Presented to:

BOABC Webinar

CSA F280 HVAC Requirements & Single Zone Cooling for Part 9 Buildings

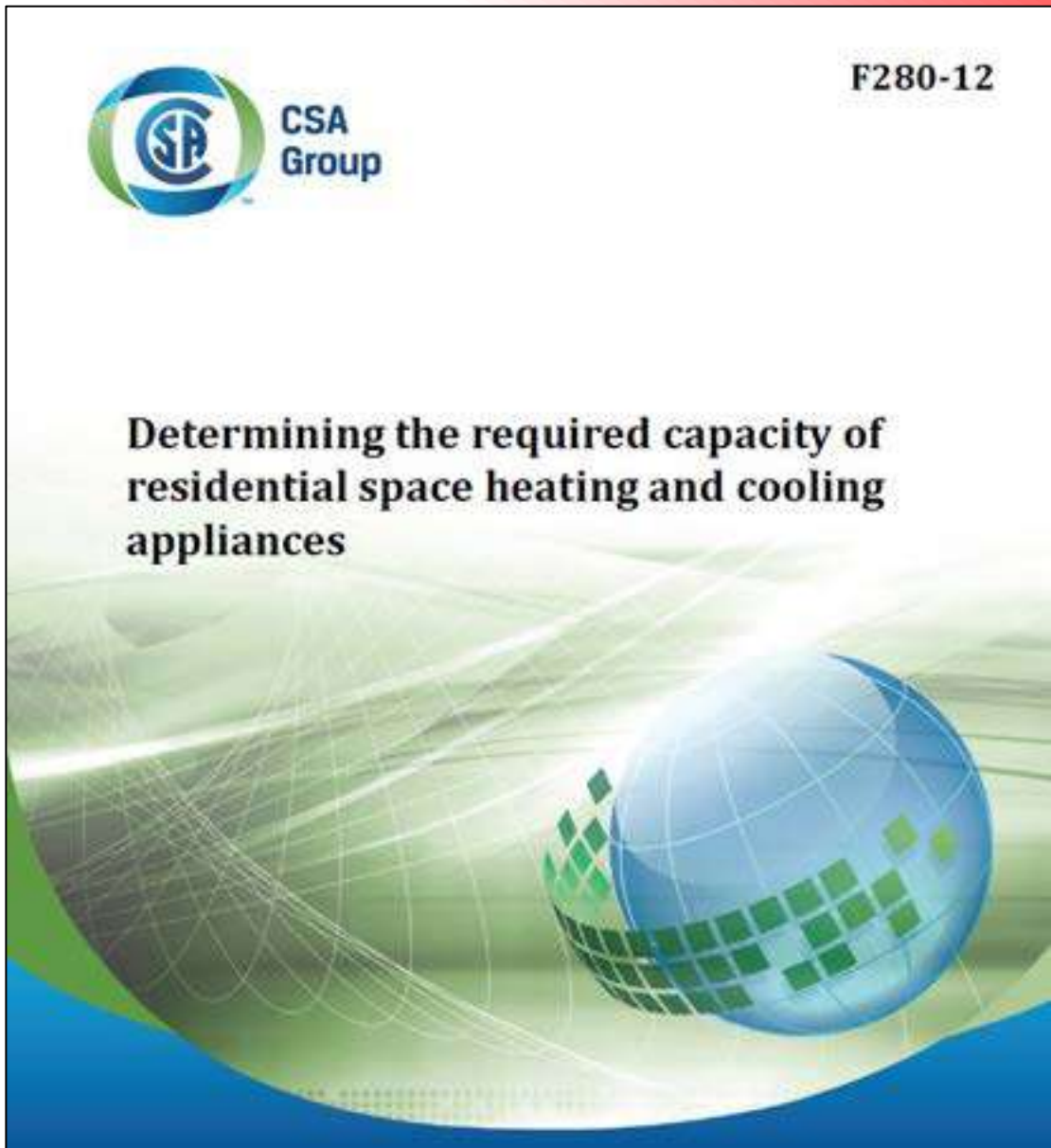
Presented by:

Todd Backus, P.Eng.

March 18th, 2025

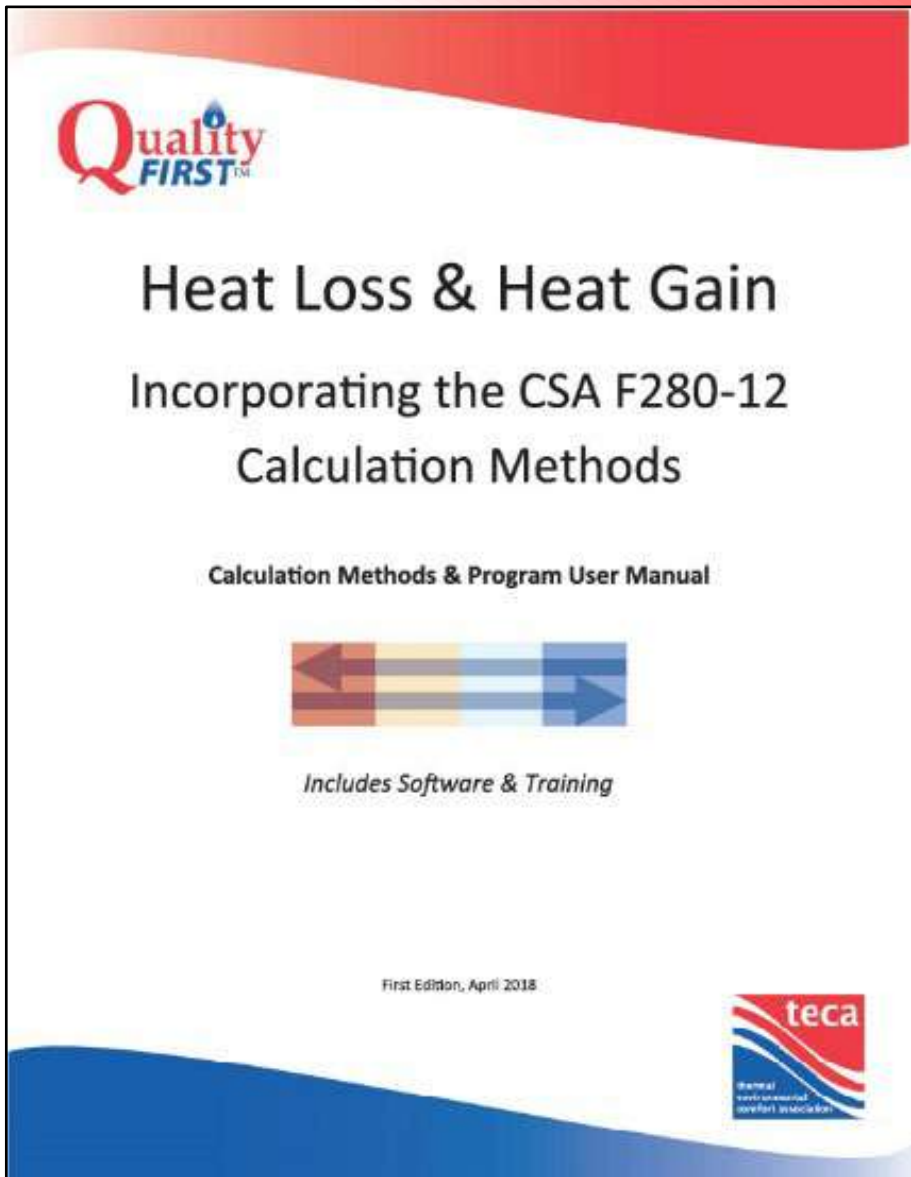
AGENDA

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



ABOUT TECA

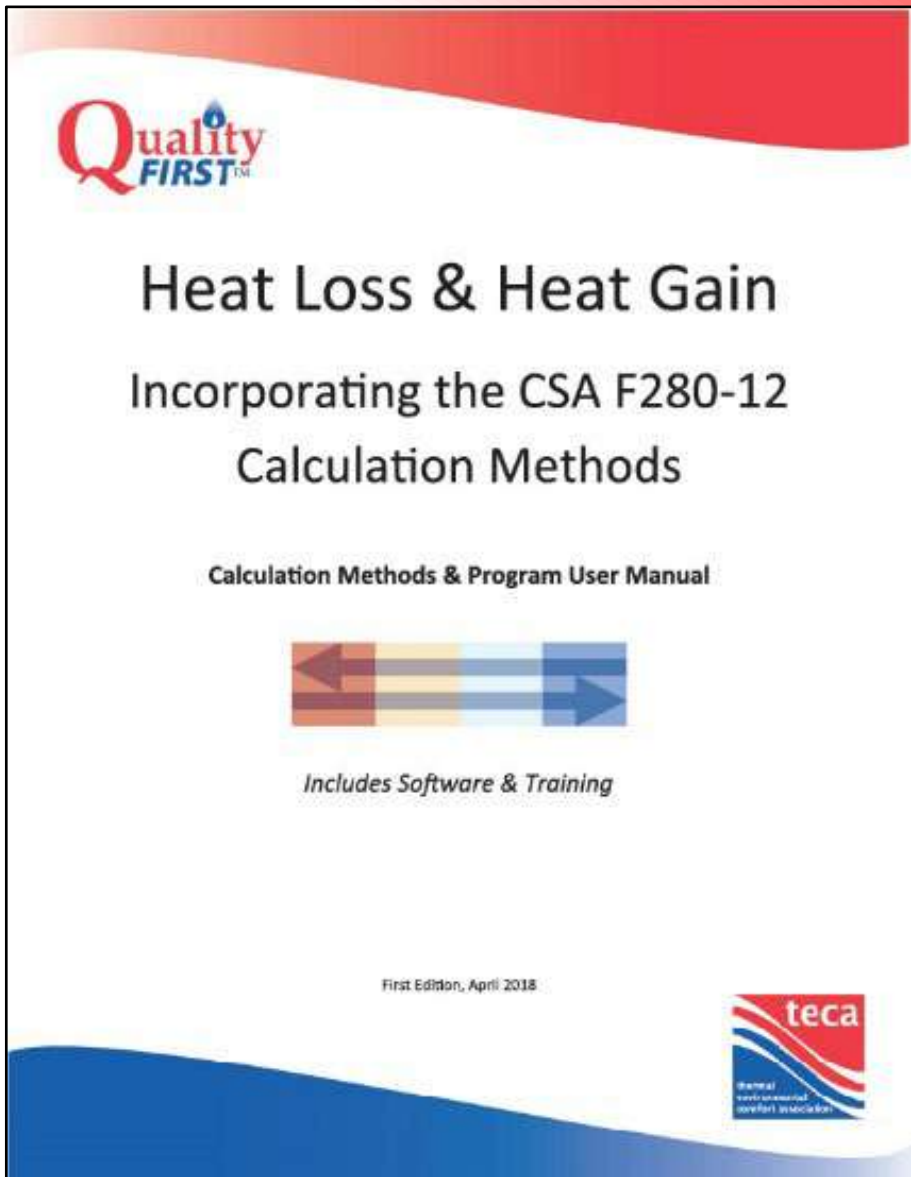
- Non-Profit Trade Association
- Our Mission:
  - Further Education in the HVAC Industry
  - Develop & Provide Training in the HVAC Industry
  - Practical Training for Trades People & Inspectors
  - Advocate for the HVAC Trades to Government
  - Advise Regulators & Building Officials on Best Practices



ABOUT TECA

TECA provides:

- Training for Heat Loss & Heat Gain calculations
- TECA's HLHG calculator is required for the course
- Collaboration with HPSC
  - Acceptable courses for Home Performance Contractor Network - HVAC certification



BCBC HVAC REQUIREMENTS

Major HVAC Sections in Part 9:

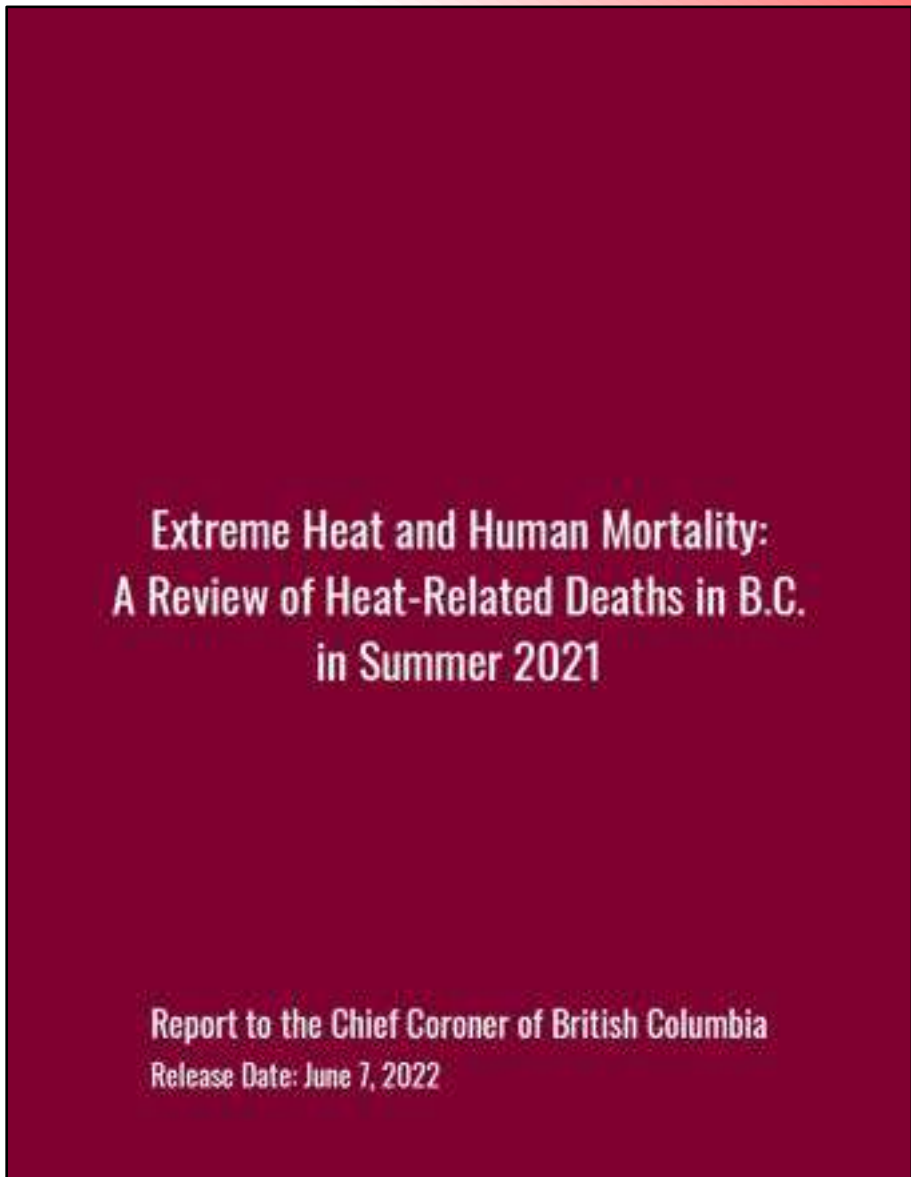
- 9.32. Ventilation
- 9.33. Heating & Air Conditioning
- 9.36. Energy Efficiency

Equipment efficiency:

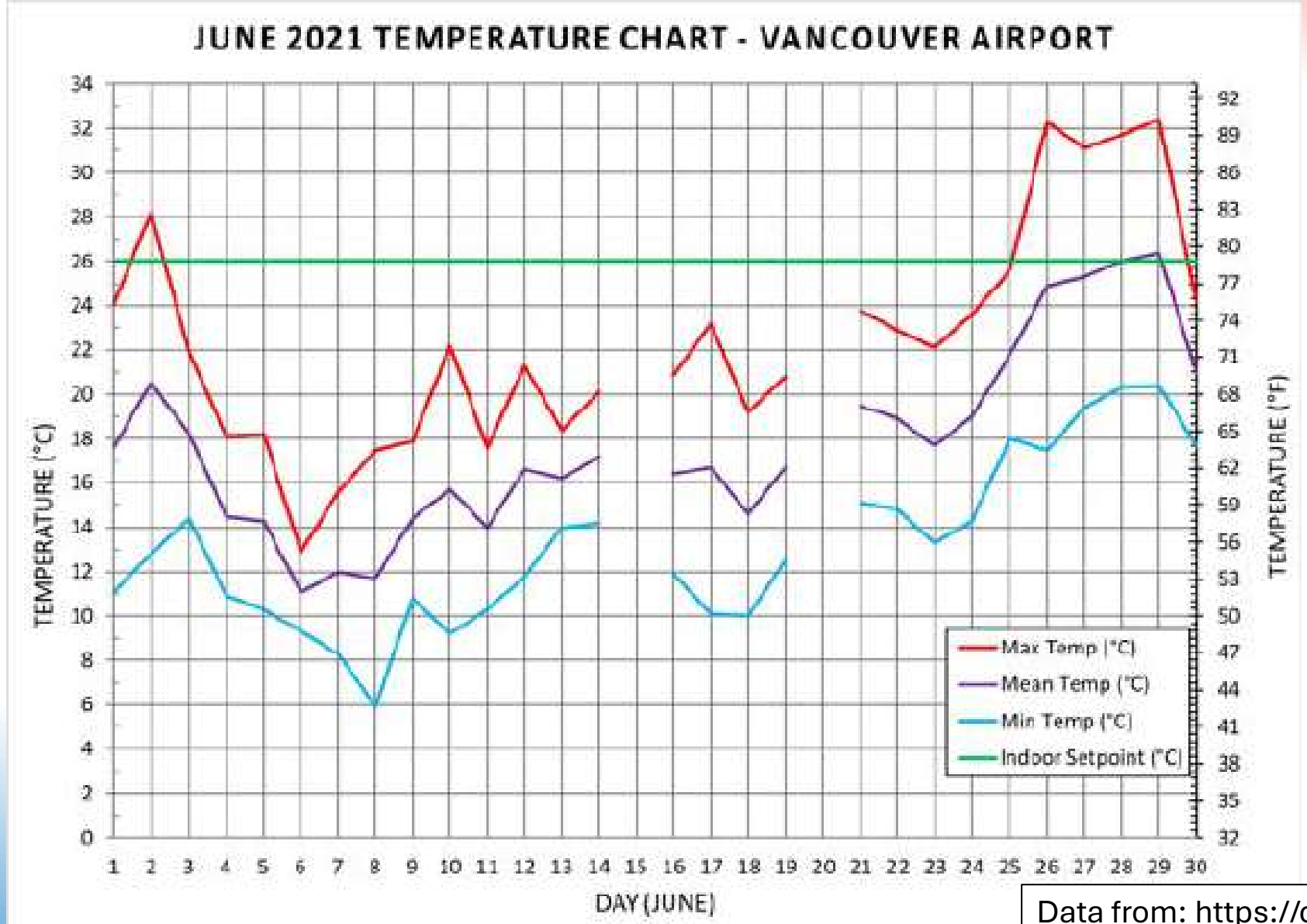
- 9.37. GHG Emissions

EXTREME HEAT REPORT

- Extreme heat wave (or heat dome)
- 619 deaths from extreme heat
  - June 25th - July 1st, 2021
  - 98% of deaths occurred indoors
- High pressure area trapped heat for days & set record temperatures
  - Many locations hit 40°C (104°F)
  - Overnight temperatures stayed high



