Load Summary

CSA F280 Load Calculation

Project #:L211

October 03, 2023

Project Information

Project #: L211

Name: Matthew Holmes

Location: 10403, Y1A7A1, Whitehorse, Yukon, Canada

Notes:

Outdoor Conditions

Location:	Whitehorse, Yukon Territory
Latitude:	61
Soil Temp:	37.4 °F
Heating Design Temp:	-41.8 °F
Cooling Design Temp:	77.0 °F

Indoor Conditions

	Heating	Cooling
Room Temp:	70 °F °F	75 °F °F
Design ΔT:	111.8 °F	2.0 °F

Infiltration

See detailed load report for all settings

Stories:	Two
Type:	Detached
Air Tightness:	Average (1946-1960)
Heating Air Changes:	0.74 /hr
Cooling Air Changes:	0.07 /hr

Ventilation

Num Occupants: 2

	Heating	Cooling
Air Changes:	0.28 /hr	0.27 /hr
Flowrate:	100 cfm	100 cfm
Effectiveness*:	0.6	0.6

Floorplan/Levels

Ground Floor	1,000 ft²
Main Floor	1,066 ft²
Total Heated Area:	2,066 ft²
Total Cooled Area:	2,131 ft²

Total Heat Loss: 54,114 Btu/hr

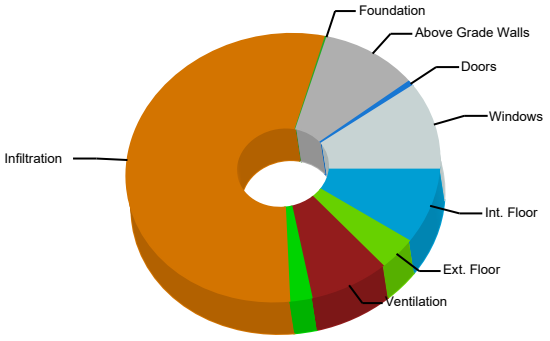
Total Heat Gain: 10,150 Btu/hr

Latent Factor: 1.3

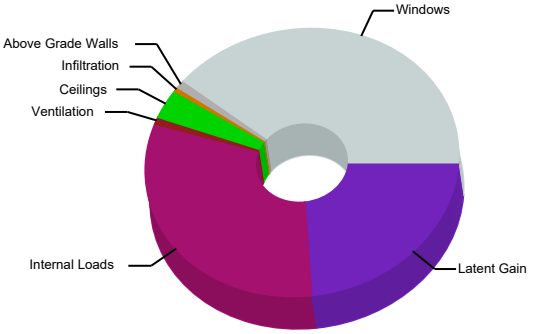
Load Breakdown

Name	Heat Loss	Heat Gain
Windows	6,231	4,013
Doors	386	0
Skylights	0	0
Above Grade Walls	6,133	98
Exposed Floors	0	0
Foundation	102	0
Infiltration	32,798	52
Ceiling	1,354	351
Duct Loads	0	0
Ventilation	4,801	86
Internal Loads	0	3,207
Other Loads	0	0
External Floor Radiant Panel Loss	2,309	0
Internal Floor Radiant Panel Loss	5,478	0
Total Sensible	54,114	7,807
Latent Gain	0	2,342
Total Load	54,114	10,150
Total Area	2,066 ft²	2,131 ft²

Heat Loss Breakdown



Heat Gain Breakdown



(*) Heating: apparent sensible effectiveness of the HRV; Cooling: adjusted total recovery efficiency of the HRV/ERV.

Calculations meet requirements of CSA F280-12 (R2021 Update 3)
Length = ft Area = ft² Temperature = °F Flowrate = USGPM Air Flow = cfm Heat Loss = Btu/hr
Unit Heat Loss = Btu/(hr·ft²) Rv = hr·ft²·°F/btu Head Loss = ft water RH = Radiant Floor Heating
BB = Baseboard FA = Forced Air OTH = Other Heating SM = Snowmelt N = Not Heated

Created Using LoopCAD 2023 (2023-10-20)
Software Version:23.0.0180 R

See sections at end of report for important Notes, Assumptions and Disclaimers.

Disclaimers

With the permission of Canadian Standards Association, material is reproduced from CSA Standard, CSA F280-12 (Revision 2021 Update 3), Determining the Required Capacity of Residential Space Heating and Cooling Appliances which is copyrighted by Canadian Standards Association, 178 Rexdale Blvd., Toronto, Ontario, M9W 1R3, www.shopcsa.ca. While use of this material has been authorized, CSA shall not be responsible for the manner in which the information is presented, nor for any interpretations thereof.

Cold weather humidification, or some lifestyles that produce excessive moisture, may cause condensation to occur if the absolute humidity of the indoor air is too high for the momentary circumstances. Condensation can occur on surfaces or concealed within the structure, and can lead to mold, mildew, frost damage, and moisture damage. The software does not perform calculations for the estimation or detection of possible condensation problems, and it is the designers (i.e. software users) responsibility to do so independently if required.

The calculated values shown in this report are based on the data input by the user of the software. Inaccurate or erroneous data input will result in inaccurate or erroneous results. You are strongly advised to review all input data carefully, and to have the calculated results reviewed by an experienced heating professional to ensure reasonableness and suitability for your application.

IN NO EVENT WILL AVENIR SOFTWARE INC. (“AVENIR”) OR ITS AFFILIATES BE LIABLE UNDER ANY CONTRACT, NEGLIGENCE, STRICT LIABILITY OR OTHER LEGAL OR EQUITABLE THEORY FOR ANY CONSEQUENTIAL, INCIDENTAL, INDIRECT OR SPECIAL OR PUNITIVE DAMAGES WHATSOEVER (INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF BUSINESS PROFITS, BUSINESS INTERRUPTION, LOSS OF BUSINESS INFORMATION OR DATA AND THE LIKE), EVEN IF SUCH PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. AVENIR’S CUMULATIVE LIABILITY FROM ANY CAUSE RELATED TO OR ARISING FROM THE USE THIS REPORT, AND REGARDLESS OF THE FORM OF THE ACTION, SHALL BE LIMITED TO NO GREATER THAN THE AMOUNT OF FEES PAID TO AVENIR UNDER THE SOFTWARE LICENSE AGREEMENT.

Load Details

CSA F280 Load Calculation

Project #:L211

October 03, 2023

Project Information

Project #: L211

Name: Matthew Holmes

Location: 10403, Y1A7A1, Whitehorse, Yukon, Canada

Notes:

CSA Load Details

Total Heating: 54,114 Btu/hr **Total Cooling: 10,150 Btu/hr** **Latent Factor: 1.3**

Outdoor Conditions

Location:	Whitehorse, Yukon Territory
Latitude:	61
Soil Temp:	37.4 °F
Heating Design Temp:	-41.8 °F
Cooling Design Temp:	77.0 °F

Indoor Conditions

	Heating	Cooling
Room Temp:	70 °F	75 °F
Design ΔT:	111.8 °F	2.0 °F

Infiltration

Stories:	Two
Air Tightness:	Average (1946-1960)
Building Site:	Suburban, forest
Walls Shielding:	Very heavy
Flue Shielding:	Heavy
Building Type/Foundation:	Detached/ Full
Flue Diameters:	4 in, 4 in
Building Volume / Height:	22,093 ft³ / 24'-11"
Heating Air Changes:	0.74 /hr
Cooling Air Changes:	0.07 /hr

Ventilation

	Heating	Cooling
Air Changes:	0.28 /hr	0.27 /hr
Flowrate:	100 cfm	100 cfm
Effectiveness*:	0.6	0.6

Floorplan/Levels

Ground Floor	1,000 ft²	Total Heated Area:	2,066 ft²
Main Floor	1,066 ft²	Total Cooled Area:	2,131 ft²

Calculations meet requirements of CSA F280-12 (R2021 Update 3)

Created Using LoopCAD 2023 (2023-10-20)

(1) ΔT: Difference between supply air and return air (2) Estimated air flow based on specified supply air ΔT

Version:23.0.0180 R

(*) Heating: apparent sensible effectiveness of the HRV; Cooling: adjusted total recovery efficiency of the HRV/ERV.

