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ENERGY STAR® for New Homes: Technical Specification - Ontario

January 2011
(Revised September 2011)



Canada

**ENERGY STAR® for New Homes:
Technical Specification - Ontario**
January 2011, revised September 2011



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Technical Specification - Ontario

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Summary of Technical Changes

Release Date	Clause	Technical Change
Jan 28, 2011	Table 3.2 and 3.3	House Air Leakage numbers modified as per Table 4.4.
	Table 3.3	Water Heating – DWHR requirement deleted as there was no applicable BOP.
	Table 4.4	S. Ontario attached houses NLR changed to $\leq 1.43 \text{ L/s/m}^2 @50\text{Pa}$, Mid/east Ontario attached houses NLA changed to $< 2.0 \text{ cm}^2/\text{m}^2$ ($< 2.86 \text{ in}^2/100 \text{ ft}^2$) and NLR changed to $\leq 1.43 \text{ L/s/m}^2 @50\text{Pa}$ ($\leq 0.286 \text{ cfm/ft}^2 @50\text{Pa}$).
Sept. 2011	1.2	Note removed and document versions added to sub clauses.
	1.3.1.4	Definition clarified
	1.3.2	Footnotes added to ERV and HRV indicating they are interchangeable.
	Figure 3.1	Note added for application clarification.
	Tables 3.1 to 3.4	Corrections made: In Section 4.4, House air leakage, of Tables 3.1 to 3.4, “@50PA” was added after L/s/m ² ; In Section 4.8, Water heating, of Tables 3.1 to 3.4, “storage tank” added to describe condensing tanks and a footnote was added.
	Table 3.3 and 3.4	In Section 4.7, Ducts, of Tables 3.3 and 3.4, the word “and” was added to the line” Sealed, in heated boundary”
	Tables 3.1 to 3.4	In Section 4.3.1, Basement Slab, of Tables 3.1 to 3.4, the abbreviation “w” was changed to “with”.
	Tables 3.1 to 3.4	In Section 4.5, Ventilation, of Tables 3.1 to 3.4, the abbreviation “w” was changed to “with”.
	Section 4	Title changed to “Requirements for Building Components, HVAC Equipment, Lighting Fixtures and Appliances”
	4.3.1.4	NRCan recommendation moved to a note.
	4.3.1.5	Clarification that the basement slab insulation applies to the entire slab area.
	4.3.2.1	Descriptive clause for effective resistance levels changed to effective “thermal” resistance levels
	4.3.2.2	Clause previously omitted. Provides a methodology for determining effective insulation levels.
	4.4.4.1	For this version of the ESNH Tech Spec-ON only, exterior dimensions of walls will be accepted; clarification was added for the center line of common walls; @50PA (imperial) was also added after cfm/ft ² .
	4.5.1.2	NRCan recommendation moved to a note.
	4.5.1.3	Now 4.5.1.2 and HRV changed to HRV/ERV.
	4.5.3	Energy Recovery added to title and within sub clauses.
	4.5.3.1	Clarification added for HRV/ERV efficiencies in BOPs.
	4.5.3.2	NRCan recommendation moved to a note.
	4.5.3.3	Now Clause 4.5.3.2 and “of each other” added to balancing description.
	4.5.3.4	Clause deleted.
	4.6.1.1	Clarification and footnote added regarding oil-fired furnaces and boilers.
	4.6.1.4	Corrected sentence.
	4.6.1.5	Clarified clause for in floor heating.
	Figure 4.7	Figure revised for greater clarity.
	4.8.2.2	Word “of” changed in clause to “from”.
	4.9.1.2	Clarified clause for eligible electrical credits.
	4.9.1.3	Was Clause 4.9.1.2. Clarified that it applies to drainwater heat recovery systems.
	4.9.2	Lighting Section added to correspond to August 2010 decision by the ESNH

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		Technical Advisory Committee (TAC) regarding Lighting requirements.
	4.9.2.3	An example was added for clarity.
	Table 4.9	Description of Ventilation Distribution clarified.
	Appendix A	Footnote clarified.



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1. APPLICATION AND DEFINITIONS

1.1 Application

1.1.1. Technical Specification and Other Regulations

- 1.1.1.1. All ENERGY STAR® qualified new homes in Ontario must comply with this document and all other ENERGY STAR program documentation published by Natural Resources Canada (NRCan), specifically the documents noted in Section 1.2.
- 1.1.1.2. This document is effective January 1, 2011.
- 1.1.1.3. All ENERGY STAR qualified new homes are required to comply with all applicable legislation and regulations.
- 1.1.1.4. Where these technical specifications indicate requirements that are less than the minimum requirements indicated by the Ontario Building Code (OBC) in place at the time of construction of the home, the requirements of the Code shall govern.
Copies of the Ontario Building Code can be obtained by visiting <http://www.obc.mah.gov.on.ca/site4.aspx>
- 1.1.1.5. NRCan works with a network of service organizations to deliver the ENERGY STAR for New Homes (ESNH) initiative (see the most current version of NRCan's "*ENERGY STAR for New Homes Roles and Responsibilities*" document for more information on this topic). In the field, service organizations shall verify that each ENERGY STAR qualified new house that they and their network of certified energy advisors (CEAs) label meets the ESNH minimum requirements. CEAs are permitted to accept the builders' confirmation for upgrades that cannot be verified on-site, for example, the level of insulation in sealed wall cavities.

1.1.2. Eligible Housing Types

- 1.1.2.1. Except as provided in clause 1.1.2.2 and 1.1.2.3, the Builder Option Packages (BOPs) in Section 3 apply to houses that are eligible for an EnerGuide rating under the EnerGuide Rating System- ERS (new homes).
- 1.1.2.2. The BOPs in Section 3 do not apply to manufactured homes with a chassis, residential units in buildings of more than three floors in height above grade, or multi-unit residential buildings (MURBs).
- 1.1.2.3. Currently, the BOPs in Section 3 do not apply to stacked units or electrically heated homes; however, these houses may comply under alternate compliance measures as described in the *ENERGY STAR for New Homes: Compliance Options* document.

1.2 Reference Publications

1.2.1. NRCan Publications

- 1.2.1.1. *NRCan's Minimum Requirements for ENERGY STAR Qualified New Homes*, January 2011
- 1.2.1.2. *ENERGY STAR for New Homes Roles and Responsibilities*, February, 2008
- 1.2.1.3. *ENERGY STAR File Submission Protocol*, November 1, 2008
- 1.2.1.4. *ENERGY STAR for New Homes: Compliance Options*, January 2011
- 1.2.1.5. *Maps of Climate Data*, May 2008, for houses complying under the prescriptive path. Houses complying under the performance path must reference the *Maps of Climate Data* version applicable to the software version used.

1.2.2. Other Publications

- 1.2.2.1. Ontario Building Code

1.3 Terms and Definitions

1.3.1. Definitions

- 1.3.1.1. Attached House
One dwelling that shares a wall with one or more adjacent dwellings. Common examples include row houses, townhomes, and semi-detached homes.
- 1.3.1.2. Builder Option Package (BOP)
Packages of pre-selected building envelope, mechanical and electrical specifications which have been validated and published by NRCan to ensure performance at a specified EnerGuide rating on average.
- 1.3.1.3. Detached House
A dwelling with walls, floors and ceilings that are independent of any other unit or building, as opposed to attached housing.
- 1.3.1.4. Effective RSI Value
Overall thermal resistance of a component (i.e. wall, ceiling, etc.) including framing members and other building materials that make up the component measured in m^2C/W ($ft^2 F/W$); 1 RSI = 5.67R.
- 1.3.1.5. Grade
The lowest of the average levels of finished ground adjoining each exterior wall of a building.
- 1.3.1.6. Permanent Foundation
The foundation is constructed from concrete, wood or steel; it is structurally complete; and the foundation is accepted by the authority having jurisdiction.

