Presented to:

BOABC Conference

CSA F280 HVAC Requirements for Part 9 Buildings

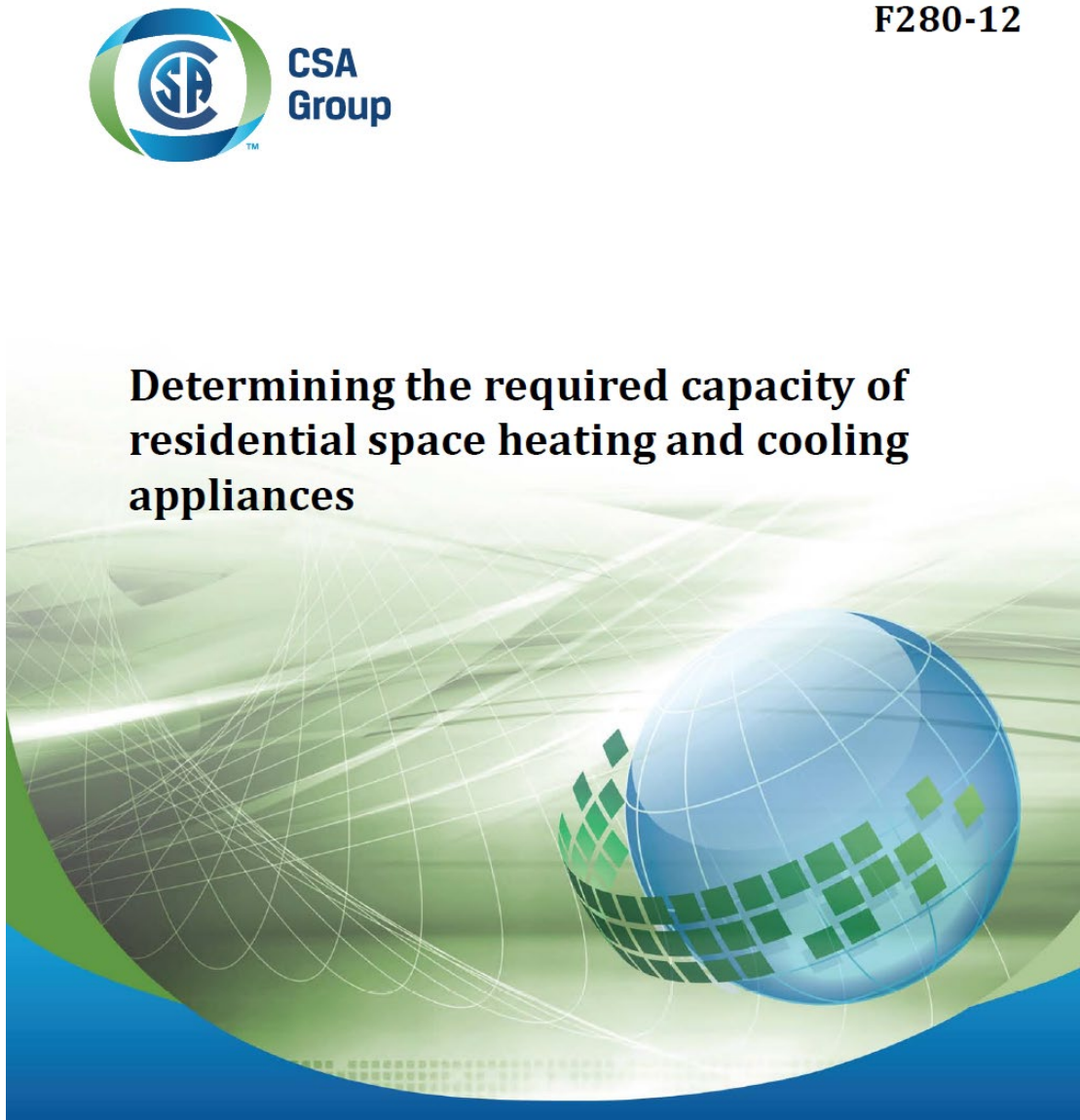
Presented by:

Todd Backus, P.Eng.

May 28th, 2024

AGENDA

1. Introduction
2. CSA F280-12 Standard
3. Certified Calculators
4. BCBC & NBC Requirements
5. HLHG Inputs & Reports
6. Common Errors & Omissions
7. 26°C Refuge Room Example
8. Q & A



INTRODUCTION

EDUCATION

- BCIT – Sheet Metal TQ
  2003-2008
- BCIT – Mechanical Engineering Degree
  2015 - 2019

CAREER

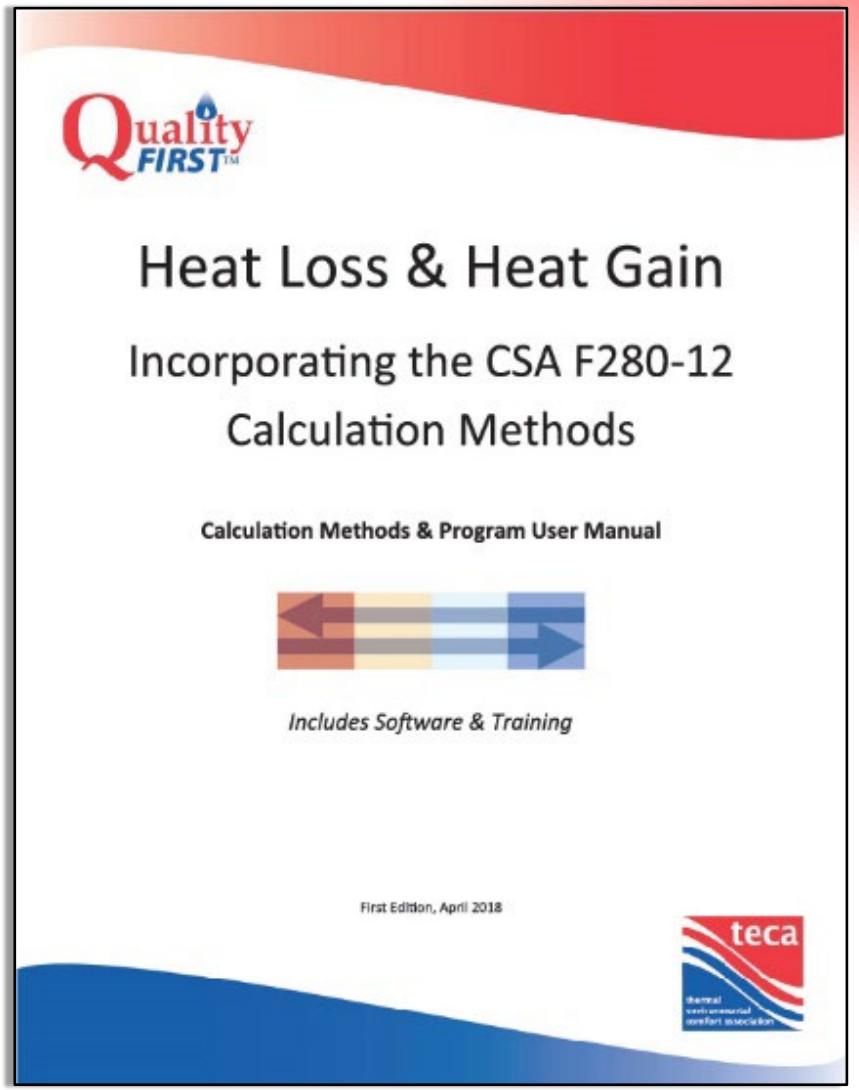
- Sheet Metal Worker & Contractor
  2003-2015
- Mechanical Engineer - Consultant
  2019 - 2023
- Manager - Programs Development
  2023 - Present

Todd Backus, P.Eng.

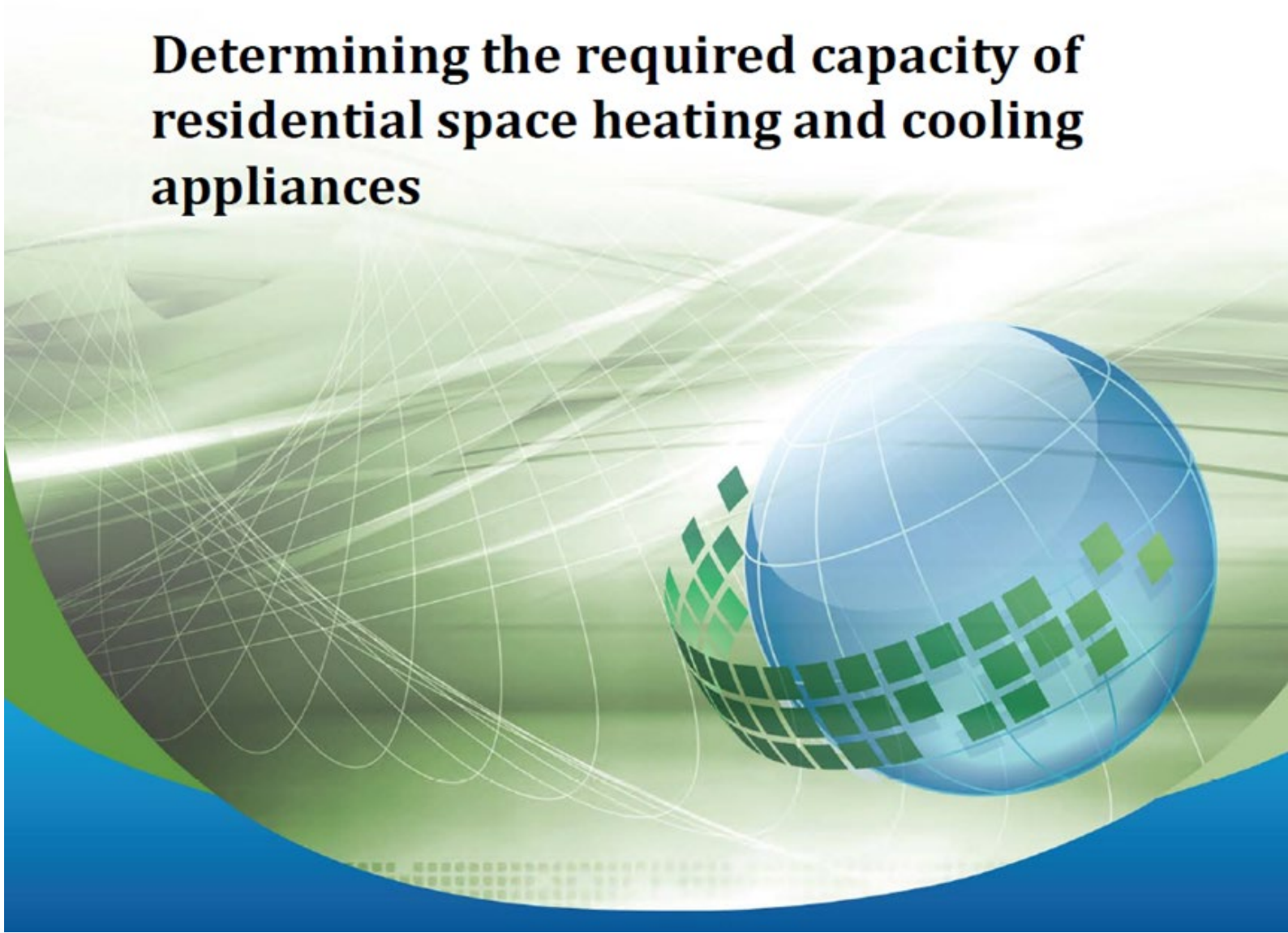
Manager - Programs Development

ABOUT TECA

- Non-Profit Trade Association
- Our Mission:
  - Further Education in the HVAC Industry
  - Develop & Provide Training in the HVAC Industry
  - Practical Training for Trades People & Inspectors
  - Advocate for the HVAC Trades to Government Officials
  - Advise Regulators & Building Officials on Best Practices



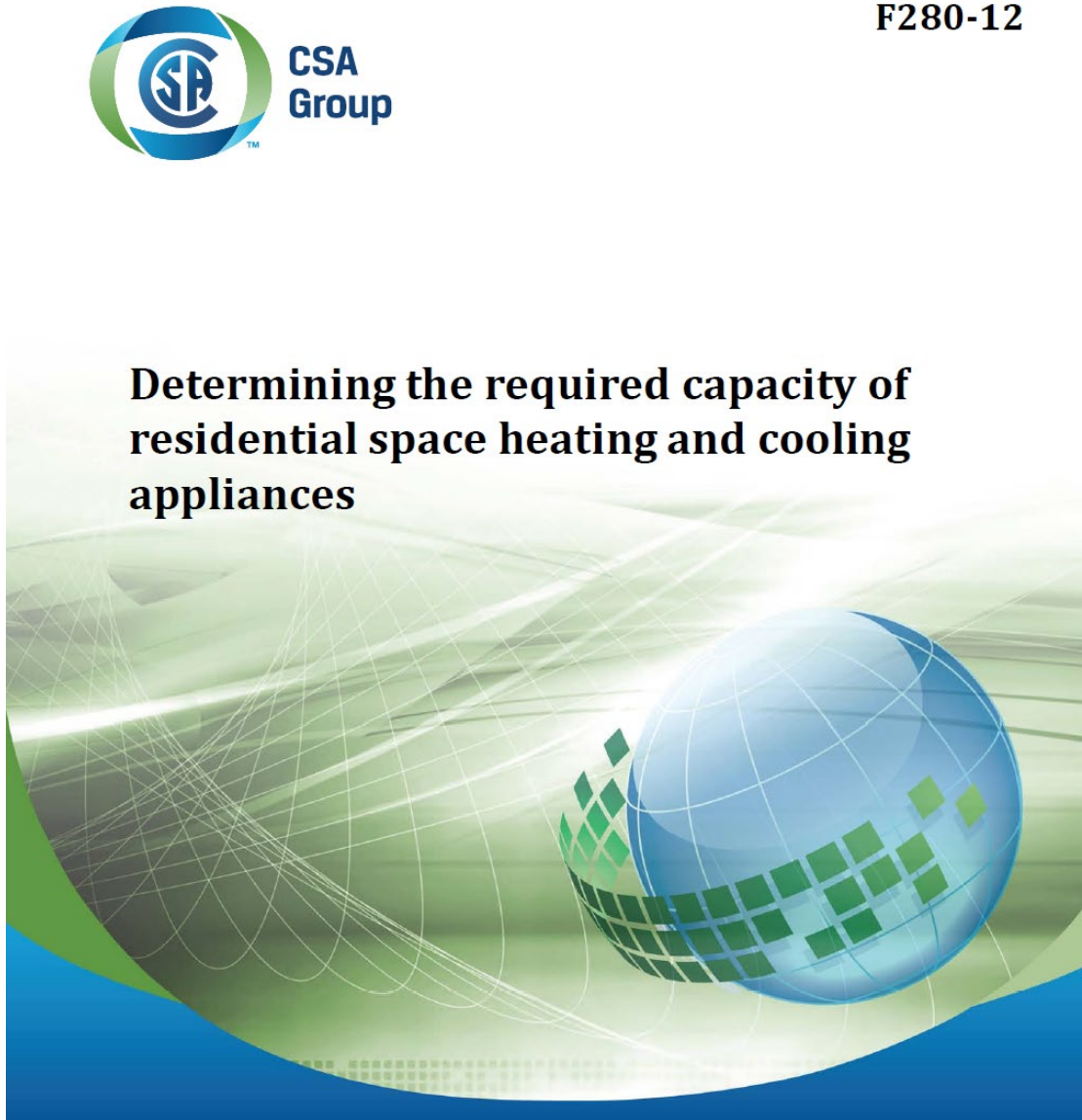
CSA F280-12 (R2021)



CSA F280 SCOPE

The CSA F280-12 (R2021) Standard:

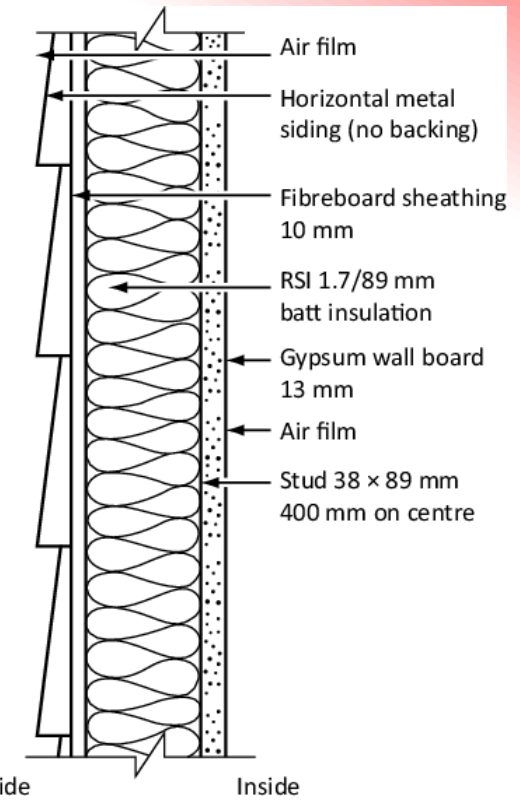
- Calculation method for heat loss & heat gain for selecting equipment
- Methods for Verifying Calculators
- Applies to Part 9 Buildings
- **<u>Does not</u>** comment on distribution systems or installation practices



ABOVE GRADE WALL CALCULATIONS

Components of the Above Grad Wall Calculation:

$$\text{Heat Loss}_{\text{AGW}} = \frac{\text{Area}}{\text{R}} * \Delta\text{T}$$



Where:

- Heat Loss [BTUH or W] = Heat loss requirement at peak load
- Area [m^2 or ft^2] = The area of the wall (adjusted for stud spacing)
- R $\left[\frac{m^2 * °C}{W} \; or \; \frac{ft^2 * °F}{BTUH}\right]$ = Thermal resistance of wall assembly
- ΔT [°C or °F] = Indoor setpoint temperature - Outdoor design temperature

