



Heat Loss Summary

ASHRAE Load Calculation

Project #:ACTION/HOMERANCH

March 09, 2023

Project Information

Project #: ACTION/HOMERANCH
Name: HOMERANCH/ACTION
Location: 27315 HOME RANCH ROAD

Notes:

Load Calculation Summary

Design Location: (User Specified) steamboat springs , Colorado
Load Calculation Method: ASHRAE
Outdoor Temperature: -15.0 °F
Floorplans / Levels:
Basement 1,989 ft²
Main Floor 9,163 ft²
Second Floor 1,902 ft²
Third Floor 155 ft²
Total Area: 13,209 ft²

Component Losses: 156,263 Btu/hr
Infiltration/Ventilation: 184,121 Btu/hr
Radiant Back Losses: 48,251 Btu/hr
Total Heating Load: 388,635 Btu/hr

Radiant Heating: 292,975 Btu/hr
Radiant Back Losses: 48,251 Btu/hr
Other: 47,410 Btu/hr
Total Heating Load: 388,635 Btu/hr
Surface Temperature: 83 - 90 °F

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	13,209	RH,OTH	70.0	32,845	67,758	37,700	0	57,463	15,470	184,121	0	-6,722	388,635	30.8

Basement

Slab Below Grade Construction

Room	Area	Heating Type	Room Temp	Walls	Windows	Doors	Skylights	Floor	Ceiling	Infiltration	Additional	Recovered Panel Loss	Design Load	Unit Loss
BASMENT	1,989	RH	70.0	3,786	2,164	0	0	3,156	30	23,928	0	0	33,063	17.6
Sub Total	1,989	RH	70.0	3,786	2,164	0	0	3,156	30	23,928	0	0	33,063	17.6

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

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Version:22.0.0781 R

See end of report for important Notes and Disclaimers.

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
FORMAL ENTRY/PWDR	1,034	RH,OTH	70.0	1,231	3,091	8,601	0	6,918	1,545	14,867	0	0	36,253	36.3
GARAGE	1,256	RH	70.0	2,431	3,245	14,481	0	7,122	2,179	18,091	0	0	47,549	39.2
GREAT HALL	1,416	RH,OTH	70.0	4,044	15,686	8,601	0	9,615	2,133	23,405	0	0	63,485	46.4
GREAT ROOM/BILLARD	1,269	RH,OTH	70.0	2,804	11,227	794	0	7,788	1,923	17,735	0	-209	42,062	34.3
KITCHEN	2,188	RH	70.0	2,825	6,087	2,989	0	14,389	3,197	30,174	0	0	59,660	28.0
MAIN FL OFFICE	290	RH,OTH	70.0	1,132	2,061	777	0	1,918	0	4,171	0	0	10,059	37.1
NORHT CLOSET	432	RH	70.0	835	386	0	0	628	89	5,780	0	-628	7,090	17.2
PRIMARY BATH	300	RH	70.0	1,277	1,549	794	0	480	441	4,068	0	-480	8,129	29.2
PRIMARY BED/HEARTH ROOM	545	RH,OTH	70.0	1,679	7,856	0	0	1,082	945	8,735	0	-1,082	19,214	37.3
SOUTH CLOSETR	432	RH	70.0	1,020	2,189	0	0	807	163	5,771	0	-807	9,144	22.3
Sub Total	9,163	RH,OTH	70.0	19,277	53,378	37,038	0	50,747	12,614	132,796	0	-3,206	302,645	34.3

