

INSTRUCTION MANUAL: BC ENERGY COMPLIANCE REPORT FOR (SOME) PART 9 BUILDINGS

FOR ENERGUIDE RATING SYSTEM ENERGY ADVISORS AND SERVICE ORGANIZATIONS

JANUARY 2018

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INTRODUCTION

The **BC Energy Step Code** is a voluntary 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. 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 choose to adopt in bylaws and policies.

The **BC Energy Compliance Report - Performance Paths for Part 9 Buildings** provides a standardized report template for Part 9 buildings complying with Subsection 9.36.5. or 9.36.6. of the 2012 BC Building Code. The compliance report may be used by:

- EnerGuide Rating System (ERS) Registered Energy Advisors and other energy modellers to produce a standardized compliance report;
- Builders to translate an energy model into a BC Energy Step Code Report;
- Local governments to verify builders are complying with a bylaw or policy that references a level of the Step Code (for example Step 3); 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:

- 1. General guidelines for using the BC Energy Compliance Report
- 2. A table of instructions for completing the BC Energy Compliance Report
- 3. Details on how to use H0T2000 to calculate the BC ENERGY STEP CODE metrics (Section D) of the BC Energy Compliance Report.

GUIDELINES FOR ENERGUIDE RATING SYSTEM IMPLEMENTATION

	GUIDELINES
Online	The BC Energy Compliance Report can be found online at:
Access	 <u>https://www2.gov.bc.ca/gov/content/industry/construction-industry/building-</u>
	<u>codes-standards/energy-efficiency/energy-step-code/resources</u>
ERS Energy	Use EnerGuide Rating System Version 15.4, HOT2000 Version 11.4 (or most recent version).
Modelling	Follow energy modelling instructions in the most recent versions of the following EnerGuide
	Rating System documents:
	ERS Administrative Procedures;
	ERS HOT2000 User Guide;
	ERS Technical Procedures; and
	ERS Standard
Building	Version 1.0 of this manual only provided detailed instructions on how to generate the BC
Types	Energy Compliance Report for single family detached homes. More work is required to fully
	define and document guidelines for semi-detached homes, attached homes, MURBs and
	non-residential part 9 buildings.
Energy Step	Users of this Instruction Manual and the BC Energy Compliance Report should be familiar
Code	and have read within the 2012 BC Building Code:
Regulation	• Article 2.2.8.1. of Division C, Information Required on Drawings and Specifications;
	Article 2.2.8.3. of Division C, House Performance Compliance Calculation Report;
	 Subsection 9.36.5. of Division B, Energy Performance Compliance; and
	Subsection 9.36.6. of Division B, Energy Step Code.
Technical	Guidelines for Using HOT2000 v.11 to Demonstrate Compliance with Subsection
Resources	9.36.5 of the 2015 National Building Code, Natural Resources Canada

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" (2012 BCBC A-9.36.6.4.(2)(b)). Therefore, when using the EnerGuide Rating System for compliance with Subsection 9.36.6. of Division B, Energy Step Code, energy advisors must adhere to the energy modelling, site verification, and data collection requirements outlined in the following documents:

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

STEP CODE METRICS CALCULATOR

A Microsoft Excel **Step Code Metrics Calculator** is provided as a tool to assist EnerGuide Rating System energy advisors in calculating the BC Energy Step Code Metrics for Section D of the BC Energy Compliance Report. By entering data from the HOT2000 energy model and selecting the project's climate zone and the required 'Step', this tool calculates the Mechanical Energy Use Intensity (MEUI), ERS Rating % Lower Than EnerGuide Reference House, Thermal Energy Demand Intensity (TEDI), Peak Thermal Load (PTL), and the Rated Greenhouse Gas Intensity. The calculator also compares the calculated Step Code Metrics to the selected required Step and determines which metric the home passed and the overall result.

The Step Code Metrics Calculator includes a macro to clear the user entered HOT2000 data. You may get a security warning depending on your MS Excel security settings.

Important Note: When using the calculator, or doing manual calculations, ensure that the HOT2000 file is set to metric units.

