Heat Loss Detail

ASHRAE Load Calculation

Project #:redmond-white-atwood

September 25, 2019

Project Information

Project #: redmond-white-atwood

Name: redmond-white-atewood

Location: 910 yamonite

Notes:

Load Calculation Summary

Design Location:	(User Specified) steamboat springs , Colorado	Component Losses:	28,308 Btu/hr
Load Calculation Method:	ASHRAE	Infiltration/Ventilation:	29,981 Btu/hr
Outdoor Temperature:	-15.0 °F	Radiant Back Losses:	2,624 Btu/hr
Floorplans / Levels:		Total Heating Load:	60,913 Btu/hr
Ground Floor	908 ft²		
Main Floor	908 ft²	Radiant Heating:	34,814 Btu/hr
Total Area:	1,817 ft²	Radiant Back Losses:	2,624 Btu/hr
		Other:	23,475 Btu/hr
		Total Heating Load:	60,913 Btu/hr

Load Calculation Data

Project Summary

Room	Area	Heating Type	Room Temp	Walls	Windows	Doors	Skylights	Floor	Ceiling	Infiltration	Additional	Recovered Panel Loss	Design Load	Unit Loss
Ground Floor	908	RH	70.0	3,990	3,670	2,529	0	2,624	15	12,447	0	0	25,275	30.1
Main Floor	908	RH,OTH	70.0	4,404	8,527	3,597	0	1,351	1,576	17,533	0	-1,351	35,638	41.3
Total For Project	1,817	RH,OTH	70.0	8,394	12,197	6,127	0	3,974	1,590	29,981	0	-1,351	60,913	35.8

Ground Floor

bedrooms&bath

Total Area:	304 ft²	Infiltration/Ventilation Load:	4,160 Btu/hr
Ceiling Height:	9' ft	Component Losses:	4,316 Btu/hr
Volume:	2,428 ft³	Additional Losses:	0 Btu/hr
Exposed Perimeter:	54'-8" ft	Total Room Loss:	8,476 Btu/hr
		Recovered Floor Loss:	0 Btu/hr
Room Temperature:	70 °F	Net Room Load:	8,476 Btu/hr
Space Above:	Main Floor		

Heating System

Heating Type:	Radiant	Surface Temp:	83 °F
Floor Area:	280 ft²	Net Room Load:	8,476 Btu/hr
Unheated Area:	0 ft²	Floor Back Loss:	1,065 Btu/hr
Net Heated Area:	280 ft²	Recovered Floor Loss:	0 Btu/hr
Floor Cover Rv:	0.5 hr·ft²·°F/btu	Gross Upward Load:	7,411 Btu/hr
Panel Type:	Embedded Slab		
		Supplemental Heat Supply:	0 Btu/hr
Supplemental Heating Type:	Other	Net Upward Load:	7,411 Btu/hr
Required Supply Temp:	112 °F	Total Radiant Load:	8,476 Btu/hr

Component Losses

Component	Length	Width/Height	Area	Construction	Rv	Heat Loss	Unit Loss
Window	6'	2'-6"	15	C3	3.1	411	1.5
Window	2'-8"	4'	11	C3	3.1	292	1
Window	2'-8"	4'	11	C3	3.1	292	1
Window	6'	2'-6"	15	C3	3.1	411	1.5
Window	2'-8"	2'	5	C3	3.1	146	0.5
Exposed Walls Above Grade	54'-8"	9'	435	C1	21.8	1,693	6
Slab	-	-	304	C4	Slab Insulation: 10.0 hr·ft²·°F/btu	1,065	3.8
Exposed Ceiling	-	-	2	C5	49.0	4	0
Total	-	-	-	-	-	4,316	15.4

entry/mudroom

Total Area:	267 ft²	Infiltration/Ventilation Load:	3,655 Btu/hr
Ceiling Height:	9' ft	Component Losses:	4,386 Btu/hr
Volume:	2,134 ft³	Additional Losses:	0 Btu/hr
Exposed Perimeter:	40'-4" ft	Total Room Loss:	8,040 Btu/hr
		Recovered Floor Loss:	0 Btu/hr
Room Temperature:	70 °F	Net Room Load:	8,040 Btu/hr
Space Above:	Main Floor		

Heating System

Heating Type:	Radiant	Surface Temp:	85 °F
Floor Area:	245 ft²	Net Room Load:	8,040 Btu/hr
Unheated Area:	0 ft²	Floor Back Loss:	798 Btu/hr
Net Heated Area:	245 ft²	Recovered Floor Loss:	0 Btu/hr
Floor Cover Rv:	0.5 hr·ft²·°F/btu	Gross Upward Load:	7,242 Btu/hr
Panel Type:	Embedded Slab		
		Supplemental Heat Supply:	0 Btu/hr
Supplemental Heating Type:	Other	Net Upward Load:	7,242 Btu/hr
Required Supply Temp:	116 °F	Total Radiant Load:	8,040 Btu/hr

