



ENERGY
STEPCODE
BUILDING BEYOND THE STANDARD

**INSTRUCTION MANUAL:
BC ENERGY COMPLIANCE REPORTS FOR
PART 9 RESIDENTIAL BUILDINGS**

**FOR ENERGUIDE RATING SYSTEM
ENERGY ADVISORS AND SERVICE ORGANIZATIONS
USING THE 9.36.5 & 9.36.6 PERFORMANCE PATHS**

**Developed with the support of Natural Resources Canada,
FortisBC & BC Housing**

**To be used with 2018 BC Building Code Revisions 2 & 3
(effective Dec. 12, 2019)**

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Table of Contents

1	Introduction	3
1.1	The EnerGuide Rating System, Single Family Dwellings, Multi-Unit Residential Buildings, and Attached Ground-Oriented Residential Buildings.....	3
1.2	2019 BCBC Updates to Step Code Targets for Part 9 Buildings	6
1.3	2018 BCBC Step Code Compliance Options, with December 2019 Revisions	6
2	Guidelines For Completing BC Energy Compliance Reports Using EnerGuide Rating System	9
3	EnerGuide Rating System.....	10
4	Step Code Metrics Compliance Calculators and Reports.....	10
5	Instructions for filling out Pre-Construction and As-Built Compliance Reports	12
6	Instructions for Modelling Attached Ground-Oriented Part 9 Residential Buildings	28
6.1	Background	28
6.2	Solution	29
	APPENDIX I – Sample Step Code Compliance Report	38
	APPENDIX II – 2018 BCBC Updates to Step Code Targets for Part 9 Buildings – Revision 2.....	41
	APPENDIX III – Rounding Calculations	52
	APPENDIX IV – Manually Calculating Proposed and As-Built House Rated Energy Consumption and Reference House Rated Energy Target.....	53
	APPENDIX V – Manually Calculating Mechanical Energy Use Intensity (MEUI).....	56
	APPENDIX VI – Manually Calculating ERS Rating % Lower Than EnerGuide Reference House	57
	APPENDIX VII – Manually Calculating Thermal Energy Demand Intensity (TEDI) and Adjusted Thermal Energy Demand Intensity	59
	APPENDIX VIII – Manually Calculating the Building Envelope % Performance Improvement over the EnerGuide Reference House.....	61
	APPENDIX X – Manually Calculating % Building’s Conditioned Space Served By Space-Cooling Equipment.....	65
	APPENDIX XI – Manually Calculating Energy Source Annual Energy Consumption.....	67
	Appendix XII: List of Modifications to the BCBC 2018 Revision 2 & 3 - Step Code Compliance Calculator/Report Generator.....	71
	April 21, 2020.....	71
	May 6, 2020	71
	May 26, 2020	71
	July 22, 2020	71
	Contact Information and Comments	72

1 Introduction

The **BC Energy Step Code** (the “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 can choose to build to, and as of December 15, 2017, communities may voluntarily adopt in bylaws and policies. The Step Code was updated in December 2018 and again in December 2019. This manual provides a summary of the relevant December 2019 Step Code updates and a revised set of instructions for using the EnerGuide Rating System’s HOT2000 for generating BC Energy Compliance Reports. Previous versions of this manual will be kept available on the Step Code website for instances where Building Permits were applied for prior to Dec. 12, 2019.

The “**BC Energy Compliance Reports**” (or “Compliance Reports”) provide standardized report templates for Part 9 residential buildings complying with Subsection 9.36.5. or 9.36.6. of the 2018 BC Building Code. The Compliance Reports (one for the Building Permit stage, and one for the 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;
- 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.

The **BC Energy Compliance Report - Performance Paths for Part 9 Buildings - Instruction Manual** provides:

- General guidelines for using the BC Energy Compliance Report for compliance using the EnerGuide Rating System;
- A table of instructions for completing the BC Energy Compliance Report; and
- Details on how to use HOT2000 to complete the BC Energy Step Code Compliance Calculator, to determine if the building’s performance meets the BC Energy Step Code metrics.

1.1 The EnerGuide Rating System, Single Family Dwellings, Multi-Unit Residential Buildings, and Attached Ground-Oriented Residential Buildings

The EnerGuide Rating System Standard version 15.7 describes whether a building is eligible for evaluation under the ERS.¹

“1.2.1 Eligible housing types

1.2.1.1 Houses

Houses that contain only one *dwelling unit*, with or without non-residential occupancies, are eligible to be evaluated under the EnerGuide Rating System if they meet the following conditions:

- not greater than three storeys in building height, where building height (in number of storeys) is determined using one of the following methods:
 - in conformity with the National Building Code of Canada 2015;
 - in conformity with the provincial or territorial building code in force;

¹ Natural Resources Canada, “EnerGuide Rating System Standard Version 15.7”, July 2019, pp. 1-2.

- the number of storeys fully above the highest point of finished ground with no more than a combination of four full or partial storeys above the lowest point of finished ground.
- not greater than 600 m² (6458 sq. ft.) in *building area*;
- are on permanent foundations (this includes a parking garage), or are permanently moored float homes; and
- where a house consists of a mix of residential and non-residential occupancies, where occupancy definitions are those used by the National Building Code of Canada 2015 (i.e. business and personal services, mercantile or low-hazard industrial occupancies):
 - the combined total floor area of the non-residential occupancies is less than that of the residential spaces and does not exceed 300 m² (3229 sq. ft.), excluding parking garages that serve residential occupancies; and
 - the risk category of the non-residential occupancies falls within the acceptable risk categories, as per the *EnerGuide Rating System—Technical Procedures Appendix A*.

NOTES:

- 1) Row houses and semi-detached houses are to be assessed as houses unless they are comprised of fully or partially stacked *units* or are joined by a common space, in which case they are to be assessed as a *multi-unit residential building*.
- 2) Houses with *secondary suites* are considered *multi-unit residential buildings*.

1.2.1.2 Multi-unit residential buildings

For a building to be eligible as a MURB under the EnerGuide Rating System, it must meet the requirements in **Section 1.2.1.1**'s bulleted list and the following conditions:

- contains between two and 100 units;
- dwelling units do not share cooking or sanitary facilities;
- each dwelling unit has a private entrance either from the outside of the building or from a common space (e.g. hallway, lobby, vestibule, or interior stairway) that can be used without passing through another dwelling unit;
- units are fully or partially stacked or joined by a common space;
- secondary suites are fully or partially stacked, side-by-side or joined by a common space; and
- where a building consists of a mix of residential and non-residential occupancies (i.e. business and personal services, mercantile or low-hazard industrial occupancies):
 - the combined total floor area of the non-residential occupancies is less than that of the residential spaces (i.e. areas used for dwelling units and common spaces) and does not exceed 300 m² (3229 sq. ft.), excluding parking garages that serve residential occupancies; and
 - the risk category of the non-residential occupancies falls within the acceptable risk categories, as per the *EnerGuide Rating System—Technical Procedures Appendix A*.

When the preceding conditions are met, the building can be evaluated as a whole or single-dwelling units can be evaluated individually.

NOTE:

- 1) Houses with *secondary suites* are considered *multi-unit residential buildings*."

The EnerGuide Rating System's Technical Procedures defines five "house" types and six "Multi-Unit Residential Building" types²:

² Natural Resources Canada, "EnerGuide Rating System Technical Procedures 15.7", July 2019, pp. 30-31.

- House: single detached; row, end unit; row, middle unit³; double/semi-detached; and mobile home⁴; and
- Multi-unit Residential Building: detached duplex⁵; detached triplex; attached duplex; attached triplex; apartment; and apartment row.

The Compliance Calculators for calculating the performance of buildings are contained as two tabs (spreadsheets) in an Excel workbook:

- 1) One tab for houses that are not attached (e.g. single detached and mobile homes) and multi-unit residential buildings (MURBs) as defined by the ERS; and
- 2) One tab for Ground-oriented attached houses that are not considered MURBs under the EnerGuide Rating System (e.g. row houses (end and middle units) and double/semi-detached houses).

The Attached Non-MURB calculator differs from the SFD and MURB Calculator and ERS version 15 procedures in that each unit as per ERS guidelines is first modelled, but then requires that the ERS metrics for each unit be input into the Compliance Calculator for attached ground-oriented Part 9 buildings. The calculator then sums, and where appropriate, averages, the metrics for each unit to achieve the Step Code metrics for the building as a whole. It also takes into consideration the challenge of creating an air barrier between attached units where one is not required by the BC Building Code.

³ Row, middle unit is defined as “A dwelling unit separated by at least two vertical divisions termed ‘party walls’, from the adjacent dwelling units.” For example, in a square quadplex with one unit on each of the four corners, each unit would be considered a “row, middle unit” because each unit is attached to 2 or more separate units by a “party wall”.

⁴ Under the Specifications tab, HOT2000 also includes three more house types: duplex (non-MURB), triplex (non-MURB), and apartment (non-MURB). However, they are not listed in the ERS Technical Procedures version 15.7 and are not to be used in HOT2000 for the purposes of the Attached Non-MURB calculator.

⁵ Detached duplex would include most single-detached buildings with secondary suites.

1.2 2019 BCBC Updates to Step Code Targets for Part 9 Buildings

On December 12, 2019, Revision 2 to the BC Building Code 2018 created new BC Energy Step Code targets for Part 9 buildings. These changes were made to achieve the following objectives⁶:

- (1) To reflect the climate variability within each climate zone and to allow the designer to calculate the TEDI requirements based on climate data specific to the building location.
- (2) To accommodate for buildings that may not be able to take advantage of solar heat gain due to the project location or have building features, such as cathedral roofs, that could negatively impact meeting the Step Code requirements.

The December 2019 changes made to the BC Energy Compliance Report support the above noted objectives and are summarized below.

Builders now have three options to meet the Performance Requirement for the Building Envelope 1) TEDI, 2) Adjusted TEDI, or 3) the Building Envelope % Performance Improvement over the EnerGuide Reference House. Either compliance path can be followed and there are no restrictions within the code regarding one compliance path over another.

1. **Revision to the Thermal Energy Demand Intensity (TEDI) Targets – Now called the Adjusted TEDI:**

An adjusted scale has been introduced to TEDI targets to reflect the climate variability within each given climate zone. The adjusted scale will allow builders in colder parts of a climate zone to adjust their TEDI target based on the Degree Days Below 18°C (HDD) of their project location, rather than use a single target for the entire climate zone. HDD and other climate related information is found in Division B, Appendix C of the BC Building Code 2018. Should the climate data not be available within the BC Building Code for a given building location, then the Authority Having Jurisdiction is to be contacted for further information. The calculation procedure to demonstrate compliance with Step Code requirements is the same for both the TEDI metric and the Adjusted TEDI metric.

- ### 2. **Addition of an Alternative for Measuring Building Envelope Performance – Building Envelope % Performance Improvement over the EnerGuide Reference House:** This change provides an alternative path for builders to demonstrate that the envelope performance requirements are met when using the EnerGuide Rating System. This metric, expressed as a percentage, compares the difference between the Auxiliary Energy Required of a **modified** proposed house to the Auxiliary Energy Required of an EnerGuide Rating System reference house indicated as the *Building Envelope % Better* in the Compliance Reports and Calculator. For directions regarding how to modify the proposed house and manually calculate this metric, see Appendix VIII.

1.3 2018 BCBC Step Code Compliance Options, with December 2019 Revisions

This section of the *BC Energy Compliance Reports Instruction Manual* aims to provide a clear description of the revised options outlined in Subsection 9.36.6.3 and Tables **9.36.6.3.-A** through **9.36.6.3.-G** of the 2018 BCBC. The tables can be found in Appendix II of this manual. To achieve compliance with subsection 9.36.6 of the 2018 BC Building Code, a building must meet performance targets for all three categories: Building Equipment and Systems, Building Envelope, and Airtightness. There is only one airtightness target for each Step level. Within the categories of Building Equipment and Systems and Building Envelope, there are multiple options for compliance when targeting Steps 2-5. As shown in the tables below, the compliance requirements and compliance options for Step 1 differ from Steps 2-5.

⁶ https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/construction-industry/building-codes-and-standards/bulletins/b19-08_step_code_revision_2_bulletin_2020_01_08.pdf

1. **Step 1**

Step 1	
<u>Airtightness Requirement</u>	There is no airtightness requirement for Step 1
<u>Building Equipment and Systems & Building Envelope</u>	EnerGuide Rating % Lower than EnerGuide Reference House: not less than 0% lower energy consumption. This requirement is the same across all climate zones (see tables 9.36.6.3-A through 9.36.6.3-F)
	OR
	Conform to Subsection 9.36.5

2. **Steps 2 through 5**

a. Performance of Building Equipment and Systems – Steps 2-5

Building Equipment and Systems compliance is met by achieving the applicable targets for Option 1 or Option 2		
Note: Option 1 is not available for buildings aiming to achieve Step 5.		
<u>Option 1</u>	EnerGuide Rating % lower than EnerGuide Reference House	Required targets are based on the Degree Days Below 18°C of the building location and found in the appropriate table (9.36.6.3-A through 9.36.6.3-F)
OR		
<u>Option 2</u>	Mechanical Energy Use Intensity (MEUI)	The applicable MEUI requirements are based on the Degree Days Below 18°C of the building location, the amount of the building’s conditioned space served by space-cooling equipment, and the building’s floor area of conditioned space. The applicable MEUI target is listed in table 9.36.6.3-G .

b. Performance of Building Envelope – Steps 2-5

Performance Requirement of the Building Envelope is met by achieving the applicable targets for either Option 1, Option 2, or Option 3.		
<u>Option 1</u>	Thermal Energy Demand Intensity (TEDI)	Required targets are based on the Degree Days Below 18°C of the building location and found in the appropriate table (9.36.6.3.-A through 9.36.6.3.-F)
OR		
<u>Option 2</u>	Adjusted Thermal Energy Demand Intensity (TEDI)	The applicable Adjusted TEDI requirements are based on the Degree Days Below 18°C of the building location. The adjusted TEDI targets are based on the formula outlined in Article 9.36.6.3.(4) (also shown in Appendix II of this manual). The Compliance Report Calculator will automatically calculate the adjusted TEDI when HDDs are entered into the calculator. Table A-9.36.6.3.(4) lists the adjusted TEDI targets for every 100 HDDs.
OR		
<u>Option 3</u>	Building Envelope % Performance Improvement over the EnerGuide Reference House	The Building Envelope % Performance Improvement over the EnerGuide Reference House compares the percentage difference of Auxiliary Energy Required of a proposed house over the Auxiliary Energy Required for the EnerGuide Reference House. The required targets are based on the Degree Days Below 18°C of the building location and can be found in the appropriate table (9.36.6.3.-A through 9.36.6.3.-F)

2 Guidelines For Completing BC Energy Compliance Reports Using EnerGuide Rating System

ITEM	GUIDELINES
Online Access	The BC Energy Compliance Reports can be found online at: <ul style="list-style-type: none"> • https://energystepcode.ca/compliance-tools-part9/
BC Energy Compliance Report Versions	As of the date of issue of this manual, there are three versions of the BC Energy Compliance Report: <ul style="list-style-type: none"> • VERSION 1.1: Used for building permit applications submitted prior to December 10, 2018, or as required by the Authority Having Jurisdiction (AHJ). • BCBC 2018 REVISION 1 – EFFECTIVE 2018-12-10: Used for building permit applications submitted on or after December 10, 2018, or as required by AHJ. <ul style="list-style-type: none"> ○ Updated version published on September 17, 2019 includes guidance on modelling attached ground-oriented residential buildings that are not considered multi-unit residential buildings under the EnerGuide Rating System. • BCBC 2018 REVISION 2 – EFFECTIVE 2019 -12-12: Used for building permit applications submitted on or after December 12, 2019, or as required by AHJ.
Compliance Calculator and Report Generator	<ul style="list-style-type: none"> • Users of the Compliance Calculator and Report Generator must use recent versions of Microsoft Excel. Legacy versions of Microsoft Excel will not be supported. • These instructions are designed for individuals using the integrated Microsoft Excel BC Energy Compliance Calculator and Report Generator.
ERS Energy Modelling	Use EnerGuide Rating System Version 15.x, HOT2000 Version 11.x (most recent version). ⁷ Follow the energy modelling instructions in the most recent versions of the following EnerGuide Rating System documents: <ul style="list-style-type: none"> • ERS Administrative Procedures; • ERS HOT2000 User Guide; • ERS Technical Procedures; and • ERS Standard.
Building Types	<p>This version of the manual provides detailed instructions on how to generate the BC Energy Compliance Report for Part 9 residential buildings eligible for evaluation under the ERS as described in Section 1.1 of this Manual. The list aligns with building types that are generally understood by building inspectors.</p> <p>This drop down does not necessarily use the same nomenclature as HOT2000. A “multi-plex (non-MURB)” as described in Building Types would contain at least three units that share at least two party walls. Each of these units would be defined as “row, middle units” in the “Attached non-MURB Calculator”. A “Row House (non-MURB)” would have at least two units defined as “row, end unit” plus at least one “row, middle unit”</p>

⁷ The current version of HOT2000 at the time of writing is 11.7, and the current version of the ERS is v 15.7. This guidance applies to any version of HOT2000 v 11 and any version of the ERS v 15; however, an EnerGuide rating cannot be acquired using any version prior to ERS v 15.7

Energy Step Code Regulation	<p>Users of this Instruction Manual and the BC Energy Compliance Report should be familiar and have read within the 2018 BC Building Code:</p> <ul style="list-style-type: none"> • Article 2.2.8.2. of Division C, Information Required on Drawings and Specifications; • Article 2.2.8.3. of Division C, House Performance Compliance Calculation Report;⁸ • Subsection 9.36.5. of Division B, Energy Performance Compliance; • Subsection 9.36.6. of Division B, Energy Step Code;⁹ and • Information Bulletin No. B18-08: Revisions to the 2018 BC Building Code. • Information Bulletin No. B19-03: Guidelines for Energy Advisors – Setting Airtightness Values for Energy Modelling of Part 9 Buildings for Compliance with the BC Energy Step Code • Information Bulletin No. B19-08: Changes to the BC Energy Step Code for Part 3 and Part 9 Buildings
Technical Resources	<ul style="list-style-type: none"> • Guidelines for Using HOT2000 v.11.x to Demonstrate Compliance with Subsection 9.36.5 of the 2015 National Building Code, Natural Resources Canada

3 EnerGuide Rating System

Although not a requirement of the British Columbia Building Code, users of the EnerGuide Rating System (ERS) must be Energy Advisors registered and in good standing with Natural Resources Canada in accordance with the EnerGuide Rating System 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 EnerGuide Rating System 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 the latest version of the following documents:

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

4 Step Code Metrics Compliance Calculators and Reports

A Microsoft Excel **BC Energy Step Code Compliance Calculator** workbook with integrated **BC Energy Compliance Report Generators** is now available to assist EnerGuide Rating System Energy Advisors. Features include:

- Calculator tools assist with the calculations for the BC Energy Step Code Metrics for Section D and the additional metrics for Section F of the BC Energy Compliance Report. By entering data from the HOT2000 energy model, selecting the project’s climate zone, entering the project’s Degree Days Below 18°C (HDDs), entering cooling system capacity, and the required ‘Step’, these tools calculate the Mechanical Energy Use Intensity (MEUI), ERS Rating % Lower Than EnerGuide Reference House,

⁸ The content of these two articles can be found in Ministerial Order BA 2018 2, available at https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/construction-industry/building-codes-and-standards/revisions-and-mo/bcbc_2018_revision1_signed_order.pdf

⁹ The content of this subsection can be found in Ministerial Order BA 2018 2, available at https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/construction-industry/building-codes-and-standards/revisions-and-mo/bcbc_2018_revision1_signed_order.pdf

Thermal Energy Demand Intensity (TEDI), Adjusted TEDI, and performance requirement of the building envelope via the Building Envelope % Performance Improvement over the EnerGuide Reference House. The calculators also compare the calculated Step Code Metrics to the selected required Step and determine which metrics the building has achieved and the overall result.

