

Project Information

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

Notes:

Outdoor Conditions

Location: (User Specified) Whitehorse, Yukon Territory
 Latitude: 61
 Soil Temp: 37.4 °F
 Heating Design Temp: -22.0 °F
 Cooling Design Temp: 77.0 °F

Infiltration

See detailed load report for all settings
 Stories: Two
 Type: Detached
 Air Tightness: Energy Tight
 Heating Air Changes: 0.25 /hr
 Cooling Air Changes: 0.03 /hr

Floorplan/Levels

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

Indoor Conditions

	Heating	Cooling
Room Temp:	70 °F °F	75 °F °F
Design ΔT:	92.0 °F	2.0 °F

Ventilation

Num Occupants: 2
 Air Changes: Heating 0.28 /hr, Cooling 0.27 /hr
 Flowrate: Heating 100 cfm, Cooling 100 cfm
 Effectiveness*: Heating 0.6, Cooling 0.6

Total Heat Loss: 26,855 Btu/hr

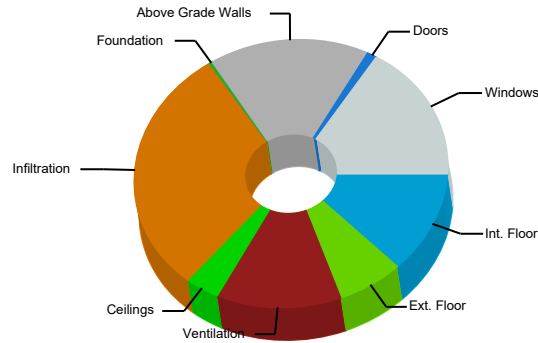
Total Heat Gain: 10,111 Btu/hr

Latent Factor: 1.3

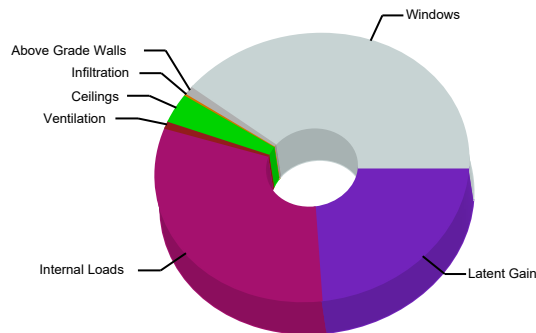
Load Breakdown

Name	Heat Loss	Heat Gain
Windows	5,128	4,013
Doors	317	0
Skylights	0	0
Above Grade Walls	5,047	98
Exposed Floors	0	0
Foundation	100	0
Infiltration	9,140	23
Ceiling	1,114	351
Duct Loads	0	0
Ventilation	3,951	86
Internal Loads	0	3,207
Other Loads	0	0
External Floor Radiant Panel Loss	2,059	0
Internal Floor Radiant Panel Loss	3,735	0
Total Sensible	26,855	7,778
Latent Gain	0	2,333
Total Load	26,855	10,111
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

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: 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.



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: 26,855 Btu/hr **Total Cooling: 10,111 Btu/hr** **Latent Factor: 1.3**

Outdoor Conditions

Location: (User Specified) Whitehorse, Yukon Territory
 Latitude: 61
 Soil Temp: 37.4 °F
 Heating Design Temp: -22.0 °F
 Cooling Design Temp: 77.0 °F

Indoor Conditions

	Heating	Cooling
Room Temp:	70 °F	75 °F
Design ΔT:	92.0 °F	2.0 °F

Infiltration

Stories: Two
 Air Tightness: Energy Tight
 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: 0.25 /hr
 Cooling Air Changes: 0.03 /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)

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

(*) 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

Created Using LoopCAD 2023 (2023-10-20)

Version:23.0.0180 R

See end of report for important Notes and Disclaimers.

Constructions

Doors

Description	R-Value	Area	Heating	Cooling
Insulated fiberglass—Polystyrene core	4.83	17	317	0

Walls

Description	R-Value	Area	Heating	Cooling
Wall	48.0	2,805	5,047	98

Ceilings

Description	R-Value	Area	Heating	Cooling
Ceiling	88.0	1,066	1,114	351

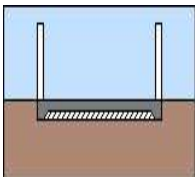
Glazing

Windows

Description	Exposure	R-Value	SHGC	Area	Heating	Cooling
Glass	E	6.4	0.30	57	824	795
Glass	S	6.4	0.30	188	2,700	1,917
Glass	W	6.4	0.30	85	1,217	1,174
Glass	N	6.4	0.30	27	386	127

Foundations

ID	Code	Description	Area	Heat Loss	Options
F0	SCB_25	Slab Floors	1,066	2,158	Slab Insulation: 20.0 hr-ft ² -°F/btu



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

F0

Duct Loads

All ducts are in conditioned space.

