

OBC SB-12

Energy Efficiency Requirements – Prescriptive Compliance

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Summary

Ontario has some of the most progressive regulations in North America for energy conservation in housing. With every iteration of the Ontario Building Code (OBC) requirements related to energy performance have increased with the goal of reducing energy consumption and the emission of Green House Gases (GHG). These regulations are captured in OBC Part 12 and Supplementary Standard SB-12 Energy Efficiency for Housing. The requirements cover new housing and additions to existing housing within the scope of OBC Part 9. Non-residential buildings within the scope of Part 9 must meet the requirements of SB-10.

The energy efficiency for renovations to existing buildings must comply with the provisions of Parts 10 & 11.

Architects will naturally focus on the building envelope provisions of SB-12. However, mechanical and electrical energy efficiency requirements for housing are also covered in SB-12.

Prior to January 1st, 2017, Chapter 2 offers designers four compliance options for Housing: Prescriptive, Performance, Energy Star for New Homes v12.1, and the R-2000 (2012) Standard.

Similarly, after December 31st, 2016, Chapter 3 offers designers these four compliance options but the Energy Star Standard is upgraded to v12.6. All options are intended to reduce energy consumption by 15% below 2014 requirements.

With the release on July 7, 2016 of the anticipated revision to SB-12, designers may now use *effective RSI(R)* and *U-Values* for assemblies in Chapter 3 as an alternate to the *RSI(R)* and *U-Values* of the insulation alone. Other important changes include:

- Separate tables for metric and imperial values
- Number of prescriptive compliance packages doubled from 8 to 16 in Zone 1 and from 7 to 14 in Zone 2.
- Optional credits for documented air tightness.
- Inclusion of the R-2000 (2012) standard as an acceptable solution.

While this Practice Tip provides an overview of the prescriptive requirements of OBC SB-12, it is supplemental to it. Readers should review SB-12 in its entirety. If energy modelling is required refer to PT.36.1.

SB-12 Organization

Chapter 1 General

- 1.1.1. Energy Efficiency Compliance
- 1.2.1. Application of Supplementary Standard SB-12
- 1.3.1. Definitions of Words and Phrases
- 1.3.2. Symbols and Other Abbreviations
- 1.4.1. Referenced Documents

- 1.4.2. Abbreviations.

Chapter 2 Acceptable Solutions for Achieving Energy Efficiency Compliance before January 01, 2017

2.1.1. Prescriptive Compliance Packages

2.1.2. Performance Compliance

2.1.3. Other Acceptable Compliance Methods – Energy Star v12.1 and R-2000.

Chapter 3 Acceptable Solutions for Achieving Energy Efficiency Compliance after December 31, 2016

• 3.1.1. Prescriptive Compliance Packages

• 3.1.2. Performance Compliance

• 3.1.3. Other Acceptable Compliance Methods – Energy Star v12.6 and R-2000.

Suggested Procedures for Prescriptive Compliance

- Determine the area of windows, glazing in doors, sidelights, sliding glass doors and skylights in your project and their percentage of the vertical envelope area (FDWR). This will determine which compliance paths are available to you. The prescriptive paths limit the area of windows, glazing in doors, sidelights, sliding glass doors and skylights to 17% (22% with improved glazing) FDWR. Above 22% FDWR energy modelling is required.
- SB-12 assumes a high level of air tightness, 2.5 to 3 Air Changes per Hour (ACH). The selection of appropriate materials, attention to detail and careful review during construction are critical if the air barrier system is to achieve these targets. Chapter 3 offers reduced assembly insulation options where airtightness is verified by blower door testing.
- The maximum permissible U-Values for windows are for the complete assembly. Frame losses, especially through metal frames, can significantly reduce the performance of the windows. Some manufacturers provide tables for determining the window assembly U-Value based on, frame type, Centre of Glass (CoG) values and window areas. The National Fenestration Rating Council (NFRC) standard ANSI/NFRC 100-2014 sets out the procedures for determining the overall U-Value of windows. Software such as Therm may also be used. ER ratings are acceptable. Use SB-12 Tables 2.1.1.8. and 3.1.1.8. for conversion of ER to U-Values.
- Determine if any exceptions and adjustments for thermal bridging, glazing, log, post beam plank construction, Insulated Concrete Forms (ICF) and basement walls apply. If so adjust the design values and check for compliance.
- OBOA has produced a convenience form for recording SB-12 compliance information which is acceptable to most municipalities.

Chapter 2 - Acceptable Solutions for Achieving Energy Efficiency Compliance before January 1, 2017

Chapter 2 is intended to reduce building energy consumption by 5% below previous OBC requirements.

