



ENERGY STAR® for New Homes Technical Specifications

Acknowledgement

EnerQuality Corporation wishes to thank our consultants Bruce Gough, John Godden and Paul Duffy as well as the members of the Technical Steering Committee, with the support of Natural Resources Canada (NRCan), for developing this document.

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BETTER BUILT HOMES

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1. Overview

1.1. Scope

1.1.1. General

- (1) All ENERGY STAR¹ qualified new homes are required to comply with the most recent version of the ENERGY STAR for New Homes Technical Specifications.
- (2) This document describes the ENERGY STAR for New Homes Technical specifications Version 3.0. It is effective April 1, 2007 and applies to all homes enrolled in Ontario after April 1, 2007.
- (3) However, a house may be enrolled under Version 2.0 until September 30, 2007 if the builder is able to demonstrate one of the following exists for the house:
 - a. A building permit for the house has been issued prior to September 30, 2007, or
 - b. Substantially complete designs for the house have been developed
- (4) Where a house was enrolled prior to April 1, 2007, the applicable ENERGY STAR for New Homes Technical Specifications Version 1.0 or 2.0 may be used to certify the house as ENERGY STAR qualified. In all cases, any homes enrolled under a version older than Version 3.0 prior to April 1, 2007 will need to label the home ENERGY STAR qualified by March 30, 2009.
- (5) All ENERGY STAR qualified new homes are required to comply with all applicable legislation and regulations, and
- (6) Where these Technical Specifications are less than the requirements of the Ontario Building Code (OBC) 2007, the requirement of the OBC 2007 shall govern.

1.1.2. Eligible Housing Types

- (1) Except as provided in 1.1.2. (2), the Building Packages apply to all low-rise, residential types regulated by the OBC, Part 9 regardless of attachment, building orientation, distribution of windows, building size and eligible heating system type. This includes all forms of single detached, attached and stacked housing and various factory built homes including modular, panelized, SIP's, and ICF houses that require a foundation set and some site assembly.
- (2) The Building Packages do not apply to manufactured homes with a chassis, or to residential units in buildings of more than three floors in height above grade.

1.1.3. Compliance by Building Package

- (1) A table of minimum prescriptive building design specifications in Section 2 defines the Building Package (BP) for compliance as an ENERGY STAR qualified new home in each of the two climatic zones in Ontario.
- (2) Alternative Building Packages and trade-offs are described in Section 4, which provide compliance choices for the builder.
- (3) Each Building Package and the optional trade-offs have been pre-determined to meet or exceed the performance specifications of ENERGY STAR for New Homes.
- (4) Compliance with the Building Packages requires no HOT2000 software modeling.

1.1.4. Alternate Compliance with EGNH Software

- (1) An evaluation of a house using the EnerGuide for New Houses² (EGNH) Administrative and Technical Procedures (January 2005) may be used to determine compliance for a package of features that is not described by the Building Package and trade-offs (see Section 4.1).
- (2) The minimum EGNH rating for an ENERGY STAR qualified new home under this set of technical specifications is 80.

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² EnerGuide for New Houses is a trademark of Natural Resources Canada.

1.1.5. Administrative Procedures

- (1) These administrative procedures comply with the ENERGY STAR for New Homes Administrative Procedures (April 2007) issued by EnerQuality Corporation (EnerQuality).
- (2) The builder must hold a valid "Participant Administrative Arrangement - ENERGY STAR® for New Homes Builder/Evaluator" with NRCan and be trained and certified according to the latest ENERGY STAR for New Homes Administrative Procedures.
- (3) Certified Energy Evaluators (evaluators) must hold a valid "Participant Administrative Arrangement - ENERGY STAR® for New Homes Builder/Evaluator" with NRCan and be trained and certified by EnerQuality. A current list of evaluators is available from EnerQuality.
- (4) The builder chooses a Building Package and any optional trade-offs.
- (5) The builder must enroll each house intended to be ENERGY STAR qualified with EnerQuality upon sale or at a trigger point prior to construction such as the selection of upgrades.
- (6) The builder hires an evaluator to develop a custom package using the Building Packages and Trade-offs, or EGNH software, or for help determining how they will comply with the building package.
- (7) Once the house is under construction, the builder is required to hire an evaluator to conduct on-site inspections and verify that all the requirements of an ENERGY STAR qualified new home are present using a checklist and procedures prescribed by EnerQuality.
- (8) When compliance is verified and any deficiencies are corrected, an ENERGY STAR for New Homes label will be issued to the builder to affix to the electrical panel of the home.
- (9) The evaluator will forward completed checklists to EnerQuality who will perform quality assurance reviews of the evaluator's work.

1.2. Inspection Protocol

1.2.1. General

- (1) Inspection and certification of an ENERGY STAR qualified new home may only be conducted by a third party evaluator certified by EnerQuality. All homes enrolled to be ENERGY STAR qualified are required to be inspected during construction by an evaluator to confirm compliance with these technical specifications either by the Single Unit Inspection Method or by Sampling Inspection Method as described in the ENERGY STAR for New Homes Administrative Procedures.

1.2.2. Inspection of Modular Homes

- (1) In-plant sampling may be arranged for manufacturers of modular homes for those items that cannot be inspected on site. In-plant inspection sampling will be performed upon the first production house manufactured to a new Building Package and then upon a sample rate as may be agreed between the evaluator and the manufacturer.
- (2) Factory-built modular homes must receive the second (final) on-site inspection of the Single Unit Inspection Method.

2. Core Building Packages

Table 2.1.

Core Building Packages for ENERGY STAR Qualified New Homes in Ontario

<i>Element</i>	<i>Minimum Requirement (South ≤5000 DDC)</i>	<i>Minimum Requirement (North >5000 DDC)</i>	<i>See Also Section #</i>
Windows, Sliding Glass Doors and Skylights	ENERGY STAR qualified windows Canada Zone B	ENERGY STAR qualified windows Canada Zone C	3.1.1
Window Area	≤ 13% of above grade boundary wall area		3.1.1
Exterior Doors	Insulated slab door		3.1.2
Heated Ceiling w/ attic	R40	R50	3.2.1
Heated Ceiling w/o attic	R31		3.2.2
Exterior Walls	R19+5 ^(1,3)	R19+7.5 ^(1,3)	3.3, 4.0
Exposed Floors	R31		3.4
Basement Walls	full height, R12 ⁽³⁾	full height, R+15 / R19	3.5
Slab w/o in-floor heating > 4 ft below grade:	un-insulated	un-insulated	3.6.1
< 4 ft below grade:	R+10 frost wall	R+15 frost wall	3.6.2-3
Slab w/ in-floor heating	R+10, full slab		3.6.4
House Air Leakage	Detached Homes: Air Leakage test: Less than 0.2 cfm50/ft ² Attached Homes: Air Leakage test: Less than 0.286 cfm50/ft ²		3.7
Ventilation	Detached homes: HRV with min. sensible efficiency of 60% at 0C ⁽³⁾ Attached Homes: Exhaust Fan without heat recovery Plus: Forced air distribution is required to be interconnected with the operation of the principal exhaust fan or HRV.		3.8, 4.0 3.8.4
Space Heating	Fuel: ENERGY STAR qualified equipment Electrical: special requirements		3.9.1 3.9.4
Ducts	All ducts are to be located within the heated boundary. All supply trunks, supply branch take-offs, return trunks, and lined joists are to be sealed.		3.9.3
Water Heating	Fuel: Canadian Minimum Efficiency requirements Electrical: Minimum EF 0.92		3.10
Electrical Savings	A minimum savings of 600, 800, 1000 or 1200 kWh/yr depending upon the finished floor area of the home.		3.11
ENERGY STAR Branding	Unless otherwise noted elsewhere in this document, all windows and all space heating equipment are required to be ENERGY STAR qualified. All products selected for the Electricity Savings credits in Section 3.11 that are installed in an ENERGY STAR qualified new home at time of sale, are required to be ENERGY STAR qualified, whenever a Canadian ENERGY STAR specification applies.		3.1 3.9.1 3.11
<p>(1) Thermal resistances in this table are minimum nominal values that are contained in standard wood framing members and exclude the resistance of any other non-insulating layer in the assembly. A "+" designates insulation that is applied continuously over framing or solid walls without thermal bridging by wood or metal members. R19 is the nominal thermal resistance of R20 batts which are compressed to fit in a 2x6 cavity.</p> <p>(2) Assemblies which provide the equivalent effective thermal resistance are listed in Section 3 for each major element of this table. The determination of effective thermal resistances with framing members is described in Section 4.2.</p> <p>(3) Alternative Building Packages and trade-offs are described in Section 4 which permit the builder to choose other exterior walls, ventilation, basement walls and heating equipment.</p>			