ABOVE GRADE WALL CALCULATIONS

The U-value has become more popular, it is also common to express as:

$$\text{Heat Loss}_{\text{AGW}} = \text{Area} * \text{U} * \Delta\text{T}$$

Note: $\text{U} = \frac{1}{\text{R}}$

FENESTRATION CALCULATIONS

CSA: 6.2.2. Heat gain through transparent & translucent building assemblies

- Solar Heat Gain Coefficient (SHGC)
- Solar Radiation Incident on the Window (based on orientation & latitude)

$$\text{Heat Gain}_{CT} = \text{Area} * \left\{ \frac{\Delta T}{R} + \text{SHGC} * \text{Solar}_o * \text{Latitude}_{Factor} \right\}$$

Estimated solar radiation (W/m^2)

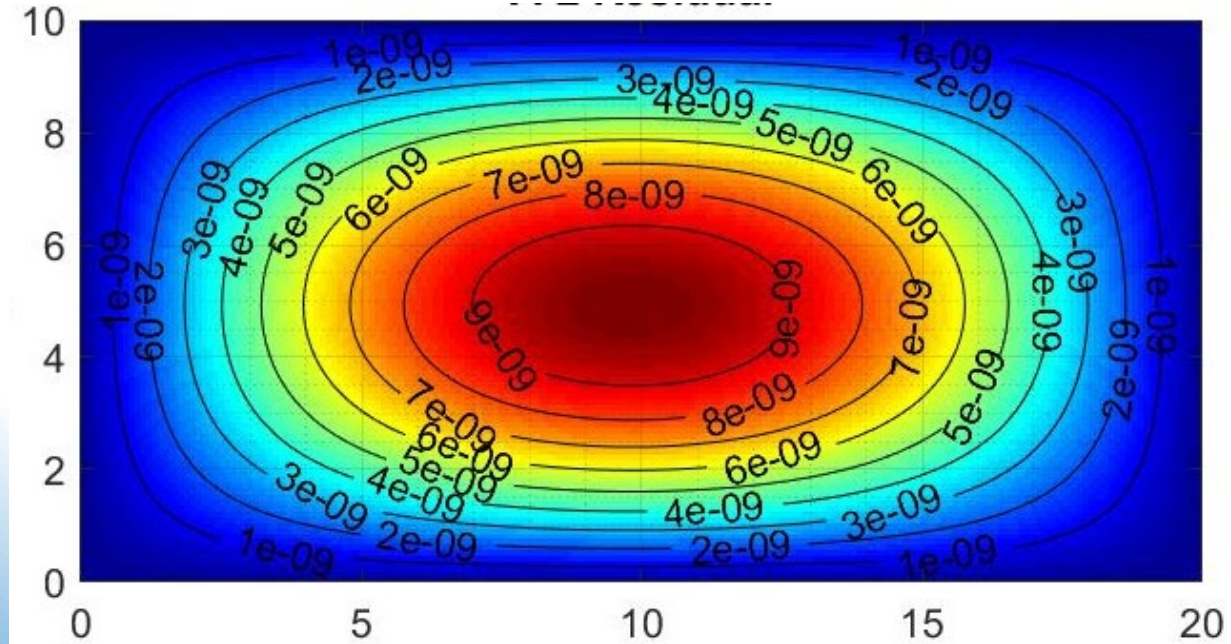
	North	South	East/West	Northeast/ Northwest	Southeast/ Southwest	Horizontal
$Solar_0$	93	160	285	194	252	534

LFactor = 1 + (Latitude - 40) * 0.0375

CSA F280 LIMITATIONS

Calculates Peak Loads:

- Outputs either BTU/hour (or Watts)
  - Energy over **Time**
  - Cannot simulate the build-up of heating over time
  - If the peak load can be satisfied, partial loads will also be satisfied



CSA F280 LIMITATIONS

CSA F280-12 Requires Accurate Data:

- Improper modeling might yield convincing but incorrect outputs
- Difficult to determine accuracy of 26°C refuge room
  - Example at the end of the presentation

CSA F280 REPORTING

Required Input Information:

- Client & Project Number
- Building Location
- Calculation Assumptions
- Design Temperatures
- Building Envelope Properties
- Contact Information of Designer

Table E.1
Inputs for preparing heat loss and gain calculation summary sheet
(See Clause 7.1 and Annex D.)

Field	Title	Description	Example
1	Drawings issued for	Client/company the heat loss gain calculations were performed for	John Doe Construction
2	Project number	Client/job code for the use of the issuer of the Heat Loss Gain Calculations	0402-96
BUILDING LOCATION		**Where the project is located**	
3	Model	Code or name designated to a plan set	Craftsman- Walkout-Option 2
4	Address	Municipal designated location of the project	496 Fake Street
5	City & Province	City (county, township, etc.) and province the project is located in	Toronto, Ontario
6	Site	Name of the development area the project is located in	Fakewood Heights
7	Lot	Numbered land parcel within the site	Lot 16, Phase II
8	Postal Code	Canada Post assigned postal code for the address	M6J 2P9
CALCULATIONS BASED ON		**The assumptions and data the heat loss gain calculation is based on**	
9	Dimensional information based on	Source of the component sizing data for the heat loss gain calculation	Anybody Design. Dwgs Dated 7/Oct/2010
10	Attachment	Building connection to another building's conditioned space	Detached, left/right/ mid, top/bottom/mid
11	Number of stories	Floor levels in the building – Indicate if basement is included	2 + basement
12	Weather location	Weather data location selected in the heat loss gain calculations	Toronto
13	Ventilated?	Was the building's ventilation included in the heat loss gain calculation	Included
14	HRV?	Is an HRV used for the ventilation of the building?	Yes–Blowhard Cyclone 2WA

CSA F280 CALCULATORS

F280-12 Software Verified according to the procedure set out in F280-12, Section 8.

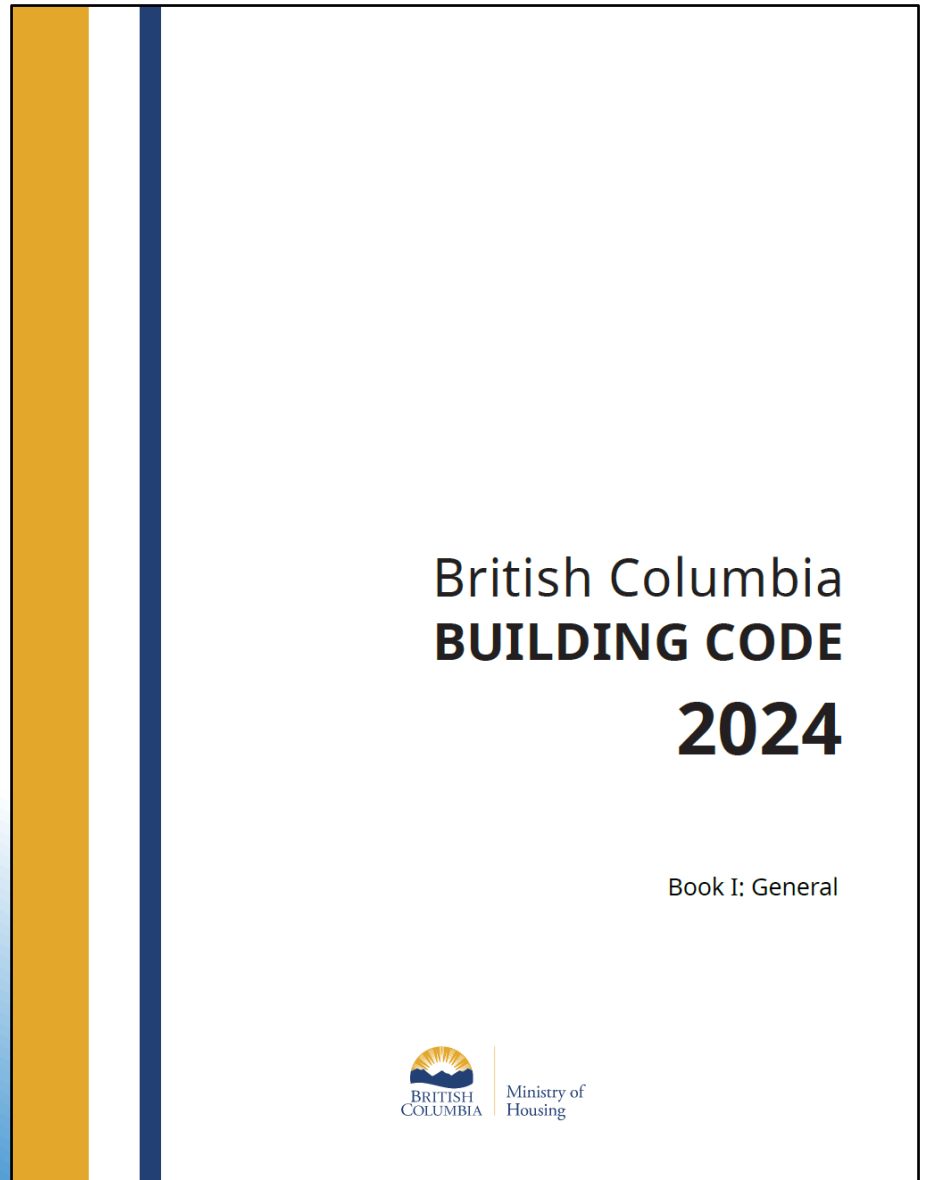
COMPANY NAME	SOFTWARE NAME	ROOM BY ROOM	WHOLE HOUSE	CONDITIONS	WEBSITE
Building Technology Services	Building Tech F280	✓	✓	Click Here	BuildingTech
Avenir Software Inc	HeatCAD/LoopCAD	✓	✓	Click Here	HeatCAD LoopCAD
Thermal Environmental Comfort Association	Teca Heat Loss & Heat Gain Calculator	✓	✓	Click Here	teca
Volta Research Inc	Volta Snap		✓	Click Here	volta SNAP
MiTek Inc	Right-Suite Universal	✓	✓	Click Here	www.wrightsoft.com
Sustainable HVAC Design Inc	Sustainable HVAC F280	✓	✓	Click Here	
McCallum HVAC Design Inc	Mecha F280	✓	✓	Click Here	MCCALLUM HVAC DESIGN INC design excellence with on time delivery

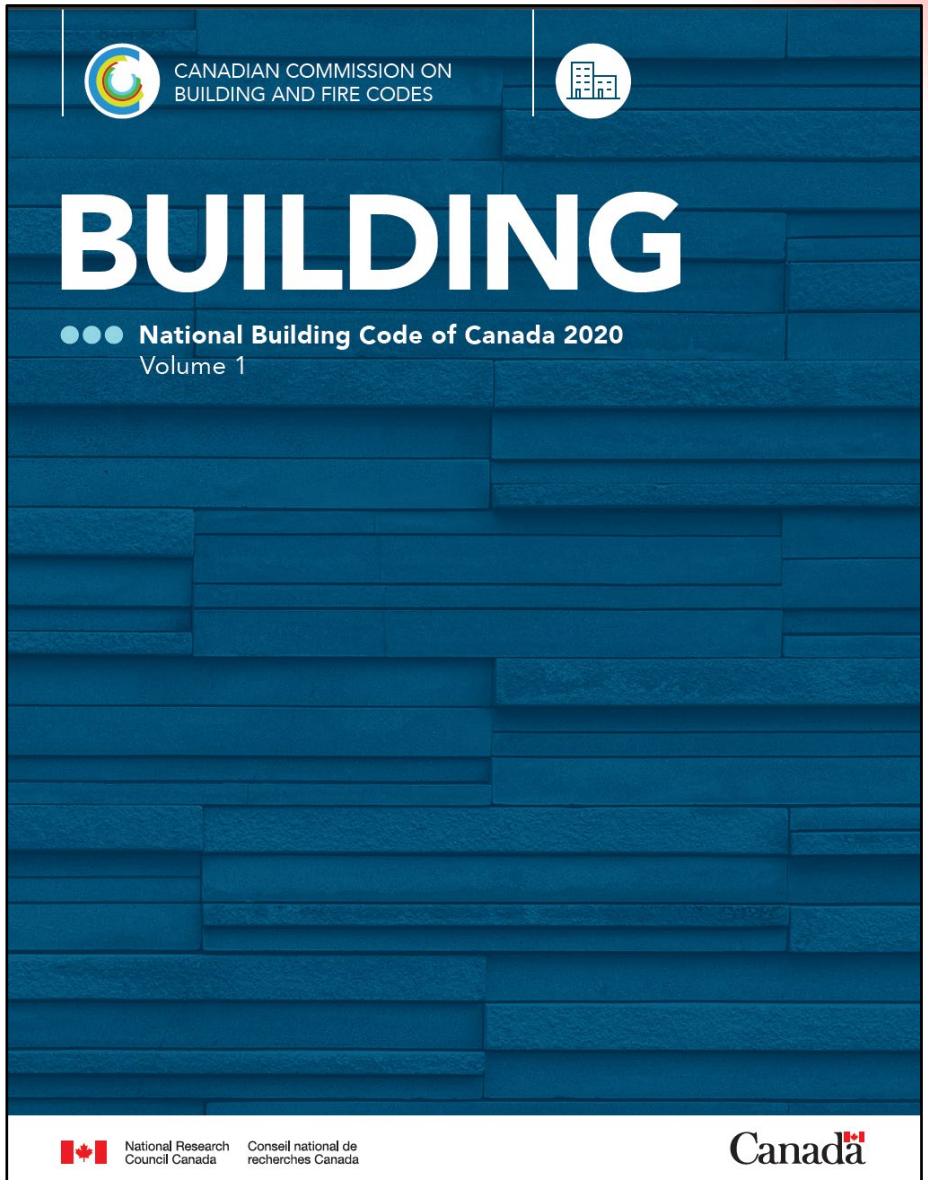
Current List of Certified Calculators: https://hvacdc.ca/?page_id=406

HVAC DESIGNERS OF CANADA
VERIFIED F280 SOFTWARE

HVAC DESIGNERS OF CANADA
VERIFIED F280 SOFTWARE

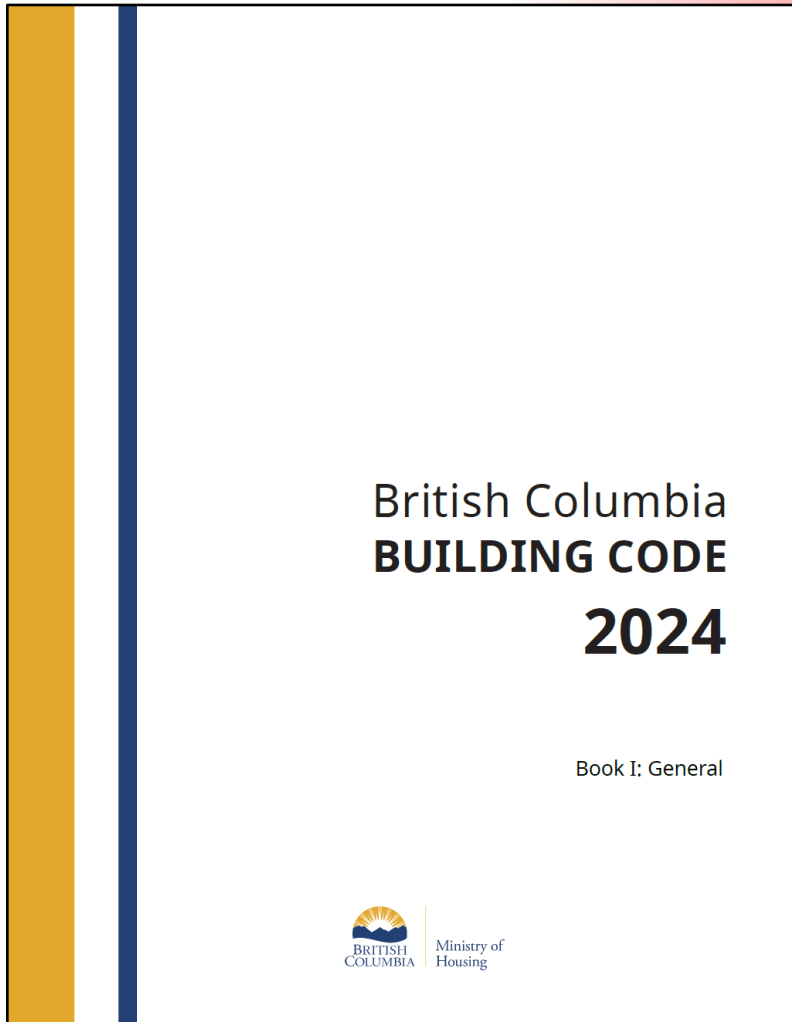
BC & NATIONAL CODE REQUIREMENTS





CODE REQUIREMENTS

- Heating & Cooling Equipment to be sized using CSA F280-12 standard
- Design temperatures are prescriptive
  - Indoor Setpoint Temperatures
  - Outdoor Design Temperatures
- One room must be able to maintain 26°C
  - *Applies to BCBC Only



CODE REQUIREMENTS: CSA F280

9.33.5.1. Capacity of Heating and Cooling Appliances

1) The **required capacity of heating and cooling appliances** located in a dwelling unit and serving only that dwelling unit, shall be determined in accordance with **CSA F280**, "Determining the required capacity of residential space heating and cooling appliances“ except that the design temperatures shall conform to Subsection 9.33.3.

CODE REQ: TEMPERATURES

9.33.3.1. Indoor Design Temperatures

1) At the outside winter design temperature, required heating facilities shall be capable of maintaining an indoor air temperature of not less than
   a) 22°C in all living spaces,
   b) 18°C in unfinished basements,
   c) 18°C in common service rooms, ancillary spaces and exits in houses with a secondary suite, &
   d) 15°C in heated crawl spaces.