Component Losses

Component	Length	Width/Height	Area	Construction	Rv	Heat Loss	Unit Loss
Window	4'-6"	5'	23	C3	3.1	617	2.5
Window	8'	5'	40	C3	3.1	1,097	4.5
Door	3'	6'-8"	20	C6	2.2	781	3.2
Exposed Walls Above Grade	40'-4"	9'	280	C1	21.8	1,091	4.4
Slab	-	-	267	C4	Slab Insulation: 10.0 hr·ft²·°F/btu	798	3.3
Exposed Ceiling	-	-	1	C5	49.0	1	0
Total	-	-	-	-	-	4,386	17.9

master bed

Total Area:	219 ft²	Infiltration/Ventilation Load:	2,995 Btu/hr
Ceiling Height:	9' ft	Component Losses:	2,221 Btu/hr
Volume:	1,748 ft³	Additional Losses:	0 Btu/hr
Exposed Perimeter:	19'-10" ft	Total Room Loss:	5,216 Btu/hr
		Recovered Floor Loss:	0 Btu/hr
Room Temperature:	70 °F	Net Room Load:	5,216 Btu/hr
Space Above:	Main Floor		

Heating System

Heating Type:	Radiant	Surface Temp:	82 °F
Floor Area:	204 ft²	Net Room Load:	5,216 Btu/hr
Unheated Area:	0 ft²	Floor Back Loss:	360 Btu/hr
Net Heated Area:	204 ft²	Recovered Floor Loss:	0 Btu/hr
Floor Cover Rv:	0.5 hr·ft²·°F/btu	Gross Upward Load:	4,857 Btu/hr
Panel Type:	Embedded Slab		
		Supplemental Heat Supply:	0 Btu/hr
Supplemental Heating Type:	Other	Net Upward Load:	4,857 Btu/hr
Required Supply Temp:	109 °F	Total Radiant Load:	5,216 Btu/hr

Component Losses

Component	Length	Width/Height	Area	Construction	Rv	Heat Loss	Unit Loss
Door	6'	6'-8"	40	C2	3.1	1,097	5.4
Window	3'-6"	2'-8"	9	C3	3.1	256	1.3
Exposed Walls Above Grade	19'-10"	9'	129	C1	21.8	503	2.5
Slab	-	-	219	C4	Slab Insulation: 10.0 hr·ft²·°F/btu	360	1.8
Exposed Ceiling	-	-	4	C5	49.0	6	0
Total	-	-	-	-	-	2,221	10.9

masterbath

Total Area:	120 ft²	Infiltration/Ventilation Load:	1,638 Btu/hr
Ceiling Height:	9' ft	Component Losses:	1,904 Btu/hr
Volume:	957 ft³	Additional Losses:	0 Btu/hr
Exposed Perimeter:	22'-6" ft	Total Room Loss:	3,543 Btu/hr
		Recovered Floor Loss:	0 Btu/hr
Room Temperature:	70 °F	Net Room Load:	3,543 Btu/hr
Space Above:	Main Floor		

Heating System

Heating Type:	Radiant	Surface Temp:	84 °F
Floor Area:	109 ft²	Net Room Load:	3,543 Btu/hr
Unheated Area:	0 ft²	Floor Back Loss:	401 Btu/hr
Net Heated Area:	109 ft²	Recovered Floor Loss:	0 Btu/hr
Floor Cover Rv:	0.5 hr·ft²·°F/btu	Gross Upward Load:	3,142 Btu/hr
Panel Type:	Embedded Slab		
		Supplemental Heat Supply:	0 Btu/hr
Supplemental Heating Type:	Other	Net Upward Load:	3,142 Btu/hr
Required Supply Temp:	114 °F	Total Radiant Load:	3,543 Btu/hr

Component Losses

Component	Length	Width/Height	Area	Construction	Rv	Heat Loss	Unit Loss
Door	2'-6"	6'-8"	17	C6	2.2	651	6
Window	2'-8"	2'	5	C3	3.1	146	1.3
Exposed Walls Above Grade	22'-6"	9'	181	C1	21.8	703	6.5
Slab	-	-	120	C4	Slab Insulation: 10.0 hr·ft²·°F/btu	401	3.7
Exposed Ceiling	-	-	2	C5	49.0	3	0
Total	-	-	-	-	-	1,904	17.5