3. Guidelines for Building Packages

3.1. Windows and Doors

3.1.1. Windows, Sliding Glass Doors and Skylights

- (1) All windows, glass doors and skylights are required to be ENERGY STAR qualified windows as zone B for Southern Ontario (less than or equal to 5000 Degree Days Celsius (DDC)) and as zone C for Northern Ontario (greater than 5000 DDC).
- (2) In order to be ENERGY STAR qualified, a window manufacturer is required to provide NRCan evidence of software simulation results under NFRC 100/200 or CSA A440.2 for each window model. Windows and glass doors may comply either by U-value or by Energy Rating (ER). Skylights may comply by their U value only. Table 3.1.1. below summarizes these requirements by climate zone.
- (3) Up to 15 ft² of the windows and glass doors in a house are exempt from these requirements. Where the glazed area of doors is less than 50% of the door area, it is also exempt from these requirements.
- (4) Except as provided in (6) or (7) below, the total area of all windows, sliding glass doors and skylights is limited to 13% of the boundary wall area.
- (5) The boundary 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 area the boundary wall area includes walls which are common to another heated unit.
- (6) The area of windows may be increased from 13% to 16% of the boundary wall area if any of the following trade-offs are applied, providing the trade-off is not applied as a trade-off for other elements of the Alternative Building Packages in Section 4.:
 - (a) Windows which qualify for ENERGY STAR Zone C are substituted in the South, or which qualify for Zone D are substituted in the North, **or**,
 - (b) An additional electrical savings credit is provided as per Section 3.11 equal to not less than 50% of the target amount on a floor area basis, **or**,
 - (c) An HRV with a minimum average sensible efficiency of not less than 67% at 0C is installed.
- (7) The area of windows may be increased above 16% without limit if any of the following trade-offs are applied, providing the trade-off is not applied as a trade-off for other elements of the Alternative Building Packages in Section 4.:
 - (a) Windows which qualify for ENERGY STAR Zone C are substituted in the South, or which qualify for Zone D are substituted in the North, **and** an additional electrical savings credit is provided as per Section 3.11 equal to not less than 50% of the target amount on a floor area basis.
 - (b) An HRV with a minimum average sensible efficiency of not less than 75% at 0C is installed.
 - (c) A dual fuel heat pump or a geothermal heat pump is installed (a dual fuel or a geothermal heat pump may be used for multiple trade-offs).

**Table 3.1.1.
Summary of Requirements for ENERGY STAR Qualified Windows and Sliding Glass Doors for ENERGY STAR Qualified New Homes in Ontario**

Zone	Degree Days Celsius	U-Value Compliance Minimum ⁽¹⁾ W/m ² (Btuh/ft ² .F)	ER Compliance Maximum ⁽¹⁾		Skylights U-Value W/m ² (Btuh/ ft ² .F)
			ERop / ERfix 2004 Standard	ERop / ERfix 1998 Standard	
A	<3500	2.0 (0.35)	17 / 27	(-16 / -6)	3.10 (0.54)
B	3500-5000	1.8 (0.32)	21 / 31	(-12 / -2)	2.80 (0.50)
C	5001-8000	1.6 (0.28)	25 / 35	(-10 / 0)	2.60 (0.46)
D	>8000	1.4 (0.25)	29 / 39	(-8 / +2)	2.38 (0.42)

1. Refer to www.energystar.gc.ca for detail of the technical criteria and listings of approved products.

3.1.2. Exterior Doors

- (1) The door panels of exterior doors and door entry systems are required to contain an insulated core.
- (2) One exterior door entry system per home may be exempted from this requirement.

3.2. Heated Ceiling Assemblies

3.2.1. Ceilings With Accessible Attics

- (1) The minimum nominal thermal resistance for ceilings with accessible attics is R40 in the South and R50 in the North. Tables 3.2.1.A and 3.2.1.B list the minimum depth of common attic insulation products to provide the required nominal resistances.
- (2) For ceilings with accessible attics the nominal resistance value is required to be increased by 25% if the depth of insulation at the inside edge of the exterior bearing wall is reduced by more than 40%. This requirement is intended to encourage raised heel trusses and other solutions that reduce heat loss at roof edges, and help reduce roof/ice damming. There are many variables that affect the depth of insulation including the thickness of the wall, the size and geometry of the truss chord members at the wall bearing, the slope of the roof, the allowance for venting under the roof sheathing, and the type and depth of roof insulation. For example, if the top truss chord is a 2x6, the depth of insulation 10.5", the wall a 2x6, the vent space 2.5", then a roof slope of 7:12 or greater will provide less than 40% compression.

Table 3.2.1.A
Equivalent Ceiling w/ Attic Insulation for Nominal R40 (\leq 5000 DDC)

11.4" high density mineral fibre batt
11.1" blown cellulose fibre (settled)
12.1" blown mineral fibre (settled)
Any attic insulation product which provides a minimum nominal resistance of R40

Table 3.2.1.B
Equivalent Ceiling w/ Attic Insulation for Nominal R50 (>5000 DDC)

13.9" blown cellulose fibre (settled)
15.2" blown mineral fibre (settled)
Any attic insulation product which provides a minimum nominal resistance of R50

3.2.2. Ceilings Without Accessible Attics

- (1) For ceilings without accessible attics the minimum nominal resistance value is R31 in standard 2x10 wood framing. Other assemblies which provide an equivalent effective resistance are described in Table 3.2.2. The same values apply to both climate zones.
- (2) The area of ceiling without an attic shall not cover more than 33% of the insulated ceiling area.
- (3) The area of ceilings without attics may be increased without limit if any of the following trade-offs are applied, providing the trade-off is used only once and has not been applied as a trade-off for other elements:
 - (a) The thermal resistance is increased to a nominal value of R40.
 - (b) An HRV with a minimum sensible efficiency of 65% at 0C.
 - (c) A furnace with a minimum AFUE of 92% is installed.
 - (d) An additional 400 kWh of electrical savings are provided as per Section 3.11.
 - (e) A dual fuel heat pump or a geothermal heat pump is installed (a dual fuel or a geothermal heat pump may be used for multiple trade-offs).