TABLE OF INSTRUCTIONS

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

REPORT ITEM	INSTRUCTIONS						
A: PROJECT INFROMATION							
Building Permit #	Building Permit Number from Municipality / District. To be						
	completed by Authority Having Jurisdiction (AHJ).						
Builder	Full Builder Company Name. In the case of Homeowner Builder,						
	enter Homeowner's Name.						
Project Address	The add	ress for the project.	If no address is available v	vrite			
	PENDING.						
Municipality / District	Full name of Municipality / District of where the home is being						
	built, e.g. City of North Vancouver or District of North Vancouver.						
	Confirm	with the AHJ or use	a census map to ensure th	hat the			
	municip	ality/district is ident	ified correctly.				
Postal Code	Canada	Post Postal Code, if	available. If no postal code	İS			
Desileting Trues	available	e write PENDING.					
Building Type	Select a	ppropriate type of b	uliding from the drop dow	n menu,			
If Other, Please Specify	e.g. Sing	vilding type is not list	tad in the dran down man	, specify			
If Other, Please Specify	If the building type is not listed in the drop down menu, specify						
Number of Dwolling Units	Indicate the number of dwelling units in the building. As defined						
	in BCBC	a "dwelling unit me	ans a suite operated as a	As defined			
	houseke	ening unit used or	intended to be used by on	e or more			
	persons and usually containing cooking, eating, living, sleeping						
	and sanitary facilities" (BCBC Article 1.4.1. of Division A)						
Climate Zone	BCBC Cl	mate Zone as define	ed by the Heating Degree-I	., Davs of the			
	building	's location or by the	AHJ.	,			
		Climate Zone	Heating Degree-Days				
		4	< 3000				
		5	3000 to 3999				
		6	4000 to 4999				
		7A	5000 to 5999				
		7B	6000 to 6999				
		8	≥ 7000				
PID or Legal Description	The Pare	cel Identifier (PID) is	a nine-digit number that u	iniquely			
	identifie	s a parcel in the land	d title register in BC. Check	the <u>BC</u>			
	Land Tit	le and Survey websi	<u>te</u> to find the PID or Legal I	Description			
	for the property.						

BC Building Code Performance	Select the BC Energy Compliance path the project is going under:				
Compliance Path	• If using the 9.36.5. Energy Performance Compliance				
	Path , check the box and complete Sections A, B, <u>C</u> , & E of				
	the BC Energy Compliance Report.				
	• If using the 9.36.6. Energy Step Code Compliance Path,				
	check the box and complete Sections A, B, D , & E of the				
	BC Energy Compliance Report.				
Software Name	List Full Name of Software (i.e. HOT2000) used for energy				
	performance modelling.				
Version	List Version of Software (e.g. v11.4 of HOT2000).				
Climatic Data (Location)	Indicate the Weather location used by the Software. In				
	HOT2000, this can be found in the Weather tab under the				
	Location selection.				
B: BUI	LDING CHARACTERISTICS SUMMARY				
Details (Assembly / System Type /	Provide a summary of the building characteristics details:				
Fuel Type / Etc.)	Provide a summary list as per example in Appendix I.				
	When listing building envelope assemblies, it's a 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.				
Effective RSI-Value / Efficiency	Indicate the energy performance of each building characteristic.				
	Building Envelope: Indicate the effective RSI-value of the				
	building envelope components from the HOT2000 TSV				
	data. Look for the following TSV variables				
	 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				
	Note: the RSI-values from HOT2000 may be different from				
	RSI-values on the architectural drawings.				
	• 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 HAVC systems.				
	See examples in Appendix I				
Exterior Walls & Floor Headers	Describe assembly/construction details of the above grade				
	exterior walls and headers.				

Roof / Ceilings	Describe assembly/construction details of the ceilings (attics,
	cathedral ceilings, etc.).
Foundation Walls, Headers, &	Describe assembly/construction details of the foundation walls,
Slabs	header and slab.
	Also indicate whether the slab is below or above the frost line
	and whether it's heated (e.g. in-floor heating) or not.
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.
FDWR	Enter the ratio of total vertical 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 to be included in the FDWR for BCBC
	compliance.
	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."
	FD: Fenestration and Door Area
	W: Above Grade Gross Wall Area, including headers,
	above-ground foundation walls and pony walls.
	• FDWR (%) = FD/W * 100%
Air Barrier System & Location	Describe the type(s) and location(s) of the air barrier system(s).
Space Conditioning (Heating and	Describe the type(s) of heating and cooling system(s) used.
Cooling)	
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).
Pre-Construction Confirmation	Indicate the company that completed the architectural drawings
Statement: The above information	and the date it was completed. This information is found on the
is correct based on drawings	drawings.
As-Built Confirmation Statement:	Indicates that the site verification was completed according to
The above information is correct	NRCan ERS procedures. Include the date of the site visit.
based on a site evaluation	
completed on	