1.3.1.7. R-value

An imperial system measurement indicating the resistance of a given thickness of material to the flow of heat: the higher the R-value, the greater the insulation.

1.3.1.8. Slab on grade Foundation

The distance between the slab and ceiling is greater than 1.2m (4') with the slab at or within 0.6m (2') of grade.

1.3.1.9. Trade-off

A tested and approved decrease in the specification of one element of the building package in exchange for an increase in the specification of one or more other elements that results in an equivalent EnerGuide rating.

1.3.1.10. Walkout

A type of foundation where the depth of the foundation below grade decreases from one end of the foundation to the other. Specifically, it refers to a case where a portion of the basement wall is exposed containing a full door exit way from the basement to the outside (so that a person can "walk out" of their basement without going upstairs).

1.3.2. Abbreviated Terms

ACH Air Change per Hour

AFUE Annual Fuel Utilization Efficiency

ASHRAE American Society of Heating, Refrigeration and Air Conditioning Engineers

BOP Builder Option Package

CSA Canadian Standards Association

CEA Certified Energy Advisor

CFL Compact Fluorescent Lighting

DHW Domestic Hot Water

DWHR Drain Water Heat Recovery

EF Energy Factor

ELA Equivalent Leakage Area

EPA Environmental Protection Agency (US)

ERS EnerGuide Rating System

ERV Energy Recovery Ventilator¹

ESNH ENERGY STAR for New Homes

ETL a listed mark certified by Intertek testing laboratories

HRV Heat Recovery Ventilator²

¹ For the purposes of this document, reference to an ERV is interchangeable with an HRV.

HSPF	Heating Seasonal Performance Factor
HVI	Home Ventilating Institute
ICF	Insulated Concrete Form
IMS	Integrated Mechanical System
MURB	Multi-Unit Residential Building
NLA	Normalized Leakage Area
NLR	Normalized Leakage Rate
NRCan	Natural Resources Canada
OBC	Ontario Building Code
OSB	Oriented Strand Board
RSI	R-value Système International
SO	Service Organization
SIP	Structural Insulated Panel
SPF	Spray Polyurethane Foam
ULC	Underwriters Laboratories of Canada

² For the purposes of this document, reference to an HRV is interchangeable with an ERV.

2. COMPLIANCE OPTIONS

2.1 General

2.1.1. Requirements

- 2.1.1.1. The construction specifications for each ENERGY STAR® qualified house must be determined using an NRCan-approved compliance option noted in NRCan's *ENERGY STAR for New Homes: Compliance Options*. The *ENERGY STAR for New Homes: Compliance Options* document also specifies the on-site evaluation procedures and file submission requirements that must be followed.
- 2.1.1.2. This *ENERGY STAR for New Homes Technical Specification - Ontario* describes prescriptive path packages that have been pre-approved by NRCan to meet the ENERGY STAR for New Homes prescriptive path requirements. A performance path option is also described in Section 5.

3. BUILDER OPTION PACKAGES AND TRADE-OFFS

3.1 General

3.1.1. Builder Option Packages

- 3.1.1.1. This *ENERGY STAR® for New Homes Technical Specification - Ontario* addresses all components of the home building envelope and mechanical systems required to meet NRCan's minimum requirements for ENERGY STAR qualified new homes.
- 3.1.1.2. Minimum prescriptive building design specifications are provided in Section 3, Builder Option Packages (BOPs), for compliance within the southern Ontario (Toronto, Simcoe, London, Windsor), mid/eastern Ontario (Ottawa, Kingston, and Muskoka) and northern Ontario (Sault Ste. Marie, North Bay, Sudbury, Thunder Bay, Timmins) climate zones. Refer to Figure 3.1 for climate zone boundaries.
- 3.1.1.3. Each BOP described within this document has been pre-determined to meet or exceed the performance specifications of ENERGY STAR for New Homes.
- 3.1.1.4. If they are used as described within this document the BOPs and trade-offs require no HOT2000 software modeling.
- 3.1.1.5. Additional requirements are noted in Section 4.

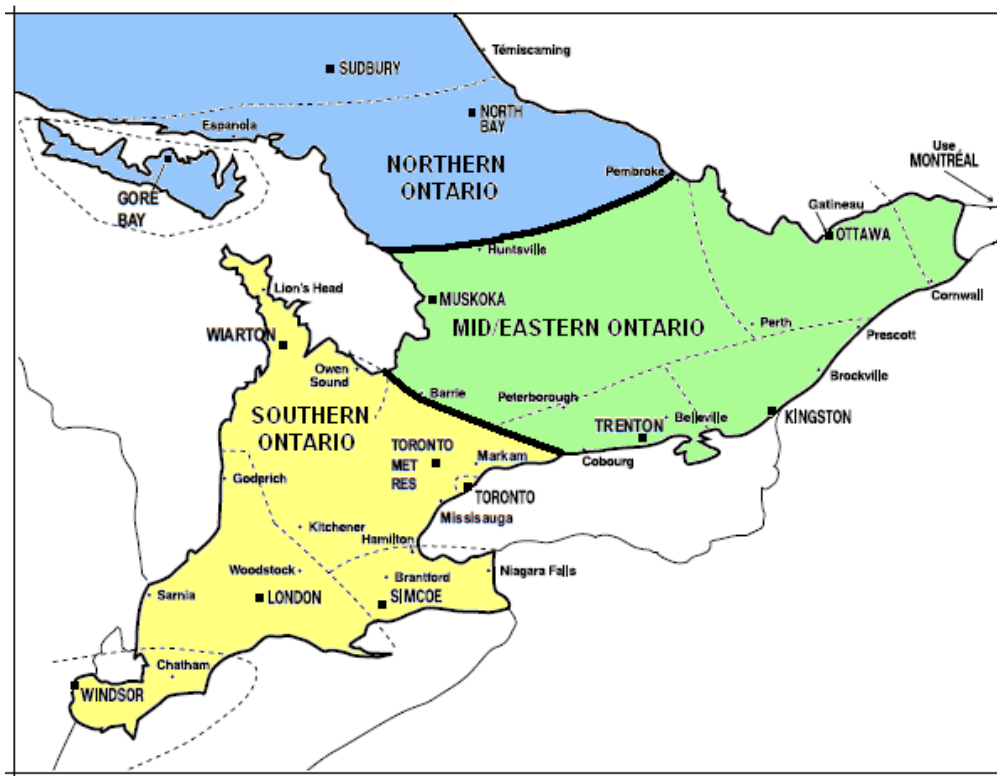
3.1.2. Instructions for Using Tables 3.1, 3.2, 3.3 and 3.4

- 3.1.2.1. Tables 3.1 to 3.4 identify prescriptive requirements for ENERGY STAR builder option packages (BOPs) for three climate zones in Ontario. Refer to Figure 3.1 for climate zone boundaries. Criteria for southern Ontario are covered in Tables 3.1 and 3.2, criteria for mid/eastern Ontario are covered in Table 3.3 and criteria for northern Ontario are covered in Table 3.4.
- 3.1.2.2. The columns are divided first by building type (detached or attached) and then by foundation type (full basement unless otherwise noted as walk-out or slab). Each column relates to a different package. The core BOPs are in the darkest blue, grey,

purple, orange, yellow or green respectively and their requirements are indicated by a star (★) symbol.