- The workbook incorporates a report generator for the Pre-Construction and As-Built Compliance Reports. The calculated metrics do not have to be transferred to a separate document (e.g. a PDF version of the Compliance Report). Various other sections of the reports will also auto-populate to save the Energy Advisor time and reduce potential for data entry errors.

Important Notes:

- The calculator is designed for recent versions of Microsoft Excel. Legacy versions of Excel may not be supported and could impact the functionality of the calculator.
- When using the calculators, or doing manual calculations, ensure the HOT2000 file is set to **metric units**.
- AHJs may, at their discretion, require evidence that any changes to building design after building permit, but before completion, does not affect compliance with the Step Code. This may include revisions to the energy model and the pre-construction compliance report.
- Keep the P-file (Pre-Construction) section of the calculator static when updating the As-Built report to keep a record of what had been submitted. In other words, do not update the Proposed House and Proposed Reference House entries in the P-file (Pre-Construction) section of the calculator when doing the As-Built and As-Built Reference House entries.

5 Instructions for filling out Pre-Construction and As-Built Compliance Reports

This table of instructions provides a description of what information should be included within each data entry point (field) of the BC Energy Compliance report.

A: PROJECT INFORMATION	
REPORT ITEM	INSTRUCTIONS
Building Permit # (if available)	Building Permit Number from the Authority Having Jurisdiction (AHJ, i.e. the Local Government). To be retrieved acquired when available from the AHJ or builder.
	<i>Data must be entered manually in the Pre-Construction Report; entered data auto-populates in the As-Built Report.</i>
Builder	Full Builder Company Name. In the case of Homeowner Builder, enter Homeowner's Name.
	<i>Data must be entered manually in the Pre-Construction Report; entered data auto-populates in the As-Built Report.</i>
Project Address	The address for the project. If no address is available write PENDING.
	<i>Data must be entered manually in the Pre-Construction Report; entered data auto-populates in the As-Built Report.</i>
Municipality / District	Full name of Jurisdiction of where the building is being constructed, e.g. enter "City of North Vancouver" or "District of North Vancouver". Please ensure the Jurisdiction's name is identified correctly.
	<i>Data must be entered manually in the Pre-Construction Report; entered data auto-populates in the As-Built Report.</i>
Postal Code	Canada Post Postal Code, if available. If no postal code is available write PENDING.
	<i>Data must be entered manually in the Pre-Construction Report; entered data auto-populates in the As-Built Report.</i>
PID or Legal Description	The Parcel Identifier (PID) is a nine-digit number that uniquely identifies a parcel in the land title register in BC. Check the BC Land Title and Survey website to find the PID or Legal Description for the property.
	<i>Data must be entered manually in the Pre-Construction Report; entered data auto-populates in the As-Built Report.</i>

A: PROJECT INFORMATION															
REPORT ITEM	INSTRUCTIONS														
Building Type	Select appropriate type of building from the drop-down menu, e.g. Single-Detached House, rowhouse, etc. Note: The selection of Building Type determines which calculator will auto-fill the reports. If the building is an attached, non-MURB building (e.g., Double/Semi-detached (non-MURB), Row House (non-MURB), Multi-plex (non-MURB), the “Attached Non-MURB Calculator” sheet must be used, as the report will seek results from that calculator.														
	<i>Selection must be made manually in both the Pre-Construction and the As-Built Reports.</i>														
If Other, Please Specify	If the building type is not listed in the drop-down menu, specify what building type it is in the Other field.														
	<i>Data must be entered manually in the Pre-Construction Report; entered data auto-populates in the As-Built Report.</i>														
Number of Dwelling Units	Indicate the number of dwelling units in the building. As defined in BCBC, a “dwelling unit means a suite operated as a housekeeping unit, used or intended to be used by one or more persons and usually containing cooking, eating, living, sleeping and sanitary facilities.” (BCBC Division A, Article 1.4.1.2.)														
	<i>Data must be entered manually in the Pre-Construction Report; entered data auto-populates in the As-Built Report.</i>														
Climate Zone	BCBC Climate Zone as defined by the Degree Days Below 18°C of the building’s location or as defined by the AHJ.														
	<table border="1"> <thead> <tr> <th>Climate Zone</th> <th>Heating Degree Days</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>< 3000</td> </tr> <tr> <td>5</td> <td>3000 to 3999</td> </tr> <tr> <td>6</td> <td>4000 to 4999</td> </tr> <tr> <td>7A</td> <td>5000 to 5999</td> </tr> <tr> <td>7B</td> <td>6000 to 6999</td> </tr> <tr> <td>8</td> <td>> 6999</td> </tr> </tbody> </table>	Climate Zone	Heating Degree Days	4	< 3000	5	3000 to 3999	6	4000 to 4999	7A	5000 to 5999	7B	6000 to 6999	8	> 6999
	Climate Zone	Heating Degree Days													
4	< 3000														
5	3000 to 3999														
6	4000 to 4999														
7A	5000 to 5999														
7B	6000 to 6999														
8	> 6999														
<i>Input into appropriate calculator. Auto-populates both the Pre-Construction and the As-Built Reports based on calculator input.</i>															
Degree Days Below 18°C (HDD)	The Degree Days Below 18°C determined by the building’s location found in Division B, Appendix C of the BC Building Code 2018, or as defined by the AHJ. The adjusted TEDI targets are based on the formula outlined in Article 9.36.6.3 (4) (also shown in Appendix II of this manual). Table A-9.36.6.3.(4) lists the adjusted TEDI targets for increments of 100 Degree Days Below 18°C.														

A: PROJECT INFORMATION	
REPORT ITEM	INSTRUCTIONS
	Auto populated in both the pre-construction and as-built reports when HDD are entered into the calculator.
Floor Area of Conditioned Space (m ²)	Indicate the floor area of conditioned space in square metres. In HOT2000, this is calculated by summing the Above Grade and Below Grade heated floor area found in the Specifications tab.
	<i>Auto populated in both the pre-construction and as-built reports from the calculator. The calculator requires only the Above Grade and Below Grade Floor Area of Conditioned Space and automatically sums the two, preventing calculation errors.</i>
BC Building Code Performance Compliance Path	<p>Select the BC Energy Compliance path the project is following:</p> <ul style="list-style-type: none"> • If following the Subsection 9.36.6. Energy Step Code Compliance Path, check the box and complete Sections A, B, D, & E of the BC Energy Compliance Report. • If following the Subsection 9.36.5. Energy Performance Compliance Path, but NOT complying with Step Code, check the box and complete Sections A, B, C, & E of the BC Energy Compliance Report. (For further guidance, see the Section C guidance below.) <ul style="list-style-type: none"> *Many fields in the reports auto-fill from the calculator worksheets. If not using the calculators, some fields will have to be filled out manually after printing. • If using the Subsection 9.36.5. Energy Performance Compliance Path AND complying with Subsection 9.36.6. Energy Step Code Compliance Path check the box and complete Sections A, B, C, D, & E of the BC Energy Compliance Report. (For further guidance, see the Section C guidance below.) <ul style="list-style-type: none"> ○ For Steps 1 to 5, the ERS Rating % Lower than EnerGuide Reference House is not applicable as the ERS path is not being pursued. Therefore, this line in Section D does not need to be completed. As well, for Steps 2 to 5, do not select an airtightness value in Section C of the Pre-Construction report; the proposed airtightness value should only be included in Section D. For the As-Built report, the tested airtightness value should be included in Sections C and D (for further guidance, see the Section C guidance below.) ○ Many fields in the reports auto-fill from the calculator worksheets. If not using the calculators, some fields will have to be filled out manually after printing.
	<i>Data must be entered manually in the Pre-Construction Report; entered data auto-populates in the As-Built Report.</i>
Software Name	List Full Name of Software (e.g. HOT2000) used for energy performance modelling.

A: PROJECT INFORMATION	
REPORT ITEM	INSTRUCTIONS
	<i>Data must be entered manually in the Pre-Construction Report; entered data auto-populates in the As-Built Report.</i>
Version	List Version of Software (e.g. v11.7 of HOT2000).
	<i>Data must be entered manually in the Pre-Construction Report; entered data auto-populates in the As-Built Report.</i>
Climatic Data (Location)	Indicate the Weather location used by the Software. In HOT2000, this can be found in the Weather tab under the Location drop down menu.
	<i>Data must be entered manually in the Pre-Construction Report; entered data auto-populates in the As-Built Report.</i>

B: BUILDING CHARACTERISTICS SUMMARY	
<i>(Auto-fill data can be manually overwritten in As-Built Report)</i>	
REPORT ITEM	INSTRUCTIONS
Details (Assembly / System Type / Fuel Type / Etc.)	Provide a summary of the building characteristics details: <ul style="list-style-type: none"> • Provide a summary list as per example in Appendix I. When listing building envelope assemblies, it is good practice to list the components from outside to inside for walls and top to bottom for ceilings and floors; or • Indicate information as requested by AHJ.
	<i>Building Characteristics Summary information entered in the Pre-Construction Report is auto-populated into the As-Built Report. To accommodate changes during construction, the auto populated values can be overwritten in the as-built report.</i>

B: BUILDING CHARACTERISTICS SUMMARY*(Auto-fill data can be manually overwritten in As-Built Report)*

REPORT ITEM	INSTRUCTIONS
Effective RSI-Value / Efficiency	<p>Indicate the energy performance of each building characteristic.</p> <ul style="list-style-type: none"> • Building Envelope: Indicate the effective RSI-value of the building envelope components from the HOT2000 Tab Separated Values (TSV) file data. Look for the following TSV variables: <ul style="list-style-type: none"> ○ CeilIns – weighted average ceiling effective RSI-value ○ MainWallIns – weighted average wall effective RSI-value ○ FndWallIns – weighted average effective foundation wall RSI-value ○ EGHInExposedFlr – weighted average effective exposed floor RSI-value <p>Note: the RSI-values from HOT2000 may be different from RSI-values on the architectural drawings.</p> <ul style="list-style-type: none"> • Fenestration and Doors: Indicate the range of U-values and SHGC for the windows, skylights, and doors from the energy performance labels. • HVAC: Indicate the efficiency of the HVAC systems. • See examples in Appendix I <p><i>Building Characteristics Summary information entered in the Pre-Construction Report is auto-populated into the As-Built Report. To accommodate changes during construction, the auto populated values can be overwritten in the as-built report.</i></p>
Exterior Walls & Floor Headers	Describe assembly/construction details of the above grade exterior walls and headers.
Roof / Ceilings	Describe assembly/construction details of the roofs (attics, cathedral roof, etc.).
Foundation Walls, Headers, & Slabs	<p>Describe assembly/construction details of the foundation walls, header and slab.</p> <p>Also indicate whether the slab is below or above the frost line and whether the slab is heated (e.g. in-floor heating) or not.</p>
Floors over Unheated Spaces	Describe assembly/construction details of the exposed floor(s).
Fenestration and Doors	Describe the type and efficiency characteristics of the fenestration and doors.

B: BUILDING CHARACTERISTICS SUMMARY

(Auto-fill data can be manually overwritten in As-Built Report)

REPORT ITEM	INSTRUCTIONS
FDWR	<p>Enter the ratio of total <u>vertical</u> fenestration and door area to gross wall area as a percentage. This information should be available on the architectural drawings. Note: the FDWR found in the EnerGuide Rating System Results screen includes the area of skylights which should not be included in the FDWR for BCBC compliance.</p> <p>For the manual calculation (summarized below), refer to NRCan’s “Guidelines for Using HOT2000 v.11 to Demonstrate Compliance with Subsection 9.36.5 of the 2015 National Building Code.”</p> <ol style="list-style-type: none"> 1. FD: Fenestration and Door Area 2. W: Above Grade Gross Wall Area, including headers, above-ground foundation walls and pony walls. 3. FDWR (%) = FD/W * 100%
Air Barrier System & Location	Describe the type(s) and location(s) of the air barrier system(s) used.
Space Conditioning (Heating and Cooling)	Describe the type(s) of heating and cooling system(s) used. If a space cooling system is installed but the annual energy consumption of the cooling system is not included in the MEUI metric write: COOLING NOT INCLUDED IN MEUI.
Service Water Heating	Describe the type(s) of domestic hot water heating system(s) used.
Ventilation	Describe the type(s) of ventilation system(s) used.
Other Energy Impacting Features	Describe and indicate other features that may impact the energy performance of the building (e.g. drain water heat recovery unit).
<i>(Pre-Construction Confirmation Statement):</i> Based on information provided by the builder, and drawings prepared by:	Indicates the information provided in Section B was sourced from information provided by the builder to the EA or sourced by the EA from the architectural drawings. Provide the name of the firm that completed the architectural drawings and the date it was completed.
<i>(As-Built Confirmation Statement):</i> Based on information provided by the builder, and a site evaluation completed on...	Indicates that the information provided in Section B was sourced from information provided by the builder to the EA or was sourced from information collected by the EA at the post-construction site evaluation that was completed according to NRCan ERS procedures. Provide the date of the site visit.

C: 9.36.5. ENERGY PERFORMANCE COMPLIANCE

REPORT ITEM	INSTRUCTIONS
<p>Complete this section if using the Energy Performance Compliance Path in Subsection 9.36.5., for compliance with either of Subsections 9.36.5. or 9.36.6.</p> <p>If the building is complying with the BC Energy Step Code using Subsection 9.36.5., please complete both Section C and Section D, following the guidance provided under BC Building Code Performance Compliance Path in Section A and restated below.</p> <p>Note: The following guidance applies where HOT2000 is used to model for compliance with Subsection 9.36.5. Those using other software may not be able to apply these instructions to their projects.</p>	
<p>Proposed / As-Built House Rated Energy Consumption (GJ/year)</p>	<p>Where using HOT2000 for Subsection 9.36.5. compliance, follow NRCan’s instructions as outlined in the “Guidelines for Using HOT2000 v.11 to Demonstrate Compliance with Subsection 9.36.5 of the 2015 National Building Code” document to obtain the HVAC and Hot Water Heating energy consumption for the Proposed / As-Built House.</p>
<p>Reference House Rated Energy Target (GJ/year)</p>	<p>Where using HOT2000 for Subsection 9.36.5. compliance, follow NRCan’s instructions as outlined in the “Guidelines for Using HOT2000 v.11 to Demonstrate Compliance with Subsection 9.36.5 of the 2015 National Building Code” document to obtain the HVAC and Hot Water Heating energy consumption for the Reference House.</p> <p><i>The calculator offers an auto-total in the SUM cell.</i></p>
<p>Airtightness (As-Built Only):</p>	<p>If an airtightness test is done on the As-Built house, indicate the airtightness value as tested, as per BCBC 2018 Division C, Article 2.2.8.2.(1)(f), “where a test is used to determine the airtightness of a house, the actual measured airtightness of the building envelope in air changes per hour will be reported.”</p>
<p>The airtightness value used in the energy model calculations for the Proposed / As-Built House is:</p>	<p>Indicate the airtightness value used in the energy model for the Proposed / As-Built House by selecting the appropriate option:</p> <ul style="list-style-type: none"> • 4.5 ACH @ 50 Pa, where the construction complies with Section 9.25., • 3.5 ACH @ 50 Pa, where it can be shown that the air barrier system is constructed in accordance with Subsection 9.25.3 and Articles 9.36.2.9. and 9.36.2.10., or • Tested in accordance with Article 9.36.5.10.(11) of Division B (only an option for the As-Built house). <p>Note: If complying with Step 2 or above of Subsection 9.36.6. using Subsection 9.36.5., the airtightness value being used in the proposed house need not be entered in the Pre-Construction Report. This should be added in Section D.</p> <p>For more details, see BCBC Article 9.36.5.10.(9) of Division B.</p>

Confirmation Statement: The above calculation was performed in compliance with Subsection 9.36.5. of Division B	Check to confirm Section C of the Compliance Report is completed in compliance with Subsection 9.36.5. of Division B.
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D: 9.36.6. ENERGY STEP CODE COMPLIANCE

Complete this section if complying with Subsection 9.36.6.

Note: the guidance provided applies to the completion of the BC Energy Compliance Reports using HOT2000 and the EnerGuide Rating System for modelling. Those using other software may not be able to apply these instructions to their projects.

The metrics itemized in this section are auto-populated in the BC Energy Compliance Reports from the appropriate calculator.