**Table 3.2.2.
Equivalent Heated Ceiling Assemblies w/o Attic for R31 (both climate zones)**

standard wood 2x10 @ 16" o.c. with R31 batts,
wood I-joist, 9.5" @ 16" o.c. with R28 batts,
steel 2x10 @ 24" o.c. with R 28 batts, + R10 insulating board
SIPS roof panels wood 2x8 @ 48" o.c. with 7 1/4" type 1 EPS core or equivalent
Any wall exceeding these specifications, or any wall with an effective resistance equal or greater than R26.5, or as calculated for the roof with R31 batts above.

3.3. Main Wall Assemblies

3.3.1. General

- (1) Sample equivalent wall assemblies for the core Building Package requirements of Section 2 are provided in Tables 3.3.1.A for R19+5 assemblies in the South Climate Zone.
- (2) Sample equivalent wall assemblies which are permitted as Trade-Off Main Walls as per Section 4 Alternate Building Packages, are provided in Table 3.3.2.A for the South Climate Zone.
- (3) Sample equivalent wall assemblies for the core Building Package requirements of Section 2 are provided in Tables 3.3.1.B for R19+7.5 assemblies in the North Climate Zone.
- (4) Sample equivalent wall assemblies which are permitted as Trade-Off Main Walls under Section 4 Alternate Building Packages and Trade-Offs are provided in Table 3.3.2.B for the North Climate Zone.
- (5) Wood framing in the tables is described in terms of the stud spacing and as either standard or advanced. A description of standard and advanced framing area percentages is reviewed in Table 4.2.1.

**Table 3.3.1.A
Equivalent Main Wall Assemblies for R19+5 (≤5000 DDC)**

standard wood 2x6 @ 16" o.c. with R19 batts, + R5 insulating board
standard wood 2x6 @ 16" o.c. with R22 batts, + R3.8 insulating board
advanced wood 2x6 @ 19.2" o.c. with R22 batts, + R2.7 insulating board
standard wood 2x4 @ 16" o.c. with R12 batts, + R10 insulating board
standard wood 2x4 @ 16" o.c. with R14 batts, + R9 insulating board
steel 2x6 @ 16" o.c. with R 20 batts, + R10 insulating board
SIPS wall panels wood 2x6 @ 48" o.c. with 5 1/2" type 1 EPS core or equivalent
ICF walls providing effective thermal resistance of not less than R21.3
Any wall exceeding these specifications, or any wall with an effective resistance equal or greater than of R21.3, or, as calculated for the wall with R19 batt + R5 ins. bd. above.

**Table 3.3.1.B
Equivalent Main Wall Assemblies for R19+7.5 (>5000 DDC) TO BE CHANGED**

standard wood 2x6 @ 16" o.c. with R19 batts, + R7.5 insulating board
standard wood 2x6 @ 24" o.c. with RSI 22 batts, + R6 insulating board
steel 2x6 @ 16" o.c. with R 22 batts, + R12 insulating bd.
SIPS wall panels wood 2x8 @ 48" o.c. with 7 1/4" type 1 EPS core or equivalent
Any wall exceeding these specifications, or any wall with an effective resistance equal or greater than of R24, or, as calculated for the wall with R19 batt + R7.5 ins. bd. above.

3.3.2. Trade-Offs for Main Walls

**Table 3.3.2.A
Trade-Offs for Main Walls (≤ 5000 DDC)**

<i>Substitute any of the following as permitted by the Alternate Building Packages, South Climate Zone, Section 4.2</i>
standard wood 2x6 @ 16" o.c. with R22 batts
standard wood 2x6 @ 16" o.c. with R19 batt, + R1.5 fibre board
advanced wood 2x6 @ 19.2" o.c. with R19 batt
standard wood 2x4 @ 16" o.c. with R14 batt, + R5 ins. board
standard wood 2x4 @ 16" o.c. with R13 batt, + R6 ins. board
standard wood 2x4 @ 16" o.c. with R12 batt, + R7 ins. board
Any wall exceeding these specifications or any wall with an effective resistance equal or greater than of R17.3 or as calculated for the wall with R14 batt + R5 ins. bd. above.

**Table 3.3.2.B
Trade-Offs for Main Walls (>5000 DDC)
TO BE CHANGED to R19+5 AND RELOCATED TO SECTION 4**

<i>Substitute:</i>
standard wood 2x6 @ 19.2" o.c. with R21.5 batts, + R1.5 fibre board
standard wood 2x6 @ 24" o.c. with R22 batts, 1/2" asphalt impregnated fibre board
2x6 steel wall @ 16" o.c. with R20 batts, + R7.5 ins. board
Any wall exceeding these specifications, or any wall with an effective resistance equal or greater than of R21.3, or as calculated for the wall with R19 batt + R5 ins. bd. above.
<i>Add any of the following:</i>
HRV with min. sensible efficiency of 60% at 0C.
<i>Or</i>
Water heater with a min. EF of 0.85
<i>Or</i>
ENERGY STAR Zone C windows (U =< 0.28), 10.5% wall area limit
<i>Or</i>
ENERGY STAR Zone D windows (U =< 0.25), 12.5% wall area limit
<i>Or</i>
ICF Basement Wall providing effective thermal resistance of not less than R24, and Perimeter 2 ft sub-slab insulation of minimum R5

3.4. Exposed Floors

3.4.1. Minimum Nominal Resistance

- (1) For exposed floors the minimum nominal resistance value is R31 in standard 2x10 wood framing. Other assemblies which provide an equivalent effective resistance are described in Table 3.4.1. The same values apply to both climate zones.

**Table 3.4.1.
Equivalent Exposed Floor Assemblies for Nominal R31 (both climate zones)**

5/8" OSB subfloor, standard wood 2x10 @ 16" o.c. with nominal R31 insulation
5/8" OSB subfloor, wood I-joist, 9.5" @ 16" o.c. with nominal R28 insulation
5/8" OSB subfloor, standard wood 2x8 @ 16" o.c. with R21.5 insulation + R7.5 insulating board
Any floor assembly with an effective thermal resistance of not less than R29.

3.5. Basement Wall Assemblies

3.5.1. General

- (1) All enclosed crawlspaces in contact with the ground are required to be conditioned and the same insulation requirements apply to crawlspaces as for basements.
- (2) These requirements apply to basement walls which extend on average no more than 2 ft. above grade. Where a basement wall extends more than 4 ft. above grade the requirements of Main Walls in Section 3.3 apply.
- (3) Full height insulation is intended to cover the entire area of the basement wall. A small gap of 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 4 ft. below grade. Where the floor of a shallow basement is less than 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) Tables of equivalent full height basement wall assemblies for the Building Packages are provided in Tables 3.5.1.A and 3.5.1.B.
- (5) Alternate basement walls which permit the builder to lift interior-side insulation above the floor are described in Sections 3.5.2.A and 3.5.2.B.

**Table 3.5.1.A
Full Height Basement Wall Assemblies for R12 (≤5000 DDC)**

R12 insulating board applied inside (with gypsum board finish), or exterior side.
wood 2x4 @ 16" o.c. w/ R12 batts
R12 roll blankets
wood 2x3 @ 16" o.c., w/ R8 batts + min. R4 insulating board applied to concrete wall
steel 2x4 @ 24" o.c. with R 12 batts + min. R4 insulating board applied to concrete wall
Any basement wall assembly that extends full height with an effective thermal resistance greater than R12 in 2x4 wood framing @ 16" o.c. excluding the resistance of air films and concrete.