- Determine the type and efficiency of the space heating equipment.
- Using the Annual Fuel Utilization Efficiency (AFUE), the energy source and the climate zone select the appropriate table from Article 2.1.1.2., 2.1.1.3. or Table 36.3A below.
- Select a Compliance Package and the associated envelope component insulation RSI(R)-Values or thermal conductivity U-Values from the tables.
- Space heating equipment minimum AFUE, Heat Recovery Ventilator (HRV) minimum efficiency, and domestic hot water minimum Energy Factor (EF) are provided for each Compliance Package.

Table 36.3A						
Energy Source	Annual Fuel Utilization Efficiency (AFUE)					
	<78%		78% to 90%		≥90%	
	Zone 1	Zone 2	Zone 1	Zone 2	Zone 1	Zone 2
Natural Gas – Propane ¹	-	-	-	-	2.1.1.2.A	2.1.1.3.A
Solid Fuel	2.1.1.2.A	2.1.1.3.A	2.1.1.2.A	2.1.1.3.A	2.1.1.2.A	2.1.1.3.A
Oil	2.1.2. ²	2.1.2. ²	2.1.1.2.B	2.1.1.3.B	2.1.1.2.A	2.1.1.3.A
Ground Source	2.1.1.2.A	2.1.1.3.A	2.1.1.2.A	2.1.1.3.A	2.1.1.2.A	2.1.1.3.A
Solar: Wind or Photovoltaic	-	-	-	-	2.1.1.2.C	2.1.1.3.C
Solar Heating	2.1.2. ²	2.1.2. ²	2.1.1.2.B	2.1.1.3.(B)	2.1.1.2.A	2.1.1.3.A
Electricity from Grid ³	-	-	-	-	2.1.1.2.C	2.1.1.3.C

Notes on table:

1. AFUE of natural gas – propane furnaces is required to be ≥ 90%
2. 2.1.2. Performance Compliance requires energy modelling
3. Electric resistance heating is assumed to be 100% efficient.

Chapter 3 - Acceptable Solutions for Achieving Energy Efficiency Compliance after December 31, 2016

The objective of Chapter 3 is to reduce energy consumption to 15% below 2014 requirements. The July 7, 2016 revision includes a number of important changes:

- Designers may now use *effective RSI(R)*-Values for assemblies as an alternate to the RSI(R)-Values of the insulation alone. The *effective RSI(R)*-Values can be determined with software such as NRCan’s EE4 and Hot 2000 or from “ANSI/ASHRAE/IES 90.1-2010 Energy Standard for Buildings except Low-Rise Residential Buildings” (ASHRAE 90.1) Appendix A.
- Separate tables for metric and imperial values.
- Number of prescriptive compliance packages doubled from 8 to 16 in Zone 1 and from 7 to 14 in Zone 2.
- Reduced thermal resistance permitted for Insulated Concrete Form (ICF) walls.
- Optional credits for documented air tightness.
- Drain Water Heat Recovery Units are required in all dwelling units with showers except where there are no storeys or crawl spaces below any of the showers in the dwelling unit.
- Inclusion of the R-2000 (2012) standard as an acceptable solution.

Chapter 3 is very similar to Chapter 2 and the same procedures should be followed.

- Determine the type and AFUE of the space heating equipment.
- Using the AFUE, the energy source and the climate zone select the appropriate table from Article 3.1.1.2., 3.1.1.3. or Table 36.3B below.

- Select a Compliance Package and the associated envelope component nominal insulation RSI(R), thermal conductivity U-Values or assembly *effective RSI*-Values from the tables. ASHRAE 90.1 2010 Normative Appendix A provides useful tables for converting assembly component insulation thermal resistance RSI(R)-values to overall assembly thermal transmittance U-Values (*effective U-Values*) which take into account *parallel path losses*. EE4 from NRCan is a convenient and easy to use software for determining the *effective RSI (R) and U-Values*.
- Note the space heating equipment minimum AFUE, Heat Recovery Ventilator (HRV) minimum efficiency and domestic hot water minimum Energy Factor (EF) provided for each Compliance Package. HRVs are required in all compliance packages.