Length = ft Area = ft² Temperature = °F Flowrate = USGPM Air Flow = cfm Heat Loss = Btu/hr Unit Heat Loss = Btu/(hr·ft²) Rv = hr·ft²·°F/btu

Head Loss = ft water RH = Radiant Floor Heating BB = Baseboard FA = Forced Air OTH = Other Heating SM = Snowmelt N = Not Heated

See end of report for important Notes and Disclaimers.

Constructions

Doors

Description	R-Value	Area	Heating	Cooling
Insulated fiberglass—Polystryrene core	4.83	17	386	0

Walls

Description	R-Value	Area	Heating	Cooling
Wall	48.0	2,805	6,133	98

Ceilings

Description	R-Value	Area	Heating	Cooling
Ceiling	88.0	1,066	1,354	351

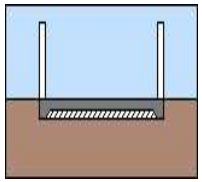
Glazing

Windows

Description	Exposure	R-Value	SHGC	Area	Heating	Cooling
Glass	E	6.4	0.30	57	1,002	795
Glass	S	6.4	0.30	188	3,281	1,917
Glass	W	6.4	0.30	85	1,479	1,174
Glass	N	6.4	0.30	27	469	127

Foundations

ID	Code	Description	Area	Heat Loss	Options
F0	SCB_25	Slab Floors	1,066	2,411	Slab Insulation: 20.0 hr·ft²·°F/btu



F0

Description

SCB_25
- concrete or soil (for crawl space) floor
- bottom of slab fully insulated except under footing/foundation wall (ie. insulation starts 0.25 m from edge)
- first storey is non-brick veneer or bricks thermally broken from concrete floor

Options

Slab Insulation: 20.0 hr·ft²·°F/btu

Duct Loads

All ducts are in conditioned space.

Internal Loads

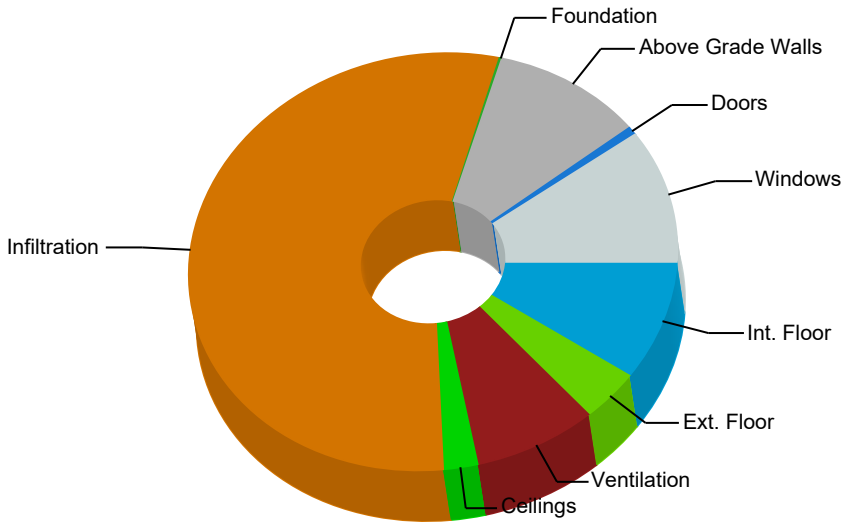
Occupants:	2
Total Internal Heat Gain:	10,150 Btu/hr

No rooms specified at peak cooling. Internal loads will be evenly distributed throughout the building.

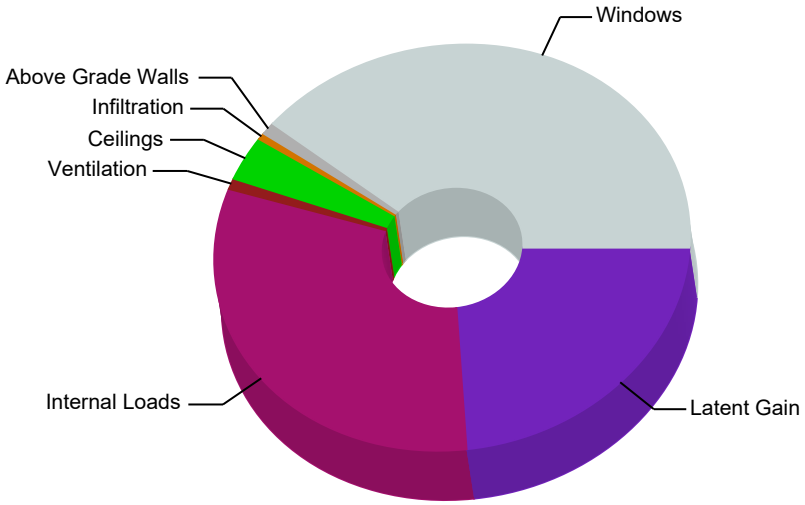
Load Breakdown

Name	Heat Loss	Heat Gain
Windows	6,231	4,013
Doors	386	0
Skylights	0	0
Above Grade Walls	6,133	98
Exposed Floors	0	0
Foundation	102	0
Infiltration	32,798	52
Ceiling	1,354	351
Duct Loads	0	0
Ventilation	4,801	86
Internal Loads	0	3,207
Other Loads	0	0
External Floor Radiant Panel Loss	2,309	0
Internal Floor Radiant Panel Loss	5,478	0
Total Sensible	54,114	7,807
Latent Gain	0	2,342
Total Load	54,114	10,150
Total Area	2,066 ft²	2,131 ft²

Heat Loss Breakdown



Heat Gain Breakdown



Heating Zones

Zone	Area	Room Temp	Total Load
Zone 101	524	70	16,622
Zone 102	476	70	13,700
Zone 201	1,066	70	23,792

Heating Rooms

Room	Area	Room Temp	Total Load
Corridor / Entry	266	70	8,978
Dining	476	70	13,700
Downstair WC	45	70	1,640
Pantry	73	70	1,837
Rumpus Room	141	70	4,168
Bedroom 1	146	70	2,725
Bedroom 2	154	70	4,023
Laundry	57	70	592
Library/Office/Upstairs Corridor	341	70	6,140
Primary WC	91	70	2,928
PrimaryBedroom	207	70	5,291
Upstair WC	69	70	2,094

Cooling Zones

Zone	Area	Room Temp	Total Load
C1	2,131	75	10,150

Cooling Rooms

Room	Area	Room Temp	Total Load
Corridor / Entry	266	75	1,384
Dining	476	75	2,518
Downstair WC	45	75	164
Mechanical ROom	66	75	138
Pantry	73	75	143
Rumpus Room	141	75	565
Bedroom 1	146	75	692
Bedroom 2	154	75	734
Laundry	57	75	137
Library/Office/Upstairs Corridor	341	75	1,445

Primary WC	91	75	695
PrimaryBedroom	207	75	1,135
Upstair WC	69	75	401

CSA Room Details

Corridor / Entry (Ground Floor)

Load Breakdown

Name	Heat Loss	Heat Gain
Windows	794	630
Doors	386	0
Above Grade Walls	734	15
Infiltration	5,681	8
Ventilation	732	12
Internal Loads	0	400
External Floor Radiant Panel Loss	651	0
Total Sensible	8,978	1,065
Total Floor Area	266 ft²	266 ft²

Constructions

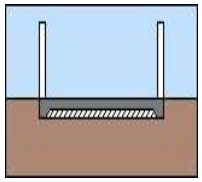
Type	Description	R-Value	Area	Heating	Cooling
Doors	Insulated fiberglass—Polystryrene core	4.83	17	386	0
Walls	Wall	48.0	315	734	15

Glazings

Type	Description	Exposure	R-Value	SHGC	Area	Heating	Cooling
Windows	Glass	E	6.4	0.30	45	794	630

Foundation

ID	Code	Description	Area	Heat Loss	Options
F0	SCB_25	Slab Floors	266	651	Slab Insulation: 20.0 hr·ft²·°F/btu



F0

Description

SCB_25
- concrete or soil (for crawl space) floor
- bottom of slab fully insulated except under footing/foundation wall (ie. insulation starts 0.25 m from edge)
- first storey is non-brick veneer or bricks thermally broken from concrete floor