- 3.1.2.3. Trade-offs are provided for some, but not all, of the house types. Trade-offs are coloured to match their related core BOP but are in a lighter tone and the requirements are indicated by an “X”.
- 3.1.2.4. The sub-headings under “Trade-Offs” identify, where applicable, building elements whose core BOP criteria may be traded-off by applying more stringent criteria to other elements. Trade-offs either allow a lower insulation level in the exterior walls than the core BOP, allow the elimination of an HRV, or allow for a larger window area than for the core BOP. There is no need to refer back to the core BOP, each column is a complete specification.
- 3.1.2.5. Each row of the table relates to a different building element requirement. Each row that has a ★ (for core BOPs) or an X (for trade-offs) indicates a required element of the BOP shown in the vertical column. For example, for southern Ontario, the first ★ for the core BOP for a detached home indicates a requirement for zone B windows.

Figure 3.1 ENERGY STAR for New Homes Climate Zones – Ontario



NOTE This map applies to prescriptive path house files. Houses complying under the performance path must adhere to the *Maps of Climate Data* zones applicable to the software version used.

Table 3.1 Builder Option Packages for Southern Ontario – Detached Homes

Element (refer to section for details)		Minimum Requirement		Detached Homes											Walkout	Slab			
				Core BOP Id1	Trade-Offs												Core BOP Id2	Core BOP Id3	Core BOP Id4
					Exterior Wall					Principal Exhaust									
Id-xw-1.1.1	Id-xw-1.1.2	Id-xw-1.1.3	Id-xw-1.2.1	Id-xw-1.2.2	Id-px-1.1.1	Id-px-1.1.2	Id-px-1.2.1	Id-px-1.2.2	Id-px-1.3.1	Id-wa-1.1.1									
Windows* and Ext. Doors*	Zone B Zone C	*	X	X	X	X	X	X	X	X	X	X	X	X	*	*	*		
Window Area (4.2.1)	max. 13% of above grade wall area** 13% - 16% of above grade wall area	*	X	X	X	X	X	X	X	X	X	X	X	X	*	*	*		
Ceiling with Attic (4.3.2)	RSI 6.5 (R37) effective RSI 7.7 (R44) effective	*	X	X	X	X	X	X	X	X	X	X	X	X	*	*	*		
Ceiling w/o Attic (4.3.2)	RSI 4.7 (R26.5) effective	*	X	X	X	X	X	X	X	X	X	X	X	X	*	*	*		
Exterior Walls (4.3.2)	RSI 3.0 (R17.3) effective RSI 3.8 (R21.3) effective	*	X	X	X	X	X	X	X	X	X	X	X	X	*	*	*		
Exposed Floors (4.3.2)	RSI 5.1 (R29) effective	*	X	X	X	X	X	X	X	X	X	X	X	X	*	*	*		
Basement Slab (4.3.1)	RSI 0.9 (R5) effective with thermal break RSI 0.9 (R5) effective***														*	*	*		
Basement Walls (4.3.1)	RSI 1.7 (R9.5) effective RSI 2.6 (R14.6) effective	*	X	X	X	X	X	X	X	X	X	X	X	X	*	*	NA		
House Air Leakage (4.4)	max. 2.5 ACH@ 50PA or NLA <1.4 cm2/m2 or NLR ≤1.02 L/s/m ² @50PA	*	X	X	X	X	X	X	X	X	X	X	X	X	*	*	*		
Ventilation* (4.5)	HRV/ERV with efficiency of 60% at 0°C HRV/ERV with efficiency of 64% at 0°C HRV/ERV with efficiency of 67% at 0°C HRV/ERV with efficiency of 75% at 0°C Exhaust fan without heat recovery	*	X	X	X	X	X	X	X	X	X	X	X	X	*	*	*		
Space Heating* (4.6)	Min. AFUE of 90% Min. AFUE of 92% Min. AFUE of 95% Min. AFUE of 96%	*	X	X	X	X	X	X	X	X	X	X	X	X	*	*	*		
Ducts (4.7)	Sealed and in heated boundary	*	X	X	X	X	X	X	X	X	X	X	X	X	*	*	*		
Water Heating* (4.8)	Fuel ES qualified or elect. min. EF 0.92 Fuel min. EF of 0.80 Fuel min. EF of 0.82 Instantaneous min. EF 0.90 Condensing storage tank min. TE 90%**** Min. 42% eff. DWHR serving 1 shower	*	X	X	X	X	X	X	X	X	X	X	X	X	*	*	*		
Electrical Savings* (4.9)	Min. credit of 245 kWh/year Min. credit of 400 kWh/year Additional 700 kWh credit	*	X	X	X	X	X	X	X	X	X	X	X	X	*	*	*		

♦refer to Appendix A for assemblies that meet the requirements.

* denotes requirement for ENERGY STAR qualified product. NOTE: Propane and natural gas furnaces are exempt from the ENERGY STAR qualification requirement for this version of the ESNH Technical Specification - ON.

** for BOPS with Zone B windows, the area of windows, sliding glass doors and skylights can be increased to 16% of the above grade boundary wall area if Zone C windows are installed.

*** a slab edge thermal break is recommended.

**** The efficiency for all storage type water heaters (condensing and non condensing) above 75,000 BTUs is rated in TE.

Notes

1. "Window" refers to windows, sliding glass doors and skylights.
2. "Window Area" refers to the area of windows, sliding glass doors and skylights.

Legend for trade-off identifiers:

ld – London climate zone (applies to all of Southern Ontario)

xw – exterior wall

px – principal exhaust

wa – window area

Table 3.2 Builder Option Packages for Southern Ontario – Attached Homes

Element (refer to section for details)		Attached Homes				
		Core BOP Id5	Trade-Offs			Slab
			Exterior Wall			Core BOP Id6
Minimum Requirement		Id-xw-5.1.1	Id-xw-5.1.2	Id-xw-5.1.3		
Windows* and Ext. Doors*	Zone B	*	X	X	X	*
Window Area (4.2.1)	max. 13% of above grade wall area**	*	X	X	X	*
Ceiling with Attic♦ (4.3.2)	RSI 6.6 (R37) effective	*	X	X	X	*
Ceiling w/o Attic♦ (4.3.2)	RSI 4.7.5 (R26.5) effective	*	X	X	X	*
Exterior Walls♦ (4.3.2)	RSI 3.0 (R17.3) effective		X	X	X	
	RSI 3.2 (R18.2) effective					*
	RSI 3.8 (R21.3) effective	*				
Exposed Floors♦ (4.3.2)	RSI 5.1 (R29) effective	*	X	X	X	*
Basement Slab (4.3.1)	RSI 0.9 (R5) effective***					*
Basement Walls♦ (4.3.1)	RSI 1.7 (R9.5) effective	*	X	X	X	NA
House Air Leakage (4.4)	max. 3.0 ACH@ 50PA or NLA < 2.0 cm ² /m ² or NLR ≤ 1.43 L/s/m ² @50PA	*	X	X	X	*
Ventilation* (4.5)	Exhaust fan without heat recovery	*	X	X	X	*
Space Heating* (4.6)	Min. AFUE of 90%	*	X	X	X	*
Ducts (4.7)	Sealed and in heated boundary	*	X	X	X	*
	Water Heating* (4.8)	Fuel ES qualified or elect. min. EF 0.92	*			X
	Fuel min. EF of 0.80		X			
	Instantaneous min. EF of 0.90			X		*
Electrical Savings* (4.9)	Min. credit of 245 kWh/year	*	X	X	X	*
	Additional 700 kWh credit				X	

♦refer to Appendix A for assemblies that meet the requirements.

*denotes requirement for ENERGY STAR qualified product. NOTE: Propane and natural gas furnaces are exempt from the ENERGY STAR qualification requirement for this version of the ESNH Technical Specification - ON.

** for BOPs with Zone B windows, the area of windows, sliding glass doors and skylights can be increased to 16% of the above grade boundary wall area if Zone C windows are installed.