EXTREME HEAT REPORT



Data from: https://climate.weather.gc.ca/

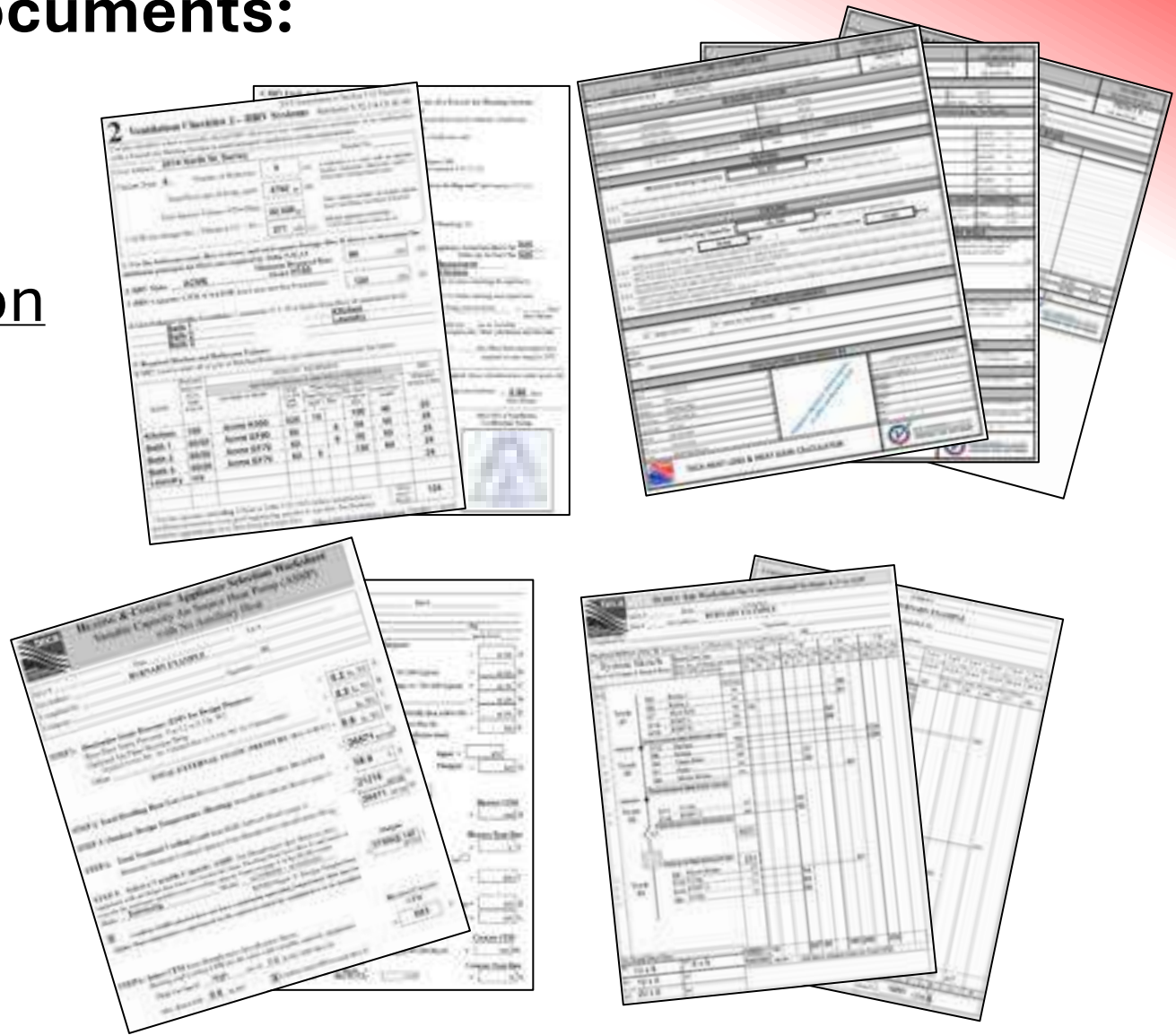
CSA F280 COMPLIANCE

- Critical for proper equipment selection
  - Proper calculations & documentation is the foundation of HVAC design
- Required for sizing distribution systems
  - Duct sizing, and/or
  - Hydronic piping
- Verification of code compliance
  - Reports must be reviewed by AHJ
  - Standard report format facilitates reviews

DESIGN & PLAN CHECKING

Recommended Building Permit Documents:

- Ventilation Checklist
- Heat Loss & Heat Gain Calculation
- Equipment Selection Worksheet
- Design Summary
- System Drawings & Schematics
- Required Permits

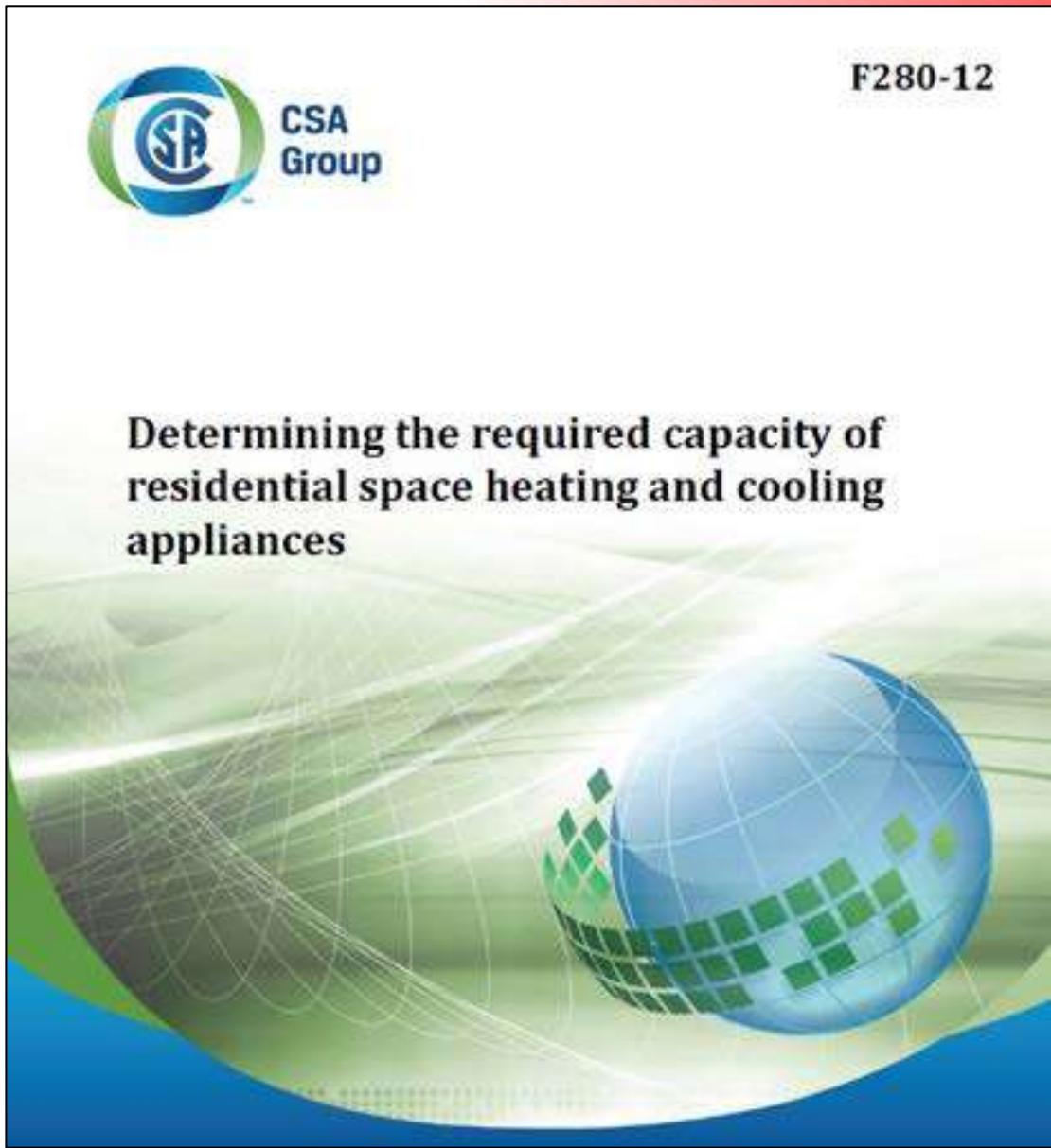


CSA F280-12 (R2021)

CSA F280 STANDARD

Scope of CSA F280-12 (R2021):

- Calculation method for heat loss & heat gain
- Used for selecting equipment
- Applies to Part 9 Buildings
- **Does not** comment on distribution systems or installation practices
- **Only outputs peak loads!**



CSA F280 STANDARD

- For **entire dwelling** heating & cooling
- **NOT** designed to model a single room
  - Assumptions must be made to model a single room
- **TECA & HVAC DC:**
  - Finalizing modeling guidelines

Guideline on Single Zone Cooling in Dwelling Units

Version 1.0 February 17, 2025

The BC Building Code (BCBC)-2024 introduced a maximum design temperature limit of 26°C for a minimum of a single living space in each dwelling unit. In April 2024, the Province of BC's Building's Safety and Standards Branch (BSSB) released Information Bulletin No. B24-08 that provides information on the new provisions in the BCBC 2024 related to minimizing the risks to health and safety due to overheating in dwelling units. Although the BSSB bulletin provided general information on requirements, and strategies with mechanical cooling systems as well as some passive design measures, it did not provide the necessary depth on the technical considerations to meet the BCBC 2024 requirements.

To address these concerns, HVAC Designers of Canada (HVAC DC) and the Thermal Environmental Comfort Association (TECA) together with stakeholders from the home building sector have developed a Guideline on Single Zone Cooling in Dwelling Units.

We thank the following individuals and organizations for their valuable contribution to the development of this Guideline.

Todd Backus,	Thermal Environmental Comfort Association
Dara Bowser,	HVAC Designers of Canada
Liam Butters,	Ecology Consulting
Sean Capstick,	City of Langford
Ryan Coleman	Ecolighten Energy Solutions
Chris Dawe,	Our Energy Consulting
John Harris	Heating Refrigeration & Air Conditioning Institute
Seamus Jones,	Natural Resources Canada, LEEP
Pete Koefgen,	Fortis BC
Wilma Leung,	BC Housing
Matt McMaster	City of Nanaimo
Rob Pope,	Ecolighten Energy Solutions
Pauline Rupp,	Canadian Home Builders Association of BC
Robin Sandilands,	Avenir Software
Scott Williams,	BC Building and Safety Standards Branch

This document was developed with financial support from Natural Resources Canada LEEP, based on a CSA F280-12 Seed Document on single zone cooling.

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

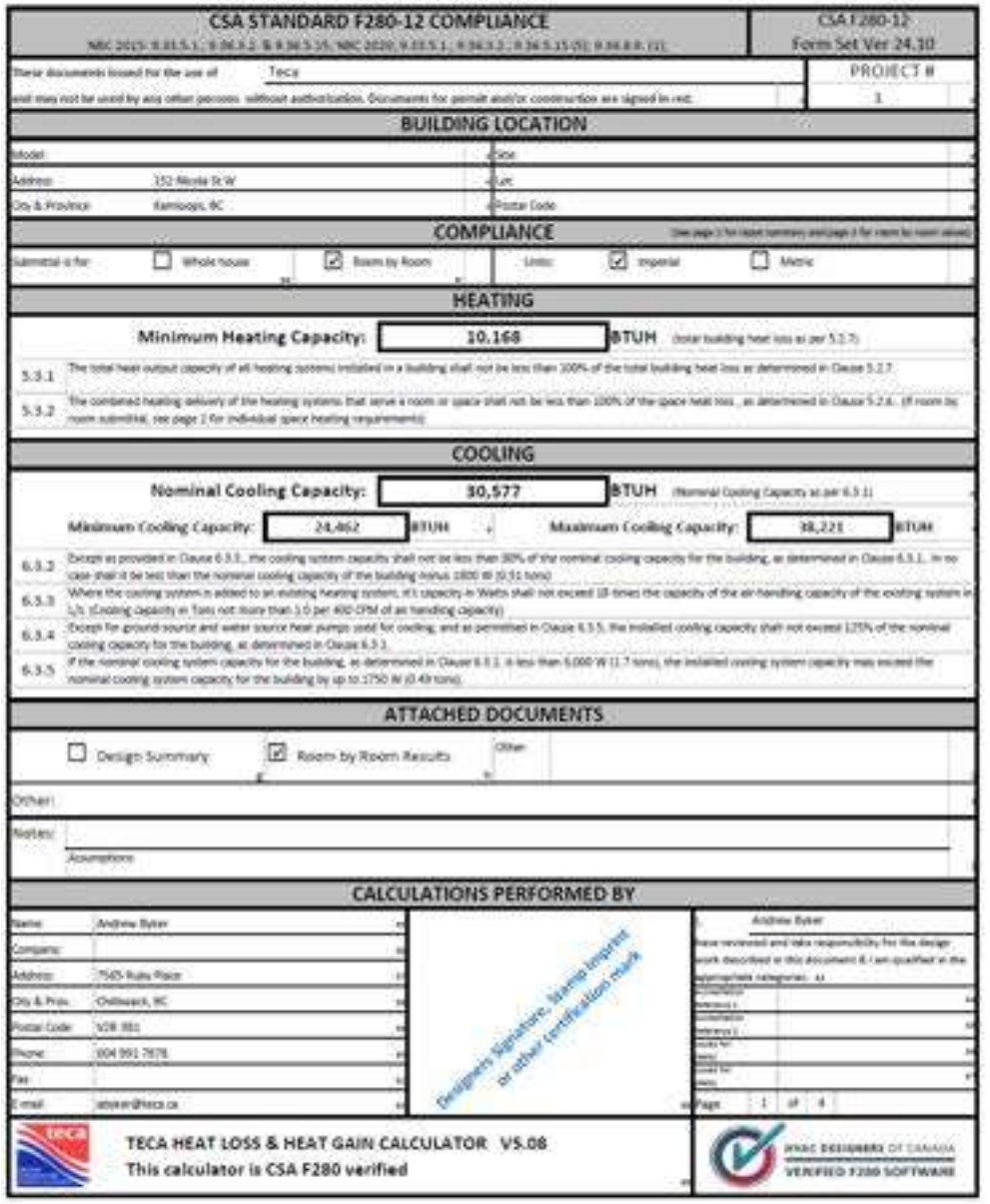
7.2 - Reporting

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**.

CSA F280 REPORTING

CSA Standard F280-12 Report:

- Standard report form is required to simplify the review process
  - Contains critical design information noted in CSA F280 Standard
- Single room cooling also has a standardized format



CSA STANDARD F280-12 COMPLIANCE

CSA F280-12
Form Set Ver 24.10

Teca

PROJECT #
1

BUILDING LOCATION

Model:
Lot:
Address: 152 Nicola St W
City & Province: Kamloops, BC
Postal Code:

COMPLIANCE

Submittal is for: ☐ Whole house ☑ Room by Room
Units: ☑ Imperial ☐ Metric

HEATING

Minimum Heating Capacity: 10,168 BTUH

5.3.1 The total heat output capacity of all heating systems installed in a building shall not be less than 100% of the total building heat loss as determined in Clause 5.2.7.

5.3.2 The combined heating delivery of the heating systems that serve a room or space shall not be less than 100% of the space heat loss , as determined in Clause 5.2.6. (If room by room submittal, see page 2 for individual space heating requirements)

COOLING

Nominal Cooling Capacity: 30,577 BTUH

Minimum Cooling Capacity: 24,462 BTUH
Maximum Cooling Capacity: 38,221 BTUH

6.3.2 Except as provided in Clause 6.3.3., the cooling system capacity shall not be less than 80% of the nominal cooling capacity for the building, as determined in Clause 6.3.1., in no case shall it be less than the nominal cooling capacity of the building minus 1800 W (0.51 tons)

6.3.3 Where the cooling system is added to an existing heating system, it's capacity in Watts shall not exceed 10 times the capacity of the air-handling capacity of the existing system in L/s. (Cooling capacity in Tons not more than 1.0 per 400 CFM of air handling capacity)

6.3.4 Except for ground-source and water source heat pumps used for cooling, and as permitted in Clause 6.3.5, the installed cooling capacity shall not exceed 125% of the nominal cooling capacity for the building, as determined in Clause 6.3.1.

6.3.5 If the nominal cooling system capacity for the building, as determined in Clause 6.3.1. is less than 6,000 W (1.7 tons), the installed cooling system capacity may exceed the nominal cooling system capacity for the building by up to 1750 W (0.49 tons).

ATTACHED DOCUMENTS

☐ Design Summary ☑ Room by Room Results Other

Other:

Notes:

Assumptions:

CALCULATIONS PERFORMED BY

Name: Andrew Byker
Company:
Address: 7565 Ruby Place
City & Prov.: Chilliwack, BC
Postal Code: V2R 0E1
Phone: (604 991 7878
Fax:
E-mail: abyker@teca.ca

Designers Signature, Stamp (mpnt or other certification mark)

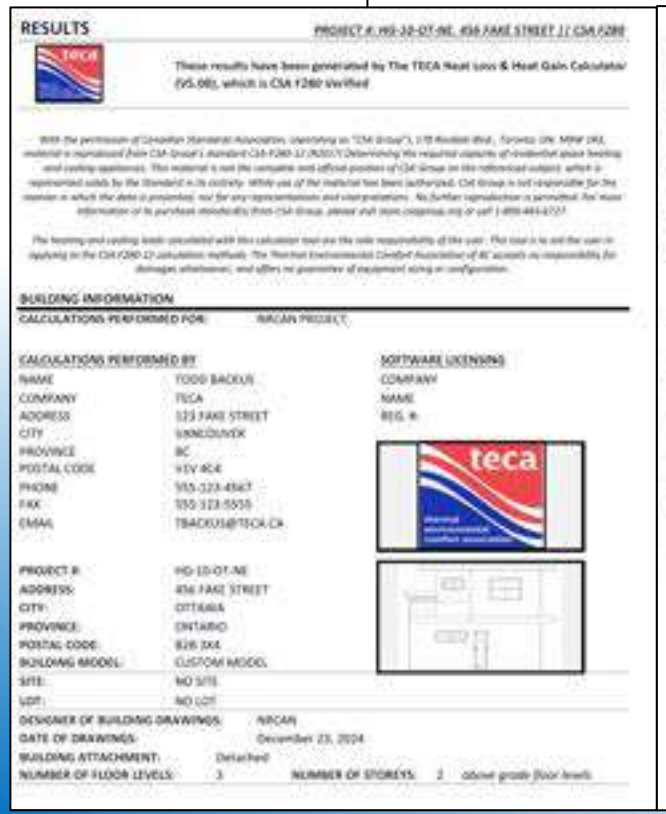
Andrew Byker

Page 1 of 4

TECA HEAT LOSS & HEAT GAIN CALCULATOR V5.08
This calculator is CSA F280 verified

HVAC DESIGNERS OF CANADA
VERIFIED F280 SOFTWARE

PREVIOUS CSA F280 REPORT


RESULTS

PROJECT #: HG-10-OT-NE, 456 FAKE STREET // CSA F280

These results have been generated by The TECA Heat Loss & Heat Gain Calculator (V5.08), which is CSA F280 Verified

BUILDING INFORMATION

CALCULATIONS PERFORMED FOR: NRCAN PROJECT

CALCULATIONS PERFORMED BY

NAME	TODD BADEUX
COMPANY	TECA
ADDRESS	123 FAKE STREET
CITY	VANCOUVER
PROVINCE	BC
POSTAL CODE	V1V 4C4
PHONE	555-123-4567
FAX	555-123-5555
EMAIL	TBADEUX@TECA.CA

SOFTWARE LICENSING

COMPANY	
NAME	
REG. #	

PROJECT #:	HG-10-OT-NE
ADDRESS:	456 FAKE STREET
CITY:	OTTAWA
PROVINCE:	ONTARIO
POSTAL CODE:	B2B 2X4
BUILDING MODEL:	CUSTOM MODEL
SITE:	NO SITE
LOT:	NO LOT