CODE REQ: COOLING

9.33.3.1. Indoor Design Temperatures

2) At the outside summer design temperature, **required cooling** facilities shall be capable of maintaining an indoor air temperature of **not more than 26°C** in at least one living space in each dwelling unit.

*NOTE: Sentence **9.33.3.1. 2)** applies only to the BCBC.

BSSB INFORMATION BULLETIN

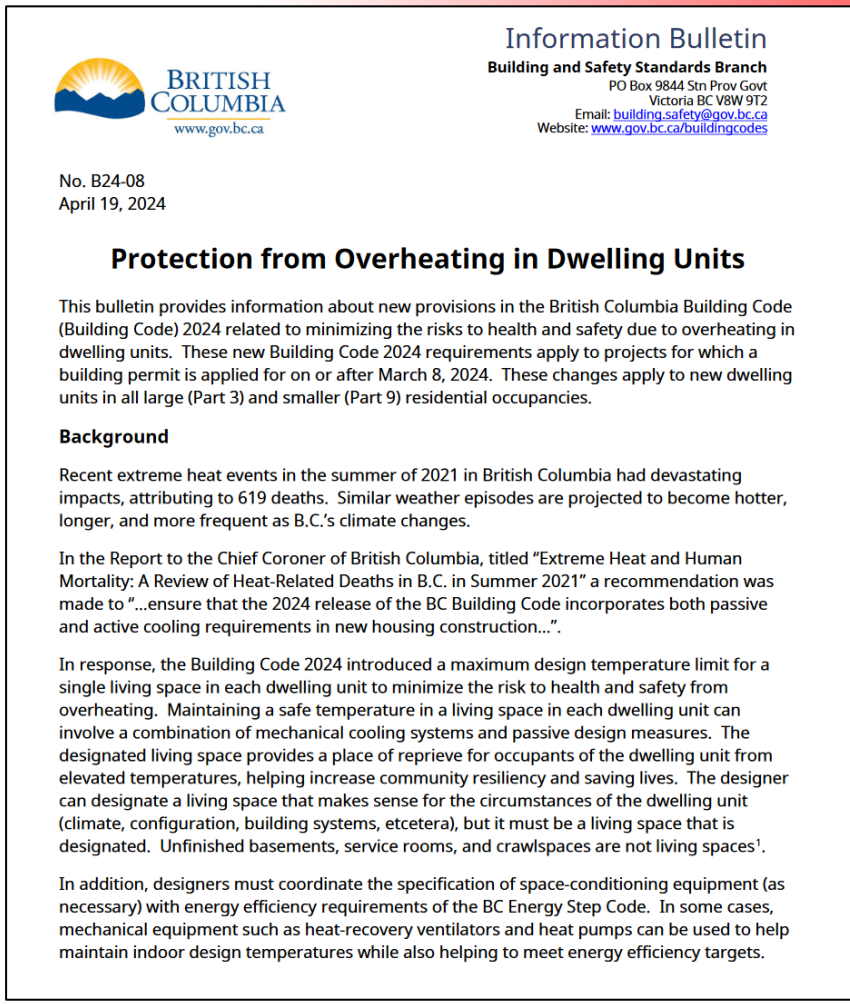
Building and Safety Standards Branch

No. B24-08

April 19, 2024

Protection from Overheating in Dwelling Units

- 5-Page Bulletin on the 26°C Refuge Room
- Passive Cooling Strategies
- Energy Modelling Requirements (use CSA F280, not HOT 2000)
- Allows for Passive Cooling Strategies
  - Refers to Sentence 2.2.2.1.(1) of Division C.



Information Bulletin

Building and Safety Standards Branch
PO Box 9844 Stn Prov Govt
Victoria BC V8W 9T2
Email: building.safety@gov.bc.ca
Website: www.gov.bc.ca/buildingcodes

BRITISH COLUMBIA
www.gov.bc.ca

No. B24-08
April 19, 2024

Protection from Overheating in Dwelling Units

This bulletin provides information about new provisions in the British Columbia Building Code (Building Code) 2024 related to minimizing the risks to health and safety due to overheating in dwelling units. These new Building Code 2024 requirements apply to projects for which a building permit is applied for on or after March 8, 2024. These changes apply to new dwelling units in all large (Part 3) and smaller (Part 9) residential occupancies.

Background

Recent extreme heat events in the summer of 2021 in British Columbia had devastating impacts, attributing to 619 deaths. Similar weather episodes are projected to become hotter, longer, and more frequent as B.C.'s climate changes.

In the Report to the Chief Coroner of British Columbia, titled "Extreme Heat and Human Mortality: A Review of Heat-Related Deaths in B.C. in Summer 2021" a recommendation was made to "...ensure that the 2024 release of the BC Building Code incorporates both passive and active cooling requirements in new housing construction...".

In response, the Building Code 2024 introduced a maximum design temperature limit for a single living space in each dwelling unit to minimize the risk to health and safety from overheating. Maintaining a safe temperature in a living space in each dwelling unit can involve a combination of mechanical cooling systems and passive design measures. The designated living space provides a place of reprieve for occupants of the dwelling unit from elevated temperatures, helping increase community resiliency and saving lives. The designer can designate a living space that makes sense for the circumstances of the dwelling unit (climate, configuration, building systems, etcetera), but it must be a living space that is designated. Unfinished basements, service rooms, and crawlspaces are not living spaces[1].

In addition, designers must coordinate the specification of space-conditioning equipment (as necessary) with energy efficiency requirements of the BC Energy Step Code. In some cases, mechanical equipment such as heat-recovery ventilators and heat pumps can be used to help maintain indoor design temperatures while also helping to meet energy efficiency targets.

https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/construction-industry/building-codes-and-standards/bulletins/2024-code/b24-08_overheating.pdf

BSSB INFORMATION BULLETIN

Sentence 2.2.2.1.(1) of Division C

2.2.2.1. General Information Required

1) Sufficient information shall be provided to show that the proposed work will conform to this Code and whether or not it may affect adjacent property.

CODE REQ: OUTDOOR TEMP.

9.33.3.2. Outdoor Design Temperatures

1) The outdoor conditions to be used in designing heating and air-conditioning systems shall be determined in conformance with Article 1.1.3.1.

1.1.3.1. Climatic and Seismic Values

3) The **outside winter design temperatures** determined from Appendix C shall be those listed for the **January 2.5%** values.

5) The **outside summer design temperatures** determined from Appendix C shall be those listed for the **July 2.5% dry** values.

Table C-2
Climatic Design Data for Selected Locations in British Columbia
Forming Part of Appendix C

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	15 Min. Rain, mm	One Day Rain, 1/50, mm	Ann. Rain, mm	Moist. Index	Ann. Tot. Ppn., mm	Driving Rain Wind Pressures, Pa, 1/5	Snow Load, kPa, 1/50		Hourly Wind Pressures, kPa	
		January		July 2.5%												
		2.5% °C	1% °C	Dry °C	Wet °C								S_s	S_r	1/10	1/50
British Columbia																
100 Mile House	1040	-30	-32	29	17	5030	10	48	300	0.4	425	60	2.6	0.3	0.27	0.35
Abbotsford	70	-8	-10	29	20	2860	12	112	1525	1.6	1600	160	2.0	0.3	0.33	0.44
Agassiz	15	-9	-11	31	21	2750	8	128	1650	1.7	1700	160	2.4	0.7	0.35	0.47
Alberni	12	-5	-8	31	19	3100	10	144	1900	2.0	2000	220	2.6	0.4	0.24	0.32
Ashcroft	305	-24	-27	34	20	3700	10	37	250	0.3	300	80	1.7	0.1	0.29	0.38
Bamfield	20	-2	-4	23	17	3080	13	170	2870	3.0	2890	280	1.0	0.4	0.38	0.50
Beatton River	840	-37	-39	26	18	6300	15	64	330	0.5	450	80	3.3	0.1	0.23	0.30
Bella Bella	25	-5	-7	23	18	3180	13	145	2715	2.8	2800	350	2.6	0.8	0.40	0.50
Bella Coola	40	-14	-18	27	19	3560	10	140	1500	1.9	1700	350	4.5	0.8	0.29	0.39
Burns Lake	755	-31	-34	26	17	5450	12	54	300	0.6	450	100	3.4	0.2	0.29	0.39
Cache Creek	455	-24	-27	34	20	3700	10	37	250	0.3	300	80	1.7	0.2	0.29	0.39
Campbell River	20	-5	-7	26	18	3000	10	116	1500	1.6	1600	260	2.8	0.4	0.41	0.48
Carmi	845	-24	-26	31	19	4750	10	64	325	0.4	550	60	3.6	0.2	0.29	0.38
Castlegar	430	-18	-20	32	20	3580	10	54	560	0.6	700	60	4.2	0.1	0.26	0.34
Chetwynd	605	-35	-38	27	18	5500	15	70	400	0.6	625	60	2.4	0.2	0.30	0.40
Chilliwack	10	-9	-11	30	20	2780	8	139	1625	1.7	1700	160	2.2	0.3	0.35	0.47
Colwood Region Colwood (Colwood Corners)	64	-6	-8	26	18	2900	10	100	1000	1.13	1030	220	1.7	0.3	0.48	0.63
Colwood (Royal Bay Village)	20	-5	-7	24	17	2600	8	80	910	1.05	930	220	1.2	0.3	0.48	0.63
Colwood (Triangle Mountain)	220	-7	-9	25	17	3300	10	105	11885	1.29	1225	220	2.5	0.3	0.48	0.63
Comox	15	-7	-9	27	18	2930	10	106	1175	1.3	1200	260	2.4	0.4	0.41	0.48
Courtenay	10	-7	-9	28	18	2930	10	106	1400	1.5	1450	260	2.4	0.4	0.41	0.48
Cranbrook	910	-26	-28	32	18	4400	12	59	275	0.3	400	100	3.0	0.2	0.25	0.33
Crescent Valley	585	-18	-20	31	20	3650	10	54	675	0.8	850	80	4.2	0.1	0.25	0.33
Crofton	5	-4	-6	28	19	2880	8	86	925	1.1	950	160	1.8	0.2	0.32	0.40
Dawson Creek	665	-38	-40	27	18	5900	18	75	325	0.5	475	100	2.5	0.2	0.30	0.40
Dease Lake	800	-37	-40	24	15	6730	10	45	265	0.6	425	50	2.8	0.1	0.23	0.30
Dog Creek	450	-28	-30	29	17	4800	10	48	275	0.4	375	100	1.8	0.2	0.27	0.35
Duncan	10	-6	-8	28	19	2980	8	103	1000	1.1	1050	180	1.8	0.4	0.31	0.39
Elko	1065	-28	-31	30	19	4600	13	64	440	0.5	650	100	3.6	0.2	0.30	0.40
Fernie	1010	-27	-30	30	19	4750	13	118	860	0.9	1175	100	4.5	0.2	0.30	0.40
Fort Nelson	465	-39	-42	28	18	6710	15	70	325	0.6	450	80	2.4	0.1	0.23	0.30
Fort St. John	685	-35	-37	26	18	5750	15	72	320	0.5	475	100	2.8	0.1	0.29	0.39
Glacier	1145	-27	-30	27	17	5800	10	70	625	0.8	1500	80	9.4	0.2	0.24	0.32

CLIMATIC DATA

Appendix C Climatic and Seismic Information for Building Design in Canada

Table C-2
Climatic Design Data for Selected Locations in British Columbia
Forming Part of Appendix C

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	15 Min. Rain, mm	One Day Rain, 1/50, mm	Ann. Rain, mm	Moist. Index	Ann. Tot. Ppn., mm	Driving Rain Wind Pressures, Pa, 1/5	Snow Load, kPa, 1/50		Hourly Wind Pressures, kPa	
		January		July 2.5%												
		2.5% °C	1% °C	Dry °C	Wet °C								S_s	S_r	1/10	1/50
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100 Mile House	1040	-30	-32	29	17	5030	10	48	300	0.4	425	60	2.6	0.3	0.27	0.35
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Alberni	12	-5	-8	31	19	3100	10	144	1900	2.0	2000	220	2.6	0.4	0.24	0.32
Ashcroft	305	-24	-27	34	20	3700	10	37	250	0.3	300	80	1.7	0.1	0.29	0.38
Bamfield	20	-2	-4	23	17	3080	13	170	2870	3.0	2890	280	1.0	0.4	0.38	0.50

HEAT LOSS & HEAT GAIN INPUTS & RESULTS

- The following slides demonstrate the TECA HLHG calculator.
- Other certified calculators may report the same information in a different format.
- CSA F280-12 Table E.1. outlines require report information.

HLHG BUILDING INPUTS

- Building Location
  - Latitude (Solar Impact)
  - Orientation of Building
  - Outdoor Design Temperature
- Building Design Parameters
  - Building Construction (R-Values & Glazing Coatings)
  - Air Tightness
  - Ventilation System
  - Mechanical System
  - Indoor Setpoint Temperature

HLHG BUILDING INFORMATION

DESIGNER & SITE INFORMATION

The TECA Heat Loss & Heat Gain Calculator V5.04 is F280 Verified Software

USER INFORMATION

CALCULATIONS PERFORMED BY

NAME	Todd Backus
COMPANY	TECA
ADDRESS	123 Fake Street
CITY	Nanaimo
PROVINCE	BC
POSTAL CODE	V9R 1P3
PHONE	555-555-5555
FAX	-
EMAIL	tbackus@teca.ca

PURCHASED BY

COMPANY	TECA
NAME	Todd Backus
REGISTRATION #:	33816800

HOVER NOTES

SELECT UNITS

IMPERIAL — *select units before making inputs, and do not change the units after inputs have been made*

PROJECT INFORMATION

BUILDING SITE

ADDRESS:	453 West 12th Ave.	SITE:	
CITY:	Vancouver	LOT:	
PROVINCE:	BC	BUILDING MODEL:	
POSTAL CODE:	V5Y 1V4		

WEATHER DATA — *select the weather location (or closest geographical location if city is not found)*

PROVINCE: British Columbia (BC)
CITY: Vancouver (city hall)

weather data for each city is populated from the CSA F280 weather tables - the user can enter custom data (below)

OUTDOOR TEMP. (heating):	-7.0 °C	HEATING DEG. DAYS:	2825	O. HUMIDITY RATIO:	11.0 g/kg
OUTDOOR TEMP. (cooling):	28.0 °C	BC CLIMATE ZONE:	4	STrange:	7.0 °C
SOIL TEMPERATURE:	11.0 °C	LATITUDE:	49.25	JAN. AVG. WIND:	11.0 km/h
		LONGITUDE:	-123.12	JUL. AVG. WIND:	11.0 km/h

☐ **CUSTOM WEATHER DATA** (if known) — *customize by inputting any or all of the data below; leave blank to use above data*

PROJECT

CALCULATIONS PERFORMED FOR:	James Bond (the client)
PROJECT #:	Example
DESIGNER OF BUILDING DRAWINGS:	JM
DATE OF DRAWINGS:	March 21, 2024

BUILDING INFORMATION | ROOM DIMENSIONS | RESULTS | AIRFLOW | SCRAP | IMPORT | HELP

BUILDING INFORMATION

define the floor area and volume below

WHAT IS THIS CALCULATOR USED FOR?

BUILDING AREA & VOLUME CALCULATOR

SHOW VOLUME MEASUREMENT DIAGRAM

Floor #:	C.CRAWL	BASEMENT	AG Floor i	AG Floor ii	AG Floor iii	AG Floor iv
Floor Area (ft²):		344.00	344.00	344.00		
Total Wall Height (ft):		8.00	8.00	8.54		
FND Wall Height (ft):		5.00	0.00	0.00		
Header Area (ft²):		344.00	344.00	0.00		
Header Height (ft):		1.00	1.00	0.00		
Added Volume (ft³):						
Total Volume (ft³):	0.00	3096.00	3096.00	2937.76	0.00	0.00
	HC	B	2	3	4	5

1032.0 ft² < TOTAL BUILDING FLOOR AREA

9129.8 ft³ < TOTAL BUILDING VOLUME

(DISPLAY) SUMMARY OF OVERALL BUILDING GEOMETRY

	AREA		VOLUME	
CONDITIONED LIVING SPACE	1032.0	ft²	9129.8	ft³
HEATED CRAWLSPACE	0.0	ft²	0.0	ft³

OF BEDROOMS: 2 # OF PEOPLE: 3 *if unknown, use # bedrooms + 1*

A.G. HEIGHT OF HIGHEST CEILING: 29.00 ft

INDOOR DESIGN TEMP. (HEAT): 22.0 °C
INDOOR DESIGN TEMP. (COOL): 24.0 °C

CSA recommended design temperatures:

HEAT: 22C (living space), 18C (unfinished basement), 15C (heated crawl space)
COOL: 24C (all conditioned space).

WHAT ARE THESE DESIGN TEMPERATURES?

AIR TIGHTNESS / INFILTRATION

** select the options below that best describe the location of the building*

HOW TO IDENTIFY THE SHIELDING TYPE?

BUILDING SITE SHIELDING: Suburban, forest
LOCAL WALL SHIELDING: Heavy
LOCAL FLUE SHIELDING: Heavy

WEATHER STATION LOCATION: Open flat terrain, grass
ANEMOMETER HEIGHT: 32.81 ft (default)
or enter custom: ft

define the air tightness of the building with one of the three options below:

○ BLOWER DOOR TEST RESULTS: AIR TIGHTNESS (ACH50): ELA (in²): @ 10 Pa
or,
◉ TARGET AIR TIGHTNESS: AIR TIGHTNESS (ACH50): 1.00 ELA (in²): 15.0 @ 10 Pa
or,
○ SELECT FROM A LIST OF VALUES:

is the air tightness value assumed? Y *enter "Y" or leave blank*

DUCTING & VENTING PENETRATIONS

enter the diameter of all penetrations below (to see all penetration types, see yellow hover note)

DIAMETER: in

ALL PENETRATION TYPES

VENTILATION SYSTEM

enter only continuous and mechanical (fan driven) ventilation here

VENTILATION TYPES | FRESH AIR SUPPLY INTAKE DUCT?

