Canadian Home Builders' Association
Net Zero Home Labelling Program – Version 1.4
Technical Procedures Guidebook

Effective: January 1, 2023
Last Updated: December 20, 2022

Canadian Home Builders' Association
141 Laurier Avenue West, Suite 500
Ottawa, ON, K1P 5J3
613.230.3060

CONTENTS

PURPOSE

This document is designed to assist Qualified Net Zero Energy Advisors, Builders and Service Organizations with the verification of Qualified Net Zero and Net Zero Ready homes. This document serves to support the requirements outlined in the *CHBA Net Zero Technical Requirements* and the *CHBA Net Zero Administrative Requirements*.

Notes, including pertinent websites are in blue boxes.

Calculations and examples are in grey boxes.

Tips are in yellow boxes.

OVERVIEW

This document defines the detailed methods of verification for the requirements in the CHBA Net Zero Home Labelling Program which will henceforth be referred to as the *Program*. The document is organized by clauses that correlate with main section headers of the *CHBA Net Zero Technical Requirements* with the addition of Section 5.0: Modelling Guidelines. For example, section 3.0: Building Envelope of this document correlates with Section 3.0: Building Envelope of the *Technical Requirements*. The sub headers in this document do not correlate directly with the sub headers in the *Technical Requirements.* Where applicable, the clauses in this document specify as a subtitle which clause they should be used for verifying in the *Technical Requirements*.

To complete the verification of a proposed CHBA Qualified Net Zero or Net Zero Ready home, the energy advisor will need to obtain copies of documentation or technical details for products and equipment installed in the home.

No action is required by the energy advisor for requirements that cannot be visually verified (e.g. building assemblies such as walls and floors). The builder is responsible for ensuring that all aspects which cannot be visually verified meet the Program's requirements.

Refer to the Net Zero Project Registration Workbook (xls) for information that needs to be recorded. The Project Registration Workbook shall be retained by the CHBA Qualified Net Zero Service Organization and then submitted to CHBA for quality assurance audit or other purposes.

The terms "house" and "home" are used throughout this document and are intended to include MURB single units and MURB whole buildings unless stated otherwise.

On-Site Data Collection: The *EnerGuide Rating System—Technical Procedures* must be followed.

HOT2000 Modelling: The *EnerGuide Rating System—HOT2000 User Guide* and *EnerGuide Rating System—Technical Procedures* must be followed.

REFERENCE DOCUMENTS

In addition to the *CHBA Net Zero Technical Procedures Guidebook*, the following referenced documents are required for the administration of the CHBA Net Zero Home Labelling Program. References to these documents in the *Technical Procedures Guidebook* apply to the most current versions. If you are a CHBA member you may find these downloadable documents at www.chba.ca/NZProgramRequirements. If you are already a Natural Resources Canada program participant, you may find the NRCan documents on the members-only resource centre.

This program is built on the EnerGuide Rating System, R-2000 and ENERGY STAR® for New Homes initiatives of the federal Department, Natural Resources Canada (NRCan). The CHBA Net Zero Technical Requirements compile the relevant technical requirements from each of these three NRCan initiatives to simplify meeting the CHBA Net Zero requirements. This document defines the verification methods required in order to ensure the *CHBA Net Zero Technical Requirements* are met.

Reference Publications

Issuing Agency	Document
NRCan	2012 R-2000 Standard
NRCan	ENERGY STAR® for New Homes (ESNH) Standard v12 or v17
NRCan	EnerGuide Rating System (ERS) v15.x
NRCan	ENERGY STAR® for New homes (ESNH) – Technical Procedures – v17.x
NRCan	EnerGuide Rating System (ERS) – HOT2000 User Guide - v15.x
CHBA	Net Zero Home Labelling Program Technical Requirements v1.x
CHBA	Net Zero Home Labelling Program Technical Requirements - Renovations v1.x
CHBA	Net Zero Home Labelling Program Administrative Requirements v1.x
CHBA	Net Zero Home Labelling Program IAQ Checklist

Source: "ENERGY STAR for New Homes Technical Procedures V. 17.2," Natural Resources Canada, [2020].
Reproduced with the permission of the Department of Natural Resources, 2020.

1.0 GENERAL

1.1 Eligible Housing Types

Verifying 1.1.2: The energy advisor shall visually verify that the building is no more than three storeys in height, is on a permanent foundation and is one of the eligible housing types (i.e. house, MURB whole building or MURB single unit). The energy advisor shall also validate that the building is only used for residential occupancy. To determine compliance with the 600 m^2 maximum building area, on-site measurements and manual geometry calculations may be required. Please refer to *EnerGuide Rating System—Technical Procedures* for building height procedures.

1.2 Determination of Number of Heating Degree Days

The number of heating degree days (HDDs) is provided in local building codes. Where a local code does not exist or does not define the number of HDDs, HDDs from the *National Building Code* (NBC) 2015 (Appendix C) must be applied. While the energy advisor does not have to verify anything concerning this requirement, the energy advisor must determine the HDDs of the location of the house in order to determine certain requirements.