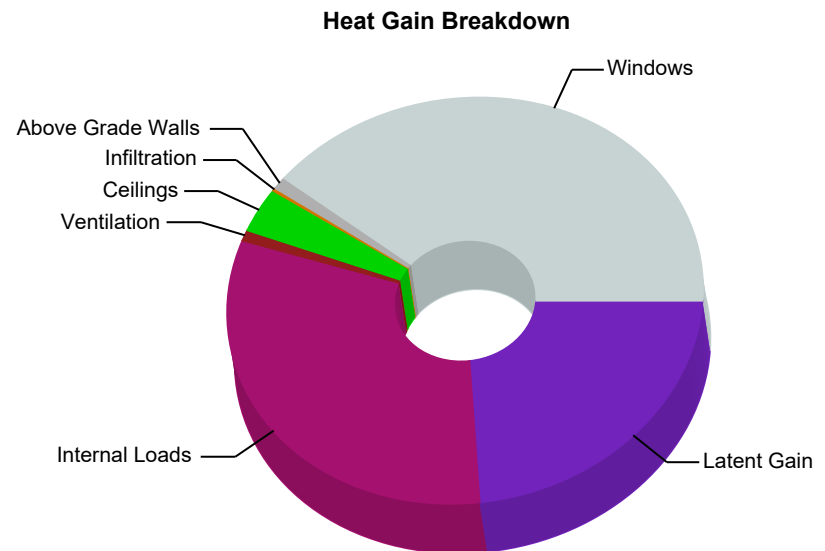
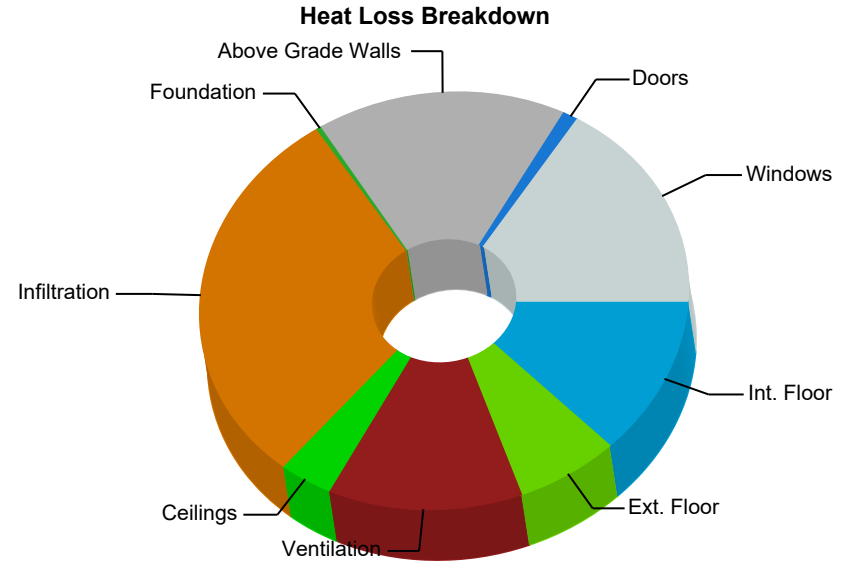
Internal Loads

Occupants: 2
Total Internal Heat Gain: 10,111 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	5,128	4,013
Doors	317	0
Skylights	0	0
Above Grade Walls	5,047	98
Exposed Floors	0	0
Foundation	100	0
Infiltration	9,140	23
Ceiling	1,114	351
Duct Loads	0	0
Ventilation	3,951	86
Internal Loads	0	3,207
Other Loads	0	0
External Floor Radiant Panel Loss	2,059	0
Internal Floor Radiant Panel Loss	3,735	0
Total Sensible	26,855	7,778
Latent Gain	0	2,333
Total Load	26,855	10,111
Total Area	2,066 ft ²	2,131 ft ²



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

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

(*) 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

Heating Zones

Zone	Area	Room Temp	Total Load
Zone 101	524	70	8,085
Zone 102	476	70	6,636
Zone 201	1,066	70	12,134

Heating Rooms

Room	Area	Room Temp	Total Load
Corridor / Entry	266	70	4,360
Dining	476	70	6,636
Downstair WC	45	70	803
Pantry	73	70	896
Rumpus Room	141	70	2,026
Bedroom 1	146	70	1,390
Bedroom 2	154	70	2,052
Laundry	57	70	302
Library/Office/Upstairs Corridor	341	70	3,132
Primary WC	91	70	1,493
PrimaryBedroom	207	70	2,698
Upstair WC	69	70	1,068

Cooling Zones

Zone	Area	Room Temp	Total Load
C1	2,131	75	10,111

Cooling Rooms

Room	Area	Room Temp	Total Load
Corridor / Entry	266	75	1,379
Dining	476	75	2,508
Downstair WC	45	75	163
Mechanical ROom	66	75	138
Pantry	73	75	143
Rumpus Room	141	75	563
Bedroom 1	146	75	689
Bedroom 2	154	75	731
Laundry	57	75	137
Library/Office/Upstairs Corridor	341	75	1,440

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

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

(*) 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

Created Using LoopCAD 2023 (2023-10-20)

Version:23.0.0180 R

Primary WC	91	75	692
PrimaryBedroom	207	75	1,130
Upstair WC	69	75	399

CSA Room Details

Corridor / Entry (Ground Floor)

Load Breakdown

Name	Heat Loss	Heat Gain
Windows	653	630
Doors	317	0
Above Grade Walls	604	15
Infiltration	1,582	3
Ventilation	611	12
Internal Loads	0	400
External Floor Radiant Panel Loss	592	0
Total Sensible	4,360	1,061
Total Floor Area	266 ft ²	266 ft ²

Constructions

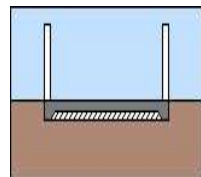
Type	Description	R-Value	Area	Heating	Cooling
Doors	Insulated fiberglass—Polystyrene core	4.83	17	317	0
Walls	Wall	48.0	315	604	15