DESIGNER OF BUILDING DRAWINGS: NRCAN

DATE OF DRAWINGS: December 23, 2024

BUILDING ATTACHMENT: Detached

NUMBER OF FLOOR LEVELS: 3 NUMBER OF STOREYS: 2 above grade floor levels


PROJECT #: HG-10-OT-NE, 456 FAKE STREET

WEATHER DATA

LATITUDE: 45.49 LONGITUDE: 75.51

Summer Mean Daily Temperature Range: 12 °C WINDOW SHADING: NO

VENTILATION SYSTEM: Non dedicated MUA: 110CFM, ASRE 76, ATRE 0

HEATING SYSTEM: Forced air (central system with ductwork)

FRONT OF HOUSE FACING DIRECTION: NO

Is this value assumed? YES

AIR TIGHTNESS / INFILTRATION: ACH50: 1.5, ELA: 865.2 cm², ELA @10Pa

Is the air tightness value assumed? YES

BUILDING SITE SHIELDING: Low crops, x/H = 20

LOCAL WALL SHIELDING: Light local shielding

LOCAL FLUE SHIELDING: Light local shielding

INDOOR DESIGN TEMPERATURES:

HEATING: 22°C, 71.6°F

COOLING: 24°C, 75.2°F

OF BEDROOMS: 4

OF PEOPLE: 5

OUTDOOR DESIGN TEMPERATURES:

HEATING: -26°C, -14.8°F

COOLING: 30°C, 86°F

SOIL TEMPERATURE: 8 °C

Attached documents:

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

Notes from the calculator operator:


PROJECT #: HG-10-OT-NE, 456 FAKE STREET

BUILDING ENVELOPE ELEMENTS

WALLS

CEILINGS

INTERIOR FOUNDATION WALL

EXPOSED FLOOR

EXPOSED HEADER

WINDOWS

SKYLIGHTS

DOORS

SHADINGS

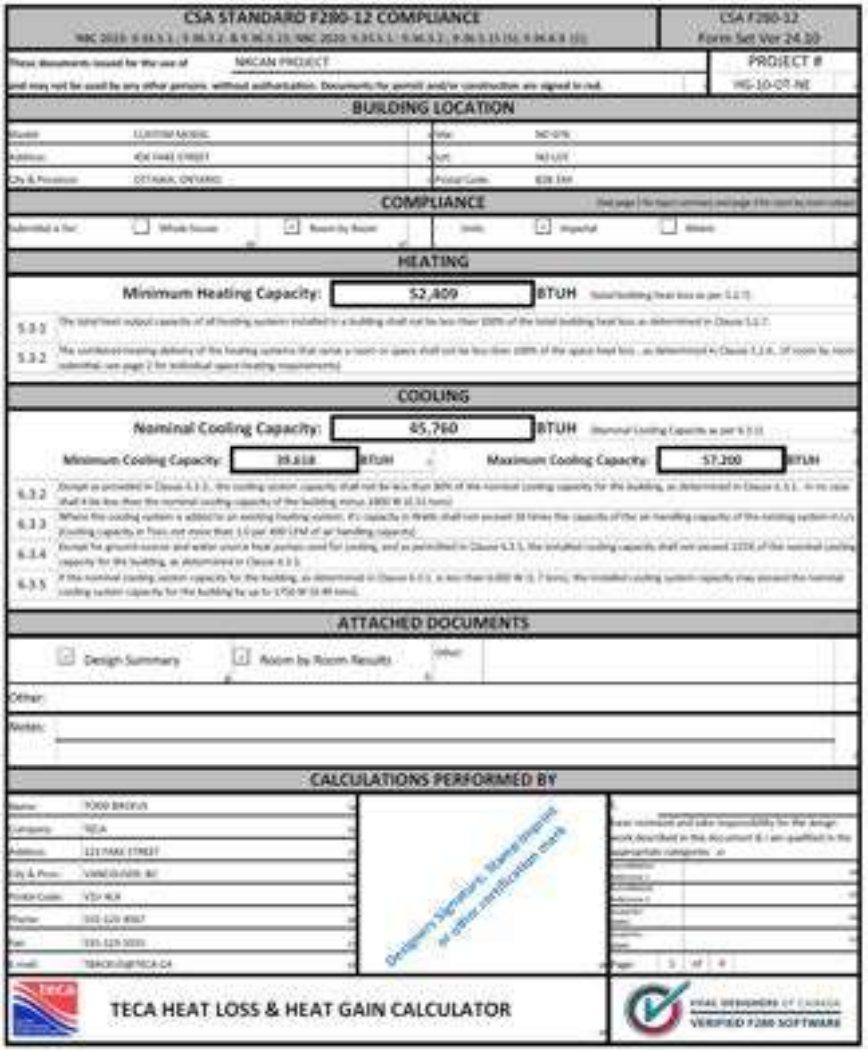
FOUNDATIONS


HEAT LOSS & HEAT GAIN SUMMARY, ($/UH)

PROJECT #: HG-10-OT-NE, 456 FAKE STREET

ROOM NAME	FLOOR LEVEL	FL AREA (ft²)	HEAT LOSS TOTAL	HEAT GAIN SENS.	HEAT GAIN TOTAL (sensible + latent)
OVERALL BUILDING		AREA 3315	HEAT LOSS 52409	GAIN (sens.) 35390	GAIN (total) 45760

NEW CSA F280 REPORT



CSA STANDARD F280-12 COMPLIANCE

CSA F280-12 Form Set Ver 24.10

These documents issued for the use of NRCAN PROJECT

and may not be used by any other persons without authorization. Documents for permit and/or construction are signed & sealed.

PROJECT # HG-10-OT-NE

BUILDING LOCATION

COMPLIANCE

HEATING

Minimum Heating Capacity: 52,409 BTUH

COOLING

Nominal Cooling Capacity: 45,760 BTUH

Minimum Cooling Capacity: 39,618 BTUH Maximum Cooling Capacity: 57,200 BTUH

ATTACHED DOCUMENTS

Design Summary Room by Room Results

CALCULATIONS PERFORMED BY

TECA HEAT LOSS & HEAT GAIN CALCULATOR

VERIFIED F280 SOFTWARE

CSA F280-12 INPUT SUMMARY

CSA F280-12 Form Set Ver 24.10

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PROJECT #: HG-10-OT-NE

BUILDING LOCATION

CALCULATION BASED ON (See Following Page For Results)

HEATING DESIGN CONDITIONS

COOLING DESIGN CONDITIONS

ABOVE GRADE WALLS

BELOW GRADE WALLS

FLOOR HEADERS

CEILINGS

WINDOWS

EXPOSED FLOORS

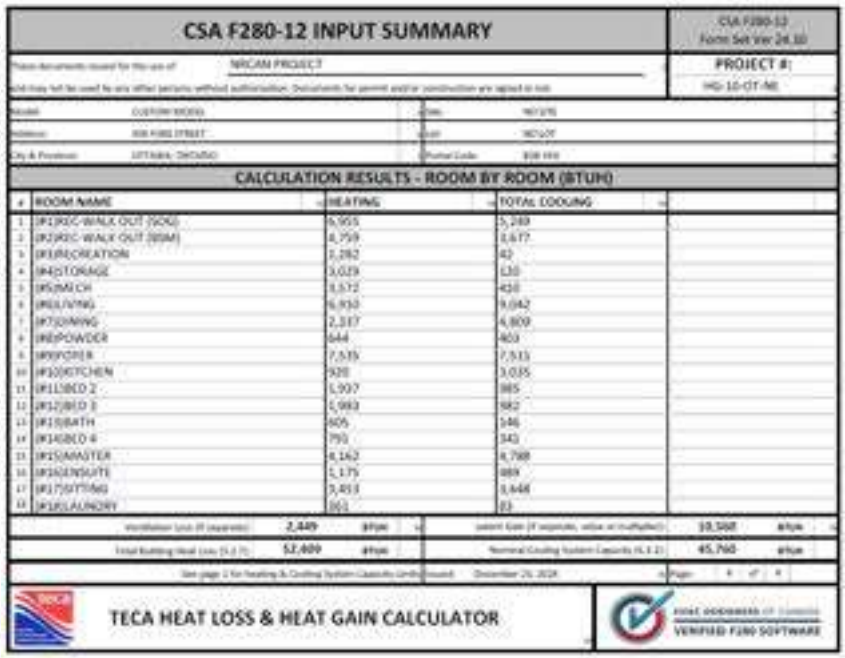
SKYLIGHTS

DOORS

FOUNDATIONS

TECA HEAT LOSS & HEAT GAIN CALCULATOR

VERIFIED F280 SOFTWARE



CSA F280-12 INPUT SUMMARY

CSA F280-12 Form Set Ver 24.10

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PROJECT #: HG-10-OT-NE

CALCULATION RESULTS - ROOM BY ROOM (BTUH)

#	ROOM NAME	HEATING	TOTAL COOLING
1	(#1)REC-WALK OUT (SOG)	6,955	5,289
2	(#2)REC-WALK OUT (BSM)	8,759	3,677
3	(#3)RECREATION	1,282	42
4	(#4)STORAGE	3,029	120
5	(#5)MECH	3,572	420
6	(#6)LIVING	6,910	9,042
7	(#7)DINING	2,337	4,809
8	(#8)FOYER	644	403
9	(#9)FOYER	7,535	7,511
10	(#10)KITCHEN	920	3,035
11	(#11)BED 2	1,907	985
12	(#12)BED 3	1,983	982
13	(#13)BATH	605	346
14	(#14)BED 4	791	343
15	(#15)MASTER	4,162	4,788
16	(#16)ENSUITE	1,175	889
17	(#17)SITTING	3,453	3,448
18	(#18)LAUNDRY	861	83

Ventilation Loss (if separate) 2,449 BTUH — Latent Gain (if separate, value or multiplier) 10,560 BTUH

Total Building Heat Loss (UL) 52,409 BTUH — Nominal Cooling System Capacity 45,760 BTUH

See page 1 for Heating & Cooling System Capacity Limits — Issued: December 20, 2024 — Page 4 of 4

TECA HEAT LOSS & HEAT GAIN CALCULATOR

VERIFIED F280 SOFTWARE

CSA F280 REPORTING

Required Input Information:

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

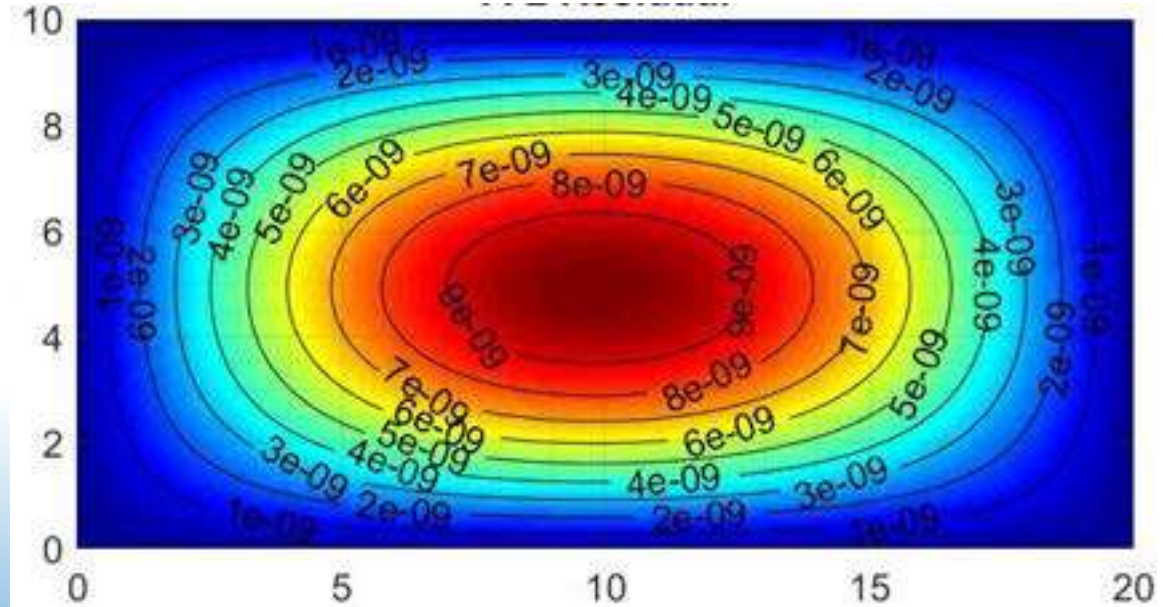
Table E.1
Inputs for preparing heat loss and gain calculation summary sheet
(See Clause 7.1 and Annex D.)

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 LIMITATIONS

Calculates Peak Loads:

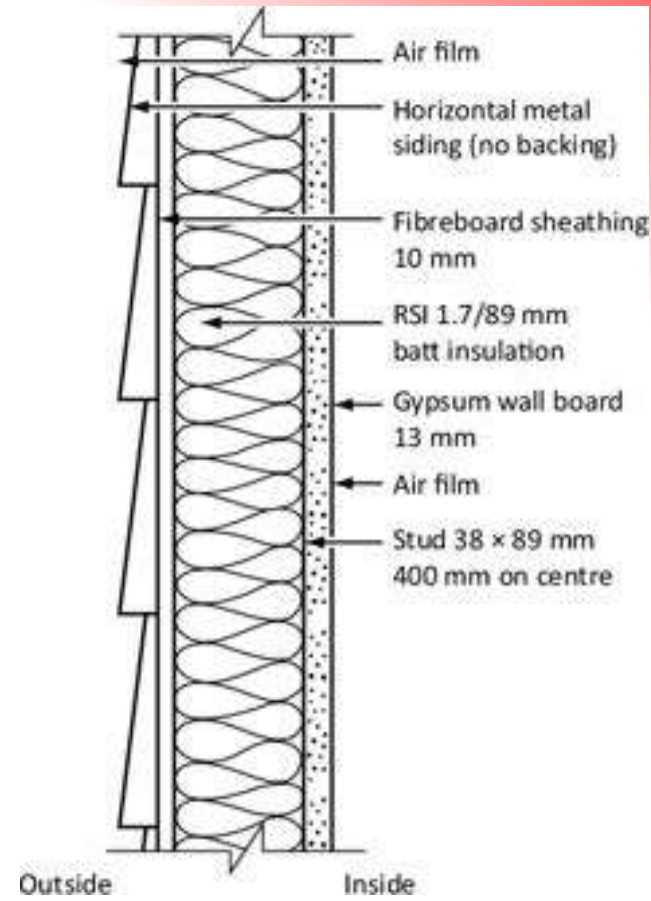
- Outputs either BTU/hour (or Watts)
  - Energy over **Time**
  - Cannot simulate the build-up of heating over time
  - If the peak load can be satisfied, partial loads will also be satisfied



ABOVE GRADE WALL CALCULATIONS

Components of the Above Grade Wall Calculation:

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



Where:

- Heat Loss [W or BTUH] = Heat loss requirement at peak load
- Area [m^2 or ft^2] = The area of the wall (adjusted for stud spacing)
- R $\left[\frac{m^2 * ℃}{W} \; or \; \frac{ft^2 * °F}{BTUH}\right]$ = 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:

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

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

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

$$\text{Latitude}_{Factor} = 1 + \{\text{Latitude} - 40\} * 0.0375$$

INTERNAL LOADS: CSA F280

External Loads:

- Conductive heat transfer, solar radiation, ventilation & leakage

Internal Loads for Heat Gain:

- Occupants: 70 W (240 BTUH) per person
- Electrical:
  - Min. 800 W (2,730 BTUH),
  - 4 W/m^2 (1.27 BTUH/ft^2) if > 200m^2 (2,150 ft^2)

CSA F280 CALCULATORS

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

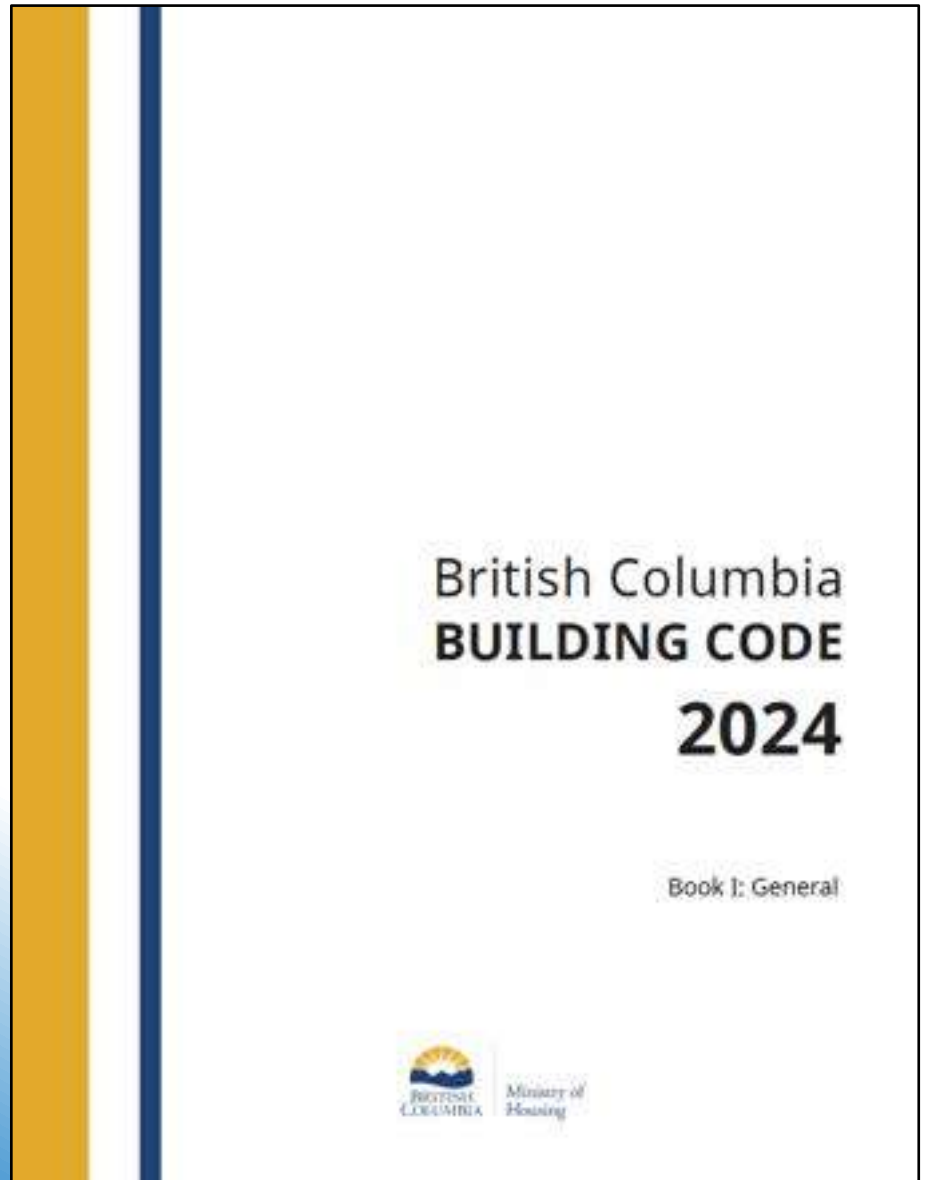
COMPANY NAME	SOFTWARE NAME	ROOM BY ROOM	WHOLE HOUSE	CONDITIONS	WEBSITE
Building Technology Services	Building Tech F280	✓	✓	Click Here	BuildingTech
Avenir Software Inc	HeatCAD/LoopCAD	✓	✓	Click Here	HeatCAD LoopCAD
Thermal Environmental Comfort Association	Teca Heat Loss & Heat Gain Calculator	✓	✓	Click Here	
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