1.3 Determination of Frost Line Depth

It is the responsibility of the authority having jurisdiction (e.g. building inspector) to determine the depth of frost penetration. The energy advisor does not have to verify anything concerning this requirement but must enter this number in HOT2000's **Weather** screen.

2.0 GENERAL REQUIREMENTS

2.1 Building Codes and Regulations

Verifying 2.1.1: It is the responsibility of the authority having jurisdiction (e.g. building inspector) to determine whether the applicable building code has been applied. The energy advisor does not have to verify anything concerning this requirement.

2.2 Energy Efficiency Regulations

Verifying 2.1.2: The energy advisor shall either obtain from the builder copies of documentation or technical details on the equipment and products installed in the house or use the nameplate information to determine the make and model number of the installed equipment. The energy advisor shall then verify that the installed equipment meets Canada's Energy Efficiency Regulations requirements by checking whether the equipment is listed on NRCan's equipment database.

TIP:

If equipment is listed on NRCan's equipment database, the equipment meets Canada's Energy Efficiency Regulations. Links to the database are provided throughout the *CHBA Net Zero Technical Requirements* document by type of equipment.

2.3 Photovoltaic Modelling

Verifying 2.4.1: The energy advisor shall model the energy production of the photovoltaic array as per the *EnerGuide Rating System—Technical Procedures* and the *EnerGuide Rating System—HOT2000 User Guide*. If the home is labelling as Net Zero Ready, the individual modelling the array area, using reasonableness and good faith, shall model only available on-site locations that the a photovoltaic system could practically and viably be installed on in the future.

NOTE:

This requirement is in place so that Net Zero Ready homes can, in practise, reach 0 GJ modelled annual energy consumption should the homeowner move forward with having the designed photovoltaic system installed. This requirement discourages energy advisors and builders from using impractical photovoltaic models and modelling photovoltaics with the sole purpose of achieving 0 GJ modelled energy consumption, without considering the viability for the homeowner of a future installation.

3.0 BUILDING ENVELOPE

3.1 Minimum Effective Thermal Resistance of Opaque Assemblies

Verifying 3.3.1: The builder shall provide the details of all building assemblies and components, and the energy advisor shall model these according to the *EnerGuide Rating System—HOT2000 User Guide and EnerGuide Rating System—Technical Procedures*. The validation of the requirements in Table 4 of the *CHBA Net Zero Technical Requirements* is performed by checking the effective RSI/R values listed in HOT2000's user interface for each building envelope component. For basement foundation walls, sum the values listed in the Interior Added Insulation, Core Wall Type, Exterior Added Insulation R-Value fields and a constant of RSI 0.12 (to account for the interior air film) to obtain the total effective thermal resistance value. In the case where the composite feature is used, each section effective thermal resistance value must be validated.

For foundation floors, the energy advisor shall indicate if the floor is below or above the frost line and if a Heated floor is present. Model using the radio buttons and checkboxes in HOT2000's foundation Wall/Floor Construction screens.

TIP:

Modelling should be done with as few building components as possible, provided they have the same assembly, to minimize file rejections if the calculated component's effective thermal resistance value is lower than the minimum prescribed in Table 4 of the *CHBA Net Zero Technical Requirements*.

3.2 Eligible Insulation Materials

Verifying 3.3.2: The builder is responsible to ensure that insulation materials conform to the applicable standard, which can normally be verified by checking information on the product packaging. Assemblies with thermal resistance values evaluated by the Canadian Construction Materials Centre (CCMC) are permitted to be used. Refer to the *EnerGuide Rating System—HOT2000 User Guide*, section 4.4.1 for instructions on how to model tested assemblies.

3.3 Wall and Floor Assemblies Below or in Contact With The Ground

Verifying 3.3.3.1: The energy advisor shall visually verify all elevations to determine the 'finished grade'. Where applicable (i.e. where the finished grade portions are more than 600 mm (2 ft.), see Figure 1, the energy advisor shall model the above-ground portions using the Composite feature from the Foundation section of the HOT2000 file if two different levels of insulation are used on the foundation walls in order to meet the above grade wall insulation requirement. The builder is responsible to ensure that the requirement has been met. The energy advisor does not need to take any action on-site to verify compliance where the requirement cannot be visually verified.