**Table 3.5.1.B
Full Height Basement Wall Assemblies for R+15 / R19 (>5000 DDC)**

R15 insulating board applied inside (with gypsum board finish), or exterior side.
wood 2x6 @ 16" o.c. with R 19 batts
wood 2x4 @ 16" o.c. with R 12 batts + min. R5 insulating board applied to concrete wall
wood 2x3 @ 16" o.c., with R8 batts + min. R8 insulating board applied to concrete wall
steel 2x4 @ 24" o.c. with R 12 batts + min. R8 insulating board applied to concrete wall
Any basement wall assembly that extends full height with an effective thermal resistance greater than R15 excluding the resistance of air films and concrete.

3.5.2. Basement Walls with Raised Interior Insulation

Table 3.5.2.A
Basement Walls with Raised Interior Insulation (≤ 5000 DDC)

<i>Substitute:</i>
Any interior side basement wall insulation, compliant with ≤ 5000 DDC climate zone, applied to the top 4 ft. of the wall, and not less than 2 ft. below grade, raised approx. 46" above floor.
<i>Add:</i>
Insulating board of minimum R4 applied to the exterior side, extending from grade to footing, with an average overlap with the interior side insulation of not less than 2'-0".

<i>Substitute:</i>
Interior side basement wall insulation raised not more than 12" above floor
<i>Add any of the following:</i>
Any interior side basement wall insulation compliant with South Climate Zone and furnace with min. AFUE of 94%.
<i>Or</i>
Any interior side basement wall insulation compliant with North Climate Zone.

Table 3.5.2.B
Basement Walls with Raised Interior Insulation (> 5000 DDC)

<i>Substitute:</i>
Any interior side basement wall insulation, compliant with > 5000 DDC climate zone, applied to the top 4 ft of the wall, and not less than 2 ft below grade, raised approx. 46" above floor.
<i>Add:</i>
Insulating board of min. R5 applied to the exterior side, extending from grade to footing, with an average overlap with the interior side insulation of not less than 2'-0".

3.6. Floor Slab on Ground

3.6.1. Deep Basement Slab

- (1) No insulation is required under or around a slab on ground which is greater than 4 ft below grade.

3.6.2. Slab with Frost Walls

- (1) These requirements apply where a slab on ground is less than 4 ft below grade and a frost wall extends below the slab at the exterior perimeter of the building. This includes slab on grade foundations where the entire perimeter is at or above grade, walk-out basement slabs where at least one edge of a slab is less than 2 ft below grade and to shallow basements less than 4 ft below grade.
- (2) Insulation shall be applied on the frost walls around the slab on ground. Insulation may be applied on either the interior or exterior side of the frost wall, and shall extend vertically from the slab to the top of the footing of the frost wall, not less than 4 ft below grade. The minimum thermal resistance of the insulation on the frost wall shall be R10 in the South (≤ 5000 DDC) and R15 in the North (> 5000 DDC).
- (3) A thermal break of not less than R5 shall extend between the edge of the slab and the frost walls.
- (4) Insulation on the interior side basement walls or main walls is required to extend to the slab without a gap where the slab is less than 4 ft below grade.
- (5) Pony walls around a walk-out basement of wood frame construction shall be the same construction and thermal resistance as the main exterior walls.

- (6) No insulation is required on common walls between units where insulation is applied on the exterior side of the frost wall. Where a frost wall is insulated on the interior side of attached units, the insulation shall extend on the party wall frost wall foundation to an equivalent distance as the depth of the frost wall below the slab.

3.6.3. Slab with Grade Beam

- (1) These requirements apply for insulation where a slab on ground has a perimeter grade beam and no frost wall.
- (2) The minimum thermal resistance of the insulation shall be R10 in the South (≤ 5000 DDC) and R15 in the North (> 5000 DDC).
- (3) Insulation shall be applied under the slab extending horizontally for not less than 4 ft from the inside edge of the perimeter grade beam.
- (4) Insulation shall be applied around all sides of the perimeter grade beam such that the insulation is continuous from the horizontal insulation under the slab, down the inside of the grade beam under the grade beam and up the full height of the grade beam on the exterior side.

3.6.4. Slab with In-floor Heating

- (1) Full sub-slab insulation is required in any slab with in-floor heating regardless of the depth below or above grade. The sub-slab insulation is to be a minimum of R10 in the South (≤ 5000 DDC) or R15 in the North (> 5000 DDC).
- (2) Where a walk out or slab on grade is provided with in floor heating, insulation shall be provided both on the frost walls and under the full slab.

3.7. Whole House Air Leakage

3.7.1. General

- (1) All ENERGY STAR New Homes must meet a Normalized Leakage Rate (NLR) of not more than 0.2 cfm50/ft² (1.0 L/s50/m²). 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.
- (2) The Normalized Leakage Area (NLA) is an alternate compliance measure and is to be less than 2.0 in²/100 ft² (1.4 cm²/m²) of the heated boundary area, where the leakage area is determined by CAN/CGSB 149.10 at 10 Pa. The total 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 heated and which are common with adjacent units. The boundary wall area is determined using the exterior dimensions of exterior walls and walls common to other units.
- (3) In the case of attached residential units whether row, semi, or stacked, the maximum NLR is 0.286 cfm50/ft² (1.43 L/s50/m²), or the maximum NLA is 2.86 in²/100 ft² (2.0 cm²/m²).
- (4) 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.

3.8. Mechanical Ventilation and Ventilation Distribution

3.8.1. General

- (1) A principal exhaust fan is required in all ENERGY STAR qualified new homes with a minimum ventilation capacity as described in the OBC 9.32.
- (2) Additional requirements to those of the OBC are described for principal exhaust fans without heat recovery, for heat recovery ventilators and for the ventilation distribution system.

3.8.2. Principal Exhaust Fans Without Heat Recovery

- (1) A principal exhaust fan without heat recovery may be used in attached forms of ENERGY STAR qualified new homes.

- (2) A principal exhaust fan without heat recovery may also be used in detached homes with certain alternative Building Packages which are described in Section 4.
- (3) The principal exhaust fan must be intended for continuous operation. Surface mounted principal exhaust fans are required to be rated at or less than 1.5 sones by data published by HVI and to be ENERGY STAR qualified.

3.8.3. Heat Recovery Ventilators (HRVs)

- (1) An HRV is required to be installed as the principal exhaust fan in single detached ENERGY STAR qualified new homes unless a principal exhaust fan without heat recovery is selected as part of an Alternative Building Package in Section 4.
- (2) An HRV is not required in an attached ENERGY STAR qualified new home unless chosen as part of an Alternative Building Package in Section 4.
- (3) An HRV is required to be installed such that the supply and exhaust flows are measured and balanced within 10% 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.
- (4) An HRV is required to have a minimum sensible efficiency of not less than 60% at 0C as determined by data published by HVI.

3.8.4. Ventilation Distribution System

- (1) The principal exhaust fan control is required to be interconnected with a forced air distribution system such that switching on the principal exhaust fan operates the forced air system. This may require installation of a 110/24 Volt relay to activate the G line leading from the thermostat to the furnace. HRV's may have a relay incorporated in their control board for this purpose.
- (2) A ventilation distribution system is required to distribute the ventilation air of the principal exhaust fan throughout the house. The 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 (bedrooms, living area and any floor without either). A dedicated, branched ventilation supply and/or exhaust system is required only if the house has radiant heating. Distribution from/to an HRV may otherwise be simplified and connected directly to the furnace return.