C: 9.36.5. ENERGY PERFORMANCE COMPLIANCE				
Complete this section only if using the	he Energy Performance Compliance Path in Subsection 9.36.5.			
Proposed / As-Built House Energy	Follow NRCan's instructions as outlined in the "Guidelines for			
Rated Consumption (GJ/year)	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.			
Reference House Rated Target	Follow NRCan's instructions as outlined in the "Guidelines for			
(GJ/year)	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.			
The airtightness value used in the	Indicate the airtightness value used in the energy model for the			
energy model calculations for the	Proposed / As-Built House by selecting the appropriate option:			
Proposed / As-Built House is:	• 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 Sentence (11) (see 9.36.5.10.			
	(11) of Division B).			
	For more details, see BCBC Sentence 9.36.5.10.(9) of Division B.			
Confirmation Statement: The	Check to confirm this is completed in compliance with Subsection			
above calculation was performed	9.36.5. of Division B.			
in compliance with Subsection				
9.36.5. of Division B				
D: 9.36.6. ENERGY STEP CODE COMP	PLIANCE			
Complete this section only if using t	he Energy Performance Compliance Path in Subsection 9.36.6.			
Proposed House / As-Built House	Annual energy consumption of the Proposed / As-Built House			
Rated Energy Consumption	without baseloads. Equivalent to 'Total AEC' minus 'Baseloads'			
(GJ/year)	from the HOT2000 calculation results, rounded to the nearest			
	whole number. See Appendix III for calculation details.			
Reference House Rated Energy	Annual energy consumption of the Reference House without			
Target (GJ/year)	baseloads. Equivalent to 'ERS reference house-Base Case' minus			
	'Baseloads' from the HOT2000 calculation results, rounded to the			
	nearest whole number. See Appendix III for calculation details.			
Step Code Level	Indicate the Step Code level the project is required to meet, as			
	set by the AHJ.			
Mechanical Energy Use Intensity	Required: Enter compliance requirement per BCBC Article			
(MEUI)	9.36.6.3. of Division B			

	Proposed: Use the Proposed House energy model, see
	instructions in Appendix IV
	As-Built: Use the As-Built energy model, see instructions in
	Appendix IV
ERS Rating % Lower Than	Required: Enter compliance requirement per BCBC Article
EnerGuide Reference House,	9.36.6.3. of Division B
where applicable	Proposed: Use the Proposed House energy model, see
	instructions in Appendix V
	As-Built: Use the As-Built energy model, see instructions in
	Appendix V
Thermal Energy Demand Intensity	Required: Enter compliance requirement per BCBC Article
(TEDI)	9.36.6.3. of Division B
	Proposed: Use the Proposed House energy model, see
	instructions in Appendix VI
	As-Built: Use the As-Built energy model, see instructions in
	Appendix VI
Peak Thermal Load (PTL)	Required: Enter compliance requirement per BCBC Article
	9.36.6.3. of Division B
	Proposed: use the Proposed House energy model, see
	instructions in Appendix VII
	As-Built: Use the As-Built energy model, see instructions in
	Appendix VII
Airtightness in Air Changes per	Required: Enter compliance requirement per BCBC Article
Hour at 50 Pa differential	9.36.6.3. of Division B.
	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.
	As-Built: Enter actual blower door test results from the final site
	evaluation.
Step Code [Design] Requirements	Check Yes or No if the home met, or did not meet, the
Met	requirement for the prescribed Step Code level.
Confirmation Statement: The	Check the appropriate compliance calculation method used.
above calculation was performed	
in compliance with (see Clause	
2.2.8.3.(2)(e) of Division C)	
	E: COMPLETED BY
Full Name (Print)	Print first and last name of Registered Energy Advisor (EA).
Company Name	Enter EA's full company name.
Phone	Enter EA's business phone number.
Address	Enter EA's business company address.
Email	Enter EA's business email address.

