



**MODELLING GUIDELINES AND
INSTRUCTION MANUAL:
BC STEP CODE COMPLIANCE CHECKLIST
FOR PART 9 RESIDENTIAL BUILDINGS**

**9.36.5 & 9.36.6 PERFORMANCE PATHS
AND
SECTION 9.37 GREENHOUSE GAS EMISSIONS**

Accompanies 2018 BC Building Code Revision 5

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1 Introduction

The **BC Energy Step Code** (Energy Step Code) is a provincial standard enacted in April 2017 that provides an incremental and consistent approach to achieving more energy efficient buildings that go beyond the requirements of the base BC Building Code (BCBC). It does so by establishing a series of measurable, performance-based energy efficiency requirements for construction that builders must build to. As of May 1st, 2023, Step 3 is the new base code requirement.

The **BC Zero Carbon Step Code** (Zero Carbon Step Code): In 2021, the province released its CleanBC Roadmap to 2030 climate plan. It included a commitment that “all new buildings in the province must produce zero greenhouse gas pollution from their operations by 2030.” In 2023, the Province of British Columbia entered the Zero Carbon Step Code into regulation as the pathway to get there. As of May 1, 2023, local governments can reference the Zero Carbon Step Code in their building bylaws, if they wish.

In this document, the “Step Code” is being used to refer to both the BC Energy and Zero Carbon Step Codes.

The **“BC Compliance Checklists”** (formerly known as Compliance Reports) provide standardized report templates for Part 9 residential buildings complying with Subsection 9.36.5. or 9.36.6. and 9.37 of the 2018 BC Building Code revision 5. The Compliance Checklists (one for the Pre Construction / Permit stage, one for Mid Construction and one for As Built / Occupancy Permit stage) may be used by EnerGuide Rating System (ERS) Registered Energy Advisors (Energy Advisors) and other energy modellers to produce a standardized compliance report that allows:

- Builders to demonstrate that the home/building meets Step Code requirements,
- Local governments to verify builders are complying with a bylaw or policy that references a particular Step of the Step Code, and
- Local governments and utilities to process incentives or rebates that may be aligned with BC Energy Step Code metrics.

This manual provides detailed instructions for the Step Code Checklist (the “Checklist”). This guide is primarily focused on using the ERS system and HOT2000, however the Checklist is set up to accommodate other modelling tools such as PHPP and energy plus. Those using other systems should have a deep understanding of how their model works in order to ensure the correct inputs into the Checklist.

Previous versions of this manual contained the code language and tables. This manual is intended as an instruction manual only. The BCBC is available from BCCodes.ca.

1.1 Definitions & Abbreviations

Common terms and abbreviations used throughout this manual are described below.

Abbreviation	Term & Description (if applicable)
ACH	Air Changes per Hour, typically at a 50 Pa pressure differential
AFUE	Annual Fuel Utilization Efficiency
AHJ	Authority Having Jurisdiction, i.e. local government, examples: city or municipality
As Built	Post-Construction, plans must be confirmed by a site visit
BCBC	BC Building Code, This version of the Checklist refers to BCBC2018 Revision 5
Calculator	The tab within the Checklist Excel sheet where data is entered and calculations for compliance are completed.
Compliance Checklist	Pre-Construction/ Mid-Construction & As-Built Compliance Forms; Forms generated through use of the Calculator. Previously referred to as "Compliance Forms" or "Compliance Reports". The naming has been revised to harmonize with Part 3.
DES	District Energy System
EA	ERS Registered Energy Advisor; a person registered with NRCan to perform ERS modeling and is insured to do so in BC.
EF	Emissions Factor
% EFF / ER	Efficiency or Energy Ratio
ERS	EnerGuide Rating System; for the purposes of this manual this refers to revision 15 or newer
Fenestration	Envelope assemblies that transfer visible light such as windows (including framing)
GHG	Greenhouse Gas
HDD	Heating Degree Days
HSPF	Heating Seasonal Performance Factor
MEUI	Mechanical Energy Use Intensity in kWh/(m ² ·year)
Mid Con	Mid-Construction
NLA	Normalized Leakage Area in cm ² /m ² , typically at a reference pressure of 10 Pa.
NLR	Normalized Leakage Rate L/s/m ² , typically at a reference pressure of 50 Pa for Part 9 buildings.
NRCan	Natural Resources Canada (-resources.canada.ca)
Pre Con	Pre-Construction
SEER	Seasonal Energy Efficiency Ratio
SHGC	Solar Heat Gain Coefficient
TEDI	Thermal Energy Demand Intensity in kWh/(m ² ·year)
USI	U-value in metric (SI) units (W/m ² K), indicates the insulation of windows

2 Key Updates from Previous Versions

The Pre-construction, Mid-Construction, and As-Built Compliance Reports have been updated to reflect the latest version of the BCBC and provide more auto-population tools. Much of the original reports remains the same, and energy modellers will find the interface and layout largely familiar.