It is critical to use the correct calculator tab in the in the workbook titled “BC Step Code Compliance Calculator Report” to calculate the metrics. The lowercase word “calculator” is intended to refer to both the general calculator and the attached ground-oriented non-MURB residential building calculator

*** For instructions on how to model ground-oriented attached Part 9 residential buildings (e.g. row houses, duplexes, triplexes, etc.) that are NOT considered MURBs by the ERS¹⁰ use the instructions in the next section titled “Instructions for Modelling Attached Ground-Oriented Part 9 Residential Buildings”**

REPORT ITEM	INSTRUCTIONS
Proposed House / As-Built House Rated Energy Consumption (GJ/year)	Annual energy consumption of the Proposed / As-Built House without baseloads . Equivalent to ‘Total AEC’ minus ‘Baseloads’ from the HOT2000 calculation results, rounded to the nearest whole number. See Appendix IV for manual calculation details where to locate data in HOT2000.
	<i>Input HOT2000 data in calculator. Auto-populates in Pre-Construction and As-Built Report based on Calculator Results</i>
Reference House Rated Energy Target (GJ/year)	Annual energy consumption of the Reference House without baseloads . Equivalent to ‘ERS reference house-Base Case’ minus ‘Baseloads’ from the HOT2000 calculation results, rounded to the nearest whole number. See Appendix IV for manual calculation details and where to locate data in HOT2000.
	<i>Input HOT2000 data in calculator. Auto-populates in Pre-Construction and As-Built Report based on Calculator Results</i>
Step Code Level	Indicates the Step Code level the project is required to meet, as set by the AHJ.
	<i>Select Step Level in calculator. Auto-populates in Pre-Construction and As-Built Report based on Calculator Results</i>

¹⁰ Natural Resources Canada, “EnerGuide Rating System Technical Procedures Version 15.7”, Terms and Definitions, “multi-unit residential building”, page xiii.

<p>Mechanical Energy Use Intensity (MEUI)</p>	<p>The MEUI in Section D is automatically calculated after input of HOT2000 data and Climate and Cooling Information into the calculator.</p> <p>Required: The compliance requirement as per BCBC 2018 Article 9.36.6.3. of Division B.</p> <p>Proposed: Use the Proposed House energy model, see instructions for manual calculations and where to locate data in HOT2000 in Appendix V.</p> <p>As-Built: Use the As-Built energy model, see instructions for manual calculations and where to locate data in HOT2000 in Appendix V.</p> <p>For Determining: % of the Building’s Conditioned Space Served by Space-Cooling Equipment, see instructions in Appendix IX.</p>
	<p><i>Input HOT2000 Data in calculator. Auto-populates in Pre-Construction and As-Built Report based on Calculator Results</i></p>
<p>ERS Rating % Lower Than EnerGuide Reference House, where applicable</p>	<p>This info in Section D is automatically calculated for buildings that have complied following the ERS, after HOT2000 data is entered into the calculator.</p> <p>Required: The compliance requirement as per BCBC 2018 Article 9.36.6.3. of Division B.</p> <p>Proposed: Use the Proposed House energy model, see instructions for manual calculations and where to locate data in HOT2000 in Appendix VI.</p> <p>As-Built: Use the As-Built energy model, see instructions for manual calculations and where to locate data in HOT2000 in Appendix VI.</p> <p>Note: If not using the ERS to comply with the Step Code, this section need not be completed. Compliance when not using ERS is demonstrated by meeting the metrics for Steps 2 and above.</p>
	<p><i>Input HOT2000 data in calculator. Auto-populates in Pre-Construction and As-Built Report based on Calculator Results</i></p>
<p>Thermal Energy Demand Intensity (TEDI)</p>	<p>This info in Section D is automatically calculated after input of HOT2000 data in calculator.</p> <p>Required: The compliance requirement as per BCBC 2018 Article 9.36.6.3. of Division B.</p> <p>Proposed: Use the Proposed House energy model, see instructions for manual calculations and where to locate data in HOT2000 in Appendix VII.</p> <p>As-Built: Use the As-Built energy model, see instructions for manual calculations and where to locate data in HOT2000 in Appendix VII.</p>
	<p><i>Input HOT2000 Data in calculator. Auto-populates in Pre-Construction and As-Built Report based on Calculator Results</i></p>
<p>Adjusted Thermal Energy Demand Intensity (TEDI)</p>	<p>This info in Section D is automatically calculated after input of HOT2000 and Heating Degree Day data in calculator.</p> <p>Required: The compliance requirement as per BCBC 2018 Subsection 9.36.6.3 of Division B.</p> <p>Proposed: Use the Proposed House energy model, see instructions for manual calculations and where to locate data in HOT2000 in Appendix VII.</p> <p>As-Built: Use the As-Built energy model</p>

	<i>Input HOT2000 and Heating Degree Day Data in calculator. Auto-populates in Pre-Construction and As-Built Report Based on Calculator Results.</i>
Building Envelope % Performance Improvement over the EnerGuide Reference House	<p>This info in Section D is automatically calculated after input of HOT2000 data in calculator.</p> <p>Required: The compliance requirement as per BCBC 2018 Subsection 9.36.6.3. of Division B.</p> <p>Proposed: Use the Proposed House energy model, modeled with mechanical equipment types and efficiencies set to the Reference House default values as explained in Appendix VIII. See instructions for manual calculations and where to locate data in HOT2000 in Appendix VIII.</p> <p>As-Built: Use the As-Built energy model with mechanical equipment types and efficiencies set to the Reference House default values. See instructions for manual calculations and where to locate data in HOT2000 in Appendix VIII.</p>
	<i>Input HOT2000 Data in calculator. Auto-populates in Pre-Construction and As-Built Report based on Calculator Results</i>
Airtightness in Air Changes per Hour at 50 Pa differential	<p>This info in Section D is automatically calculated after input of HOT2000 data in calculator.</p> <p>Required: The compliance requirement as per BCBC 2018 Article 9.36.6.3. of Division B.</p> <p>Proposed: Enter compliance requirement per BCBC Article 9.36.6.3. of Division B OR other lower airtightness target as identified by the Energy Advisor.</p> <p>As-Built: Enter actual blower door test result from the final site evaluation.</p>
	<i>HOT2000 Input Data in calculator. Auto-populates in Pre-Construction and As-Built Report based on Calculator Results</i>
Step Code [Design] Requirements Met	Check Yes or No if the home met, or did not meet, the requirement for the prescribed Step Code level.
	<i>Auto-populates in Pre-Construction and As-Built Report based on Calculator Results</i>
Confirmation Statement: The above calculation was performed in compliance with (see Clause 2.2.8.3.(2)(e) of Division C)	<p>Check the appropriate compliance calculation method used (i.e.:</p> <ul style="list-style-type: none"> • Subsection 9.36.5., • The Passive House Planning Package (PHPP), version 9 or newer, and the energy model was prepared by a Certified Passive House Designer or Certified Passive House Consultant, • The EnerGuide Rating System (ERS), version 15 or newer, or • The applicable requirements of NECB Part 8 and the City of Vancouver Energy Modelling Guidelines.

E: COMPLETED BY	
REPORT ITEM	INSTRUCTIONS
Full Name (Print)	Print first and last name of Registered Energy Advisor.
Company Name	Enter Energy Advisor’s full company name.

Phone	Enter Energy Advisor’s business phone number.
Address	Enter Energy Advisor’s business company address.
Email	Enter Energy Advisor’s business email address.
Date (dd/mm/yyyy)	Enter the date when the BC Energy Compliance Report was completed.
Advisor ID Number	Enter Energy Advisor’s identification number issued by the Service Organization.
Service Organization	Enter the name of the Service Organization where the file was submitted.
EnerGuide P / N #	Enter the full EnerGuide Rating System P file ¹¹ and/or N file ¹² number.
<i>Calculator Instruction: “E: COMPLETED BY” information that is manually entered by the Energy Advisor in the Pre-Construction Report is auto-populated in the As-Built Report. If the ‘Completed By’ information changes, the data can be overwritten by the completing Energy Advisor.</i>	

¹¹ The P file is an energy model of the proposed house, and is reviewed by the Energy Advisor to confirm that the proposed house could achieve the required performance based on the house plans, the proposed mechanical equipment, and the house’s location, among other specifications.

¹² The N file is an energy model of the as-built house, and represents the house as constructed. It must incorporate the airtightness value from an airtightness test performed in accordance with Sentence 9.36.6.5.(1) of the BCBC. The N file is also submitted to NRCAN for quality assurance purposes. The results are returned as an EnerGuide rating for the house and for the reference house, which can then be used to submit a BC Energy Compliance Report (see Bulletin B18-03) to the Authority Having Jurisdiction (AHJ) to determine Code compliance.

F: OTHER ENERGY MODELLING METRICS

<p>Airtightness NLA@10Pa</p>	<p>Reference House: Use the Proposed House ERS Reference House for the Pre-Construction Compliance Report or the As-Built ERS Reference House for the As-Built Compliance Report. Taken from Full House Report’s “Air Leakage and Mechanical Ventilation” section. Reported in cm^2/m^2, rounded to the hundredth’s decimal (two decimal places).</p> <p>Proposed: Taken from the Proposed House energy model’s Full House Report from the “House with standard operating conditions” run “Air Leakage and Mechanical Ventilation” section <u>or</u> from the Homeowner Information Sheet. Reported in cm^2/m^2, rounded to the hundredths decimal (two decimal places).</p> <p>As-Built: Taken from the As-Built House energy model’s Full House Report from the “House with standard operating conditions” run “Air Leakage and Mechanical Ventilation” section <u>or</u> from the Homeowner Information Sheet. Reported in cm^2/m^2, rounded to the hundredths decimal (two decimal places).</p>
<p>Rated Greenhouse Gas Emissions</p>	<p>Reference House: Use the Proposed House ERS Reference House for the Pre-Construction Compliance Report or the As-Built ERS Reference House for the As-Built Compliance Report. Take ‘Estimated Greenhouse Gas Emissions’ from the Full House Report from the “Reference House” run, and multiply by 1000 kg/t to get kg/year, rounded to the nearest whole number.</p> <p>Proposed: Take ‘Estimated Greenhouse Gas Emissions’ from Proposed House energy model Full House Report from the “House with standard operating conditions” run, multiplied by 1000 kg/t to get kg/year, rounded to the nearest whole number.</p> <p>As-Built: Take ‘Estimated Greenhouse Gas Emissions’ from As-Built House energy model Full House Report from the “House with standard operating conditions” run, multiplied by 1000 kg/t to get kg/year, rounded to the nearest whole number.</p>
	<p><i>Input HOT2000 Data in calculator. Auto-populates in Pre-Construction and As-Built Report based on Calculator Results</i></p>

<p>Rated Greenhouse Gas Intensity</p>	<p>Reference House: Use the Proposed House ERS Reference House for the Pre-Construction Compliance Report or the As-Built ERS Reference House for the As-Built Compliance Report. Take the ‘Estimated Greenhouse Gas Emissions’ from Full House Report from the “Reference House” run. Divide the Estimated Greenhouse Gas Emissions by the total heated floor area and multiply by 1000 kg/t to get kg/m²/year, rounded to the nearest hundredth (i.e. two decimal places).</p> <p>Proposed: Take the ‘Estimated Greenhouse Gas Emissions’ from Proposed House energy model’s Full House Report from the “House with operating conditions” run. Divide the Estimated Greenhouse Gas Emissions by the total heated floor area and multiply by 1000kg/t to get kg/m²/year, rounded to the hundredths decimal (two decimal places).</p> <p>As-Built: Take the ‘Estimated Greenhouse Gas Emissions’ from As-Built House energy model’s Full House Report from the “House with operating conditions” run. Divide the Estimated Greenhouse Gas Emissions by the total heated floor area and multiply by 1000 kg/t to get kg/m²/year, rounded to the nearest hundredth (i.e. two decimal places).</p> <p><i>Input HOT2000 Data in calculator. Auto-populates in Pre-Construction and As-Built Report based on Calculator Results</i></p>
<p>Rated Energy Use Intensity</p>	<p>Reference House: Use the Proposed House ERS Reference House for the Pre-Construction Compliance Report or the As-Built ERS Reference House for the As-Built Compliance Report. ‘ERS Reference House (GJ/year)’ taken from the HOT2000 calculation results divided by Total Floor Area of Conditioned Space. Reported in GJ/m²/year, rounded to the nearest hundredth (i.e. two decimal places).</p> <p>Proposed: ‘Energy Use Intensity’ taken from the Proposed House energy model HOT2000 calculation results divided by Total Floor Area of Conditioned Space. Reported in GJ/m²/year, rounded to the hundredth (i.e. two decimal places).</p> <p>As-Built: ‘Energy Use Intensity’ taken from the As-Built House energy model HOT2000 calculation results divided by Total Floor Area of Conditioned Space. Reported in GJ/m²/year, rounded to the hundredth (i.e. two decimal places).</p> <p><i>Input HOT2000 Data in calculator. Auto-populates in Pre-Construction and As-Built Report based on Calculator Results</i></p>
<p>Peak Thermal Load (PTL)</p>	<p>Reference House: Use the Proposed House ERS Reference House for the Pre-Construction Compliance Report or the As-Built ERS Reference House for the As-Built Compliance Report, see instructions in Appendix VIII.</p> <p>Proposed: Use the Proposed House energy model, see instructions for manual calculations and where to locate data in HOT2000 in Appendix VIII.</p> <p>As-Built: Use the As-Built energy model, see instructions for manual calculations and where to locate data in HOT2000 in Appendix VIII.</p> <p><i>Input HOT2000 Data in calculator. Auto-populates in Pre-Construction and As-Built Report based on Calculator Results</i></p>

<p>% of the Building's Conditioned Space Served by Space-Cooling Equipment</p>	<p>Enter "Not more than 50%" if the HOT2000 energy model <u>does not</u> have the cooling energy consumption included in the annual energy consumption (i.e. cooling energy is not included in ERS GJ rating), even if there is cooling installed in the home that is modelled as an atypical load.</p> <p>If the HOT2000 energy model <u>does have</u> the cooling energy consumption included in the annual energy consumption (i.e. cooling energy is included in the ERS GJ rating):</p> <p>(3) Enter "Not more than 50%" if the cooling system's capacity is not more than 50% of the Design Cooling Load.</p> <p>(4) Enter "More than 50%" if the cooling system's capacity is more than 50% of the Design Cooling Load.</p> <p>See instructions in Appendix IX.</p>
<p>% Lower than Reference House With Baseloads Included</p>	<p>Enter the '% Lower (Higher) Than Ref House' from the EnerGuide Rating System Results screen. This metric can only be used if the file is completed by a registered ERS energy advisor using ERS modelling procedures and the file is submitted to the Service Organization and Natural Resources Canada.</p>
<p>Energy Source</p>	<p>Enter the annual consumption of the various energy sources used by the home in GJ. See instructions in Appendix XI.</p>
<p>Electricity Consumption</p>	<p>Reference House: Enter Reference House electricity consumption, see instructions in Appendix XI.</p> <p>Proposed: Use the Proposed House energy model, see instructions in Appendix XI.</p> <p>As-Built: Use the As-Built energy model, see instructions in Appendix XI.</p>
<p>Natural Gas Consumption</p>	<p>Reference House: Enter Reference House natural gas consumption, see instructions in Appendix XI.</p> <p>Proposed: Use the Proposed House energy model, see instructions in Appendix XI.</p> <p>As-Built: Use the As-Built energy model, see instructions in Appendix XI.</p>

Propane Consumption	<p>Reference House: Enter Reference House propane consumption, see instructions in Appendix XI.</p> <p>Proposed: Use the Proposed House energy model, see instructions in Appendix XI.</p> <p>As-Built: Use the As-Built energy model, see instructions in Appendix XI.</p>
	<p><i>Input HOT2000 Data in calculator. Auto-populates in Pre-Construction and As-Built Report based on Calculator Results</i></p>
District Energy Consumption	<p>The process to determine the annual district energy consumption is yet to be determined.</p>
	<p><i>Input HOT2000 Data in calculator. Auto-populates in Pre-Construction and As-Built Report based on Calculator Results</i></p>
On-Site Renewables Consumption	<p>This field refers to the amount of energy generated from on-site renewable sources that offset the total energy consumption of the home.</p> <p>Reference House: Enter “N/A” or “-” as On-site Renewables is not included in the EnerGuide Rating System Reference House.</p> <p>Proposed: Use the Proposed House energy model, see instructions in Appendix XI.</p> <p>As-Built: Use the As-Built energy model, see instructions in Appendix XI.</p>
	<p><i>Input HOT2000 Data in calculator. Auto-populates in Pre-Construction and As-Built Report based on Calculator Results</i></p>
Other	<p>Only enter the annual consumption in GJ of other energy sources that are included in the total energy consumption of the energy model. For example:</p> <ol style="list-style-type: none"> (1) If a wood burning stove is present but “Usage” is set to “Never” in HOT2000, do <u>not</u> enter the energy consumption for the wood. (2) If a wood burning stove is present and “Usage” is set to “Always” in HOT2000, <u>enter</u> the energy consumption for the wood. <p>Reference House: Enter annual consumption of other energy sources in GJ. The energy consumption of other sources is available in the Reference House Full House Report under “Estimated Annual Fuel Consumption Summary.” Convert these to GJ. See Appendix X for more information.</p> <ul style="list-style-type: none"> • If completing the Pre-Construction Compliance Report, use the Reference House Full House Report from the Proposed House energy model. • If completing the As-Built Compliance Report, use the Reference House Full House Report from the As-Built energy model. <p>Proposed: Use the Proposed House energy model, see instructions in Appendix XI.</p> <p>As-Built: Use the As-Built energy model, see instructions in Appendix XI.</p>
	<p><i>Input HOT2000 Data in calculator. Auto-populates in Pre-Construction and As-Built Report based on Calculator Results</i></p>

Total Consumption	<p>Sum the Electricity, Natural Gas, Propane, District Energy, and Other energy consumption and subtract the On-Site Renewables and enter it into the respective Total field for the Reference House, Proposed House, and As-Built house.</p> <p>(1) i.e. Electricity (GJ) plus Natural Gas (GJ) plus Propane (GJ) plus District Energy (GJ) plus Other (GJ) minus On-Site Renewables (GJ)</p>
	<p><i>Input HOT2000 Data in calculator. Auto-populates in Pre-Construction and As-Built Report based on Calculator Results</i></p>
G: OPTIONAL CERTIFICATIONS	
Pending - Labelling Programs	<p>If there is a pending energy labelling certification, check the appropriate box and, if applicable, indicate the appropriate level of the certification (e.g. Built Green, Level: Gold).</p>

6 Instructions for Modelling Attached Ground-Oriented Part 9 Residential Buildings

NOTE:

- These procedures provide guidance and instruction on how to model non-MURB, Attached Ground-Oriented Part 9 Residential Buildings for the BC Energy Step Code and on how to use the *Attached Non-MURB Calculator* spreadsheet tab found in the *BCBC 9.36.6 Compliance Calculator* workbook.
- These procedures do NOT apply to Attached Ground-Oriented Part 9 Residential Buildings defined by the EnerGuide Rating System as MURBs. The EnerGuide Rating System defines Attached Ground-Oriented Buildings with any vertical overlap of any unit over another unit as a MURB.
- Non-MURB Attached Ground-Oriented Part 9 Residential Buildings include all Part 9 residential buildings with 2 or more units where no units have any vertical overlap: for example, double/semi-detached buildings, triplexes, quadplexes, etc. and row houses.
- The “Attached Non-MURB Calculator” differs from the first Compliance Calculator and ERS version 15 procedures in that each unit as per ERS guidelines is first modelled, but then requires that the ERS metrics for each unit be input into the Calculator for Attached Ground-Oriented Part 9 buildings. The calculator then sums, and where appropriate, averages, the metrics for each unit to achieve the Step Code metrics for the building as a whole. It takes into consideration the challenge of creating an air barrier between attached units, where one is not required by the BC Building Code.
- If manually calculating the Step Code metrics, please also refer to Appendices I through XI in this manual.