Date (dd/mm/yyyy)	Enter the date the BC Energy Compliance Report was completed.
Advisor ID Number	Enter EA'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 and/or N file number.
F: OT	HER ENERGY MODELLING METRICS
Airtightness NLA@10Pa	Taken from the Full House Report's "Air Leakage and Mechanical
	Ventilation" section or from the Homeowner Information Sheet.
EnerGuide Rating	The 'Rating' from the HOT2000 calculation results, including
	baseloads.
EnerGuide Reference House	The 'Reference House' from the HOT2000 calculation results,
	including baseloads.
EnerGuide Rating % Lower than	The '% Lower (Higher) Than Ref Hse' from the HOT2000
EnerGuide Reference House,	calculation results.
House with baseloads	
Rated Energy Use Intensity	The 'Energy Use Intensity' from the HOT2000 calculation results.
Rated Greenhouse Gas Emissions	The 'Estimated Greenhouse Gas Emissions' from the Full House
	Report from the "House with standard operating conditions" run,
	multiplied by 1000kg/t to get kg/year.
Rated Greenhouse Gas Intensity	The 'Greenhouse Gas Intensity' is calculated by dividing the
	Rated Greenhouse Gas Emissions by the total heated floor area
	and multiplied by 1000kg/t to get kg/m²/year.
G: OPTIONAL CERTIFICATIONS	
Pending	If there is a pending energy labelling certification check the
	appropriate box and, if relevant, write in the appropriate level of
	the certification (e.g BUILT GREEN, Level: Gold)

APPENDIX I – Sample Step Code Compliance Report

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A: DDO IFCT INFOD	MATION					
A. PROJECT INFOR						
Building Permit #:		Building Type: Single Detacher	d _			
Builder: Tom Builderma	n	If Other, Please Specify:				
Project Address: 123	lain Street	Number of Dwelling Units: 1				
Municipality / District	Vancouver, BC	Climate Zone: 4				
Postal Code: V6Z 1K/		PID or Legal Description: 01	2-3456-789			
BC Building Code Perf	ormance Compliance Path (select one):					
9.36.5. →	Complete Sections A, B, C, & E	🗙 9.36.6. 🔶 Complete Sections A, B	, D, & E			
Software Name: HOT2	000 Version: 11.4	Climatic Data (Location): Var	couver, BC			
-						
B: BUILDING CHAR	ACTERISTICS SUMMARY (see BCB)	C Clause 2.2.8.3.(2)(b) of Division C)				
	DETAILS (ASSEMBLY / SY	STEM TYPE / FUEL TYPE / ETC.)	EFFECTIVE RSI-VALU / EFFICIENCY			
EXTERIOR WALLS & FLOOR HEADERS	2x6, 16" OC, R22; Headers v	RSI 2.85				
ROOF / CEILINGS	Attic Truss, 24" OC, R40	RSI 6.93				
FOUNDATION WALLS,	8" Concrete, 2x4, 16" OC, R14; I Uninsulated Slab	RSI 2.02				
HEADERS, & SLADS	Slab Is: X Below OR Above Frost	d				
FLOORS OVER UNHEATED SPACES	2x11 7/8 TJI, R40		RSI 7.44			
	Doors: Steel Insulated		Doors: U1.4			
FENESTRATION	Windows: Vinyl, Double Glazed	SGHG=0.25 to				
& DOORS	FDWR: 21 %	0.30				
& DOORS		ane Barrier	UV-stab 6mil polyethylene			
& DOORS	Interior Polyethylene Membra		Natural Gas Furnace, no cooling Furnace = 95% AFUE Gas fireplace, direct-vented with no standing pilot Fireplace = 76%			
& DOORS AIR BARRIER SYSTEM & LOCATION SPACE CONDITIONING (HEATING & COOLING)	Interior Polyethylene Membra Natural Gas Furnace, no cooling Gas fireplace, direct-vented with no sta	anding pilot	Fireplace = 76%			
& DOORS	Interior Polyethylene Membra Natural Gas Furnace, no cooling Gas fireplace, direct-vented with no sta On-demand Hot Water Heate	anding pilot ≩r	0.97 EF			
& DOORS AIR BARRIER SYSTEM & LOCATION SPACE CONDITIONING (HEATING & COOLING) SERVICE WATER HEATING VENTILATION	Interior Polyethylene Membra Natural Gas Furnace, no cooling Gas fireplace, direct-vented with no sta On-demand Hot Water Heate HRV	anding pilot 2r	0.97 EF SRE at OC=61%, -25C=58%			