3.9. Space Heating & Cooling Systems

3.9.1. Eligible Equipment

- (1) Table 3.9.1 lists the eligible space heating systems which may be used in ENERGY STAR qualified new homes.
- (2) Electric resistance systems and air source heat pumps for space heating are permitted but require additional controls and measures which are described in Section 3.9.4.
- (3) Fuel based space heating equipment in attached unit housing is exempted from the requirements for furnaces, hydronic/combination and cooling equipment in the table below where the space heating design load is 35,000 Btu/h or less. In these cases the following are permitted:
 - (a) Packaged heating / cooling equipment certified as "space constrained" under DOE 10 CFR Part 30 with an AFUE \geq 80% and a SEER of \geq 10.6.
 - (b) Combination water heaters with a minimum thermal efficiency of 76%.

**Table 3.9.1.
Requirements for Heating and Cooling Equipment
in ENERGY STAR Qualified New Homes**

<i>Fuel</i>	<i>Equipment</i>	<i>Requirement</i>
All	Thermostats	ENERGY STAR qualified ⁽¹⁾ thermostats.
Natural Gas / Propane	Furnace (> 35000 Btuh)	ENERGY STAR qualified ⁽¹⁾ furnace with minimum AFUE of 90%.
	Hydronic / Combination (> 35000 Btuh)	ENERGY STAR qualified ⁽¹⁾ boiler with minimum AFUE of 85% or water heater with 0.85 EF.
	Fireplace	Direct vent gas fireplace.
Oil	Furnace	Furnace with minimum AFUE of 85%. ⁽¹⁾
	Hydronic / Combination	ENERGY STAR qualified ⁽¹⁾ boiler with minimum AFUE of 85%.
Electricity	Resistance Heating Air Source Heat Pump	See special requirements for electric heating in Section 3.9.4. ENERGY STAR qualified ⁽¹⁾ split system air source heat pump equipment with minimum HSPF (zone V) of 7.1 or SEER of 14
	Ground Source Heat Pump	ENERGY STAR qualified ⁽¹⁾ GSHP w/ integrated demand water heater. Direct Expansion – minimum 15 EER / 3.5 COP Closed Loop – minimum 14.1 EER / 3.3 COP
Dual Fuel	Fuel based space heating and ASHP	Any fuel based furnace or combination heating system and ASHP where the fuel system is designed for peak heating loads and both the fuel system and the air source heat pump comply with these requirements.
Cooling	Split System AC Single Package AC	ENERGY STAR qualified with minimum 14 SEER, EER 11.5 or SEER 13 installed with an air handler with an ECM motor. ENERGY STAR qualified with minimum 14 SEER, EER 11.0
Wood	Fireplace / Stove	Certified by EPA, 40 CFR Part 60 or equivalent. Plus: HRV, CO detector per OBC 9.32.3.8
1. Equipment is required to be ENERGY STAR qualified or to comply with the stipulated minimum efficiency requirement as verified by information published by GAMA, ARI.		

3.9.2. Combustion Venting

- (1) All combustion exhaust systems in furnaces, boilers, water heaters and gas fireplaces are required to be non-spillage susceptible with direct venting or power venting.
- (2) Where a combustion air supply duct is provided that terminates in conditioned space, 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. Water heaters with more than 50,000 BTUH input capacity and which are not provided with electrical contacts by the manufacturer for control of remote devices are exempt from this requirement.

3.9.3. Ducts

- (1) All ducts for heating, ventilation and air conditioning distribution must be located within the heated boundary.
- (2) All main trunk ducts for the supply and return of air distribution systems, and all branch take-offs and joist lined returns on the same floor level as the main trunk ducts are required to be sealed with foil tape or mastic sealant such that no significant leakage points are observable by visual inspection.
- (3) HRV connections to the outdoor vent hoods must be sealed and insulated.

3.9.4. Building Packages with Electric Space Heating

- (1) A building is electrically heated if more than 10% of the heating load is provided by resistance heating.
- (2) Dual-fuel air source heat pumps with fuel back up heating and geothermal heat pumps are exempt from these requirements.
- (3) A building package is presented in table 3.9.4.1. for certification of ENERGY STAR qualified new homes with electric space heating. This table applies to all homes which are located in either climate zone.
- (4) Where electric baseboards are used, a line voltage thermostat that meets CAN/CSA C828 is required to be installed.
- (5) Additional requirements may be introduced for electric thermal storage (ETS). Electric thermal storage technologies are being developed which enable peak load reductions and the storage of thermal energy derived from electricity during off-peak periods.

**Table 3.9.4.1.
Building Package for ENERGY STAR Qualified New Homes with Electric Space Heating (all climate zones)**

<i>Element</i>	<i>Requirement</i>
Windows, Sliding Glass Doors	ENERGY STAR qualified windows labeled as Zone D and complying with a maximum U-value of 1.4 W/m ² K (triple)
Heated Ceiling w/ attic	R50 (nominal)
Exterior Walls	R29 (nominal)
Basement Walls	R19 (nominal)
Ventilation	HRV w/ minimum sensible efficiency of 60% at 0C
Other elements	ENERGY STAR Core Building Package Section 2
Air Leakage Control	ENERGY STAR Core Building Package

3.10. Water Heaters

3.10.1. General

- (1) All combustion heating equipment for boilers and water heaters is required to be direct vented or power vented and to be non-spillage susceptible.
- (2) There is no ENERGY STAR qualification for water heaters. Oil and gas water heaters are required to comply with Canada's minimum Energy Efficiency Regulations which are reviewed in Table 3.10.1.
- (3) Electric resistance systems for water heating are permitted but require improved performance, represented by a minimum energy factor (EF).

**Table 3.10.1.
Requirements for Water Heaters**

<i>Fuel</i>	<i>Equipment</i>	<i>Requirement</i>
Natural Gas / Propane	Water Heater	Canada's Energy Efficiency Regulations EF ≥ 0.67 – 0.0005V, V= volume in Litres.
Oil	Water Heater	Canada's Energy Efficiency Regulations EF ≥ 0.59 – 0.0005V, V = volume in Litres.
Electricity	Water Heater	EF ≥ 0.92 Storage tank type only, no instantaneous electric permitted.

3.10.2. Drainwater Heat Recovery (DHR)

- (1) Drainwater Heat Recovery (DHR) technology has demonstrated a significant potential to reduce energy use and peak loads for water heating and is eligible for credits in ENERGY STAR qualified new homes using one of the options below:
 - (a) Under Section 3.11 Electrical and Appliances Savings Requirements, or under Section 3.12 Fuel Savings Credits.
 - (b) Using a combined energy factor (EF) with a hot water heater, it may meet the EF requirements for water heaters in the Alternative Building Packages described in Section 4.
 - (c) Using a combined EF with a hot water heater, or as an Energy Credit, it may be part of alternate compliance using EGNH software as described in Section 5.1.
- (2) The combined EF may be calculated as shown in the paper "Drainwater Heat Recovery Credits for ENERGY STAR Qualified New Homes", Energy Building Group Ltd., 21 March, 2006.
- (3) The product must be labeled: "Approved for Potable Water". The product must be certified by a Canadian licensed certification company such as ULC, CSA, ETL, etc.
- (4) The product must be tested for heat exchange effectiveness at 9.5 lpm flow using hot water drain at 41.0C and entering water supply no greater than 9.5C.
- (5) The product must be installed according to the manufacturer's instructions.
- (6) Where a single DHR unit is installed in a house with two or more stacks the credit must be reduced by 1/3 if not connected to all the showers in the house.