Glazings

Type	Description	Exposure	R-Value	SHGC	Area	Heating	Cooling
Windows	Glass	E	6.4	0.30	45	653	630

Foundation

ID	Code	Description	Area	Heat Loss	Options
F0	SCB_25	Slab Floors	266	592	Slab Insulation: 20.0 hr·ft ² ·°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	1,497	1,172
Above Grade Walls	861	12
Foundation	94	0
Infiltration	2,413	6
Ventilation	931	23
Internal Loads	0	716
External Floor Radiant Panel Loss	841	0
Total Sensible	6,636	1,929
Total Floor Area	476 ft ²	476 ft ²

Constructions

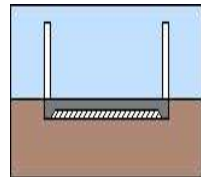
Type	Description	R-Value	Area	Heating	Cooling
Walls	Wall	48.0	449	861	12

Glazings

Type	Description	Exposure	R-Value	SHGC	Area	Heating	Cooling
Windows	Glass	S	6.4	0.30	74	1,067	757
Windows	Glass	W	6.4	0.30	30	430	415

Foundation

ID	Code	Description	Area	Heat Loss	Options
F0	SCB_25	Slab Floors	476	934	Slab Insulation: 20.0 hr-ft ² -°F/btu



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

F0

Downstair WC (Ground Floor)

Load Breakdown

Name	Heat Loss	Heat Gain
Windows	171	56
Above Grade Walls	126	0
Foundation	6	0
Infiltration	291	0
Ventilation	112	1
Internal Loads	0	68
External Floor Radiant Panel Loss	96	0
Total Sensible	803	126
Total Floor Area	45 ft ²	45 ft ²

Constructions

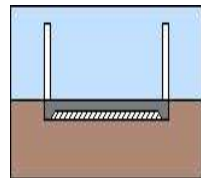
Type	Description	R-Value	Area	Heating	Cooling
Walls	Wall	48.0	66	126	0

Glazings

Type	Description	Exposure	R-Value	SHGC	Area	Heating	Cooling
Windows	Glass	N	6.4	0.30	12	171	56

Foundation

ID	Code	Description	Area	Heat Loss	Options
F0	SCB_25	Slab Floors	45	102	Slab Insulation: 20.0 hr·ft ² ·°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

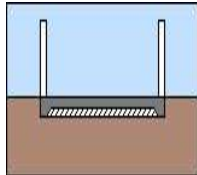
Name	Heat Loss	Heat Gain
Above Grade Walls	0	7
Infiltration	0	0
Ventilation	0	0
Internal Loads	0	99
Total Sensible	0	106
Total Floor Area	0 ft ²	66 ft ²

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·ft ² ·°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

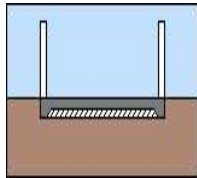
Name	Heat Loss	Heat Gain
Above Grade Walls	267	0
Infiltration	324	0
Ventilation	125	0
Internal Loads	0	110
External Floor Radiant Panel Loss	181	0
Total Sensible	896	110
Total Floor Area	73 ft ²	73 ft ²

Constructions

Type	Description	R-Value	Area	Heating	Cooling
Walls	Wall	48.0	139	267	0

Foundation

ID	Code	Description	Area	Heat Loss	Options
F0	SCB_25	Slab Floors	73	181	Slab Insulation: 20.0 hr·ft ² ·°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	214	207
Above Grade Walls	446	10
Infiltration	733	1
Ventilation	283	4
Internal Loads	0	211
External Floor Radiant Panel Loss	349	0
Total Sensible	2,026	433
Total Floor Area	141 ft ²	141 ft ²

Constructions

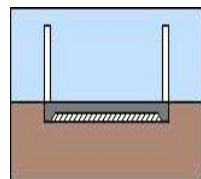
Type	Description	R-Value	Area	Heating	Cooling
Walls	Wall	48.0	233	446	10

Glazings

Type	Description	Exposure	R-Value	SHGC	Area	Heating	Cooling
Windows	Glass	W	6.4	0.30	15	214	207

Foundation

ID	Code	Description	Area	Heat Loss	Options
F0	SCB_25	Slab Floors	141	349	Slab Insulation: 20.0 hr-ft ² -°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	358	254
Above Grade Walls	227	0
Infiltration	435	2
Ceiling	153	48
Ventilation	216	6
Internal Loads	0	220
Internal Floor Radiant Panel Loss	290	0
Total Sensible	1,390	530
Total Floor Area	146 ft ²	146 ft ²

Constructions

Type	Description	R-Value	Area	Heating	Cooling
Walls	Wall	48.0	118	227	0
Ceilings	Ceiling	88.0	146	153	48
Radiant Floors	Concrete Thin Slab; R-6.31 Insulation Below Tubing.	6.31	146	290	0

Glazings

Type	Description	Exposure	R-Value	SHGC	Area	Heating	Cooling
Windows	Glass	S	6.4	0.30	25	358	254

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

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

(*) 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

Created Using LoopCAD 2023 (2023-10-20)

Version:23.0.0180 R

Bedroom 2 (Main Floor)