Options

Slab Insulation: 20.0 hr·ft²·°F/btu

Dining (Ground Floor)

Load Breakdown

Name	Heat Loss	Heat Gain
Windows	1,819	1,172
Above Grade Walls	1,046	12
Foundation	96	0
Infiltration	8,670	14
Ventilation	1,117	23
Internal Loads	0	716
External Floor Radiant Panel Loss	953	0
Total Sensible	13,700	1,937
Total Floor Area	476 ft²	476 ft²

Constructions

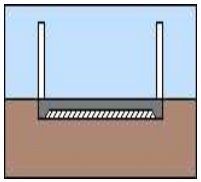
Type	Description	R-Value	Area	Heating	Cooling
Walls	Wall	48.0	449	1,046	12

Glazings

Type	Description	Exposure	R-Value	SHGC	Area	Heating	Cooling
Windows	Glass	S	6.4	0.30	74	1,296	757
Windows	Glass	W	6.4	0.30	30	523	415

Foundation

ID	Code	Description	Area	Heat Loss	Options
F0	SCB_25	Slab Floors	476	1,048	Slab Insulation: 20.0 hr·ft²·°F/btu



F0

Description

SCB_25
- concrete or soil (for crawl space) floor
- bottom of slab fully insulated except under footing/foundation wall (ie. insulation starts 0.25 m from edge)
- first storey is non-brick veneer or bricks thermally broken from concrete floor

Options

Slab Insulation: 20.0 hr·ft²·°F/btu

Downstair WC (Ground Floor)

Load Breakdown

Name	Heat Loss	Heat Gain
Windows	208	56
Above Grade Walls	154	0
Foundation	6	0
Infiltration	1,040	1
Ventilation	134	1
Internal Loads	0	68
External Floor Radiant Panel Loss	98	0
Total Sensible	1,640	126
Total Floor Area	45 ft²	45 ft²

Constructions

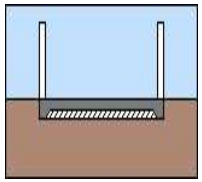
Type	Description	R-Value	Area	Heating	Cooling
Walls	Wall	48.0	66	154	0

Glazings

Type	Description	Exposure	R-Value	SHGC	Area	Heating	Cooling
Windows	Glass	N	6.4	0.30	12	208	56

Foundation

ID	Code	Description	Area	Heat Loss	Options
F0	SCB_25	Slab Floors	45	104	Slab Insulation: 20.0 hr·ft²·°F/btu



F0

Description

SCB_25
- concrete or soil (for crawl space) floor
- bottom of slab fully insulated except under footing/foundation wall (ie. insulation starts 0.25 m from edge)
- first storey is non-brick veneer or bricks thermally broken from concrete floor

Options

Slab Insulation: 20.0 hr·ft²·°F/btu

Mechanical ROom (Ground Floor)

Load Breakdown

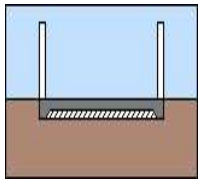
Name	Heat Loss	Heat Gain
Above Grade Walls	0	7
Infiltration	0	0
Ventilation	0	0
Internal Loads	0	99
Total Sensible	0	106
Total Floor Area	0 ft²	66 ft²

Constructions

Type	Description	R-Value	Area	Heating	Cooling
Walls	Wall	48.0	172	0	7

Foundation

ID	Code	Description	Area	Heat Loss	Options
F0	SCB_25	Slab Floors	66	0	Slab Insulation: 20.0 hr·ft²·°F/btu



F0

Description

SCB_25
- concrete or soil (for crawl space) floor
- bottom of slab fully insulated except under footing/foundation wall (ie. insulation starts 0.25 m from edge)
- first storey is non-brick veneer or bricks thermally broken from concrete floor

Options

Slab Insulation: 20.0 hr·ft²·°F/btu

Pantry (Ground Floor)

Load Breakdown

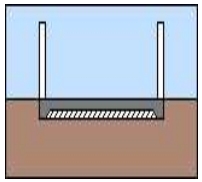
Name	Heat Loss	Heat Gain
Above Grade Walls	324	0
Infiltration	1,156	0
Ventilation	149	0
Internal Loads	0	110
External Floor Radiant Panel Loss	208	0
Total Sensible	1,837	110
Total Floor Area	73 ft²	73 ft²

Constructions

Type	Description	R-Value	Area	Heating	Cooling
Walls	Wall	48.0	139	324	0

Foundation

ID	Code	Description	Area	Heat Loss	Options
F0	SCB_25	Slab Floors	73	208	Slab Insulation: 20.0 hr·ft²·°F/btu



F0

Description

SCB_25
- concrete or soil (for crawl space) floor
- bottom of slab fully insulated except under footing/foundation wall (ie. insulation starts 0.25 m from edge)
- first storey is non-brick veneer or bricks thermally broken from concrete floor

Options

Slab Insulation: 20.0 hr·ft²·°F/btu

Rumpus Room (Ground Floor)

Load Breakdown

Name	Heat Loss	Heat Gain
Windows	260	207
Above Grade Walls	542	10
Infiltration	2,628	3
Ventilation	338	4
Internal Loads	0	211
External Floor Radiant Panel Loss	399	0
Total Sensible	4,168	434
Total Floor Area	141 ft²	141 ft²

Constructions

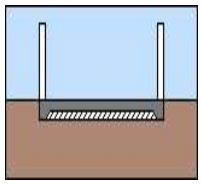
Type	Description	R-Value	Area	Heating	Cooling
Walls	Wall	48.0	233	542	10

Glazings

Type	Description	Exposure	R-Value	SHGC	Area	Heating	Cooling
Windows	Glass	W	6.4	0.30	15	260	207

Foundation

ID	Code	Description	Area	Heat Loss	Options
F0	SCB_25	Slab Floors	141	399	Slab Insulation: 20.0 hr·ft²·°F/btu



F0

Description

SCB_25
- concrete or soil (for crawl space) floor
- bottom of slab fully insulated except under footing/foundation wall (ie. insulation starts 0.25 m from edge)
- first storey is non-brick veneer or bricks thermally broken from concrete floor

Options

Slab Insulation: 20.0 hr·ft²·°F/btu

Bedroom 1 (Main Floor)

Load Breakdown

Name	Heat Loss	Heat Gain
Windows	436	254
Above Grade Walls	276	0
Infiltration	1,560	4
Ceiling	186	48
Ventilation	267	6
Internal Loads	0	220
Internal Floor Radiant Panel Loss	563	0
Total Sensible	2,725	532
Total Floor Area	146 ft²	146 ft²

Constructions

Type	Description	R-Value	Area	Heating	Cooling
Walls	Wall	48.0	118	276	0
Ceilings	Ceiling	88.0	146	186	48
Radiant Floors	Concrete Thin Slab; R-6.31 Insulation Below Tubing.	6.31	146	563	0

Glazings

Type	Description	Exposure	R-Value	SHGC	Area	Heating	Cooling
Windows	Glass	S	6.4	0.30	25	436	254

Bedroom 2 (Main Floor)

Load Breakdown

Name	Heat Loss	Heat Gain
Windows	436	254
Above Grade Walls	694	18
Infiltration	2,303	4
Ceiling	196	51
Ventilation	394	6
Internal Loads	0	232
Internal Floor Radiant Panel Loss	1,819	0
Total Sensible	4,023	564
Total Floor Area	154 ft²	154 ft²

Constructions

Type	Description	R-Value	Area	Heating	Cooling
Walls	Wall	48.0	298	694	18
Ceilings	Ceiling	88.0	154	196	51
Radiant Floors	Concrete Thin Slab; R-6.31 Insulation Below Tubing.	6.31	154	1,819	0

Glazings

Type	Description	Exposure	R-Value	SHGC	Area	Heating	Cooling
Windows	Glass	S	6.4	0.30	25	436	254

Laundry (Main Floor)

Load Breakdown

Name	Heat Loss	Heat Gain
Above Grade Walls	122	0
Infiltration	339	0
Ceiling	72	19
Ventilation	58	0
Internal Loads	0	86
Internal Floor Radiant Panel Loss	141	0
Total Sensible	592	105
Total Floor Area	57 ft²	57 ft²