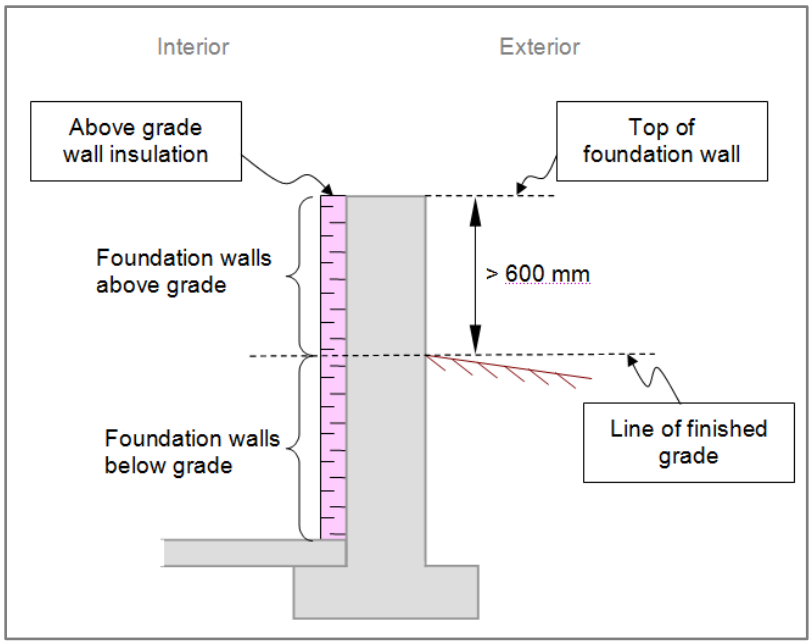


Figure 1: Line of finished grade and above grade wall insulation

Verifying 3.3.3.2: See Figure 2 for an illustration of compliance. The builder is responsible to ensure that the requirement has been met. The energy advisor does not need to take any action on-site to verify compliance where the requirement cannot be visually verified.

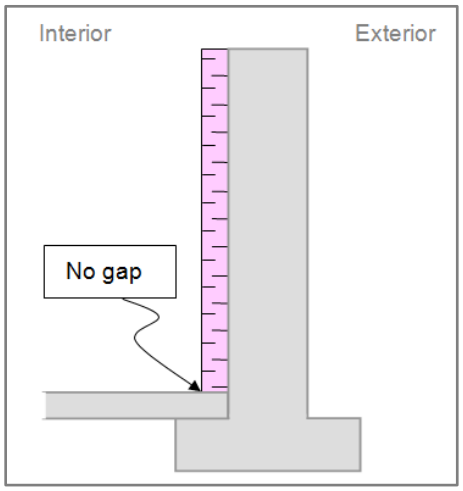


Figure 2: No gap in insulation

Verifying 3.3.3.3: Where possible, the energy advisor shall visually verify whether foundation walls with height equal or greater than 1.2 m (4 ft.) have a gap in insulation no greater than 150 mm (6”) between the bottom edge of the interior foundation wall and the top of the floor (see Figure 3). Where applicable, the energy advisor shall record the observed height of the gap. The appropriate thermal resistance values and covered walls percentage of the foundation assembly shall be modelled using the Composite feature from the Foundation section of the HOT2000 file where different insulation levels exist. If a gap in insulation is observed, the energy advisor shall model the basement insulation configuration as per the *EnerGuide Rating System—HOT2000 User Guide*, using the *Composite RSI/R Calculator*.

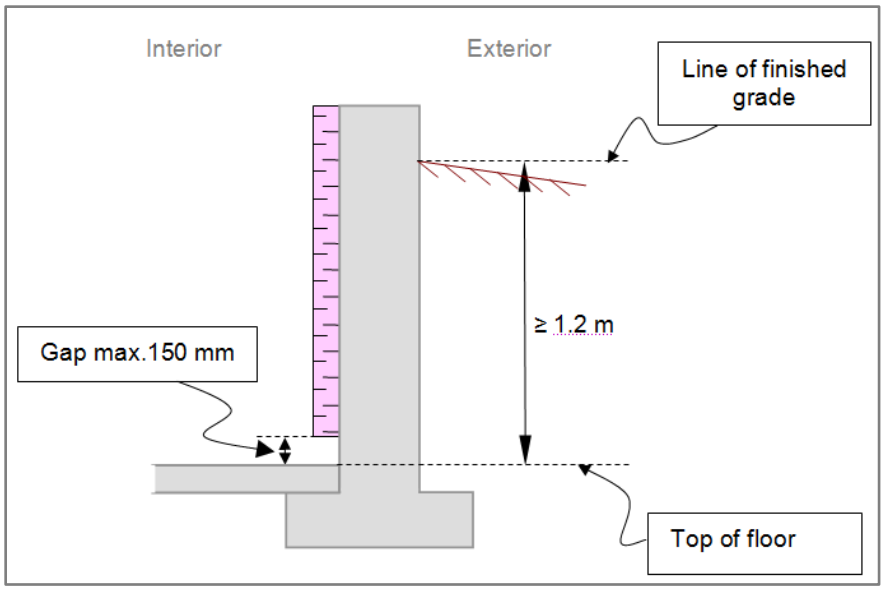


Figure 3: Maximum 150 mm (6") gap in insulation

Verifying 3.3.3.4: See Figure 4 for an illustration of compliance. The builder is responsible to ensure that the requirement has been met. The energy advisor does not need to take any action on-site to verify compliance where the requirement cannot be visually verified.