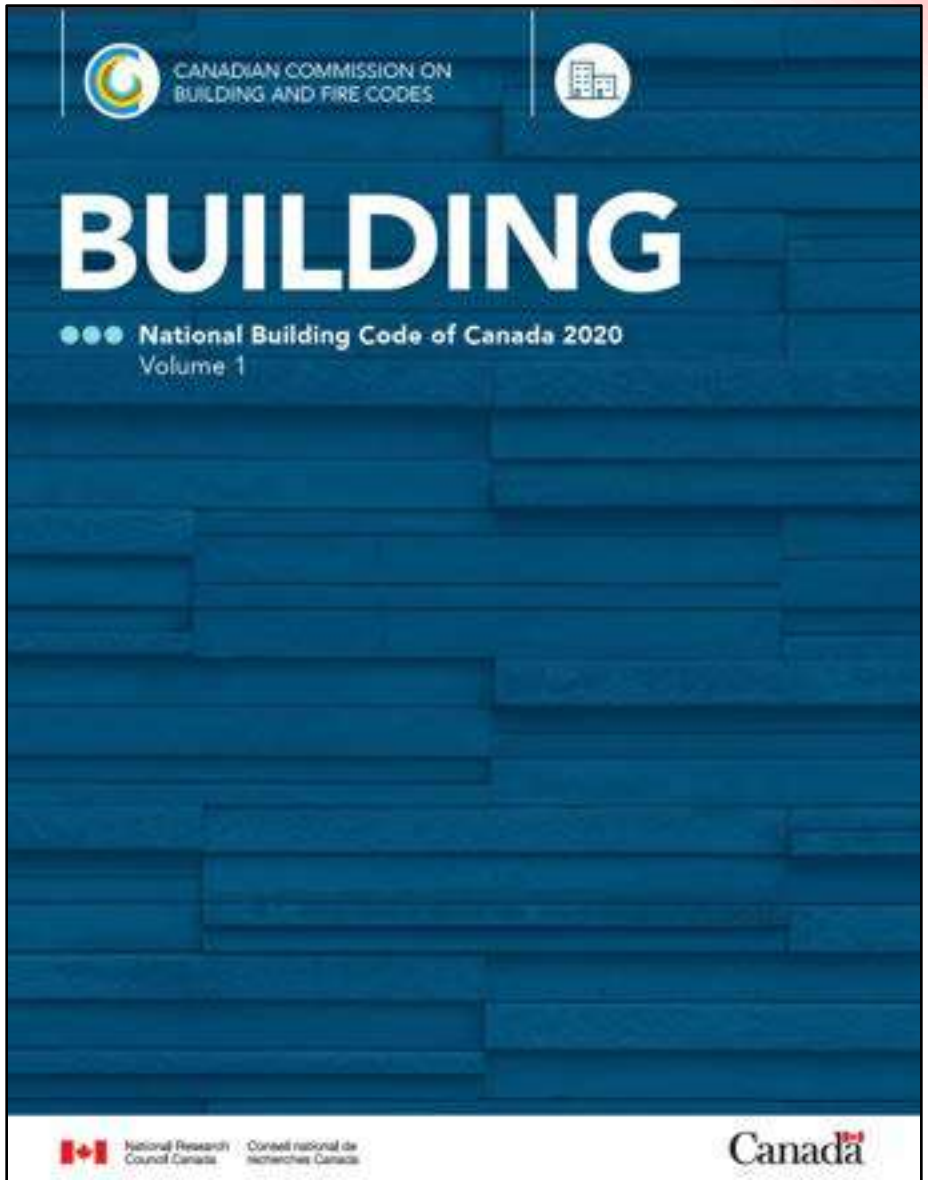
Current List of Certified Calculators: https://hvacdc.ca/?page_id=406

HVAC DESIGNERS OF CANADA

VERIFIED F280 SOFTWARE

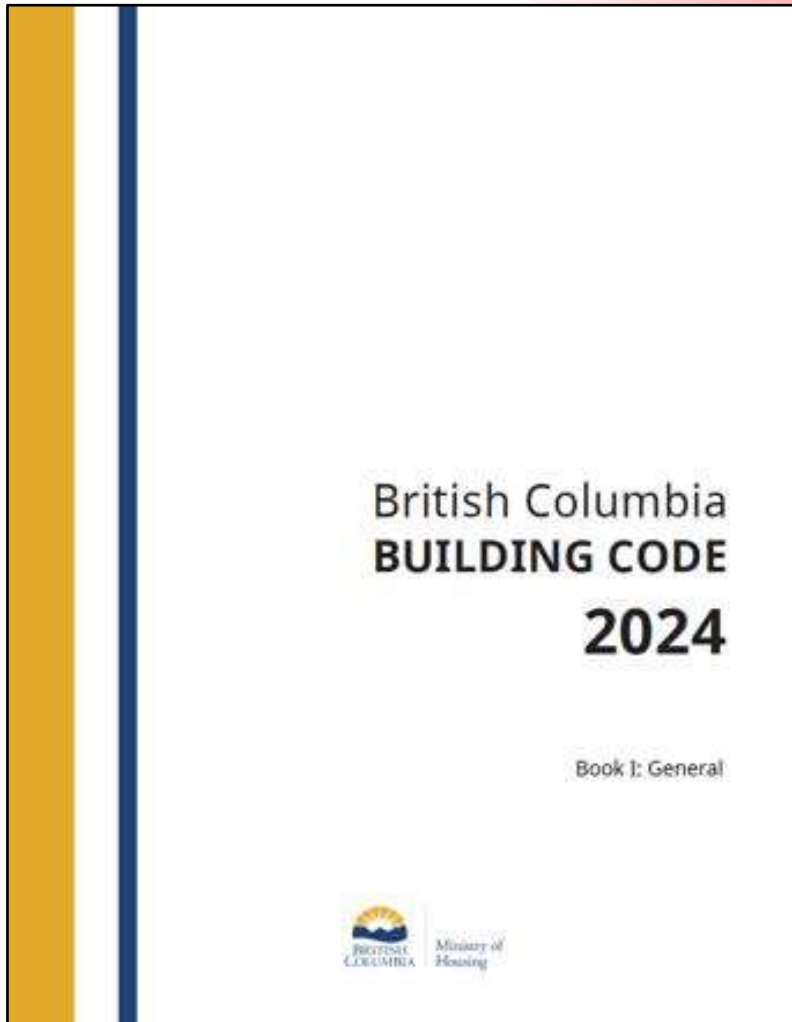
BC & NATIONAL CODE REQUIREMENTS





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.

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.

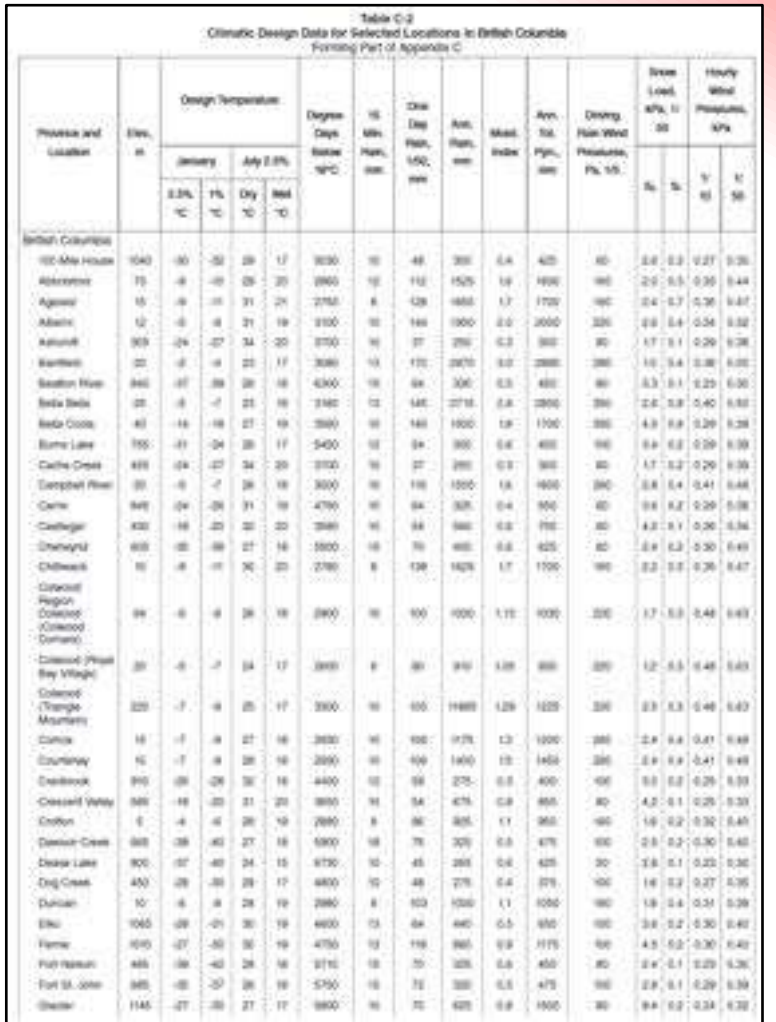


Table C-2
Climatic Design Data for Selected Locations in British Columbia
Forming Part of Appendix C

Province and Location	Elev., m	Design Temperature: January 2.5% °C	Design Temperature: January 1% °C	Design Temperature: July 2.5% Dry °C	Design Temperature: July 2.5% Wet °C	Degree Days Below 18°C	15 Min. Rain, mm	One Day Rain, 1/50, mm	Ann. Rain, mm	Mean. Index	Ann. Tot. Pcp., mm	Driving Rain Wind Pressures, Pa, 1/5	Snow Load, kPa, 1/ 50		Hourly Wind Pressures, kPa	
													%	%	1/ 10	1/ 50
British Columbia																
100 Mile House	1040	-30	-32	29	17	9030	10	48	300	0.4	420	60	2.0	0.3	0.27	0.35
Abbotsford	70	-9	-11	29	20	2950	12	112	1525	1.9	1650	140	2.0	0.5	0.35	0.44
Agassiz	15	-9	-11	31	21	2750	8	128	1450	1.7	1720	140	2.4	0.7	0.36	0.47
Alberni	12	-5	-8	31	19	3100	10	144	1900	2.0	2000	220	2.0	0.4	0.24	0.32
Ashcroft	303	-24	-27	34	20	5700	10	37	250	0.3	300	80	1.7	0.1	0.29	0.38
Banff/Alb	22	-2	-4	23	17	3680	13	170	2670	3.0	2880	280	1.0	0.4	0.36	0.50
Beaton River	840	-37	-39	30	18	6300	15	64	330	0.3	450	80	0.3	0.1	0.23	0.30
Bella Bella	20	-5	-7	23	16	3160	13	345	2710	2.6	2800	350	2.0	0.8	0.40	0.50
Bella Coola	40	-14	-16	27	19	3560	10	140	1600	1.8	1700	300	4.3	0.8	0.29	0.38
Burns Lake	755	-31	-34	29	17	5400	12	64	300	0.6	400	100	0.4	0.2	0.29	0.39
Cache Creek	670	-34	-37	34	20	5700	10	37	250	0.3	300	80	1.7	0.2	0.29	0.39
Campbell River	20	-5	-7	26	18	3000	10	110	1300	1.6	1600	280	2.8	0.4	0.41	0.48
Cache	640	-24	-26	31	19	4750	10	64	325	0.4	550	80	0.6	0.2	0.29	0.38
Castlegar	430	-18	-20	32	20	3940	10	64	560	0.6	700	80	4.3	0.1	0.36	0.34
Chetwynd	600	-30	-32	27	16	5500	10	70	400	0.6	625	80	2.4	0.2	0.30	0.40
Chilliwack	10	-8	-11	30	20	2780	8	139	1625	1.7	1700	160	2.2	0.5	0.26	0.47
Coleced Region Coleced (Coleced Domain)	84	-5	-8	28	18	2960	10	100	1000	1.10	1000	220	1.7	0.3	0.48	0.63
Coleced (Pearl Bay Village)	20	-5	-7	24	17	2800	8	80	910	1.05	900	220	1.2	0.3	0.48	0.63
Coleced (Triangle Mountain)	220	-7	-9	25	17	3300	10	100	11660	1.29	1220	220	2.3	0.3	0.48	0.63
Comox	10	-7	-9	27	18	3650	10	100	1175	1.3	1200	280	2.4	0.4	0.41	0.48
Courtenay	15	-7	-9	28	18	2890	10	100	1400	1.5	1450	280	2.4	0.4	0.41	0.48
Cranbrook	910	-29	-28	32	18	4400	12	59	275	0.3	400	100	0.3	0.2	0.25	0.33
Crescent Valley	580	-18	-20	31	20	3800	10	54	475	0.8	650	80	4.2	0.1	0.25	0.33
Crofton	5	-4	-6	26	19	2880	8	86	825	1.1	950	160	1.0	0.2	0.32	0.40
Dawson Creek	600	-38	-40	27	16	5900	18	75	320	0.3	475	100	2.3	0.2	0.30	0.40
Dease Lake	800	-37	-40	24	15	6700	10	45	265	0.4	425	80	3.8	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	2880	8	103	1000	1.1	1050	160	1.8	0.4	0.31	0.39
Elko	1060	-28	-31	30	19	4600	13	64	440	0.5	650	100	3.8	0.2	0.30	0.40
Fernie	1010	-27	-30	32	19	4750	12	118	960	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	695	-35	-37	26	18	5700	15	72	330	0.5	475	100	2.8	0.1	0.29	0.39
Gander	1145	-27	-30	27	17	9900	10	70	625	0.8	1500	80	9.4	0.2	0.34	0.32

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.

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

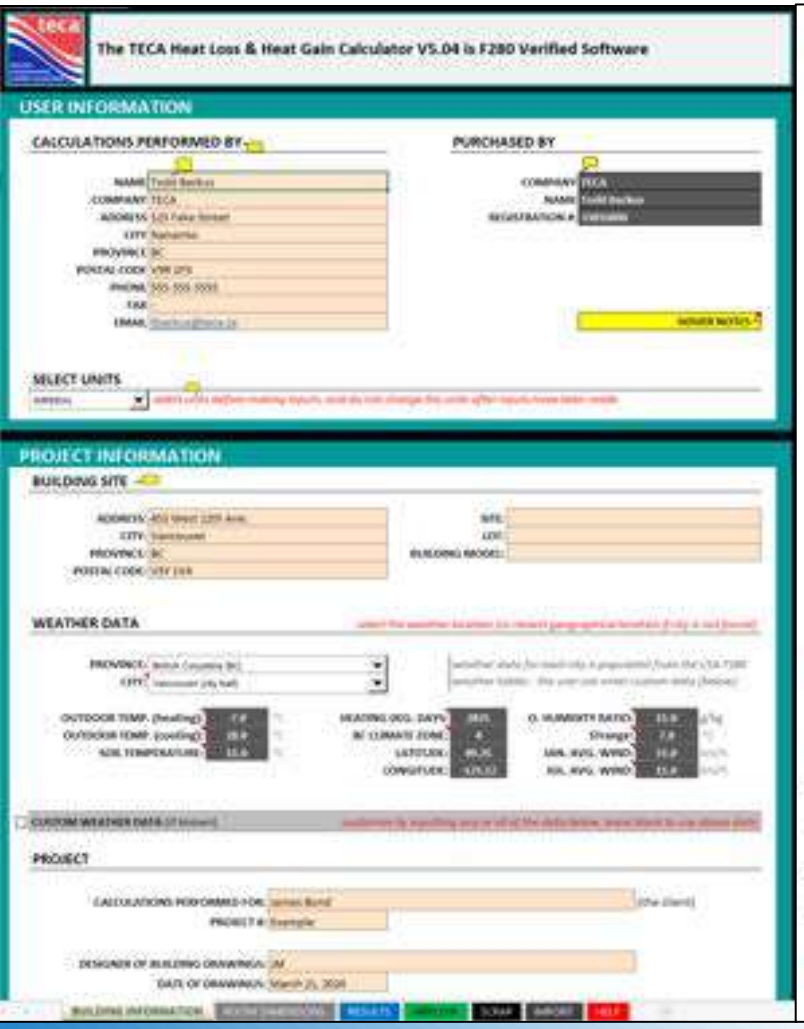
Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	15 Min. Rain, mm	One Day Rain, 1/50, mm	Ann. Rain, mm	Moist. Index	Ann. Tot. Ppn., mm	Driving Rain Wind Pressures, Pa, 1/5	Snow Load, kPa, 1/50		Hourly Wind Pressures, kPa	
		January		July 2.5%												
		2.5% °C	1% °C	Dry °C	Wet °C								S_s	S_r	1/10	1/50
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

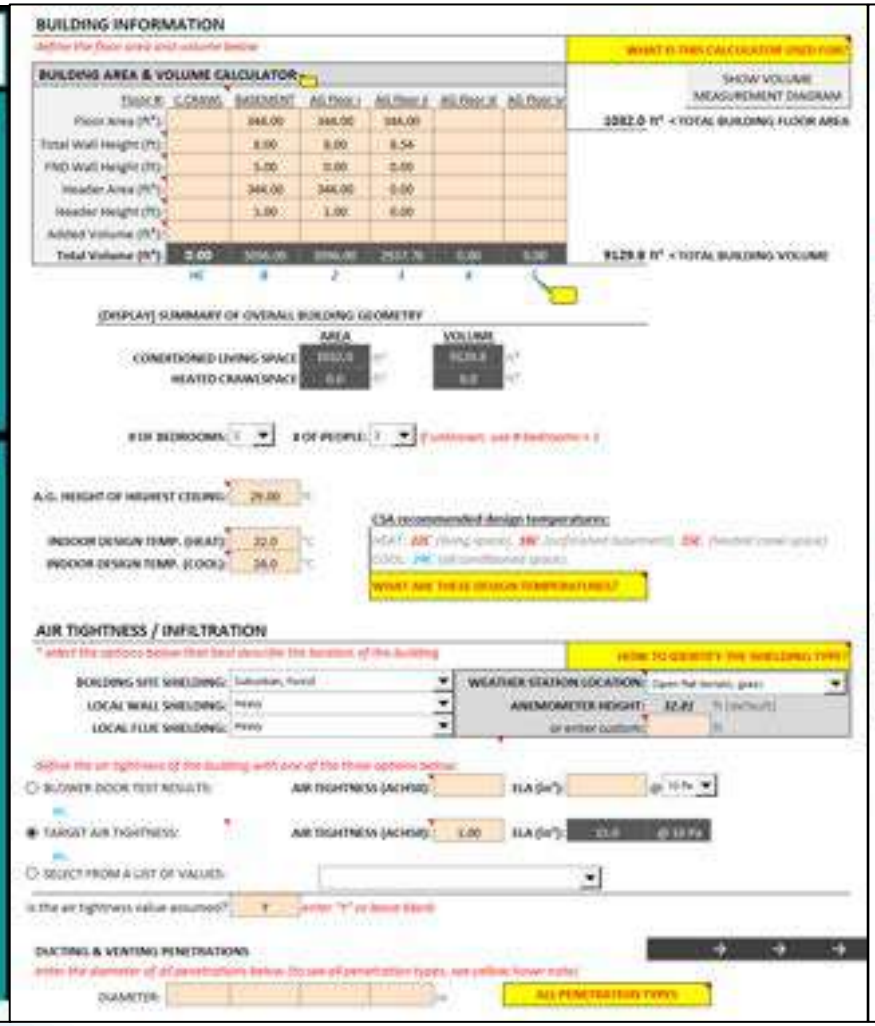
HLHG INPUTS & REPORTS

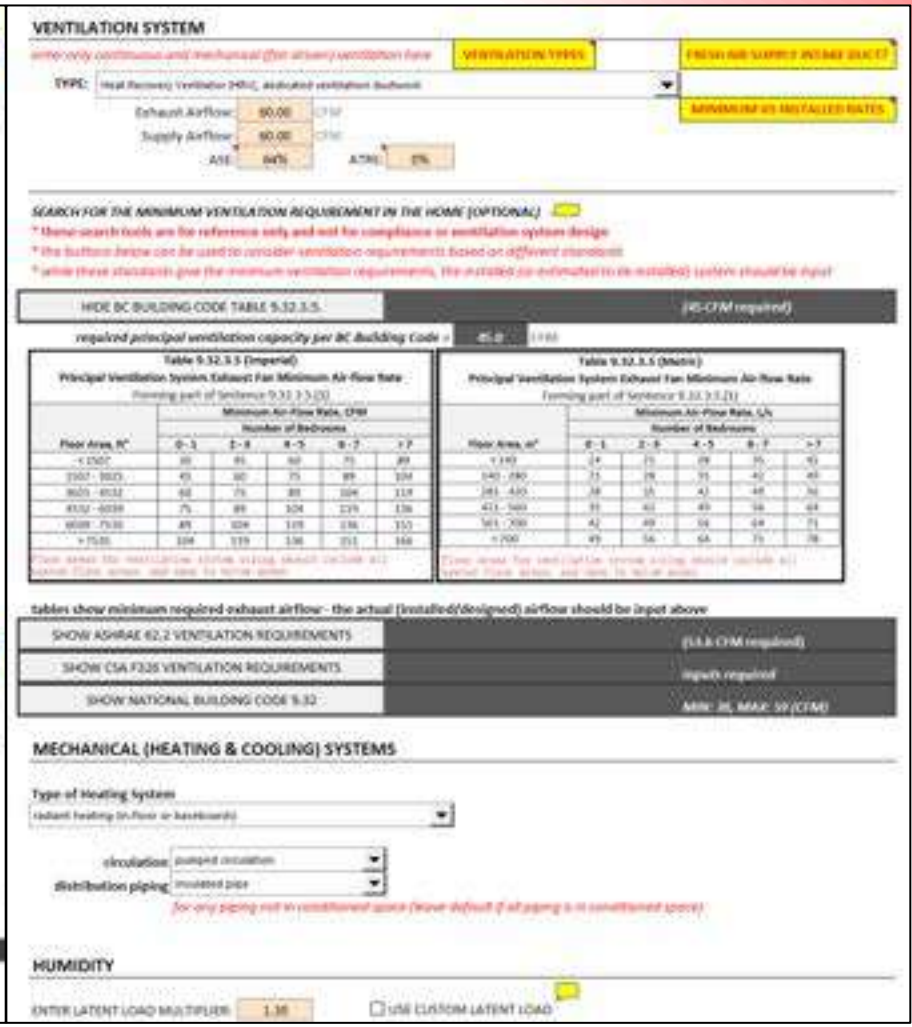
- The following slides demonstrate the TECA HLHG calculator
- CSA F280-12 Table E.1. outlines require report information
- Other certified calculators perform the same calculations and can report the information in a standardized form