Constructions

Type	Description	R-Value	Area	Heating	Cooling
Walls	Wall	48.0	53	122	0
Ceilings	Ceiling	88.0	57	72	19
Radiant Floors	Concrete Thin Slab; R-6.31 Insulation Below Tubing.	6.31	57	141	0

Library/Office/Upstairs Corridor (Main

Load Breakdown

Name	Heat Loss	Heat Gain
Windows	941	468
Above Grade Walls	648	0
Infiltration	3,516	7
Ceiling	434	112
Ventilation	602	11
Internal Loads	0	514
Internal Floor Radiant Panel Loss	1,425	0
Total Sensible	6,140	1,112
Total Floor Area	341 ft²	341 ft²

Constructions

Type	Description	R-Value	Area	Heating	Cooling
Walls	Wall	48.0	278	648	0
Ceilings	Ceiling	88.0	341	434	112
Radiant Floors	Concrete Thin Slab; R-6.31 Insulation Below Tubing.	6.31	341	1,425	0

Glazings

Type	Description	Exposure	R-Value	SHGC	Area	Heating	Cooling
Windows	Glass	N	6.4	0.30	15	261	71
Windows	Glass	S	6.4	0.30	39	680	397

Primary WC (Main Floor)

Load Breakdown

Name	Heat Loss	Heat Gain
Windows	436	346
Above Grade Walls	413	10
Infiltration	1,677	4
Ceiling	116	30
Ventilation	287	7
Internal Loads	0	137
Internal Floor Radiant Panel Loss	385	0
Total Sensible	2,928	535
Total Floor Area	91 ft²	91 ft²

Constructions

Type	Description	R-Value	Area	Heating	Cooling
Walls	Wall	48.0	177	413	10
Ceilings	Ceiling	88.0	91	116	30
Radiant Floors	Concrete Thin Slab; R-6.31 Insulation Below Tubing.	6.31	91	385	0

Glazings

Type	Description	Exposure	R-Value	SHGC	Area	Heating	Cooling
Windows	Glass	W	6.4	0.30	25	436	346

PrimaryBedroom (Main Floor)

Load Breakdown

Name	Heat Loss	Heat Gain
Windows	695	460
Above Grade Walls	785	16
Infiltration	3,030	6
Ceiling	263	68
Ventilation	518	10
Internal Loads	0	312
Internal Floor Radiant Panel Loss	864	0
Total Sensible	5,291	873
Total Floor Area	207 ft²	207 ft²

Constructions

Type	Description	R-Value	Area	Heating	Cooling
Walls	Wall	48.0	337	785	16
Ceilings	Ceiling	88.0	207	263	68
Radiant Floors	Concrete Thin Slab; R-6.31 Insulation Below Tubing.	6.31	207	864	0

Glazings

Type	Description	Exposure	R-Value	SHGC	Area	Heating	Cooling
Windows	Glass	S	6.4	0.30	25	434	254
Windows	Glass	W	6.4	0.30	15	261	207

Upstair WC (Main Floor)

Load Breakdown

Name	Heat Loss	Heat Gain
Windows	208	165
Above Grade Walls	395	11
Infiltration	1,199	2
Ceiling	87	23
Ventilation	205	4
Internal Loads	0	103
Internal Floor Radiant Panel Loss	281	0
Total Sensible	2,094	308
Total Floor Area	69 ft²	69 ft²

Constructions

Type	Description	R-Value	Area	Heating	Cooling
Walls	Wall	48.0	169	395	11
Ceilings	Ceiling	88.0	69	87	23
Radiant Floors	Concrete Thin Slab; R-6.31 Insulation Below Tubing.	6.31	69	281	0

Glazings

Type	Description	Exposure	R-Value	SHGC	Area	Heating	Cooling
Windows	Glass	E	6.4	0.30	12	208	165

Disclaimers

With the permission of Canadian Standards Association, material is reproduced from CSA Standard, CSA F280-12 (Revision 2021 Update 3), Determining the Required Capacity of Residential Space Heating and Cooling Appliances which is copyrighted by Canadian Standards Association, 178 Rexdale Blvd., Toronto, Ontario, M9W 1R3, www.shopcsa.ca. While use of this material has been authorized, CSA shall not be responsible for the manner in which the information is presented, nor for any interpretations thereof.

Cold weather humidification, or some lifestyles that produce excessive moisture, may cause condensation to occur if the absolute humidity of the indoor air is too high for the momentary circumstances. Condensation can occur on surfaces or concealed within the structure, and can lead to mold, mildew, frost damage, and moisture damage. The software does not perform calculations for the estimation or detection of possible condensation problems, and it is the designers (i.e. software users) responsibility to do so independently if required.

The calculated values shown in this report are based on the data input by the user of the software. Inaccurate or erroneous data input will result in inaccurate or erroneous results. You are strongly advised to review all input data carefully, and to have the calculated results reviewed by an experienced heating professional to ensure reasonableness and suitability for your application.

IN NO EVENT WILL AVENIR SOFTWARE INC. (“AVENIR”) OR ITS AFFILIATES BE LIABLE UNDER ANY CONTRACT, NEGLIGENCE, STRICT LIABILITY OR OTHER LEGAL OR EQUITABLE THEORY FOR ANY CONSEQUENTIAL, INCIDENTAL, INDIRECT OR SPECIAL OR PUNITIVE DAMAGES WHATSOEVER (INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF BUSINESS PROFITS, BUSINESS INTERRUPTION, LOSS OF BUSINESS INFORMATION OR DATA AND THE LIKE), EVEN IF SUCH PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. AVENIR’S CUMULATIVE LIABILITY FROM ANY CAUSE RELATED TO OR ARISING FROM THE USE THIS REPORT, AND REGARDLESS OF THE FORM OF THE ACTION, SHALL BE LIMITED TO NO GREATER THAN THE AMOUNT OF FEES PAID TO AVENIR UNDER THE SOFTWARE LICENSE AGREEMENT.

Heating System Summary

Project #:L211
October 03, 2023

Project Information

Project #: L211
Name: Matthew Holmes
Location: 10403, Y1A7A1, Whitehorse, Yukon, Canada

Notes:

Project Summary

Load Calculation Method:	CSA F280-12	Total Circuit Lengths:		Component Losses:	14,206 Btu/hr
Design Location:	Whitehorse, Yukon Territory	Barrier PEX 1/2"	2,320 ft	Infiltration/Ventilation:	37,599 Btu/hr
Outdoor Temperature:	-41.8 °F			Radiant Back Losses:	2,309 Btu/hr
Floorplans / Levels:		Total RH Circuits:	10	Total Heating Load:	54,114 Btu/hr
Ground Floor	1,000 ft²	Total Manifolds:	1		
Main Floor	1,066 ft²	Total Zones:	3	Radiant Heating:	36,769 Btu/hr
Total Area:	2,066 ft²			Radiant Back Losses:	2,309 Btu/hr
		Fluid Type:	30% Propylene Glycol	Other:	15,036 Btu/hr
		Total Tubing Volume:	21.35 USG	Total Heating Load:	54,114 Btu/hr
		Glycol Volume:	6.41 USG		
		Surface Temperature:	83 - 84 °F		

Note that this project has rooms that may require a supplemental heat supply to meet the design load.

Zone Heating Summary

Zone #	Gross Area	Construction	Heating Types	RH[1] Circuits	Total Tubing	Manifolds	Flowrate	Head Loss (Circuit Only)	RH Load[2]	Supplemental	Zone Load[3]
Zone 101	524	Embedded Slab	RH,OTH	3	578	1	1.33	2.2	10,828	5,793	16,622
Zone 102	476	Embedded Slab	RH,OTH	2	516	1	1.00	4.1	9,271	4,429	13,700
Zone 201	1,066	Concrete Thin Slab	RH,OTH	5	1,226	1	2.56	4.4	24,457	4,813	29,270

(1) Complete circuits assigned to this zone. (2) Total Radiant heating load for rooms in zone, including all panel back loss. (3) Total load for zone including all panel back loss. Does not account for reclaimed loss within building envelope.