Load Breakdown

Name	Heat Loss	Heat Gain
Windows	358	254
Above Grade Walls	571	18
Infiltration	642	2
Ceiling	161	51
Ventilation	319	6
Internal Loads	0	232
Internal Floor Radiant Panel Loss	1,401	0
Total Sensible	2,052	562
Total Floor Area	154 ft ²	154 ft ²

Constructions

Type	Description	R-Value	Area	Heating	Cooling
Walls	Wall	48.0	298	571	18
Ceilings	Ceiling	88.0	154	161	51
Radiant Floors	Concrete Thin Slab; R-6.31 Insulation Below Tubing.	6.31	154	1,401	0

Glazings

Type	Description	Exposure	R-Value	SHGC	Area	Heating	Cooling
Windows	Glass	S	6.4	0.30	25	358	254

Laundry (Main Floor)**Load Breakdown**

Name	Heat Loss	Heat Gain
Above Grade Walls	101	0
Infiltration	94	0
Ceiling	60	19
Ventilation	47	0
Internal Loads	0	86
Internal Floor Radiant Panel Loss	72	0
Total Sensible	302	105
Total Floor Area	57 ft ²	57 ft ²

Constructions

Type	Description	R-Value	Area	Heating	Cooling
Walls	Wall	48.0	53	101	0
Ceilings	Ceiling	88.0	57	60	19
Radiant Floors	Concrete Thin Slab; R-6.31 Insulation Below Tubing.	6.31	57	72	0

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

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

(*) 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

Created Using LoopCAD 2023 (2023-10-20)

Version:23.0.0180 R

Library/Office/Upstairs Corridor (Main)

Load Breakdown

Name	Heat Loss	Heat Gain
Windows	774	468
Above Grade Walls	534	0
Infiltration	980	3
Ceiling	357	112
Ventilation	487	11
Internal Loads	0	514
Internal Floor Radiant Panel Loss	768	0
Total Sensible	3,132	1,108
Total Floor Area	341 ft ²	341 ft ²

Constructions

Type	Description	R-Value	Area	Heating	Cooling
Walls	Wall	48.0	278	534	0
Ceilings	Ceiling	88.0	341	357	112
Radiant Floors	Concrete Thin Slab; R-6.31 Insulation Below Tubing.	6.31	341	768	0

Glazings

Type	Description	Exposure	R-Value	SHGC	Area	Heating	Cooling
Windows	Glass	N	6.4	0.30	15	215	71
Windows	Glass	S	6.4	0.30	39	559	397

Primary WC (Main Floor)**Load Breakdown**

Name	Heat Loss	Heat Gain
Windows	358	346
Above Grade Walls	340	10
Infiltration	467	2
Ceiling	95	30
Ventilation	232	7
Internal Loads	0	137
Internal Floor Radiant Panel Loss	364	0
Total Sensible	1,493	532
Total Floor Area	91 ft ²	91 ft ²

Constructions

Type	Description	R-Value	Area	Heating	Cooling
Walls	Wall	48.0	177	340	10
Ceilings	Ceiling	88.0	91	95	30
Radiant Floors	Concrete Thin Slab; R-6.31 Insulation Below Tubing.	6.31	91	364	0

Glazings

Type	Description	Exposure	R-Value	SHGC	Area	Heating	Cooling
Windows	Glass	W	6.4	0.30	25	358	346

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

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

(*) 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

Created Using LoopCAD 2023 (2023-10-20)

Version:23.0.0180 R

PrimaryBedroom (Main Floor)

Load Breakdown

Name	Heat Loss	Heat Gain
Windows	572	460
Above Grade Walls	646	16
Infiltration	844	3
Ceiling	216	68
Ventilation	420	10
Internal Loads	0	312
Internal Floor Radiant Panel Loss	559	0
Total Sensible	2,698	869
Total Floor Area	207 ft ²	207 ft ²

Constructions

Type	Description	R-Value	Area	Heating	Cooling
Walls	Wall	48.0	337	646	16
Ceilings	Ceiling	88.0	207	216	68
Radiant Floors	Concrete Thin Slab; R-6.31 Insulation Below Tubing.	6.31	207	559	0

Glazings

Type	Description	Exposure	R-Value	SHGC	Area	Heating	Cooling
Windows	Glass	S	6.4	0.30	25	357	254
Windows	Glass	W	6.4	0.30	15	214	207

Upstair WC (Main Floor)

Load Breakdown

Name	Heat Loss	Heat Gain
Windows	171	165
Above Grade Walls	325	11
Infiltration	334	1
Ceiling	72	23
Ventilation	166	4
Internal Loads	0	103
Internal Floor Radiant Panel Loss	281	0
Total Sensible	1,068	307
Total Floor Area	69 ft ²	69 ft ²

Constructions

Type	Description	R-Value	Area	Heating	Cooling
Walls	Wall	48.0	169	325	11
Ceilings	Ceiling	88.0	69	72	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	171	165

Design Locaton

Location:	Whitehorse	Latitude:	61
Province/State:	Yukon Territory		
Country:	Canada		
Outdoor Heating Design Temp:	-22.0 °F	Mean Soil Temp:	37.4 °F
Outdoor Cooling Design Temp:	77.0 °F	Humidity Ratio:	7
Heating Degree Days:	6580	January Wind:	11.8 ft/s
Summer Mean Temp Range:	19.8 °F	July Wind:	9.1 ft/s
Average Air Temperatures:			
January:	1.4 °F	July:	57.2 °F
February:	10.4 °F	August:	53.6 °F
March:	19.4 °F	September:	44.6 °F
April:	33.8 °F	October:	32.0 °F
May:	44.6 °F	November:	14.0 °F
June:	53.6 °F	December:	10.4 °F

CSA2012Custom

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.