Energy Source	Annual Fuel Utilization Efficiency (AFUE)					
	<84%		84% to 92%		≥92%	
	Zone 1	Zone 2	Zone 1	Zone 2	Zone 1	Zone 2
Natural Gas, Propane ¹			3.1.1.2.B	3.1.1.3.B	3.1.1.2.A	3.1.1.3.A
Oil	3.1.2. ²	3.1.2. ²	3.1.1.2.B	3.1.1.3.B	3.1.1.2.A	3.1.1.3.A
Wood Burning ³	3.1.1.2.A, B or C	3.1.1.3.A, B or C	3.1.1.2.A, B or C	3.1.1.3.A, B or C	3.1.1.2.A, B or C	3.1.1.3.A, B or C
Earth Energy	3.1.1.2.A, B or C	3.1.1.3.A, B or C	3.1.1.2.A, B or C	3.1.1.3.A, B or C	3.1.1.2.A, B or C	3.1.1.3.A, B or C
Air or Water Source Heat Pumps ⁴	3.1.1.2.A, B or C	3.1.1.3.A, B or C	3.1.1.2.A, B or C	3.1.1.3.A, B or C	3.1.1.2.A, B or C	3.1.1.3.A, B or C
Wind or Photovoltaic	3.1.2. ²	3.1.2. ²	3.1.1.2.C	3.1.1.3.C	3.1.1.2.C	3.1.1.3.C
Solar heating	3.1.2. ²	3.1.2. ²	3.1.1.2.A	3.1.1.3.A	3.1.1.2.A	3.1.1.3.A
Electricity from Grid ⁵	-	-	-	-	3.1.1.2.C	3.1.1.3.C
Combined Space Heating and Domestic Hot Water ⁶	3.1.2. ²	3.1.2. ²	3.1.1.2.A, A4	3.1.1.3.A, A4 or A5	3.1.1.2.A, A4	3.1.1.3.A, A4 or A5

Notes on table:

1. AFUE of natural gas – propane furnaces is required to be ≥ 90%
2. 3.1.2. Performance Compliance requires energy modelling.
3. For wood burning appliances, earth energy systems and air or water source heat pumps the requirements for space heating equipment do not apply.
4. Air or Water Source Heat Pump values apply to systems without electric resistance back-up heating.
5. Electric resistance heating is assumed to be 100% efficient
6. Combined Space Heating and Domestic Hot Water systems have specific efficiency requirements. Refer to OBC Vol 2, SB-12 3.1.1.2.(7) and 3.1.1.3.(7).

Definitions

effective U-Value: The *effective U-Value* is the overall thermal transmittance of a building envelope assembly is the rate in $W/(m^2 \cdot K)$ at which heat is transferred through all components of the assembly subject to a temperature difference and includes the interior and exterior air films.

effective RSI(R)-Value is the effective thermal resistance of an assembly. It is the inverse of *effective U-Value*.

parallel path losses: The overall thermal transmittance of an assembly with framing members and insulation of different thermal conductivity in the same plane. Insulation fills the cavities created by the framing. *Parallel path losses* take into account the thermal bridging of the framing members and can be significant. The *effective U-Value* of a steel stud wall with only mineral fibre insulation between the studs is approximately 60% higher than of the U-Value of the insulation alone.

References

Codes, Standards and Guides

1. [ASHRAE 90.1 2010](#) (Imperial Edition)
2. MMAH, OBC Volume 1 Division B, Part 12 Resource Conservation and Environmental Integrity, Service Ontario Publications, January 1, 2014
3. MMAH, OBC Volume 2 Supplementary Standard SB-1, *Climate and Seismic Data*, September 14, 2012
4. MMAH, OBC Volume 2 Supplementary Standard SB-12, Energy Efficiency for Housing, Service Ontario Publications, July 7 2016. Minister's ruling [MR-16-S-26](#),
5. NFRC, [ANSI/NFRC 100-2014](#), Procedure for Determining Fenestration Product U-factors,
6. NRCan, [EnerGuide Rating System Technical Procedures](#), Version 15.1, November 2015,
7. NRCan, [ENERGY STAR® for New Homes: Technical Specification – Ontario](#), January 1, 2011, revised September 2011,
8. NRCan [ENERGY STAR® for New Homes Standard](#) – Version 12.6, April 22, 2015
9. NRCan, [R-2000 Standard \(2012 Edition\)](#), Effective July 1, 2012.

Software

1. Natural Resources Canada, [HOT2000](#), v11.2
2. Natural Resources Canada: [EE4](#), Version 1.7, 2005,
3. University of California, [THERM](#), v 7.4.3, October 2015.

Other References

1. OBOA, [Energy Efficiency Design Summary \(EEDS\) Forms and FAQ's](#) (Revised) Part 9 Residential, effective January 1, 2017
2. All Practice Tips within the PT.36 Series.

The OAA does not provide legal, insurance or accounting advice. Readers are advised to consult their own legal, accounting or insurance representatives to obtain suitable professional advice in those regards.