6.1 Background

Among the 1,586 buildings in BC that were modelled using the ERS in 2017¹³, the median air changes per hour at 50 Pascals pressure differential (ACH₅₀) was:

Table 1. Median airtightness results for energy assessments across BC in 2017

Type of Building	Number of Assessments	Median Airtightness (ACH ₅₀)
Single Detached	1160	3.49
Double/Semi-detached	109	3.69
Row house, end unit	122	4.11
Row house, middle unit	193	4.72
Total	1586	3.81

There is a difference in air leakage for attached buildings compared to air leakage for detached buildings. Detached buildings, by default, leak to the exterior. Air leakage between attached buildings can be to both conditioned space (a neighbouring unit) and unconditioned space (the exterior).

While there are builders who can construct attached units and achieve the airtightness goals of the BC Energy Step Code, requiring each unit to meet an airtightness target would require a new Code requirement, as the Code addresses buildings and not individual units.

¹³ Based on data acquired from NRCan.

This solution is intended for buildings that are seeking to comply with the Lower Steps of the BC Energy Step Code (i.e., Steps 1, 2 and 3). The correction is available only down to 1.5 ACH.

6.2 Solution

The goal of this section is to document a consistent approach on reporting on the energy performance of attached ground-oriented Part 9 dwelling units divided by vertical party walls with no stacking, i.e. attached buildings that are not considered MURBs in the ERS Technical Procedures.

The Technical Procedures of the ERS has definitions for several “house” types – single detached; row, end unit; row, middle unit; double/semi-detached; and mobile home. For row and semi-detached to qualify to be modelled as a single unit, there must be at least one vertical division (known as a party wall), with no stacking of units. If there is even a small amount of stacking or if attached units are joined by a common space, the building must go through the ERS multi-unit residential building (MURB) processes.

The ERS defines a “row, middle unit” as “A dwelling unit separated by at least two vertical divisions termed “party walls”, from the adjacent dwelling units.” This selection should be made in HOT2000 for any units in triplexes, quadplexes or multiplexes with more than one neighbouring unit.

Under the Specifications tab, HOT2000 also includes three more house types: duplex (non-MURB), triplex (non-MURB), and apartment (non-MURB). They are not listed in the ERS Technical Procedures version 15.6 and **are not to be used** in HOT2000 for the purposes of the *Attached Non-MURB Calculator*.

1) **Create the energy models:**

- a) **P file:** Create a P-file for Unit 1 in HOT2000 Version 11.7 or newer as per ERS guidelines. Under Natural Air Infiltration → Specifications → Air Tightness Type select “Blower Door Test Values” and enter:
 - i) a value based on the Building and Safety Standards Branch (BSSB) Information Bulletin No. B19-03 guidance on selecting airtightness of proposed building; or
 - ii) 4.55 ACH₅₀; or
 - iii) the highest of the builder's last 5 Blower door tests (See ERS User Guide Version 11.7 section 7.13.1).
- b) **N file:** Create an N file for Unit 1 in HOT2000 Version 11.7 or newer as per ERS guidelines using the results of the blower door test.

2) **Adjust the ACH:**

NOTE: If a multi-zone blower door test is planned at the P file stage and/or performed at the N file stage DO NOT adjust the ACH, and go to step 3 below.

IMPORTANT: Because of the information outlined in Section 6.1, Energy Advisors are permitted to use a 0.5 ACH₅₀ adjustment for attached ground units where the airtightness test values are as low as 2.00 ACH₅₀. This enables, for example an energy advisor to input $2.00 - 0.50 = 1.50$ ACH₅₀. Below 2.00 ACH₅₀ until 1.50 ACH₅₀, the Energy Advisor may use a value of 1.50 ACH₅₀. Below 1.50 ACH₅₀, the Energy Advisor must use the ACH₅₀ value as tested.

If performing single-zone blower door tests on each unit, create a Save-As file. Name the Save-AS file with the N or P file 10 character string as per ERS guidelines---i.e. *SOEA(N or P)XXXXXX* where SO is

the Service Organization number, EA the Energy Advisors # with the SO, and XXXXX the file number of the respective P/N file that will be submitted to NRCAN. Close the save-as file.

Open the original file and name it the same as the Save-as file, plus “-SC”: ie. *SOEA(N or P)XXXXX-SC*. Using this file, do the following:

a) **P file:** Under Natural Air Ventilation/Specifications/“Air Tightness Type”, select “*Blower Door test Values*” and input as follows:

- i) Enter into the *Air Change Rate* field, a value as guided by following “*Guidelines for Energy Advisors – Setting Airtightness Values...*”; *Information Bulletin No. B19-03*.
- ii) Set the “Equivalent Leakage Area” to calculated.

b) **N file:** Under Natural Air Ventilation/Specifications/“Air Tightness Type”, select “*Blower Door test Values*” and input into the *Air Change Rate* field:

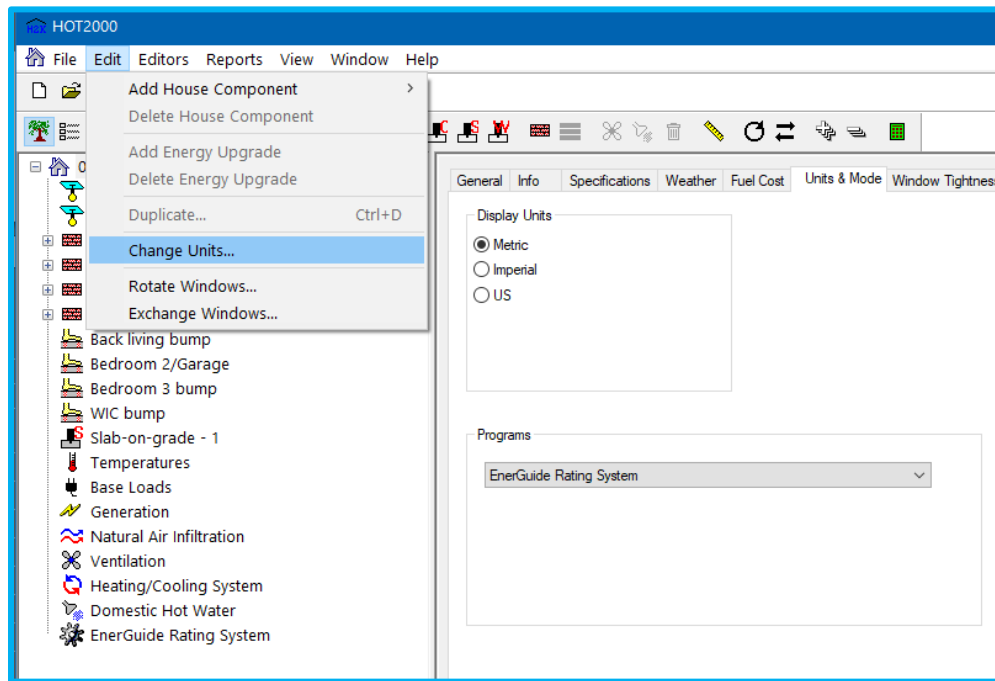
- i) Input into the *Air Change Rate* field the resulting ACH from the blower door test minus 0.5 ACH₅₀ for results that are 2.00 ACH₅₀ or greater. Below 2.00 ACH₅₀ until 1.50 ACH₅₀, the Energy Advisor may use a value of 1.50 ACH₅₀. Below 1.50 ACH₅₀, the Energy Advisor must use the ACH₅₀ value as tested.
- ii) Set the “Equivalent Leakage Area” to calculated.

The screenshot shows a software interface with two tabs: "Specifications" and "Other Factors". The "Specifications" tab is active and contains several sections:

- House:** House Volume is 609.4 m³. There is a checkbox for "Includes crawlspace volume" which is unchecked. The "Air Tightness Type" dropdown menu is set to "Blower door test values".
- Building Site:** Terrain is set to "Suburban, forest". Above Grade Height of Highest Ceiling is 5.5 m.
- Exhaust Devices Test:** Depressurization test status is "Not applicable". Depressurization test result is 0 Pa.
- Blower Test:** There is a checkbox for "Air Leakage Test Data" which is unchecked. The "Air Change Rate" is 2.50 @ 50 Pa. The "Test Type" dropdown is set to "CGSB". The "Equivalent Leakage Area" Type is set to "Calculated". The Value is 568.9 cm² at 10 Pa.
- Local Shielding:** Walls are set to "Heavy" and Flue is set to "Light".

3) **Input into the Attached Non-MURB Calculator**, outputs from the HOT2000 file as follows:

Ensure units are in metric (Select Edit → Change Units → Units & Mode → Display Units → Metric).



Use the outputs from the respective P or N file from bullet 1 above, where a multi zone test is planned or performed OR from the respective “SAVE AS” P or N file from step 2 above where a multi zone test is NOT planned or performed.

- a) For each unit, select the unit type (row, end unit; row, middle unit; or double/semi-detached). Extract from the appropriate HOT2000 model and enter into the Excel Step Code Compliance workbook’s *Attached Non-MURB Calculator* spreadsheet, the unit’s **Floor Area** (see Appendix V for where to find floor area), and the **ACH** used from the appropriate file. The Floor Area and Building Envelope Surface Area will be the same for the Proposed and Reference cases. The ACH for the reference house is already entered in the calculator.

Note:

- As per ERS guidelines, takeoffs for **Volume** and **Floor Area** are to be the interior side of the Party Walls for each unit.

- b) Perform a calculation (“Reports/Calculate” or Alt+C) on the P or N file, and Select the **Base** tab on the dialogue box. In the Excel Step Code Compliance *Attached Non-MURB Calculator* spreadsheet tab:
- i) enter the **Total AEC** for the Proposed House into its field in the Unit 1 row.
 - ii) enter the **ERS Reference House Net (GJ/a)** for the Reference House into its respective field in the Unit 1 row in the calculation spreadsheet.

Base Upgrade Advanced

EnerGuide Rating System Results

Rating	67	GJ/a	Reference House	75	GJ/a	Nat. ACH	0.15
Energy Use Intensity	0.30	GJ/m ² /a	% Lower Than Ref Hse	10.7	%	Q _{Tot}	61.6 L/s
Greenhouse Gases	0.9	t/a				Q _{Warm}	26.11 L/s

Rated Annual Energy Consumption (AEC)		Rated Annual Energy Production (AEP)		A _{windows & doo} / A _{walls}		14.9 %	
Space Heating	25.89	GJ	Electricity Generation	0.0	GJ	Ref Hse A _{windows & doo} / A _{walls}	17.0 %
Space Cooling	1.99	GJ	Solar DHW	0.0	GJ	Design Heat Loss	6.2 kW
DHW	12.62	GJ	Total AEP	0.0	GJ	Design Heat Gain	3.1 kW
Ventilation, Electric	0.56	GJ					
Baseloads	25.62	GJ					
Total AEC	66.68	GJ	Net AEC - AEP	66.68	GJ		

House Name	AEC (GJ/a)	AEP (GJ/a)	Net (GJ/a)
ERS reference house			74.52
General mode			67.77
House with standard operating conditions			66.68

- c) In HOT2000, open the Full Report/*House with Standard Operating Conditions* for the proposed house:
- i) Go to the *Air Leakage and Mechanical Ventilation* area. Enter the **Building Envelope Surface Area** in m², the **Baseloads** in GJ, and the **Normalized Leakage Area @ 10 Pa** into their respective fields in the Unit 1 row in the calculation spreadsheet.

Note:

- The **Building Envelope Surface Area** does NOT include Party Wall areas.
- DO NOT manually sum the areas from the summary view.

AIR LEAKAGE AND MECHANICAL VENTILATION

Building Envelope Surface Area: 517.12 m²

Air Tightness Level is Average (4.55 ACH @ 50 Pa)

Terrain Description	Height (m)
@ Weather Station : Open flat terrain, grass	10.0
@ Building site : Suburban, forest	5.5

Local Shielding:

Walls: Heavy
Flue : Light

Leakage Fractions-

Ceiling: 0.200
Walls: 0.600
Floors: 0.200

Estimated Equivalent Leakage Area @ 10 Pa: 1005.78 cm²

Normalized Leakage Area @ 10 Pa: 1.9449 cm²/m²

Estimated Airflow to cause a 5 Pa Pressure Difference: 64 L/s

Estimated Airflow to cause a 10 Pa Pressure Difference: 101 L/s

ELA used to calculate Estimated Airflows: 402.31 cm²

- ii) Go to the *Annual Space Heating Summary*. Enter the **Auxiliary Energy Required** in MJ into its respective field in the Unit 1 row in the calculation spreadsheet. Note: This is the Auxiliary Energy Required used to calculate the TEDI. To obtain the Auxiliary Energy Required figure that is needed to calculate the Building Envelope % Performance Improvement over the EnerGuide Reference House, see step 5 below.

ANNUAL SPACE HEATING SUMMARY	
Gross Space Heat Loss:	83230 MJ
Gross Space Heating Load:	89770 MJ
Usable Internal Gains:	26026 MJ
Usable Internal Gains Fraction:	31.3 %
Usable Solar Gains:	34882 MJ
Usable Solar Gains Fraction:	41.9 %
Auxiliary Energy Required:	28863 MJ
Space Heating System Load:	28863 MJ
Furnace/Boiler Seasonal efficiency:	93.6 %
Furnace/Boiler Annual Energy Consumption:	29804 MJ

- iii) Go to the *Design Space Heating and Cooling Loads* area. Enter the **Design Heat Loss** and the **Design Cooling Load** in Watts into their respective fields in the Unit 1 row in the calculation spreadsheet.

DESIGN SPACE HEATING AND COOLING LOADS	
Design Heat Loss* at -4.0 °C (10.10 Watts / m3):	6155 Watts
Design Cooling Load* for July at (24.0 °C):	3111 Watts
* Please refer to notes at the end of this report.	

- iv) Go to the *Air Conditioning System* area. Enter the **Capacity** in Watts into its field in the Unit 1 row in the calculation spreadsheet.

AIR CONDITIONING SYSTEM	
System Type:	Mini-split ductless
Manufacturer:	
Model:	
Capacity:	3782 Watts
SEER	15.00
Sensible Heat Ratio:	0.76
Indoor Fan Flow Rate:	255.21 L/s
Ventilator Flow Rate:	0.00 L/s
Fraction of windows Openable:	0.000
Cooling system capacity sizing factor:	1.000
Economizer control:	N/A
Air Conditioner is integrated with the Heating System	

- v) When required by the AHJ, go to the *Energy Consumption Report* and the *Estimated Annual Fuel Consumption Report* and enter into the respective rows in columns J through P in the *Attached Non-MURB Calculator* spreadsheet the GHGs, fuel consumption (Electricity, Natural Gas, etc.), On-site renewables, and Other (for example wood). See the screenshot in 3 c) above.

ENERGY CONSUMPTION SUMMARY REPORT						
Estimated Annual Space Heating Energy Consumption	= 25892.97 MJ	= 7192.49 kWh				
Ventilator Electrical Consumption: Heating Hours	= 0.00 MJ	= 0.00 kWh				
Estimated Annual DHW Heating Energy Consumption	= 12620.95 MJ	= 3505.82 kWh				
ESTIMATED ANNUAL SPACE + DHW ENERGY CONSUMPTION	= 38513.92 MJ	= 10698.31 kWh				
Estimated Greenhouse Gas Emissions	0.866 tonnes/year					
ESTIMATED ANNUAL FUEL CONSUMPTION SUMMARY						
Fuel	Space Heating	Space Cooling	DHW Heating	Baseloads	Ventilation	Total
Natural Gas (m3)	23.8	0.0	338.7	0.0	0.0	362.5
Electricity (kWh)	6946.4	552.2	0.0	7117.4	155.1	14771.0

- 4) In HOT2000, open the Full House Report for the reference house and:
- Go to the *Air Leakage and Mechanical Ventilation* area. Enter the **Normalized Leakage Area @ 10 Pa** into its respective field in the Unit 1 row in the calculation spreadsheet. (See the screenshot in 3) c) above).
 - Go to the *Annual Space Heating Summary*. Enter the **Auxiliary Energy Required** in MJ into its respective field in the Unit 1 row in the calculation spreadsheet. (See the screenshot in 3) c) above).
 - Go to the *Design Space Heating and Cooling Loads* area. Enter the **Design Heat Loss** in Watts into their respective fields in the Unit 1 row in the calculation spreadsheet. (See the screenshot in 3) c) above).
- 5) Save the P or N-file as a new file and name it "%TEDI Ref". To ensure the proposed house has the same mechanical as the reference house (As required for the Building Envelope % Performance Improvement over the EnerGuide Reference House), change the file as follows:
- Ventilation:
 - In the *Whole-house components* tab, set all fans to N/A (including HRV if modeled). Then set the fan type to **Utility**, the exhaust and supply airflow rates to according to Table 9.32.3.5 in the BC Building Code and leave the fan power as default.
 - In the *Supplemental components* tab, set all fans except the Dryer to N/A. Leave the Dryer settings as defaults.
 - Run the Full House Report for the ERS reference house and go to the **NEW ERS VENTLATION DATA** section and note the **Fan Power** and the **Airflow Supply & Exhaust Rates** (see screenshot below).