			_						
	AS-BUILT HOUSE RATED E	NERGY CONSUMPTION (GJ/YEAR)		REF	ERENCE HOUSE RAT	TED ENE	RGY TA	RGET (GJ/YEAF	R)
	HVAC				HVAC				
Γ	Hot Water Heating]	Ho	t Water Heating				
	SUM]		SUM				
The ai	irtightness value used in t	the energy model calculations for	the	As-Built I	House is:				
	4.5 ACH @ 50Pa	3.5 ACH @ 50Pa OR	ł	Tested A	t	ACH@	50Pa		
The a	hove calculation was pe	rformed in compliance with Sub	sect	tion 9.36	5 of Division B		Yes	No	
D: 9.	36.6. ENERGY STEP C	ODE COMPLIANCE (see Ser	nter	nce 2.2.8	.3(3) of Division	י C)			
Comp	olete this section only if	using the Energy Step Code Com	nplia	ance Pati	n in Subsection 9.	36.6.			
As-Bu	ult House Rated Energy (Consumption (G1/year): 44		Referen	ce House Rated F	nerevi	Tareet	(GJ/vear):	53
	6,		_						
		METRIC			UNITS	REQU	JIRED	PROPOSED	AS-BUIL
Step	Code Level				Step 1, 2, 8, 4, or 5	3	3		3
Mech	hanical Energy Use Inten	sity (MEUI)			kWh/(m²·year)	45	(max)		38
ERS	Rating % Lower Than Ene	rGuide Reference House, where a	appli	icable	%	20	(min)		17.1
Ther	mal Energy Demand Inte	nsity (TEDI)			kWh/(m²-year)	40	(max)		26
Peak Thermal Load (PTL)				₩/m²	30	(max)		21	
Airtightness in Air Changes per Hour at 50 Pa differential				ACH @ 50 Pa	2.5	(max)		1.8	
				s	tep Code Require	ements	Met:	X Yes	No
The al Select	bove calculation was pe One: Subsection 9.36.5., The Passive House P House Designer or C The EnerGuide Ratin The applicable required	rformed in compliance with (see lanning Package (PHPP), version (ertified Passive House Consultan g System (ERS), version 15 or new rements of NECB Part 8 and the C	9 or nt, wer, City	newer, an or of Vancou	.3.(2)(e) of Divisio nd the energy mod	in C) Iel was Illing Gi	prepar uidelin	red by a Certi ies.	fied Passiv
E: CO	OMPLETED BY								
Full N	lame (Print): Jim Advisom	lan			If applicable, er	nter ER	S info	rmation:	
Comp	any Name: Advisorman B	uilding Tech			Advisor ID Number: AAXX				
Phone	e: 604-777-999				Service Organiz	ation: E	Best S(O Ltd	
Addre	ess: 123 Cross Road, Vand	ouver BC			EnerGuide P #:	AAXXP	00184		
Email	: jim@jimsso.ca				EnerGuide N #:	AAXXN	100184	ł	

SUPPLEMENTARY INFORMATION

Supplementary information is not required for Code Compliance but may be requested by the local municipality/district.

If required, complete the applicable sections below.

F: OTHER ENERGY MODELLING METRICS

METRIC	UNITS	PROPOSED	AS-BUILT
Airtightness NLA@10Pa	cm²/m²		0.97
EnerGuide Rating	GJ/year		70
EnerGuide Reference House	GJ/year		79
EnerGuide Rating % Lower Than EnerGuide Reference House House with baseloads	%		11.4
Rated Energy Intensity	GJ/m ³ /year		0.21
Rated Greenhouse Gas Emissions	kg/year		2395
Rated Greenhouse Gas Intensity	kg/m²/year		7.4

G: OPTIONAL CERTIFICATIONS

PENDING:

BUILTGREEN®, Level:	ENERGY STAR® for New Homes
Certified Passive House	LEED [®] Canada for Homes, Level:
CHBA Net Zero House	R2000
	Other:

APPENDIX II – Rounding Calculations

To ensure consistency among Energy Advisors, below are guidelines for rounding when performing calculations to obtain the Step Code Metrics:

- When pulling information from HOT2000 and making calculations (through the Energy Step Code Compliance Calculator or by hand) enter all values 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, MEUI and PTL 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:
 - If the tenth decimal is less than 5, round down (e.g. 26.<u>4</u>9 is rounded <u>down</u> to 26).
 - If the tenth decimal is equal to or greater than 5, round up (e.g. 26.<u>5</u>1 is rounded <u>up</u> to 27).
- **3.** When entering **ERS % Lower Than Reference House** and **Airtightness in Air Changes Per Hour at 50Pa** 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. 26.5<u>1</u> is rounded <u>down</u> to 26.5).
 - If the hundredth decimal is equal to or greater than 5, round up (e.g. 26.4<u>9</u> is rounded <u>up</u> to 26.5). Similarly, 26.9<u>5</u> is rounded <u>up</u> to 27.0.