TYPE: Heat Recovery Ventilator (HRV), dedicated ventilation ductwork

MINIMUM VS INSTALLED RATES

Exhaust Airflow: 60.00 CFM
Supply Airflow: 60.00 CFM
ASE: 64% ATRE: 0%

SEARCH FOR THE MINIMUM VENTILATION REQUIREMENT IN THE HOME (OPTIONAL)

** these search tools are for reference only and not for compliance or ventilation system design*
** the buttons below can be used to consider ventilation requirements based on different standards*
** while these standards give the minimum ventilation requirements, the installed (or estimated to be installed) system should be input*

HIDE BC BUILDING CODE TABLE 9.32.3.5. — *(45 CFM required)*

required principal ventilation capacity per BC Building Code = 45.0 CFM

Table 9.32.3.5 (Imperial)
Principal Ventilation System Exhaust Fan Minimum Air-flow Rate
Forming part of Sentence 9.32.3.5.(1)

	Minimum Air-Flow Rate, CFM				
	Number of Bedrooms				
Floor Area, ft²	0 - 1	2 - 3	4 - 5	6 - 7	> 7
< 1507	30	45	60	75	89
1507 - 3025	45	60	75	89	104
3025 - 4532	60	75	89	104	119
4532 - 6039	75	89	104	119	136
6039 - 7535	89	104	119	136	151
> 7535	104	119	136	151	166

Floor areas for ventilation system sizing should include all heated floor areas, and open to below areas

Table 9.32.3.5 (Metric)
Principal Ventilation System Exhaust Fan Minimum Air-flow Rate
Forming part of Sentence 9.32.3.5.(1)

	Minimum Air-Flow Rate, L/s				
	Number of Bedrooms				
Floor Area, m²	0 - 1	2 - 3	4 - 5	6 - 7	> 7
< 140	14	21	28	35	42
140 - 280	21	28	35	42	49
281 - 420	28	35	42	49	56
421 - 560	35	42	49	56	64
561 - 700	42	49	56	64	71
> 700	49	56	64	71	78

Floor areas for ventilation system sizing should include all heated floor areas, and open to below areas

tables show minimum required exhaust airflow - the actual (installed/designed) airflow should be input above

SHOW ASHRAE 62.2 VENTILATION REQUIREMENTS — *(53.6 CFM required)*
SHOW CSA F326 VENTILATION REQUIREMENTS — *inputs required*
SHOW NATIONAL BUILDING CODE 9.32 — *MIN: 38, MAX: 59 (CFM)*

MECHANICAL (HEATING & COOLING) SYSTEMS

Type of Heating System: radiant heating (in-floor or baseboards)

circulation: pumped circulation
distribution piping: insulated pipe

for any piping not in conditioned space (leave default if all piping is in conditioned space)

HUMIDITY

ENTER LATENT LOAD MULTIPLIER: 1.30 ☐ USE CUSTOM LATENT LOAD

HLHG REPORT: BUILDING INFO

RESULTS

PROJECT #: Example. 453 West 12th Ave. || CSA F280

These results have been generated by The TECA Heat Loss & Heat Gain Calculator (V5.04), which is Verified F280 Software

BUILDING INFORMATION

CALCULATIONS PERFORMED FOR: James Bond

CALCULATIONS PERFORMED BY

NAME	Todd Backus
COMPANY	TECA
ADDRESS	123 Fake Street
CITY	Nanaimo
PROVINCE	BC
POSTAL CODE	V9R 1P3
PHONE	555-555-5555
FAX	-
EMAIL	tbackus@teca.ca

SOFTWARE LICENSING

COMPANY	TECA
NAME	Todd Backus
REG. #:	33816800

optional - operator logo, qualification/certification stamp, signature, BCIN qualification attestation, etc.

optional - include photo of house / building drawings here

PROJECT #:	Example
ADDRESS:	453 West 12th Ave.
CITY:	Vancouver
PROVINCE:	BC
POSTAL CODE:	V5Y 1V4
BUILDING MODEL:	
SITE:	
LOT:	
DESIGNER OF BUILDING DRAWINGS:	JM
DATE OF DRAWINGS:	March 21, 2024
BUILDING ATTACHMENT:	Detached
NUMBER OF FLOOR LEVELS:	3 **NUMBER OF STOREYS:** 2 *above grade floor levels*

PROJECT #: Example. 453 West 12th Ave.

WEATHER DATA	Vancouver (city hall)		
LATITUDE:	49.25	**LONGITUDE:**	-123.12
Summer Mean Daily Temperature Range	7 °C	**WINDOW SHADING:**	NO
VENTILATION SYSTEM	Dedicated HRV, 60CFM, ASE0.64, ATRE:0		
HEATING SYSTEM	radiant heating (in-floor or baseboards)		
FRONT OF HOUSE FACING DIRECTION:	SW		
is this value assumed?	no		
AIR TIGHTNESS / INFILTRATION	ACH50: 1, ELA: 96.5 cm², ELA @10Pa		
is the air tightness value assumed?	yes		
BUILDING SITE SHIELDING:	Suburban, forest		
LOCAL WALL SHIELDING:	Open flat terrain, grass		
LOCAL FLUE SHIELDING:	Open flat terrain, grass		
INDOOR DESIGN TEMPERATURES:		**# OF BEDROOMS:**	2
HEATING:	22°C, 71.6°F	**# OF PEOPLE:**	3
COOLING:	24°C, 75.2°F		
OUTDOOR DESIGN TEMPERATURES:			
HEATING:	-7°C, 19.4°F		
COOLING:	28°C, 82.4°F		
SOIL TEMPERATURE:	11 °C		

Attached documents:

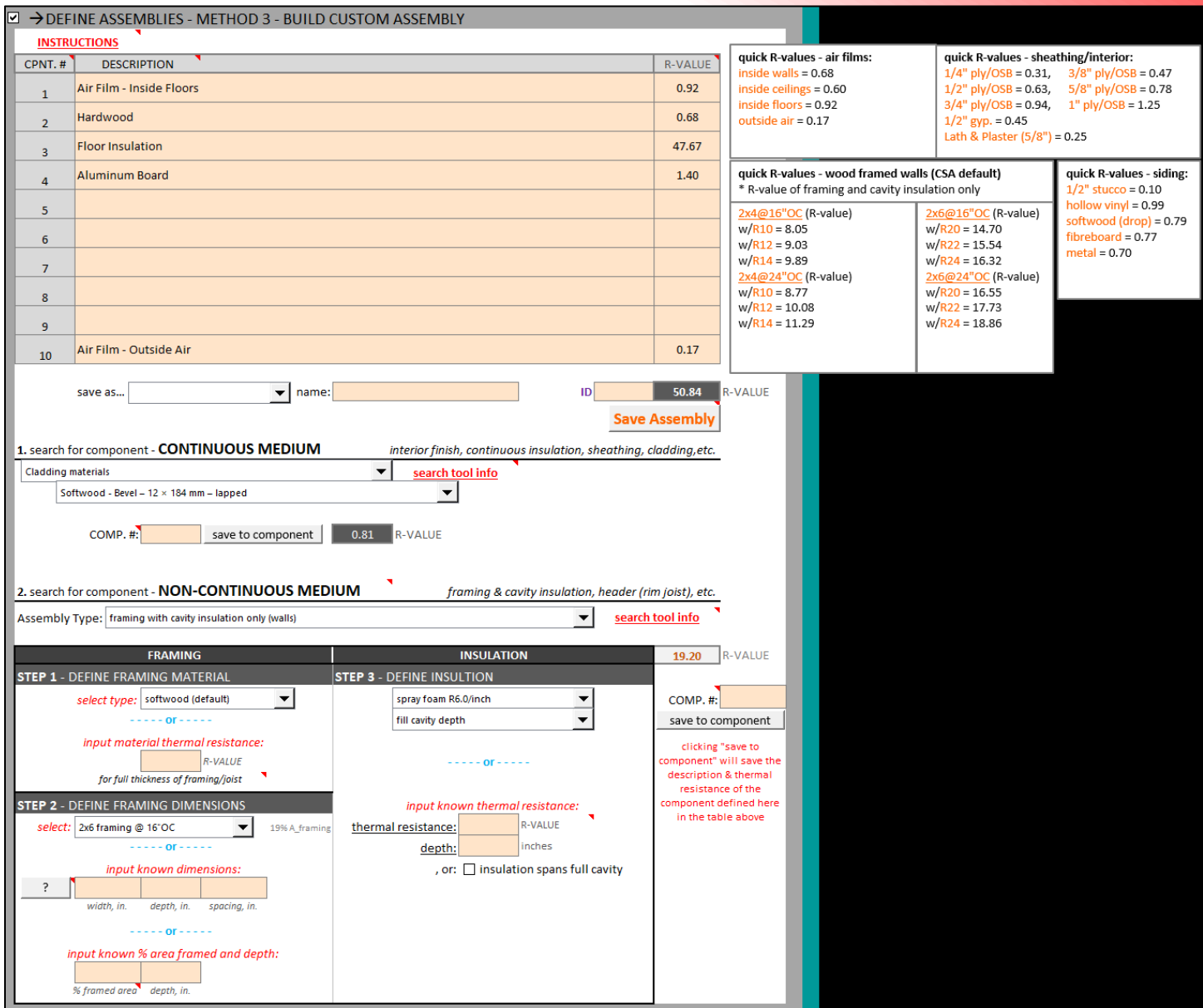
Assumptions noted (in addition to listed assumptions on page 1):

Notes from the calculator operator:

BUILDING ASSEMBLY INPUTS

Custom Building Assemblies:

- Walls
- Windows & Skylights
- Doors
- Foundations



HLHG REPORT: BUILDING ASSEMBLY

PROJECT #: Example. 453 West 12th Ave.

BUILDING ENVELOPE ELEMENTS

WALLS

1/ (Wood Wall), Air Film - inside walls, // 1/2" Drywall, // 2*6, 16" OC w/ R6 Insulation, // 2" type 2 bread board as continuous insulation on exterior, // 1/2" Sheeting, // Wall Material - Softwood, air film - outside air; 29.91R-VALUE

CEILINGS

1/ (Ceiling), Air Film - inside ceiling, // 5/8 Drywall, // Ceiling Insulation, // 1/2" Sheathing, // 2" of type 2 insulation, air film - outside air; 57.84R-VALUE

INTERIOR FOUNDATION WALL

EXPOSED FLOOR

1/ (Floor - Exposed), Air Film - inside floors, // Hardwood, // Floor Insulation, // Aluminum Board, air film - outside air; 50.84R-VALUE

EXPOSED HEADER

1/ (Floor Header w/ Wood Walls); 32.3R-VALUE

2/ (Floor Header w/ Leger Boad); 35.37R-VALUE

WINDOWS

1/ (Door Window) double glazed, Fixed — Wood/Vinyl, insulating, clear, 6mm Air, USI: 3.13, SHGC: 0.59

2/ (Window - Typ) double glazed, Operable — Wood/Vinyl, insulating, clear, 6mm Air, USI: 2.44, SHGC: 0.49

SKYLIGHTS

DOORS

1/ (Door) Insulated metal — Polyurethane core, without storm door, USI: 0.91

SHADINGS

FOUNDATIONS

1/ [Basement / Lowest Floor] Concrete Slab & Walls, insulation: interior wall = 2.72RSI, exterior wall = 2.64RSI (configuration #69) // any first storey construction type, interior surface of wall insulated over full-height, exterior surface of wall insulated over full-height, sub-surface of floor slab fully insulated but no insulation under footings, thermal-break between walls and floor slab // AREA: 320ft², FULL PERIMETER: 72ft, EXPOSED PERIMETER: 72ft

WALLS

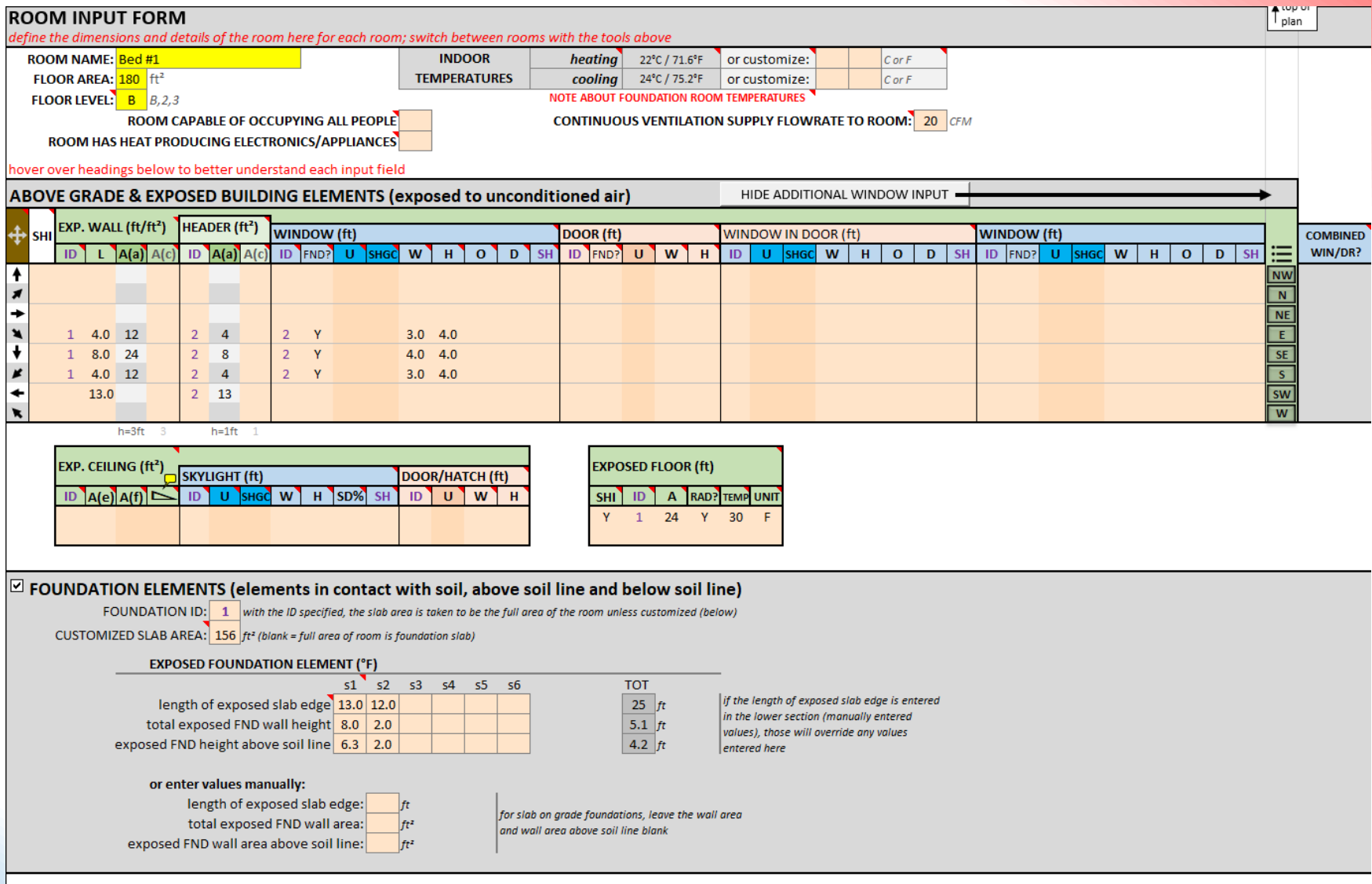
- 1/ (Wood Wall),
- Air Film - Inside Walls,
- 1/2" Drywall,
- 2*6, 16" OC w/ R6 Insulation,
- 2" Type 2 Bread Board as Continuous Insulation on Exterior,
- 1/2" Sheeting,
- Wall Material - Softwood,
- Air Film - Outside Air;

29.91 R-VALUE

HLHG ROOM INPUTS

Individual Room Inputs:

- Critical to size HVAC distribution systems
- Indoor setpoint temperature can be unique to each room
- Continuous Ventilation?
- Occupants?
- Electrical Loads?