NEW ERS VENTILATION DATA

Whole House Systems

Air Distribution/circulation type: Dedicated low volume ductwork
Air Distribution/circulation fan power: 100.00 Watts
Operation schedule: 480.00 min/day

System # 1 Type: Utility

Manufacturer:

Model:

Airflow Supply Rate: 39.20 L/s Exhaust: 39.20 L/s

Fan Power: 90.94 Watts

- iv) Reset the fan power for the utility fan equal to the noted value for the reference house.
- v) Reset, if necessary, the supply and exhaust flow rates to equal the flow rates noted for the reference house divided by 1.225. (in the above screen shot = $39.2/1.225 = 32$ L/sec).

Note: The Airflow Rates and Fan Power changes with the number of units in a MURB.

b) Space heating:

- i) Set Type 1 to Baseboards/Hydronic/Plenum heaters, Output Capacity = Calculated;
- ii) Set Type 2 to N/A;
- iii) Deselect Radiant Heating;
- iv) Set Supplemental Heat Systems to 0.
- v) Set Fans/Pumps to N/A.

c) Domestic Hot Water:

- i) set to
 - (1) Energy Source = Electricity;
 - (2) Tank Type = Conventional tank;
 - (3) Tank Volume = 189.3 L, 41.6 Imp, 50 US gal;
 - (4) Energy Factor = 0.870
 - (5) Input Capacity = 3000 Watts
- ii) Run the full house report for the reference house and go to the **DOMESTIC WATER HEATING SYSTEM** section and note the **Stand By Heat Loss Rate** (see screen shot below).

DOMESTIC WATER HEATING SYSTEM

PRIMARY Water Heating Fuel: Electricity
Water Heating Equipment: Conventional tank
Calculated Energy Factor: 0.870
Manufacturer:
Model:

Tank Capacity: 189.3 Litres
Tank Location: Main floor

Stand By Heat Loss Rate: 77.86 W
Thermal Efficiency: 98.00 %
Burner Capacity: 3000.00 W

- iii) Reset the Energy Factor drop down box to **Standby**.
- iv) In the *Standby Heat Loss* field enter the value noted (see screen shot below).

Energy Factor Uniform Energy Factor
 Energy Source: Electricity
 Tank Type: Conventional tank
 Tank Volume: 189.3 L, 41.6 Imp, 50 US gal
 Energy Factor: Standby (0.870)
 Tank Location: Main floor
 Standby: Standby
 Standby Heat Loss: 77.9 W
 Thermal Efficiency: 98 %
 Input Capacity: 3000 W

- 6) From the TEDI % Ref file, **open the FULL House Report for the *proposed* house** and:
- Go to the *Annual Space Heating Summary*. Enter the **Auxiliary Energy Required** in MJ into the “*PROPOSED Auxiliary Energy Required*” column in the Unit 1 row in the calculation spreadsheet (see the screenshot below).

ANNUAL SPACE HEATING SUMMARY		ANNUAL SPACE HEATING SUMMARY	
Gross Space Heat Loss:	82275 MJ	Gross Space Heat Loss:	81347 MJ
Gross Space Heating Load:	80213 MJ	Gross Space Heating Load:	80307 MJ
Usable Internal Gains:	41467 MJ	Usable Internal Gains:	40683 MJ
Usable Internal Gains Fraction:	50.4 %	Usable Internal Gains Fraction:	50.0 %
Usable Solar Gains:	13368 MJ	Usable Solar Gains:	9988 MJ
Usable Solar Gains Fraction:	Proposed 16.2 %	Usable Solar Gains Fraction:	Reference 12.3 %
Auxiliary Energy Required:	25377 MJ	Auxiliary Energy Required:	29636 MJ
Space Heating System Load:	25377 MJ	Space Heating System Load:	29636 MJ
Furnace/Boiler Seasonal efficiency:	100.0 %	Furnace/Boiler Seasonal efficiency:	100.0 %
Furnace/Boiler Annual Energy Consumption:	315 MJ	Furnace/Boiler Annual Energy Consumption:	3791 MJ

- From the TEDI % Ref file, **open the FULL House Report for the *reference* house** and:
 - Go to the *Annual Space Heating Summary*. Enter the **Auxiliary Energy Required** in MJ into the “*REFERENCE Auxiliary Energy Required*” column in the Unit 1 row in the calculation spreadsheet (see the screenshot above).
- When required by the AHJ**, go to the *Energy Consumption Report* and the *Estimated Annual Fuel Consumption Report* and enter into the respective rows in columns labelled M through R in the *Attached Non-MURB Calculator* spreadsheet the GHGs, fuel consumption (Electricity, Natural Gas, etc.), On-site renewables, and Other (for example wood). (See the screenshot in 3) c) above). **Save the HOT2000 file.**
- Create a new HOT2000 file** for each townhome unit and repeat steps 1 to 5 for each unit.
- When all units have been modeled** and the data has been entered into the excel Step Code Compliance workbook, go to the *Attached Non-MURB Calculator* spreadsheet. This spreadsheet automatically calculates the building’s overall MEUI, %LTRH, TEDI, and ACH. The results are found in

column L, rows 41 to 44 for the proposed (pre-construction) house and rows 52 to 55 for the as-built house. These results are auto-filled into section D of the respective “Pre-construction” and “As-Built” report tabs. In rows 60 to 74 in the *Attached Non-MURB Calculator* tab you will find the information that auto-fills section E of the respective “Pre-construction” and “As-Built” report tabs

- 11) Fill out the remaining information** required in the Pre-construction or As Built Report, print the applicable report to PDF and submit to the builder, or the AHJ, or both as necessary. Note – the Energy Advisor must also submit the HOT2000 N file to the AHJ, demonstrating that the air changes per hour reported in the As Built calculator and report is no more than 0.5 ACH₅₀ lower than the air changes per hour in the N file.

More Details on Calculations

1) Air Changes per Hour:

$$\text{The } ACH_{50} \text{ for the building} = \frac{(ACH_{50,1} \times SA_1) + (ACH_{50,2} \times SA_2) + \dots + (ACH_{50,n} \times SA_n)}{SA_{total}}$$

Where:

n = # of TH units;

SA = Exterior building envelope Surface Area (does NOT include party wall areas). This value is found in the full report “Air Leakage and Mechanical Ventilation” area.

AIR LEAKAGE AND MECHANICAL VENTILATION

Building Envelope Surface Area: 517.12 m²

- 2)** All the individual unit outputs entered into the *Attached Non-MURB Calculator* spreadsheet as per the instructions above are summed for each category (i.e. Space Heating system Load, AEC, etc.) to generate building totals. These building totals are used to calculate the step code metrics for %LTRH, MEUI, and TEDI for the building as a whole.

APPENDIX I – Sample Step Code Compliance Report

Pre-Construction

BC ENERGY COMPLIANCE REPORT - PERFORMANCE PATHS FOR PART 9 BUILDINGS		
Revised July 15, 2020		
For Buildings Complying with Subsection 9.36.5. or 9.36.6. of the 2018 BC Building Code (see BCBC Article 2.2.8.3. of Division C)		
A: PROJECT INFORMATION		
Building Permit #:		Building Type*: Row House (non-MURB) ▾
Builder:		If Other, Please Specify: _____
Project Address:		Number of Dwelling Units: _____
Municipality / District:		Climate Zone: _____
Postal Code:		Heating Degree Days: _____
PID or Legal Description:		Floor Area of Conditioned Space (m ²): _____
BC Building Code Performance Compliance Path: (Select boxes that apply)		*Building Type must be selected in order to auto populate this report correctly*
<input type="checkbox"/>	9.36.6. → Complete Sections A, B, D, & E	
<input type="checkbox"/>	9.36.5., NOT complying with Step Code → Complete Sections A, B, C, & E	
<input type="checkbox"/>	9.36.5., complying with Step Code → Complete Sections A, B, C, D & E	
Software Name:	Version:	Climatic Data (Location):
B: BUILDING CHARACTERISTICS SUMMARY (see BCBC Clause 2.2.8.3.(2)(b) of Division C)		
	Details (Assembly / System Type / Fuel Type / Etc.)	Eff R_{SI}, U_{SI}, SHGC, etc
Exterior Walls & Floor Headers		Effective R _{SI}
Roof / Ceilings		Effective R _{SI}
Foundation Walls, Headers, & Slabs		Effective R _{SI}
	Slab Is: <input type="checkbox"/> Below OR <input type="checkbox"/> Above Frost Line <input type="checkbox"/> Heated OR <input type="checkbox"/> Unheated	
Floors Over Unheated Spaces		Effective R _{SI}
Fenestration & Doors		U _{SI} , SHGC
	FDWR: _____ %	
Air Barrier System & Location		
Space Conditioning (Heating & Cooling)		%, HSPF, or SEER
Service Water Heating		EF or % eff
Ventilation		
Other Energy Impacting Features		
Based on information provided by the builder and drawings prepared by _____		
		Dated (YYYY/MM/DD) _____

C: 9.36.5. ENERGY PERFORMANCE COMPLIANCE (see BCBC Clause 2.2.8.3.(2)(c) of Division C)

Complete this section if using the Energy Performance Compliance Path in Subsection 9.36.5.

Proposed House Energy Consumption (GJ/year)		Reference House Rated Energy Target (GJ/year)	
HVAC		HVAC	
Hot Water Heating		Hot Water Heating	
SUM	-	SUM	-

The airtightness value used in the energy model calculations for the Proposed house is:

4.5 ACH @ 50Pa 3.5 ACH @ 50Pa **OR** Tested At _____ ACH @ 50Pa

The above calculation was performed in compliance with Subsection 9.36.5. of Division B: Yes No

D: 9.36.6. ENERGY STEP CODE COMPLIANCE (see BCBC Sentence 2.2.8.3.(3) of Division C)

Complete this section if using the Energy Step Code Compliance Path in Subsection 9.36.6.

If using 9.36.5 to comply with 9.36.6, print and manually fill in the table below. The table below auto-fills from the calculator worksheets and the fields cannot be overwritten.

Rated Energy Consumption (GJ/year):	Proposed House -	Reference House -	HDD: 0
Metric	Units	Required	Proposed
Step Code Level	Step 1, 2, 3, 4, or 5	1	1
Mechanical Energy Use Intensity (MEUI)	kWh/(m ² -year)	- (max)	0
ERS Rating % Lower Than EnerGuide Reference House, <i>where applicable</i>	%	- (min)	0.0
Thermal Energy Demand Intensity (TEDI)	kWh/(m ² -year)	- (max)	
Adjusted TEDI	kWh/(m ² -year)	- (max)	
Building Envelope % Better	%	- (max)	0
Airtightness in Air Changes per Hour at 50 Pa differential	ACH @ 50 Pa	- (max)	
Step Code Design Requirements Met: No			

The above calculation was performed in compliance with (see BCBC Clause 2.2.8.3.(2)(e) of Division C)

Select one:

- Subsection 9.36.5.,
- The Passive House Planning Package (PHPP), version 9 or newer, and the energy model was prepared by a Certified Passive House Designer or Certified Passive House Consultant,
- The EnerGuide Rating System (ERS), version 15 or newer, or
- The applicable requirements of NECB Part 8 and the City of Vancouver Energy Modelling Guidelines.
- The "Instructions for Modelling Attached Ground Oriented Part 9 Residential Buildings" (found in Section 6 of the BC Energy Compliance Reports Instruction Manual)

E: COMPLETED BY

Full Name (Print):		Service Organization:	
Company Name:		Service Organization #:	Advisor ID #:
Phone:		EnerGuide P-file #'s:	0
Address:			
Email:			
Date (dd/mm/yyyy):			
CODECO entered into Info Field 8 of HOT 2000	<input type="checkbox"/>	Note: The same EA will have different ID #s with different SOs	

SUPPLEMENTARY INFORMATION

Supplementary information is not required for Code Compliance but may be requested by the local municipality/district. Where applicable, all metrics within Section F are calculated with baseloads included. If required, complete the applicable sections below.

F: OTHER ENERGY MODELLING METRICS

#	Metric	Units	Reference House	Proposed House
1	Normalized Leakage Area (NLA) @10Pa	cm ² /m ²	-	-
2	Rated Greenhouse Gas Emissions	kg/year	-	-
3	Rated Greenhouse Gas Intensity	kg/m ² /year	-	-
4	Rated Energy Use Intensity	GJ/m ² /year	-	-
5	Peak Thermal Load (PTL)	W/m ²	-	-
6	% of the Building's Conditioned Space Served by Space-Cooling Equipment	%	N/A	-
7	% Lower Than Reference House With Baseloads Included	%	N/A	-

#	Energy Source	Reference House Energy Consumption (GJ/year)	Proposed House Energy Consumption (GJ/year)
	Electricity	-	-
	Natural Gas	-	-
	Propane	-	-
8	District Energy	N/A	-
	On-Site Renewables	N/A	-
	Other:	-	-
	Total	0	0

G: OPTIONAL CERTIFICATIONS

PENDING

- BUILTGREEN®, Level: _____
- Certified Passive House
- CHBA Net Zero House

PENDING

- ENERGY STAR® for New Homes
- LEED® for Homes
- R2000
- Other: _____

APPENDIX II – 2018 BCBC Updates to Step Code Targets for Part 9 Buildings – Revision 2

Revisions to the BCBC became effective on December 12, 2019. This Appendix details the changes related to the BC Energy Step Code compliance targets for Part 9 buildings. Tables outlining the current Step Code metric targets can be found at the end of this Appendix. The following summary updates are taken from the Building and Safety Standards Branch [Information Bulletin No. B19-08](#), and other communications from the Building and Safety Standards Branch.

Change 1: Adjusted Thermal Energy Demand Intensity (Adjusted TEDI)

Issue

Under the BC Building Code 2018 Revision 1 requirements, builders working in colder areas within a given climate zone have had difficulty meeting the BC Energy Step Code TEDI targets for Part 9 residential buildings in their designated climate zone.

Outcome

An adjusted scale has been introduced to TEDI targets to reflect the climate variability within each given climate zone and provide an equivalent TEDI energy budget for each project. The adjusted scale is based on Degree Days Below 18°C (HDD) rather than on a single value for an entire climate zone. HDD and other climate related information is found in Division B, Appendix C of the Building Code.

Impact

This change, identified as the Adjusted TEDI in the BC Energy Compliance report, will result in higher (easier to achieve) TEDI targets for all locations with HDDs that are higher than the HDD at the lower range of each climate zone. This improves fairness across each climate zone and enables Part 9 residential buildings at the colder fringes of a climate zone to more easily achieve the revised TEDI targets.

Change 2: Addition of an Alternative for Measuring Building Envelope Performance – Building Envelope % Performance Improvement over the EnerGuide Reference House

Issue

In some buildings with unique or energy challenging features (such as cathedral ceilings or multiple articulations in the roofs or walls) the modelling results can show significant improvements to energy performance, yet may not even meet Step 2, even with relaxed TEDI targets. For some buildings, even the lower Step TEDI targets may be impractical to achieve.

Outcome

This change, identified as the *Building Envelope % Better* in the Compliance Reports and Calculator, provides an alternative path for builders using the EnerGuide Rating System approach. The Building Envelope % Performance Improvement over the EnerGuide Reference House targets for Steps 2 to 5 will demonstrate whether or not sufficient envelope performance improvements have been made by

comparing the percentage difference between the Auxiliary Energy Required of a modified proposed house to the Auxiliary Energy Required of an EnerGuide Rating System reference house.

Impact

This change will ensure fairness across a greater range of building designs and provide an alternative way to demonstrate that buildings are meeting the building envelope energy performance objectives of the BC Energy Step Code Council. This approach is based on a similar approach being considered for the model National Building Code.

BCBC 2018 Revision 2

Please find below excerpts from the BC Building Code 2018 pertaining to Revision 2 changes to the Energy Step Code effective December 12, 2019

Table 9.36.6.3.-A

Requirements for Buildings Located Where the Degree-Days Below 18°C Value is less than 3000⁽¹⁾

Forming Part of Sentence 9.36.6.3.(1)

Step	Airtightness (Air Changes per Hour at 50 Pa Pressure Differential)	Performance Requirement of <i>Building</i> Equipment and Systems	Performance Requirement of <i>Building</i> Envelope
1	N/A	EnerGuide Rating % lower than EnerGuide Reference House: not less than 0% lower energy consumption or conform to Subsection 9.36.5.	
2	≤ 3.0	EnerGuide Rating % lower than EnerGuide Reference House: not less than 10% lower energy consumption or the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-G	thermal energy demand intensity ≤ 35 kWh/(m ² ·year), thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4), or not less than 5% performance improvement over the EnerGuide Reference House
3	≤ 2.5	EnerGuide Rating % lower than EnerGuide Reference House: not less than 20% lower energy consumption or the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-G	thermal energy demand intensity ≤ 30 kWh/(m ² ·year), thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4), or not less than 10% performance improvement over the EnerGuide Reference House
4	≤ 1.5	EnerGuide Rating % lower than EnerGuide Reference House: not less than 40% lower energy consumption or the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-G	thermal energy demand intensity ≤ 20 kWh/(m ² ·year), thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4), or not less than 20% performance improvement over the EnerGuide Reference House
5	≤ 1.0	the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-G	thermal energy demand intensity ≤ 15kWh/(m ² ·year), thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4), or not less than 50% performance improvement over the EnerGuide Reference House
Notes to Table 9.36.6.3.A: (1) See Sentence 1.1.3.1.(1) and Table C-2 in Appendix C.			