Main Floor

upper great room

Total Area:	908 ft²	Infiltration/Ventilation Load:	17,533 Btu/hr
Ceiling Height:	11'-3" ft	Component Losses:	19,456 Btu/hr
Volume:	10,237 ft³	Additional Losses:	0 Btu/hr
Exposed Perimeter:	137'-2" ft	Total Room Loss:	36,989 Btu/hr
		Recovered Floor Loss:	-1,351 Btu/hr
Room Temperature:	70 °F	Net Room Load:	35,638 Btu/hr
Space Above:	Not Heated		
Space Below:	Ground Floor/Open or Vented Crawlspace		

Heating System

Heating Type:	Radiant	Surface Temp:	78 °F
Floor Area:	863 ft²	Net Room Load:	35,638 Btu/hr
Unheated Area:	80 ft²	Floor Back Loss:	1,351 Btu/hr
Net Heated Area:	783 ft²	Recovered Floor Loss:	-1,351 Btu/hr
Floor Cover Rv:	0.5 hr·ft²·°F/btu	Gross Upward Load:	35,638 Btu/hr
Panel Type:	Suspended Pipe		
		Supplemental Heat Supply:	23,475 Btu/hr
Supplemental Heating Type:	Other	Net Upward Load:	12,163 Btu/hr
Required Supply Temp:	140 °F	Total Radiant Load:	13,514 Btu/hr

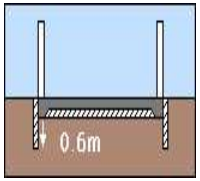
Component Losses

Component	Length	Width/Height	Area	Construction	Rv	Heat Loss	Unit Loss
Window	4'	4'	16	C3	3.1	439	0.5
Window	4'	4'	16	C3	3.1	439	0.5
Window	4'	2'	8	C3	3.1	219	0.3
Window	4'	2'	8	C3	3.1	219	0.3
Door	6'	6'-8"	40	C2	3.1	1,097	1.3
Window	4'	4'	16	C3	3.1	439	0.5
Window	8'	4'	32	C3	3.1	877	1
Door	8'	8'	64	C6	2.2	2,500	2.9
Window	8'	4'	32	C3	3.1	877	1
Window	3'	8'	24	C3	3.1	658	0.8
Window	3'	8'	24	C3	3.1	658	0.8
Window	4'-6"	5'	23	C3	3.1	617	0.7
Window	5'	5'	25	C3	3.1	685	0.8
Window	4'-6"	5'	23	C3	3.1	617	0.7
Window	5'	5'	25	C3	3.1	685	0.8
Window	8'	5'	40	C3	3.1	1,097	1.3
Exposed Walls Above Grade	137'-2"	11'-3"	1,132	C1	21.8	4,404	5.1
Floor	-	-	908	C7	19.0 (panel Insulation)	1,351	1.6
Exposed Ceiling	-	-	908	C5	49.0	1,576	1.8
Total	-	-	-	-	-	19,456	22.5

Construction Legend

Construction Code	Component	R-Value	Source	Description
C1	Wall	21.8	ASHRAE	2x6 inch wood stud 16"OC wall with fiberglass insulation, extruded polystyrene sheathing and aluminum or vinyl siding
C2	Door	3.1	User Specified	CUSTOM
C3	Window	3.1	User Specified	Operable windows - Double Glazing (e = 0.05 on surface 2 or 3), 13 mm argon space, Reinforced Vinyl/Aluminum Clad Wood
C5	Ceiling	49.0	User Specified	CUSTOM
C6	Door	2.2	ASHRAE	Swinging Door (Rough Opening = 970 x 2080 mm), Wood slab in wood frame, 25% glazing (560 x 910 lite), Double Glazing with 12.7 mm air space, Thermally broken sill
C7	Heated Floor	19.0 (panel Insulation)	User Specified	Suspended Pipe

CSA Construction Legend



C4

Description

SCB_33
- 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)
- thermal break around edge of slab
- vertical skirt extends from bottom of slab

Options

Slab Insulation: 10.0 hr·ft²·°F/btu

Design Locaton

Location:	steamboat springs		Altitude:	6800'	ft
Province/State:	Colorado		Standard Pressure:	12.5	Psi
Country:	United States				
Outdoor Heating Design Temp:	-15.0	°F	Humidity Ratio:	0.0009	
Number of Days over 18C:	2761		Mean Soil Temp:	40.0	°F
Average Air Temperatures:					
January:	-10.0	°F	July:	77.2	°F
February:	10.0	°F	August:	74.7	°F
March:	30.0	°F	September:	66.7	°F
April:	52.7	°F	October:	54.7	°F
May:	62.4	°F	November:	30.0	°F
June:	72.0	°F	December:	20.0	°F