APPENDIX III – 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:

- a. The Proposed or As-Built House Rated Energy Consumption describes the energy use over a year without baseloads, expressed in GJ/year.
- b. 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:

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

3. HOT2000 Screenshot:

erGuide Rating System Re	sults							
Rating		70	GJ/a Reference He	ouse	79	GJ/a N	lat. ACH	0
Energy Use Intensity	().21	GJ/m²/a % Lower Than Ref	Hse	11.4	%	Q _{Tot}	5
Greenhouse Gases		2.4	t/a				Q _{Warn}	31
Rated Annual Energy Consu	Imption (AB	EC)	Rated Annual Energy P	roduction ((AEP)			
Space Heating	31.60	GJ	Electricity Generation	0.0	GJ	Awin	dows & door	s/A
Space Cooling	0.0	GJ	Solar DHW	0.0	GJ	Ref Hse A _{win}	dows & door	s/A
DHW	11.80	GJ	Total AEP	0.0	GJ		Design	Heat
Ventilation, Electric	0.70	GJ					Design	Heat
Baseloads	25.62	GJ	2					
Total AEC	<mark>69.72</mark>	GJ	1 Net AEC - AEP	69.72	GJ			
House Name			AE	EC (GJ/a)		AEP (GJ/a)	Net (GJ/a)
ERS reference houseBase	e Case						78.79	3
General modeBase Case							71.20	

- (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's rounder further.

4. Example Calculation:

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

APPENDIX IV – 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)
 - General Info Specifications Weather Fuel Cost Units & Mode Window Tightness Code Summary Building Type House Multi-unit: one unit Plan Shape Multi-unit: whole building Base Upgrade Advanced Other, 9-10 corners Single Detached **EnerGuide Rating System Results** 70 GJ/a Rating Front Orientation 0.21 GJ/m²/a Energy Use Intensity Two storeys 2.4 t/a Greenhouse Gases emal Mass Year Built Yea 2017 Light, wood frame User specified **Effective Mass Fraction** Wall Colour Value Rated Annual Energy Consumption (AEC) Ra 1.00 0.4 Default Space Heating 31.60 GJ Ele Foundation Soil Condition Roof Colour Value Space Cooling 0.0 GJ 0.4 Normal conductivity (dry sand, loam, clay) -Default DHW 11.80 GJ Water Table Level Ventilation, Electric 0.70 GJ Normal (7-10m/23-33ft) Default Roof Cavity Inputs inputs 25.62 GJ 2 Baseloads Heated Floor Area 69.72 GJ 1 Total AEC m2 3 Above Grad 229.59 277.78 m2 4 Below Grade

3. HOT2000 Screenshots:

- (1) Total AEC (GJ) = Total Annual Energy Consumption of the House.
- (2) **Baseloads (GJ)** = Annual Baseload consumption based on ERS Standard Operating Conditions.
- (3) Above Grade Heated Floor Area (m²) = The sum of all floor areas that are located on a floor level that is entirely above grade.
- (4) 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.
- (5) Energy conversion where 277.78kWh = 1GJ
- 5. Example Calculation:

4.

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

APPENDIX V – 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**: %LTRH without baseloads (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 11.3, ERS Version 15. The metric does not include the ERS assumed electric base loads.
- Formula: %LTRH w/o BL (%) = 100 ((Total Energy Consumption Proposed House (kWh/year) Baseloads (kWh/year)) · 100 / (Total Energy Consumption Reference House (kWh/year) – Baseloads (kWh/year)))
- 3. HOT2000 Screenshots:

Base Upgrade Advanced		
Space Conditioning and DI	HW Analysis	
Space Conditioning and D	HW Consumption (GJ/a)	Space conditioning and DHW consumption
5	OC House Reference House	<mark>.% Lower Than Ref Hse</mark> 17.1 %
Net AEC - AEP	69.7 78.8	_
Baseloads -	25.6 - 25.6	
Space and DHW Consumption =	44.1 = 53.2	· · · · · · · · · · · · · · · · · · ·

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 form the third "Advanced" tab for increased accuracy.