Table 9.36.6.3.-B

Requirements for Buildings Located Where the Degree-Days Below 18°C Value is 3000 to 3999⁽¹⁾

Forming Part of Sentence 9.36.6.3.(1)

Step	Airtightness (Air Changes per Hour at 50 Pa Pressure Differential)	Performance Requirement of <i>Building</i> Equipment and Systems	Performance Requirement of <i>Building</i> Envelope
1	N/A	EnerGuide Rating % lower than EnerGuide Reference House: not less than 0% lower energy consumption or conform to Subsection 9.36.5.	
2	≤ 3.0	EnerGuide Rating % lower than EnerGuide Reference House: not less than 10% lower energy consumption or the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-G	thermal energy demand intensity ≤ <u>45 kWh/(m²·year)</u> , thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4), or not less than 5% performance improvement over the EnerGuide Reference House
3	≤ 2.5	EnerGuide Rating % lower than EnerGuide Reference House: not less than 20% lower energy consumption or the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-G	thermal energy demand intensity ≤ <u>40 kWh/(m²·year)</u> , thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4), or not less than 10% performance improvement over the EnerGuide Reference House
4	≤ 1.5	EnerGuide Rating % lower than EnerGuide Reference House: not less than 40% lower energy consumption or the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-G	thermal energy demand intensity ≤ <u>30 kWh/(m²·year)</u> , thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4), or not less than 20% performance improvement over the EnerGuide Reference House
5	≤ 1.0	the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-G	thermal energy demand intensity ≤ <u>20 kWh/(m²·year)</u> , thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4), or not less than 50% performance improvement over the EnerGuide Reference House
<p>Notes to Table 9.36.6.3.B: (1) See Sentence 1.1.3.1.(1) and Table C-2 in Appendix C.</p>			

Table 9.36.6.3.-C

Requirements for Buildings Located Where the Degree-Days Below 18°C Value is 4000 to 4999⁽¹⁾

Forming Part of Sentence 9.36.6.3.(1)

Step	Airtightness (Air Changes per Hour at 50 Pa Pressure Differential)	Performance Requirement of <i>Building</i> Equipment and Systems	Performance Requirement of <i>Building</i> Envelope
1	N/A	EnerGuide Rating % lower than EnerGuide Reference House: not less than 0% lower energy consumption or conform to Subsection 9.36.5.	
2	≤ 3.0	EnerGuide Rating % lower than EnerGuide Reference House: not less than 10% lower energy consumption or the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-G	thermal energy demand intensity ≤ 60 kWh/(m ² ·year), thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4), or not less than 5% performance improvement over the EnerGuide Reference House
3	≤ 2.5	EnerGuide Rating % lower than EnerGuide Reference House: not less than 20% lower energy consumption or the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-G	thermal energy demand intensity ≤ 50 kWh/(m ² ·year), thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4), or not less than 10% performance improvement over the EnerGuide Reference House
4	≤ 1.5	EnerGuide Rating % lower than EnerGuide Reference House: not less than 40% lower energy consumption or the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-G	thermal energy demand intensity ≤ 40 kWh/(m ² ·year), thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4), or not less than 20% performance improvement over the EnerGuide Reference House
5	≤ 1.0	the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-G	thermal energy demand intensity ≤ 25kWh/(m ² ·year), thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4), or not less than 50% performance improvement over the EnerGuide Reference House
<p>Notes to Table 9.36.6.3.C: (1) See Sentence 1.1.3.1.(1) and Table C-2 in Appendix C.</p>			

Table 9.36.6.3.-D
Requirements for Buildings Located Where the Degree-Days Below 18°C Value
is 5000 to 5999(1)

Forming Part of Sentence 9.36.6.3.(1)

<u>Step</u>	<u>Airtightness</u> (Air Changes per Hour at 50 Pa Pressure Differential)	<u>Performance Requirement of Building Equipment and Systems</u>	<u>Performance Requirement of Building Envelope</u>
1	N/A	<u>EnerGuide Rating % lower than EnerGuide Reference House:</u> <u>not less than 0% lower energy consumption</u> <u>or</u> <u>conform to Subsection 9.36.5.</u>	
2	<u>≤ 3.0</u>	<u>EnerGuide Rating % lower than EnerGuide Reference House: not less than 10% lower energy consumption</u> <u>or</u> <u>the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-G</u>	<u>thermal energy demand intensity ≤80 kWh/(m²·year), thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4), or not less than 5% performance improvement over the EnerGuide Reference House</u>
3	<u>≤ 2.5</u>	<u>EnerGuide Rating % lower than EnerGuide Reference House: not less than 20% lower energy consumption</u> <u>or</u> <u>the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-G</u>	<u>thermal energy demand intensity ≤ 70 kWh/(m²·year), thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4), or not less than 10% performance improvement over the EnerGuide Reference House</u>
4	<u>≤ 1.5</u>	<u>EnerGuide Rating % lower than EnerGuide Reference House: not less than 40% lower energy consumption</u> <u>or</u> <u>the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-G</u>	<u>thermal energy demand intensity ≤ 55 kWh/(m²·year), thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4), or not less than 20% performance improvement over the EnerGuide Reference House</u>
5	<u>≤ 1.0</u>	<u>the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-G</u>	<u>thermal energy demand intensity ≤ 35kWh/(m²·year), thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4), or not less than 50% performance improvement over the EnerGuide Reference House</u>
<u>Notes to Table 9.36.6.3.D:</u> <u>(1) See Sentence 1.1.3.1.(1) and Table C-2 in Appendix C.</u>			

Table 9.36.6.3.-E
Requirements for Buildings Located Where the Degree-Days Below 18°C Value is 6000 to 6999(1)
Forming Part of Sentence 9.36.6.3.(1)

<u>Step</u>	<u>Airtightness</u> (Air Changes per Hour at 50 Pa Pressure Differential)	<u>Performance Requirement of Building Equipment and Systems</u>	<u>Performance Requirement of Building Envelope</u>
<u>1</u>	<u>N/A</u>	<u>EnerGuide Rating % lower than EnerGuide Reference House:</u> <u>not less than 0% lower energy consumption</u> <u>or</u> <u>conform to Subsection 9.36.5.</u>	
<u>2</u>	<u>≤ 3.0</u>	<u>EnerGuide Rating % lower than EnerGuide Reference House: not less than 10% lower energy consumption</u> <u>or</u> <u>the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-G</u>	<u>thermal energy demand intensity ≤ 100 kWh/(m²·year), thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4), or not less than 5% performance improvement over the EnerGuide Reference House</u>
<u>3</u>	<u>≤ 2.5</u>	<u>EnerGuide Rating % lower than EnerGuide Reference House: not less than 20% lower energy consumption</u> <u>or</u> <u>the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-G</u>	<u>thermal energy demand intensity ≤ 90 kWh/(m²·year), thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4), or not less than 10% performance improvement over the EnerGuide Reference House</u>
<u>4</u>	<u>≤ 1.5</u>	<u>EnerGuide Rating % lower than EnerGuide Reference House: not less than 40% lower energy consumption</u> <u>or</u> <u>the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-G</u>	<u>thermal energy demand intensity ≤ 65 kWh/(m²·year), thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4), or not less than 20% performance improvement over the EnerGuide Reference House</u>
<u>5</u>	<u>≤ 1.0</u>	<u>the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-G</u>	<u>thermal energy demand intensity ≤ 50 kWh/(m²·year), thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4), or not less than 50% performance improvement over the EnerGuide Reference House</u>
<u>Notes to Table 9.36.6.3.E:</u> (1) <u>See Sentence 1.1.3.1.(1) and Table C-2 in Appendix C.</u>			

Table 9.36.6.3.-F

Requirements for Buildings Located Where the Degree-Days Below 18°C Value is greater than 6999(1)

Forming Part of Sentence 9.36.6.3.(1)

Step	<u>Airtightness</u> (Air Changes per Hour at 50 Pa Pressure Differential)	<u>Performance Requirement of Building Equipment and Systems</u>	<u>Performance Requirement of Building Envelope</u>
1	N/A	<u>EnerGuide Rating % lower than EnerGuide Reference House:</u> <u>not less than 0% lower energy consumption</u> <u>or</u> <u>conform to Subsection 9.36.5.</u>	
2	≤ 3.0	<u>EnerGuide Rating % lower than EnerGuide Reference House: not less than 10% lower energy consumption</u> <u>or</u> <u>the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-G</u>	<u>thermal energy demand intensity $\leq 120 \text{ kWh}/(\text{m}^2 \cdot \text{year})$, thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4), or not less than 5% performance improvement over the EnerGuide Reference House</u>
3	≤ 2.5	<u>EnerGuide Rating % lower than EnerGuide Reference House: not less than 20% lower energy consumption</u> <u>or</u> <u>the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-G</u>	<u>thermal energy demand intensity $\leq 105 \text{ kWh}/(\text{m}^2 \cdot \text{year})$, thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4), or not less than 10% performance improvement over the EnerGuide Reference House</u>
4	≤ 1.5	<u>EnerGuide Rating % lower than EnerGuide Reference House: not less than 40% lower energy consumption</u> <u>or</u> <u>the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-G</u>	<u>thermal energy demand intensity $\leq 80 \text{ kWh}/(\text{m}^2 \cdot \text{year})$, thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4), or not less than 20% performance improvement over the EnerGuide Reference House</u>
5	≤ 1.0	<u>the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-G</u>	<u>thermal energy demand intensity $\leq 60 \text{ kWh}/(\text{m}^2 \cdot \text{year})$, thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4), or not less than 50% performance improvement over the EnerGuide Reference House</u>
<p><u>Notes to Table 9.36.6.3.F:</u> (1) <u>See Sentence 1.1.3.1.(1) and Table C-2 in Appendix C</u></p>			

Subsection 9.36.6.3.

4) For *buildings* conforming to the requirements of any of Steps 1 to 5, thermal energy demand intensity requirements may be calculated using the applicable following formula for *buildings* located where the degree-days below 18°C value is less than 3000

$$TEDI_{adjusted} = TEDI_{step} + (TEDI_{higher} - TEDI_{step})(HDD_{actual} - HDD_{lowest})/500$$

for *buildings* located where the degree-days below 18°C value is 3000 to 6999

$$TEDI_{adjusted} = TEDI_{step} + (TEDI_{higher} - TEDI_{step})(HDD_{actual} - HDD_{lowest})/1000$$

for *buildings* located where the degree-days below 18°C value is 7000 or greater

$$TEDI_{adjusted} = TEDI_{step} + (TEDI_{step} - TEDI_{lower})(HDD_{actual} - HDD_{lowest})/1000$$

where

$TEDI_{adjusted}$ = thermal energy demand intensity requirement adjusted by heating degree-days,

$TEDI_{step}$ = applicable maximum thermal energy demand intensity requirement in Tables 9.36.6.3.-A to 9.36.6.3.-F,

$TEDI_{higher}$ = maximum thermal energy demand intensity requirement for the same Step as stated in the subsequent Table of Tables 9.36.6.3.-A to 9.36.6.3.-F,

$TEDI_{lower}$ = maximum thermal energy demand intensity requirement for the same Step as stated in the preceding Table of Tables 9.36.6.3.-A to 9.36.6.3.-F,

HDD_{actual} = actual degree-days below 18°C for the *building* location determined in accordance with Subsection 1.1.3.,

HDD_{lowest} = lowest degree-days below 18°C value within the range of the applicable Table of Tables 9.36.6.3.-A to 9.36.6.3.-F.
(See Note 9.36.6.3.(4).)

5) For compliance with Tables 9.36.6.3.-A to 9.36.6.3.-F, envelope performance improvement over the EnerGuide reference house shall be calculated by

a) computing the annual space heating energy use for both the reference house and the proposed house, and

b) expressing the difference between the reference house space heating energy use and proposed house space heating energy use as a percentage of the space heating energy requirement.

Appendix Notes for Article 9.36.6.3.(4)

A-9.36.6.3.(4): Thermal Energy Demand Intensity Adjusted. The thermal energy demand intensity requirements in Tables 9.36.6.3.-A to 9.36.6.3.-F, stated in kWh/(m²·year), are based on the lowest degree-days below 18°C value for each range. Sentence (4) provides a calculation to take into account various building locations along the range of degree-days below 18°C in order to adjust the thermal energy demand intensity requirements to a specific location. The designer may apply the thermal energy demand intensity requirement in the Tables, or may apply a calculated adjusted

thermal energy demand intensity requirement using the applicable formula.

Tables 9.36.6.3.-A to 9.36.6.3.- F are organized in ranges of degree-days below 18°C, beginning from lower degree-days below 18°C to higher. In order to calculate the adjusted thermal energy demand intensity requirement, it is necessary to use values from other Tables as variables. For buildings in locations where the degree-days below 18°C value is less than 6999, the applicable thermal energy demand intensity value is subtracted from the higher thermal energy demand intensity value in a subsequent Table, for the same step. For buildings in locations where the degree-days below 18°C value is equal to or greater than 7000, the lower thermal energy demand intensity value in the preceding Table is subtracted from the applicable thermal energy demand intensity value, for the same step. The lowest degree-days below 18°C value is the value at the lowest end of the range, for example using Table 9.36.6.3.-C, the lowest degree-days below 18°C value to which the Table applies is 4000.

Table A-9.36.6.3.(4) provides thermal energy demand intensity values calculated using the formulas provided listed by degree-days below 18°C in increments of 100.

Table A-9.36.6.3.(4) Thermal Energy Demand Intensity Budgets by 100 Degree-Days Below 18°C Increments

Degree Days Below 18°C	Thermal Energy Demand Intensity, kWh/(m ² /year),			
	Step 2	Step 3	Step 4	Step 5
2500	35	30	20	15
2600	37	32	22	16
2700	39	34	24	17
2800	41	36	26	18
2900	43	38	28	19
3000	45	40	30	20
3100	47	41	31	21
3200	48	42	32	21
3300	50	43	33	22
3400	51	44	34	22
3500	53	45	35	23
3600	54	46	36	23
3700	56	47	37	24
3800	57	48	38	24
3900	59	49	39	25
4000	60	50	40	25
4100	62	52	42	26
4200	64	54	43	27
4300	66	56	45	28
4400	68	58	46	29
4500	70	60	48	30
4600	72	62	49	31
4700	74	64	51	32
4800	76	66	52	33
4900	78	68	54	34
5000	80	70	55	35
5100	82	72	56	37

5200	84	74	57	38
5300	86	76	58	40
5400	88	78	59	41
5500	90	80	60	43
5600	92	82	61	44
5700	94	84	62	46
5800	96	86	63	47
5900	98	88	64	49
6000	100	90	65	50
6100	102	92	67	51
6200	104	93	68	52
6300	106	95	70	53
6400	108	96	71	54
6500	110	98	73	55
6600	112	99	74	56
6700	114	101	76	57
6800	116	102	77	58
6900	118	104	79	59
7000	120	105	80	60
7100	122	107	82	61
7200	124	108	83	62
7300	126	110	85	63
7400	128	111	86	64
7500	130	113	88	65
7600	132	114	89	66
7700	134	116	91	67
7800	136	117	92	68
7900	138	119	94	69
8000	140	120	95	70

APPENDIX III – Rounding Calculations

To ensure consistency among Energy Advisors, below are guidelines for rounding when performing calculations to obtain the Step Code Metrics from HOT2000 and for the BC Energy Compliance Report:

1. When pulling information from HOT2000 and making calculations (through the Energy Step Code Compliance Calculator or by hand) enter all values, whenever possible, to the **hundredth** decimal place (2 numbers after the decimal).
2. When entering **Proposed or As-Built House Rated Energy Consumption, Reference House Rated Energy Target, TEDI, Building Envelope % Performance Improvement over the EnerGuide Reference House, and MEUI** calculation results into Section D of the BC Energy Compliance Report, round the results to the nearest whole number (i.e. no decimal places). This means that:
 - a. If the tenth decimal is less than 5, round down (e.g. 26.49 is rounded down to 26).
 - b. If the tenth decimal is equal to or greater than 5, round up (e.g. 26.50 is rounded up to 27).
3. When entering **ERS % Lower Than Reference House, and Airtightness in Air Changes Per Hour at 50 Pa** into Section D of the BC Energy Compliance Report, round the results to the tenth decimal place (i.e. one decimal place). This means that:
 - If the hundredth decimal is less than 5, round down (e.g. 26.51 is rounded down to 26.5).
 - If the hundredth decimal is equal to or greater than 5, round up (e.g. 26.49 is rounded up to 26.5). Similarly, 26.95 is rounded up to 27.0.

APPENDIX IV – Manually Calculating Proposed and As-Built House Rated Energy Consumption and Reference House Rated Energy Target

Proposed and As-Built House Rated Energy Consumption without baseloads in GJ/year
Reference House Rated Energy Target without baseloads in GJ/year

1. Definition:

- The Proposed or As-Built House Rated Energy Consumption describes the energy use over a year without baseloads, expressed in GJ/year.
- The Reference House Rated Energy Target describes the energy use over a year without baseloads if the home was built to the National Building Code, expressed in GJ/year.

2. Formula:

- Proposed or As-Built House Rated Energy Consumption (GJ) = Total Annual Energy Consumption of the House (GJ) – Baseloads (GJ)
- Reference House Rated Energy Target (GJ) = Total Annual Energy Consumption of the Reference House (GJ) – Baseloads (GJ)

3. HOT2000 Screenshots are provided for manual calculations. For the Excel Compliance Calculator HOT2000 Inputs, see HOT2000 Tab.

