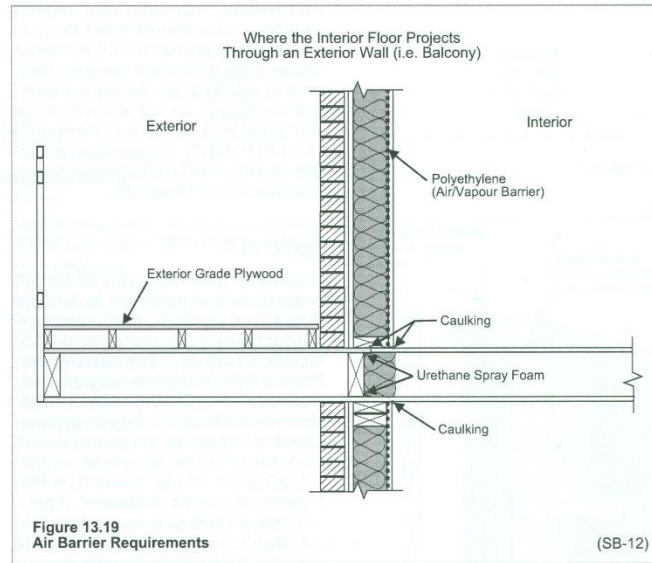
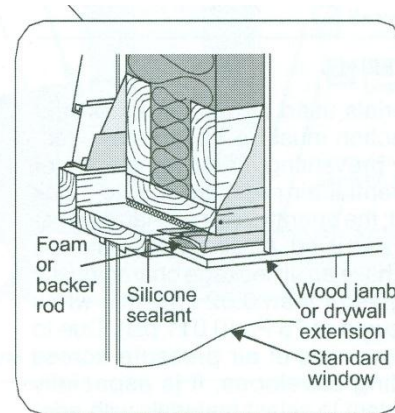
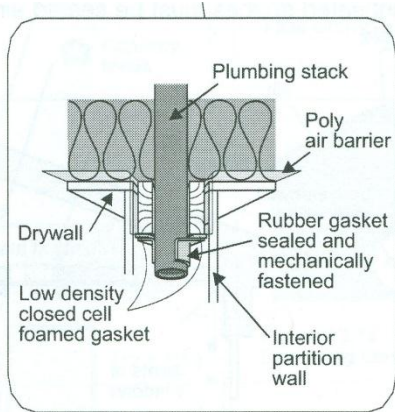


Note: shaded components designate air flow retarder system

What Building Inspectors will be looking for



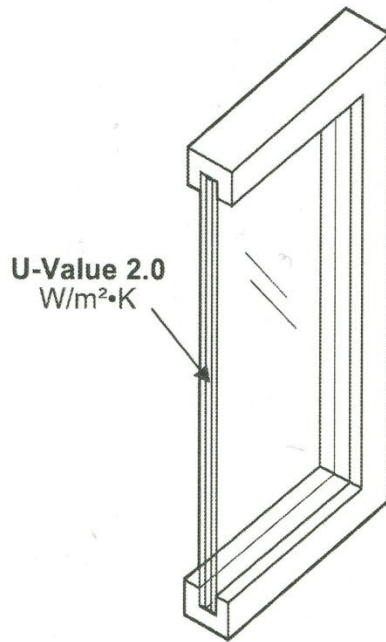
What Building Inspectors will be looking for



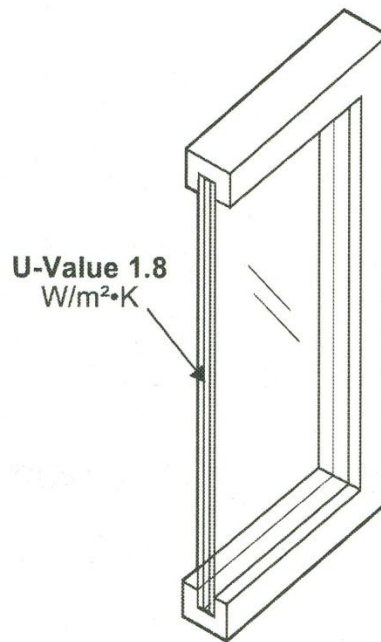
Note: SB12- 3.2.1(2) requires continuity of air barrier throughout the basement