Key changes from the previous version of the tool are listed below.

2.1 The Calculator

- There is now an auto-populate function in the Calculator. By clicking the “get data” button, the user can auto-fill the performance data directly from a HOT2000 model.
- The Zero Carbon Step Code has been added to the calculator form. These sections function in much the same way as the Energy Step Code areas on previous forms.
- It is no longer required to fill out a separate sheet for attached buildings and MURBs. All buildings are now accommodated on one sheet. Single family homes and MURBs may use only one line of the Calculator, with attached non-MURBs using several. The user can use the expander (+) button on the left-hand side to show or hide extra rows as needed or use the Show and Hide Rows buttons.

2.2 The Pre-Construction and As-Built Checklist

- A title/summary page has been added to all Checklists, for at-a-glance compliance information. Detailed information is available on later pages.
- The Zero Carbon Step Code has been added to the Checklist.
- More space has been allocated to the building assembly section to allow modellers space to clearly convey their assumptions and modelling parameters.

2.3 The Mid-Construction Checklist

- The mid-construction form has been added to the Checklist. This new form now closely resembles the other forms and is intended to highlight changes from the pre-construction forms to ensure the building is still on track to meet the requirements.
- A detailed air leakage test results section has been added to allow for more detailed comments and correction lists.

2.4 Model Details Reports

- Detailed model information has been added, to provide detailed model inputs. This is intended to replace the full house report as a means of Authority Having Jurisdiction (AHJ) quality control.
- This form can be generated by clicking the Pre Con or As Built HOT2000 detail Report button in the Calculator.

3 Training

3.1 Step Code Training

Training for this Checklist as well as Step Code training in general will be available on an ongoing basis from the Province and other organizations. Visit www.EnergyStepCode.ca for more information and check back regularly as new information is made available.

4 Part 9 Step Code Scope Clarification

4.1 Previous Versions of the Checklist

For projects that fall under the purview of previous versions/revisions of the BC Building Code the previous versions of the Checklist remain valid for those projects. This version of the Checklist is not backwards compatible and cannot be used for previous versions or revisions of the BC Building Code.

4.2 EnerGuide Rating System Eligible Homes

Homes using the ERS must comply with all requirements as defined in the ERS technical documentation. In some circumstances, a model may be required to vary from that standard (e.g. if an AHJ requires a different HDD from the HOT2000 default file.) In that case, there will be two models, one for ERS submission and one for code compliance.

4.3 EnerGuide Rating System

Although not a requirement of the BCBC, ERS users must be registered Energy Advisors in good standing with Natural Resources Canada in accordance with ERS Administrative Procedures, and must adhere to the technical standards and procedures of the ERS (as described in BCBC 2018 Note A-9.36.6.4.(2)(b)).

Therefore, when using the ERS for compliance with Subsection 9.36.6. of Division B of the BC Building Code (i.e. the BC Energy Step Code), Energy Advisors must adhere to the energy modelling, site verification, and data collection requirements outlined in Version 15 of the following documents:

- ERS Administrative Procedures;
- ERS HOT2000 User Guide;
- ERS Technical Procedures; and
- ERS Standard.

4.4 Buildings with a Mix of Stacked and Non-Stacked Units

For the purposes of Step Code compliance when following the Energuide Rating System compliance path, a building with a mix of stacked and non-stacked units can be modelled as follows:

- Where possible, all stacked units can be modelled as a single (whole building) MURB
- All non-stacked units can be modelled as single units unless those units are connected by common space and can be modelled as a single (whole building) MURB.

Note: “Stacked” refers to any horizontal overlap of units this could include just a closet or an entire floor. See ERS technical procedures for more details.