Base				Upgrade				Advanced			
EnerGuide Rating System Results											
Rating	70	GJ/a	Reference House	79	GJ/a	Nat. ACH	0.0				
Energy Use Intensity	0.21	GJ/m ² /a	% Lower Than Ref Hse	11.4	%	Q _{Tot}	51.0				
Greenhouse Gases	2.4	t/a				Q _{Warm}	31.7				
Rated Annual Energy Consumption (AEC)						Rated Annual Energy Production (AEP)					
Space Heating	31.60	GJ	Electricity Generation	0.0	GJ	<i>A_{windows & doors} / A_{wr}</i>					
Space Cooling	0.0	GJ	Solar DHW	0.0	GJ	Ref Hse <i>A_{windows & doors} / A_{wr}</i>					
DHW	11.80	GJ	Total AEP	0.0	GJ	Design Heat Lo					
Ventilation, Electric	0.70	GJ				Design Heat G					
Baseloads	25.62	GJ	2								
Total AEC	69.72	GJ	1	Net AEC - AEP	69.72	GJ					
House Name		AEC (GJ/a)		AEP (GJ/a)		Net (GJ/a)					
ERS reference house----Base Case						78.79	3				
General mode----Base Case						71.26					
House with standard operating conditions----Base Case						69.72					

Base	Upgrade	Advanced		
EnerGuide Rating System Results				
Rating	70 GJ/a	Reference House 79 GJ/a	Nat. ACH	0.0
Energy Use Intensity	0.21 GJ/m ² /a	% Lower Than Ref Hse 11.4 %	Q _{Tot}	51.0
Greenhouse Gases	2.4 t/a		Q _{Warm}	31.7
Rated Annual Energy Consumption (AEC)		Rated Annual Energy Production (AEP)		
Space Heating	31.60 GJ	Electricity Generation	0.0 GJ	$A_{windows \& \ doors} / A_{wt}$
Space Cooling	0.0 GJ	Solar DHW	0.0 GJ	Ref Hse $A_{windows \& \ doors} / A_{wt}$
DHW	11.80 GJ	Total AEP	0.0 GJ	Design Heat Lo
Ventilation, Electric	0.70 GJ			Design Heat Gz
Baseloads	25.62 GJ 2			
Total AEC	69.72 GJ 1	Net AEC - AEP	69.72 GJ	
House Name	AEC (GJ/a)	AEP (GJ/a)	Net (GJ/a)	
ERS reference house----Base Case			78.79 3	
General mode----Base Case			71.26	
House with standard operating conditions----Base Case			69.72	

- (1) **Total AEC (GJ)** = Total Annual Energy Consumption of the House.
- (2) **Baseloads (GJ)** = Annual Baseload consumption based on ERS Standard Operating Conditions.
- (3) **ERS reference house--Base Case (GJ)** = Total Annual Energy Consumption of the Reference House.

Important Note: Do not take the values from the Advanced tab as those have already been rounded to the tenth decimal, which may give a higher or lower result if it is rounded further.

4. Example Calculation (Red numerals below refer to screen shot above):

- a. Proposed or As-Built House Rated Energy Consumption = **1** – **2**
 - Proposed or As-Built House Rated Energy Consumption = 69.72 GJ *minus* 25.62 GJ = 44.10 GJ; and rounded down to 44 GJ/year.
- b. Reference House Rated Energy Target = **3** – **2**
 - Reference House Rated Energy Target = 78.79 GJ *minus* 25.62 GJ = 53.17 GJ; and rounded down to 53 GJ/year.

APPENDIX V – Manually Calculating Mechanical Energy Use Intensity (MEUI)

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 (kWh/(m²·year)) = (Total Annual Energy Consumption (kWh/year) – Baseloads (kWh/year)) / Heated Floor Area (m²)
- HOT2000 Screenshots are provided for manual calculations. For the Excel Compliance Calculator HOT2000 Inputs, see HOT2000 Tab.**

The screenshot displays the EnerGuide Rating System (ERS) software interface. On the left, the 'EnerGuide Rating System Results' window shows a Rating of 70 GJ/a, Energy Use Intensity of 0.21 GJ/m²/a, and Greenhouse Gases of 2.4 t/a. Below this, the 'Rated Annual Energy Consumption (AEC)' table lists: Space Heating (31.60 GJ), Space Cooling (0.0 GJ), DHW (11.80 GJ), Ventilation, Electric (0.70 GJ), Baseloads (25.62 GJ), and Total AEC (69.72 GJ). The 'Specifications' window shows Building Type as House, Single Detached, Two storeys, Light wood frame, Normal conductivity foundation, and Normal water table level. The 'Units & Mode' window shows Year Built as 2017, Wall Colour as Default, Roof Colour as Default, and Heated Floor Area as 229.59 m² Above Grade and 96.1602 m² Below Grade. A calculation is shown: (69.72 - 25.62) / (229.59 + 96.16) * 277.78 = 37.61 kWh/(m²·year), rounded to 38 kWh/(m²·year).

- **Total AEC (GJ)** = Total Annual Energy Consumption of the House.
- **Baseloads (GJ)** = Annual Baseload consumption based on ERS Standard Operating Conditions.
- **Above Grade Heated Floor Area (m²)** = The sum of all floor areas that are located on a floor level that is entirely above grade.
- **Below Grade Heated Floor Area (m²)** = The sum of all basement floor areas that are located on a floor level that is wholly or partially below grade.
- Energy conversion where **277.78 kWh = 1 GJ**

- Example Calculation (Red numbers refer to screen shot above):**
 - MEUI = [(1 minus 2) / (3 + 4)] * 5
 - MEUI = [(69.72 GJ minus 25.62 GJ) divided by (229.59 m² plus 96.16 m²)] multiplied by 277.78 kWh/GJ = 37.61 kWh/(m²·year); rounded up to 38 kWh/(m²·year)

APPENDIX VI – Manually Calculating ERS Rating % Lower Than EnerGuide Reference House

EnerGuide Rating System (ERS) Rating Compared to ERS Reference House without baseloads (%LTRH w/o BL) in percentage (%).

- 1. Definition:** Percentage Lower Than Reference House without baseloads (%LTRH w/o BL) 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.
- 2. Formula:** $\%LTRH\ w/o\ BL\ (\%) = 100 - ((\text{Total Energy Consumption Proposed House (kWh/year)} - \text{Baseloads (kWh/year)}) \times 100 / (\text{Total Energy Consumption Reference House (kWh/year)} - \text{Baseloads (kWh/year)}))$
- 3. HOT2000 Screenshots are provided for manual calculations. For the Excel Compliance Calculator HOT2000 Inputs, see HOT2000 Tab.**

	SOC House	Reference House
Net AEC - AEP	69.7	78.8
Baseloads	- 25.6	- 25.6
Space and DHW Consumption	= 44.1	= 53.2

Space conditioning and DHW consumption
% Lower Than Ref Hse 17.1 %

After modelling the house run the calculations by pressing Alt + C. The %LTRH w/o BL can be found on the right hand side of the third tab labelled “Advanced.”

- 4. For Manual Calculations:** The needed figures are taken from the first tab labelled “Base” instead of the space heating and DHW figures from the third “Advanced” tab for increased accuracy.

Base				Upgrade				Advanced			
EnerGuide Rating System Results											
Rating	70	GJ/a	Reference House	79	GJ/a	Nat. ACH	0.0				
Energy Use Intensity	0.21	GJ/m ² /a	% Lower Than Ref Hse	11.4	%	Q _{Tot}	51.0				
Greenhouse Gases	2.4	t/a				Q _{Warm}	31.7				
Rated Annual Energy Consumption (AEC)						Rated Annual Energy Production (AEP)					
Space Heating	31.60	GJ	Electricity Generation	0.0	GJ	<i>A_{windows & doors} / A_{wr}</i>					
Space Cooling	0.0	GJ	Solar DHW	0.0	GJ	<i>Ref Hse A_{windows & doors} / A_{wr}</i>					
DHW	11.80	GJ	Total AEP	0.0	GJ	Design Heat Lo					
Ventilation, Electric	0.70	GJ				Design Heat Ga					
Baseloads	25.62	GJ									
Total AEC	69.72	GJ									
			Net AEC - AEP	69.72	GJ						
House Name			AEC (GJ/a)	AEP (GJ/a)	Net (GJ/a)						
ERS reference house----Base Case					78.79		3				
General mode----Base Case					71.26						
House with standard operating conditions----Base Case					69.72						

- (1) **Total AEC (GJ)** = Total Annual Energy Consumption of the House.
- (2) **Baseloads (GJ)** = Annual Baseload consumption based on ERS Standard Operating Conditions.
- (3) **ERS reference house-Base Case (GJ)** = Total Annual Energy Consumption of the Reference House.

5. Example Calculation:

- %LTRH w/o BL = $100 - ((1 - 2) * 100 / (3 - 2))$
- %LTRH w/o BL = $100 - ((69.72 \text{ GJ} \text{ minus } 25.6 \text{ GJ}) \text{ multiplied by } 100 \text{ divided by } (78.79 \text{ GJ} \text{ minus } 25.62 \text{ GJ})) = 17.05\%$; rounded to 17.1%

APPENDIX VII – Manually Calculating Thermal Energy Demand Intensity (TEDI) and Adjusted Thermal Energy Demand Intensity

Thermal Energy Demand Intensity (TEDI) in kWh/(m²·year)

- Definition:** TEDI describes the annual heating required by the building for space conditioning and for conditioning of ventilation air, 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). TEDI considers thermal transmittance of the building envelope components (including assemblies, windows, doors and skylights), air leakage through the air barrier system, internal heat gains from occupants and equipment, and heat recovery from exhaust ventilation.
- Formula:** TEDI (kWh/(m²·year)) = Space Heating Demand (kWh/year) / Heated Floor Area (m²)
- HOT2000 Screenshots are provided for manual calculations. For the Excel Compliance Calculator HOT2000 Inputs, see HOT2000 Tab.**

ANNUAL SPACE HEATING SUMMARY

Gross Space Heat Loss:	67102 MJ
Gross Space Heating Load:	65212 MJ
Usable Internal Gains:	22627 MJ
Usable Internal Gains Fraction:	33.7 %
Usable Solar Gains:	12033 MJ
Usable Solar Gains Fraction:	17.9 %
Auxiliary Energy Required: 1	30551 MJ / 1000 /

*** 277.78 5**

Specifications Panel:

- Building Type: House
- Stores: Two storeys
- Thermal Mass: Light, wood frame
- Effective Mass Fraction: 1.00
- Foundation Soil Condition: Normal conductivity (dry sand, loam, clay)
- Water Table Level: Normal (7-10m/23-33ft)
- Year Built: User specified (2017)
- Wall Colour: Default (0.4)
- Roof Colour: Default (0.4)
- Heated Floor Area: Above Grade (229.59 m²) + Below Grade (96.1602 m²)

- (1) Auxiliary Energy Required (MJ)** = The amount of heat energy the space heating equipment must provide to maintain the house temperatures. Obtained from the Full House Report using data from the “House with standard operating conditions” run.
- (2) Above Grade Heated Floor Area (m²)** = The sum of all floor areas that are located on a floor level that is entirely above grade.
- (3) Below Grade Heated Floor Area (m²)** = The sum of all basement floor areas that are located on a floor level that is wholly or partially below grade.
- (4) Energy conversion where 1000 MJ = 1 GJ**
- (5) Energy conversion where 277.78 kWh = 1 GJ**

4. Example Calculation:

- TEDI = 1 / 4 / (2 + 3) * 5
- TEDI = 30,551MJ *divided by* 1000MJ/GJ *divided by* (229.59m² *plus* 96.16m²) *multiplied by* 277.78kWh/GJ = 26.05kWh/(m²·year); rounded down to 26kWh/(m²·year)

Adjusted Thermal Energy Demand Intensity (Adjusted TEDI) in kWh/(m²-year)

1. **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.
2. **Formula:** The calculation methodology to demonstrate compliance with Step Code requirements is the same for both the TEDI metric and the Adjusted TEDI metric as outlined above.

APPENDIX VIII – Manually Calculating the Building Envelope % Performance Improvement over the EnerGuide Reference House

Auxiliary Energy Required of the Modified Proposed house compared to the Auxiliary Energy Required of the Reference House in percentage (%).

- 1. Definition:** The **Building Envelope % Performance Improvement over the EnerGuide Reference House** (represented as the *Building Envelope % Better* in the Compliance Report and Calculator) is a metric that compares the percentage difference between the Auxiliary Energy Required of a modified proposed house to the Auxiliary Energy Required of the EnerGuide Rating System reference house from HOT2000 version 11.x (latest version). The **Building Envelope % Performance Improvement over the EnerGuide Reference House** targets for Steps 2 to 5 will demonstrate whether or not sufficient envelope performance improvements have been made by comparing annual space heating requirements for a proposed house to a reference house and by requiring a percent better improvement.

The Auxiliary Energy Required of the modified proposed house is created by adjusting the proposed house model (ventilation, space heating and domestic hot water), and entering the reference house values for mechanical equipment (or the Auxiliary Energy Required) into the proposed house.

- 2. Formula:** Building Envelope % Performance Improvement over the EnerGuide Reference House = $100 * \{ [\text{Auxiliary Energy Required of the Reference House (MJ)} - \text{Auxiliary Energy Required of the Proposed House (MJ)}] / [\text{Auxiliary Energy Required of the Reference House (MJ)}] \}$
- 3. Modifications to the Proposed House** To ensure the proposed house has the same mechanical as the reference house (As required for the Building Envelope % Performance Improvement over the EnerGuide Reference House), change the file as follows:
 - a) Ventilation:**
 - i) In the *Whole-house components* tab, set all fans to N/A (including HRV if modeled). Then set the fan type to **Utility**, the exhaust and supply airflow rates according to Table 9.32.3.5 in the BC Building Code and leave the fan power as default.
 - ii) In the *Supplemental components* tab, set all fans except the Dryer to N/A. Leave the Dryer settings as defaults.
 - iii) Run the Full House Report for the ERS reference house and go to the **NEW ERS VENTILATION DATA** section and note the **Fan Power** and the **Airflow Supply & Exhaust Rates** (see screen shot below).

NEW ERS VENTILATION DATA	
Whole House Systems	
Air Distribution/circulation type:	Dedicated low volume ductwork
Air Distribution/circulation fan power:	100.00 Watts
Operation schedule:	480.00 min/day
System # 1 Type:	Utility
Manufacturer:	
Model:	
Airflow Supply Rate: 39.20 L/s	Exhaust: 39.20 L/s
Fan Power: 90.94 Watts	

- iv) Reset the fan power for the utility fan equal to the noted value for the reference house.
- v) Reset, if necessary, the supply and exhaust flow rates to equal the flow rates noted for the reference house divided by 1.225. (in the above screen shot = $39.2/1.225 = 32$ L/sec).

Note: The Airflow Rates and Fan Power changes with the number of units in a MURB.

b) Space heating:

- i) Set Type 1 to Baseboards/Hydronic/Plenum heaters, Output Capacity = Calculated;
- ii) Set Type 2 to N/A;
- iii) Deselect Radiant Heating;
- iv) Set Supplemental Heat Systems to 0.
- v) Set Fans/Pumps to N/A.

c) Domestic Hot Water:

- i) Set:
 - Energy Source = Electricity;
 - Tank Type = Conventional tank;
 - Tank Volume = 189.3 L, 41.6 Imp, 50 US gal;
 - Energy Factor = 0.870
 - Input Capacity = 3000 Watts
- ii) Run the full house report for the ERS reference house and go to the **DOMESTIC WATER HEATING SYSTEM** section and note the **Stand By Heat Loss Rate** (see screen shot below).

DOMESTIC WATER HEATING SYSTEM

PRIMARY Water Heating Fuel:	Electricity
Water Heating Equipment:	Conventional tank
Calculated Energy Factor:	0.870
Manufacturer:	
Model:	
Tank Capacity:	189.3 Litres
Tank Location:	Main floor
Stand By Heat Loss Rate:	77.86 W
Thermal Efficiency:	98.00 %
Burner Capacity:	3000.00 W

- iii) Reset the Energy Factor drop down box to **Standby**.
- iv) In the *Standby Heat Loss* field enter the value noted above (see screen shot below).

Energy Factor Uniform Energy Factor
 Energy Source: Electricity
 Tank Type: Conventional tank
 Tank Volume: 189.3 L, 41.6 Imp, 50 US gal
 Energy Factor: Standby (0.870)
 Tank Location: Main floor
 Standby Heat Loss: 77.9 W
 Thermal Efficiency: 98%
 Input Capacity: 3000 W

4. **Extract the Auxiliary Energy Required:** The needed figures are taken from the Full House Reports for the Modified Proposed House with Standard Operating Conditions and the Reference House respectively (see screen shot below).

ANNUAL SPACE HEATING SUMMARY		ANNUAL SPACE HEATING SUMMARY	
Gross Space Heat Loss:	82275 MJ	Gross Space Heat Loss:	81347 MJ
Gross Space Heating Load:	80213 MJ	Gross Space Heating Load:	80307 MJ
Usable Internal Gains:	41467 MJ	Usable Internal Gains:	40683 MJ
Usable Internal Gains Fraction:	50.4 %	Usable Internal Gains Fraction:	50.0 %
Usable Solar Gains:	13368 MJ	Usable Solar Gains:	9988 MJ
Usable Solar Gains Fraction: Proposed	16.2 %	Usable Solar Gains Fraction: Reference	12.3 %
Auxiliary Energy Required:	25377 MJ	Auxiliary Energy Required:	29636 MJ
Space Heating System Load:	25377 MJ	Space Heating System Load:	29636 MJ
Furnace/Boiler Seasonal efficiency:	100.0 %	Furnace/Boiler Seasonal efficiency:	100.0 %
Furnace/Boiler Annual Energy Consumption:	315 MJ	Furnace/Boiler Annual Energy Consumption:	3791 MJ

(1) **Auxiliary Energy Required (MJ)** = The amount of heat energy the space heating equipment must provide to maintain the house temperatures.