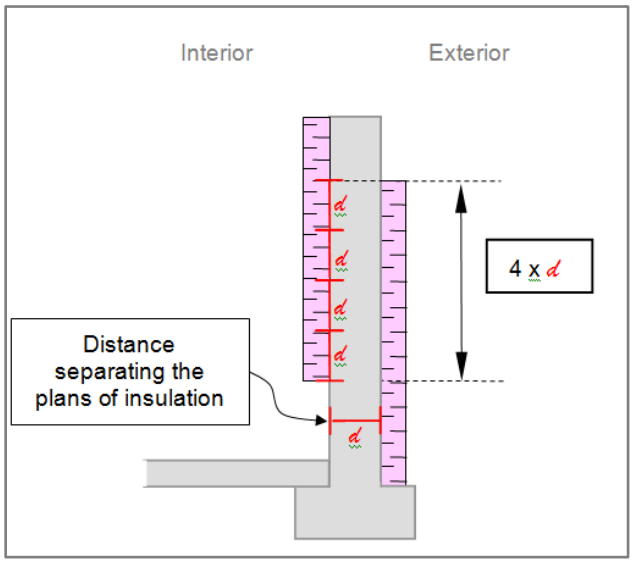


Figure 4: Interior and exterior insulation overlap

Verifying 3.3.3.5: See Figure 5 for an illustration of compliance. The builder is responsible to ensure that the requirement has been met. The energy advisor does not need to take any action on-site to verify compliance where the requirement cannot be visually verified.

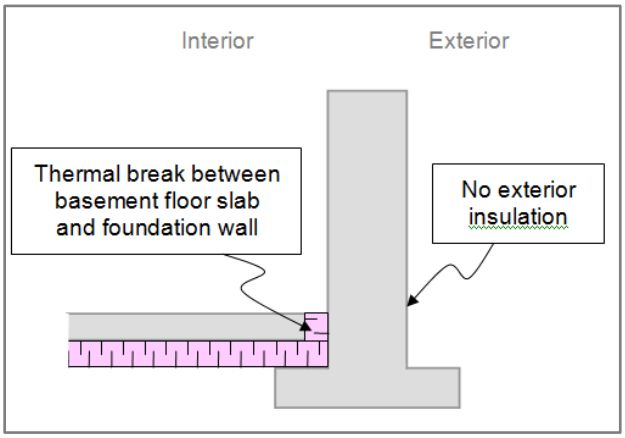


Figure 5: Thermal Break

3.4 Ceilings Below Attics

Verifying 3.3.4: See Figure 6 for a depiction of compliance. The builder is responsible to ensure that the requirement has been met. The energy advisor does not need to take any action on-site to verify compliance where the requirement cannot be visually verified. Note that insulation levels may be reduced to the extent required by the slope of the roof at the inner edge of the exterior wall.

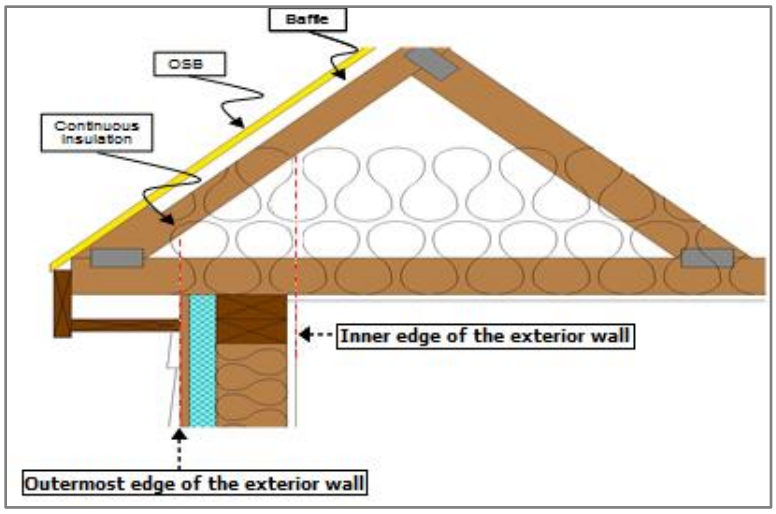


Figure 6: Ceilings below attics

3.5 Rim Joists

Verifying 3.3.5: The builder is responsible to ensure the requirement has been met. Where possible, the energy advisor shall observe the foundation header and note the type and thickness of the insulation layer.

4.0 MECHANICAL AND ELECTRICAL SYSTEMS

4.1 Venting and Combustion Air Supply of Fuel-Fired Equipment

Verifying 4.1.3 and 4.1.4: The energy advisor shall visually verify that the equipment is sealed and has the proper venting type as specified in the applicable section.

Verifying 4.1.5: The energy advisor shall visually verify that a combustion air supply duct and damper system serves only one piece of equipment and that there is a motorized damper with associated relay.

4.2 Natural Gas or Propane Fireplaces

Verifying 4.2.5: The energy advisor shall visually verify whether there is a standing pilot light present. Using product documentation provided by the builder, the energy advisor shall also cross-check the model against NRCan's equipment database to ensure it meets the CSA requirement.