ASHRAECustom

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Heat Loss Summary

ASHRAE Load Calculation

Project #:redmond-white-atwood

September 25, 2019

Project Information

Project #: redmond-white-atwood

Name: redmond-white-atewood

Location: 910 yamonite

Notes:

Load Calculation Summary

Design Location:	(User Specified) steamboat springs , Colorado	Component Losses:	28,308 Btu/hr
Load Calculation Method:	ASHRAE	Infiltration/Ventilation:	29,981 Btu/hr
Outdoor Temperature:	-15.0 °F	Radiant Back Losses:	2,624 Btu/hr
Floorplans / Levels:		Total Heating Load:	60,913 Btu/hr
Ground Floor	908 ft²		
Main Floor	908 ft²	Radiant Heating:	34,814 Btu/hr
Total Area:	1,817 ft²	Radiant Back Losses:	2,624 Btu/hr
		Other:	23,475 Btu/hr
		Total Heating Load:	60,913 Btu/hr

Load Calculation Results

Total Project

Room	Area	Heating Type	Room Temp	Walls	Windows	Doors	Skylights	Floor	Ceiling	Infiltration	Additional	Recovered Panel Loss	Design Load	Unit Loss
Total For Project	1,817	RH,OTH	70.0	8,394	12,197	6,127	0	3,974	1,590	29,981	0	-1,351	60,913	35.8

Ground Floor

Slab On Grade Construction

Room	Area	Heating Type	Room Temp	Walls	Windows	Doors	Skylights	Floor	Ceiling	Infiltration	Additional	Recovered Panel Loss	Design Load	Unit Loss
bedrooms&bath	304	RH	70.0	1,693	1,554	0	0	1,065	4	4,160	0	0	8,476	30.2
entry/mudroom	267	RH	70.0	1,091	1,714	781	0	798	1	3,655	0	0	8,040	32.8
master bed	219	RH	70.0	503	256	1,097	0	360	6	2,995	0	0	5,216	25.5
masterbath	120	RH	70.0	703	146	651	0	401	3	1,638	0	0	3,543	32.6
Sub Total	908	RH	70.0	3,990	3,670	2,529	0	2,624	15	12,447	0	0	25,275	30.1

Main Floor

Suspended Construction

Room	Area	Heating Type	Room Temp	Walls	Windows	Doors	Skylights	Floor	Ceiling	Infiltration	Additional	Recovered Panel Loss	Design Load	Unit Loss
upper great room	908	RH,OTH	70.0	4,404	8,527	3,597	0	1,351	1,576	17,533	0	-1,351	35,638	41.3
Sub Total	908	RH,OTH	70.0	4,404	8,527	3,597	0	1,351	1,576	17,533	0	-1,351	35,638	41.3

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Heating System Detail

Project #:redmond-white-atwood
September 25, 2019

Project Information

Project #: redmond-white-atwood
Name: redmond-white-atewood
Location: 910 yamonite

Notes:

Design Conditions and Summary

Load Calculation Method:	ASHRAE
Design Location:	(User Specified) steamboat springs , Colorado
Outdoor Temperature:	-15.0 °F
Floorplans / Levels:	
Ground Floor	908 ft²
Main Floor	908 ft²
Total Area:	1,817 ft²

Total Tubing Lengths:	
hePEX 1/2"	2,565 ft
Total RH Circuits:	15
Total Manifolds:	5
Total Zones:	5
Fluid Type:	100% Water
Total Tubing Volume:	23.62 USG

Component Losses:	28,308 Btu/hr
Infiltration/Ventilation:	29,981 Btu/hr
Radiant Back Losses:	2,624 Btu/hr
Total Heating Load:	60,913 Btu/hr
Radiant Heating:	34,814 Btu/hr
Radiant Back Losses:	2,624 Btu/hr
Other:	23,475 Btu/hr
Total Heating Load:	60,913 Btu/hr

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	304	RH	2	0.85	1.9	0	bedrooms&bath
102	267	RH	2	0.81	1.7	0	entry/mudroom
103	219	RH	2	0.52	0.6	0	master bed
104	120	RH	1	0.36	1.0	0	masterbath
201	908	RH,OTH	8	1.36	0.5	23,475	upper great room
Total	1,817	RH,OTH	15	3.89	1.9	23,475	