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

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

(*) 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

Created Using LoopCAD 2023 (2023-10-20)

Version:23.0.0180 R

See end of report for important Notes and Disclaimers.



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:	11,706 Btu/hr
Design Location:	(User Specified) Whitehorse, Yukon Territory	Barrier PEX 1/2"	2,320 ft	Infiltration/Ventilation:	13,091 Btu/hr
Outdoor Temperature:	-22.0 °F	Total RH Circuits:	10	Radiant Back Losses:	2,059 Btu/hr
Floorplans / Levels:		Total Manifolds:	1	Total Heating Load:	26,855 Btu/hr
Ground Floor	1,000 ft ²	Total Zones:	3	Radiant Heating:	24,756 Btu/hr
Main Floor	1,066 ft ²	Fluid Type:	30% Propylene Glycol	Radiant Back Losses:	2,059 Btu/hr
Total Area:	2,066 ft ²	Total Tubing Volume:	21.35 USG	Other:	41 Btu/hr
		Glycol Volume:	6.41 USG	Total Heating Load:	26,855 Btu/hr
		Surface Temperature:	82 - 84 °F		

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	8,048	37	8,085
Zone 102	476	Embedded Slab	RH	2	516	1	0.88	3.1	6,636	0	6,636
Zone 201	1,066	Concrete Thin Slab	RH,OTH	5	1,226	1	2.32	3.9	15,865	4	15,869

(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.

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)
Version: 23.0.0180 R

See end of report for important Notes and Disclaimers.

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	207	203	Manifold 1	1/2"	1	10	259	0.5	111	21.5	4,360	0	4,360
Zone 101	Downstair WC	RH, OTH	29	27	Manifold 1	1/2"	1	10	34	0.5	120	28.6	766	37	803
Zone 101	Pantry	RH	48	48	n/a	n/a	0	10	55	0.5	0	18.6	896	0	896
Zone 101	Rumpus Room	RH	107	107	Manifold 1	1/2"	1	10	124	0.5	107	19.0	2,026	0	2,026
Zone 102	Dining	RH	406	352	Manifold 1	1/2"	2	10	419	0.5	108	18.8	6,636	0	6,636

(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	99	14.4	1,680	0	1,680
Zone 201	Bedroom 2	RH	119	119	n/a	n/a	0	10	155	0.5	0	29.1	3,453	0	3,453
Zone 201	Laundry	RH	40	40	Manifold 1	1/2"	1	10	53	0.5	92	9.3	373	0	373
Zone 201	Library/Office/ Upstairs Corridor	RH	279	232	Manifold 1	1/2"	1	10	287	0.5	102	16.8	3,899	0	3,899
Zone 201	Primary WC	RH	65	62	n/a	n/a	0	10	80	0.5	0	30.1	1,857	0	1,857
Zone 201	PrimaryBedroom	RH	166	166	Manifold 1	1/2"	1	10	205	0.5	105	19.6	3,258	0	3,258
Zone 201	Upstair WC	RH, OTH	46	43	Manifold 1	1/2"	1	10	50	0.5	120	31.5	1,346	4	1,349

(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	4.53	4.5	120	120	20	Stainless Steel	Circuit	10	-	-
Total	3	10	4.53	4.5	-	-	-	-	-	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:	11,706 Btu/hr
Design Location:	(User Specified) Whitehorse, Yukon Territory	Barrier PEX 1/2"	2,320 ft	Infiltration/Ventilation:	13,091 Btu/hr
Outdoor Temperature:	-22.0 °F	Total RH Circuits:	10	Radiant Back Losses:	2,059 Btu/hr
Floorplans / Levels:		Total Manifolds:	1	Total Heating Load:	26,855 Btu/hr
Ground Floor	1,000 ft ²	Total Zones:	3	Radiant Heating:	24,756 Btu/hr
Main Floor	1,066 ft ²	Fluid Type:	30% Propylene Glycol	Radiant Back Losses:	2,059 Btu/hr
Total Area:	2,066 ft ²	Total Tubing Volume:	21.35 USG	Other:	41 Btu/hr
		Glycol Volume:	6.41 USG	Total Heating Load:	26,855 Btu/hr

Zone Heating Summary

Zone #	Area	Heating Types	RH Circuits	Flowrate	Head Loss	Supplemental	Rooms
101	524	RH,OTH	3	1.33	2.8	37	Pantry, Rumpus Room, Corridor / Entry, Downstair WC
102	476	RH	2	0.88	3.7	0	Dining
201	1,066	RH,OTH	5	2.32	4.5	4	Primary WC, Laundry, Primary Bedroom, Bedroom 1, Bedroom 2, Library/Office/Upstairs Corridor, Upstair WC
Total	2,066	RH,OTH	10	4.53	4.5	41	

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

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)
Version: 23.0.0180 R

See end of report for important Notes and Disclaimers.