Room Heating Summary (By Construction Type)

Embedded Slab

Zone #	Room Name	Heating Type	Floor Area	Heated Area	Manifold #	Tube Size	RH Circuits[1]	Tube Spacing	Tubing In Room	Floor Cover RV	Required Temp.	Unit RH Load	RH Load[2]	Supplemental	Total Load[3]
Zone 101	Corridor / Entry	RH, OTH	207	203	Manifold 1	1/2"	1	10	259	0.5	120	28.0	5,681	3,296	8,978
Zone 101	Downstair WC	RH, OTH	29	27	Manifold 1	1/2"	1	10	34	0.5	120	28.6	767	873	1,640
Zone 101	Pantry	RH, OTH	48	48	n/a	n/a	0	10	55	0.5	0	28.5	1,375	462	1,837
Zone 101	Rumpus Room	RH, OTH	107	107	Manifold 1	1/2"	1	10	124	0.5	120	28.1	3,005	1,162	4,168
Zone 102	Dining	RH, OTH	406	352	Manifold 1	1/2"	2	10	419	0.5	120	26.3	9,271	4,429	13,700

(1) Circuits assigned to this room. Leaders from other rooms may not be counted. (2) Includes panel back loss. (3) Total load including panel back loss. Does not account for reclaimed loss within building envelope.

Concrete Thin Slab

Zone #	Room Name	Heating Type	Floor Area	Heated Area	Manifold #	Tube Size	RH Circuits[1]	Tube Spacing	Tubing In Room	Floor Cover RV	Required Temp.	Unit RH Load	RH Load[2]	Supplemental	Total Load[3]
Zone 201	Bedroom 1	RH	117	117	Manifold 1	1/2"	1	10	143	0.5	117	28.1	3,287	0	3,287
Zone 201	Bedroom 2	RH, OTH	119	119	n/a	n/a	0	10	155	0.5	0	40.8	4,838	1,003	5,841
Zone 201	Laundry	RH	40	40	Manifold 1	1/2"	1	10	53	0.5	103	18.3	732	0	732
Zone 201	Library/Office/ Upstairs Corridor	RH, OTH	279	232	Manifold 1	1/2"	1	10	287	0.5	120	31.4	7,287	278	7,565
Zone 201	Primary WC	RH, OTH	65	62	n/a	n/a	0	10	80	0.5	0	31.7	1,955	1,358	3,313
Zone 201	PrimaryBedroom	RH, OTH	166	166	Manifold 1	1/2"	1	10	205	0.5	119	30.2	5,012	1,144	6,156
Zone 201	Upstair WC	RH, OTH	46	43	Manifold 1	1/2"	1	10	50	0.5	120	31.5	1,345	1,030	2,375

(1) Circuits assigned to this room. Leaders from other rooms may not be counted. (2) Includes panel back loss. (3) Total load including panel back loss. Does not account for reclaimed loss within building envelope.

Manifold Summary

Manifold Name	# Zones	# Circuits	Flow	Head Loss[1]	Required Temp.	Supplied Temp.	Temp Drop	Manifold Type	Control Type	# Actuators	S/R Length[2]	S/R Pipe
Manifold 1	3	10	4.88	5.1	120	120	20	Stainless Steel	Circuit	10	-	-
Total	3	10	4.88	5.1	-	-	-	-	-	10	-	-

(1) Total Head loss includes manifold, circuits and supply/return piping if specified. (2) S/R Length = one way

Disclaimers

With the permission of Canadian Standards Association, material is reproduced from CSA Standard, CSA F280-12 (Revision 2021 Update 3), Determining the Required Capacity of Residential Space Heating and Cooling Appliances which is copyrighted by Canadian Standards Association, 178 Rexdale Blvd., Toronto, Ontario, M9W 1R3, www.shopcsa.ca. While use of this material has been authorized, CSA shall not be responsible for the manner in which the information is presented, nor for any interpretations thereof.

Cold weather humidification, or some lifestyles that produce excessive moisture, may cause condensation to occur if the absolute humidity of the indoor air is too high for the momentary circumstances. Condensation can occur on surfaces or concealed within the structure, and can lead to mold, mildew, frost damage, and moisture damage. The software does not perform calculations for the estimation or detection of possible condensation problems, and it is the designers (i.e. software users) responsibility to do so independently if required.

The calculated values shown in this report are based on the data input by the user of the software. Inaccurate or erroneous data input will result in inaccurate or erroneous results. You are strongly advised to review all input data carefully, and to have the calculated results reviewed by an experienced heating professional to ensure reasonableness and suitability for your application.

IN NO EVENT WILL AVENIR SOFTWARE INC. (“AVENIR”) OR ITS AFFILIATES BE LIABLE UNDER ANY CONTRACT, NEGLIGENCE, STRICT LIABILITY OR OTHER LEGAL OR EQUITABLE THEORY FOR ANY CONSEQUENTIAL, INCIDENTAL, INDIRECT OR SPECIAL OR PUNITIVE DAMAGES WHATSOEVER (INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF BUSINESS PROFITS, BUSINESS INTERRUPTION, LOSS OF BUSINESS INFORMATION OR DATA AND THE LIKE), EVEN IF SUCH PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. AVENIR'S CUMULATIVE LIABILITY FROM ANY CAUSE RELATED TO OR ARISING FROM THE USE THIS REPORT, AND REGARDLESS OF THE FORM OF THE ACTION, SHALL BE LIMITED TO NO GREATER THAN THE AMOUNT OF FEES PAID TO AVENIR UNDER THE SOFTWARE LICENSE AGREEMENT.

Heating System Detail

Project #:L211
October 03, 2023

Project Information

Project #: L211
Name: Matthew Holmes
Location: 10403, Y1A7A1, Whitehorse, Yukon, Canada

Notes:

Design Conditions and Summary

Load Calculation Method:	CSA F280-12	Total Tubing Lengths:		Component Losses:	14,206	Btu/hr
Design Location:	Whitehorse, Yukon Territory	Barrier PEX 1/2"	2,320 ft	Infiltration/Ventilation:	37,599	Btu/hr
Outdoor Temperature:	-41.8 °F			Radiant Back Losses:	2,309	Btu/hr
Floorplans / Levels:		Total RH Circuits:	10	Total Heating Load:	54,114	Btu/hr
Ground Floor	1,000 ft²	Total Manifolds:	1			
Main Floor	1,066 ft²	Total Zones:	3	Radiant Heating:	36,769	Btu/hr
Total Area:	2,066 ft²			Radiant Back Losses:	2,309	Btu/hr
		Fluid Type:	30% Propylene Glycol	Other:	15,036	Btu/hr
				Total Heating Load:	54,114	Btu/hr
		Total Tubing Volume:	21.35 USG			
		Glycol Volume:	6.41 USG			

Note that this project has rooms that may require a supplemental heat supply to meet the design load.

Zone Heating Summary

Zone #	Area	Heating Types	RH Circuits	Flowrate	Head Loss	Supplemental	Rooms
101	524	RH,OTH	3	1.33	2.9	5,793	Pantry, Rumpus Room, Corridor / Entry, Downstair WC
102	476	RH,OTH	2	1.00	4.8	4,429	Dining
201	1,066	RH,OTH	5	2.56	5.1	4,813	Primary WC, Laundry, PrimaryBedroom, Bedroom 1, Bedroom 2, Library/Office/Upstairs Corridor, Upstair WC
Total	2,066	RH,OTH	10	4.88	5.1	15,036	

*RH Loads include internal panel back loss that may not be included in the project total.