4.3 Combined Space and Water Heating Systems

Verifying 4.3.1: The energy advisor shall record the brand name and model number of the heat generator and fancoil. The energy advisor shall verify whether the equipment has been tested to CSA P.9-11 by cross-checking the brand names and model numbers against the NRCan equipment database for P.9 combined space and water heating systems. The energy advisor shall also visually verify that the heat generator is of the condensing type by checking that certain elements, such as a condensate pipe leading to a drain, a plastic (PVC, CPVC, or ABS) vent, or a direct vent system, are present.

4.4 HRV/ERV Requirements

Verifying 4.7.3.1 (b): The energy advisor shall do a manual calculation using the calculation below to ensure the supply & exhaust flows at high speed are within 10%.

HRV BALANCING CALCULATION

$$\left| \frac{Q_{supply} - Q_{exhaust}}{Q_{supply}} \right| \times 100\% \leq 10\%$$

Where:

Q_{supply} (l/s or cfm) = the HRV supply flow at high speed listed by the HVAC contractor on the HRV label.
$Q_{exhaust}$ (l/s or cfm) = the HRV exhaust flow at high speed listed by the HVAC contractor on the HRV label.

Verifying 4.7.3.2: The energy advisor shall first confirm which level of sensible heat recovery efficiency (SRE) has been used and count the number of bedrooms in the house. The energy advisor shall then check Section III of the HVI Directory to verify whether the SRE was at the appropriate flow rate, per Table 5 of the *CHBA Net Zero Technical Requirements*. See below for an example of how to check compliance for HRV/ERV at 0 °C. To determine the SRE at -25 °C, find the closest airflow rate to that required per Table 5 and use the SRE that corresponds to that airflow rate.

Modelling of the HRV/ERV shall be done as per the *EnerGuide Rating System—Technical Procedures* section 3.5.11.2 under Scenario 1, using the minimum airflow rates as per Table 5 or a larger flowrate if known, or using the interpolation approach as demonstrated in the example below. In addition, the energy advisor must specify if the HRV/ERV is certified ENERGY STAR or HVI using the checkboxes in the HRV screen.

ELIGIBLE SRE DETERMINATION EXAMPLE

Option 1: Closest Fit Approach

A builder wishes to install an HRV with a 65% SRE in a 3 bedroom house. The airflow rate at which the SRE must be taken is 22 L/s per Table 5 of the *CHBA Net Zero Technical Requirements*.

One particular HRV unit has an SRE of 67% at 20 L/s. Since the minimum airflow rate must be 22 L/s, the SRE must be taken at a different rate. The next rate that this unit has been tested at is 30 L/s. While this rate is equal or greater than 22 L/s, the SRE at this rate is 61%. This HRV would therefore be ineligible under the closest fit approach (note, however, that this HRV is eligible through the interpolation approach, as per example in option 2 below).

Another HRV has an SRE of 73% at 25 L/s. Since the SRE has been measured at a rate equal or greater than 22 L/s and has an SRE of at least 65%, this HRV would be eligible.

Option 2: Interpolation Approach

A builder wishes to install an HRV with a 65% SRE in a 3 bedroom house. The airflow rate at which the SRE must be taken is 22 L/s per Table 5 of the *CHBA Net Zero Technical Requirements*. One particular HRV unit has an SRE of 67% at 20 L/s. Since the minimum airflow rate must be 22 L/s, the SRE must be taken at a different rate. The next rate that this unit has been tested at is 30 L/s; in this case, the SRE is 61%. To perform an interpolation of these two data points, do the following:

Let:
A1 = 20 L/s
S1 = 67%
A2 = 30 L/s
S2 = 61%
A =2 2 L/s

Solve for S using the formula: $S = [\frac{[(\mathrm{A} - \mathrm{A1})\, x\, (\mathrm{S2} - \mathrm{S1})]}{(\mathrm{A2} - \mathrm{A1})}]$

In this case, S equals 65.8% (rounds to 66%). This HRV would be eligible.

Extrapolation of airflow rates beyond those listed in the HVI Directory is not allowed under either option.

Verifying 4.7.4 Note 2: The energy advisor shall check Section III of the HVI Directory, or the NRCan equipment database, using information collected on-site or provided by the builder to ensure the equipment is listed and that it has been tested at 0 °C for locations with a 2.5% January design temperature greater than or equal to -10 °C and at both 0 °C and -25 °C for locations with a 2.5% January design temperature less than -10 °C.

4.5 IMS Requirements

Verifying 4.3.2: The energy advisor shall record the brand name and model number and visually verify whether the equipment is of the condensing type by checking that certain elements, such as a condensate pipe leading to a drain, a plastic (PVC, CPVC, or ABS) vent, or a direct vent system, are present.