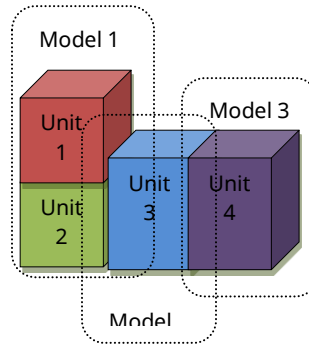
The following examples describe some common scenarios and the potential approach to meet Step Code requirements.

4.4.1 Example 1: Stacked & Non-Stacked Units with No Shared Common Space

Approach: Model Units 1 and 2 as a single MURB, and Units 3 and 4 separately attached row homes

either middle or end unit. Enter the data into the Checklist for each model on a separate line.

Note that ERS procedures allows for 4 models to be created, however this would create a slight difference in the results; therefore, to ensure consistency among Step Code projects please model as



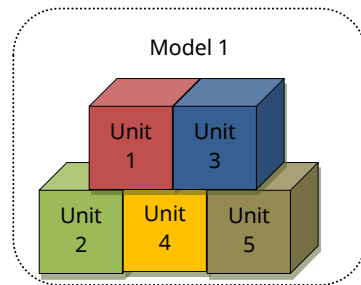
instructed above.

Buildings of this type can also be modelled as a whole building using BCBC 9.36.5.

4.4.2 Example 2: All fully or partially stacked units with or without Common Space

Approach: Model the building as a single MURB when using ERS procedures or using 9.36.5

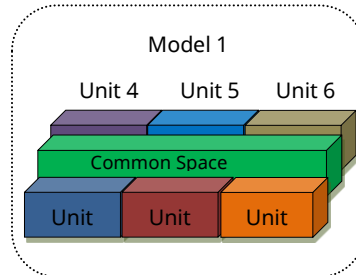
Note: ERS procedures allows for 5 models to be created, however this would create a slight difference in the results.



4.5 Multi-unit Non-Stacked Buildings

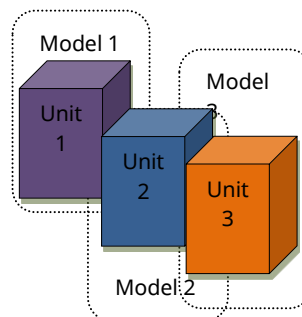
4.5.1 Example 1: Single Storey building with Common Space

Approach: Model as a single MURB whole building. Except when the common space exceeds 20% of the building floor area as per Division B, Sentence 9.36.1.3.(3). In these cases the modeler must use NECB.



4.5.2 Example 2: Multi Unit, not stacked with no Common Space

Approach: Model each unit as a separate model. Enter the data into the Checklist on separate lines.



5 Checklist Sections to be Completed

The sections of the checklist which must be completed will depend on which compliance pathway under BCBC Section 9.36 is used.

5.1 9.36.6 – EnerGuide Rating System

Complete Sections A, B, C, D, D2 (mid con only), F (auto-fills), G (auto-fills). Do not fill out Section E. An AHJ may request a copy of the Pre-Construction and As Built Detail Model Report as a means of verification.

5.2 9.36.6 – Passive House

Complete Sections A, B, C, D, D2 (mid con only), F (auto-fills), G (auto-fills). Do not fill out Section E. Using the PHPP to fill the checklist will not provide a detailed model report. Verification can be completed by reviewing the PHPP Excel file.

5.3 9.36.6 – Energy Step Code

Complete Sections A, B, C, D, D2 (mid con only), F (auto-fills), and G (auto-fills). Do not fill out Section E. Using a Model other than HOT2000 to fill the checklist will not provide a detailed model report. Verification can be completed by reviewing detailed reports from the modelling software.

5.4 9.36.5 – Energy Performance Compliance

Complete Sections A, B, C, D, D2 (mid con only), F (auto-fills), G (auto-fills). An AHJ may request a copy of the Pre-Construction and As Built Detail Model Report, however when HOT2000 is run in general mode sections of the report may be missing. The report should be considered valid these situations.

6 Guide to Auto-filling the Checklist Sheet Using HOT2000

6.1 Enabling Macros

The entire form can be filled manually, however, auto-filling and other functions of the Checklist and calculator require macros to be enabled when using Excel. This link gives a description of how to enable macros on several different types of systems:

- [How to enable and disable macros in Excel](#)

For security reasons some organizations may not allow the use of Macros. In those cases, the form will need to be filled manually. Section 7 includes instructions for manual entry.

6.2 Auto filling the Checklist

Click the line 1 “get Data” button. Navigate to your model location and select the HOT2000 file. The Checklist data will auto-populate the line. It is still possible to manually enter data on this sheet should that be required.