*** a slab edge thermal break is recommended.

Legend for trade-off identifiers:

Id – London climate zone (applies to all of Southern Ontario)

xw – exterior wall

Table 3.3 Builder Option Packages for Mid/Eastern Ontario

Element (refer to section for details)	Minimum Requirement	Detached Homes							Att. Homes		
		Core BOP od1	Trade-Offs			WalkOut	Slab	Attached BOP od5	T-O	Slab	
			Exterior Walls	W.A.							
		od-xw-1.1.1	od-xw-1.1.2	od-xw-1.2.1	od-wa-1.1.1	Core BOP od2	Core BOP od3	Core BOP od4	Ext. Wall od-xw-5.1.2	Core BOP od6	
Windows* and Ext. Doors*	Zone B Zone C	*	X	X	X	X	*	*	*	X	*
Window Area (4.2.1)	max. 13% of above grade wall area** 13% - 16% of above grade wall area	*	X	X	X		*	*	*	X	*
Ceiling with Attic* (4.3.2)	RSI 6.5 (R37) effective RSI 7.7 (R44) effective	*	X	X	X	X	*	*	*	X	*
Ceiling w/o Attic* (4.3.2)	RSI 4.7 (R26.5) effective	*	X	X	X	X	*	*	*	X	*
Exterior Walls* (4.3.2)	RSI 3.0 (R17.3) effective RSI 3.2 (R18.2) effective RSI 3.8 (R21.3) effective	*	X	X	X		*	*	*	X	*
Exposed Floors* (4.3.2)	RSI 5.1 (R29) effective	*	X	X	X	X	*	*	*	X	*
Basement Slab (4.3.1)	RSI 0.9 (R5) effective with thermal break RSI 0.9 (R5) effective***						*	*			*
Basement Walls * (4.3.1)	RSI 1.7 (R9.5) effective RSI 2.6 (R14.6) effective	*	X	X		X	*	NA	*	X	NA
House Air Leakage (4.4)	max. 2.5 ACH@ 50PA or NLA <1.4 cm ² /m ² or NLR ≤1.02 L/s/m ² @50PA max. 3.0 ACH@ 50PA or NLA < 2.0 cm ² /m ² or NLR ≤1.43 L/s/m ² @50PA	*	X	X	X	X	*	*	*		*
Ventilation* (4.5)	HRV/ERV with efficiency of 60% at 0°C HRV/ERV with efficiency of 64% at 0°C HRV/ERV with efficiency of 67% at 0°C HRV/ERV with efficiency of 75% at 0°C Exhaust fan without heat recovery	*	X	X			*	*	*		*
Space Heating* (4.6)	Min. AFUE of 90% Min. AFUE of 92%	*	X	X	X	X	*	*	*	X	*
Ducts (4.7)	Sealed and in heated boundary	*	X	X	X	X	*	*	*	X	*
Water Heating* (4.8)	Fuel ES qualified or elect. min. EF 0.92 Fuel min. EF of 0.80 Fuel min. EF of 0.82 Instantaneous min. EF of 0.90 Condensing storage tank min. TE 90%****	*			X	X	*	*	*	X	*
Electrical Savings* (4.9)	Min. credit of 245 kWh/year Min. credit of 400 kWh/year Additional 700 kWh credit	*	X	X	X	X	*	*	*	X	*

*refer to Appendix A for assemblies that meet the requirements.

* denotes requirement for ENERGY STAR qualified product. NOTE: Propane and natural gas furnaces are exempt from the ENERGY STAR qualification requirement for this version of the ESNH Technical Specification - ON.

** for BOPS with Zone B windows, the area of windows, sliding glass doors and skylights can be increased to 16% of the above grade boundary wall area if Zone C windows are installed.

*** a slab edge thermal break is recommended.

**** The efficiency for all storage type water heaters (condensing and non condensing) above 75,000 BTUs is rated in TE.

Notes

1. "Window" refers to windows, sliding glass doors and skylights.
2. "Window Area" refers to the area of windows, sliding glass doors and skylights.

Legend for trade-off identifiers:

od – Ottawa climate zone (applies to all of Mid/Eastern Ontario)

xw – exterior wall
wa – window area
T.O. – Trade-Offs

Table 3.4 Builder Option Packages for Northern Ontario

Element (refer to section for details)	Minimum Requirement	Detached Homes					Attach. Core BOP td4
		Core BOP td1	Trade-Offs Ext. Wall		W.O. Core BOP td2	Slab Core BOP td3	
			td-xw-1.1	td-xw-1.2.1			
Windows* and Ext.Doors*	Zone C	*	X	X	*	*	*
Window Area (4.2.1)	max. 13% of above grade wall area	*	X	X	*	*	*
Ceiling with Attic♦ (4.3.2)	RSI 7.7 (R44) effective	*	X	X	*	*	*
Ceiling w/o Attic♦ (4.3.2)	RSI 4.7 (R26.5) effective	*	X	X	*	*	*
Exterior Walls♦ (4.3.2)	RSI 3.0 (R17.3) effective RSI 3.8 (R21.3) effective	*	X	X	*	*	*
Exposed Floors♦ (4.3.2)	RSI 5.1 (R29) effective	*	X	X	*	*	*
Basement Slab (4.3.1)	RSI 0.9 (R5) effective with thermal break	*			*	*	
Basement Walls ♦(4.3.1)	RSI 1.7 (R9.5) effective RSI 2.6 (R14.6) effective	*	X	X	*	NA	*
House Air Leakage (4.4)	max. 2.0 ACH@ 50PA or NLA <1.1 cm ² /m ² or NLR ≤0.81 L/s/m ² @50PA max. 3.0 ACH@ 50PA or NLA <1.8 cm ² /m ² or NLR ≤1.02 L/s/m ² @50PA	*	X	X	*	*	*
Ventilation* (4.5)	HRV/ERV with efficiency of 60% at 0°C HRV/ERV with efficiency of 75% at 0°C Exhaust fan without heat recovery	*	X	X	*	*	*
Space Heating* (4.6)	Min. AFUE of 92%	*	X	X	*	*	*
Ducts (4.7)	Sealed and in heated boundary	*	X	X	*	*	*
Water Heating* (4.8)	Fuel ES qualified or elect. min. EF 0.92 Instantaneous min. EF of 0.90 Condensing storage tank min. TE of 90%**	*	X	X	*	*	*
Electrical Savings* (4.9)	Min. credit of 245 kWh/year Min. credit of 400 kWh/year	*	X	X	*	*	*

♦refer to Appendix A for assemblies that meet the requirements.

* denotes requirement for ENERGY STAR qualified product. NOTE: Propane and natural gas furnaces are exempt from the ENERGY STAR qualification requirement for this version of the ESNH Technical Specification - ON.

** The efficiency for all storage type water heaters (condensing and non condensing) above 75,000 BTUs is rated in TE.

Notes

1. "Window" refers to windows, sliding glass doors and skylights.
2. "Window Area" refers to the area of windows, sliding glass doors and skylights.

Legend for trade-off identifiers:

td – Timmins climate zone (applies to all of Northern Ontario)

xw – exterior wall
W.O. – Walk-Out

4. REQUIREMENTS FOR BUILDING COMPONENTS, HVAC EQUIPMENT, LIGHTING FIXTURES AND APPLIANCES

4.1 General

As noted in Section 2, all ENERGY STAR® qualified new homes enrolled under the BOPs identified in this document must comply with *NRCan's Minimum Requirements for ENERGY STAR Qualified New Homes* and *ENERGY STAR for New Homes: Compliance Options*. Additional specific requirements are detailed in this section.

4.2 Windows, Doors and Skylights

4.2.1. Window, Sliding Glass Door and Skylight Area

- 4.2.1.1. The total area of all windows, sliding glass doors and skylights in the core BOPs is limited to a maximum of 13% of the boundary wall area.

NOTE: The total area referred to above is the sum of all the areas of the structural rough openings for the windows, sliding glass doors and skylights.