Room Heating Summary

Ground Floor

Corridor / Entry

Total Area:	266	ft²	Radiant Heating:			Load/Loss Summary:	
Heated by:	RH,OTH		Heated Area:	203	ft²	**Room Design Load:**	5,030 Btu/hr
Room Temperature:	70	°F	Tubing in Floor:	272	ft		
Floor Covering (Rv):	0.5		Circuits in Room:	1		Radiant Load:	5,681 Btu/hr
			Tube Spacing:	10		Baseboard Load:	0 Btu/hr
			Required Surface Temp:	83	°F	Forced Air Load	0 Btu/hr
			Required Water Temp:	120	°F	Other Load:	3,296 Btu/hr
			Est. Peak Output:	5,030	Btu/hr		
						Radiant Back Loss:	651 Btu/hr
			Supplemental Req'd:	3,296	Btu/hr	Recovered Back Loss:	0 Btu/hr
						Total Heat Loss:	8,978 Btu/hr

Dining

Total Area:	476	ft²	Radiant Heating:			Load/Loss Summary:	
Heated by:	RH,OTH		Heated Area:	352	ft²	**Room Design Load:**	8,318 Btu/hr
Room Temperature:	70	°F	Tubing in Floor:	434	ft		
Floor Covering (Rv):	0.5		Circuits in Room:	2		Radiant Load:	9,271 Btu/hr
			Tube Spacing:	10		Baseboard Load:	0 Btu/hr
			Required Surface Temp:	83	°F	Forced Air Load	0 Btu/hr
			Required Water Temp:	120	°F	Other Load:	4,429 Btu/hr
			Est. Peak Output:	8,318	Btu/hr		
						Radiant Back Loss:	953 Btu/hr
			Supplemental Req'd:	4,429	Btu/hr	Recovered Back Loss:	0 Btu/hr
						Total Heat Loss:	13,700 Btu/hr

Downstair WC

Total Area:	45	ft²	Radiant Heating:			Load/Loss Summary:	
Heated by:	RH,OTH		Heated Area:	27	ft²	**Room Design Load:**	669 Btu/hr
Room Temperature:	70	°F	Tubing in Floor:	36	ft		
Floor Covering (Rv):	0.5		Circuits in Room:	1		Radiant Load:	767 Btu/hr
			Tube Spacing:	10		Baseboard Load:	0 Btu/hr
			Required Surface Temp:	83	°F	Forced Air Load	0 Btu/hr
			Required Water Temp:	120	°F	Other Load:	873 Btu/hr
			Est. Peak Output:	669	Btu/hr		
						Radiant Back Loss:	98 Btu/hr
			Supplemental Req'd:	873	Btu/hr	Recovered Back Loss:	0 Btu/hr
						Total Heat Loss:	1,640 Btu/hr

Pantry

Total Area:	73	ft²	Radiant Heating:			Load/Loss Summary:	
Heated by:	RH,OTH		Heated Area:	48	ft²	**Room Design Load:**	1,167 Btu/hr
Room Temperature:	70	°F	Tubing in Floor:	58	ft		
Floor Covering (Rv):	0.5		Circuits in Room:	0		Radiant Load:	1,375 Btu/hr
			Tube Spacing:	10		Baseboard Load:	0 Btu/hr
			Required Surface Temp:	83	°F	Forced Air Load	0 Btu/hr
			Required Water Temp:	119	°F	Other Load:	462 Btu/hr
			Est. Peak Output:	1,167	Btu/hr		
						Radiant Back Loss:	208 Btu/hr
			Supplemental Req'd:	462	Btu/hr	Recovered Back Loss:	0 Btu/hr
						Total Heat Loss:	1,837 Btu/hr

Rumpus Room

Total Area:	141	ft²	Radiant Heating:			Load/Loss Summary:	
Heated by:	RH,OTH		Heated Area:	107	ft²	**Room Design Load:**	2,606 Btu/hr
Room Temperature:	70	°F	Tubing in Floor:	128	ft		
Floor Covering (Rv):	0.5		Circuits in Room:	1		Radiant Load:	3,005 Btu/hr
			Tube Spacing:	10		Baseboard Load:	0 Btu/hr
			Required Surface Temp:	83	°F	Forced Air Load	0 Btu/hr
			Required Water Temp:	120	°F	Other Load:	1,162 Btu/hr
			Est. Peak Output:	2,606	Btu/hr		
						Radiant Back Loss:	399 Btu/hr
			Supplemental Req'd:	1,162	Btu/hr	Recovered Back Loss:	0 Btu/hr
						Total Heat Loss:	4,168 Btu/hr

Main Floor

Bedroom 1

Total Area:	146	ft²	Radiant Heating:			Load/Loss Summary:	
Heated by:	RH		Heated Area:	117	ft²	**Room Design Load:**	2,725 Btu/hr
Room Temperature:	70	°F	Tubing in Floor:	147	ft		
Floor Covering (Rv):	0.5		Circuits in Room:	1		Radiant Load:	3,287 Btu/hr
			Tube Spacing:	10		Baseboard Load:	0 Btu/hr
			Required Surface Temp:	83	°F	Forced Air Load	0 Btu/hr
			Required Water Temp:	117	°F	Other Load:	0 Btu/hr
			Est. Peak Output:	2,918	Btu/hr		
						Radiant Back Loss:	563 Btu/hr
						Recovered Back Loss:	-563 Btu/hr
						Total Heat Loss:	2,725 Btu/hr

Bedroom 2

Total Area:	154	ft²	Radiant Heating:			Load/Loss Summary:	
Heated by:	RH,OTH		Heated Area:	119	ft²	**Room Design Load:**	3,019 Btu/hr
Room Temperature:	70	°F	Tubing in Floor:	159	ft		
Floor Covering (Rv):	0.5		Circuits in Room:	0		Radiant Load:	4,838 Btu/hr
			Tube Spacing:	9		Baseboard Load:	0 Btu/hr
			Required Surface Temp:	84	°F	Forced Air Load	0 Btu/hr
			Required Water Temp:	114	°F	Other Load:	1,003 Btu/hr
			Est. Peak Output:	3,019	Btu/hr		
						Radiant Back Loss:	1,819 Btu/hr
			Supplemental Req'd:	1,003	Btu/hr	Recovered Back Loss:	-1,819 Btu/hr
						Total Heat Loss:	4,023 Btu/hr

Laundry

Total Area:	57	ft²	Radiant Heating:			Load/Loss Summary:	
Heated by:	RH		Heated Area:	40	ft²	**Room Design Load:**	592 Btu/hr
Room Temperature:	70	°F	Tubing in Floor:	54	ft		
Floor Covering (Rv):	0.5		Circuits in Room:	1		Radiant Load:	732 Btu/hr
			Tube Spacing:	10		Baseboard Load:	0 Btu/hr
			Required Surface Temp:	78	°F	Forced Air Load	0 Btu/hr
			Required Water Temp:	103	°F	Other Load:	0 Btu/hr
			Est. Peak Output:	1,005	Btu/hr		
						Radiant Back Loss:	141 Btu/hr
						Recovered Back Loss:	-141 Btu/hr
						Total Heat Loss:	592 Btu/hr

Library/Office/Upstairs Corridor

Total Area:	341 ft²	Radiant Heating:		Load/Loss Summary:	
Heated by:	RH,OTH	Heated Area:	232 ft²	**Room Design Load:**	5,862 Btu/hr
Room Temperature:	70 °F	Tubing in Floor:	293 ft		
Floor Covering (Rv):	0.5	Circuits in Room:	1	Radiant Load:	7,287 Btu/hr
		Tube Spacing:	10	Baseboard Load:	0 Btu/hr
		Required Surface Temp:	84 °F	Forced Air Load	0 Btu/hr
		Required Water Temp:	120 °F	Other Load:	278 Btu/hr
		Est. Peak Output:	5,862 Btu/hr		
				Radiant Back Loss:	1,425 Btu/hr
		Supplemental Req'd:	278 Btu/hr	Recovered Back Loss:	-1,425 Btu/hr
				Total Heat Loss:	6,140 Btu/hr

Primary WC

Total Area:	91 ft²	Radiant Heating:		Load/Loss Summary:	
Heated by:	RH,OTH	Heated Area:	62 ft²	**Room Design Load:**	1,570 Btu/hr
Room Temperature:	70 °F	Tubing in Floor:	81 ft		
Floor Covering (Rv):	0.5	Circuits in Room:	0	Radiant Load:	1,955 Btu/hr
		Tube Spacing:	9	Baseboard Load:	0 Btu/hr
		Required Surface Temp:	84 °F	Forced Air Load	0 Btu/hr
		Required Water Temp:	120 °F	Other Load:	1,358 Btu/hr
		Est. Peak Output:	1,570 Btu/hr		
				Radiant Back Loss:	385 Btu/hr
		Supplemental Req'd:	1,358 Btu/hr	Recovered Back Loss:	-385 Btu/hr
				Total Heat Loss:	2,928 Btu/hr