Modellers should not overwrite data from their energy model in this form. If any errors are noted, the model should be corrected.

For Single family homes and MURBs fill only the first line. Attached Non-MURBS, will continue this process using the next line down for each individual model in the building. (e.g: an attached non-MURB triplex will use 3 lines.) The Example shown in 4.4.2 would use three lines one for the stacked MURB units and 2 for each non stacked unit.

BC Energy Step Code Compliance Calculator

Show More Rows		9.36 Step Code Data Proposed					
Hide Rows		The following columns are used to calculate:					
Line #	Suite Number/ Name	P File #'s:	Heated Floor Area (m ²)				
			Above Grade	Below Grade	Total		
Get Data 1	Del Data	1	1234 street	51EA#	117.9	109.9	227.8
Get Data 2	Del Data	2					0
Get Data 3	Del Data	3					0
Get Data 4	Del Data	4					0
Get Data 5	Del Data	5					0

To Show or Hide lines, use the expand Button (+) on the left side of the sheet or click the show more rows button.

BC Energy Step Code Compliance Calculator

<input type="button" value="Show More Rows"/> <input type="button" value="Hide Rows"/>		9.36 Step Code Data Proposed					
<p style="text-align: center;"><u>The following columns are used to calculate:</u></p>							
		Line #	Suite Number/ Name	P File #'s:	Heated Floor Area (m ²)		
					Above Grade	Below Grade	Total
Get Data 1	Del Data	1	1234 street	51EA#	117.9	109.9	227.8
Get Data 2	Del Data	2					0
Get Data 3	Del Data	3					0
Get Data 4	Del Data	4					0
Get Data 5	Del Data	5					0

Select the Step required by the AJH, the proposed, and the As-Built Steps.

Select the Zero Carbon Step Code level required by the AHJ, for the proposed, and the As-Built building.

9.36.5 Reference house

Energy Step Code							
SELECT Energy Step Level:	<table border="1"> <tr><td>Required</td><td>3</td></tr> <tr><td>Proposed:</td><td>3</td></tr> <tr><td>As-Built:</td><td>3</td></tr> </table>	Required	3	Proposed:	3	As-Built:	3
Required	3						
Proposed:	3						
As-Built:	3						
	5 - 3000 to 3999						
ENTER Heating Degree Days (HDD):	3365						
Cooling System Capacity (Watts)	Proposed:	7					
	As-Built:	0					
	Not more than 50%	-					

Carbon Standard		
Carbon Standard Level:	Required	EL 2 - Moderate
	Proposed:	EL 2 - Moderate
	As-Built:	EL 2 - Moderate

F: 9.36.6. ENERGY STEP CODE COMPLIANCE

Proposed House Rated Energy Consumption (GJ/year): Reference House Rated Energy Target (GJ/year):

Create the detailed HOT2000 Reports by clicking the button shown in the graphic below.

			0						3.06	0.00	50.00
	2.00	0.94	0.70	21500.93	49.58	65.35	2384.21	6.50	3.06	6.11	50.00

	EL 2 - Moderate
	EL 2 - Moderate
	EL 2 - Moderate

Create Detailed Model Reports

Pre Con Detail Hot2000 Report

As Built Detail Hot2000 Report

F: Zero Carbon Step code Compliance

nr):

Proposed Calculations	
Proposed House	Proposed House

Proposed House Metrics

The model data input should now be complete.

Review the form to ensure accuracy and fill fields that are not auto-populated. If some cells have not populated review your model to ensure that it has calculated and saved correctly. The model must also be in ERS mode to populate all fields. Running in general mode will result in a partial population. See the Checklist guide for a complete list of trouble shooting options.

7 Manual Input into the Checklist

This section describes how to extract data from HOT2000 and perform manual calculations if the auto-extract function (which requires macros) is not used.

For direction on which output to enter in each field see the Checklist guide which contains a cell-by-cell reference for inputs.

7.1 Entering Data from HOT2000

Enter outputs from the HOT2000 file as follows:

- All units must be in metric.
- Fields marked with the light beige colour can be manually entered.
- Fields marked with White or other colours are calculated fields and cannot be edited.
- To show or hide rows without using macros click the +/- buttons on the far left of the sheet.