ROOM INPUT FORM

define the dimensions and details of the room here for each room; switch between rooms with the tools above

ROOM NAME: Bed #1 | FLOOR AREA: 180 ft² | FLOOR LEVEL: B *B,2,3*

INDOOR TEMPERATURES: *heating* 22°C / 71.6°F or customize: | *cooling* 24°C / 75.2°F or customize:

NOTE ABOUT FOUNDATION ROOM TEMPERATURES

ROOM CAPABLE OF OCCUPYING ALL PEOPLE

ROOM HAS HEAT PRODUCING ELECTRONICS/APPLIANCES

CONTINUOUS VENTILATION SUPPLY FLOWRATE TO ROOM: 20 CFM

hover over headings below to better understand each input field

ABOVE GRADE & EXPOSED BUILDING ELEMENTS (exposed to unconditioned air) — HIDE ADDITIONAL WINDOW INPUT

SHI	EXP. WALL (ft/ft²) ID	L	A(a)	A(c)	HEADER (ft²) ID	A(a)	A(c)	WINDOW (ft) ID	FND?	U	SHGC	W	H	O	D	SH	DOOR (ft) ID	FND?	U	W	H	WINDOW IN DOOR (ft) ID	U	SHGC	W	H	O	D	SH	WINDOW (ft) ID	FND?	U	SHGC	W	H	O	D	SH	COMBINED WIN/DR?
	1	4.0	12		2	4		2	Y			3.0	4.0																										NW
	1	8.0	24		2	8		2	Y			4.0	4.0																										N
	1	4.0	12		2	4		2	Y			3.0	4.0																										NE
		13.0			2	13																																E
		h=3ft	3		h=1ft	1																																SE
																																					S
																																					SW
																																					W

EXP. CEILING (ft²) | SKYLIGHT (ft) | DOOR/HATCH (ft)

ID	A(e)	A(f)	ID	U	SHGC	W	H	SD%	SH	ID	U	W	H

EXPOSED FLOOR (ft)

SHI	ID	A	RAD?	TEMP	UNIT
Y	1	24	Y	30	F

FOUNDATION ELEMENTS (elements in contact with soil, above soil line and below soil line)

FOUNDATION ID: 1 *with the ID specified, the slab area is taken to be the full area of the room unless customized (below)*

CUSTOMIZED SLAB AREA: 156 ft² *(blank = full area of room is foundation slab)*

EXPOSED FOUNDATION ELEMENT (°F)

	s1	s2	s3	s4	s5	s6	TOT	
length of exposed slab edge	13.0	12.0					25	ft
total exposed FND wall height	8.0	2.0					5.1	ft
exposed FND height above soil line	6.3	2.0					4.2	ft

if the length of exposed slab edge is entered in the lower section (manually entered values), those will override any values entered here

or enter values manually:

length of exposed slab edge: ft

total exposed FND wall area: ft²

exposed FND wall area above soil line: ft²

for slab on grade foundations, leave the wall area and wall area above soil line blank

HLHG REPORT: ROOM BREAKDOWN

Heating System

HEAT LOSS COMPONENT BREAKDOWN, (BTUH)	WALL	CEILING	FLOOR	WINDOW & SKYLIGHT	DOOR & HATCH	FOUNDATION	LEAKAGE	VENTILATION	DISTRIBUTION	ADDITIONAL	
ROOM NAME	WAL.	CEI.	FLR.	WIN.	DR.	FND.	LEAK.	VENT.	DIST.	ADD.	TOTAL
(#1)Bath #1	28					287	48				363
(#2)Bed #1	127		5	897		300	204	403			1935
(#3)Entrance - Basement	62				289	406	116				873
(#4)Kitchen & Living	1015			1726	289		221	403			3655
(#5)Bath #2	207	39					12				258
(#6)Hall & Laundry	291	92		269			32				684
(#7)Bed #2	438	194		1457			103	403			2596
	WAL.	CEI.	FLR.	WIN.	DR.	FND.	LEAK.	VENT.	DIST.	ADD.	TOTAL
TOTAL BUILDING	2167	325	5	4350	579	993	736	1210			10365

Cooling System

HEAT GAIN COMPONENT BREAKDOWN, (BTUH)	WALL	CEILING	FLOOR	WINDOW & SKYLIGHT	DOOR & HATCH	LEAKAGE	VENTILATION	DISTRIBUTION & ADDITIONAL	INTERNAL	TOTAL SENSIBLE	TOTAL SENSIBLE + LATENT
ROOM NAME	WAL.	CEI.	FLR.	WIN.	DR.	LEAK.	VENT.	DIST.	INT.	SENS.	TOTAL
(#1)Bath #1	4					0				4	5
(#2)Bed #1	19		1	1857		6	464			2346	3050
(#3)Entrance - Basement	8				410	1				420	546
(#4)Kitchen & Living	138			3529	255	13	155		3088	7178	9332
(#5)Bath #2	27	25				0				53	69
(#6)Hall & Laundry	34	61		399		2				495	644
(#7)Bed #2	63	127		2879		10	155		358	3592	4669
	WAL.	CEI.	FLR.	WIN.	DR.	LEAK.	VENT.	DIST.	INT.	SENS.	TOTAL
TOTAL BUILDING	293	213	1	8664	665	33	773		3446	14087	18314
										MINIMUM INSTALLED OUTPUT CAPACITY:	14651

HLHG REPORT: SUMMARY

HEAT LOSS & HEAT GAIN SUMMARY, (BTUH)

imperial

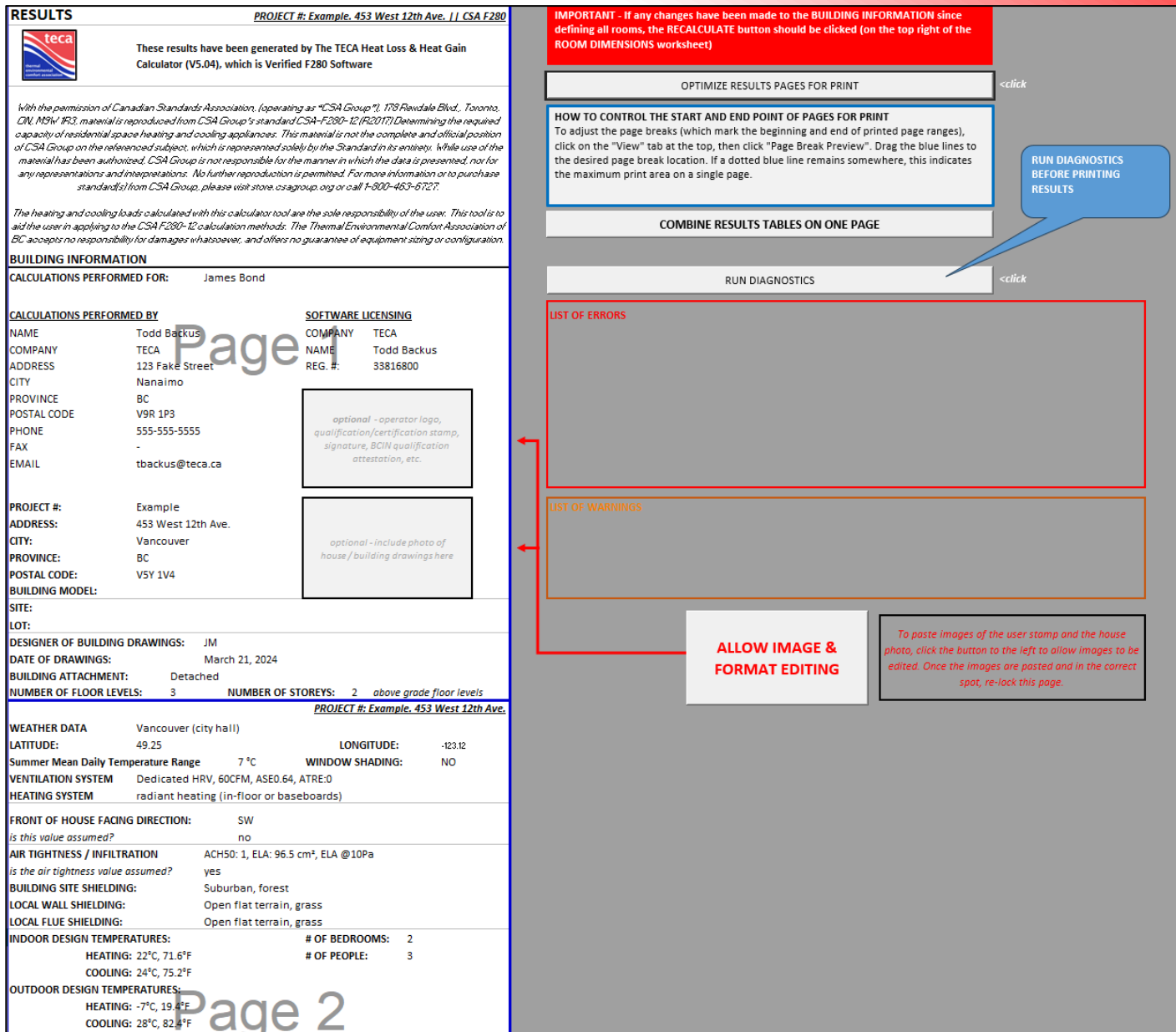
ROOM NAME	FLOOR LEVEL	FL AREA (ft²)	HEAT LOSS TOTAL	HEAT GAIN SENS.	HEAT GAIN **TOTAL (sensible + latent)**
(#1)Bath #1	1	84	363	4	5
(#2)Bed #1	1	180	1935	2346	3050
(#3)Entrance - Basement	1	80	873	420	546
(#4)Kitchen & Living	2	344	3655	7178	9332
(#5)Bath #2	3	40	258	53	69
(#6)Hall & Laundry	3	89	684	495	644
(#7)Bed #2	3	215	2596	3592	4669

	AREA	HEAT LOSS	GAIN (sens.)	GAIN (total)
OVERALL BUILDING	1032	10365	14087	**18314**

HLHG RESULTS REPORT

Results Output Page:

- Automatically creates a report
- Contains critical design information (per CSA Standard)
- Results page submitted to Building Official



RESULTS — PROJECT #: Example. 453 West 12th Ave. || CSA F280

These results have been generated by The TECA Heat Loss & Heat Gain Calculator (V5.04), which is Verified F280 Software

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BUILDING INFORMATION

CALCULATIONS PERFORMED FOR:	James Bond

CALCULATIONS PERFORMED BY		SOFTWARE LICENSING	
NAME	Todd Backus	COMPANY	TECA
COMPANY	TECA	NAME	Todd Backus
ADDRESS	123 Fake Street	REG. #:	33816800
CITY	Nanaimo		
PROVINCE	BC		
POSTAL CODE	V9R 1P3		
PHONE	555-555-5555		
FAX	-		
EMAIL	tbackus@teca.ca		

optional - operator logo, qualification/certification stamp, signature, BCIN qualification attestation, etc.

PROJECT #:	Example
ADDRESS:	453 West 12th Ave.
CITY:	Vancouver
PROVINCE:	BC
POSTAL CODE:	V5Y 1V4
BUILDING MODEL:	
SITE:	
LOT:	

optional - include photo of house / building drawings here

DESIGNER OF BUILDING DRAWINGS:	JM		
DATE OF DRAWINGS:	March 21, 2024		
BUILDING ATTACHMENT:	Detached		
NUMBER OF FLOOR LEVELS:	3	NUMBER OF STOREYS:	2 *above grade floor levels*

Page 1

PROJECT #: Example. 453 West 12th Ave.

WEATHER DATA	Vancouver (city hall)		
LATITUDE:	49.25	LONGITUDE:	-123.12
Summer Mean Daily Temperature Range	7 °C	WINDOW SHADING:	NO
VENTILATION SYSTEM	Dedicated HRV, 60CFM, ASE0.64, ATRE:0		
HEATING SYSTEM	radiant heating (in-floor or baseboards)		
FRONT OF HOUSE FACING DIRECTION:	SW		
is this value assumed?	no		
AIR TIGHTNESS / INFILTRATION	ACH50: 1, ELA: 96.5 cm², ELA @10Pa		
is the air tightness value assumed?	yes		
BUILDING SITE SHIELDING:	Suburban, forest		
LOCAL WALL SHIELDING:	Open flat terrain, grass		
LOCAL FLUE SHIELDING:	Open flat terrain, grass		
INDOOR DESIGN TEMPERATURES:		# OF BEDROOMS:	2
HEATING:	22°C, 71.6°F	# OF PEOPLE:	3
COOLING:	24°C, 75.2°F		
OUTDOOR DESIGN TEMPERATURES:			
HEATING:	-7°C, 19.4°F		
COOLING:	28°C, 82.4°F		

Page 2

IMPORTANT - If any changes have been made to the BUILDING INFORMATION since defining all rooms, the RECALCULATE button should be clicked (on the top right of the ROOM DIMENSIONS worksheet)

OPTIMIZE RESULTS PAGES FOR PRINT <click

HOW TO CONTROL THE START AND END POINT OF PAGES FOR PRINT
To adjust the page breaks (which mark the beginning and end of printed page ranges), click on the "View" tab at the top, then click "Page Break Preview". Drag the blue lines to the desired page break location. If a dotted blue line remains somewhere, this indicates the maximum print area on a single page.

RUN DIAGNOSTICS BEFORE PRINTING RESULTS

COMBINE RESULTS TABLES ON ONE PAGE

RUN DIAGNOSTICS <click

LIST OF ERRORS

LIST OF WARNINGS

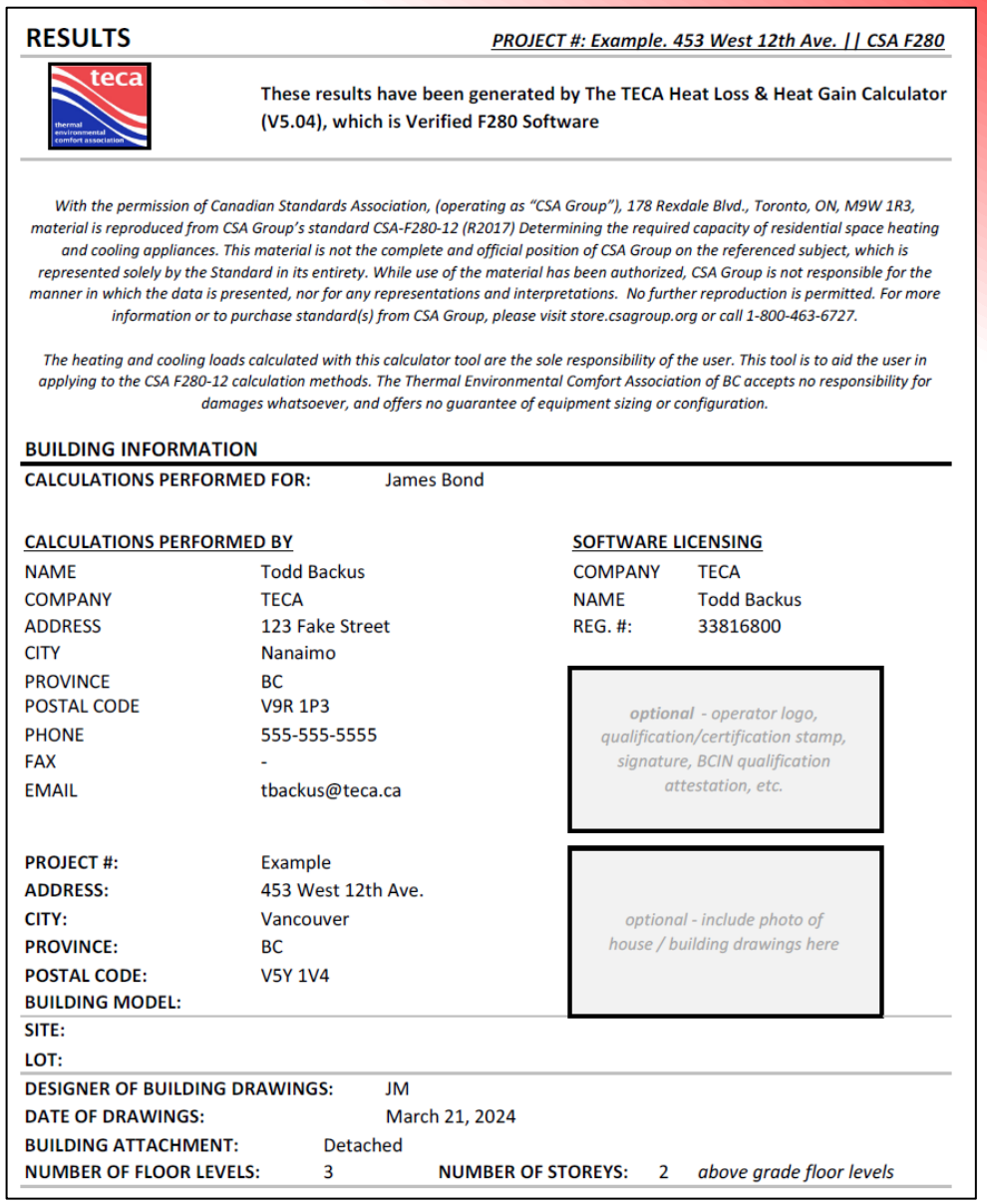
ALLOW IMAGE & FORMAT EDITING

To paste images of the user stamp and the house photo, click the button to the left to allow images to be edited. Once the images are pasted and in the correct spot, re-lock this page.