3.11. Electricity & Appliances Savings Requirements

3.11.1. General

- (1) An electricity and appliances savings target is required for each ENERGY STAR qualified new home on a finished floor area basis:

(a) Greater than 2580 ft ² (240 m ²):	1200 kWh
(b) 1940 – 2580 ft ² (180 m ²):	1000 kWh
(c) 1290 – 1940 ft ² (120 – 180 m ²):	800 kWh
(d) Less than 1290 ft ² (120 m ²):	600 kWh
- (2) Table 3.11.1 lists the electricity and appliance choices and credits.
- (3) Unless otherwise noted elsewhere in this document, all products that are required to achieve the Electricity and Appliances Savings are required to be ENERGY STAR qualified, whenever a Canadian ENERGY STAR specification applies.
- (4) Items selected elsewhere for trade-offs and alternate building packages may not also be selected for the electricity and savings credits.

**Table 3.11.1.
Electricity & Appliance Savings Credits**

<i>Technology</i>	<i>Eligibility</i>	<i>Formula (reduce consumption by)</i>	<i>Credit</i>
Heating Distribution	<ul style="list-style-type: none"> ○ Furnace or air handler with variable speed ECM™ motor 	<ul style="list-style-type: none"> ○ 700 kWh 	
Ventilation Distribution	<ul style="list-style-type: none"> ○ HRV w/ ECM™ motor 	<ul style="list-style-type: none"> ○ 200 kWh 	
	<ul style="list-style-type: none"> ○ Conventional PSC motor forced air system with interval controller to result in max. 50% ventilation on time, low speed 	<ul style="list-style-type: none"> ○ 400 kWh 	
	<ul style="list-style-type: none"> ○ Conventional PSC motor forced air low speed tap for ventilation distribution 	<ul style="list-style-type: none"> ○ 100 kWh 	
	<ul style="list-style-type: none"> ○ ENERGY STAR bathroom exhaust fans 	<ul style="list-style-type: none"> ○ 50 kWh ea. 	
	<ul style="list-style-type: none"> ○ Dedicated fully-ducted supply and exhaust ventilation system with an HRV or balanced fans, operated without a central forced air furnace or air handler. 	<ul style="list-style-type: none"> ○ Conventional HRV: 600 kWh ○ HRV w/ ECM™ motor: 800 kWh 	
Lighting	<ul style="list-style-type: none"> ○ ENERGY STAR labeled compact fluorescent lamps (CFL), or, T5 or T8 linear fluorescent (LF) bulbs, installed in hardwired fixtures. ○ Halogen mr16 lamps less than 50W 	<ul style="list-style-type: none"> ○ #CFL/T5 x 40 kWh ○ #T8 x 70 kWh ○ # x 20 kWh 	
Air Conditioning	<ul style="list-style-type: none"> ○ ENERGY STAR labeled air conditioning equipment of minimum 14 SEER or equivalent equipment as per Section 3.9. ○ Output not to exceed 100% of design load unless a two stage system 	<ul style="list-style-type: none"> ○ 100 kWh 	
	<ul style="list-style-type: none"> ○ All CFL lighting w/ eligible AC ○ Air handler w/ ECM motor w/ eligible AC ○ ERV w/ eligible AC ○ ENERGY STAR qualified windows with an average SHGC of less than 0.40 	<ul style="list-style-type: none"> ○ 100 kWh ○ 100 kWh ○ 100 kWh ○ 300 kWh 	
Clothes Washer	<ul style="list-style-type: none"> ○ Front loading ENERGY STAR qualified washer ○ Top loading ENERGY STAR qualified 	<ul style="list-style-type: none"> ○ 450 kWh ○ 150 kWh 	
Refrigerator	<ul style="list-style-type: none"> ○ ENERGY STAR qualified refrigerator 	<ul style="list-style-type: none"> ○ 150 kWh 	
Dishwasher	<ul style="list-style-type: none"> ○ ENERGY STAR qualified dishwasher 	<ul style="list-style-type: none"> ○ 100 kWh 	
Gas Appliances	<ul style="list-style-type: none"> ○ Gas Pre-Piped to kitchen range location and/or clothes dryer location 	<ul style="list-style-type: none"> ○ 100 kWh each 	
	<ul style="list-style-type: none"> ○ Gas kitchen range installed 	<ul style="list-style-type: none"> ○ 400 kWh 	
	<ul style="list-style-type: none"> ○ Gas dryer installed 	<ul style="list-style-type: none"> ○ 600 kWh 	
Drainwater Heat Recovery	<ul style="list-style-type: none"> ○ With electric water heater and DHR unit of minimum 48" length 		
	<ul style="list-style-type: none"> ○ Installed on stack with all showers ○ Installed on stack with most showers 	<ul style="list-style-type: none"> ○ 800 kWh ○ 550 kWh 	
Monitoring & Switching	<ul style="list-style-type: none"> ○ Whole house, in home, real time electricity use monitor ○ All-off switch w/ split green plugs ○ All-off switch w/ one receptacle per room ○ All-off lighting switch w/ min. one fixture per room 	<ul style="list-style-type: none"> ○ 800 kWh ○ 800 kWh ○ 300 kWh ○ 300 kWh 	
Solar Ready	<ul style="list-style-type: none"> ○ Non shaded roof area of a minimum 100 ft², 30-60 degrees slope and within 30 degrees of South, and, ○ 4" pipe leading from roof to basement for future piping or wires, capped 	<ul style="list-style-type: none"> ○ 300 kWh 	
On-Site Power Production	Solar DHW w/ electric DHW, Photovoltaic, wind, fuel cell, micro combined heat and power and micro turbine on-site power production systems	<ul style="list-style-type: none"> ○ As determined using RetScreen software or other third party performance verification 	
Total			

3.12. Fuel Savings Credits

3.12.1. General

- (1) Fuel Savings Credits are provided for new technologies which save gas or oil fuel for space heating or water heating energy in Table 4.12.1. below.
- (2) The Fuel Savings Credits are presented in equivalent kWh and may be added with electricity savings credits from Section 3.11. for additional credits for alternate building packages and trade-offs.
- (3) There is no minimum requirement for Fuel Savings Credits.
- (4) Items selected elsewhere for trade-offs and alternate building packages may not also be selected for the fuel savings credits.

**Table 3.12.1.
Fuel Savings Credits**

<i>Technology</i>	<i>Eligibility</i>	<i>Formula (reduce consumption by)</i>	<i>Credit</i>
Solar Ready	<ul style="list-style-type: none"> o Non shaded roof area of a minimum 100 ft², 30-60 degrees slope and within 30 degrees of South, and, o 4" pipe leading from roof to basement for future piping or wires, capped 	<ul style="list-style-type: none"> o 300 kWh 	
Drainwater Heat Recovery	<ul style="list-style-type: none"> o With fuel fired water heater and DHR unit of minimum 48" length o Installed on stack with all showers o Installed on stack with most showers 	<ul style="list-style-type: none"> o 800 kWh o 550 kWh 	

4. Alternate Building Packages and Trade-Offs

4.1. General

- (1) Alternate Building Packages are described which permit the builder to choose different specifications which have been pre-determined to meet EGNH 80 compliance.
- (2) The alternate Building Packages are described only in terms of the specifications which are changed from those in the Core Building Package described in Section 2.
- (3) Any item not described in the Alternate Building Packages is required to comply with those in the Core Building Package.
- (4) Options in the Alternative Building Packages may not be applied twice for other trade-offs listed elsewhere in this document.
- (5) Alternative Building Packages are assigned a mnemonic in terms of:
 - Climate Zone: s, south; n north
 - Attachment: d– single detached, a – attached
 - Trade-Off: xw- exterior wall, px – principal exhaust fan w/o recovery, xwpx – both exterior wall and principal exhaust fan w/o heat recovery.
 - Sequence number