- 4.2.1.2. The above grade wall area is measured on the basis of exterior wall dimensions and includes all perimeter boundary walls and floor rims extending from grade to the ceiling of the uppermost floor level. For purposes of determining the percentage window, sliding glass doors and skylight area, the boundary wall area includes walls which are common to another heated unit.
- 4.2.1.3. The area of windows, sliding glass doors and skylights may be increased from 13% to 16% of the above grade boundary wall area as per trade-offs outlined in the footnote of Table 3.1, 3.2, 3.3 or trade-off Id-wa-1.1.1 on Table 3.1.

4.3 Insulation Levels

4.3.1. Basement Wall and Floor Assemblies

- 4.3.1.1. These requirements apply to basement walls which extend on average no more than 0.9 m (3 ft.) above grade. Where a basement wall extends more than 0.9m (3 ft.) above grade the requirements of Exterior Wall assemblies apply.
- 4.3.1.2. All enclosed crawlspaces in contact with the ground are required to be conditioned and the same insulation requirements apply to crawlspaces as for basements.
- 4.3.1.3. Full height insulation is intended to cover the entire area of the basement wall. A small gap of 150mm (6") or less is permitted between the bottom edge of basement insulation and the floor where there is no insulation on the exterior side of the wall and the basement slab is more than 1.2m (4 ft.) below grade. Where the floor of a shallow basement is less than 1.2m (4 ft.) below grade and there is no insulation on the exterior side of the wall, insulation on the interior side shall extend to the basement floor without a gap.
- 4.3.1.4. Where a slab edge thermal break is required by a BOP in Tables 3.1 to 3.4, the thermal break shall be of an equivalent RSI value to the sub-slab insulation.

NOTE NRCan recommends that all basement floor assemblies include a thermal break between the basement floor slab and foundation walls.

- 4.3.1.5. Basement slab insulation forming part of a BOP in Tables 3.1 to 3.4 must cover the entire slab area.

4.3.2. Equivalent Insulation Levels

- 4.3.2.1. Except as provided in Clause 4.3.2.2, walls, ceilings and exposed floors shall be constructed according to the assembly descriptions provided in Appendix A to achieve the effective thermal resistance levels in the applicable Table in Section 3.
- 4.3.2.2. Assemblies not included in Appendix A require the determination of effective thermal resistance values that meet or exceed those required in the applicable Table in Section 3. The methodology for determining effective thermal resistance values must adhere to the following clauses:
- a. The determination of effective thermal resistance of assemblies must account for the effect of framing members in the insulation layers of the assembly using methods specified by ASHRAE 2001 Fundamentals, or Model National Energy Code Houses (MNECH) 1997. Framing area percentages are provided in Table 4.3 below, which are to be used when the calculation of the effective thermal resistance is undertaken by an ENERGY STAR for New Homes certified energy advisor or builder.
 - b. Framing percentage areas are reduced by increasing stud or joist spacing. In addition, wall framing percentages may be reduced by a further 4% by advanced wall framing methods which reduce the quantity of framing lumber independent of stud spacing. For example, a standard wood frame wall at 490 mm (19.2") centers may be reduced from 21.5% of the wall area to 17.5% by use of advanced wall framing. Advanced wall framing methods may include any combination of the reduction of backing for straightening of studs and finish attachment, the reduction of posts in walls under point loads, the replacement of steel posts with wood posts, the reduction of jack studs under lintels and sill plates at openings, the relocation of lintels in walls to rim joists, and the replacement of lintels with framed panels. Top plates may also be reduced to a single plate by use of stacked stud and joist assemblies, but this is not necessary to achieve 4% reductions. The framing percentage area is also reduced by the use of I-joists, raised heel trusses and in-basement wall framing.
 - c. Alternatively, the resistances of equivalent and trade-off assemblies may be assessed by use of HOT2000 software.
 - d. All normal air films and finishes are included in the assembly except as described here. In the case of exposed floors, the interior finish is limited to 15.9mm (5/8") OSB sub-floor and the exterior to gypsum board. In the case of vented heated ceilings, finishes and structure on the exterior side are excluded.
 - e. In the case of basement wall assemblies, the effective resistance is assessed as that added to concrete without the resistance of air films or concrete structure, but may include enclosed air spaces, if any. Gypsum board is included where it is a required element of the assembly.
 - f. Where two or more assemblies of the same component are present in a home, an area based averaging may be used to determine the overall resistance of that

component using the following formula: $R_{avg} = a_{tot} / (a_1/r_1 \dots + a_n/r_n)$, where a_{tot} is the total area of assemblies 1 to n, a_1 is the area of assembly one, r_1 is the resistance of assembly one, and so forth to assembly n. Normally only two or three different assemblies are involved in averaging.

Table 4.3 Percentage Framing Areas
For Use in Determining Effective Thermal Resistances

Framing System	Percentage Area
Standard wood frame wall @ 400mm (16") o.c.	23%
Standard wood frame wall @ 490mm (19.2") o.c.	21.5%
Standard wood frame wall @ 600mm (24") o.c.	20%
Advanced wood frame wall with double top plate	wall framing % by centre above less 4%
Basement wood frame wall inside concrete	wall framing % by centre above less 7%
SIPS wall @ 1200mm (48") o.c.	10%
Standard lumber joist floor @ 400mm (16") o.c.	13%
Standard lumber joist floor @ 600mm (24") o.c.	10%
I-joist floors	joist framing % by centre above less 4%
Standard roof trusses @ 400mm (16") o.c.	14%
Standard roof trusses @ 600mm (24") o.c.	11%
Raised heel roof trusses @ 400mm (16") o.c.	10%
Raised heel roof trusses @ 600mm (24") o.c.	7%
Conventional rafter/joist framing @ 400mm (16") o.c.	13%
Conventional rafter/joist framing @ 600mm (24") o.c.	10%
I-joist rafters	rafter framing % by centre above less 4%
SIPS roof @ 1200mm (48") o.c.	6%

4.4 Whole House Air Leakage

4.4.1. General

- 4.4.1.1. All ENERGY STAR qualified new homes qualifying via this technical specification must meet the airtightness requirements as detailed in 4.4.2, 4.4.3 or 4.4.4. Each house will comply with the value for the selected metric provided in Table 4.4.
- 4.4.1.2. The testing of attached units is to be done on an individual unit basis and does not require access to and simultaneous measurement of adjacent units.

4.4.2. Air Changes per Hour

- 4.4.2.1. The building envelope shall be constructed sufficiently airtight such that the air change rate at 50 Pascals is less than or equal to 2.5 Air Changes per Hour (ACH) for detached houses in southern and mid/eastern Ontario, 2.0 ACH@50 for detached houses in northern Ontario, and 3.0 ACH@50 for attached houses, when measured in accordance with CAN/CGSB-149.10-M86 (*Determination of the Airtightness of Building Envelopes by the Fan Depressurization Method*). The "as operated" procedure used by the ERS is also acceptable. ACH@50 is calculated by dividing the air flow rate by the volume of the house and then converting it to units of hours by

multiplying the result by 60 minutes per hour (imperial) or 3600 seconds per hour (metric). The ACH@50 is obtained from the blower door test.

4.4.3. Normalized Leakage Area

4.4.3.1. The Normalized Leakage Area (NLA) is an alternate compliance metric and is to be less than the values provided in Table 4.4. NLA is in cm^2/m^2 (metric) or $\text{in}^2/100\text{ft}^2$ (imperial). The NLA is calculated by dividing the equivalent leakage area (ELA) in cm^2 by the surface area of the building envelope in m^2 , where the ELA is determined by CAN/CGSB 149.10 at 10 Pa. The surface area includes all ceilings (flat and sloping), floors, walls (including door and windows) below, above and adjacent to unheated spaces and spaces heated to less than 10°C . The NLA is automatically calculated by the HOT2000 software.