PrimaryBedroom

Total Area:	207 ft²	Radiant Heating:		Load/Loss Summary:	
Heated by:	RH,OTH	Heated Area:	166 ft²	**Room Design Load:**	4,147 Btu/hr
Room Temperature:	70 °F	Tubing in Floor:	210 ft		
Floor Covering (Rv):	0.5	Circuits in Room:	1	Radiant Load:	5,012 Btu/hr
		Tube Spacing:	10	Baseboard Load:	0 Btu/hr
		Required Surface Temp:	84 °F	Forced Air Load	0 Btu/hr
		Required Water Temp:	119 °F	Other Load:	1,144 Btu/hr
		Est. Peak Output:	4,147 Btu/hr		
				Radiant Back Loss:	864 Btu/hr
		Supplemental Req'd:	1,144 Btu/hr	Recovered Back Loss:	-864 Btu/hr
				Total Heat Loss:	5,291 Btu/hr

Upstair WC

Total Area:	69 ft²	Radiant Heating:		Load/Loss Summary:	
Heated by:	RH,OTH	Heated Area:	43 ft²	**Room Design Load:**	1,064 Btu/hr
Room Temperature:	70 °F	Tubing in Floor:	51 ft		
Floor Covering (Rv):	0.5	Circuits in Room:	1	Radiant Load:	1,345 Btu/hr
		Tube Spacing:	10	Baseboard Load:	0 Btu/hr
		Required Surface Temp:	83 °F	Forced Air Load	0 Btu/hr
		Required Water Temp:	120 °F	Other Load:	1,030 Btu/hr
		Est. Peak Output:	1,064 Btu/hr		
				Radiant Back Loss:	281 Btu/hr
		Supplemental Req'd:	1,030 Btu/hr	Recovered Back Loss:	-281 Btu/hr
				Total Heat Loss:	2,094 Btu/hr

Radiant Heating Details

Manifold Summary

Manifold Name	Zones	Circuits	Flowrate	Head Loss[1]	Required Temp.	Supplied Temp.	Temp Drop	Manifold Type	Control Type	Actuators	S/R Length[2]	S/R Pipe
Manifold 1	3	10	4.88	5.1	120	120	20	Stainless Steel	Circuit	10	-	-
Total	3	10	4.88	5.1	120	-	-	-	-	10	-	-

(1) Total Head loss includes manifold, circuits and supply/return piping if specified., (2) S/R Length = one way

Tubing Circuit Details

Manifold 1

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss[1]	Temp Drop	Load	Actuator
A-1	Dining	262	10	167	Barrier PEX 1/2"	0.47	3.3	20	4,404	Yes
A-2	Dining	253	10	192	Barrier PEX 1/2"	0.53	4.1	20	5,025	Yes
A-3	Corridor / Entry	193	10	130	Barrier PEX 1/2"	0.44	2.2	20	3,493	Yes
A-4	Rumpus Room	192	10	126	Barrier PEX 1/2"	0.44	2.2	20	3,418	Yes
A-5	Downstair WC	193	10	125	Barrier PEX 1/2"	0.44	2.2	20	3,414	Yes
B-1	Laundry	246	10	161	Barrier PEX 1/2"	0.44	2.9	20	4,302	Yes
B-2	Library/Office/Upstairs Corridor	253	10	157	Barrier PEX 1/2"	0.52	4.0	20	4,898	Yes
B-3	Bedroom 1	248	10	152	Barrier PEX 1/2"	0.48	3.3	20	4,690	Yes
B-4	Upstair WC	229	10	150	Barrier PEX 1/2"	0.59	4.4	20	5,608	Yes
B-6	PrimaryBedroom	251	10	158	Barrier PEX 1/2"	0.52	3.9	20	4,883	Yes
Total	-	2,320		1,518	-	4.88	4.4		44,135	10

(1) Head loss for circuit tubing only

Disclaimers

With the permission of Canadian Standards Association, material is reproduced from CSA Standard, CSA F280-12 (Revision 2021 Update 3), Determining the Required Capacity of Residential Space Heating and Cooling Appliances which is copyrighted by Canadian Standards Association, 178 Rexdale Blvd., Toronto, Ontario, M9W 1R3, www.shopcsa.ca. While use of this material has been authorized, CSA shall not be responsible for the manner in which the information is presented, nor for any interpretations thereof.

Cold weather humidification, or some lifestyles that produce excessive moisture, may cause condensation to occur if the absolute humidity of the indoor air is too high for the momentary circumstances. Condensation can occur on surfaces or concealed within the structure, and can lead to mold, mildew, frost damage, and moisture damage. The software does not perform calculations for the estimation or detection of possible condensation problems, and it is the designers (i.e. software users) responsibility to do so independently if required.

The calculated values shown in this report are based on the data input by the user of the software. Inaccurate or erroneous data input will result in inaccurate or erroneous results. You are strongly advised to review all input data carefully, and to have the calculated results reviewed by an experienced heating professional to ensure reasonableness and suitability for your application.

IN NO EVENT WILL AVENIR SOFTWARE INC. (“AVENIR”) OR ITS AFFILIATES BE LIABLE UNDER ANY CONTRACT, NEGLIGENCE, STRICT LIABILITY OR OTHER LEGAL OR EQUITABLE THEORY FOR ANY CONSEQUENTIAL, INCIDENTAL, INDIRECT OR SPECIAL OR PUNITIVE DAMAGES WHATSOEVER (INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF BUSINESS PROFITS, BUSINESS INTERRUPTION, LOSS OF BUSINESS INFORMATION OR DATA AND THE LIKE), EVEN IF SUCH PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. AVENIR’S CUMULATIVE LIABILITY FROM ANY CAUSE RELATED TO OR ARISING FROM THE USE THIS REPORT, AND REGARDLESS OF THE FORM OF THE ACTION, SHALL BE LIMITED TO NO GREATER THAN THE AMOUNT OF FEES PAID TO AVENIR UNDER THE SOFTWARE LICENSE AGREEMENT.

Water Supply Summary

Project #:L211
October 03, 2023

Project Information

Project #: L211
Name: Matthew Holmes
Location: 10403, Y1A7A1, Whitehorse, Yukon, Canada

Notes:

Note that this project has rooms that may require a supplemental heat supply to meet the design load.

Supply Summary

Name	Temp	Total Fluid Vol	Total Flow	Head Loss[1]	Load[2]	# Circuits	# Zones
Water Temperature	120	21.35	4.88	5.1	44,135	10	3

(1) Head loss includes manifolds, circuits, and supply/return piping if specified, may also contain control valve losses. (2) Load includes all panel back losses.

Manifold Summary

Manifold Name	Circuits	Flowrate	Required Temp.	Supplied Temp.	Manifold Type	S/R Length[1]	S/R Pipe	Manifold Head Loss	Circuit Head Loss	S/R Head Loss	Total Head Loss[2]
Manifold 1	10	4.88	120	120	Stainless Steel	-	-	0.7	4.4	0.0	5.1
Total	10	4.88	-	-	-	-	-	0.7	4.4	0.0	5.1

(1) S/R Length = one way, (2) Total Head loss includes manifold, circuits and supply/return piping if specified.