REVIEWING HLHG RESULTS

VERIFY THE FOLLOWING:

- ✓ Outdoor Design Temperature
- ✓ Indoor Setpoint Temperature
- ✓ Building Construction (R-Values & Glazing Coatings)
- ✓ Building Assembly Element Areas
- ✓ Building Floor Plan Area & Perimeters of Walls
- ✓ Correct Orientation of Building
- ✓ Building Latitude
- ✓ Ventilation System
- ✓ Air Tightness
- ✓ Mechanical System



RESULTS *PROJECT #: Example. 453 West 12th Ave. || CSA F280*

These results have been generated by The TECA Heat Loss & Heat Gain Calculator (V5.04), which is Verified F280 Software

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BUILDING INFORMATION

CALCULATIONS PERFORMED FOR: James Bond

CALCULATIONS PERFORMED BY

NAME	Todd Backus
COMPANY	TECA
ADDRESS	123 Fake Street
CITY	Nanaimo
PROVINCE	BC
POSTAL CODE	V9R 1P3
PHONE	555-555-5555
FAX	-
EMAIL	tbackus@teca.ca

SOFTWARE LICENSING

COMPANY	TECA
NAME	Todd Backus
REG. #:	33816800

optional - operator logo, qualification/certification stamp, signature, BCIN qualification attestation, etc.

optional - include photo of house / building drawings here

PROJECT #:	Example
ADDRESS:	453 West 12th Ave.
CITY:	Vancouver
PROVINCE:	BC
POSTAL CODE:	V5Y 1V4
BUILDING MODEL:	
SITE:	
LOT:	
DESIGNER OF BUILDING DRAWINGS:	JM
DATE OF DRAWINGS:	March 21, 2024
BUILDING ATTACHMENT:	Detached
NUMBER OF FLOOR LEVELS:	3 **NUMBER OF STOREYS:** 2 *above grade floor levels*

BUILDING ASSEMBLY ERRORS

Ensure that Building Construction Elements (R-Values & Glazing Coatings):

- Meets Code Requirements
- Match the Architectural Plans
- Are Not Modified During Construction
- Noted on the HLHG Report

BUILDING ENVELOPE ELEMENTS

WALLS

1/ (Wood Wall), Air Film - inside walls, // 1/2" Drywall, // 2*6, 16" OC w/ R6 Insulation, // 2" type 2 bread board as continuous insulation on exterior, // 1/2" Sheeting, // Wall Material - Softwood, air film - outside air; 29.91R-VALUE

CEILINGS

1/ (Ceiling), Air Film - inside ceiling, // 5/8 Drywall, // Ceiling Insulation, // 1/2" Sheathing, // 2" of type 2 insulation, air film - outside air; 57.84R-VALUE

INTERIOR FOUNDATION WALL

EXPOSED FLOOR

1/ (Floor - Exposed), Air Film - inside floors, // Hardwood, // Floor Insulation, // Aluminum Board, air film - outside air; 50.84R-VALUE

EXPOSED HEADER

1/ (Floor Header w/ Wood Walls); 32.3R-VALUE

2/ (Floor Header w/ Leger Boad); 35.37R-VALUE

WINDOWS

1/ (Door Window) double glazed, Fixed — Wood/Vinyl, insulating, clear, 6mm Air, USI: 3.13, SHGC: 0.59

2/ (Window - Typ) double glazed, Operable — Wood/Vinyl, insulating, clear, 6mm Air, USI: 2.44, SHGC: 0.49

SKYLIGHTS

DOORS

1/ (Door) Insulated metal — Polyurethane core, without storm door, USI: 0.91

SHADINGS

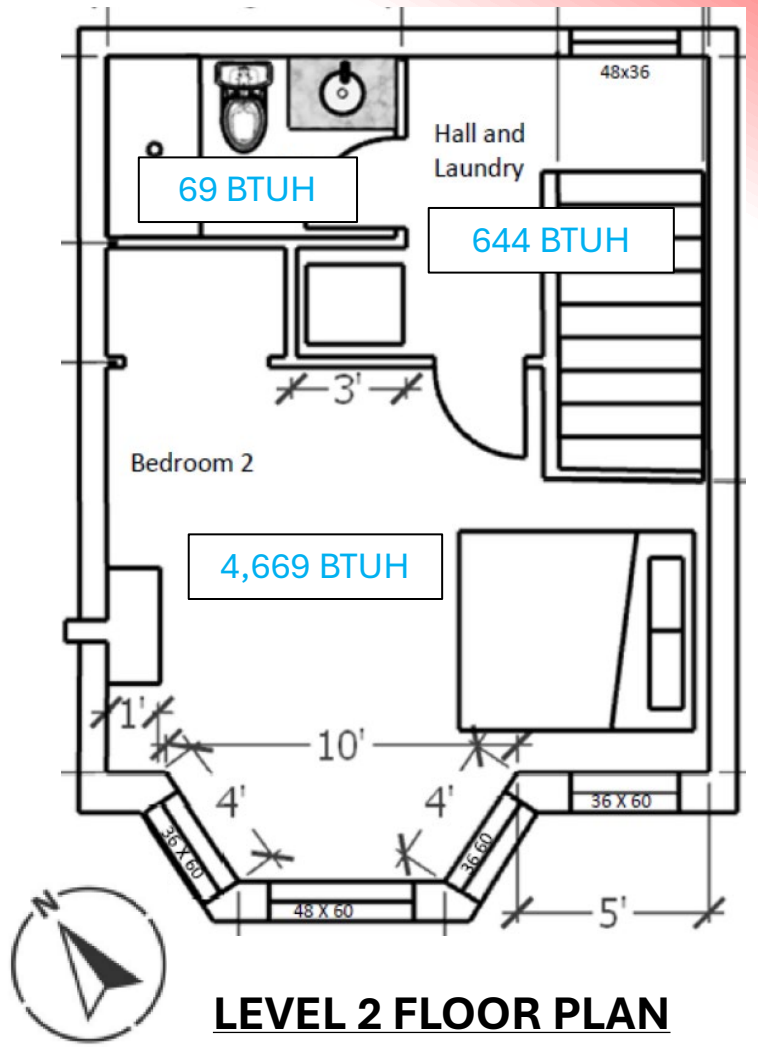
FOUNDATIONS

1/ [Basement / Lowest Floor] Concrete Slab & Walls, insulation: interior wall = 2.72RSI, exterior wall = 2.64RSI (configuration #69) // any first storey construction type, interior surface of wall insulated over full-height, exterior surface of wall insulated over full-height, sub-surface of floor slab fully insulated but no insulation under footings, thermal-break between walls and floor slab // AREA: 320ft², FULL PERIMETER: 72ft, EXPOSED PERIMETER: 72ft

FENESTRATION ERRORS

- Windows & Skylights are often the **highest** heat loss and heat gain components.
  - Mistakes inputting window sizes can result in equipment sizing and poor distribution systems.
  - Skylights have a huge impact and must be included!

HEAT GAIN COMPONENT BREAKDOWN, (BTUH)	WALL	CEILING	FLOOR	WINDOW & SKYLIGHT	DOOR & HATCH	LEAKAGE	VENTILATION	DISTRIBUTION & ADDITIONAL	INTERNAL	TOTAL SENSIBLE	TOTAL SENSIBLE + LATENT
ROOM NAME	WAL.	CEI.	FLR.	WIN.	DR.	LEAK.	VENT.	DIST.	INT.	SENS.	TOTAL
(#1)Bath #1	4					0				4	**5**
(#2)Bed #1	19		1	1857		6	464			2346	**3050**
(#3)Entrance - Basement	8				410	1				420	**546**
(#4)Kitchen & Living	138			3529	255	13	155		3088	7178	**9332**
(#5)Bath #2	27	25				0				53	**69**
(#6)Hall & Laundry	34	61		399		2				495	**644**
(#7)Bed #2	63	127		2879		10	155		358	3592	**4669**
	WAL.	CEI.	FLR.	WIN.	DR.	LEAK.	VENT.	DIST.	INT.	SENS.	TOTAL
TOTAL BUILDING	293	213	1	8664	665	33	773		3446	14087	18314
										MINIMUM INSTALLED OUTPUT CAPACITY:	14651



LEVEL 2 FLOOR PLAN

BUILDING ORIENTATION ERRORS

Solar Heat Gains:

- Heat Gain calculations are heavily impacted by building orientation
- Heat Loss calculations are **NOT** impacted by orientation.

Example:

- 20’ x 20’ Building
- 1 Door & 1 Window per Side

HEAT GAIN COMPONENT BREAKDOWN, (BTUH)

ROOM NAME	WAL.	CEI.	FLR.	WIN.	DR.	LEAK.	VENT.	DIST.	INT.	SENS.	TOTAL
(#1)North	1	59		534	1	1	77		802	1475	**1918**
(#2)East	39	59		1432	37	1	77		802	2447	**3181**
(#3)South	12	59		1072	12	1	77		802	2035	**2645**
(#4)West	39	59		1432	37	1	77		802	2447	**3181**
	WAL.	**CEI.**	**FLR.**	**WIN.**	**DR.**	**LEAK.**	**VENT.**	**DIST.**	**INT.**	**SENS.**	**TOTAL**
TOTAL BUILDING	**91**	**237**		**4469**	**87**	**4**	**309**		**3207**	**8404**	**10925**
										MINIMUM INSTALLED OUTPUT CAPACITY:	**8740**

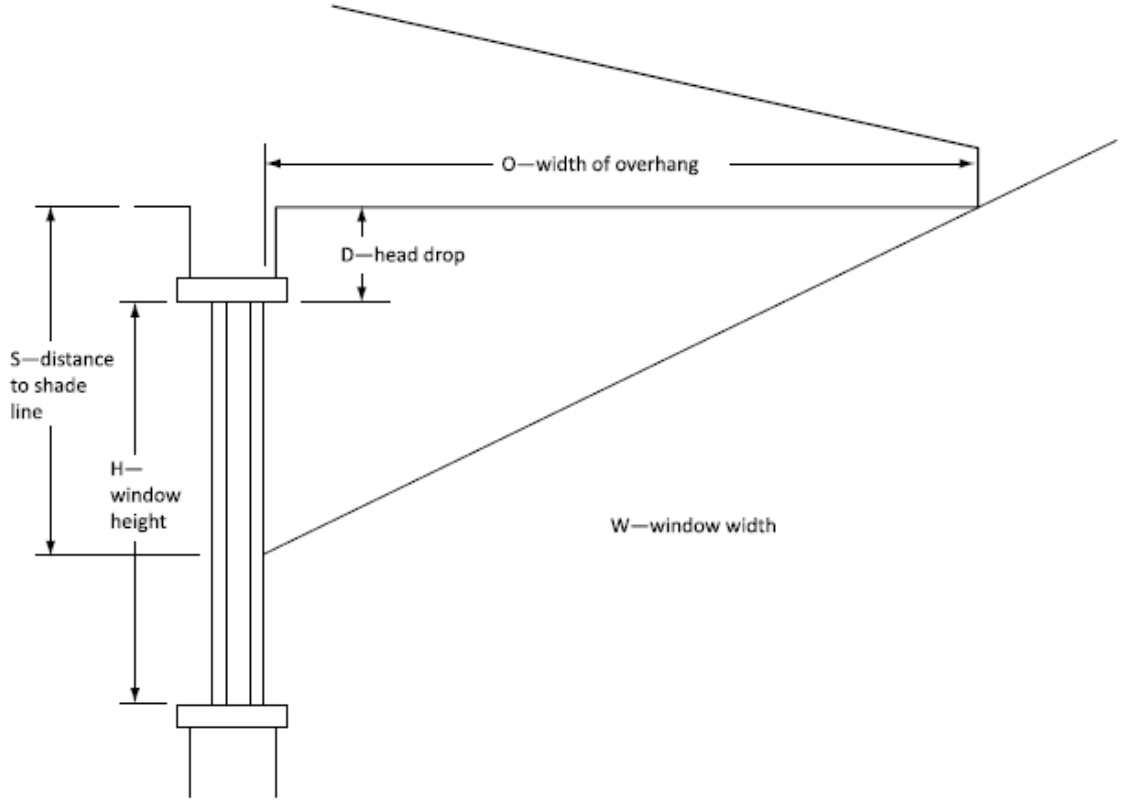
HEAT LOSS COMPONENT BREAKDOWN, (BTUH)

ROOM NAME	WAL.	CEI.	FLR.	WIN.	DR.	FND.	LEAK.	VENT.	DIST.	ADD.	TOTAL
(#1)North	196	90		718	188	266	28	202			**1688**
(#2)East	196	90		718	188	266	28	202			**1688**
(#3)South	196	90		718	188	266	28	202			**1688**
(#4)West	196	90		718	188	266	28	202			**1688**
	WAL.	**CEI.**	**FLR.**	**WIN.**	**DR.**	**FND.**	**LEAK.**	**VENT.**	**DIST.**	**ADD.**	**TOTAL**
TOTAL BUILDING	**785**	**361**		**2873**	**752**	**1062**	**111**	**807**			**6751**

OVERHANGS

- Latitude Impacts the Effectiveness of Overhangs
- The inclusion of overhangs is not required, omission will be conservative

Figure A.1
Calculation of shaded and unshaded areas of windows
(See Clause 6.2.2.1)



Direction window faces	F shade factor			
	North latitude, degrees			
	40	45	50	55
East/West	0.8	0.8	0.8	0.8
Southeast/Southwest	1.3	1.1	1	0.9
South	2.6	2	1.7	1.4

$S = F \times O$

Shaded area = $W \times (S - D)$ (should not exceed $H \times W$)

Unshaded area = $H \times W$ – (shaded area)

Note: *If D > S, then shaded area = O*

BLINDS & SHADINGS

Blinds & Shadings can be included to reduce Heat Gain loads

<u>WARNING: I do not recommend!</u>

- Relies on user input

Table 4
Curtain/blind shading factors
(See Clauses 3.2, 6.2.2.2, and B.6.2.2.1)

Type of interior shading	Type of glazing systems			
	Single	Double	Triple	Heat mirror
Interior blinds, curtains, etc.	0.50	0.55	0.57	0.60
Interior reflective metallic blinds or screens	0.35	0.37	0.40	0.44
Exterior roll shutters and screen shadings	see Notes 1) and 2)	see Notes 1) and 2)	see Notes 1) and 2)	see Notes 1) and 2)

Notes:

1) *Between pane reflective metallic blinds, and exterior shutters and screen shadings could generally be treated as walls with respect to solar gain, since the amount of solar transmitted is a small part of the load. In that case, the insulation value of the shade should only be added to the insulation value of the external shutter or shade.*
2) *For exterior shutters and screen shadings, use manufacturer's data when available. To account for both solar and conductive gains, refer to "Guidelines for Effective Residential Solar Shading Devices", Laouadi, A., National Research Council of Canada, March 2010, IRC-RR-300.*

VENTILATION ERRORS

- Only the Principal Ventilation System to be included
  - Do not include all ventilation fans in the dwelling
- Select the correct type of ventilation (HRV or Bath Fan)

Table 9.32.3.5 (Metric)
Principal Ventilation System Exhaust Fan Minimum Air-flow Rate
Forming part of Sentence 9.32.3.5.(1)

Floor Area, m²	Minimum Air-Flow Rate, L/s Number of Bedrooms				
	0 - 1	2 - 3	4 - 5	6 - 7	> 7
< 140	14	21	28	35	42
140 - 280	21	28	35	42	49
281 - 420	28	35	42	49	56
421 - 560	35	42	49	56	64
561 - 700	42	49	56	64	71
> 700	49	56	64	71	78

Floor areas for ventilation system sizing should include all heated floor areas, and open to below areas

Table 9.32.3.5 (Imperial)
Principal Ventilation System Exhaust Fan Minimum Air-flow Rate
Forming part of Sentence 9.32.3.5.(1)

Floor Area, ft²	Minimum Air-Flow Rate, CFM Number of Bedrooms				
	0 - 1	2 - 3	4 - 5	6 - 7	> 7
< 1507	30	45	60	75	89
1507 - 3025	45	60	75	89	104
3025 - 4532	60	75	89	104	119
4532 - 6039	75	89	104	119	136
6039 - 7535	89	104	119	136	151
> 7535	104	119	136	151	166

Floor areas for ventilation system sizing should include all heated floor areas, and open to below areas

REFUGE ROOM EXAMPLE

9.33.3.1. Indoor Design Temperatures

2) At the outside summer design temperature, **required cooling** facilities shall be capable of maintaining an indoor air temperature of **not more than 26°C** in at least one living space in each dwelling unit.

*NOTE: Sentence **9.33.3.1. 2)** applies only to the BCBC.

REFUGE ROOM EXAMPLE

The designer submits a heat loss & heat gain calculation.

They only intend to cool **only** the Bedroom #2 and point to the Heat Gain Summary total of **4,669 BTUH.**

Is this the correct value?

HEAT LOSS & HEAT GAIN SUMMARY, (BTUH) imperial

ROOM NAME	FLOOR LEVEL	FL AREA (ft²)	HEAT LOSS TOTAL	HEAT GAIN SENS.	HEAT GAIN **TOTAL (sensible + latent)**
(#1)Bath #1	1	84	363	4	5
(#2)Bed #1	1	180	1935	2346	3050
(#3)Entrance - Basement	1	80	873	420	546
(#4)Kitchen & Living	2	344	3655	7178	9332
(#5)Bath #2	3	40	258	53	69
(#6)Hall & Laundry	3	89	684	495	644
(#7)Bed #2	3	215	2596	3592	4669
		AREA	HEAT LOSS	GAIN (sens.)	GAIN (total)
OVERALL BUILDING		1032	10365	14087	**18314**

REFUGE ROOM EXAMPLE

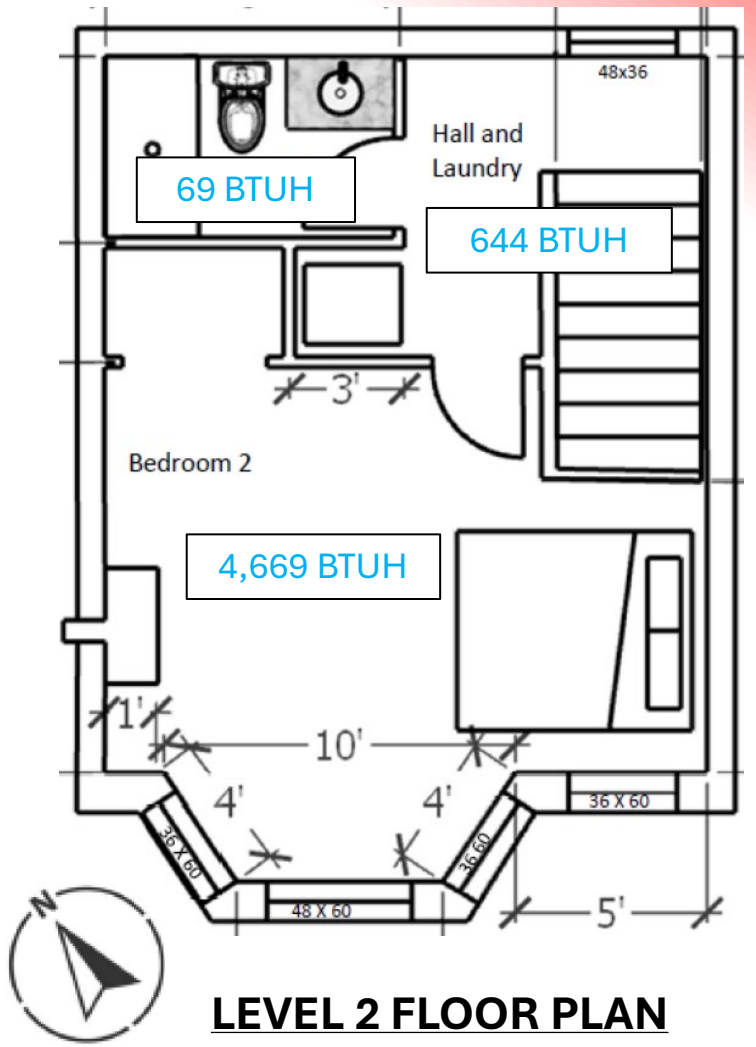
No, this is not a correct model!