5. **Example Calculation:**

- a. Building Envelope % Better= 100 * {(1Reference - 1 Proposed) / (1Reference)}
- b. Building Envelope % Better= 100 times {(29,636 MJ minus 25,377 MJ) divided by (29,636 MJ)} = 14.37%; rounded to 14%

APPENDIX IX– Manually Calculating Peak Thermal Load (PTL)

Peak Thermal Load (PTL) in W/m²

- 1. Definition:** While Peak Thermal Load (PTL) is no longer a formal reporting metric requirement for the BC Energy Step Code, it is listed on the supplementary information in Section F of the BC Energy Compliance Report, and may be an administrative requirement by some Authorities Having Jurisdiction. PTL describes the maximum heating energy required by the building for space conditioning and for conditioning of ventilation air, estimated by using an energy model at a 2.5% January design temperature and expressed in watts per square metre of area (W/m²) of conditioned space. PTL considers the same factors as TEDI, which are thermal transmittance of the building envelope components (including assemblies, windows, doors and skylights), air leakage through the air barrier system, internal heat gains from occupants and equipment, and heat recovery from exhaust ventilation.
- 2. Formula:** $PTL (W/m^2) = \text{Design Heat Loss (W)} / \text{Heated Floor Area (m}^2\text{)}$
- 3. HOT2000 Screenshots are provided for manual calculations. For the Excel Compliance Calculator HOT2000 Inputs, see HOT2000 Tab.**

The screenshot displays the HOT2000 software interface. On the left, the 'Full House Report' window shows the following data:

Design Heat Loss* at -7.0 °C (7.93 Watts / m3):	6790 Watts	1
Design Cooling Load* for July at (28.0 °C):	10217 Watts	

On the right, the 'Inputs' tab is active, showing various building parameters:

- Building Type: House
- Multi-unit: one unit
- Multi-unit: whole building
- Single Detached
- Stores: Two storeys
- Thermal Mass: Light, wood frame
- Effective Mass Fraction: 1.00
- Foundation Soil Condition: Normal conductivity (dry sand, loam, clay)
- Water Table Level: Normal (7-10m/23-33ft)
- Year Built: User specified
- Year: 2017
- Wall Colour: Default
- Value: 0.4
- Roof Colour: Default
- Value: 0.4
- Default Roof Cavity Inputs:
- Inputs
- Heated Floor Area:
 - Above Grade: 229.59 m² **2**
 - Below Grade: 96.1602 m² **3**

- (1) Design Heat Loss (W)** = The maximum heating capacity required by the building for space conditioning based on the outdoor winter design temperature. Obtained from the Full House Report using data from the “House with standard operating conditions” run.
 - (2) Above Grade Heated Floor Area (m²)** = The sum of all floor areas that are located on a floor level that is entirely above grade.
 - (3) Below Grade Heated Floor Area (m²)** = The sum of all basement floor areas that are located on a floor level that is wholly or partially below grade.
- 4. Example Calculation:**
- $PTL = 1 / (2 + 3)$
 - $PTL = 6790 \text{ W divided by } (229.59 \text{ m}^2 \text{ plus } 96.16 \text{ m}^2) = 20.84 \text{ W/m}^2$; rounded up to 21 W/m²;

Note: For manual calculations, the design heat losses (1) must be taken from the full house report instead of the “Base” tab of the calculation screen for increased accuracy.

APPENDIX X – Manually Calculating % Building’s Conditioned Space Served By Space-Cooling Equipment

Amount of the Building’s Conditioned Space Served By Space-Cooling Equipment in percentage (%)

1. **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) 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.

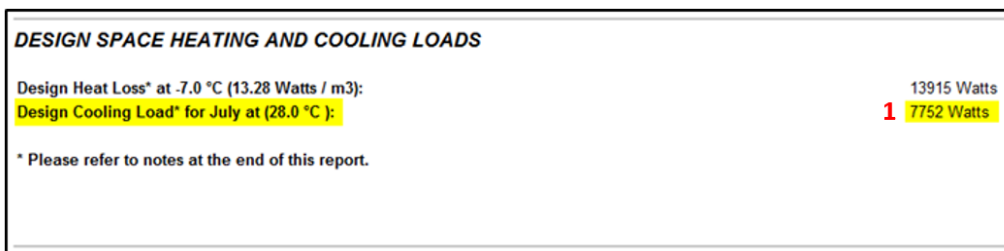
If the HOT2000 energy model does not have the cooling energy consumption included in the annual energy consumption (i.e. cooling energy is not included in the ERS GJ Rating), enter “Not more than 50%.” This applies even if there is cooling installed in the building but it is modelled as an atypical load.

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.

2. **Formula:** % of the Building’s Conditioned Space Served by Space-Cooling Equipment = Cooling Capacity of Space Cooling System (W) / Design Heat Loss (W) * 100%
 - If it equals to 50% or less, enter the % of the Building’s Conditioned Space Served by Space-Cooling Equipment as “Not more than 50%.”
 - If it equals to more than 50%, enter the % of the Building’s Conditioned Space Served by Space-Cooling Equipment as “More than 50%.”

3. **Screenshots:**

Design Cooling Load from HOT2000: Use the figure from the Full House Report for increased accuracy (vs. from the Homeowner Information Sheet or EnerGuide Rating System Calculation Results screen).



Cooling System's Cooling Capacity:

The image shows an AHRI Certified Certificate of Product Ratings form. The form includes the AHRI logo and the text "AHRI CERTIFIED" with the website "www.ahridirectory.org". The main title is "Certificate of Product Ratings". Below the title, there are several fields for product information, including AHRI Certified Reference Number, Date, Model Status, Old AHRI Reference Number, AHRI Type, Outdoor Unit Brand Name, Outdoor Unit Model Number (Condenser or Single Package), Indoor Unit Brand Name, and Indoor Unit Model Number (Evaporator and/or Air Handler). A note states: "The manufacturer of this ADP product is responsible for the rating of this system combination." Below this, it says: "Rated as follows in accordance with the latest edition of ANSI/AHRI 210/240 with Addenda 1 and 2, Performance Rating of Unitary Air-Conditioning & Air-Source Heat Pump Equipment and subject to rating accuracy by AHRI-sponsored, independent, third party testing." The key rating is highlighted in yellow: "Cooling Capacity (A2) - Single or High Stage (95F), btuh : 16900 2". Other ratings listed are SEER : 15.00, EER (A2) - Single or High Stage (95F) : 11.00, Heating Capacity (H12) - Single or High Stage (47F) : 16000, and HSPF (Region IV) : 8.20.

(1) Design Cooling Load (W) = The predicted cooling capacity required by the building for space cooling based on the outdoor summer design temperature. Obtained from the Full House Report using data from the “House with standard operating conditions” run.

(2) Cooling Capacity of Cooling System (W, kW, or BTU/hr) = The cooling capacity of the air conditioning system. For heat pumps, the capacity generally entered into HOT2000 is the heating capacity, however for this calculation the cooling capacity of the heat pump must be used.

- For central systems, obtain the cooling capacity from the [AHRI Directory](#) or [NRCAN Searchable Product List](#).
- For mini-split systems, sum the cooling capacities of the individual indoor heads.
- If the cooling capacity is unknown, follow ERS procedures to determine cooling capacity.
 - Air Conditioner: Follow ERS procedures as outlined in the ERS HOT2000 User Guide. Select Calculated from the drop down and HOT2000 will estimate an appropriate capacity. Use the rated output capacity (W) as the cooling capacity.
 - Air-Source Heat Pump: Follow ERS procedures as outlined in the ERS HOT2000 User Guide. Once the heat pump has been modelled, generate the Full House Report with standard operating conditions and record the capacity (W) for the Air Conditioning System.

(3) Capacity conversion where 1 W = 0.001 kW

(4) Capacity conversion where 1 W = 3.41214 Btu/hr

(5) Example Calculation

- % of the Building's Conditioned Space Served by Space-Cooling Equipment = $2 / [3 \text{ or } 4] / 1 * 100\%$
- % of Building's Conditioned Space Served by Space-Cooling Equipment = 16,900 Btu/hr **divided by** 3.4121 Btu/hr/W **divided by** 7752 W **multiplied by** 100% = 63.89%; rounded up to 64%.

Therefore, the % of the Building's Conditioned Space Served by Space-Cooling Equipment is “More than 50%.”

APPENDIX XI – Manually Calculating Energy Source Annual Energy Consumption

Annual Energy Consumption in GJ/year

- 1. Definition:** Energy Source Consumption describes the annual consumption of different sources of energy, such as electricity, natural gas, propane, and other fuel types. It also includes contribution from district energy and on-site renewable energy sources.

Conversion Factors

- Electricity: **Convert to GJ/year by multiplying the total electricity consumption in kWh by 0.0036 GJ/kWh.**
 - $1000 \text{ kWh} * 0.0036 \text{ GJ/kWh} = 3.6 \text{ GJ}$
- Natural Gas: **Convert to GJ/year by multiplying the total natural gas consumption in m³ by 0.03726 GJ/m³.**
 - $1000 \text{ m}^3 * 0.03726 \text{ GJ/ m}^3 = 37.3 \text{ GJ}$
- Propane: **Convert to GJ/year by multiplying the total propane consumption in litres by 0.00256 GJ/litres.**
- Oil: **Convert to GJ/year by multiplying the total oil consumption in l by 0.03852 GJ/litres.**
 - $1000 * 0.03852 \text{ GJ/ m}^3 = 38.5 \text{ GJ}$
- Wood: **Convert to GJ/year by multiplying the total wood consumption in kg by 0.018 GJ/m³.**
 - $1000 * 0.018 \text{ GJ/ m}^3 = 18 \text{ GJ}$

For the Reference House:

- Generate the Reference House Full House Report by using the Proposed House energy model for the Pre-Construction Compliance Report and the As-Built energy model for the As-Built Compliance Report.
- The energy source consumption for the reference house is found in the Reference House Full House Report under the “Estimated Annual Fuel Consumption Summary.” Use the following conversion factors to convert to GJ/year.

For the Proposed House:

- From the Proposed House energy model, enter the annual consumption in GJ of each applicable from the Annual Fuel Consumption section of the EnerGuide Rating System Results screen for each respective fuel type.

For the As-Built House:

- From the As-Built energy model, enter the annual electricity consumption in GJ from the Annual Fuel Consumption section of the EnerGuide Rating System Results screen for each respective fuel type.

Take the Annual Fuel Consumption from the HOT2000 EnerGuide Rating System Results screen and convert the consumption into GJ/year. Use the conversion factors above.

District Energy: The process to determine the annual district energy consumption is yet to be determined.

On Site Renewables:

On-Site Renewables	This field refers to the amount of energy generated from on-site renewable sources that offset the total energy consumption of the home. Note – the BC Energy Step Code is an energy performance standard. On-site renewable energy is not permitted to be used to offset site energy consumption.		
	For ERS Reference House Enter “N/A” as On-site Renewables is not included in the EnerGuide Rating System Reference House.	From the Proposed House energy model, enter annual on-site renewable energy generated in GJ from the Total AEP field of the EnerGuide Rating System Results screen. (3)	From the As-Built energy model, enter on-site renewable energy generated in GJ from the Total AEP field of the EnerGuide Rating System Results screen. (3)

Note:

Only enter the annual consumption in GJ of other energy sources that are included in the total energy consumption of the energy model. For example:

- If a wood burning stove is present but “Usage” is set to “Never” in HOT2000, do not enter the energy consumption for the wood.
- If a wood burning stove is present and “Usage” is set to “Always” in HOT2000, enter the energy consumption for the wood after converting it to GJ/year.

2. HOT2000 Screenshots are provided for manual calculations. For the Excel Compliance Calculator HOT2000 Inputs, see HOT2000 Tab.

(1) Reference House Estimated Annual Fuel Consumption

If completing the Pre-Construction Compliance Report, use the Reference House Full House Report from the Proposed House energy model. If completing the As-Built Compliance Report, use the Reference House Full House Report from the As-Built House energy model.

ESTIMATED ANNUAL FUEL CONSUMPTION SUMMARY						
Fuel	Space Heating	Space Cooling	DHW Heating	Baseloads	Ventilation	1
Natural Gas (m3)	1423.5	0.0	584.4	0.0	0.0	Total 2007.9
Electricity (kWh)	257.2	0.0	0.0	7117.4	303.6	7678.3

(2) Pre-Construction / As-Built Annual Fuel Consumption

Base Upgrade Advanced

EnerGuide Rating System Results

Rating	115 GJ/a	Reference House	102 GJ/a	Nat. ACH	0.31
Energy Use Intensity	0.33 GJ/m ² /a	% Higher Than Ref Hse	12.7 %	Q _{Tot}	125.7 L/s
Greenhouse Gases	4.6 t/a			Q _{Warn}	32.80 L/s

Rated Annual Energy Consumption (AEC)		Rated Annual Energy Production (AEP)		A _{windows & doors} / A _{walls}	
Space Heating	73.44 GJ	Electricity Generation	0.0 GJ		23.8 %
Space Cooling	0.0 GJ	Solar DHW	0.0 GJ	Ref Hse A _{windows & doors} / A _{walls}	22.0 %
DHW	15.18 GJ	Total AEP	0.0 GJ	Design Heat Loss	13.9 kW
Ventilation, Electric	0.82 GJ			Design Heat Gain	7.8 kW
Baseloads	25.62 GJ				
Total AEC	115.06 GJ	Net AEC - AEP	115.06 GJ		

House Name	AEC (GJ/a)	AEP (GJ/a)	Net (GJ/a)
ERS reference house			102.46
General mode			120.10
House with standard operating conditions			115.06

Annual Fuel Consumption

	Gross		Net	
Electricity	7711 kWh	27.8 GJ	7711 kWh	27.8 GJ
Natural Gas	2343 m ³	87.3 GJ	2343 m ³	87.3 GJ
Oil	0 L	0.0 GJ	0 L	0.0 GJ
Wood	0 kg	0.0 GJ	0 kg	0.0 GJ
Propane	0 L	0.0 GJ	0 L	0.0 GJ

OK

Use the Annual Fuel Consumption from the EnerGuide Rating System Results Screen and convert to GJ/year. Use the conversion factors above.

(3) Annual on-site renewable energy generated in GJ

Base Upgrade Advanced

EnerGuide Rating System Results

Rating	115 GJ/a	Reference House	102 GJ/a	Nat. ACH	0.31
Energy Use Intensity	0.33 GJ/m ² /a	% Higher Than Ref Hse	12.7 %	Q _{Tot}	125.7 L/s
Greenhouse Gases	4.6 t/a			Q _{Warn}	32.80 L/s

Rated Annual Energy Consumption (AEC)		Rated Annual Energy Production (AEP)		A _{windows & doors} / A _{walls}	
Space Heating	73.44 GJ	Electricity Generation	0.0 GJ		23.8 %
Space Cooling	0.0 GJ	Solar DHW	0.0 GJ	Ref Hse A _{windows & doors} / A _{walls}	22.0 %
DHW	15.18 GJ	3 Total AEP	0.0 GJ	Design Heat Loss	13.9 kW
Ventilation, Electric	0.82 GJ			Design Heat Gain	7.8 kW
Baseloads	25.62 GJ				
Total AEC	115.06 GJ	Net AEC - AEP	115.06 GJ		

House Name	AEC (GJ/a)	AEP (GJ/a)	Net (GJ/a)
ERS reference house			102.46
General mode			120.10
House with standard operating conditions			115.06

Annual Fuel Consumption

	Gross		Net	
Electricity	7711 kWh	27.8 GJ	7711 kWh	27.8 GJ
Natural Gas	2343 m ³	87.3 GJ	2343 m ³	87.3 GJ
Oil	0 L	0.0 GJ	0 L	0.0 GJ
Wood	0 kg	0.0 GJ	0 kg	0.0 GJ
Propane	0 L	0.0 GJ	0 L	0.0 GJ

OK

Enter the Total Annual Energy Production from the EnerGuide Rating System Results Screen.

Example Calculation: Reference House Electricity Consumption

- a. Electricity Consumption = 1 * 0.0036
- b. Electricity Consumption = 7678.3 kWh *multiplied by* 0.0036 GJ/year = 27.64 GJ/year, rounded to 28 GJ/year

Appendix XII: List of Modifications to the BCBC 2018 Revision 2 & 3 - Step Code Compliance Calculator/Report Generator

April 21, 2020

- Corrected area for MEUI not displaying properly when area equalled boundary values
- Corrected CODECO info 9 to info 8.
- Changed conditional formatting to show % LTRH & Building Envelope % when negative
- "Rounding Calculations" tab: corrected "% TEDI" to read "Building Envelope % Better"
- Attached Non-MURB calculator cell K114 referenced column 5 in the Step Code table but now references column 9
- As-Built and Pre-Construction Reports: Allowed all calculated metrics to be visible for Step 1
- SFH and MURB calculator and Attached Non-MURB calculators:
 - Now allows all metrics to be visible for Step 1
 - Now allows negative values for building envelope % and %LTRH to be visible.
- Attached Non-MURB Calculator: Row 29 corrected sig figs from 2 decimal places to none where applicable.
- Changed SFH and MURB tab cells L43 & L56, and Attached MURB tab cells M98 & M111 for LTRH to show values at Step 5
- Reconfigured Section E in Pre-Construction and As-Built Reports to include the SO name and added new note: "The same EA will have different ID #s with different SOs."

May 6, 2020

- Corrected/revised conditional formatting so fields in the As-Built Report using inputs from Pre-Construction Report stay yellow when nothing is entered into the Pre-Construction Report. This alerts the user to enter data in those fields.
- Added a new note to Section A in Pre-Construction Report: **"*Building Type must be selected in order to auto populate this report correctly*"**
- Added a new note to Section A in the As-Built Report: **"*Building Type must be selected in both the Pre-Construction Report AND in this As-Built Report in order to auto populate this report correctly*"**

May 26, 2020

- Changed the title and footers of this manual to include 2018 BCBC Revision 3. Since the Step Code targets were unchanged in Revision 3, this manual is otherwise identical and may be used for Part 9 residential buildings conforming to either 2018 BC Building Code Revision 2 or 3.

July 22, 2020

- Corrected cell AA92 in the Pre-Construction Report Tab which previously showed "25". Now, it shows the P-file number by re-applying the link to the appropriate calculator.
- Corrected cell L45 in the SFH and MURB Calculator Tab which previously showed red even when the required Adjusted TEDI was achieved.

Contact Information and Comments

To provide feedback and recommendations on the BC Energy Compliance Report Manual please contact Peter Sundberg at City Green Solutions via email: manager@citygreen.ca.

To provide feedback and recommendations on the calculator please contact Niels Anthonen at Enerlytics Building Performance via email: niels@enerlytics.ca.