Room Heating Summary

Ground Floor

Corridor / Entry

Total Area:	266 ft ²	<u>Radiant Heating:</u>		<u>Load/Loss Summary:</u>	
Heated by:	RH	Heated Area:	203 ft ²	Room Design Load:	3,768 Btu/hr
Room Temperature:	70 °F	Tubing in Floor:	272 ft	Radiant Load:	4,360 Btu/hr
Floor Covering (Rv):	0.5	Circuits in Room:	1	Baseboard Load:	0 Btu/hr
		Tube Spacing:	10	Forced Air Load:	0 Btu/hr
		Required Surface Temp:	80 °F	Other Load:	0 Btu/hr
		Required Water Temp:	111 °F		
		Est. Peak Output:	5,039 Btu/hr	Radiant Back Loss:	592 Btu/hr
				Recovered Back Loss:	0 Btu/hr
				Total Heat Loss:	4,360 Btu/hr

Dining

Total Area:	476 ft ²	<u>Radiant Heating:</u>		<u>Load/Loss Summary:</u>	
Heated by:	RH	Heated Area:	352 ft ²	Room Design Load:	5,795 Btu/hr
Room Temperature:	70 °F	Tubing in Floor:	434 ft	Radiant Load:	6,636 Btu/hr
Floor Covering (Rv):	0.5	Circuits in Room:	2	Baseboard Load:	0 Btu/hr
		Tube Spacing:	10	Forced Air Load:	0 Btu/hr
		Required Surface Temp:	79 °F	Other Load:	0 Btu/hr
		Required Water Temp:	108 °F		
		Est. Peak Output:	8,116 Btu/hr	Radiant Back Loss:	841 Btu/hr
				Recovered Back Loss:	0 Btu/hr
				Total Heat Loss:	6,636 Btu/hr

Downstair WC

Total Area: 45 ft²
 Heated by: RH,OTH
 Room Temperature: 70 °F
 Floor Covering (Rv): 0.5

Radiant Heating:
 Heated Area: 27 ft²
 Tubing in Floor: 36 ft
 Circuits in Room: 1
 Tube Spacing: 10
 Required Surface Temp: 83 °F
 Required Water Temp: 120 °F
 Est. Peak Output: 670 Btu/hr

Supplemental Req'd: 37 Btu/hr

Load/Loss Summary:
Room Design Load: 670 Btu/hr
 Radiant Load: 766 Btu/hr
 Baseboard Load: 0 Btu/hr
 Forced Air Load: 0 Btu/hr
 Other Load: 37 Btu/hr
 Radiant Back Loss: 96 Btu/hr
 Recovered Back Loss: 0 Btu/hr
 Total Heat Loss: 803 Btu/hr

Pantry

Total Area: 73 ft²
 Heated by: RH
 Room Temperature: 70 °F
 Floor Covering (Rv): 0.5

Radiant Heating:
 Heated Area: 48 ft²
 Tubing in Floor: 58 ft
 Circuits in Room: 0
 Tube Spacing: 10
 Required Surface Temp: 78 °F
 Required Water Temp: 105 °F
 Est. Peak Output: 1,169 Btu/hr

Load/Loss Summary:
Room Design Load: 715 Btu/hr
 Radiant Load: 896 Btu/hr
 Baseboard Load: 0 Btu/hr
 Forced Air Load: 0 Btu/hr
 Other Load: 0 Btu/hr
 Radiant Back Loss: 181 Btu/hr
 Recovered Back Loss: 0 Btu/hr
 Total Heat Loss: 896 Btu/hr

Rumpus Room

Total Area: 141 ft²
 Heated by: RH
 Room Temperature: 70 °F
 Floor Covering (Rv): 0.5

Radiant Heating:
 Heated Area: 107 ft²
 Tubing in Floor: 128 ft
 Circuits in Room: 1
 Tube Spacing: 10
 Required Surface Temp: 79 °F
 Required Water Temp: 107 °F
 Est. Peak Output: 2,613 Btu/hr

Load/Loss Summary:
Room Design Load: 1,677 Btu/hr
 Radiant Load: 2,026 Btu/hr
 Baseboard Load: 0 Btu/hr
 Forced Air Load: 0 Btu/hr
 Other Load: 0 Btu/hr
 Radiant Back Loss: 349 Btu/hr
 Recovered Back Loss: 0 Btu/hr
 Total Heat Loss: 2,026 Btu/hr

Main Floor

Bedroom 1

Total Area:	146 ft ²	<u>Radiant Heating:</u>		<u>Load/Loss Summary:</u>	
Heated by:	RH	Heated Area:	117 ft ²	Room Design Load:	1,390 Btu/hr
Room Temperature:	70 °F	Tubing in Floor:	147 ft	Radiant Load:	1,680 Btu/hr
Floor Covering (RV):	0.5	Circuits in Room:	1	Baseboard Load:	0 Btu/hr
		Tube Spacing:	10	Forced Air Load	0 Btu/hr
		Required Surface Temp:	77 °F	Other Load:	0 Btu/hr
		Required Water Temp:	99 °F		
		Est. Peak Output:	2,911 Btu/hr	Radiant Back Loss:	290 Btu/hr
				Recovered Back Loss:	-290 Btu/hr
				Total Heat Loss:	1,390 Btu/hr