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

Room Heating Summary

Ground Floor

bedrooms&bath

Total Area:	304	ft²	Radiant Heating:			Load/Loss Summary:	
Heated by:	RH		Heated Area:	280	ft²	**Room Design Load:**	7,411 Btu/hr
Room Temperature:	70	°F	Tubing in Floor:	364	ft		
Floor Covering (Rv):	0.5		Circuits in Room:	2		Radiant Load:	8,476 Btu/hr
			Tube Spacing:	9		Baseboard Load:	0 Btu/hr
			Required Surface Temp:	83	°F	Forced Air Load	0 Btu/hr
			Required Water Temp:	112	°F	Other Load:	0 Btu/hr
			Est. Peak Output:	8,270	Btu/hr		
						Radiant Back Loss:	1,065 Btu/hr
						Recovered Back Loss:	0 Btu/hr
						Total Heat Loss:	8,476 Btu/hr

entry/mudroom

Total Area:	267	ft²	Radiant Heating:			Load/Loss Summary:	
Heated by:	RH		Heated Area:	245	ft²	**Room Design Load:**	7,242 Btu/hr
Room Temperature:	70	°F	Tubing in Floor:	316	ft		
Floor Covering (Rv):	0.5		Circuits in Room:	2		Radiant Load:	8,040 Btu/hr
			Tube Spacing:	9		Baseboard Load:	0 Btu/hr
			Required Surface Temp:	85	°F	Forced Air Load	0 Btu/hr
			Required Water Temp:	116	°F	Other Load:	0 Btu/hr
			Est. Peak Output:	7,354	Btu/hr		
						Radiant Back Loss:	798 Btu/hr
						Recovered Back Loss:	0 Btu/hr
						Total Heat Loss:	8,040 Btu/hr

master bed

Total Area:	219	ft²	Radiant Heating:			Load/Loss Summary:	
Heated by:	RH		Heated Area:	204	ft²	**Room Design Load:**	4,857 Btu/hr
Room Temperature:	70	°F	Tubing in Floor:	260	ft		
Floor Covering (Rv):	0.5		Circuits in Room:	2		Radiant Load:	5,216 Btu/hr
			Tube Spacing:	9		Baseboard Load:	0 Btu/hr
			Required Surface Temp:	82	°F	Forced Air Load	0 Btu/hr
			Required Water Temp:	109	°F	Other Load:	0 Btu/hr
			Est. Peak Output:	5,820	Btu/hr		
						Radiant Back Loss:	360 Btu/hr
						Recovered Back Loss:	0 Btu/hr
						Total Heat Loss:	5,216 Btu/hr

masterbath

Total Area:	120	ft²	Radiant Heating:			Load/Loss Summary:	
Heated by:	RH		Heated Area:	109	ft²	**Room Design Load:**	3,142 Btu/hr
Room Temperature:	70	°F	Tubing in Floor:	147	ft		
Floor Covering (Rv):	0.5		Circuits in Room:	1		Radiant Load:	3,543 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:	0 Btu/hr
			Est. Peak Output:	3,297	Btu/hr		
						Radiant Back Loss:	401 Btu/hr
						Recovered Back Loss:	0 Btu/hr
						Total Heat Loss:	3,543 Btu/hr

Main Floor

upper great room

Total Area:	908	ft²	Radiant Heating:			Load/Loss Summary:	
Heated by:	RH,OTH		Heated Area:	783	ft²	**Room Design Load:**	12,163 Btu/hr
Room Temperature:	70	°F	Tubing in Floor:	1,479	ft		
Floor Covering (Rv):	0.5		Circuits in Room:	8		Radiant Load:	13,514 Btu/hr
			Tube Spacing:	8		Baseboard Load:	0 Btu/hr
			Required Surface Temp:	78	°F	Forced Air Load	0 Btu/hr
			Required Water Temp:	140	°F	Other Load:	23,475 Btu/hr
			Est. Peak Output:	12,163	Btu/hr		
						Radiant Back Loss:	1,351 Btu/hr
			Supplemental Req'd:	23,475	Btu/hr	Recovered Back Loss:	-1,351 Btu/hr
						Total Heat Loss:	35,638 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	1	2	0.85	1.9	112	116	20	TruFLOW Jr Valved w/ Balancing	Manifold	0	-	-
Manifold 2	1	2	0.81	1.7	116	116	20	TruFLOW Jr Valved w/ Balancing	Manifold	0	-	-
Manifold 3	1	2	0.52	0.6	109	116	20	TruFLOW Jr Valved w/ Balancing	Manifold	0	-	-
Manifold 4	1	1	0.36	1.0	114	116	20	TruFLOW Jr Valved w/ Balancing	Manifold	0	-	-
Manifold 5	1	8	1.36	0.5	140	140	20	TruFLOW Jr Valved w/ Balancing	Manifold	0	-	-
Total	5	15	3.89	1.9	140	-	-	-	-	0	-	-

(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	Valve Setting
A-1	bedrooms&bath	182	9	134	hePEX 1/2"	0.41	1.5	20	4,047	No	1.87
A-2	bedrooms&bath	181	9	146	hePEX 1/2"	0.44	1.8	20	4,429	No	4.2
Total	-	364		280	-	0.85	1.8		8,476	0	