HLHG BUILDING INFORMATION

DESIGNER & SITE INFORMATION







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:

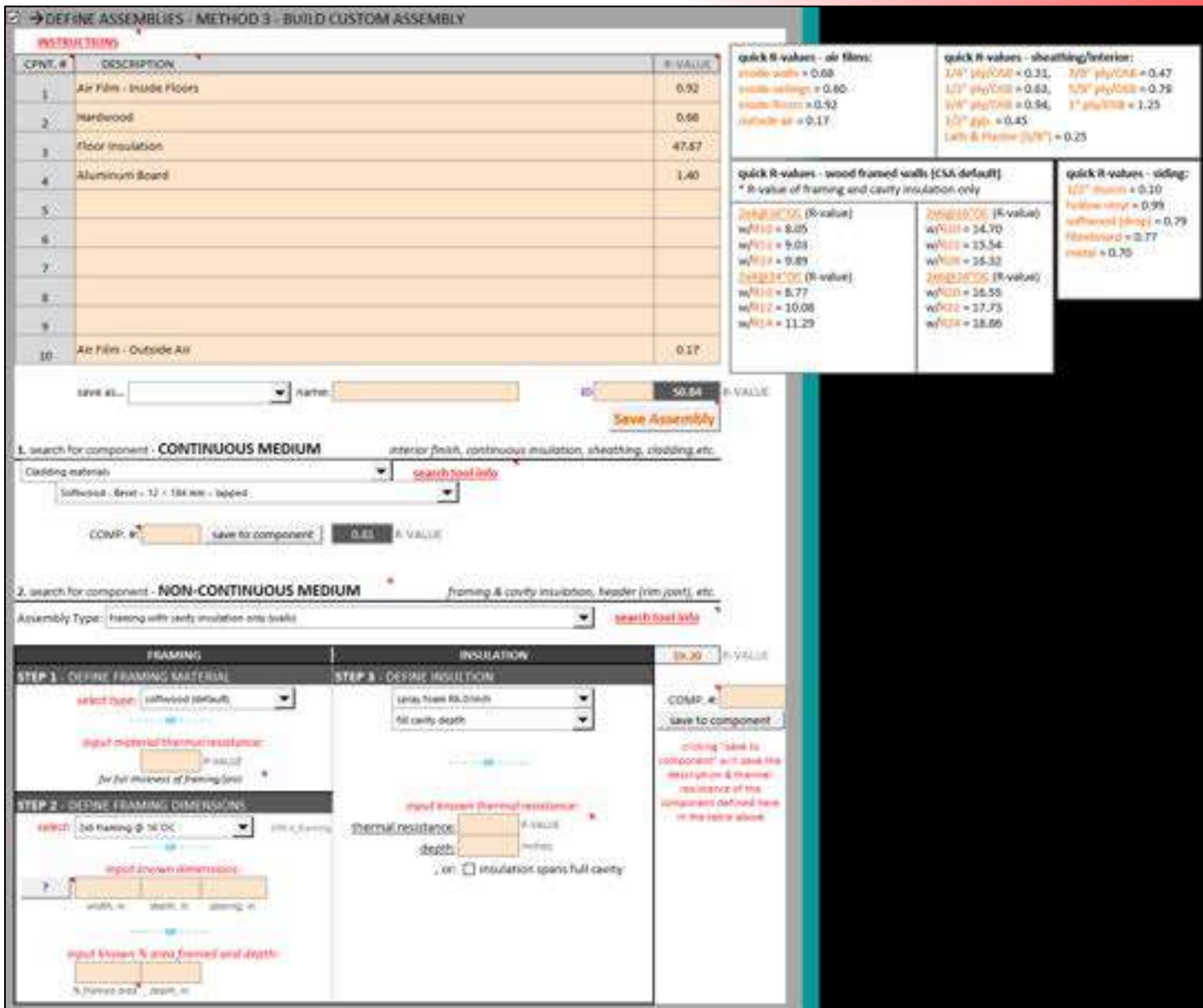
Assumptions noted (in addition to listed assumptions on page 1):

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" rd 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/ (Stool Header w/ Ledger Board); 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

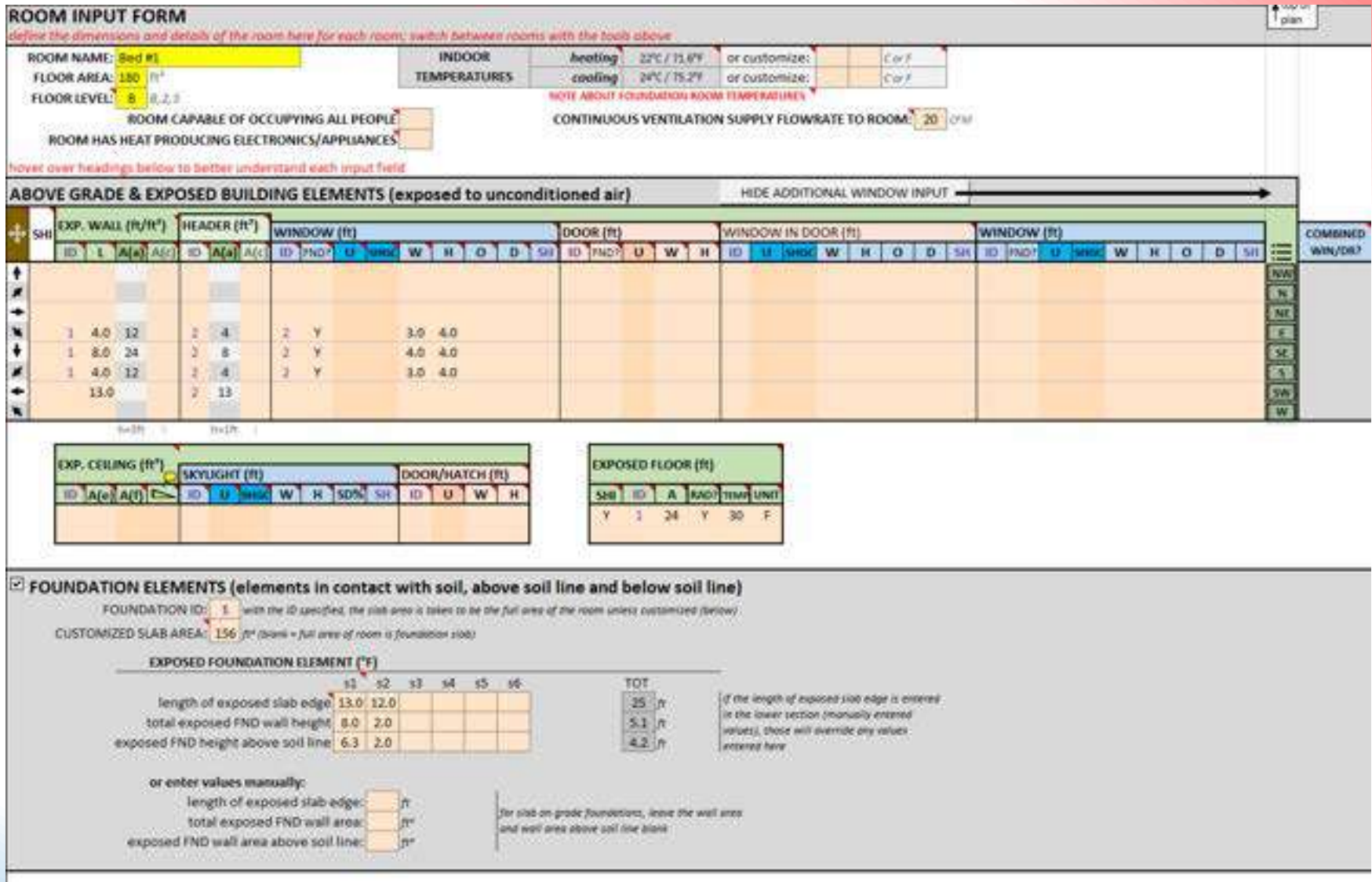
- 1/ (Wood Wall),
- Air Film - Inside Walls,
- 1/2" Drywall,
- 2*6, 16" OC w/ R6 Insulation,
- 2" Type 2 Bread Board as Continuous Insulation on Exterior,
- 1/2" Sheeting,
- Wall Material - Softwood,
- Air Film - Outside Air;

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?



HLHG REPORT: ROOM BREAKDOWN

Heating System

HEAT LOSS COMPONENT BREAKDOWN, (BTUH)

ROOM NAME	WALL WAL.	CEILING CEI.	FLOOR FLR.	WINDOW & SKYLIGHT WIN.	DOOR & HATCH DR.	FOUNDATION FND.	LEAKAGE LEAK.	VENTILATION VENT.	DISTRIBUTION DIST.	ADDITIONAL 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)

ROOM NAME	WALL WAL.	CEILING CEI.	FLOOR FLR.	WINDOW & SKYLIGHT WIN.	DOOR & HATCH DR.	LEAKAGE LEAK.	VENTILATION VENT.	DISTRIBUTION & ADDITIONAL DIST.	INTERNAL INT.	TOTAL SENSIBLE SENS.	TOTAL SENSIBLE + LATENT 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

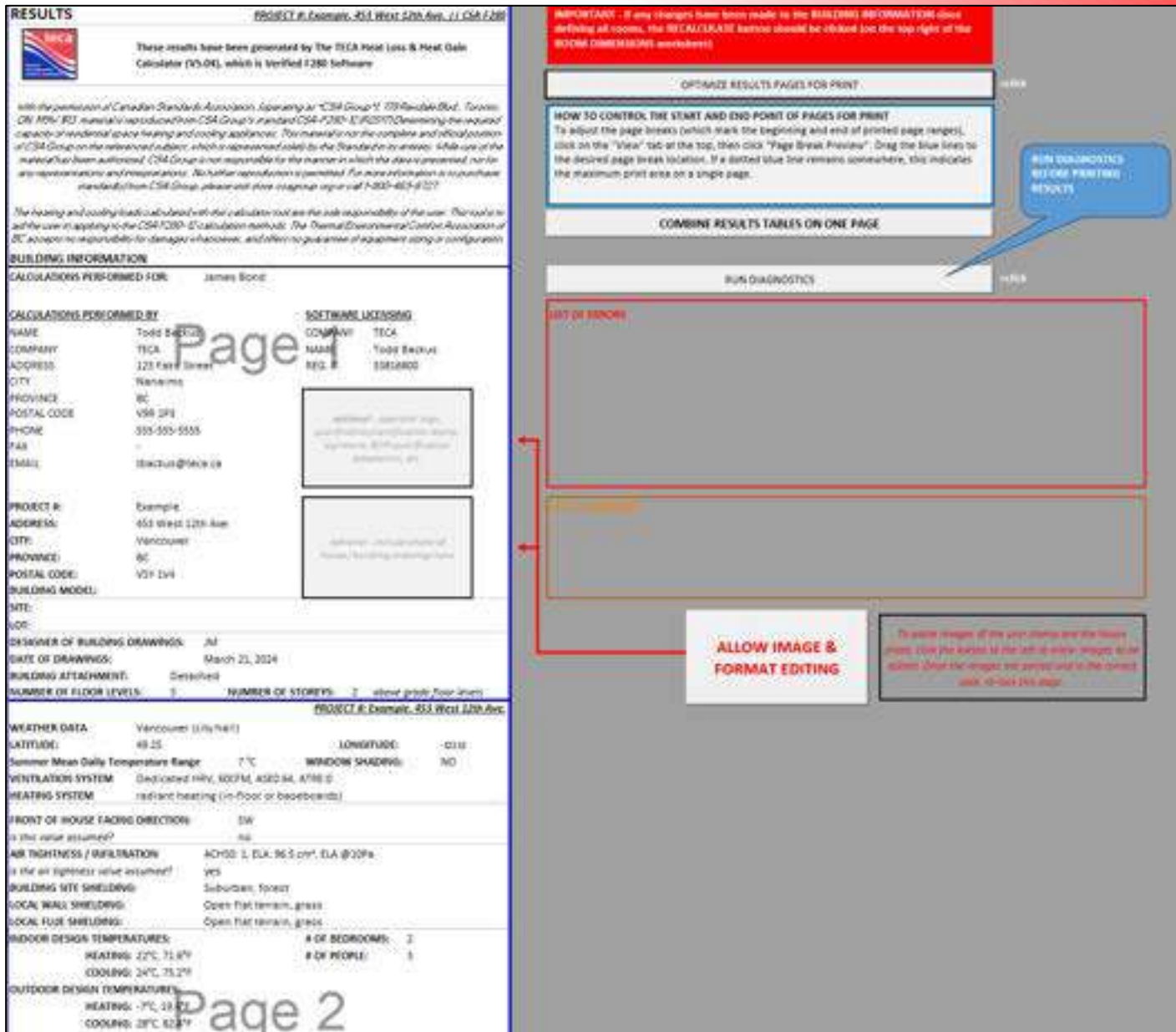
ROOM NAME	FLOOR LEVEL	FL AREA (ft²)	HEAT LOSS TOTAL	HEAT GAIN SENS.	HEAT GAIN **TOTAL (sensible + latent)**
(#1)Bath #1	1	84	363	4	5
(#2)Bed #1	1	180	1935	2346	3050
(#3)Entrance - Basement	1	80	873	420	546
(#4)Kitchen & Living	2	344	3655	7178	9332
(#5)Bath #2	3	40	258	53	69
(#6)Hall & Laundry	3	89	684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

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

HLHG REPORT

Results Output Page:

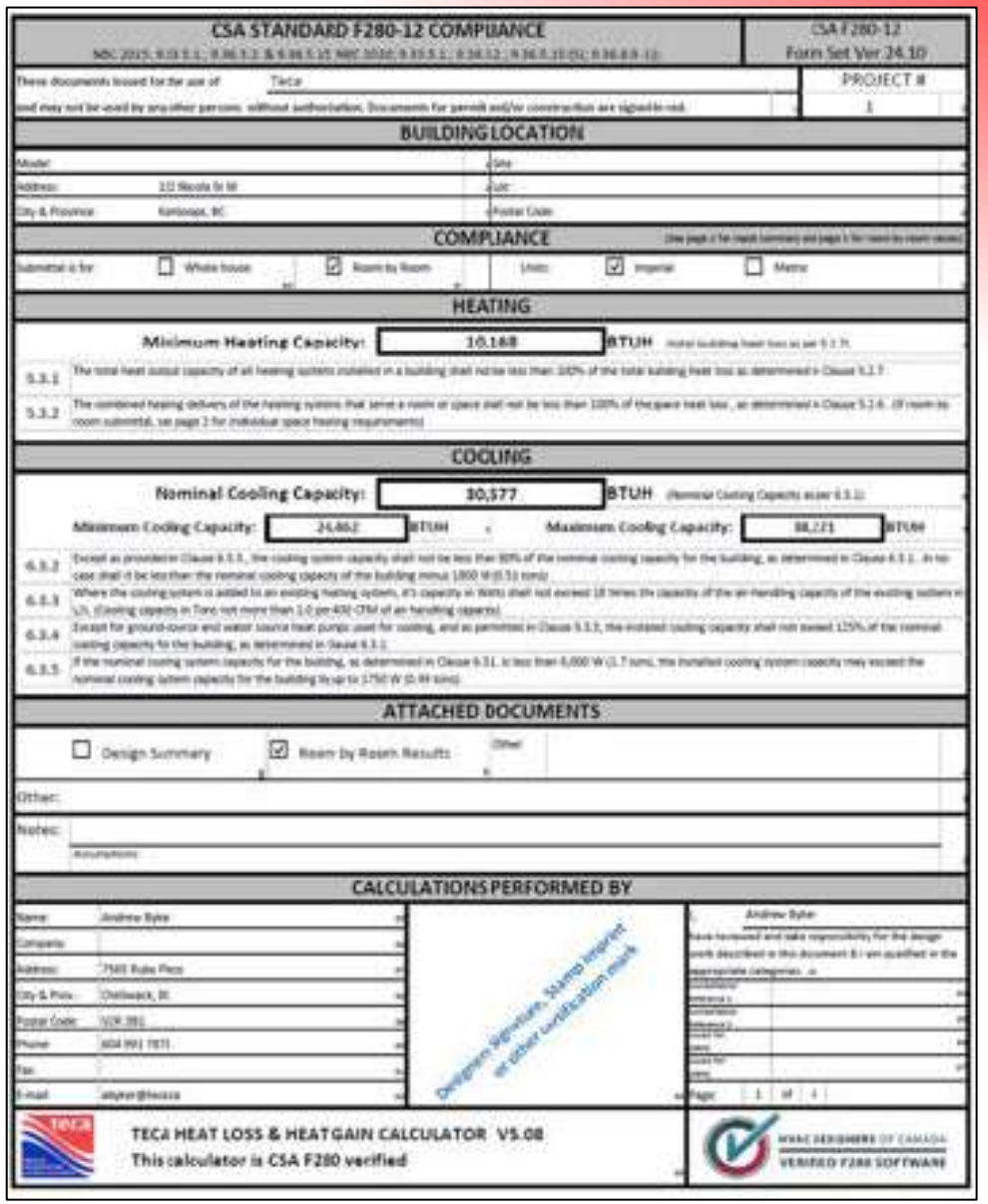
- Automatically creates a report
- Contains critical design information (per CSA Standard)
- Results page submitted to Building Official



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



CSA STANDARD F280-12 COMPLIANCE

CSA F 280-12 Form Set Ver 24.10

These documents issued for the use of: Teca

and may not be used by any other persons without authorization. Documents for permit and/or construction are signed/sealed.