78	Get Data 14	Del
79	Get Data 15	Del
80	Get Data 16	Del
81	Get Data 17	Del
82	Get Data 18	Del
83	Get Data 19	Del
84	Get Data 20	Del
85		
86		
87		
88		
112		
113		
114		
115		

7.2 Mechanical Energy Use Intensity (MEUI)

- **Term & Units:** Mechanical Energy Use Intensity (MEUI) in kWh/(m²·year)
- **Definition:** MEUI describes the mechanical energy use over a year, estimated by using an energy model in accordance with BCBC Article 9.36.6.4., normalized per square metre of area of conditioned space and expressed in kWh/(m²·year). Mechanical equipment included in the MEUI are space-heating, space-cooling, fans, service water heating equipment, pumps, and auxiliary HVAC equipment.
- **Formula:**

$$MEUI = \frac{\text{Total Consumption Proposed house (kWh per Year)} - \text{Baseloads}}{\text{Heated Floor area (m}^2\text{)}}$$

7.3 % Improvement

- **Term & Units:** EnerGuide Rating System (ERS) Rating Compared to ERS Reference House without baseloads in percentage (%).
- **Definition:** Percentage Lower Than Reference House without baseloads is a result of comparing the energy consumption of the proposed building to an automatically generated ERS reference house from HOT2000 version 11.x (latest version). The metric does not include the ERS assumed electric base loads.
- **Formula:**

$$\%Improvement = 100 - \frac{\text{Total Consumption Proposed house (kWh per Year)} - \text{Baseloads}}{\text{Total Consumption Reference House (kWh per Year)} - \text{Baseloads}}$$

7.4 Adjusted Thermal Energy Demand Intensity (Adjusted TEDI)

- **Term & Units:** Adjusted Thermal Energy Demand Intensity (Adjusted TEDI) in kWh/(m²·year)
- **Definition:** The Adjusted TEDI target is calculated based on the Degree Days Below 18°C for any given project location as per BCBC Division B, Appendix C, or as defined by the AHJ. The target values for the adjusted TEDI metric are found in BCBC Table A-9.36.6.3.(4) and the formulas in Article 9.36.6.3.(4). See Appendix II in this manual.
- **Formula:**

$$TEDI = \frac{\text{Total Space Heating Demand (kWh per year)}}{\text{Heated Floor area (m2)}}$$

7.5 % Heat Loss Reduction

- **Term & Units:** EnerGuide Rating System (ERS) standard operating conditions gross space heat loss compared to ERS Reference House gross space heat loss expressed as a %.
- **Definition:** Proposed gross space heat loss percentage reduction compared to Reference House. The Reference house is the automatically generated ERS reference house from HOT2000 version 11.x (latest version). Gross space heat loss is all heat loss conduction across opaque and transparent elements of the building envelope, air infiltration and exfiltration, and mechanical ventilation.

Note: This metric is significantly different than previous BCBC %Better Envelope metrics. The largest difference being that it does not include or account for solar gain. Building design teams that have relied on this in the past may need to use alternative metrics. Larger differences in compliance from previous metrics may also be encountered on some homes.

- **Formula:**

$$\% \text{ Heat loss reduction} = \frac{\text{Total Proposed house Gross Space Heat Loss (GJ)} - \text{Total Reference house Gross Space Heat Loss (GJ)}}{\text{Total Reference house Gross Space Heat Loss (GJ)}}$$

7.6 % Building's Conditioned Space Served by Space-Cooling Equipment

- **Term & Units:** Amount of the Building's Conditioned Space Served by Space-Cooling Equipment in percentage (%)
- **Definition:** The Amount of the Building's Conditioned Space Served by Space-Cooling Equipment describes the percentage of the building that is served by space-cooling equipment as either "Not more than 50%" or "More than 50%".
 - When determining the Percentage (%) of the Building's Conditioned Space Served by Space-Cooling Equipment using HOT2000, the Design Cooling Load (as calculated by HOT2000 or other software) will be used as a proxy for the building's conditioned space. Complete the energy model before making this calculation to ensure that the HOT2000 Design Cooling Load is calculated based on the building's assessed attributes.
 - If the HOT2000 energy model does not have the cooling energy consumption included in the annual energy consumption (i.e. cooling energy is not included in the ERS GJ Rating), enter "Not more than 50%." This applies even if there is cooling installed in the building, but it is modelled as an atypical load.
 - If the HOT2000 energy model does have the cooling energy consumption included in the annual energy consumption (i.e. cooling energy is included in the ERS GJ Rating), follow the instructions below to determine the % of the Building's Conditioned Space Served by Space-Cooling Equipment.