(1) Head loss for circuit tubing only

Manifold 2

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss[1]	Temp Drop	Load	Actuator	Valve Setting
A-3	entry/mudroom	163	9	133	hePEX 1/2"	0.44	1.5	20	4,343	No	4.2
A-4	entry/mudroom	153	9	113	hePEX 1/2"	0.37	1.1	20	3,698	No	1.3
Total	-	316		245	-	0.81	1.5		8,040	0	

(1) Head loss for circuit tubing only

Manifold 3

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss[1]	Temp Drop	Load	Actuator	Valve Setting
A-5	master bed	125	9	103	hePEX 1/2"	0.26	0.5	20	2,626	No	4.2
A-6	master bed	135	9	101	hePEX 1/2"	0.26	0.5	20	2,590	No	4.2
Total	-	260		204	-	0.52	0.5		5,216	0	

(1) Head loss for circuit tubing only

Manifold 4

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss[1]	Temp Drop	Load	Actuator	Valve Setting
A-7	masterbath	147	9	109	hePEX 1/2"	0.36	1.0	20	3,543	No	4.2
Total	-	147		109	-	0.36	1.0	21	3,543	0	

(1) Head loss for circuit tubing only

Manifold 5

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss[1]	Temp Drop	Load	Actuator	Valve Setting
B-1	upper great room	194	8	81	hePEX 1/2"	0.14	0.2	20	1,393	No	0.89
B-2	upper great room	186	8	89	hePEX 1/2"	0.15	0.3	20	1,528	No	0.95
B-3	upper great room	178	8	87	hePEX 1/2"	0.15	0.3	20	1,498	No	0.92
B-4	upper great room	180	8	88	hePEX 1/2"	0.15	0.3	20	1,510	No	0.93
B-5	upper great room	192	8	112	hePEX 1/2"	0.19	0.4	20	1,932	No	2.2
B-6	upper great room	195	8	117	hePEX 1/2"	0.20	0.5	20	2,022	No	4.2
B-7	upper great room	168	8	93	hePEX 1/2"	0.16	0.3	20	1,603	No	0.96
B-8	upper great room	185	8	118	hePEX 1/2"	0.20	0.4	20	2,028	No	4.13
Total	-	1,479		783	-	1.36	0.5		13,514	0	

(1) Head loss for circuit tubing only

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Heating System Summary

Project #:redmond-white-atwood
September 25, 2019

Project Information

Project #: redmond-white-atwood
Name: redmond-white-atewood
Location: 910 yamonite

Notes:

Project Summary

Load Calculation Method:	ASHRAE	Total Circuit Lengths:			Component Losses:	28,308	Btu/hr
Design Location:	(User Specified) steamboat springs , Colorado	hePEX 1/2"	2,565	ft	Infiltration/Ventilation:	29,981	Btu/hr
					Radiant Back Losses:	2,624	Btu/hr
Outdoor Temperature:	-15.0 °F	Total RH Circuits:	15		Total Heating Load:	60,913	Btu/hr
Floorplans / Levels:		Total Manifolds:	5				
Ground Floor	908 ft²	Total Zones:	5		Radiant Heating:	34,814	Btu/hr
Main Floor	908 ft²				Radiant Back Losses:	2,624	Btu/hr
Total Area:	1,817 ft²	Fluid Type:	100% Water		Other:	23,475	Btu/hr
		Total Tubing Volume:	23.62	USG	Total Heating Load:	60,913	Btu/hr

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	304	Embedded Slab	RH	2	364	1	0.85	1.8	8,476	0	8,476
Zone 102	267	Embedded Slab	RH	2	316	1	0.81	1.5	8,040	0	8,040
Zone 103	219	Embedded Slab	RH	2	260	1	0.52	0.5	5,216	0	5,216
Zone 104	120	Embedded Slab	RH	1	147	1	0.36	1.0	3,543	0	3,543
Zone 201	908	Suspended Pipe	RH,OTH	8	1,479	1	1.36	0.5	13,514	23,475	36,989

(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	bedrooms& bath	RH	280	280	Manifold 1	1/2"	2	9	350	0.5	112	30.2	8,476	0	8,476
Zone 102	entry/mudroom	RH	245	245	Manifold 2	1/2"	2	9	302	0.5	116	32.8	8,040	0	8,040
Zone 103	master bed	RH	204	204	Manifold 3	1/2"	2	9	247	0.5	109	25.5	5,216	0	5,216
Zone 104	masterbath	RH	109	109	Manifold 4	1/2"	1	9	140	0.5	114	32.6	3,543	0	3,543

(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.