Prescriptive table windows

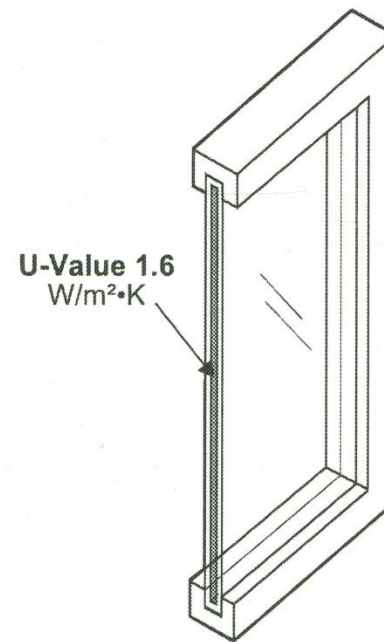
Windows and Sliding Glass Door Options



Double Pane



Double Pane
+ Low Emissivity



Double Pane
+ Low Emissivity
+ Argon filled

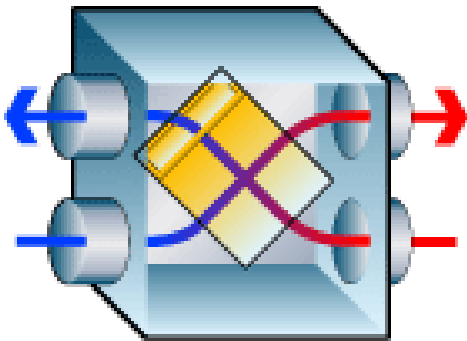
Window Ratings – metric U-factor

	<p>Canada • Zones</p> <p>A B C D ^{ER/RE 37}</p> <p>energystar.nrcan-rncan.gc.ca</p>	
	<p>Window Company Ltd.</p> <p>Triple X Operable Casement Vinyl frame, Triple glaze, Low-e coating (e=0.220, S3, S5), Krypton/air filled (both cavities), Grills <=13mm CPD: XYZ-Z-1</p>	
<p>ENERGY PERFORMANCE RATINGS</p>		
<p>U-Factor 0.19 (U.S./I-P)</p>	<p>1.10 (Metric/SI)</p>	<p>Solar Heat Gain Coefficient 0.35</p>
<p>ADDITIONAL PERFORMANCE RATINGS</p>		
<p>Visible Transmittance 0.63</p>	<p>Air Leakage 0.03 0.25 (U.S./I-P) (Metric/SI)</p>	
<p>Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRC does not recommend any product and does not warrant the suitability of any product for any specific use. Consult manufacturer's literature for other product performance information. www.nfrc.org</p>		

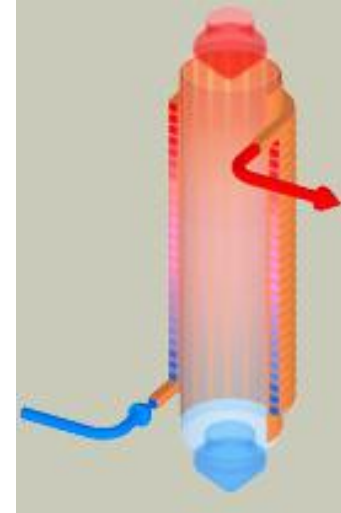
The lower the U-factor the better the value

Energy Recovery

- Heat and Enthalpy Recovery Exchangers (HRV's and ERV's)

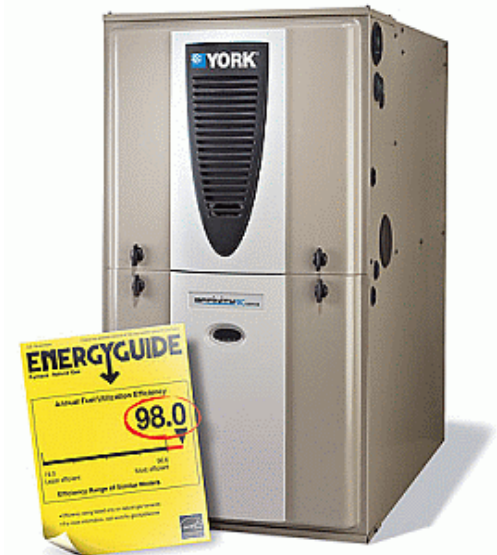


- Drain Water Heat Recovery



Mechanical Equipment

- **Hi efficiency and modulating furnaces with ECM motors 90 to 98% AFUE**
- **Fireplaces with spark ignition (no standing pilot)**
- **Combination Space and Water Heating Systems**
- **Hi SEER Air Conditioning Units**
- **Air Source Heat Pumps**



Hot Water Heaters

- **Storage Type**

- Standard PV50 .67 ef
- 1 Pipe Condensing .80 ef (est.)
- 2 Pipe Condensing .90 ef (est.)
- Solar
- Heat Pump

- **Tankless**

- Conventional .80 ef
- Condensing .90 ef
- Hi Eff Condensing .96 ef



What's it all going to cost ?

Code Effective Date	Estimated Annual Fuel Cost Savings*	Estimated Additional Capital Cost	Estimated Simple Payback
31-Dec-06	21.50%	\$1,600	3.0 years
31-Dec-08	28%	\$2,700	4.4 years
31-Dec-11	35%	\$5,900 - 6,600	6.9 - 7.9 years

Note: Figures are based on a typical 2000 square foot gas-heated house in the Greater Toronto Area