- **Formula:**

$$\% \text{ of Building Cooled} = \frac{\text{Total Space Cooling System Capacity (W)}}{\text{Total Cooling Load (W)}}$$

7.7 Energy Source Annual Greenhouse Gas Emissions

- **Term & Units:** Annual Energy Consumption in GJ/year
- **Definition:** Energy Source Consumption describes the annual consumption of different sources of energy, such as electricity, natural gas, propane, other fuel types, and district energy. Take the Annual Fuel Consumption from the HOT2000 EnerGuide Rating System Results screen and convert the consumption into GJ/year.
- For the Proposed House:
 - From the Proposed House energy model, in the applicable Calculator cell enter the annual consumption in GJ with baseloads removed from the Annual Fuel Consumption section of the EnerGuide Rating System Results screen for each respective fuel type.
 - See the cell-by-cell reference in the Checklist for more information.
- For the As-Built House:
 - From the As-Built energy model, in the applicable Calculator cell enter the annual electricity consumption in GJ with baseloads removed from the Annual Fuel Consumption section of the EnerGuide Rating System Results screen for each respective fuel type.
 - See the cell-by-cell reference in the Checklist guide for more information.

8 Greenhouse Gas Modelling Guidelines

8.1 Scope

Performance Path metrics include operational GHG emissions from systems included in the MEUI calculation. This includes space heating and cooling, domestic hot water, and ventilation.

Prescriptive Path metrics include heating systems in EL-2, heating systems and domestic hot water in EL -3 and all building systems, including equipment and appliances in EL-4.

For both the performance and the prescriptive path, exceptions apply for backup and redundant systems as noted below.

8.2 Term Clarification

HOT2000, ERS and other software may use different or similar terms as to those described below. The following clarifications have been provided for the purposes of complying with Division B, Article 9.37.1.3.:

- **Principal Heating System:** A principal heating system refers to the heating system that has been designed to accommodate the heating load of the building and may include supplementary heating equipment.
- **Supplementary Heating Equipment:** Refers to heating equipment that is used to supplement the principal heating system when the capacity of the principal equipment has been exceeded. The supplementary equipment is to be included when demonstrating compliance with Division B, Article 9.37.1.3. Examples of this can include central ducted air source heat pump (ASHP) with supplementary gas furnace, air-to-water heat pump with supplementary gas boiler and packaged dual fuel systems (electric heat pump with supplementary gas heater).
 - Note that HOT2000 uses a different definition of “Supplementary”.
- **Redundant and Backup Equipment:** Refers to equipment that is installed in addition to a principal heating system, is independent of the principal heating system and is not designed to meet the space conditioning load of the house. As per Division B, Sentence 9.36.5.4.(2) redundant or backup heat is permitted to be excluded provided it is equipped with controls and is not required to meet the space-conditioning load of the house. Examples of this can include wood burning stoves, gas fireplaces and emergency back-up equipment.

- **Equipment and Appliances:** Refers to devices that convert fuel into energy and includes heating and cooling equipment, domestic hot water equipment, and ventilation equipment as well as cook tops and laundry drying equipment.
 - **Note:** Follow ERS procedures for modelling and include all systems and equipment in the model. HOT2000 will not assign any energy load to these systems or equipment if the principal system has the capacity to serve the home. If HOT2000 is assigning heating load to a system or equipment as a result of the homes needs, it would be considered a supplementary system and counted in the GHG metrics.

8.3 Modelling instructions for GHG metrics

Observe the following instructions for fireplaces, cooking, laundry, and other auxiliary loads.

- Model all equipment and appliances per ERS procedures.
 - For the performance path, these loads are automatically removed from the calculation when using the auto populate functions.
 - Prescriptive path metrics will also automatically account for gas and propane cooking, laundry, and other loads during the auto-populate of the Checklist.
- For fireplaces, regardless of homeowner intention, select “never” for usage.

8.4 GHG Metrics

The Zero Carbon Step code identifies three ways to calculate GHG emissions, described below.