Suspended Pipe

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	upper great room	RH, OTH	863	783	Manifold 5	1/2"	8	8	1,420	0.5	140	17.3	13,514	23,475	36,989

(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	Flowrate	Head Loss[1]	Required Temp.	Supplied Temp.	Temp Drop	Manifold Type	Control Type	# Actuators	S/R Length[2]	S/R Pipe
Manifold 1	1	2	0.85	1.9	112	116	20	TruFLOW Jr Valved w/ Balancing	Manifold	0	-	-
Manifold 2	1	2	0.81	1.7	116	116	20	TruFLOW Jr Valved w/ Balancing	Manifold	0	-	-
Manifold 3	1	2	0.52	0.6	109	116	20	TruFLOW Jr Valved w/ Balancing	Manifold	0	-	-
Manifold 4	1	1	0.36	1.0	114	116	20	TruFLOW Jr Valved w/ Balancing	Manifold	0	-	-
Manifold 5	1	8	1.36	0.5	140	140	20	TruFLOW Jr Valved w/ Balancing	Manifold	0	-	-
Total	5	15	3.89	1.9	140	-	20	-	-	0	-	-

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

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Heating System Summary

Project #:redmond-white-atwood
September 25, 2019

Project Information

Project #: redmond-white-atwood
Name: redmond-white-atewood
Location: 910 yamonite

Notes:

Project Summary

Load Calculation Method:	ASHRAE	Total Circuit Lengths:			Component Losses:	28,308	Btu/hr
Design Location:	(User Specified) steamboat springs , Colorado	hePEX 1/2"	2,565	ft	Infiltration/Ventilation:	29,981	Btu/hr
					Radiant Back Losses:	2,624	Btu/hr
Outdoor Temperature:	-15.0 °F	Total RH Circuits:	15		Total Heating Load:	60,913	Btu/hr
Floorplans / Levels:		Total Manifolds:	5				
Ground Floor	908 ft²	Total Zones:	5		Radiant Heating:	34,814	Btu/hr
Main Floor	908 ft²				Radiant Back Losses:	2,624	Btu/hr
Total Area:	1,817 ft²	Fluid Type:	100% Water		Other:	23,475	Btu/hr
		Total Tubing Volume:	23.62	USG	Total Heating Load:	60,913	Btu/hr

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	304	Embedded Slab	RH	2	364	1	0.85	1.8	8,476	0	8,476
Zone 102	267	Embedded Slab	RH	2	316	1	0.81	1.5	8,040	0	8,040
Zone 103	219	Embedded Slab	RH	2	260	1	0.52	0.5	5,216	0	5,216
Zone 104	120	Embedded Slab	RH	1	147	1	0.36	1.0	3,543	0	3,543
Zone 201	908	Suspended Pipe	RH,OTH	8	1,479	1	1.36	0.5	13,514	23,475	36,989

(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	bedrooms& bath	RH	280	280	Manifold 1	1/2"	2	9	350	0.5	112	30.2	8,476	0	8,476
Zone 102	entry/mudroom	RH	245	245	Manifold 2	1/2"	2	9	302	0.5	116	32.8	8,040	0	8,040
Zone 103	master bed	RH	204	204	Manifold 3	1/2"	2	9	247	0.5	109	25.5	5,216	0	5,216
Zone 104	masterbath	RH	109	109	Manifold 4	1/2"	1	9	140	0.5	114	32.6	3,543	0	3,543

(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.

Suspended Pipe

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	upper great room	RH, OTH	863	783	Manifold 5	1/2"	8	8	1,420	0.5	140	17.3	13,514	23,475	36,989

(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	Flowrate	Head Loss[1]	Required Temp.	Supplied Temp.	Temp Drop	Manifold Type	Control Type	# Actuators	S/R Length[2]	S/R Pipe
Manifold 1	1	2	0.85	1.9	112	116	20	TruFLOW Jr Valved w/ Balancing	Manifold	0	-	-
Manifold 2	1	2	0.81	1.7	116	116	20	TruFLOW Jr Valved w/ Balancing	Manifold	0	-	-
Manifold 3	1	2	0.52	0.6	109	116	20	TruFLOW Jr Valved w/ Balancing	Manifold	0	-	-
Manifold 4	1	1	0.36	1.0	114	116	20	TruFLOW Jr Valved w/ Balancing	Manifold	0	-	-
Manifold 5	1	8	1.36	0.5	140	140	20	TruFLOW Jr Valved w/ Balancing	Manifold	0	-	-
Total	5	15	3.89	1.9	140	-	20	-	-	0	-	-

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

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Water Supply Summary

Project #:redmond-white-atwood
September 25, 2019

Project Information

Project #: redmond-white-atwood
Name: redmond-white-atewood
Location: 910 yamonite