Bedroom 2

Total Area:	154 ft ²	<u>Radiant Heating:</u>		<u>Load/Loss Summary:</u>	
Heated by:	RH	Heated Area:	119 ft ²	Room Design Load:	2,052 Btu/hr
Room Temperature:	70 °F	Tubing in Floor:	159 ft	Radiant Load:	3,453 Btu/hr
Floor Covering (RV):	0.5	Circuits in Room:	0	Baseboard Load:	0 Btu/hr
		Tube Spacing:	9	Forced Air Load	0 Btu/hr
		Required Surface Temp:	79 °F	Other Load:	0 Btu/hr
		Required Water Temp:	103 °F		
		Est. Peak Output:	3,019 Btu/hr	Radiant Back Loss:	1,401 Btu/hr
				Recovered Back Loss:	-1,401 Btu/hr
				Total Heat Loss:	2,052 Btu/hr

Laundry

Total Area:	57 ft ²	<u>Radiant Heating:</u>		<u>Load/Loss Summary:</u>	
Heated by:	RH	Heated Area:	40 ft ²	Room Design Load:	302 Btu/hr
Room Temperature:	70 °F	Tubing in Floor:	54 ft	Radiant Load:	373 Btu/hr
Floor Covering (RV):	0.5	Circuits in Room:	1	Baseboard Load:	0 Btu/hr
		Tube Spacing:	10	Forced Air Load	0 Btu/hr
		Required Surface Temp:	74 °F	Other Load:	0 Btu/hr
		Required Water Temp:	92 °F		
		Est. Peak Output:	1,020 Btu/hr	Radiant Back Loss:	72 Btu/hr
				Recovered Back Loss:	-72 Btu/hr
				Total Heat Loss:	302 Btu/hr

Library/Office/Upstairs Corridor

Total Area: 341 ft²
 Heated by: RH
 Room Temperature: 70 °F
 Floor Covering (Rv): 0.5

Radiant Heating:
 Heated Area: 232 ft²
 Tubing in Floor: 293 ft
 Circuits in Room: 1
 Tube Spacing: 10
 Required Surface Temp: 77 °F
 Required Water Temp: 102 °F
 Est. Peak Output: 5,806 Btu/hr

Load/Loss Summary:
Room Design Load: 3,132 Btu/hr
 Radiant Load: 3,899 Btu/hr
 Baseboard Load: 0 Btu/hr
 Forced Air Load: 0 Btu/hr
 Other Load: 0 Btu/hr
 Radiant Back Loss: 768 Btu/hr
 Recovered Back Loss: -768 Btu/hr
 Total Heat Loss: 3,132 Btu/hr

Primary WC

Total Area: 91 ft²
 Heated by: RH
 Room Temperature: 70 °F
 Floor Covering (Rv): 0.5

Radiant Heating:
 Heated Area: 62 ft²
 Tubing in Floor: 81 ft
 Circuits in Room: 0
 Tube Spacing: 9
 Required Surface Temp: 83 °F
 Required Water Temp: 117 °F
 Est. Peak Output: 1,545 Btu/hr

Load/Loss Summary:
Room Design Load: 1,493 Btu/hr
 Radiant Load: 1,857 Btu/hr
 Baseboard Load: 0 Btu/hr
 Forced Air Load: 0 Btu/hr
 Other Load: 0 Btu/hr
 Radiant Back Loss: 364 Btu/hr
 Recovered Back Loss: -364 Btu/hr
 Total Heat Loss: 1,493 Btu/hr

Primary Bedroom

Total Area: 207 ft²
 Heated by: RH
 Room Temperature: 70 °F
 Floor Covering (Rv): 0.5

Radiant Heating:
 Heated Area: 166 ft²
 Tubing in Floor: 210 ft
 Circuits in Room: 1
 Tube Spacing: 10
 Required Surface Temp: 79 °F
 Required Water Temp: 105 °F
 Est. Peak Output: 4,119 Btu/hr

Load/Loss Summary:
Room Design Load: 2,698 Btu/hr
 Radiant Load: 3,258 Btu/hr
 Baseboard Load: 0 Btu/hr
 Forced Air Load: 0 Btu/hr
 Other Load: 0 Btu/hr
 Radiant Back Loss: 559 Btu/hr
 Recovered Back Loss: -559 Btu/hr
 Total Heat Loss: 2,698 Btu/hr

Upstair WC

Total Area: 69 ft²
 Heated by: RH,OTH
 Room Temperature: 70 °F
 Floor Covering (Rv): 0.5

Radiant Heating:
 Heated Area: 43 ft²
 Tubing in Floor: 51 ft
 Circuits in Room: 1
 Tube Spacing: 10
 Required Surface Temp: 83 °F
 Required Water Temp: 120 °F
 Est. Peak Output: 1,064 Btu/hr

Supplemental Req'd: 4 Btu/hr

Load/Loss Summary:
Room Design Load: 1,064 Btu/hr
 Radiant Load: 1,346 Btu/hr
 Baseboard Load: 0 Btu/hr
 Forced Air Load: 0 Btu/hr
 Other Load: 4 Btu/hr
 Radiant Back Loss: 281 Btu/hr
 Recovered Back Loss: -281 Btu/hr
 Total Heat Loss: 1,068 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	4.53	4.5	120	120	20	Stainless Steel	Circuit	10	-	-
Total	3	10	4.53	4.5	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"	0.44	3.1	20	3,163	Yes
A-2	Dining	253	10	192	Barrier PEX 1/2"	0.44	3.0	20	3,622	Yes
A-3	Corridor / Entry	193	10	130	Barrier PEX 1/2"	0.44	2.2	20	2,653	Yes
A-4	Rumpus Room	192	10	126	Barrier PEX 1/2"	0.44	2.2	20	2,480	Yes
A-5	Downstair WC	193	10	125	Barrier PEX 1/2"	0.44	2.2	20	2,740	Yes
B-1	Laundry	246	10	161	Barrier PEX 1/2"	0.44	2.9	20	2,792	Yes
B-2	Library/Office/Upstairs Corridor	253	10	157	Barrier PEX 1/2"	0.44	2.9	20	2,638	Yes
B-3	Bedroom 1	248	10	152	Barrier PEX 1/2"	0.44	2.9	20	2,562	Yes
B-4	Upstair WC	229	10	150	Barrier PEX 1/2"	0.55	3.9	20	4,358	Yes
B-6	PrimaryBedroom	251	10	158	Barrier PEX 1/2"	0.44	2.9	20	3,516	Yes
Total	-	2,320		1,518	-	4.53	3.9		30,522	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:

Supply Summary

Name	Temp	Total Fluid Vol	Total Flow	Head Loss ¹	Load ²	# Circuits	# Zones
Water Temperature	120	21.35	4.53	4.5	30,522	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	4.53	120	120	Stainless Steel	-	-	0.6	3.9	0.0	4.5
Total	10	4.53	-	-	-	-	-	0.6	3.9	0.0	4.5

(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"	0.44	3.1	20	3,163	Yes
A-2	Dining	253	10	192	Barrier PEX 1/2"	0.44	3.0	20	3,622	Yes
A-3	Corridor / Entry	193	10	128	Barrier PEX 1/2"	0.44	2.2	20	2,653	Yes
A-4	Rumpus Room	192	10	126	Barrier PEX 1/2"	0.44	2.2	20	2,480	Yes
A-5	Downstair WC	193	10	125	Barrier PEX 1/2"	0.44	2.2	20	2,740	Yes
B-1	Laundry	246	10	161	Barrier PEX 1/2"	0.44	2.9	20	2,792	Yes
B-2	Library/Office/Upstairs Corridor	253	10	157	Barrier PEX 1/2"	0.44	2.9	20	2,638	Yes
B-3	Bedroom 1	248	10	152	Barrier PEX 1/2"	0.44	2.9	20	2,562	Yes
B-4	Upstair WC	229	10	150	Barrier PEX 1/2"	0.55	3.9	20	4,358	Yes
B-6	PrimaryBedroom	251	10	158	Barrier PEX 1/2"	0.44	2.9	20	3,516	Yes
Total	-	2,320		1,515	-	4.53	3.9	-	30,522	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.

Project Information

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

Notes:

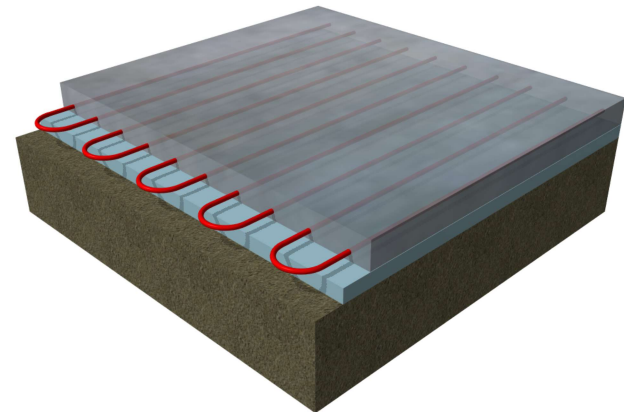
Design Conditions and Summary

Load Calculation Method:	CSA F280-12	Component Losses:	11,706 Btu/hr
Design Location:	(User Specified) Whitehorse, Yukon Territory	Infiltration/Ventilation:	13,091 Btu/hr
Outdoor Temperature:	-22.0 °F	Radiant Back Losses:	2,059 Btu/hr
Floorplans / Levels:		Total Heating Load:	26,855 Btu/hr
Ground Floor	1,000 ft ²	Radiant Heating:	24,756 Btu/hr
Main Floor	1,066 ft ²	Radiant Back Losses:	2,059 Btu/hr
Total Area:	2,066 ft ²	Other:	41 Btu/hr
		Total Heating Load:	26,855 Btu/hr

Radiant Panel Details

Panel Type #1 - Embedded Slab

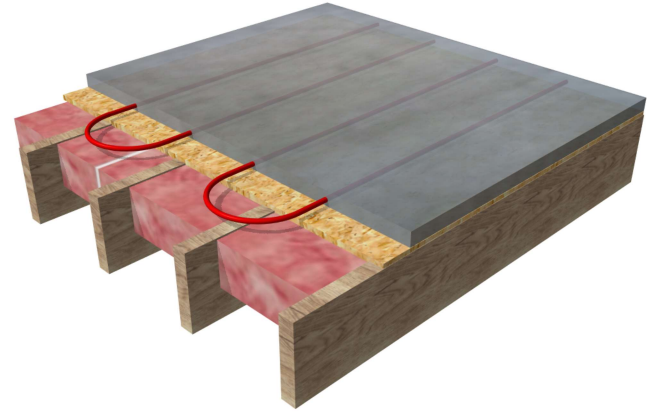
Slab Thickness:	4.0 in
Tube Depth:	2.5 in
Slab R per Inch (Embedding Material):	0.15 °F•ft ² •hr/(Btu•in)
Spacing:	10 in
Floorplans:	
Ground Floor	798 ft ²



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

Panel Type #2 - Concrete Thin Slab

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

**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.