4.6 Integrated HRV Air Handler Requirements

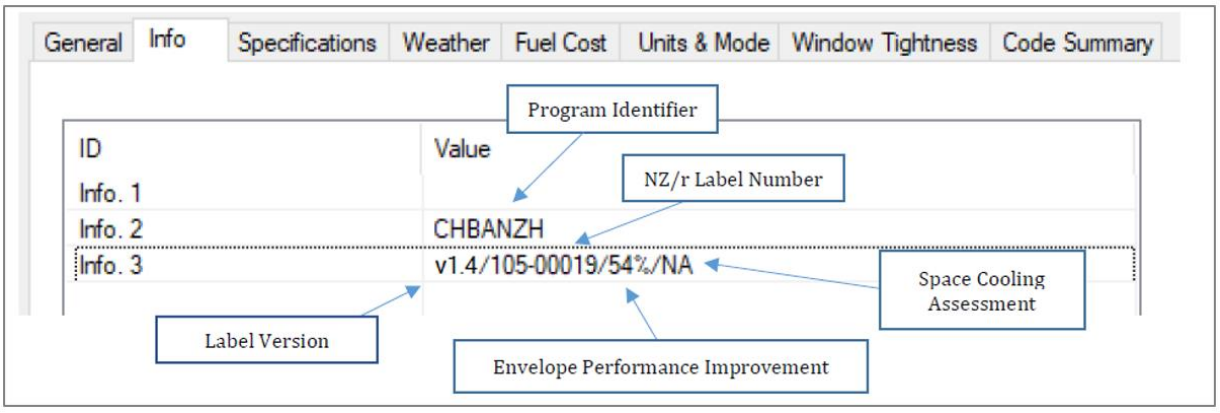
Verifying 4.7.4.2: The energy advisor shall obtain from the builder a copy of the Section 8 test report to confirm the equipment is compliant. The builder is responsible to ensure that the equipment has a defrost mechanism. The presence of a defrost mechanism shall be determined by obtaining a copy of the manufacturer's specification or operation manual indicating the presence of a defrost mechanism.

4.7 Air Distribution Systems

Verifying 4.8.1 and 4.8.2: The builder is responsible to ensure that the requirements have been met. Where possible, such as when the ductwork in the basement is visible, the energy advisor shall visually verify that the requirements have been met.

5.0 MODELLING GUIDELINES

All homes registering for the CHBA Net Zero Home Labelling Program (whether Net Zero or Net Zero Ready) must enter the following information into Info Field 2 & Info Field 3 in the HOT2000 ERS file submitted to NRCan. As depicted below in Figure 1 the building envelope performance and space cooling assessment must be embedded into Info Field 3 along with the NZ/r Label Number and program version. Do not include spaces in Info Field 3. The Program Identifier is entered into Info Field 2. If the home will also be receiving an ENERGY STAR® label or R-2000 certificate, enter ESNH or R2000 into Info Field 1 in the ERS file.
It is the responsibility of the builder, EA and SO to ensure all ENERGY STAR® or R-2000 program requirements have been met. (If choosing ESNH prescriptive path, the SO must enter CHBANZH in the comments field of the ESNH Compliance Tool.)



***Note**: Homes labelling under the Renovations Program are not required to create a Building Envelope file and Space Cooling file on the pre-renovation file submission. However, all three HOT2000 file runs are required for the post-renovation file submission.*

5.1 HOT2000 Files

The Builders' Qualified Net Zero Energy Advisor is required to submit a Proposed Design Model HOT2000 file for each home to the Qualified Net Zero Service Organization.

The Proposed Design Model file describes the home as it is intended to be constructed – it includes the building envelope, mechanical systems and renewable energy systems, as well as the nominal space cooling specifications. This model is used to demonstrate compliance with the Net Zero performance requirement. (See Step 2 in Section 5.3: Modelling Procedure)

The HOT2000 file submitted to the Qualified Net Zero Service Organization must reflect the final design. The following sections provide more details for each of these requirements.

NOTE: *One of the most important components of the Net Zero Home Technical Requirements is the energy target, which is based on the net consumption of energy for space conditioning. The energy target is calculated for each house based on its size, location and fuel type under standard operating conditions. The equations for calculating the energy target are embedded in the approved compliance software and do not have to be calculated by either the builder or the Qualified Net Zero Energy Advisor.*

5.2 HOT2000 Tools

There are two tools to assist with the Net Zero Home performance calculations:

1. **HOT2000 (v.11):** HOT2000 is a whole-house energy simulation tool and is widely used in Canadian government programs.
2. **Project Registration Workbook:** Within the worksheet there are two calculation spreadsheets used to determine compliance with both the building envelope percent better than reference house requirement as well as the space cooling threshold requirement. The space cooling threshold calculation is only to be completed if the Proposed Design Model file will not include a space cooling system, such as a conventional air conditioning unit or an air source heat pump.

5.3 Modelling Procedure

Step 1: Create a Building Envelope Design Model File

1.1 Choose 'ERS' mode in HOT2000.

1.2 Do not change the default standard operating conditions.

1.3 Enter the standard mechanical conditions specified in Table 1 below.

Table 1: Standard mechanical conditions for determination of building envelope energy loss target

Function	Component	Efficiency
Space heating	Electric baseboards	100%
Water heating	Electric storage	0.86 EF
Ventilation	Balanced with heat recovery	SRE: 60% at 0°C, 55% at -25°C Fan efficacy: 0.48 L/s/W

1.4 Model the proposed building envelope specifications, including the proposed airtightness level (maximum 1.5 ACH for detached or 2.0 ACH for attached) of the as-built house using the targeted air-tightness level to be determined by the Blower Door procedures identified in ERS v3 or newer.