4.4.4. Normalized Leakage Rate

4.4.4.1. The Normalized Leakage Rate (NLR) is an alternate compliance measure and is to be less than or equal to the values provided in Table 4.4. NLR is in L/s/m^2 @50Pa (metric) or cfm/ft^2 @50Pa (imperial). The NLR is calculated as the total leakage rate at 50 Pa divided by the total boundary area, where the total leakage at 50 Pa is determined by application of the flow coefficient and exponent derived by CAN/CGSB 149.10. The NLR target may be used to determine a total target leakage rate for an air leakage test by multiplication with the total boundary area. The heated boundary area is determined as the total area of all the wall, roof and floor components which enclose the heated space and includes those walls, roofs and floors which are common with adjacent heated units. Therefore the surface area taken from HOT2000 must be modified to include common walls which are not included in the HOT2000 model. The boundary wall area is determined using the interior* dimensions of exterior walls and center line dimensions of walls common to other units.

* For this version of the ESNH Technical Specification-ON, NRCan will accept exterior wall dimensions in this calculation

Table 4.4 Whole House Air Leakage

Climate Zone	Detached Houses					Attached Houses				
	ACH @50 PA	NLA		NLR (@50Pa)		ACH @50PA	NLA		NLR (@50Pa)	
		cm^2/m^2	$\text{in}^2/100 \text{ft}^2$	L/s/m^2	Cfm/ft^2		cm^2/m^2	$\text{in}^2/100 \text{ft}^2$	L/s/m^2	Cfm/ft^2
Southern Ontario	≤2.5	<1.4	<2.0	≤1.02	≤0.200	≤3.0	<2.0	<2.86	≤1.43	≤0.286
Mid/East Ontario	≤2.5	<1.4	<2.0	≤1.02	≤0.200	≤3.0	<2.0	<2.86	≤1.43	≤0.286
Northern Ontario	≤2.0	<1.1	<1.6	≤0.81	≤0.160	≤3.0	<1.8	<2.6	≤1.02	≤0.200

4.5 Mechanical Ventilation and Ventilation Distribution

4.5.1. General

- 4.5.1.1. A principal exhaust fan is required with a minimum ventilation capacity as described in the OBC 9.32.
- 4.5.1.2. An HRV/ERV is required to be installed as the principal exhaust fan in single detached houses unless a principal exhaust fan without heat recovery is selected as part of an alternative Builder Option Package as per tables 3.1 to 3.4.

NOTE NRCan strongly recommends the installation of a heat recovery ventilator (HRV) or energy recovery ventilator (ERV).

4.5.2. Principal Exhaust Fans without Heat Recovery

- 4.5.2.1. The principal exhaust fan must be rated at or less than 1.5 sones by data published by HVI and must be ENERGY STAR qualified.

4.5.3. Heat Recovery/Energy Recovery Ventilators (HRV/ERVs)

- 4.5.3.1. If an HRV/ERV is installed, it must be ENERGY STAR qualified. A higher efficiency may be required for a particular BOP or trade off as per Tables 3.1 to 3.4
- 4.5.3.2. If an HRV/ERV is installed, it must be installed such that the supply and exhaust flows are measured and balanced within 10% of each other by a technician qualified by the manufacturer, or by HRAI, and a label is required to be attached to the HRV indicating the installing company and the measured flow rates.

NOTE If an HRV/ERV is installed, it is recommended that it be certified (and comply with Section III) by the Home Ventilating Institute (HVI) as an HRV/ERV.

4.5.4. Ventilation Distribution System

- 4.5.4.1. A ventilation distribution system is required to distribute the ventilation air throughout the house. Ventilation distribution may use a central forced air system or a dedicated, fully-ducted supply and return system, which is in compliance with Section 9.32 of the OBC.
- 4.5.4.2. Where a central forced air system is utilized either fully or in part to distribute ventilation air, the principal exhaust fan control shall be interconnected with the forced air distribution system such that switching on the principal exhaust fan operates the forced air system.

4.6 Space Heating Systems

4.6.1. Eligible Equipment

- 4.6.1.1. Except as provided in Clause 4.6.1.2, natural gas-fired, propane-fired and oil-fired furnaces³ and natural gas-fired, propane-fired and oil-fired boilers must be ENERGY STAR qualified **and** have the minimum AFUE rating specified for the weather region as per Tables 3.1 to 3.4.
- 4.6.1.2. Integrated mechanical systems (IMS) are permissible where they are compliant with *CSA P.10-07 Standard: Performance of Integrated Mechanical Systems for Residential Heating and Ventilation*, meet or exceed the standard's premium performance requirements and have an overall thermal performance factor of 0.90 or higher. There are no ENERGY STAR specifications for IMS at this time.
- 4.6.1.3. Natural gas-fired/propane-fired fireplaces must be direct vent with spark ignition ("spark ignition" is also referred to as "intermittent"). Refer to the following website to search for acceptable products:
<http://oee.nrcan.gc.ca/residential/business/manufacturers/search/fireplace-search.cfm>.
- 4.6.1.4. Wood fireplaces/stoves must be certified by the U.S. Environmental Protection Agency (EPA) wood-burning appliance standards 40 Code of Federal Regulations (CFR) 60 Subpart AAA - Standards of Performance for New Residential Wood Heaters - or CSA-B415 "Performance testing of solid-fuel-burning heating appliances" compliant. In addition, an HRV/ERV and carbon monoxide detector(s) must be installed.
- 4.6.1.5. Radiant in-floor heating is not included in any of the BOPs in Tables 3.1 to 3.4, and must be modelled following the performance compliance path.

4.6.2. Combustion Venting

- 4.6.2.1. All combustion venting systems for furnaces, boilers, water heaters and gas fireplaces are required to be non-spillage susceptible with direct venting or power venting.
- 4.6.2.2. Where a combustion air supply duct that terminates in conditioned space is provided, it shall be equipped with an approved device to control unintended air leakage when air is not required for combustion. This requirement is intended to apply on an individual appliance basis and the same combustion air supply and damper system may not be shared and controlled by two or more heating appliances.