Second Floor

Suspended Construction

Room	Area	Heating Type	Room Temp	Walls	Windows	Doors	Skylights	Floor	Ceiling	Infiltration	Additional	Recovered Panel Loss	Design Load	Unit Loss
MEZZANIE	674	RH,OTH	70.0	3,699	0	0	0	1,150	900	9,006	0	-1,150	13,605	21.5
PARLOR	466	RH,OTH	70.0	1,704	3,472	0	0	787	710	6,559	0	-787	12,444	28.3
RANCH SUITE	254	RH,OTH	70.0	862	1,784	0	0	525	441	3,394	0	-525	6,481	27.3
SUITE BATHROOM	215	RH	70.0	1,412	715	0	0	308	0	2,880	0	-294	5,020	25.8
UPPER OFFICE	292	RH,OTH	70.0	1,230	3,091	0	0	603	506	3,900	0	-599	8,732	32.1
Sub Total	1,902	RH,OTH	70.0	8,908	9,061	0	0	3,373	2,557	25,738	0	-3,355	46,282	26.1

Third 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 stairs	155	RH,OTH	70.0	874	3,155	662	0	187	269	1,660	0	-162	6,645	48.1
Sub Total	155	RH,OTH	70.0	874	3,155	662	0	187	269	1,660	0	-162	6,645	48.1

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Heat Loss Detail

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Radiant Back Losses: 48,251 Btu/hr
Total Heating Load: 388,635 Btu/hr

Radiant Heating: 292,975 Btu/hr
Radiant Back Losses: 48,251 Btu/hr
Other: 47,410 Btu/hr
Total Heating Load: 388,635 Btu/hr
Surface Temperature: 83 - 90 °F

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
Basement	1,989	RH	70.0	3,786	2,164	0	0	3,156	30	23,928	0	0	33,063	17.6
Main Floor	9,163	RH,OTH	70.0	19,277	53,378	37,038	0	50,747	12,614	132,796	0	-3,206	302,645	34.3
Second Floor	1,902	RH,OTH	70.0	8,908	9,061	0	0	3,373	2,557	25,738	0	-3,355	46,282	26.1
Third Floor	155	RH,OTH	70.0	874	3,155	662	0	187	269	1,660	0	-162	6,645	48.1
Total For Project	13,209	RH,OTH	70.0	32,845	67,758	37,700	0	57,463	15,470	184,121	0	-6,722	388,635	30.8

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
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Basement

BASMENT

Total Area:	1,989 ft²	Infiltration/Ventilation Load:	23,928 Btu/hr
Ceiling Height:	10' ft	Component Losses:	9,135 Btu/hr
Volume:	17,905 ft³	Additional Losses:	0 Btu/hr
Exposed Perimeter:	234'-3" ft	Total Room Loss:	33,063 Btu/hr
Room Temperature:	70 °F	Recovered Floor Loss:	0 Btu/hr
Space Above:	Main Floor	Net Room Load:	33,063 Btu/hr

Heating System

Heating Type:	Radiant	Surface Temp:	79 °F
Floor Area:	1,873 ft²	Net Room Load:	33,063 Btu/hr
Unheated Area:	40 ft²	Floor Back Loss:	3,156 Btu/hr
Net Heated Area:	1,833 ft²	Recovered Floor Loss:	0 Btu/hr
Floor Cover Rv:	0.0 hr-ft²·°F/btu	Gross Upward Load:	29,961 Btu/hr
Panel Type:	Embedded Slab	Supplemental Heat Supply:	0 Btu/hr
Supplemental Heating Type:	Other	Net Upward Load:	29,961 Btu/hr
Required Supply Temp:	102 °F	Total Radiant Load:	33,063 Btu/hr

Component Losses

Component	Length	Width/Height	Area	Construction	Rv	Heat Loss	Unit Loss
Window	2'	3'	6	C3	3.3	155	0.1
Window	3'	3'	9	C3	3.3	232	0.1
Window	3'	3'	9	C3	3.3	232	0.1
Window	3'	3'	9	C3	3.3	232	0.1
Window	3'	3'	9	C3	3.3	232	0.1
Window	3'	3'	9	C3	3.3	232	0.1
Window	3'	3'	9	C3	3.3	232	0.1
Window	2'	3'	6	C3	3.3	155	0.1
Window	3'	3'	9	C3	3.3	232	0.1
Window	3'	3'	9	C3	3.3	232	0.1
Exposed Walls Above Grade	234'-3"	2'-6"	946	C2	27.0	1,570	0.8
Basement with Walls	-	-	1,989	C1	Exterior Wall Insulation: 10.0 hr·ft²·°F/btu Interior Wall Insulation: 19.0 hr·ft²·°F/btu Slab Insulation: 10.0 hr·ft²·°F/btu	5,372	2.9
Exposed Ceiling	-	-	17	C4	49.0	30	0.0
Total	-	-	-	-	-	9,135	4.9