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	116.5	10.00	2.54	1.9	25,275	7	4
Water Temperature	140.0	13.61	1.36	0.5	13,514	8	1

(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	2	0.85	112	116	TruFLOW Jr Valved w/ Balancing	-	-	0.1	1.8	0.0	1.9
Manifold 2	2	0.81	116	116	TruFLOW Jr Valved w/ Balancing	-	-	0.1	1.5	0.0	1.7
Manifold 3	2	0.52	109	116	TruFLOW Jr Valved w/ Balancing	-	-	0.1	0.5	0.0	0.6
Manifold 4	1	0.36	114	116	TruFLOW Jr Valved w/ Balancing	-	-	0.1	1.0	0.0	1.0
Manifold 5	8	1.36	140	140	TruFLOW Jr Valved w/ Balancing	-	-	0.1	0.5	0.0	0.5
Total	15	3.89	140	-	-	-	-				1.9

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

Water Temperature (116 °F)

Manifold 1 (116 °F, TruFLOW Jr Valved w/ Balancing, 2 Circuits)

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss[1]	Temp Drop[2]	Load[3]	Actuator	Valve Setting
A-1	bedrooms&bath	182	9	134	hePEX 1/2"	0.41	1.5	20	4,047	No	1.87
A-2	bedrooms&bath	181	9	146	hePEX 1/2"	0.44	1.8	20	4,429	No	4.2
Total	-	364		280	-	0.85	1.8	-	8,476	0	

(1) Head loss for circuit tubing only. (2) Design Temp Drop (Estimated Actual Drop). (3) Load includes panel back losses.

Manifold 2 (116 °F, TruFLOW Jr Valved w/ Balancing, 2 Circuits)

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss[1]	Temp Drop[2]	Load[3]	Actuator	Valve Setting
A-3	entry/mudroom	163	9	133	hePEX 1/2"	0.44	1.5	20	4,343	No	4.2
A-4	entry/mudroom	153	9	113	hePEX 1/2"	0.37	1.1	20	3,698	No	1.3
Total	-	316		245	-	0.81	1.5	-	8,040	0	

(1) Head loss for circuit tubing only. (2) Design Temp Drop (Estimated Actual Drop). (3) Load includes panel back losses.

Manifold 3 (116 °F, TruFLOW Jr Valved w/ Balancing, 2 Circuits)

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss[1]	Temp Drop[2]	Load[3]	Actuator	Valve Setting
A-5	master bed	125	9	103	hePEX 1/2"	0.26	0.5	20	2,626	No	4.2
A-6	master bed	135	9	101	hePEX 1/2"	0.26	0.5	20	2,590	No	4.2
Total	-	260		204	-	0.52	0.5	-	5,216	0	

(1) Head loss for circuit tubing only. (2) Design Temp Drop (Estimated Actual Drop). (3) Load includes panel back losses.

Manifold 4 (116 °F, TruFLOW Jr Valved w/ Balancing, 1 Circuits)

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss[1]	Temp Drop[2]	Load[3]	Actuator	Valve Setting
A-7	masterbath	147	9	109	hePEX 1/2"	0.36	1.0	20	3,543	No	4.2
Total	-	147		109	-	0.36	1.0	-	3,543	0	

(1) Head loss for circuit tubing only. (2) Design Temp Drop (Estimated Actual Drop). (3) Load includes panel back losses.

Water Temperature (140 °F)

Manifold 5 (140 °F, TruFLOW Jr Valved w/ Balancing, 8 Circuits)

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss[1]	Temp Drop[2]	Load[3]	Actuator	Valve Setting
B-1	upper great room	194	8	81	hePEX 1/2"	0.14	0.2	20	1,393	No	0.89
B-2	upper great room	186	8	89	hePEX 1/2"	0.15	0.3	20	1,528	No	0.95
B-3	upper great room	178	8	87	hePEX 1/2"	0.15	0.3	20	1,498	No	0.92
B-4	upper great room	180	8	88	hePEX 1/2"	0.15	0.3	20	1,510	No	0.93
B-5	upper great room	192	8	112	hePEX 1/2"	0.19	0.4	20	1,932	No	2.2
B-6	upper great room	195	8	117	hePEX 1/2"	0.20	0.5	20	2,022	No	4.2
B-7	upper great room	168	8	93	hePEX 1/2"	0.16	0.3	20	1,603	No	0.96
B-8	upper great room	185	8	118	hePEX 1/2"	0.20	0.4	20	2,028	No	4.13
Total	-	1,479		783	-	1.36	0.5	-	13,514	0	

(1) Head loss for circuit tubing only. (2) Design Temp Drop (Estimated Actual Drop). (3) Load includes panel back losses.

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