8.4.1 Total GHG

- **Term & Units:** Maximum Total GHG Emissions in kg CO_{2e}/ year
- **Definition:** Total GHG is calculated by multiplying the total yearly fuel use of systems included in the MEUI by the emission factor of each fuel type.
- **MURB and Multi Unit:** Total GHG limit is multiplied by the total number of units.
- **Formula:**

$$Total\ GHG = \left[\begin{array}{l} (Total\ Electricity\ Use - Baseloads\ (GJ)\ x\ EF) \\ +\ (Total\ Gas\ Use - Baseloads\ (GJ)\ x\ EF) \\ +\ (Ttotal\ Other\ Use - Baseloads\ (GJ)\ x\ EF) \end{array} \right] \times Total\ \#\ of\ Units$$

- Notes:
 - In some cases, conversion from kWh to GJ may be required.
 - See Section 8.5 for Emissions Factor (EF) values.

8.4.2 GHG Intensity (per Floor Area)

- **Term & Units:** GHG emission intensity with a maximum limit expressed in kg CO_{2e}/m²/ year.
- **Definition:** GHG emissions per floor area is calculated by multiplying the total yearly fuel use of all fuel types associated with MEUI (space heating and cooling, domestic hot water and ventilation) by the emission factor of each fuel type and dividing by the heated floor area.

- **Formula:**

$$GHGI = \frac{\begin{aligned} &(\text{Total Electricity Use} - \text{Baseloads (GJ)} \times \text{EF}) \\ &+ (\text{Total Gas Use} - \text{Baseloads (GJ)} \times \text{EF}) \\ &+ (\text{Total Other Use} - \text{Baseloads (GJ)} \times \text{EF}) \end{aligned}}{\text{Total Heated Floor area (m}^2\text{)}}$$

- Notes:
 - In some cases, conversion from kWh to GJ may be required.
 - See Section 8.5 for Emissions Factor (EF) values.

8.4.3 Prescriptive Pathway

- **Term & Units:** Prescriptive option based on fuel type. This metric does not require modelled values.
- **Definition:** Please refer to Table 9.37.1.3. for requirements; below is a summary of options:
 - EL2 – Principal Heating system(s) decarbonized
 - EL3 – Principal Heating and Hot water system(s) decarbonized
 - EL4 – All systems including equipment and appliances decarbonized with the exception of redundant of back-up equipment

8.5 Emissions Factors

Emissions Factors are used to calculate the associated operational GHG emissions produced with each type of fuel used by the building.

- **Electricity & Natural Gas:** Electricity and natural gas emissions factors are set by the BCBC (Division B, Sentence 9.37.1.3(2)) for the entire province and are not to be adjusted for different local utilities providers.
 - Electricity
 - Convert to GJ/year by multiplying the total electricity consumption in kWh by 0.0036 GJ/kWh.
 - Example: 1000 kWh per year * 0.0036 GJ/kWh = 3.6 GJ per year
 - Natural Gas
 - Convert to GJ/year by multiplying the total natural gas consumption in m³ by 0.03726 GJ/m³.
 - Example: 1000 m³ per year * 0.03726 GJ/ m³ = 37.3GJ per year

- **Other:** The use of additional emissions factors for other fuels not listed in the BC Building Code are to be approved by the AHJ prior to proceeding.
 - Factors for the following fuel types are provided here as a reference from the [National Inventory Report 1990-2020](#) from Environment and Climate Change Canada:

Fuel	kg CO_{2e}/kWh	kg CO_{2e}/GJ
Propane	0.2155	59.86
Light Fuel Oil (Standard)	0.2579	71.64
Heavy Fuel Oil	0.2689	74.69
Diesel Fuel (Standard)	0.2581	71.69
Wood Fuel	0.0786	21.83

- **District Energy Systems:**
 - Emission Factors for DES use must be determined to the satisfaction of the AHJ in discussion with the utility. It may be required to show copies of purchase agreements, DES fuel source information, or other documents at time of permit submission.
 - HOT2000 is not capable of producing separate values for district energy systems. Modellers using HOT2000 will need to manually separate the results to provide Checklist inputs.

9 Air Leakage

ERS and Step Code differ in their approach to air leakage. ERS applies results to single units if they are not MURBS while Step Code applies results to the entire building regardless of whether or not it is a MURB. For this reason, when using ERS procedures for testing non-MURB attached units the party wall air leakage must be accounted for. This can be done in one of two ways:

- Using 9.36.5 and completing a multi-fan, multi-zone test or
- Using ERS procedures and applying a discounted air leakage result. For those using a single fan, single zone testing procedure follow the steps in section 9.1.