1.5 Run the 'Building Envelope Design Model' file and generate the full house report using ERS Reference House ruleset.

1.6 From the Energy Consumption Summary Report collect the Estimated Space Heating Energy Consumption (MJ) for the Reference House and enter it into the appropriate cell in the 'Building Envelope' section of Tab 2 in the Project Registration Workbook.

1.7 Enter the Space Heating System Load for the ERS Reference House (MJ) and the Proposed House with Standard Operating Conditions (MJ) into the appropriate cells in the 'Building Envelope' section of Tab 2 in the Project Registration Workbook.

1.8 Tab 2 in the Project Registration Workbook will indicate whether the building envelope design model meets the building envelope target requirement of (>33%).

1.9 If the requirement is not met, modify the building envelope specifications in the HOT2000 Building Envelope Design Model file, and re-enter the building envelope energy consumption in the 'Building Envelope" section of Tab 2 in the Project Registration Workbook. Follow this process iteratively until the target is met.

1.10 Once the target has been met, save the HOT2000 file with the file name '[ProjectName]_BldgEnv'. The value recorded in "% improvement over code reference house" from Tab 2 of the Project Registration Workbook must be recorded for inclusion in Info Field 3 of the Proposed Design Model file as shown in Figure 1.

NOTE: Refer to the "Design Modelling Guidance" below for additional details/guidelines for modelling building envelope parameters.

Step 2: Create a Proposed Design Model

2.1 Use the '[ProjectName]_BldgEnv' file (created in Step 1) to create the proposed design model which shall reflect the as-built envelope systems, mechanical systems and renewable energy systems that will be included in the building.

2.2 Ensure HOT2000 is still running in 'ERS' mode.

2.3 If space cooling is installed add the following standard conditions for space cooling into the HOT2000 file:
– On the Heating/Cooling System, in the A/C or Heat Pump screen, set:
- Openable Window Area: 15% (Allows for free cooling when possible)

2.4 Use the existing modelling capabilities within HOT2000 to model mechanical equipment and renewable energy production.

2.5 Electrical base loads reductions are available to houses meeting the Net Zero level provided the eligibility requirements have been met. As per the ERS modelling procedures, enter the Reduced Operating Conditions as applicable on the 'Base Loads' screen in the HOT2000 file. See Tables 2 and Table 3 below.

2.6 If space cooling is installed, do not proceed to Step 3. Enter "NA" in Info Field 3, as shown in Figure 1. Save the file as '[ProjectName]_ProposedDesign'.

Table 2: Reduced Operating Conditions – Electrical Base Loads

Load	Standard (kWh/day)	Reduced (kWh/day)	Eligibility Requirements
Lighting	3.0	2.0 or 1.0	For 2.0: 25%-75% of fixtures with CFLs &/or LEDs For 1.0: >75% of fixtures with CFLs &/or LEDs
Appliances	6.3	Determined by the annual electrical usage of the appliance, as reported in NRCan's equipment database.	Use the actual EnerGuide appliance rating if it is lower than the following standard values: Refrigerator: 639 kWh/yr Electric range: 565 kWh/yr Dishwasher: 260 kWh/yr Clothes washer: 197 kWh/yr Clothes dryer: 916 kWh/yr
Other Electric	9.7	n/a	n/a
Exterior	0.5	n/a	n/a

Table 3: Reduced Operating Conditions – Hot Water Loads

Load	Standard[1] (L/day)	Reduced (L/day)	Eligibility Requirements
Showerheads	~190	~26[2]	Maximum flow rate of 7.6 L/min[3]
Bathroom Faucets		2	Maximum flow rate of 5.7 L/min[3]
Clothes Washer		18	ENERGY STAR qualified
Dishwasher		3	ENERGY STAR qualified

NOTES:
1. The actual hot water load will vary slightly depending on the mains water temperature.
2. The actual reduction of hot water load from the shower will vary slightly depending on the mains water temperature.
3. These specifications are the same as the minimum requirements in the draft 2014 R-2000 Standard.
4. The difference in the EnerGuide Rating between a Net Zero and Net Zero Ready file will be the difference between the Reduced Operating Conditions and Standard Operating Conditions, and the on-site renewables. Where the eligibility requirements are met, a Net Zero Ready file can use Reduced Operating Conditions to define the energy target when modelling renewables.

Step 3: Evaluate the Space Cooling Requirement

3.1 If space cooling is not installed, the space cooling threshold must be evaluated, and the results must be recorded in the Project Registration Workbook.

3.2 Using the file created in Step 2, add the following standard conditions for space cooling into the HOT2000 file to create your space cooling evaluation file:
- On the Heating/Cooling System tab, in the A/C screen, set:
  - Central Equipment Type: Central Single Package System
  - Openable Window Area: 15% (Allows for free cooling when possible)
  - Output Capacity: Calculated (in Specifications/Use Section)

3.3 Run the file and generate the full house report using "house with standard operating conditions". Save the HOT2000 file as '[ProjectName]_SCEval'.