Datias		70	C I/- Deference l		70		
Rating		/0	GJ/a Reference r	House	/9	GJ/a ľ	Nat. ACH U
Energy Use Intensity).21	GJ/m²/a % Lower Than Re	ef Hse	11.4	%	Q _{Tot} 5
Greenhouse Gases		2.4	ťa				Q _{Warn} 31
Rated Annual Energy Consur	nption (Al	EC)	Rated Annual Energy	Production	I (AEP))	
Space Heating	31.60	GJ	Electricity Generation	0	0 GJ	A wir	ndows & doors / A
Space Cooling	0.0	GJ	Solar DHW	0	0 GJ	Ref Hse A _{wir}	ndows & doors / A
DHW	11.80	GJ	Total AEP	0	0 GJ	1	Design Heat
Ventilation, Electric	0.70	GJ					Design Heat
Baseloads	25.62	GJ	2				
Total AEC	<mark>69.72</mark>	GJ	1 Net AEC - AEP	69.7	2 GJ		
House Name			A	EC (GJ/a)		AEP (GJ/a)	Net (GJ/a)
ERS reference houseBase	Case						78.79 3
General modeBase Case							71.26

- (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 ((69.72GJ minus 25.6GJ) multiplied by 100 divided by (78.79GJ minus 25.62GJ)) = 17.05%; rounded to 17.1%

APPENDIX VI – Calculating Thermal Energy Demand Intensity (TEDI)

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.
- 2. Formula: TEDI (kWh/(m²·year) = Space Heating Demand (kWh/year) / Heated Floor Area (m²)

3. HOT2000 Screenshots:

HOT2000 - [Full House Report]] File Edit Editors Reports View Wind	ow Help		Mutiunt: Mutiunt: Single Detac	one unit whole building hed	Plan Shap Other, 9-1	e 10 comers •
ANNUAL SPACE HEATING SUM	MARY		Storeys Two storeys	•	Front Oner East	tation
Gross Space Heat Loss:	67102 MJ		Thermal Mass Light, wood frame	•	Year Buit User specified 🔷	Year 2017
Gross Space Heating Load: Usable Internal Gains:	65212 MJ 22627 MJ		Effective Mass Fraction		Wall Colour Default •	Value 0.4
Usable Internal Gains Fraction: Usable Solar Gains:	33.7 % 12033 MJ	4	Foundation Soil Condition Normal conductivity (dry sand,) Water Table Level	oam, clay) 🔹	Roof Colour Default *	0.4
Usable Solar Gains Fraction: Auxilary Energy Required: 1	17.9 % 30551 MJ	/ 1000 /	Normal (7-10m/23-33ft)	•	Default Roof Cavity Input: Heate	d Roor Area
					Above Grade 229 Below Grade 96.1	59 m² 2 602 m² 3

- (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 1000MJ = 1GJ
- (5) Energy conversion where 277.78kWh = 1GJ
- 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)

APPENDIX VII – Calculating Peak Thermal Load (PTL)

Peak Thermal Load (PTL) in W/m²

- Definition: 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 in accordance with BCBC Article 9.36.6.4., 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/m²) = Design Heat Loss (W) / Heated Floor Area (m²)

3. Hot2000 Screenshots:

	Plan Shape Other, 9-10 comers
File Editors Reports View Window Help Image: Storeys Image: Store	Year Buit Year Year Buit Year User specified 2017 Wall Colour Value Default 0.4 Roof Colour Value Default 0.4 Wall Colour Value Default 0.4 We perfault 0.4 Wall Colour Value Default 0.4 Wall Colour Value Default 0.4 Manuel Colour 0.4 Wall Colour 0.4 Below Conde 229.59 mail 2 Below Conde 96.1002 mail 3

- (1) Design Heat Loss (W) = The maximum heating energy 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 = 6790W *divided by* (229.59m² *plus* 96.16m²) = 20.84W/m²; rounded up to 21W/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.

CONTACT INFORMATION AND COMMENTS

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