4.2. Single Detached Homes, South Climate Zone

4.2.1. Exterior Wall Trade-Offs

ABP sd-xw-1

- Any Trade-Off Main Wall assembly for the South Climate Zone as per Section 3.3.2.
- **Any one of:** Water heater with minimum EF of 0.80, **or**, fuel hot water tank with minimum 48" DHR

ABP sd-xw-2

- Any Trade-Off Main Wall assembly for the South Climate Zone as per Section 3.3.2.
- HRV with minimum sensible efficiency of 75% at 0C
- **Any one of:** Basement walls compliant with North Climate Zone, **or,** furnace with minimum AFUE of 95%

ABP sd-xw-3

- Any Trade-Off Main Wall assembly for the South Climate Zone as per Section 3.3.2.
- Dual purpose boiler or furnace with minimum AFUE of 90% **and** water heater with minimum EF of 0.85

ABP sd-xw-4

- Any Trade-Off Main Wall assembly for the South Climate Zone as per Section 3.3.2
- Basement walls compliant with North Climate Zone, **or,** furnace with minimum AFUE of 95%
- Window area less than 10% of above grade boundary wall area, Zone B windows, **or,** window area less than 13% of above grade boundary wall area, Zone C windows
- **Any one of:** R50 attic insulation, **or,** water heater with minimum EF of 0.62, **or,** an additional 350 kWh electrical savings credits per Section 3.11, **or,** furnace with minimum AFUE of 0.92

ABP sd-xw-5

- Any Trade-Off Main Wall assembly for the South Climate Zone as per Section 3.3.2
- One solar DHW panel with heat exchanger pack and storage tank and fuel water heater

ABP sd-xw-6

- Any Trade-Off Main Wall assembly for the South Climate Zone as per Section 3.3.2
- One solar air panel with PV powered circulation fan
- **Any one of:** R50 attic insulation, **or,** water heater with minimum EF of 0.62, **or,** furnace with minimum AFUE of 92%, **or,** an additional 350 kWh electrical savings credits per Section 3.11, **or,** window area less than 10% above grade boundary wall area, Zone B windows, **or,** window area less than 13% of above grade boundary wall area, Zone C windows

4.2.2. HRV Trade-Offs**ABP sd-px-1**

- Principal exhaust fan without heat recovery
- Water heater with minimum EF of 0.85
- Basement walls compliant with North Climate zone, **or,** furnace with minimum AFUE of 95%

ABP sd-px-2

- Principal exhaust fan without heat recovery
- Basement walls compliant with North Climate Zone
- Hot water heater with minimum EF of 0.80 **or** fuel hot water tank with minimum 48" DHR
- **Any one of:** R50 attic insulation, **or,** water heater with minimum EF of 0.62, **or,** furnace with minimum AFUE of 92%, **or,** an additional 350 kWh electrical savings credits per Section 3.11, **or,** window area less than 10% above grade boundary wall area, Zone B windows, **or,** window area less than 13% of above grade boundary wall area, Zone C windows

ABP sd-px-3

- Principal exhaust fan without heat recovery
- Furnace with minimum AFUE of 95%
- Hot water heater with minimum EF of 0.80 **or** fuel hot water tank with minimum 48" DHR
- **Any one of:** R50 attic insulation, **or,** an additional 350 kWh electrical savings credits per Section 3.11, **or,** window area less than 10% of above grade boundary wall area, Zone B windows, **or,** window area less than 13% of above grade boundary wall area, Zone C windows

ABP sd-px-4

- Principal exhaust fan without heat recovery
- Basement walls compliant with North Climate Zone
- Dual purpose boiler or furnace with minimum AFUE of 90% **and** water heater with minimum EF of 0.85

ABP sd-px-5

- Principal exhaust fan without heat recovery
- ICF basement walls
- Hot water heater with minimum EF of 0.80 **or** fuel hot water tank with minimum 48" DHR
- **Any one of:** R50 attic insulation, **or**, water heater with minimum EF of 0.62, **or**, furnace with minimum AFUE of 92%, **or**, an additional 350 kWh electrical savings credits per Section 3.11, **or**, window area less than 10% boundary wall area, Zone B windows, **or**, window area less than 13% of boundary wall area, Zone C windows

4.2.3. Exterior Wall & HRV Trade-Offs

ABP sd-xwpx-1

- Principal Exhaust Fan without heat recovery
- Any Trade-Off Main Wall assembly for the South Climate Zone as per Section 3.3.2
- R50 attic insulation
- Basement walls compliant with North Climate Zone
- Furnace with minimum AFUE of 95%
- an additional 350 kWh electrical savings credits per Section 3.11.
- Window area less than 10% of above grade boundary wall area, Zone B windows, **or**, window area less than 13% of above grade boundary wall area, Zone C windows
- Hot water heater with min. EF of 0.80 **or**, fuel hot water tank with minimum 48" DHR

ABP sd-xwpx-2

- Principal Exhaust Fan without heat recovery
- Any Trade-Off Main Wall assembly for the South Climate Zone as per Section 3.3.2
- R50 attic insulation
- Basement walls compliant with North Climate Zone
- Dual purpose boiler or furnace with 90% AFUE and water heater with minimum EF of 0.85
- An additional 700 kWh electrical savings credit per Section 3.11.
- Window area less than 10% of above grade boundary wall area, Zone B windows, **or**, window area less than 13% of above grade boundary wall area, Zone C windows

ABP sd-xwpx-3

- Principal Exhaust Fan without heat recovery
- Any Trade-Off Main Wall assembly for the South Climate Zone as per Section 3.3.2
- R50 attic insulation
- Basement walls compliant with North Climate Zone
- Furnace with minimum AFUE of 95%
- Hot water heater with min. EF of 0.85
- An additional 500 kWh electrical savings credits per Section 3.11.

ABP sd-xwpx-4

- Principal Exhaust Fan without heat recovery
- Any Trade-Off Main Wall assembly for the South Climate Zone as per Section 3.3.2
- **Either of:** Basement walls compliant with North Climate Zone, **or**, furnace with minimum AFUE of 95%
- Hot water heater with min. EF of 0.80, **or**, fuel hot water tank with minimum 48" DHR
- One solar DHW panel with heat exchanger pack and storage tank

- **Any one of:** R50 attic insulation, **or**, an additional 350 kWh electrical savings credits per Section 3.11, **or**, window area less than 10% boundary wall area, Zone B windows, **or**, window area less than 13% of boundary wall area, Zone C windows

ABP sd-xwpx-5

- Principal Exhaust Fan without heat recovery
- Any Trade-Off Main Wall assembly for the South Climate Zone as per Section 3.3.2
- ICF basement walls
- Hot water heater with min. EF of 0.80, **or**, fuel hot water tank with minimum 48" DHR

ABP sd-xwpx-6

- Principal Exhaust Fan without heat recovery
- Any Trade-Off Main Wall assembly for the South Climate Zone as per Section 3.3.2
- Dual Fuel ASHP or Geothermal Heat Pump

4.3. Attached Homes, South Climate Zone

4.3.1. Exterior Wall Trade-Offs

ABP sa-xw-1

- Any Trade-Off Main Wall assembly for the South Climate Zone as per Section 3.3.2
- HRV with minimum sensible efficiency 60%

ABP sa-xw-2

- Any Trade-Off Main Wall assembly for the South Climate Zone as per Section 3.3.2
- Water heater with minimum EF of 0.80