3.4 From the HOT2000 report, collect the following parameters and input them into the Space Cooling Evaluation Tool in Tab 2 in the Project Registration Workbook:
- From the Air Conditioning System Performance Section in the report:
  - Annual Sensible Load (MJ)
  - Annual Latent Load (MJ)
- From the Building Parameter Summary Section in the report:
  - House Volume (m^3)

3.5 The next step will depend on the results from the Space Cooling Evaluation Tool:
- If the Project Registration Workbook calculates a cooling load less than 2.0 MJ/m^3, the house is within the acceptable threshold and does not require a space cooling system to be modelled. In this case, enter "NA" in Info Field 3, as shown in Figure 1, to record how the space cooling requirement is being met.
- If the Project Registration Workbook calculates a cooling load greater than or equal to 2.0 MJ/m^3, modify the space cooling equipment efficiency specifications to a SEER 13 with the capacity being equal to the capacity calculated in the HOT2000 file. In this case, enter "Cooling considered" in Info Field 3, as shown in Figure 1 to record how the space cooling requirement is being met.

3.6 Save the file as '[ProjectName]_ProposedDesign'.

5.4 Design Modelling Guidance

All HOT2000 files for the Net Zero Home Labelling Program must adhere to the following guidelines.

1. Use of HOT2000 and Other Tools

Whenever possible, applicants shall use the existing modelling capabilities within HOT2000 to estimate energy savings and renewable energy production. Refer to ERS v15 guidelines for the proper modelling of renewables.

2. Building Envelope Assemblies

These must be accurately represented in HOT2000, including their dimensions, insulation levels and framing components. This includes all exposed walls, ceilings, floors, floor headers, and opaque components of entry doors. Ceilings with attics must accurately reflect the specified roof slope and heel height. Below grade assemblies must include dimensions, insulation levels, placement and configuration, and framing components.

3. Natural Air Infiltration

Configure the air-infiltration specification tab as follows:
– Building terrain: Suburban, forest
– Local shielding, walls: Heavy
– Local shielding, flue: Light
– Specify the height above grade of the highest ceiling

4. Heating and Cooling

All specified heating systems shall be described in HOT2000's Heating/Cooling tab. All heating and cooling systems shall be sized according to requirements in CSA F280-12 "Determining the Required Capacity of Residential Space Heating and Cooling Appliances", and their efficiency and performance parameters shall reflect test results from the appropriate test protocol, as identified in this Technical Requirement. Other parameters in the Heating/Cooling dialogue shall be set as follows:
– Cooling season shall start in May and finish in October, with the design month in July.
– Fan power consumption and operation shall be as specified.

5. Water Heating

All specified water heating systems shall be described in HOT2000's Domestic Hot Water tab. All water heating systems shall be sized as specified by the designer, and their efficiency and performance parameters shall reflect test results from the appropriate test protocol, as identified in this Technical Requirement.

6. Renewable Electricity Generation

To achieve Net Zero performance, applicants must calculate the expected electrical energy production from all on-site renewable electricity sources (solar photovoltaic or wind energy) following NRCan's technology-specific procedures:

6.1 Solar Photovoltaics

Describe the performance of any photovoltaic systems using HOT2000's generation tab. The array area, slope and azimuth dimensions must reflect the specified design. Additionally, applicants must either:
– Choose the applicable default module types provided by HOT2000, or
– Choose "User Specified" and provide 3rd-party certified performance test data (module efficiency, nominal operating cell temperature, and temperature coefficient of efficiency).

Provide the rated DC-to-AC conversion efficiency for their specified inverter. As a reminder, the parameters shall be as follows:

– Miscellaneous array losses: 5%
– Other Power condition losses: 0%
– Inverter efficiency: 95% or per inverter manual
– Grid absorption rate: 100%

NOTE: In HOT2000, azimuth is measured as 'degrees counter clockwise from SOUTH'. 0 <= Azimuth <= +/-180.

6.2 Wind Generation

Claim credit for electricity generated by on-site wind turbines. HOT2000 does not currently support wind turbines - applicants must use RETScreen. Applicants claiming credit for wind turbines shall estimate the wind generation using either:

– The measured annual average wind speed for their location at a height of 10 m, or
– The measured annual average wind speed for their location at the specified turbine hub height, provided that the applicants show the local building code, zoning requirements, lot and building plans permit the specified turbine to be installed.

6.3 PV Commissioning Report and PV Ready Checklists

– The PV Commissioning Report is to be completed for a Net Zero Home file submission. The report serves to ensure the installation of a quality photovoltaic system that will perform as intended.
– The NRCan PV Ready Checklist is to be completed for a Net Zero Ready Home file submission with roof mounted PV. The checklist serves to confirm that the home meets the technical requirements for a future installed roof mounted photovoltaic system.
– The Ground Mounted PV Ready Checklist is to be completed for a Net Zero Ready Home file submission. The checklist serves to confirm that the home meets the technical requirements for a future installed ground mounted photovoltaic system.