Why?

HEAT LOSS & HEAT GAIN SUMMARY, (BTUH) imperial

ROOM NAME	FLOOR LEVEL	FL AREA (ft²)	HEAT LOSS TOTAL	HEAT GAIN SENS.	HEAT GAIN **TOTAL (sensible + latent)**
(#1)Bath #1	1	84	363	4	5
(#2)Bed #1	1	180	1935	2346	3050
(#3)Entrance - Basement	1	80	873	420	546
(#4)Kitchen & Living	2	344	3655	7178	9332
(#5)Bath #2	3	40	258	53	69
(#6)Hall & Laundry	3	89	684	495	644
(#7)Bed #2	3	215	2596	3592	4669

	AREA	HEAT LOSS	GAIN (sens.)	GAIN (total)
OVERALL BUILDING	1032	10365	14087	**18314**



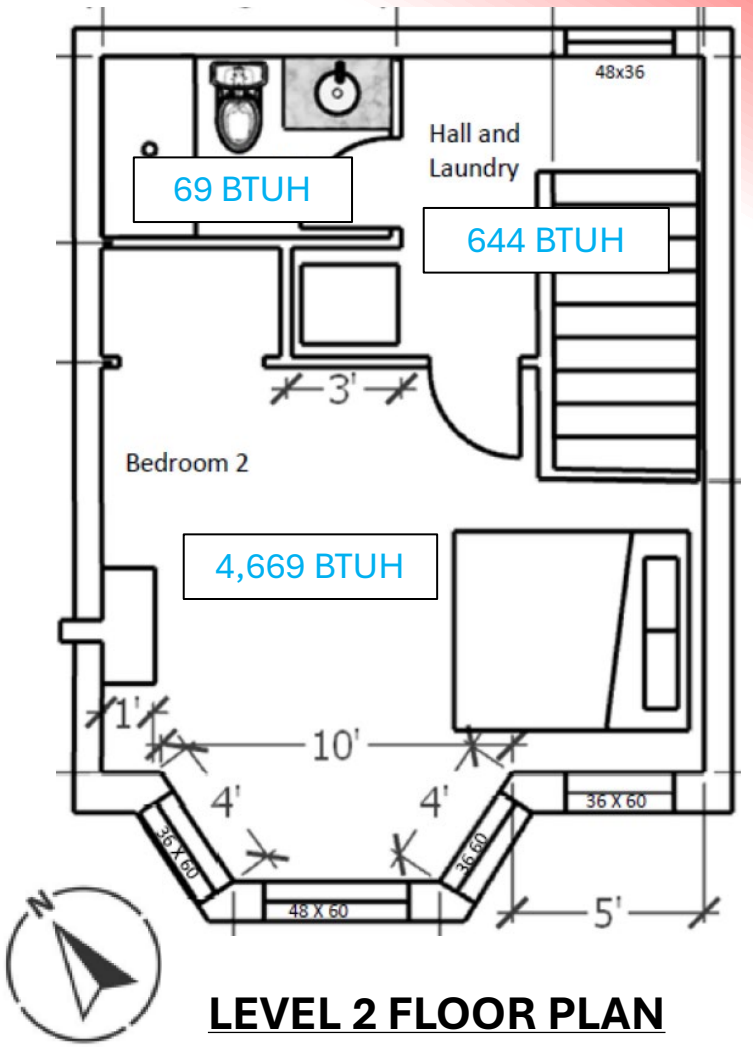
LEVEL 2 FLOOR PLAN

REFUGE ROOM EXAMPLE

Errors in Modeling:

- The heat gain calculation was performed on the **entire dwelling**, not just the bedroom #2.
  - Interior walls and floors will be assumed to have **no heat transfer** because they are modeled as conditioned spaces.
- Have the **occupants** been included in the calculation?
  - Refer to the Component Breakdown

HEAT GAIN COMPONENT BREAKDOWN, (BTUH)	WALL	CEILING	FLOOR	WINDOW & SKYLIGHT	DOOR & HATCH	LEAKAGE	VENTILATION	DISTRIBUTION & ADDITIONAL	INTERNAL	TOTAL SENSIBLE	TOTAL SENSIBLE + LATENT
ROOM NAME	WAL.	CEI.	FLR.	WIN.	DR.	LEAK.	VENT.	DIST.	INT.	SENS.	TOTAL
(#1)Bath #1	4					0				4	5
(#2)Bed #1	19		1	1857		6	464			2346	3050
(#3)Entrance - Basement	8				410	1				420	546
(#4)Kitchen & Living	138			3529	255	13	155		3088	7178	9332
(#5)Bath #2	27	25				0				53	69
(#6)Hall & Laundry	34	61		399		2				495	644
(#7)Bed #2	63	127		2879		10	155		358	3592	4669
	WAL.	CEI.	FLR.	WIN.	DR.	LEAK.	VENT.	DIST.	INT.	SENS.	TOTAL
TOTAL BUILDING	293	213	1	8664	665	33	773		3446	14087	18314
										MINIMUM INSTALLED OUTPUT CAPACITY:	14651

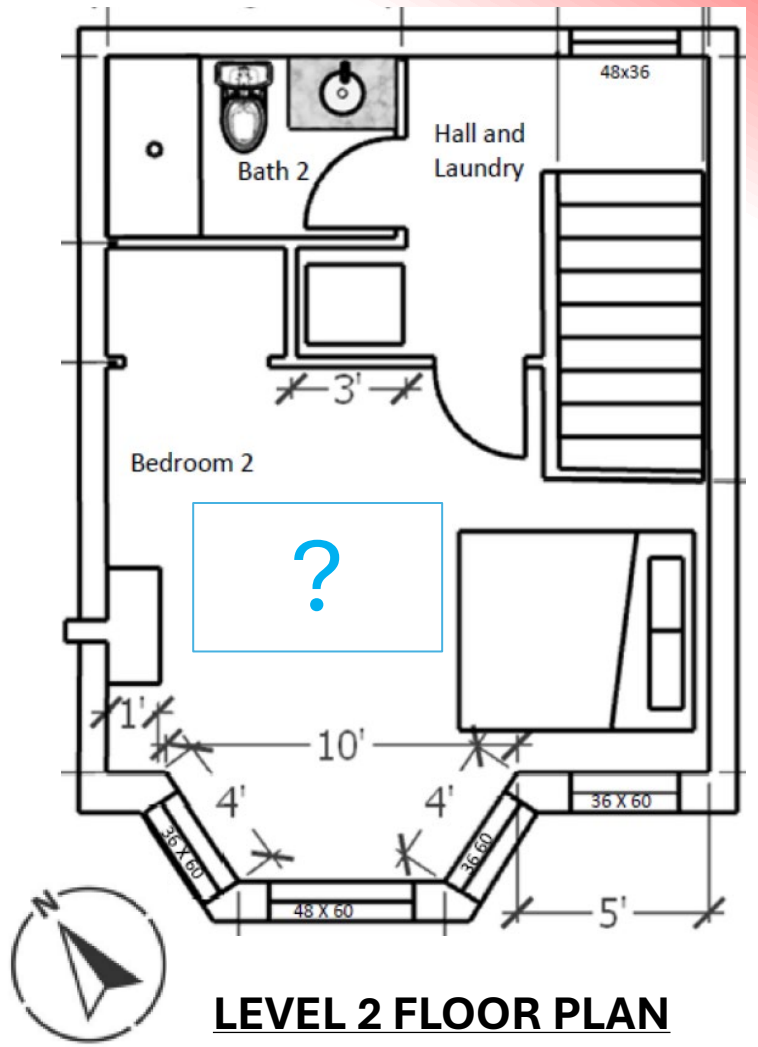


LEVEL 2 FLOOR PLAN

REFUGE ROOM EXAMPLE

How to Model (IN MY OPINION):

- Only calculate heat gain on the single room.
- Interior walls can be assumed to be at outdoor design conditions (very conservative).
- Include all dwelling occupants in this room.
- Assume a min. electrical load of 800 Watts (2,730 BTUH).
- Indoor setpoint temperature of 26°C (typically 24°C)



LEVEL 2 FLOOR PLAN

REFUGE ROOM COMPARISON

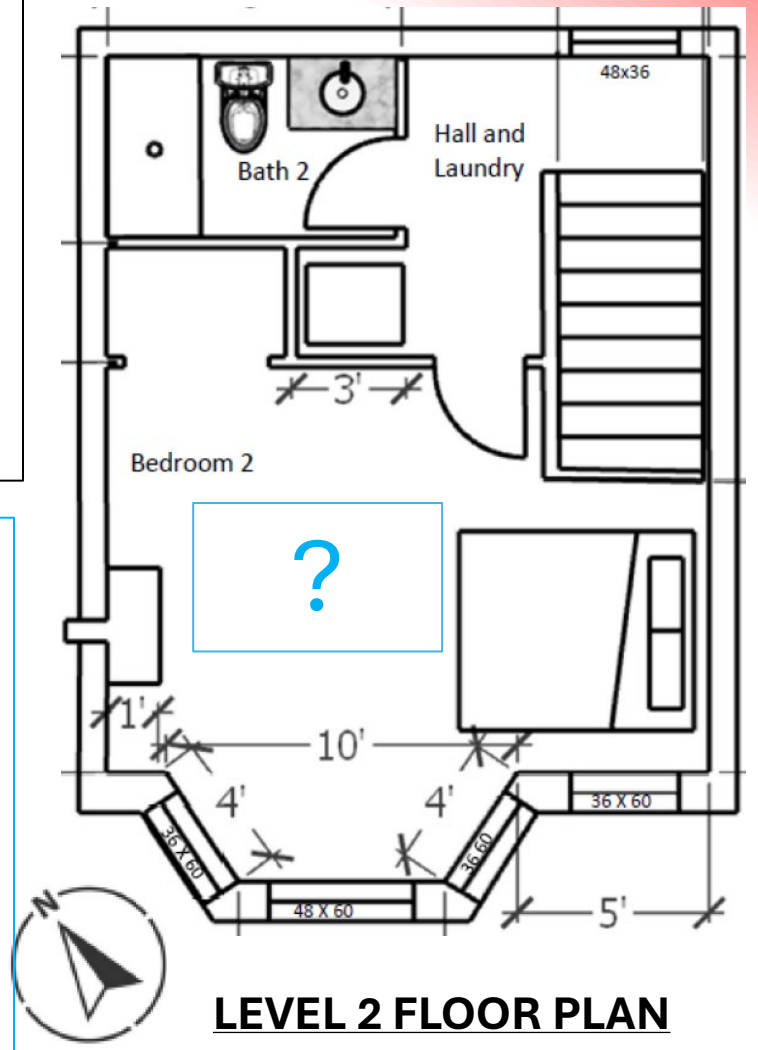
HEAT GAIN COMPONENT BREAKDOWN, (BTUH)	WALL	CEILING	FLOOR	WINDOW & SKYLIGHT	DOOR & HATCH	LEAKAGE	VENTILATION	DISTRIBUTION & ADDITIONAL	INTERNAL	TOTAL SENSIBLE	TOTAL SENSIBLE + LATENT
ROOM NAME	WAL.	CEI.	FLR.	WIN.	DR.	LEAK.	VENT.	DIST.	INT.	SENS.	TOTAL
TOTAL BUILDING	49	114		2778		7	77		3446	6472	8413
MINIMUM INSTALLED OUTPUT CAPACITY:											6730

HEAT GAIN COMPONENT BREAKDOWN, (BTUH)	WALL	CEILING	FLOOR	WINDOW & SKYLIGHT	DOOR & HATCH	LEAKAGE	VENTILATION	DISTRIBUTION & ADDITIONAL	INTERNAL	TOTAL SENSIBLE	TOTAL SENSIBLE + LATENT
ROOM NAME	WAL.	CEI.	FLR.	WIN.	DR.	LEAK.	VENT.	DIST.	INT.	SENS.	TOTAL
(#1)Bath #1	4					0				4	5
(#2)Bed #1	19		1	1857		6	464			2346	3050
(#3)Entrance - Basement	8				410	1				420	546
(#4)Kitchen & Living	138			3529	255	13	155		3088	7178	9332
(#5)Bath #2	27	25				0				53	69
(#6)Hall & Laundry	34	61		399		2				495	644
(#7)Bed #2	63	127		2879		10	155		358	3592	4669
TOTAL BUILDING	293	213	1	8664	665	33	773		3446	14087	18314
MINIMUM INSTALLED OUTPUT CAPACITY:											14651

CSA F280-12

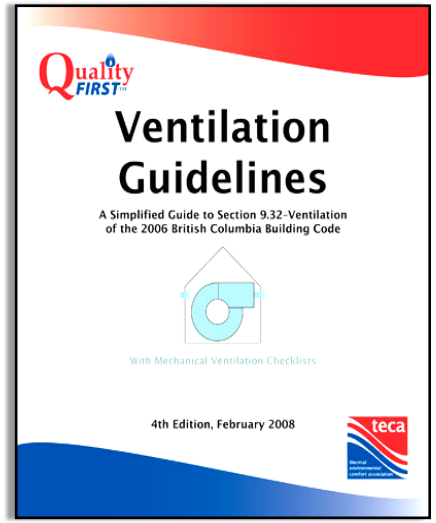
Allows for 80% of total heat gain for minimum sizing.

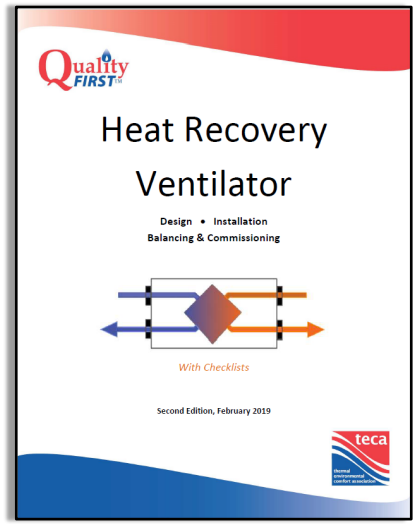
*Some values lower because indoor temperature is **26°C** rather than **24°C**.

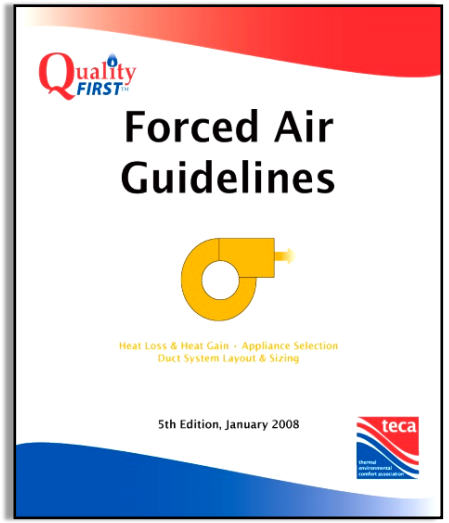


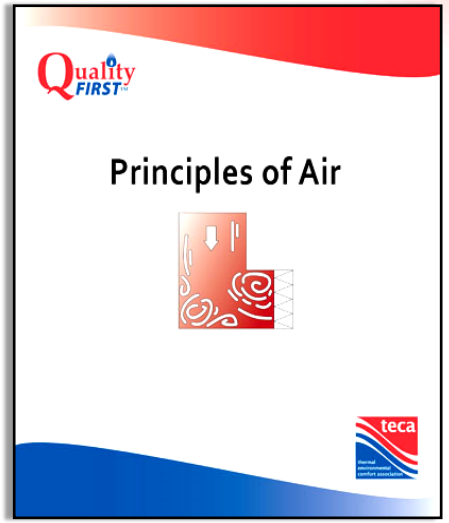
LEVEL 2 FLOOR PLAN

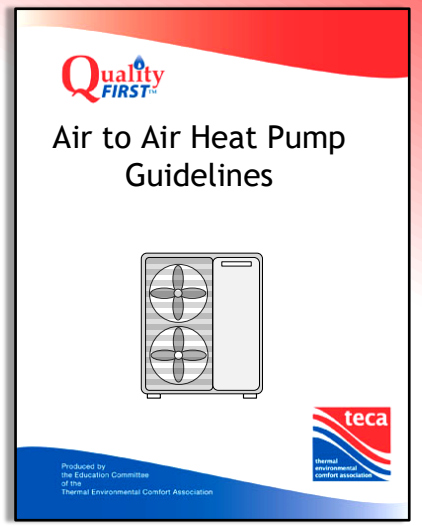
TECA COURSES

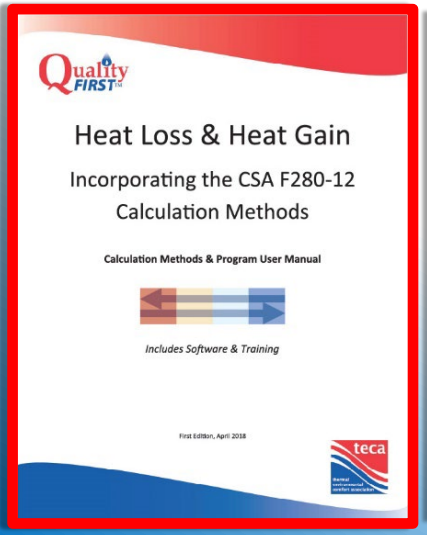


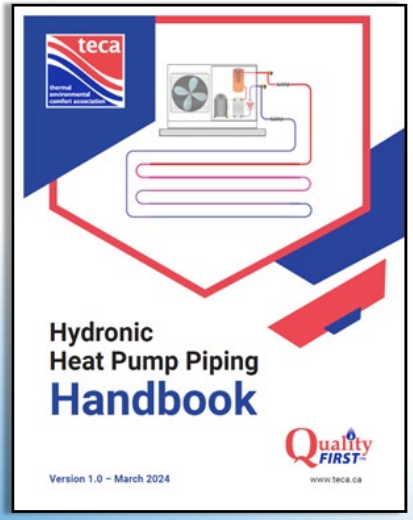


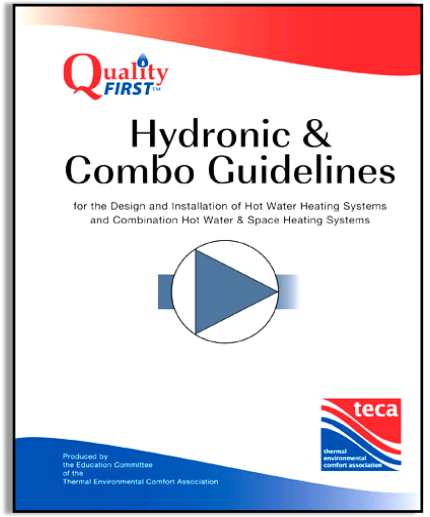


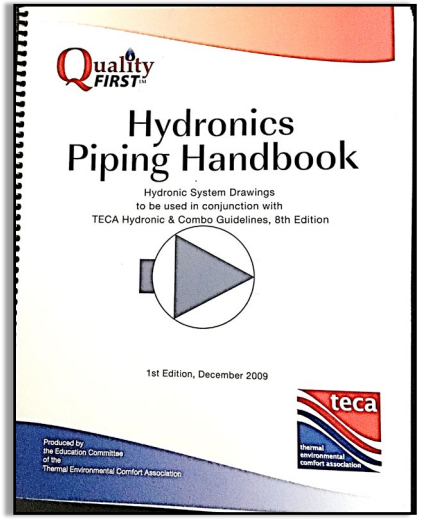












QUESTIONS & COMMENTS?