Main Floor

FORMAL ENTRY/PWDR

Total Area: 1,034 ft²
Ceiling Height: 10'-9" ft
Volume: 11,125 ft³
Exposed Perimeter: 65'-7" ft
Room Temperature: 70 °F
Space Above: Second Floor
Space Below: Basement/Open or Vented Crawlspace

Infiltration/Ventilation Load: 14,867 Btu/hr
Component Losses: 21,386 Btu/hr
Additional Losses: 0 Btu/hr
Total Room Loss: 36,253 Btu/hr
Recovered Floor Loss: 0 Btu/hr
Net Room Load: 36,253 Btu/hr

Heating System

Heating Type: Radiant
Floor Area: 998 ft²
Unheated Area: 87 ft²
Net Heated Area: 911 ft²
Floor Cover Rv: 1.0 hr-ft²·°F/btu
Panel Type: Warmboard

Supplemental Heating Type: Other
Required Supply Temp: 122 °F

Surface Temp: 84 °F
Net Room Load: 36,253 Btu/hr
Floor Back Loss: 6,918 Btu/hr
Recovered Floor Loss: 0 Btu/hr
Gross Upward Load: 29,741 Btu/hr

Supplemental Heat Supply: 5,487 Btu/hr
Net Upward Load: 24,254 Btu/hr
Total Radiant Load: 30,766 Btu/hr

Component Losses

Component	Length	Width/Height	Area	Construction	Rv	Heat Loss	Unit Loss
Window	3'	7'	21	C3	3.3	541	0.5
Window	3'	7'	21	C3	3.3	541	0.5
Window	3'	7'	21	C3	3.3	541	0.5
Window	3'	7'	21	C3	3.3	541	0.5
Window	2'	9'	18	C3	3.3	464	0.5
Window	2'	9'	18	C3	3.3	464	0.5
Door	6'	10'	60	C6	2.6	1,985	2.0
Door	10'	10'	100	C6	2.6	3,308	3.3
Door	10'	10'	100	C6	2.6	3,308	3.3
Exposed Walls Above Grade	65'-7"	11'-9"	391	C2	27.0	1,231	1.2
Floor	-	-	1,034	C5	19.0 (panel Insulation)	6,918	6.9
Exposed Ceiling	-	-	890	C4	49.0	1,545	1.5
Total	-	-	-	-	-	21,386	21.4

GARAGE

Total Area: 1,256 ft²
Ceiling Height: 10'-9" ft
Volume: 13,537 ft³
Exposed Perimeter: 116' ft
Room Temperature: 70 °F
Space Above: Second Floor
Space Below: Basement/Open or Vented Crawlspace

Infiltration/Ventilation Load: 18,091 Btu/hr
Component Losses: 29,459 Btu/hr
Additional Losses: 0 Btu/hr
Total Room Loss: 47,549 Btu/hr
Recovered Floor Loss: 0 Btu/hr
Net Room Load: 47,549 Btu/hr