ABP sa-xw-3

- Any Trade-Off Main Wall assembly for the South Climate Zone as per Section 3.3.2
- An additional electricity savings credit not less than the target in Section 3.11 on a floor area basis

ABP sa-xw-4

- Any Trade-Off Main Wall assembly for the South Climate Zone as per Section 3.3.2
- Water heater with minimum EF of 0.62
- Window area less than 10% of above grade boundary wall area

5. Compliance Alternatives

5.1. Compliance with EGNH Rating

5.1.1. Non-Electrically Heated Homes

- (1) An EGNH rating and HOT2000™³ modeling software may be used to assess individual house models for compliance with ENERGY STAR New Homes. The analysis is required to be performed by a Certified Energy Evaluator for ENERGY STAR New Homes.
- (2) The result is limited to the specific house model that is rated. It is best suited to facilitate compliance of homes which are not well covered by the Building Packages. These include homes with larger window areas, small attached units or homes with low rates of air leakage. It is also intended to facilitate an entry point for builders with existing EGNH ratings who are in transition to ENERGY STAR Building Packages. A final inspection is required on each house and this evaluation must comply with the EGNH on-site inspection procedures as outlined in the EGNH Administrative and Technical Procedures.
- (3) All one-off evaluations are to be run using version 9.33 of the HOT2000 software in EGNH mode using the as built specifications of the building.
- (4) Table 4.1.1. summarizes the minimum requirements by element for alternate compliance by EGNH Rating for fuel heated homes; for electrically heated homes see 4.1.2. In order to qualify as an ENERGY STAR New Home, an EGNH rated new home must also meet ENERGY STAR requirements for air leakage, duct sealing, ventilation interconnect and electrical and appliance savings that are not accounted in the rating, as noted for these technical specifications.
- (5) An input to HOT2000 for air leakage based upon the as tested ACH50 format may be developed from the ENERGY STAR New Homes Normalized Leakage Rate (NLR) in Table 5.1.1.
$$\text{ACH50} = (\text{hour conversion} \times \text{NLR} \times \text{total boundary area}) / \text{total volume}$$
- (6) A credit for electricity and appliances savings may be entered under Base Loads / Energy Credits. The quantity of the electrical savings credit is established as per Section 3.11 of these specifications.
- (7) A combined EF for a hot water tank with a DHR device may be input for hot water tanks. The combined EF is determined as reviewed in Section 3.10. In cases where the combined EF exceeds 1.0, the Base Loads / Energy Credit may also be used. The credit is determined as 32% of the hot water energy load as assessed by HOT2000. This credit is reduced by one third where the DHR is not connected to all the showers in the house.
- (8) A summary of the EGNH rated package is required as an attachment to the final inspection checklist.
- (9) The ENERGY STAR qualified new home using the performance path is required to be inspected for compliance verification.

³ HOT 2000 is a registered trademark of Natural Resources Canada and is used with permission.

**Table 5.1.1.
Minimum Requirements for Compliance of ENERGY STAR Qualified New
Homes by EGNH Rating**

Element	Minimum Requirement
Minimum EGNH Rating	80 for all detached and attached housing types
Windows	ENERGY STAR qualified for climate zone with U-Value and SHGC as per test results (Section 3.1) for the window manufacturer.
Insulation in Ceilings, Main Walls and Floors	Ontario Building Code Section 12.2.3.1.
Basement Insulation	Full height, nominal R12 in the South, effective R15 in the North as per Section 3.5.
Air Tightness	As per Section 3.7.1. Detached: max. NLR of 0.2 cfm50/ft ² (1.0 L/s50/m ²) Attached: max. NLR of 0.286 cfm50/ft ² (1.43 L/s50/m ²)
Ventilation	Principal and Total Ventilation capacities as per Section 3.8 of these specifications.
Heating	Minimum efficiencies as per Section 3.9
Hot Water	Minimum efficiencies as per Section 3.10
Duct Sealing	Required as per Section 3.9.3.
Ventilation Interconnect	Required as per Section 3.8
Electrical & Appliances Savings	Required as per Section 3.11

5.1.2. Electrically Heated Homes

- (1) A minimum EGNH rating of 80 is required for all types of electrically heated homes.
- (2) As an ENERGY STAR New Home, the rated house shall comply with the insulation and ventilation requirements in Section 3.9.4, and with all the minimum requirements for air sealing, electricity savings and ventilation, regardless of the rating score.

5.2. Development of Custom Building Packages with EGNH Software

- (1) Alternate, custom Building Packages may be developed using HOT2000 v9.33 software and a target rating of 80, if the resulting packages are intended to be applied across a range of house models of a builder.
- (2) The window area is required to be equally distributed around each of the faces of the building. In the case of either single detached or attached homes the total window area is required to be 13% of the above grade boundary wall area. The average U-value shall not be less than and the SHGC not greater than:
 - (a) 0.32 Btu/ft².F and 0.48 for ENERGY STAR zone B
 - (b) 0.30 Btu/ft².F and 0.48 for ENERGY STAR zone C
 - (c) 0.24 Btu/ft².F and 0.42 for ENERGY STAR zone D
- (3) Alternative window areas and specifications may be used subject to submission of a justification and approval by the EnerQuality Technical Committee.
- (4) All the items reviewed in Section 5.1 apply.

5.3. Effective Thermal Resistances of Assemblies

5.3.1. General

- (1) The assessment of equivalent and trade-off assemblies require the determination of effective resistance values that meet or exceed those provided in the tables in Section 3.
- (2) The determination of effective thermal resistances 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 5.3.1. below, which are to be used when the calculation of the effective thermal resistances is undertaken by an ENERGY STAR New Homes evaluator or builder.

- (3) Framing percentage areas are reduced by increasing stud or joist spacing. In addition, wall framing percentages may be reduced 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 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 sills 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 use of I-joists, raised heel trusses and in basement wall framing.
- (4) Alternatively, the resistances of equivalent and trade-off assemblies may be assessed by use of HOT2000 software. Since HOT2000 may use different resistances for materials than the references in (2) above, or, different framing areas than described in the table below, it is necessary to use HOT2000 to first assess the effective resistance of the base ENERGY STAR assembly as described in Section 3 as equivalent or as a trade-off, then that of the proposed alternate.
- (5) 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 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.
- (6) 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.
- (7) 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: $R_{avg} = a_{tot} / (a_1/r_1 + a_2/r_2 \dots + a_n/r_n)$, 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 5.3.1.
Percentage Framing Areas for Use in Determining Effective Thermal Resistances**

Framing System	Percentage Area
Standard wood frame wall @ 16" o.c.	23%
Standard wood frame wall @ 19.2" o.c.	21.5%
Standard wood frame wall @ 24" o.c.	20%
Advanced wood frame wall w/ double top plate	wall framing percentage by centre above less 4%.
Basement wood frame wall inside concrete	wall framing percentage by centre above less 7%
SIPS walls @ 48" o.c	10%
Standard lumber joist floor @ 16" o.c.	13%
Standard lumber joist floor @ 24" o.c.	10%
I-joist floors	joist framing percentage by centre above less 4%
Standard roof trusses @ 16" o.c.	14%
Standard roof trusses @ 24" o.c.	11%
Raised Heel roof trusses @ 16" o.c.	10%
Raised Heel roof trusses @ 24" o.c.	7%
Conventional rafter/joist roof framing @ 16" o.c.	13%
Conventional rafter/joist roof framing @ 24" o.c.	10%
I-joist rafters	rafter framing percentage by centre above less 4%
SIPS roofs @ 48" o.c	6%