4.7 Ducts

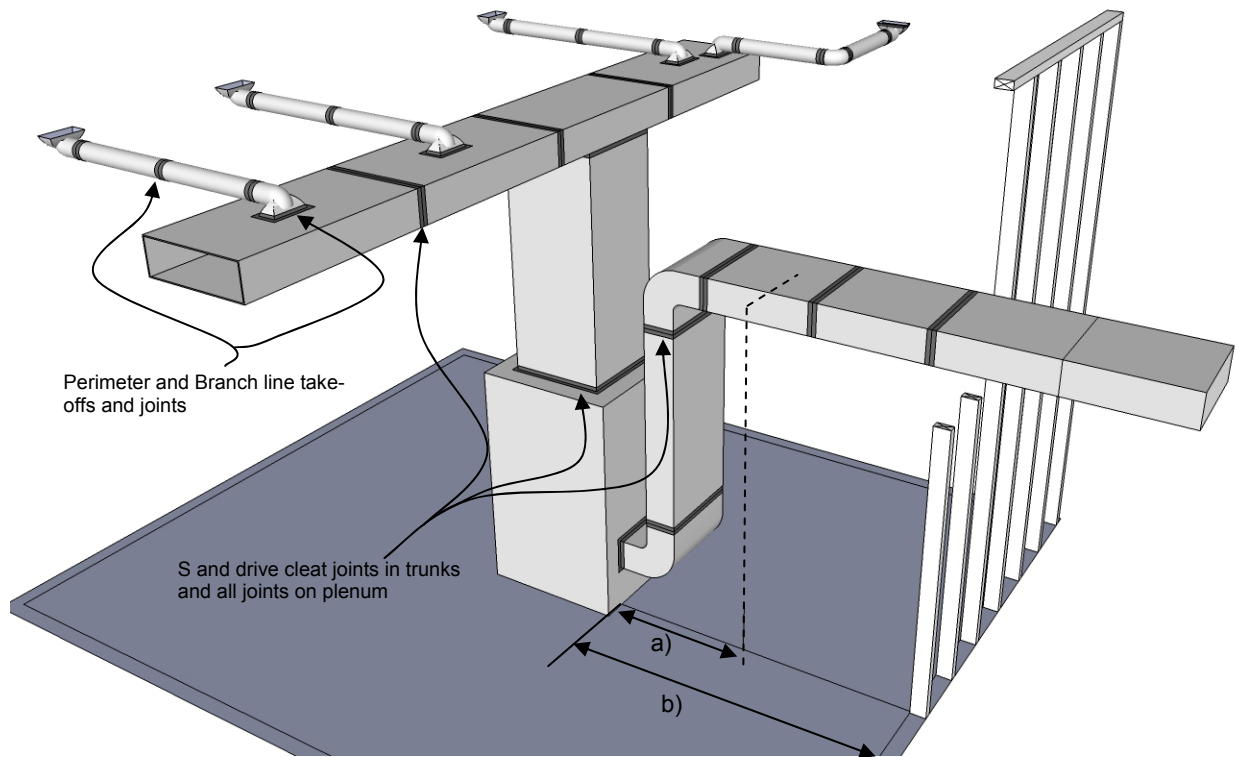
4.7.1. General

- 4.7.1.1. All ducts for heating, ventilation and air conditioning must be located within the heated boundary.
- 4.7.1.2. HRV connections to the outdoor vent hoods must be sealed and insulated.

³ For this version of the ENERGY STAR for New Homes Technical Specification-ON, natural gas-fired and propane-fired furnaces are exempt from the ENERGY STAR requirements of 4.6.1.1 but must still meet the AFUE requirements of Tables 3.1 to 3.4

- 4.7.1.3. For dedicated fully ducted ventilation ductwork (e.g. HRV/ERV ducts), all manufactured and site assembled joints must be sealed.
- 4.7.1.4. All other common heating, air conditioning and ventilation air distribution systems, including all main supply air trunk transverse S and drive joints, branch take-offs, branch supply joints and manufactured beaded joints on round perimeter pipes that are located on the same level as the main supply trunk ducts, must be sealed with approved duct tape (e.g., foil tape or flexible duct tape, but not vinyl backed duct tape) or mastic.
- 4.7.1.5. The following joints are exempt from additional sealing:
 - a. Self-sealing manufactured pipe, take-offs, and fittings (with manufactured seal or incorporated gaskets);
 - b. Snap lock and folded seam longitudinal duct joints; and
 - c. Knurled adjustable joints on manufactured elbows.
- 4.7.1.6. For common return ducts, the more stringent of (a) or (b) below must be adhered to:
 - a. The drop to the furnace and at least one horizontal metre of return duct(s) measured from the furnace/air handler connection must be sealed with approved tape or mastic; or
 - b. Within a framed or closed mechanical room, all the return ducts, including joist returns, must be sealed with approved tape or mastic.

Figure 4.7 Duct Sealing



For common return ducts, the more stringent of (a) or (b) below must be adhered to:

- a. The drop to the furnace and at least one horizontal metre of return duct(s) measured from the furnace/air handler connection must be sealed with approved tape or mastic; or
- b. Within a framed or closed mechanical room, all the return ducts, including joist returns, must be sealed with approved tape or mastic.

4.8 Water Heaters

4.8.1. General

- 4.8.1.1. Except as noted in this specification, all combustion heating equipment for boilers and water heaters used for DHW must be ENERGY STAR qualified and be direct vented or power vented. This includes all tankless water heaters and for gas storage tank water heaters that have a nominal input equal to or less than 75,000 Btu/h.
- 4.8.1.2. Gas storage tank water heaters with a nominal input of over 75,000 Btu/h may be used but must be of the condensing type.
- 4.8.1.3. Electric resistance water heaters are permitted but require improved performance, represented by a minimum energy factor (EF) of 0.92.

4.8.2. Drainwater Heat Recovery (DWHR)

- 4.8.2.1. Drainwater Heat Recovery (DWHR) technology is eligible for credits under Section 4.9 Electricity and Appliance Savings Requirements.
- 4.8.2.2. The product must be installed according to the manufacturer's instructions and must always be mounted vertically (not to exceed 5 degrees from vertical).
- 4.8.2.3. All installed DWHR systems must be on NRCan's list of approved systems and be rated to perform at 42% efficiency or greater.

4.9 Electricity Savings Requirements

4.9.1. General

- 4.9.1.1. Where minimum electrical credits are specified in Tables 3.1 to 3.4, electricity and appliance choices and credits shall comply with Table 4.9.
- 4.9.1.2. The only eligible electrical credits that can be used for BOPs in Tables 3.1 to 3.4 are listed in Table 4.9. The only way to receive the full range of credits available under the EnerGuide Rating System is to use the performance compliance path.
- 4.9.1.3. Drainwater heat recovery systems that are required to meet a BOP or trade-off package shall not be eligible for the electricity and appliance savings credits noted in Table 4.9.

4.9.2. Lighting

- 4.9.2.1. NRCan recommends the use of ENERGY STAR qualified lighting fixtures, ENERGY STAR qualified bulbs and control mechanisms (i.e.: timer, dimmer switch, photo sensor, or motion sensor) wherever possible.
- 4.9.2.2. As of August 1, 2010, the ENERGY STAR for New Homes requirement for lighting is that a minimum of 75% of lighting fixtures (including interior and exterior fixtures) be any combination of the following:
 - a. ENERGY STAR qualified hardwired (i.e.: Pin-type) lighting fixtures;
 - b. Filled with ENERGY STAR qualified bulbs; or
 - c. Connected to an energy management control system such as a dimmer, timer, or motion sensor. A maximum of three fixtures per house may qualify via this option.
- 4.9.2.3. To determine the minimum number of fixtures which must meet the above noted requirement, one must take the total number of fixtures (interior and exterior), multiply the total by .75, and round up to the nearest whole number.

e.g If a home has 19 or 20 fixtures, at least 15 must be ENERGY STAR qualified fixtures or contain ENERGY STAR qualified bulbs, and up to 3 of the 15 fixtures may be non-ENERGY STAR qualified and filled with non-ENERGY STAR qualified bulbs if they are connected to an energy management control system such as dimmer, timer or motion sensor.

Table 4.9 Electricity & Appliance Savings Credits

Technology	Eligibility	Credit
Ventilation Distribution	HRV coupled with forced air distribution, air handler or furnace with an AFUE rating of 85% or higher (natural gas, oil, or propane fuel fired appliances only) with a brushless DC motor; or,	407 kWh
	Dedicated fully-ducted supply and exhaust ventilation system with an HRV or balanced fans, with forced air system with an AFUE rating of 85% or higher (natural gas, oil, or propane fuel fired appliances only).	581 kWh
Lighting	Compact fluorescent lighting (CFL) installed in 75% of fixtures or 75% of the fixtures of the home are ENERGY STAR qualified; or	245 kWh
	CFLs installed in all fixtures in the kitchen, main hallway and living/family room or all fixtures installed within the kitchen, main hallway and living/family room are ENERGY STAR qualified ; or,	245 kWh
	CFLs or ENERGY STAR qualified fixtures installed in entire house.	550 kWh
Clothes Washer	ENERGY STAR qualified washer.	240 kWh
Refrigerator	ENERGY STAR qualified refrigerator.	70 kWh
Dishwasher	ENERGY STAR qualified dishwasher.	100 kWh
Drainwater Heat Recovery	DWHR unit from NRCan approved list and with 42% efficiency or greater:	1200kWh
	Installed on vertical stacks serving two or more showers. Installed on vertical stack serving one shower.	600 kWh

Note: Only one credit per technology category may be applied, i.e. you may only select one lighting credit.