Heating System

Heating Type:	Radiant	Surface Temp:	88 °F
Floor Area:	1,212 ft²	Net Room Load:	47,549 Btu/hr
Unheated Area:	0 ft²	Floor Back Loss:	7,122 Btu/hr
Net Heated Area:	1,212 ft²	Recovered Floor Loss:	0 Btu/hr
Floor Cover Rv:	0.0 hr-ft²·°F/btu	Gross Upward Load:	40,427 Btu/hr
Panel Type:	Warmboard		
Supplemental Heating Type:	Other	Supplemental Heat Supply:	0 Btu/hr
Required Supply Temp:	115 °F	Net Upward Load:	40,427 Btu/hr
		Total Radiant Load:	47,549 Btu/hr

Component Losses

Component	Length	Width/Height	Area	Construction	Rv	Heat Loss	Unit Loss
Window	3'	7'	21	C3	3.3	541	0.4
Window	3'	7'	21	C3	3.3	541	0.4
Window	3'	7'	21	C3	3.3	541	0.4
Window	3'	7'	21	C3	3.3	541	0.4
Door	3'	8'	24	C6	2.6	794	0.7
Door	3'	8'	24	C6	2.6	794	0.7
Door	14'	10'	140	C7	2.2	5,470	4.5
Door	10'	10'	100	C7	2.2	3,907	3.2
Door	9'	10'	90	C7	2.2	3,516	2.9
Window	3'	7'	21	C3	3.3	541	0.4
Window	3'	7'	21	C3	3.3	541	0.4
Exposed Walls Above Grade	116'	11'	772	C2	27.0	2,431	2.0
Floor	-	-	1,256	C5	19.0 (panel Insulation)	7,122	5.9
Exposed Ceiling	-	-	1,256	C4	49.0	2,179	1.8
Total	-	-	-	-	-	29,459	24.3

GREAT HALL

Total Area: 1,416 ft²
Ceiling Height: 12'-4" ft
Volume: 17,514 ft³
Exposed Perimeter: 130'-8" ft
Room Temperature: 70 °F
Space Above: Second Floor
Space Below: Basement/Open or Vented Crawlspace

Infiltration/Ventilation Load: 23,405 Btu/hr
Component Losses: 40,080 Btu/hr
Additional Losses: 0 Btu/hr
Total Room Loss: 63,485 Btu/hr
Recovered Floor Loss: 0 Btu/hr
Net Room Load: 63,485 Btu/hr

Heating System

Heating Type: Radiant
Floor Area: 1,367 ft²
Unheated Area: 0 ft²
Net Heated Area: 1,367 ft²
Floor Cover Rv: 1.0 hr·ft²·°F/btu
Panel Type: Warmboard

Supplemental Heating Type: Other
Required Supply Temp: 120 °F

Surface Temp: 83 °F
Net Room Load: 63,485 Btu/hr
Floor Back Loss: 9,615 Btu/hr
Recovered Floor Loss: 0 Btu/hr
Gross Upward Load: 53,870 Btu/hr

Supplemental Heat Supply: 19,078 Btu/hr
Net Upward Load: 34,792 Btu/hr
Total Radiant Load: 44,407 Btu/hr

Component Losses

Component	Length	Width/Height	Area	Construction	Rv	Heat Loss	Unit Loss
Window	6'-4"	9'	57	C3	3.3	1,468	1.1
Window	6'-4"	9'	57	C3	3.3	1,468	1.1
Window	6'-4"	9'	57	C3	3.3	1,468	1.1
Window	4'-8"	9'	42	C3	3.3	1,082	0.8
Window	4'-8"	9'	42	C3	3.3	1,082	0.8
Door	6'	10'	60	C6	2.6	1,985	1.5
Window	6'-4"	9'	57	C3	3.3	1,468	1.1
Window	6'-4"	9'	57	C3	3.3	1,468	1.1
Window	6'-4"	9'	57	C3	3.3	1,468	1.1
Window	4'-8"	9'	42	C3	3.3	1,082	0.8
Window	4'-8"	9'	42	C3	3.3	1,082	0.8
Door	20'	10'	200	C6	2.6	6,616	4.8
Wall	41'	5'	160	C2	27.0	504	0.4
Window	3'	3'	9	C3	3.3	232	0.2
Window	3'	3'	9	C3	3.3	232	0.2
Window	3'	3'	9	C3	3.3	232	0.2
Window	3'	3'	9	C3	3.3	232	0.2
Window	3'	3'	9	C3	3.3	232	0.2
Wall	50'	5'	196	C2	27.0	617	0.5
Window	3'	3'	9	C3	3.3	232	0.2
Window	3'	3'	9	C3	3.3	232	0.2
Window	3'	3'	9	C3	3.3	232	0.2
Window	3'	3'	9	C3	3.3	232	0.2
Window	3'	3'	9	C3	3.3	232	0.2
Window	3'	3'	9	C3	3.3	232	0.2
Exposed Walls Above Grade	130'-8"	13'	929	C2	27.0	2,924	2.1
Floor	-	-	1,416	C5	19.0 (panel Insulation)	9,615	7.0
Exposed Ceiling	-	-	1,229	C4	49.0	2,133	1.6
Total	-	-	-	-	-	40,080	29.3