PROJECT #: 1

BUILDING LOCATION

Model:

Address: 111 Nicola St W

City & Province: Kamloops, BC

Site:

Lot:

Postal Code:

COMPLIANCE

Submittal is for: ☐ Whole house ☑ Room by Room

Units: ☑ Imperial ☐ Metric

HEATING

Minimum Heating Capacity: 10,168 BTUH

5.3.1 The total heat output capacity of all heating systems installed in a building shall not be less than 100% of the total building heat loss as determined in Clause 5.2.1

5.3.2 The combined heating delivery of the heating systems that serve a room or space shall not be less than 100% of the space heat loss , as determined in Clause 5.2.6. (If room-by-room submittal, see page 2 for individual space heating requirements)

COOLING

Nominal Cooling Capacity: 30,577 BTUH

Minimum Cooling Capacity: 24,462 BTUH

Maximum Cooling Capacity: 38,221 BTUH

6.3.2 Except as provided in Clause 6.3.3., the cooling system capacity shall not be less than 80% of the nominal cooling capacity for the building, as determined in Clause 6.3.1. In no case shall it be less than the nominal cooling capacity of the building minus 1,800 W (0.51 tons)

6.3.3 Where the cooling system is added to an existing heating system, it's capacity in Watts shall not exceed 18 times the capacity of the air-handling capacity of the existing system in L/s. (Cooling capacity in Tons not more than 1.0 per 400 CFM of air handling capacity)

6.3.4 Except for ground-source and water source heat pumps used for cooling, and as permitted in Clause 6.3.3, the installed cooling capacity shall not exceed 125% of the nominal cooling capacity for the building, as determined in Clause 6.3.1.

6.3.5 If the nominal cooling system capacity for the building, as determined in Clause 6.3.1. is less than 6,000 W (1.7 tons), the installed cooling system capacity may exceed the nominal cooling system capacity for the building by up to 1750 W (0.49 tons)

ATTACHED DOCUMENTS

☐ Design Summary ☑ Room by Room Results Other:

Other:

Notes:

CALCULATIONS PERFORMED BY

Name: Andrew Byke

Company:

Address: 7560 Ryley Place

City & Prov.: Chilliwack, BC

Postal Code: V2R 3B1

Phone: 604 991 7871

Fax:

E-mail: abyke@teca.ca

Designers signature, Stamp imprint or other certification mark

Andrew Byke

Page: 1 of 4

TECA HEAT LOSS & HEATGAIN CALCULATOR V5.08

This calculator is CSA F280 verified

HRAI DESIGNERS OF CANADA VERIFIED F280 SOFTWARE

BUILDING ASSEMBLY ERRORS

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

- Meet 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"x6, 16" OC w/ R6 Insulation, // 3" 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); 35.97R-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

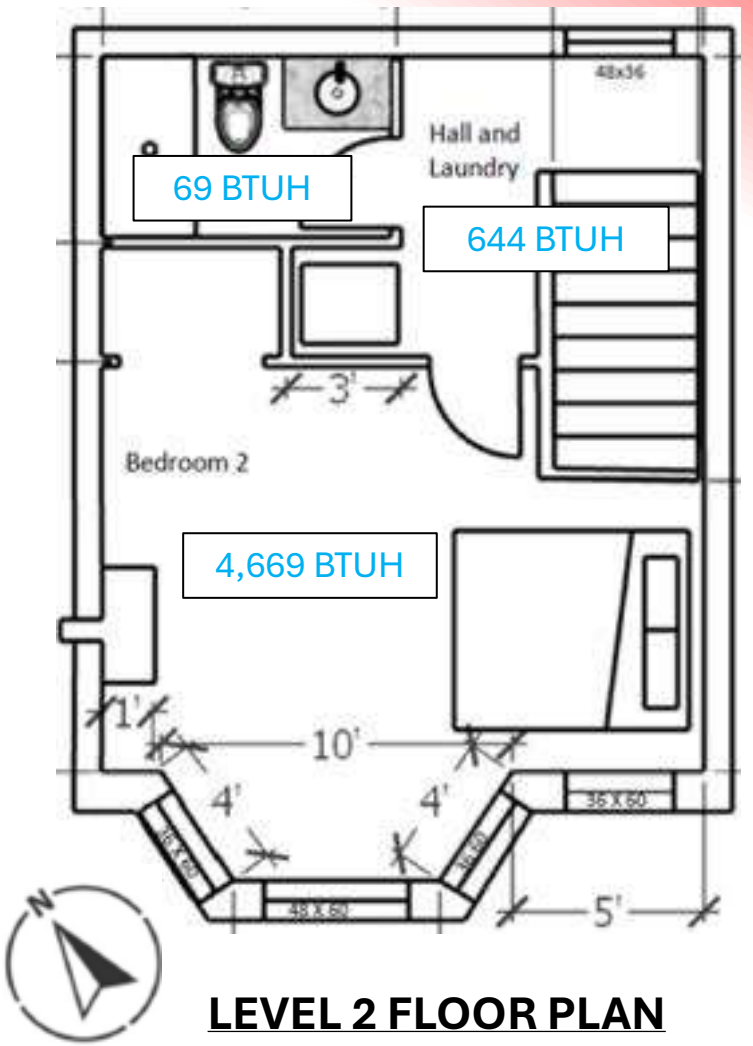
FOUNDATIONS

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

Orientation Example:

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

Solar Heat Gains:

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

HEAT GAIN COMPONENT BREAKDOWN, (BTUH)

ROOM NAME	WAL.	CEI.	FLR.	WIN.	DR.	LEAK.	VENT.	DIST.	INT.	SENS.	TOTAL
	WALL	CEILING	FLOOR	WINDOW & SKYLIGHT	DOOR & HATCH	LEAKAGE	VENTILATION	DISTRIBUTION & ADDITIONAL	INTERNAL	TOTAL SENSIBLE	TOTAL SENSIBLE + LATENT
(#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

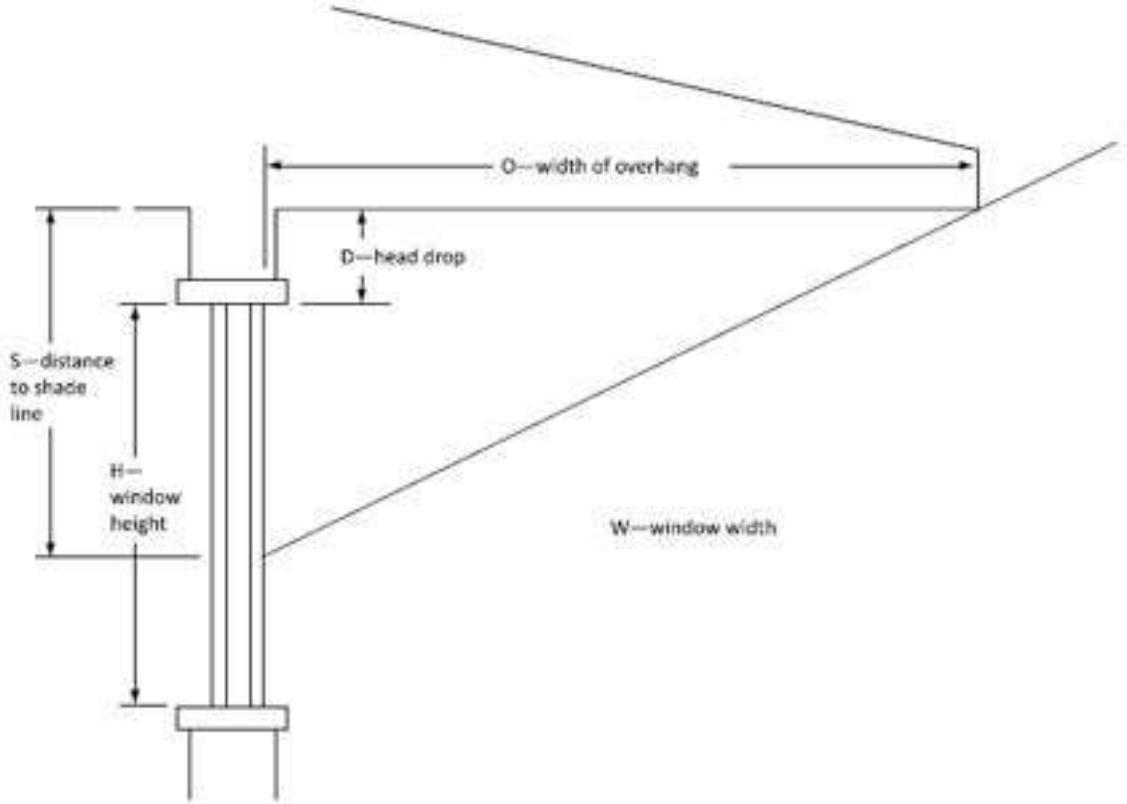
HEAT LOSS COMPONENT BREAKDOWN, (BTUH)

ROOM NAME	WAL.	CEI.	FLR.	WIN.	DR.	FND.	LEAK.	VENT.	DIST.	ADD.	TOTAL
	WALL	CEILING	FLOOR	WINDOW & SKYLIGHT	DOOR & HATCH	FOUNDATION	LEAKAGE	VENTILATION	DISTRIBUTION	ADDITIONAL	
(#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 <u>not required</u>, 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)
  - HRV efficiency impacts the load

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

SHORT BREAK!
FOLLOWED BY EXAMPLES

CSA F280 HLHG EXAMPLE

Site Information:

- **Vancouver, BC**
  - **-7°C Winter Design Temperature**
  - **28°C Summer Design Temperature**
- 3 Story, 3,067 ft^2 detached home
- Indoor setpoint temperature modeled at **26°C for cooling**
  - **CSA F280 specifies indoor setpoint of 24°C for cooling**
- Net Zero building assemblies
- 5 Occupants
- HRV: 110 CFM with 82% ASE
- No window shades included

BASEMENT PLAN

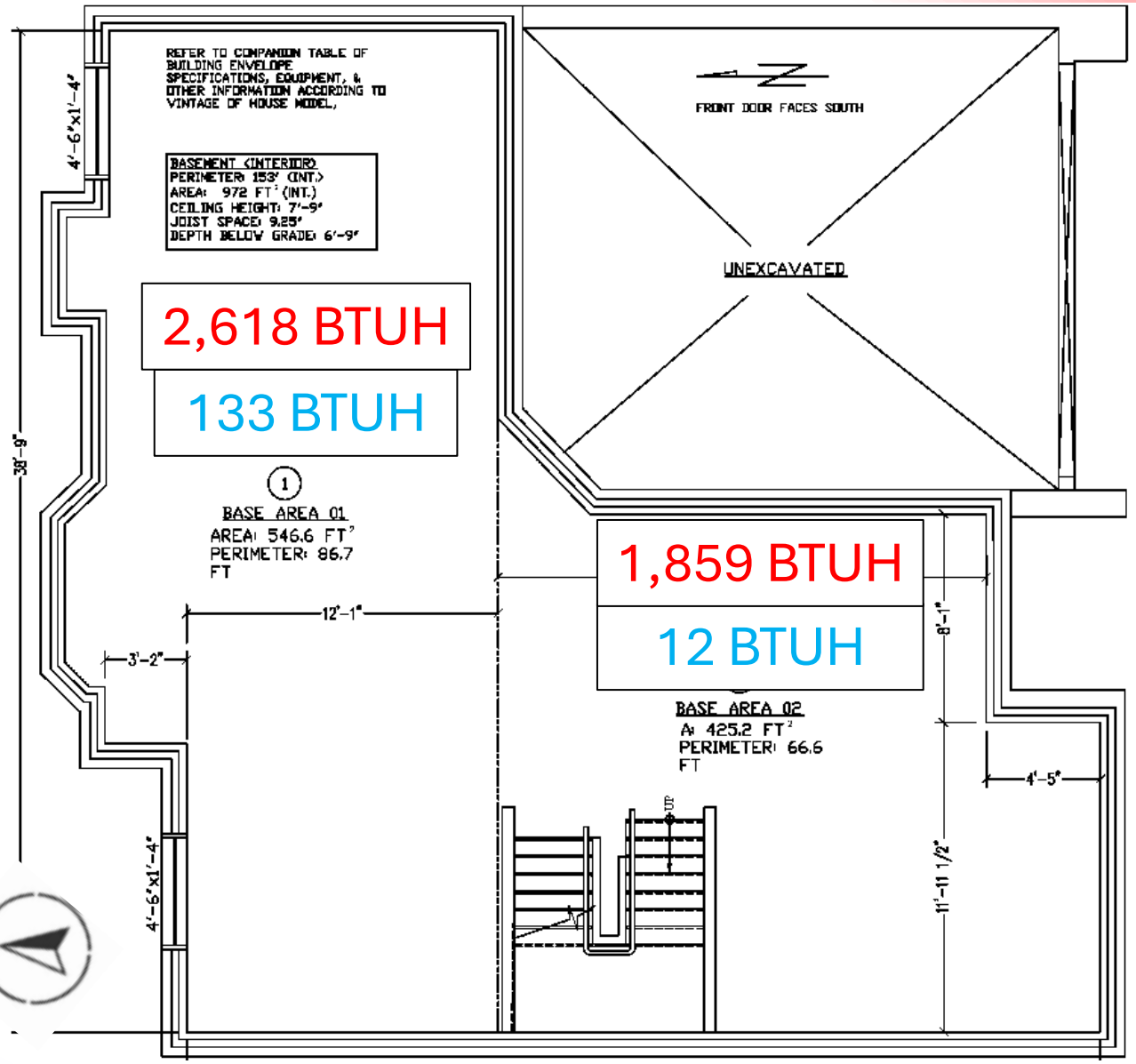
Heat Loss (Heating):

4,477 BTUH

Heat Gain (Cooling):

145 BTUH

*Mostly below grade



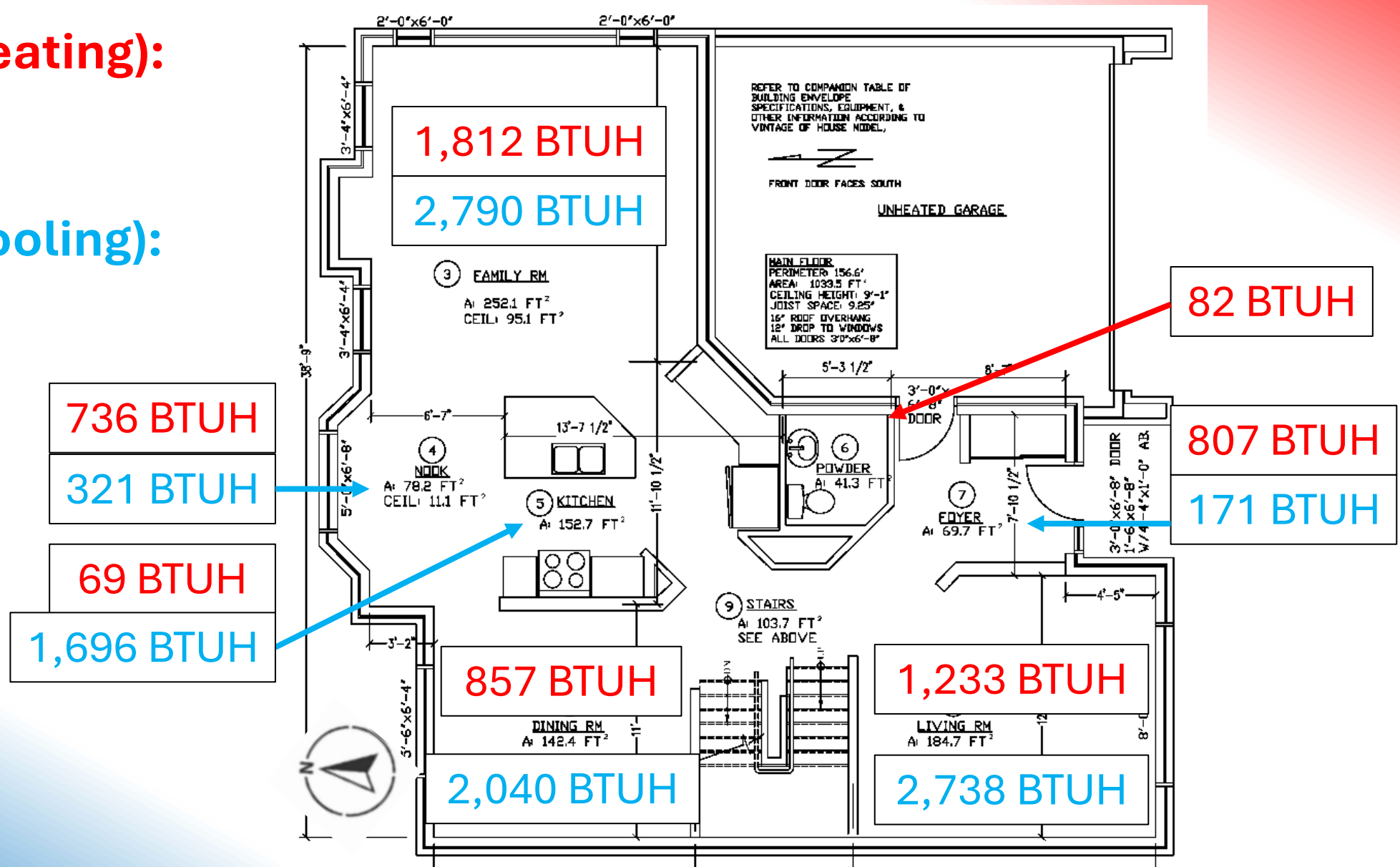
MAIN FLOOR PLAN

Heat Loss (Heating):

5,596 BTUH

Heat Gain (Cooling):