5. COMPLIANCE ALTERNATIVE

5.1 Performance Compliance with EnerGuide Rating

5.1.1. General

- 5.1.1.1. Refer to the *ENERGY STAR® for New Homes: Compliance Options* document for additional details on the performance path requirements. As noted in Section 2, all ENERGY STAR qualified new homes must comply with *NRCan's Minimum Requirements for ENERGY STAR Qualified New Homes* and *ENERGY STAR for New Homes: Compliance Options*. Additional specific requirements for performance path files for houses located in Ontario are detailed in this section.

5.1.2. Additional Requirements for Ontario

- 5.1.2.1. All performance evaluations are to be run using the appropriate version of the HOT2000 software in EnerGuide for New Homes mode using the as-built specifications of the building. Until further notice, for MURBS, HOT2000 version 10.5 or newer shall be used; for all other housing types, version 9.34C shall be used.
- 5.1.2.2. Where compliance is determined using the performance option, house elements shall comply with Table 5.1 and NRCan's *Minimum Requirements for ENERGY STAR Qualified New Homes*.
- 5.1.2.3. A credit for electricity and appliance savings may be entered on the Base Loads Energy Credits tab. The quantity of the eligible electrical savings credit is established

as per Section 4.9 of these specifications and must comply with NRCan's guidelines on the use of the electrical credits.

Table 5.1 Minimum Requirements for Performance Compliance

Element	Minimum Requirement
Minimum EnerGuide Rating	80 for all detached and attached housing types.
Ventilation	Ventilation systems as per Section 4.5 of these specifications.
Heating	Minimum requirements as per Section 4.6*.
Hot Water	Minimum requirements as per Section 4.8.
Duct Sealing	Required as per Section 4.7.
Ventilation Interconnect	Required as per Subsection 4.5.4.
Electricity & Appliance Savings	400 kWh/year for detached houses and 245 kWh/year for attached units. Credits as per section 4.9 and NRCan's policy on electrical credits.

* For natural gas/propane fireplaces, standing pilot models may be installed, but must be modeled as such.

APPENDIX A - EQUIVALENT ASSEMBLIES

House Component	Minimum Effective RSI(R) Value	Construction Method/Equivalent Assembly
Ceiling with Attic	6.5 (R37)	290mm (11.4") high density mineral fibre batt
		282mm (11.1") blown cellulose fibre (settled)
		381mm (15.0") blown mineral fibre (settled)
	7.7 (R44)	353mm (13.9") blown cellulose fibre (settled)
		470mm (18.5") blown mineral fibre (settled)
Ceiling without Attic	4.7 (R26.5)	89mm (3.5") 227g (half-pound) open-cell light density spray polyurethane foam (SPF) and 260mm (10.25") of blown cellulose fibre (settled)
		standard wood 38x235 (2x10) @ 400mm (16") o.c. with RSI 5.5 (R31) batts, wood I-joist, 240mm (9.5") @ 400mm (16") o.c. with RSI 4.9 (R28) batts
		wood I-joist, 240mm (9.5") @ 400mm (16") o.c. with 213mm (8.4") SPF*
Main Walls	3.0 (R17.3)	standard wood 38x140 (2x6) @ 400mm (16") o.c. with RSI 3.9 (R22) batts
		standard wood 38x140 (2x6) @ 400mm (16") o.c. with RSI 3.3 (R19) batt, + RSI 0.26 (R1.5) fibre board
		standard wood 38x89 (2x4) @ 400mm (16") o.c. with RSI 2.1 (R12) batt, + RSI 1.2 (R7) insulating board
	3.2 (R18.2)	standard wood 38x140 (2x6) @ 400mm (16") o.c. with 140mm (5.5") SPF*
		standard wood 38x140 (2x6) @ 600mm (24") o.c. with RSI 3.9 (R22) minimum
		standard wood 38x140 (2x6) @ 400mm (16") o.c. with RSI 4.2 (R24) batt
	3.8 (R21.3)	standard wood 38x140 (2x6) @ 490mm (19.2") o.c. with RSI 4.1.(R23) blown-in or batt
		standard wood 38x140 (2x6) @ 400mm (16") o.c. with RSI 3.3 (R19) batts, + RSI 0.9 (R5) insulating board
		standard wood 38x140 (2x6) @ 400mm (16") o.c. with RSI 3.9 (R22) batts, +RSI 0.7 (R3.8) insulating board
		standard wood 38x 89 (2x4) @ 400mm (16") o.c. with RSI 2.1 (R12) batts, + RSI 1.8 (R10) insulating board
Exposed Floors	5.1 (R29)	standard wood 38x89 (2x4) @ 400mm (16") o.c. with RSI 2.5 (R14) batts, + RSI 1.6 (R9) insulating board
		ICF** walls providing effective thermal resistance of not less than RSI 3.8 (R21.3)
		standard wood 38x140 (2x6) @ 400mm (16") o.c. with 140mm (5.5") SPF* + RSI 0.9 (R5) insulating board
		15.9mm (5/8") OSB subfloor, standard wood 38x235 (2x10) @ 400mm (16") o.c. with nominal RSI 5.5 (R31) insulation
		15.9mm (5/8") OSB subfloor, wood I-joist, 240mm (9.5") @ 400mm (16") o.c. with nominal RSI 4.9 (R28) insulation
Exposed Floors	5.1 (R29)	15.9mm (5/8") OSB subfloor, standard wood 38x184 (2x8) @ 400mm (16") o.c. with RSI 3.9 (R22.0) insulation + RSI 1.3 (R7.5) insulating board
		15.9mm (5/8") OSB subfloor, standard wood 38x235 (2x10) @ 400mm (16") o.c. with 213mm (8.37") 227g (half-pound) SPF* (nominal RSI 5.5 (R31))
		15.9mm (5/8") OSB subfloor, standard wood 38x235 (2x10) @ 400mm (16") o.c. with 213mm (8.37") 227g (half-pound) SPF* (nominal RSI 5.5 (R31))
		15.9mm (5/8") OSB subfloor, wood I-joist, 240mm (9.5") @ 400mm (16") o.c. with 213mm (8.4") 227g (half-pound) SPF* (nominal RSI 5.5 (R31))

*sprayed polyurethane foam - 227g (half-pound) open-cell light density

**insulated concrete form

House Component	Minimum Effective RSI(R) Value	Construction Method/Equivalent Assembly
Basement Walls	1.7 (R9.5)	RSI 1.8 (R10) insulating board applied inside (with gypsum board finish), or exterior side. standard wood 38x89 (2x4) @ 400mm (16") o.c. w/ RSI 2.1 (R12) batts RSI 2.1 (R12) roll blankets standard wood 38x 89 (2x4) @ 400mm (16") o.c. with 89mm (3.5") SPF* Any interior side basement wall insulation compliant with ENERGY STAR for New Homes standard, applied to the top 1.2m (4 ft.) of the wall, and not less than 0.6m (2 ft.) below grade, raised approximately 1.17m (46") above floor, and , insulation board of minimum RSI 0.7/R4 applied to the exterior side, extending from grade to footing, with an average overlap with the interior side insulation of not less than 0.6m (2'-0").
	2.6 (R14.6)	RSI 3.3 (R19) insulating board applied inside (with gypsum board finish), or exterior side. standard wood 38x89 (2x4) @ 400mm (16") o.c. offset w/ RSI 3.5 (R20) batts standard wood 38x89 (2x4) @ 400mm (16") o.c. offset with 140mm (5.5 ") SPF*

*sprayed polyurethane foam – 227g (half-pound) open cell light density

**insulated concrete form