*Compared to the 1997 Building Code

<http://www.mah.gov.on.ca/Page681.aspx>

Canadian New Housing Labels

Energy Focused



Sustainability - National



Sustainability - Regional



Choice and Differentiation



Canadian Commercial Rating Systems

New Construction



Existing Buildings



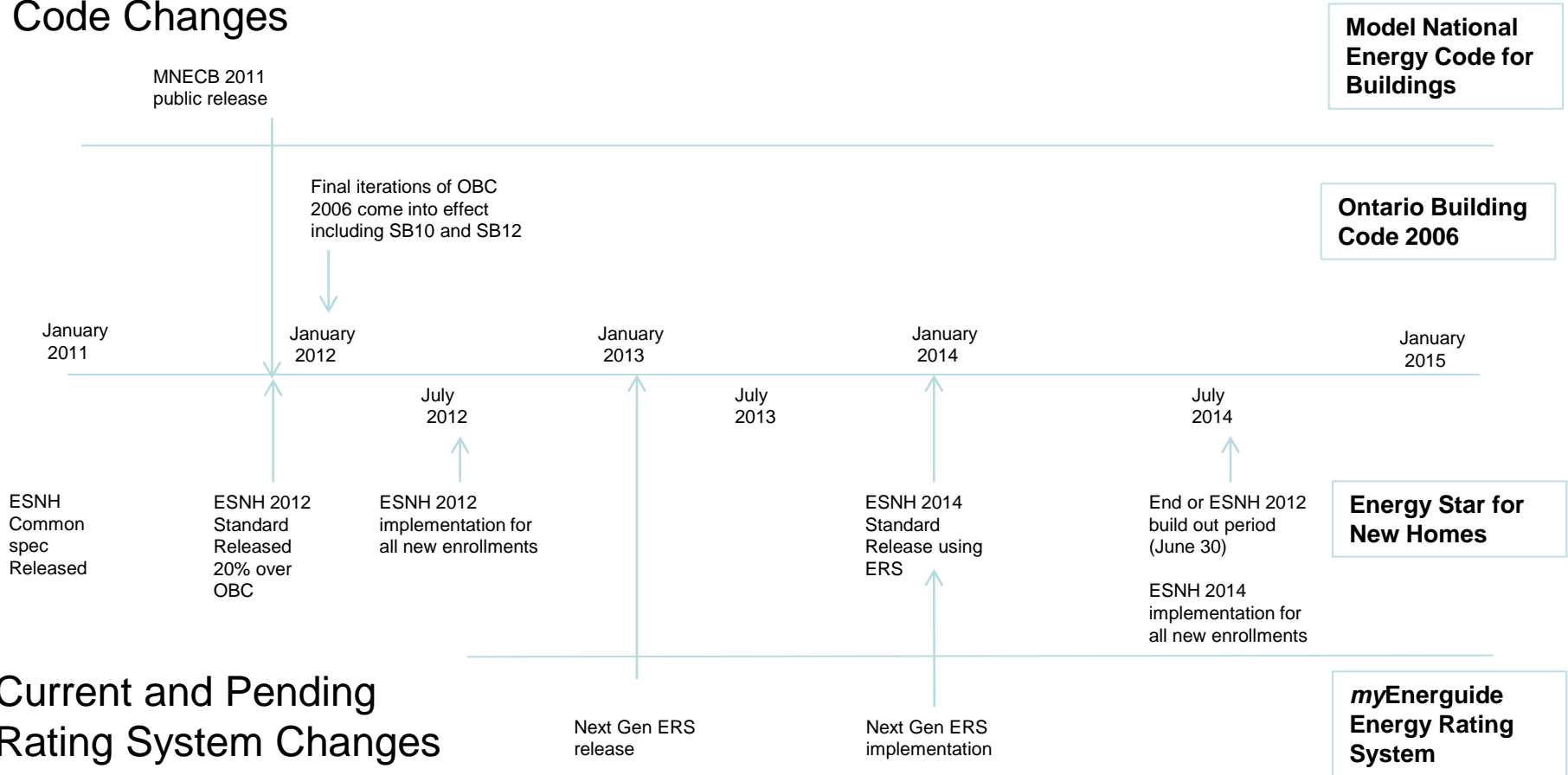
Designed for third party verification with infrastructure through GBCI



Designed for on-line self verification, can support third party verification. Existing Buildings verified by BOMA, No third party verification infrastructure for new construction in Canada

Current Timelines - Residential

Current and Pending Code Changes



Current and Pending Rating System Changes

OBC 2012

IT'S COMING. GET READY NOW!

In this workshop, you will learn:

The pros and cons of each strategy;
The individual requirements within each strategy;
How much each compliance package costs; and,
How your competition might build in 2012.



Instructor: Michael Lio

Who should attend?

Construction Managers, Contracts Managers, Designers, Architects, Product manufacturers,
Consultants & anyone who needs to know about the 2012 Code and program changes.

PRICE: \$199 + HST for HBA Members / \$299 + HST for Non-HBA Members

**WHERE: BILD Offices
20 Upjohn, Toronto**

Links

Larry Brydon LEED® AP

Reliance Home Comfort

416 704 0749

lbrydon@reliancecomfort.com

Reliance Home Comfort www.reliancehomecomfort.com

Canada Green Building Council www.cagbc.org

Sustainable Buildings Canada www.sbcanada.org

Energy Star Canada

www.oeenrcan.gc.ca/residential/business/new-homes/new-homes-initiative.cfm?attr=0