9,759 BTUH



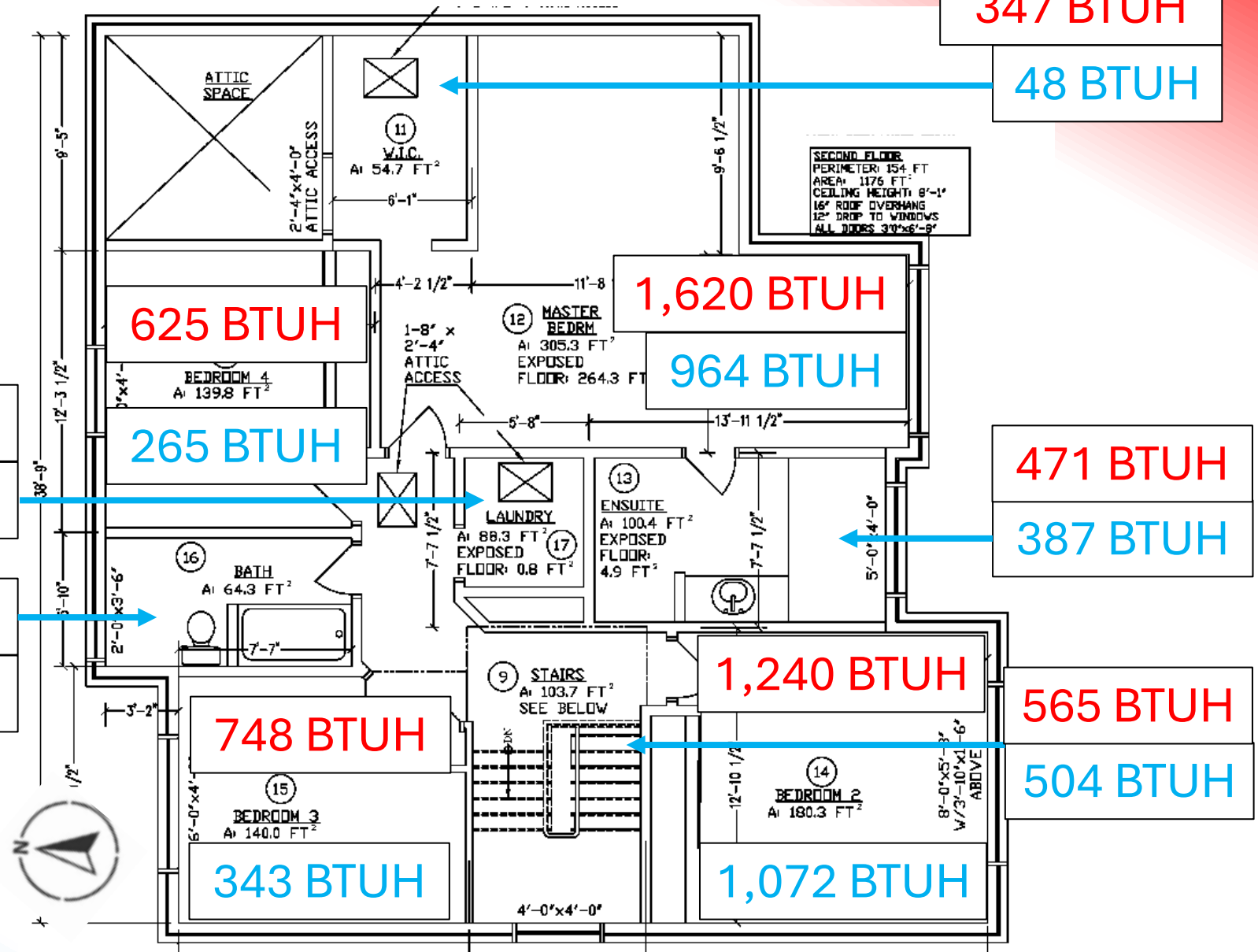
TOP FLOOR PLAN

Heat Loss (Heating):

6,042 BTUH

Heat Gain (Cooling):

3,758 BTUH



HEAT LOSS SUMMARY

Vancouver:

Temp. @ -7°C

Heat Loss:

16,115 BTUH

ROOM NAME	WAL.	CEI.	FLR.	WIN.	DR.	FND.	LEAK.	VENT.	DIST.	ADD.	TOTAL
(#18)BASE AREA 1	76			153		1262	803	324			2618
(#18)BASE AREA 2	58					1001	570	230			1859
(#18)FAMILY	542	85		845			242	98			1812
(#18)NOOK	162	10		426			98	40			736
(#18)KITCHEN	56						9	4			69
(#18)POWDER	67						11	4			82
(#18)ENTRY	138			183	334		108	44			807
(#18)LIVING	320			681			165	67			1233
(#18)STAIRS	163	92		204			76	31			565
(#18)DINING	252			445			115	46			857
(#18)W.I.C.	143	45			110		35	14			347
(#18)MASTER BEDROOM	335	272	269	516			162	66			1620
(#18)ENSUITE	55	89	5	255			47	19			471
(#18)BEDROOM2	252	160		653			124	50			1240
(#18)BEDROOM3	212	125		306			75	30			748
(#18)BATH	84	56		89			27	11			267
(#18)LAUNDRY		72	1		64		16	6			159
(#18)BEDROOM4	207	124		204			63	25			623
	WAL.	**CEI.**	**FLR.**	**WIN.**	**DR.**	**FND.**	**LEAK.**	**VENT.**	**DIST.**	**ADD.**	**TOTAL**
TOTAL BUILDING	**3121**	**1130**	**275**	**4960**	**509**	**2262**	**2747**	**1110**			**16115**

HEAT GAIN SUMMARY

Vancouver:

Temp. @ 28°C

Heat Gain:

13,659 BTUH

***Indoor temp @ 26°C**

ROOM NAME	WAL.	CEI.	FLR.	WIN.	DR.	LEAK.	VENT.	DIST.	INT.	SENS.	TOTAL
(#18)BASE AREA 1	7			88		2	6			103	**133**
(#18)BASE AREA 2	9					0	1			10	**12**
(#18)FAMILY	27	50		706		14	45		1305	2146	**2790**
(#18)NOOK	8	6		216		4	13			247	**321**
(#18)KITCHEN									1305	1305	**1696**
(#18)POWDER											
(#18)ENTRY				122		2	7			132	**171**
(#18)LIVING	29			715		13	43		1305	2106	**2738**
(#18)STAIRS	21	54		286		6	21			388	**504**
(#18)DINING	20			226		4	14		1305	1569	**2040**
(#18)W.I.C.	8	26				1	2			37	**48**
(#18)MASTER BEDROOM	26	159		504		12	40			741	**964**
(#18)ENSUITE		52		225		5	16			298	**387**
(#18)BEDROOM2	24	94		648		14	44			824	**1072**
(#18)BEDROOM3	17	73		156		4	14			264	**343**
(#18)BATH	4	33		45		1	5			89	**116**
(#18)LAUNDRY		42				1	2			45	**59**
(#18)BEDROOM4	13	73		104		3	11			204	**265**

	WAL.	CEI.	FLR.	WIN.	DR.	LEAK.	VENT.	DIST.	INT.	SENS.	TOTAL
TOTAL BUILDING	**212**	**663**		**4041**		**88**	**285**		**5218**	**10507**	**13659**

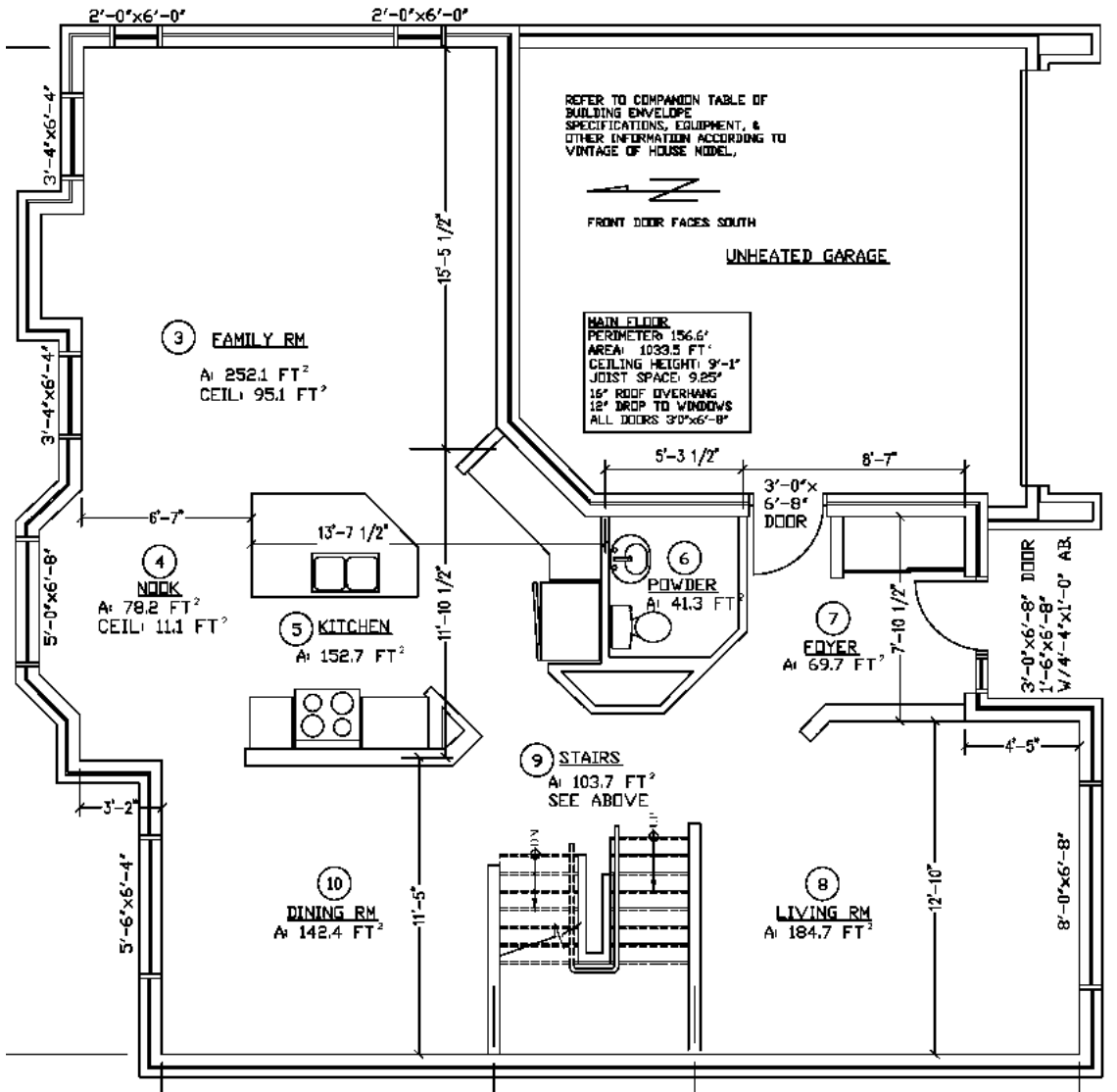
SINGLE ROOM CALCULATIONS

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.

SELECTING A SINGLE ROOM

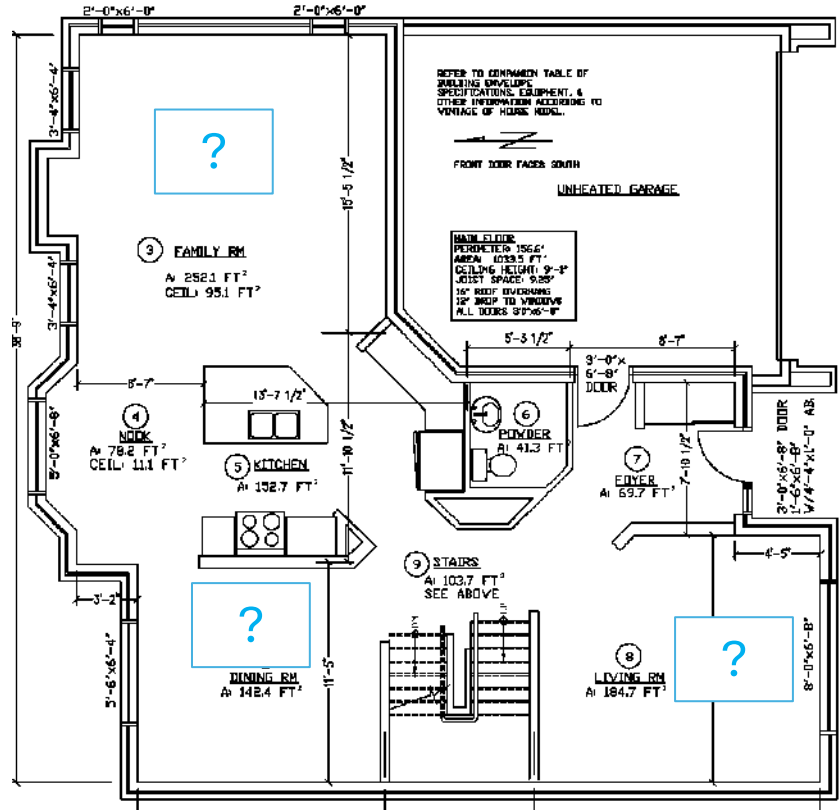
- Must be a finished room
- Can this room be isolated
- Window shades available
- Consider occupant comfort
  - How is the ventilation in the room
  - How will the occupants use the room
  - Consider how many ft^2 per occupant



MODELING A SINGLE ROOM

How to Model a Single Room to HVAC DC & TECA Standard:

- Calculate heat gain on the single room (must have doors)
- Interior surfaces assumed to be at outdoor design conditions
- Include all dwelling occupants in the single room
- Assume a min. electrical load of 800 Watts (2,730 BTUH)
- Indoor setpoint temperature of minimum 26°C
  - CSA F280 recommends **<u>24°C</u>**
- Include ventilation system

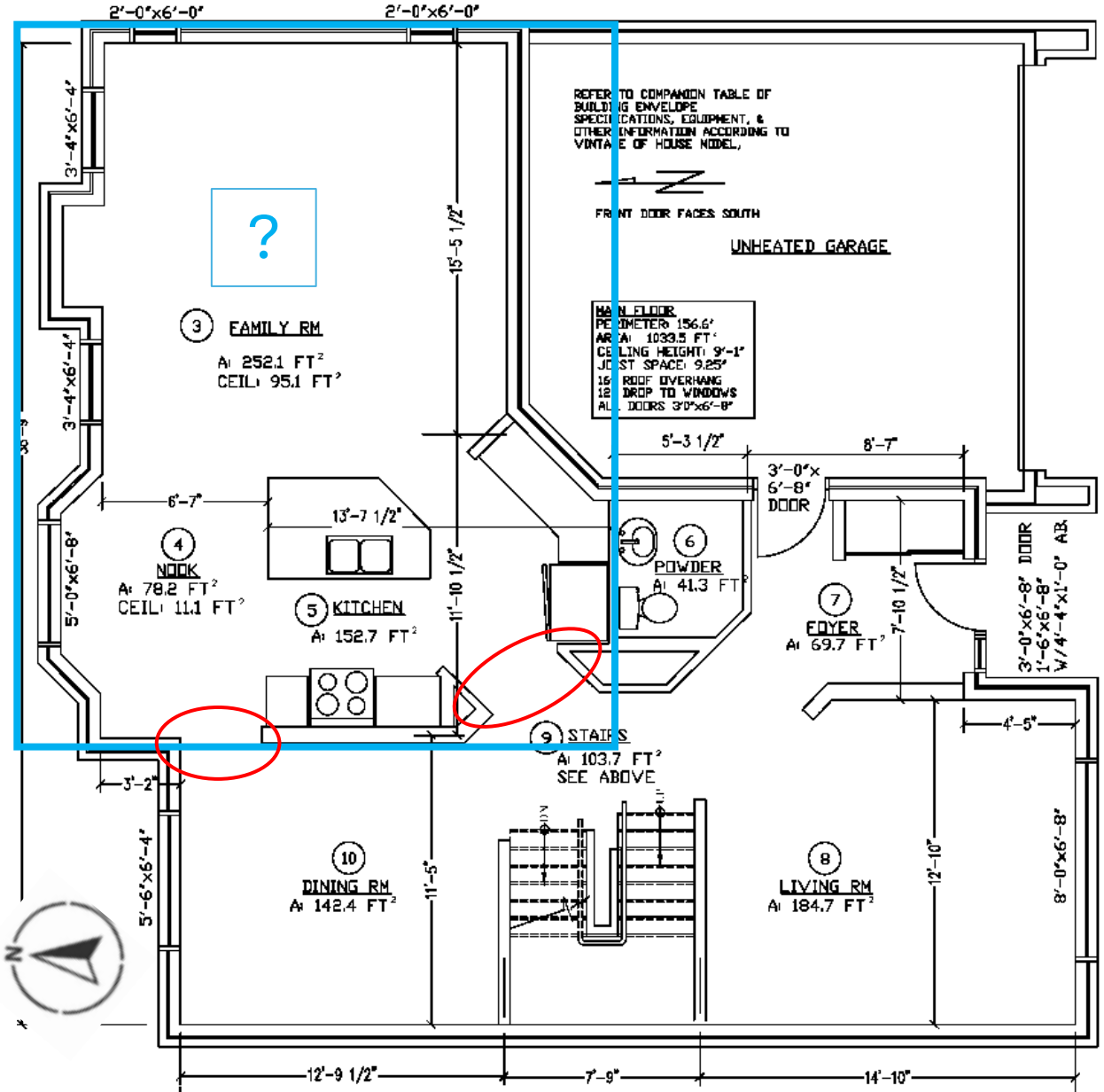


SINGLE ROOM: FAMILY ROOM

Family, Kitchen & Nook for Single Room Cooling:

- High occupant comfort level
- Cools a large area

- **Requires doors to be added!**



FAMILY ROOM COMPARISON

ROOM NAME	WAL.	CEI.	FLR.	WIN.	DR.	LEAK.	VENT.	DIST.	INT.	SENS.	TOTAL
(#18)BASE AREA 1	7			88		2	6			103	**133**
(#18)BASE AREA 2	9					0	1			10	**12**
(#18)FAMILY	27	50		706		14	45		1305	2146	**2790**
(#18)NOOK	8	6		216		4	13			247	**321**
(#18)KITCHEN									1305	1305	**1696**
(#18)POWDER											
(#18)ENTRY				122		2	7			132	**171**
(#18)LIVING	29			715		13	43		1305	2106	**2738**
(#18)STAIRS	21	54		286		6	21			388	**504**
(#18)DINING	20			226		4	14		1305	1569	**2040**
(#18)W.I.C.	8	26				1	2			37	**48**
(#18)MASTER BEDROOM	26	159		504		12	40			741	**964**
(#18)ENSUITE		52		225		5	16			298	**387**
(#18)BEDROOM2	24	94		648		14	44			824	**1072**
(#18)BEDROOM3	17	73		156		4	14			264	**343**
(#18)BATH	4	33		45		1	5			89	**116**
(#18)LAUNDRY		42				1	2			45	**59**
(#18)BEDROOM4	13	73		104		3	11			204	**265**

	WAL.	CEI.	FLR.	WIN.	DR.	LEAK.	VENT.	DIST.	INT.	SENS.	TOTAL
TOTAL BUILDING	212	663		4041		88	285		5218	10507	13659

Family & Kitchen Heat Gain:

4,807 BTUH

Family & Kit. as Single Room:

10,988 BTUH

CSA F280-12

Indoor temperature is 26°C rather than 24°C

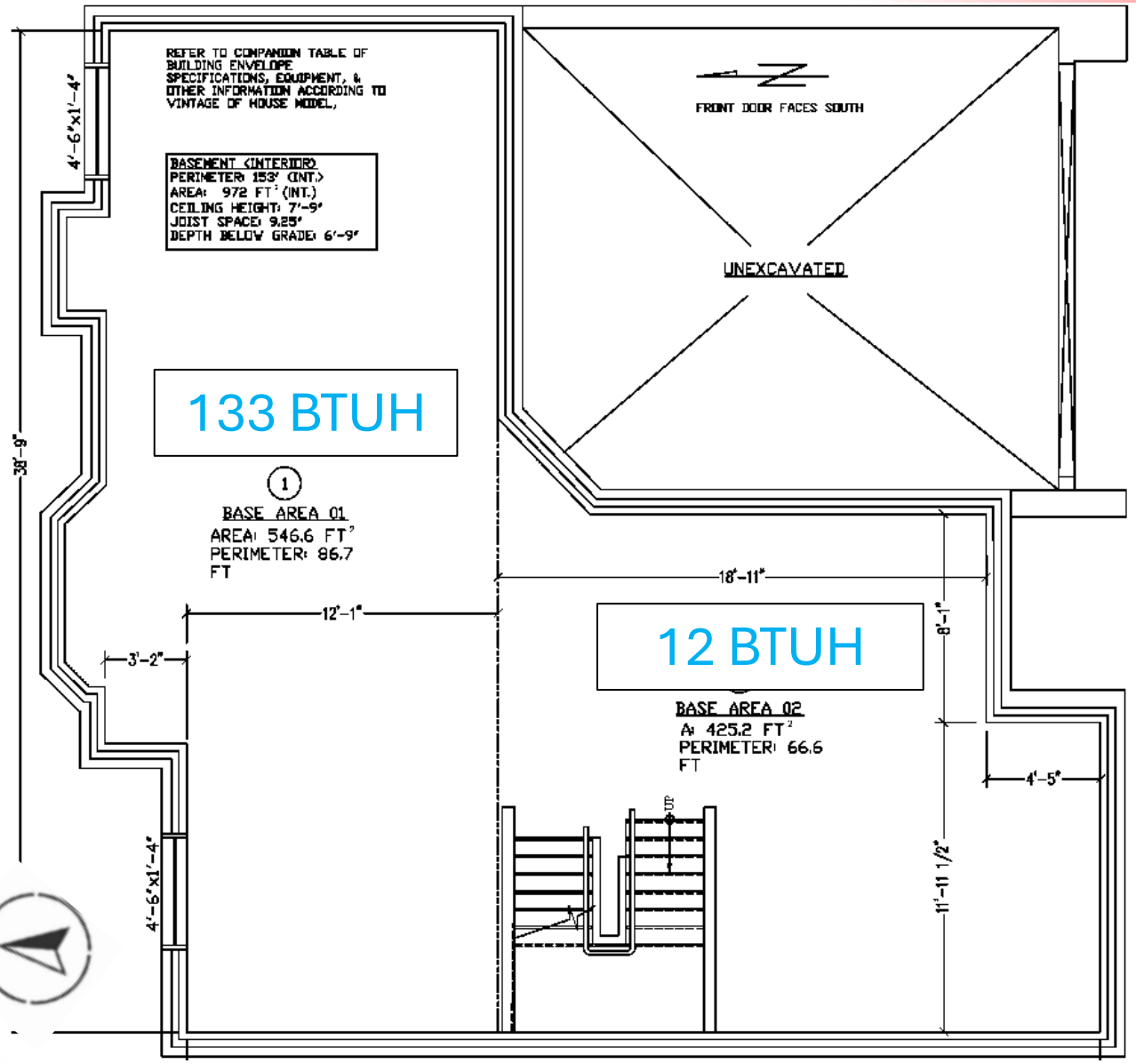
	WAL.	CEI.	FLR.	WIN.	DR.	LEAK.	VENT.	DIST.	INT.	SENS.	TOTAL
Family, Nook & Kitchen	273	2932		920	107	13	285		3924	8452	10988

BASEMENT PLAN

Why not use the basement for cooling?