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END

CSA F280-12 SCOPE

1.3 - Scope

This Standard applies to space heating and cooling appliances for use in housing and small buildings of residential occupancy to which **Part 9** of the National Building Code of Canada applies, **where the appliances are permanently installed** within the dwelling unit they serve.

CSA F280-12 REPORTING

7.1 - Reporting

A table of inputs shall be prepared that lists all of the pertinent information and assumptions upon which the calculation is based, including but not limited to

a) a **list of the input data** contained in the "Heat loss and gain calculation summary sheet" shown in Annex D; and

b) the **working fluid temperature** for heating floor assemblies in contact with soil or exposed to the exterior.

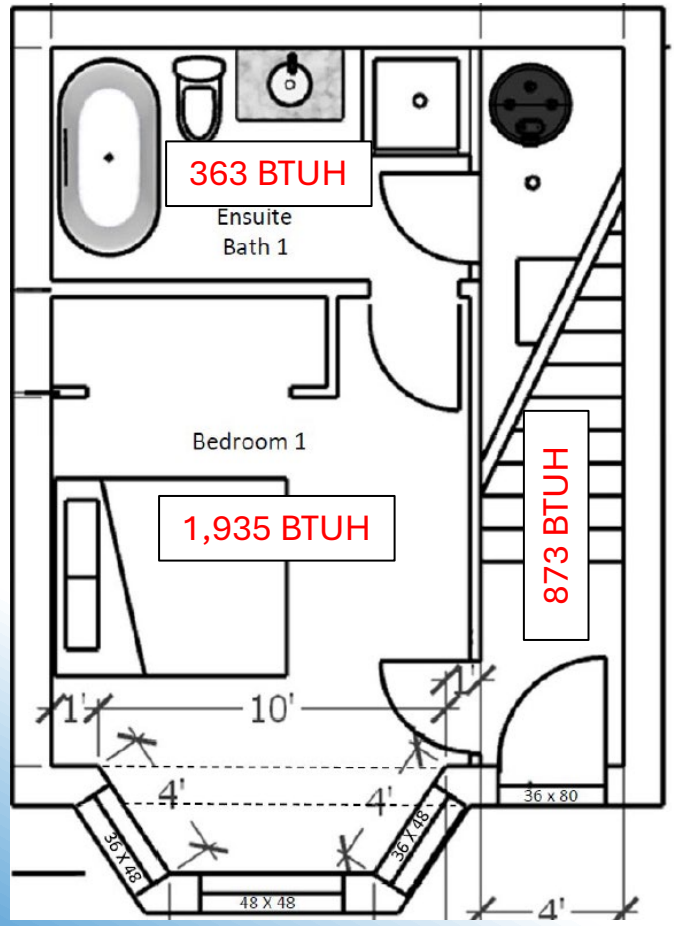
CSA F280-12 REPORTING

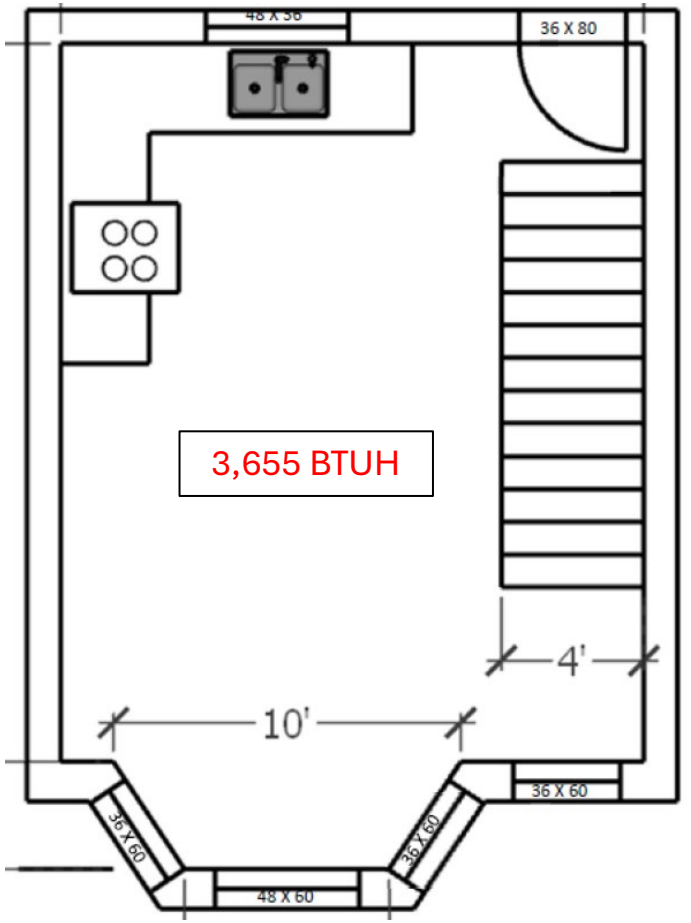
7.2 - Reporting

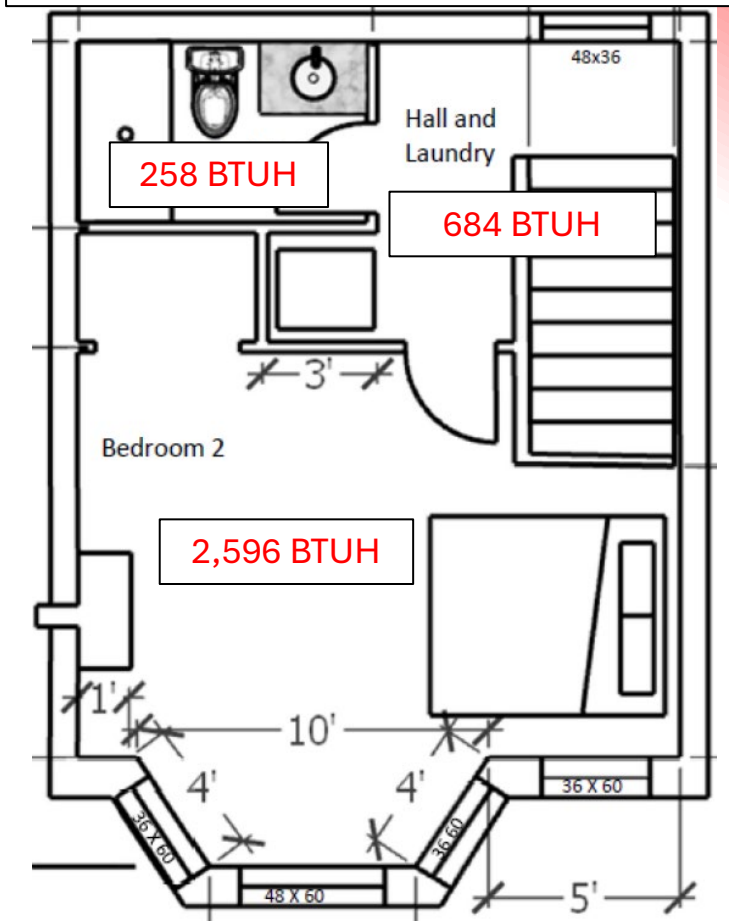
Where the **facing direction, air-tightness, or interior window shading of the building is not known** at the time of preparation of the calculation (i.e., in cases where the home is not yet built), **the table of inputs shall clearly indicate that these values are assumed**.

HEAT LOSS

HEAT LOSS COMPONENT BREAKDOWN, (BTUH)	WALL	CEILING	FLOOR	WINDOW & SKYLIGHT	DOOR & HATCH	FOUNDATION	LEAKAGE	VENTILATION	DISTRIBUTION	ADDITIONAL	
ROOM NAME	WAL.	CEI.	FLR.	WIN.	DR.	FND.	LEAK.	VENT.	DIST.	ADD.	TOTAL
(#1)Bath #1	28					287	48				363
(#2)Bed #1	127		5	897		300	204	403			1935
(#3)Entrance - Basement	62				289	406	116				873
(#4)Kitchen & Living	1015			1726	289		221	403			3655
(#5)Bath #2	207	39					12				258
(#6)Hall & Laundry	291	92		269			32				684
(#7)Bed #2	438	194		1457			103	403			2596
	WAL.	CEI.	FLR.	WIN.	DR.	FND.	LEAK.	VENT.	DIST.	ADD.	TOTAL
TOTAL BUILDING	2167	325	5	4350	579	993	736	1210			10365







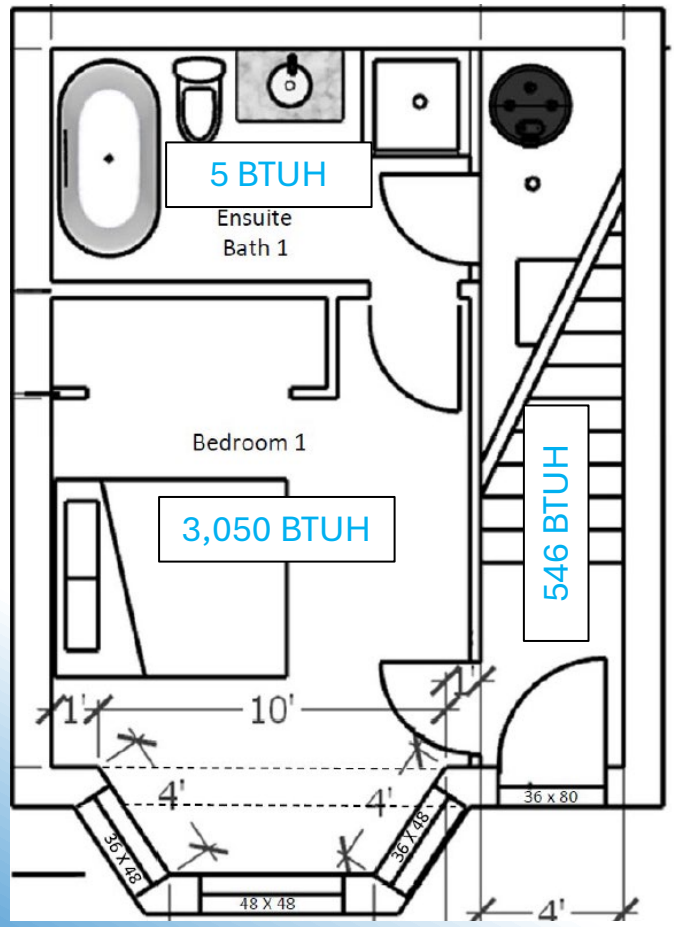
BASEMENT FLOOR PLAN

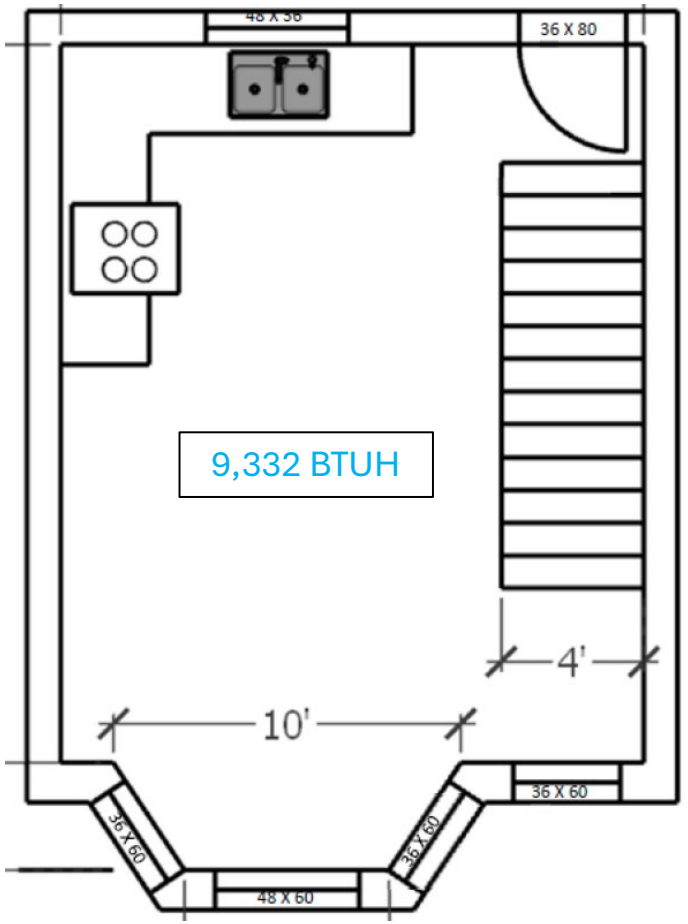
LEVEL 1 FLOOR PLAN

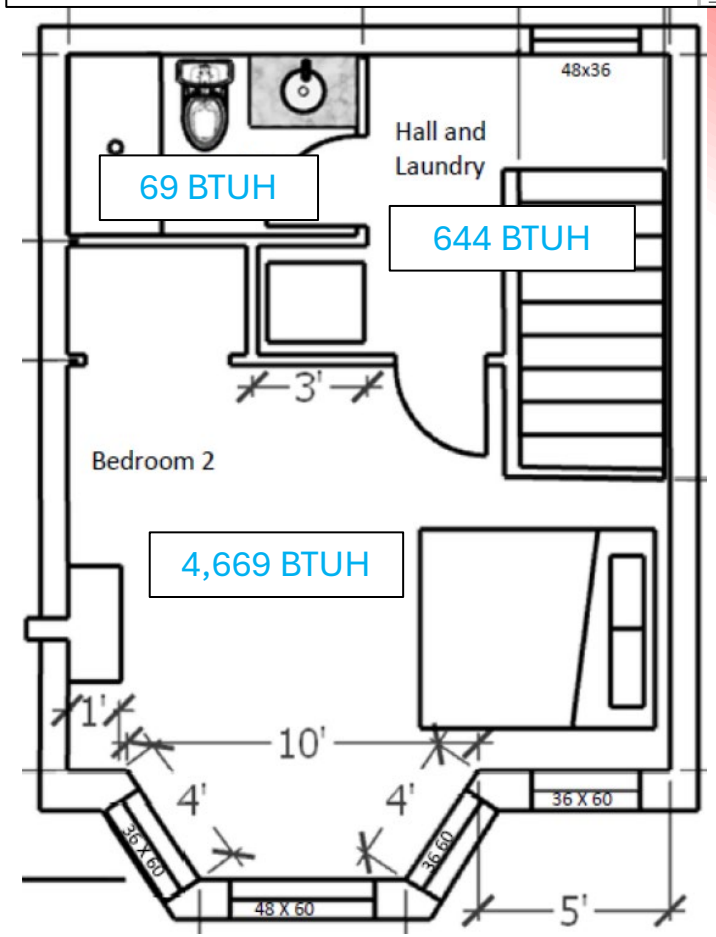
LEVEL 2 FLOOR PLAN

HEAT GAIN

HEAT GAIN COMPONENT BREAKDOWN, (BTUH)	WALL	CEILING	FLOOR	WINDOW & SKYLIGHT	DOOR & HATCH	LEAKAGE	VENTILATION	DISTRIBUTION & ADDITIONAL	INTERNAL	TOTAL SENSIBLE	TOTAL SENSIBLE + LATENT
ROOM NAME	WAL.	CEI.	FLR.	WIN.	DR.	LEAK.	VENT.	DIST.	INT.	SENS.	TOTAL
(#1)Bath #1	4					0				4	5
(#2)Bed #1	19		1	1857		6	464			2346	3050
(#3)Entrance - Basement	8				410	1				420	546
(#4)Kitchen & Living	138			3529	255	13	155		3088	7178	9332
(#5)Bath #2	27	25				0				53	69
(#6)Hall & Laundry	34	61		399		2				495	644
(#7)Bed #2	63	127		2879		10	155		358	3592	4669
	WAL.	CEI.	FLR.	WIN.	DR.	LEAK.	VENT.	DIST.	INT.	SENS.	TOTAL
TOTAL BUILDING	293	213	1	8664	665	33	773		3446	14087	18314
										MINIMUM INSTALLED OUTPUT CAPACITY:	14651







BASEMENT FLOOR PLAN

LEVEL 1 FLOOR PLAN

LEVEL 2 FLOOR PLAN