9.1 Single Fan Test Procedure

9.1.1 Applicability

The following procedure may be used when a building meets the following conditions:

- Building is not a MURB but contains more than one, non-stacked air pressure zone.
- Project is Step 3 (not Step 4 or 5).
- Each test is done as a single zone.
- Testing is completed with a single fan.
 - Example: A row home with 5 units using only one test fan.

These procedures do NOT apply to Attached Ground-Oriented Part 9 Residential Buildings defined by the ERS as MURBs. The ERS defines Attached Ground-Oriented Buildings with any vertical overlap of any unit over another unit as a MURB.

9.1.2 Procedure

Where this procedure applies, up to 0.5 ACH @ 50Pa may be subtracted from each unit's result. The adjustment can only apply down to 1.5 ACH @ 50Pa.

For example:

- If a townhome tests at 2.7 ACH @ 50Pa, the result can be entered into the HOT2000 model as 2.2.
- If a townhome tests at 1.7 ACH the result can be entered as 1.5 ACH in HOT2000.

Important Notes:

- The modeller will need to create two models if submitting to ERS. Use only the actual results for ERS. Do not submit the adjusted results for ERS labelling.

10 BC Energy Step Code and Modelled HDD & Climate Data selection

For Step Code compliance purposes, modellers should confirm with the AHJ what climate data is to be used to demonstrate compliance. Unless otherwise instructed by the AHJ, modellers can use the HDD within the HOT2000 weather data as per ERS standards.

In some cases where locations are vastly different than the HOT2000 data an AHJ may ask modellers to use climate data from a different geographic location for code compliance. In these cases, the modeller will create two models, one for submission to ERS and one for Step Code compliance with different climate data selected.

If the AHJ requires different HDD to be used from the HOT2000 default, do not change the HDD within HOT2000 as this does not impact the proposed building. Only the HDD in the Checklist should be changed. If using the auto-populate function this will need to be overwritten manually.

The HOT2000 data map is available here: [HOT2000 Climate Map \(arcgis.com\)](https://arcgis.com).

11 Using PHPP 9 with the Checklist

Using the PHPP (Passive House Planning Package) Version 9 or newer is a valid compliance pathway within BCBC. Some AHJs may allow submission of a complete model as verification for compliance; others may require the Checklist to be completed. The following instructions outline that process.

Notes:

- PHPP is not capable of producing all outputs so some fields such as those referring to the reference house may be left blank.
- In some cases, units may need conversion.
- Please take these references as a guide and not exact instructions.

11.1 Cell References

The following table outlines PHPP reference values to use in key entries within the Checklist.

Item	PHPP Reference	Checklist Reference
Floor Area	N/A: TFA is not equivalent; calculate Gross Floor Area	G11- H11
Base Load	N/A	Enter 0
Total ACE	PER/ Demand w/o household elec - Q89	L11
Building Surface Area	Areas/ Total Envelope areas - N29	N11
Building Volume	N/A	O11 – PHPP volume is not measured in the same way calculate gross volume
ACH	Ventilation / Air change rate at test – N27	P11
NLA	N/A	Leave Blank
Design Cooling load	Cooling load / Cooling Load Pc – Q62	T11
Cool System Capacity	Cooling units/ Total V52	U11
Aux Energy Demand	Annual Heat/ Annual Heating demand - O71	S11
Electricity Consumption	PER/ Final Energy Demand – Q85	AM11 – Separate different energy systems into their columns

Appendix I – Sample Step Code Compliance Checklist

The latest version of the Checklist, and other associated documents, are available at this link:

- <https://energystepcode.ca/compliance-tools-part9/>

Appendix II –BCBC 2018 Revision 5

The full version of the BCBC 2018 Revision 5 is available from BCCode.ca:

- <https://bccodes.ca/index.html>

Appendix III –BCBC 2018 Revision 5 - Bulletins

Technical bulletins for the BCBC are published by the Province and found at this link:

- <https://www2.gov.bc.ca/gov/content/industry/construction-industry/building-codes-standards/bc-codes/technical-bulletins>

The 3 bulletins currently applicable to Revision 5 are:

- [B23-03 Zero Carbon Step Code](#)
- [B23-02 9.36.1.3. Compliance Paths](#)
- [B23-01 Information for Planners about 20% Better Energy Efficiency and Zero Carbon Step Code](#)

Contact Information and Comments

To provide feedback and recommendations on the BC Energy Compliance Checklist Manual please contact BSSB via email:

- building.safety@gov.bc.ca