- Must add internal loads
  - Add 3,924 BTUH
- Heat transfer from above
- No doors to stairs
- Poor occupant comfort

- **Does this area even require cooling?**



WHEN COOLING IS REQUIRED

Move the same house to different locations!

Site Information:

- 3 Story, 3,067 ft^2 detached home
- Indoor setpoint temperature modeled at 26°C
- Net Zero building assemblies
- 5 Occupants
- HRV: 110 CFM with 82% ASE
- No window shades included

HEAT GAIN COMPARISON

CSA F280 will always return a heat loss & heat gain value for the peak load

HEAT GAIN COMPARISON TABLE			
LOCATION	OUTDOOR SUMMER DESIGN TEMPERATURE	LATITUDE	HEAT GAIN CALCULATED (REQUIRED COOLING LOAD) [BTUH]
Alert, Nunavut	13°C	82.48	5,382
Baker Lake, Nunavut	23°C	64.32	10,774
Corner Brook, Newfoundland	26°C	48.95	12,480
Dawson City, Yukon	26°C	64.07	12,587
Toronto, Ontario	31°C	43.65	15,441
Vancouver, British Columbia	28°C	49.25	13,659

ALERT HEAT GAIN EXAMPLE

Alert:

Temp. @ 13°C

Heat Gain:

5,382 BTUH

ROOM NAME	WAL.	CEI.	FLR.	WIN.	DR.	LEAK.	VENT.	DIST.	INT.	SENS.	TOTAL
(#18)BASE AREA 1				9		-5	-10			-6	**-8**
(#18)BASE AREA 2											
(#18)FAMILY		6		275		-149	-314		1305	1122	**1458**
(#18)NOOK		1				0	-1			0	**-1**
(#18)KITCHEN									1305	1305	**1696**
(#18)POWDER											
(#18)ENTRY				46		-25	-52			-30	**-39**
(#18)LIVING				363		-193	-406		1305	1068	**1388**
(#18)STAIRS		6		180		-99	-209			-122	**-158**
(#18)DINING									1305	1305	**1696**
(#18)W.I.C.		3				-2	-3			-2	**-3**
(#18)MASTER BEDROOM		19		259		-148	-311			-181	**-236**
(#18)ENSUITE		6		113		-64	-134			-78	**-101**
(#18)BEDROOM2		11		330		-182	-382			-223	**-289**
(#18)BEDROOM3		9				-5	-10			-6	**-7**
(#18)BATH		4				-2	-4			-3	**-3**
(#18)LAUNDRY		5				-3	-6			-3	**-4**
(#18)BEDROOM4		9				-5	-10			-6	**-7**

	WAL.	CEI.	FLR.	WIN.	DR.	LEAK.	VENT.	DIST.	INT.	SENS.	TOTAL
TOTAL BUILDING		**78**		**1577**		**-882**	**-1851**		**5218**	**4140**	**5382**

COOLING REQUIREMENTS

Why does Alert still require cooling?

- The internal loads from CSA F280
  - Occupants: 70 W (240 BTUH) per person
  - Electrical loads: Minimum 800 W (2730 BTUH),

    4 W/m^2 (1.27 BTUH/ft^2) if > 200m^2 (2150 ft^2)
- No credit for thermal mass of building
- Below grade elements do not get free cooling from soil temperature
- CSA F280 only allows for calculating **peak loads**

WHEN COOLING IS REQUIRED

CSA F280 will <u>always</u> output some cooling requirement

- Cannot provide an answer on when cooling is **<u>not</u>** required

- Does not allow for passive cooling
  - Cannot open a window in the model

BSSB INFORMATION BULLETIN

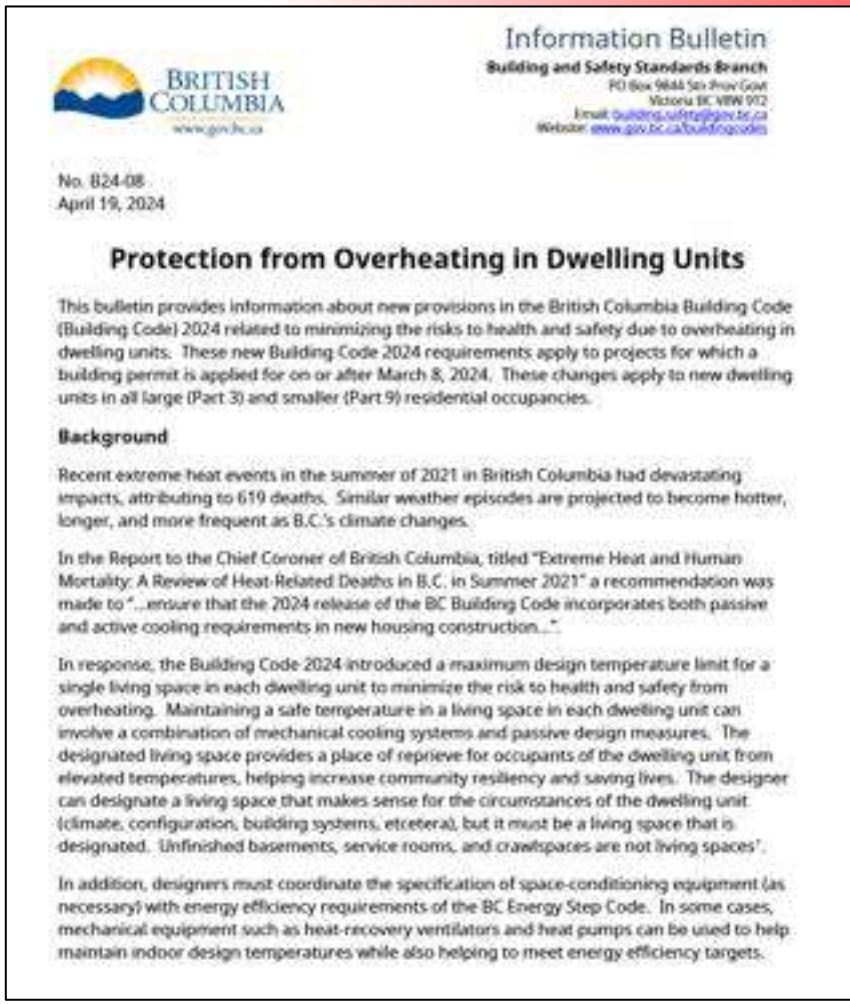
Building and Safety Standards Branch

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

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'.

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

Protection from Overheating in Dwelling Units

"Designers following Part 9 are required to **provide sufficient information** to demonstrate that a minimum of one living space in each dwelling unit meets the 26°C indoor design temperature requirement through passive and/or active measures **as per CSA F280**."

BRITISH COLUMBIA
www.gov.bc.ca

BSSB INFORMATION BULLETIN

Division C: 2.2.2.1. General Information Required

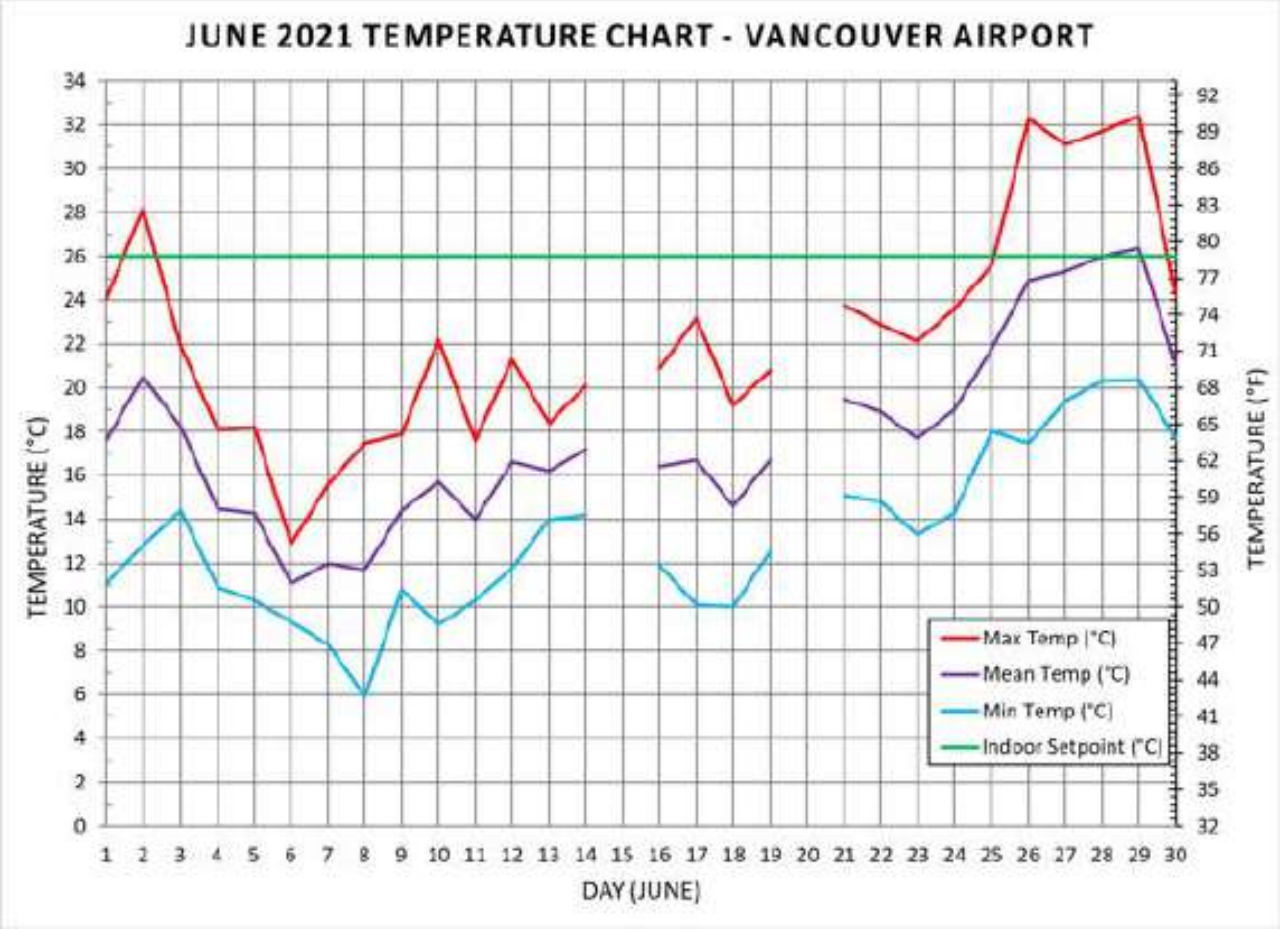
1) Sufficient information shall be provided to show that the proposed work will conform to this Code and whether or not it may affect adjacent property.

Note: CSA F280 was not designed to determine if cooling is required, only to provide a peak load

COOLING REQUIREMENTS

How do you prove cooling is not required?

- Simulation data must be provided
  - Weather data
  - Building thermal mass
  - Propagation of heat transfer
- Complex analysis!
- Engineer required?



REVIEWING A SINGLE ROOM

Errors in Modeling:

- Is the heat gain calculation performed on the **entire dwelling**, not just the living room?
  - 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?
- Have the **internal loads** been distributed to multiple rooms?
- Avoid these errors by following TECA & HVAC DC's guidelines!

COMMENTS ON FUTURE AMENDMENTS

- CSA F280 is not designed to answer if cooling is required

- **NBC is considering adopting cooling requirement**
  - The NBC is considering whole house cooling
    - ➢ Rather than allowing a refuge room
  - Cut-off temperature for outdoor design temperatures below 26°C

- BCBC will likely modify the cooling clause in the future

- Single room cooling guidelines may be adopted in the BCBC

HOME PERFORMANCE STAKEHOLDER COUNCIL

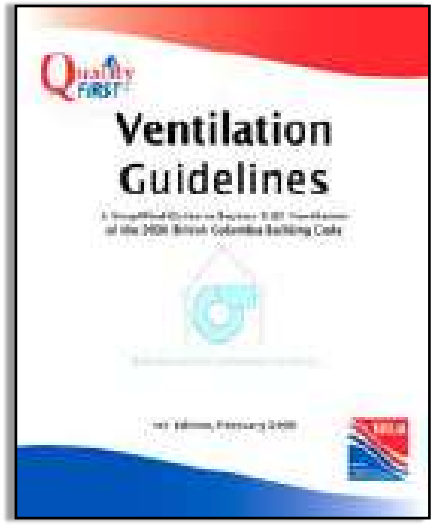
HPCN HVAC Registration Requires Training:

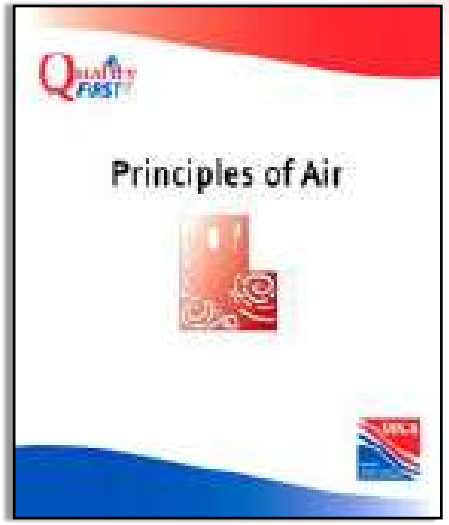
- HLHG Certification
- Principals of Moving Air
- House as a System (HPSC)

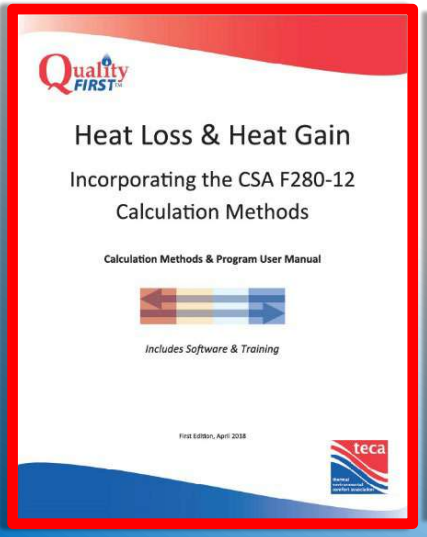
HPCN membership required for many rebates

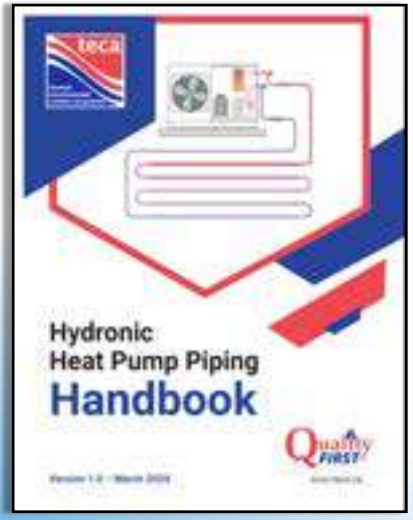
https://guides.co/g/updated-home-performance-contractor-network/231461

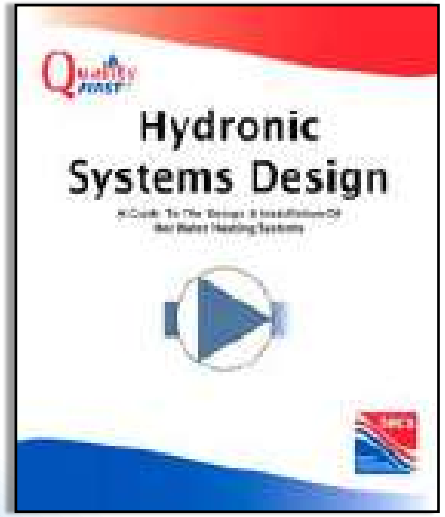
TECA COURSES

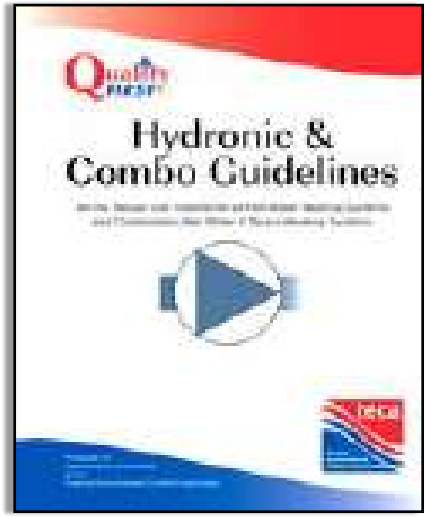


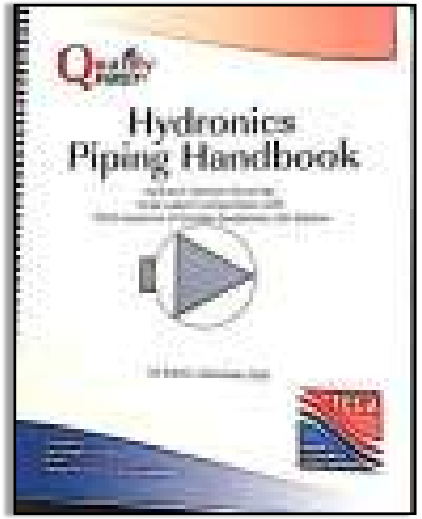












QUESTIONS & COMMENTS?

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END