Water Temperature (120 °F)

Manifold 1 (120 °F, Stainless Steel, 10 Circuits)

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss[1]	Temp Drop[2]	Load[3]	Actuator
A-1	Dining	262	10	167	Barrier PEX 1/2"	0.47	3.3	20	4,404	Yes
A-2	Dining	253	10	192	Barrier PEX 1/2"	0.53	4.1	20	5,025	Yes
A-3	Corridor / Entry	193	10	128	Barrier PEX 1/2"	0.44	2.2	20	3,493	Yes
A-4	Rumpus Room	192	10	126	Barrier PEX 1/2"	0.44	2.2	20	3,418	Yes
A-5	Downstair WC	193	10	125	Barrier PEX 1/2"	0.44	2.2	20	3,414	Yes
B-1	Laundry	246	10	161	Barrier PEX 1/2"	0.44	2.9	20	4,302	Yes
B-2	Library/Office/Upstairs Corridor	253	10	157	Barrier PEX 1/2"	0.52	4.0	20	4,898	Yes
B-3	Bedroom 1	248	10	152	Barrier PEX 1/2"	0.48	3.3	20	4,690	Yes
B-4	Upstair WC	229	10	150	Barrier PEX 1/2"	0.59	4.4	20	5,608	Yes
B-6	PrimaryBedroom	251	10	158	Barrier PEX 1/2"	0.52	3.9	20	4,883	Yes
Total	-	2,320		1,515	-	4.88	4.4	-	44,135	10

(1) Head loss for circuit tubing only. (2) Design Temp Drop (Estimated Actual Drop). (3) Required load. Includes panel back losses. Does not reflect maximum capacity of the circuit.

Disclaimers

With the permission of Canadian Standards Association, material is reproduced from CSA Standard, CSA F280-12 (Revision 2021 Update 3), Determining the Required Capacity of Residential Space Heating and Cooling Appliances which is copyrighted by Canadian Standards Association, 178 Rexdale Blvd., Toronto, Ontario, M9W 1R3, www.shopcsa.ca. While use of this material has been authorized, CSA shall not be responsible for the manner in which the information is presented, nor for any interpretations thereof.

Cold weather humidification, or some lifestyles that produce excessive moisture, may cause condensation to occur if the absolute humidity of the indoor air is too high for the momentary circumstances. Condensation can occur on surfaces or concealed within the structure, and can lead to mold, mildew, frost damage, and moisture damage. The software does not perform calculations for the estimation or detection of possible condensation problems, and it is the designers (i.e. software users) responsibility to do so independently if required.

The calculated values shown in this report are based on the data input by the user of the software. Inaccurate or erroneous data input will result in inaccurate or erroneous results. You are strongly advised to review all input data carefully, and to have the calculated results reviewed by an experienced heating professional to ensure reasonableness and suitability for your application.

IN NO EVENT WILL AVENIR SOFTWARE INC. (“AVENIR”) OR ITS AFFILIATES BE LIABLE UNDER ANY CONTRACT, NEGLIGENCE, STRICT LIABILITY OR OTHER LEGAL OR EQUITABLE THEORY FOR ANY CONSEQUENTIAL, INCIDENTAL, INDIRECT OR SPECIAL OR PUNITIVE DAMAGES WHATSOEVER (INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF BUSINESS PROFITS, BUSINESS INTERRUPTION, LOSS OF BUSINESS INFORMATION OR DATA AND THE LIKE), EVEN IF SUCH PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. AVENIR'S CUMULATIVE LIABILITY FROM ANY CAUSE RELATED TO OR ARISING FROM THE USE THIS REPORT, AND REGARDLESS OF THE FORM OF THE ACTION, SHALL BE LIMITED TO NO GREATER THAN THE AMOUNT OF FEES PAID TO AVENIR UNDER THE SOFTWARE LICENSE AGREEMENT.

Radiant Panel Schedule

Project #:L211
October 03, 2023

Project Information

Project #: L211
Name: Matthew Holmes
Location: 10403, Y1A7A1, Whitehorse, Yukon, Canada

Notes:

Design Conditions and Summary

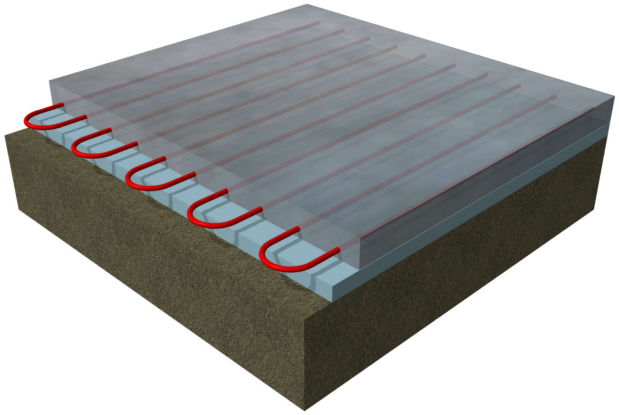
Load Calculation Method:	CSA F280-12		Component Losses:	14,206 Btu/hr
Design Location:	Whitehorse, Yukon Territory		Infiltration/Ventilation:	37,599 Btu/hr
Outdoor Temperature:	-41.8 °F		Radiant Back Losses:	2,309 Btu/hr
Floorplans / Levels:			Total Heating Load:	54,114 Btu/hr
Ground Floor	1,000 ft²			
Main Floor	1,066 ft²		Radiant Heating:	36,769 Btu/hr
Total Area:	2,066 ft²		Radiant Back Losses:	2,309 Btu/hr
			Other:	15,036 Btu/hr
			Total Heating Load:	54,114 Btu/hr

Note that this project has rooms that may require a supplemental heat supply to meet the design load.

Radiant Panel Details

Panel Type #1 - Embedded Slab

Slab Thickness:	4.0 in
Tube Depth:	2.5 in
Slab R per Inch (Embedding Material):	0.15 °F•ft²•hr/(Btu•in)
Spacing:	10 in
Floorplans:	
Ground Floor	798 ft²



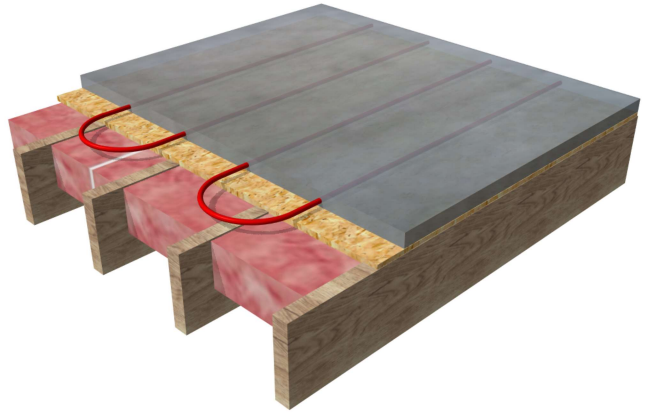
Note: Tube depth is measured from top of embedded layer to the centerline of the tubing.

Created Using LoopCAD 2023 (2023-10-20)
Version:23.0.0180 R

See end of report for important Notes and Disclaimers.

Panel Type #2 - Concrete Thin Slab

Over-pour Thickness:	2.0 in
Over-pour R per Inch:	0.15 °F•ft²•hr/(Btu•in)
Sub-Floor Thickness:	0.750 in
Sub-Floor Rv:	0.9 hr·ft²·°F/btu
Joist Construction:	Joist 2"x10" pine, 16" OC
Joist Spacing:	16 in
Joist Insulation Rv:	5.0 hr·ft²·°F/btu
Insulation Rv	5.0 hr·ft²·°F/btu
Spacing:	10 in
Floorplans:	
Main Floor	831 ft²



Disclaimers

The calculated values shown in this report are based on the data input by the user of the software. Inaccurate or erroneous data input will result in inaccurate or erroneous results. You are strongly advised to review all input data carefully, and to have the calculated results reviewed by an experienced heating professional to ensure reasonableness and suitability for your application.

IN NO EVENT WILL AVENIR SOFTWARE INC. (“AVENIR”) OR ITS AFFILIATES BE LIABLE UNDER ANY CONTRACT, NEGLIGENCE, STRICT LIABILITY OR OTHER LEGAL OR EQUITABLE THEORY FOR ANY CONSEQUENTIAL, INCIDENTAL, INDIRECT OR SPECIAL OR PUNITIVE DAMAGES WHATSOEVER (INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF BUSINESS PROFITS, BUSINESS INTERRUPTION, LOSS OF BUSINESS INFORMATION OR DATA AND THE LIKE), EVEN IF SUCH PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. AVENIR'S CUMULATIVE LIABILITY FROM ANY CAUSE RELATED TO OR ARISING FROM THE USE THIS REPORT, AND REGARDLESS OF THE FORM OF THE ACTION, SHALL BE LIMITED TO NO GREATER THAN THE AMOUNT OF FEES PAID TO AVENIR UNDER THE SOFTWARE LICENSE AGREEMENT.