GREAT ROOM/BILLARD

Total Area: 1,269 ft²
Ceiling Height: 10'-5" ft
Volume: 13,271 ft³
Exposed Perimeter: 104'-5" ft
Room Temperature: 70 °F
Space Above: Second Floor
Space Below: Basement/Open or Vented Crawlspace

Infiltration/Ventilation Load: 17,735 Btu/hr
Component Losses: 24,536 Btu/hr
Additional Losses: 0 Btu/hr
Total Room Loss: 42,271 Btu/hr
Recovered Floor Loss: -209 Btu/hr
Net Room Load: 42,062 Btu/hr

Heating System

Heating Type: Radiant
Floor Area: 1,225 ft²
Unheated Area: 124 ft²
Net Heated Area: 1,101 ft²
Floor Cover Rv: 1.0 hr·ft²·°F/btu
Panel Type: Warmboard

Supplemental Heating Type: Other
Required Supply Temp: 120 °F

Surface Temp: 83 °F
Net Room Load: 42,062 Btu/hr
Floor Back Loss: 7,788 Btu/hr
Recovered Floor Loss: -209 Btu/hr
Gross Upward Load: 34,942 Btu/hr

Supplemental Heat Supply: 6,355 Btu/hr
Net Upward Load: 28,587 Btu/hr
Total Radiant Load: 35,916 Btu/hr

Component Losses

Component	Length	Width/Height	Area	Construction	Rv	Heat Loss	Unit Loss
Window	3'	5'	15	C3	3.3	386	0.3
Window	3'	5'	15	C3	3.3	386	0.3
Window	3'	5'	15	C3	3.3	386	0.3
Window	3'	5'	15	C3	3.3	386	0.3
Window	3'	7'	21	C3	3.3	541	0.4
Window	3'	7'	21	C3	3.3	541	0.4
Window	8'-9"	9'	79	C3	3.3	2,028	1.7
Window	8'-9"	9'	79	C3	3.3	2,028	1.7
Window	5'-4"	9'	48	C3	3.3	1,236	1.0
Window	5'-4"	9'	48	C3	3.3	1,236	1.0
Door	3'	8'	24	C6	2.6	794	0.6
Wall	5'	6'	18	C2	27.0	57	0.0
Window	3'	4'	12	C3	3.3	309	0.3
Wall	5'	6'	21	C2	27.0	66	0.1
Window	3'	3'	9	C3	3.3	232	0.2
Wall	5'	10'	29	C2	27.0	91	0.1
Window	3'	7'	21	C3	3.3	541	0.4
Wall	5'	10'	29	C2	27.0	91	0.1
Window	3'	7'	21	C3	3.3	541	0.4
Wall	8'	6'	31	C2	27.0	96	0.1
Window	4'-2"	4'-2"	17	C3	3.3	447	0.4
Exposed Walls Above Grade	104'-5"	10'-9"	763	C2	27.0	2,402	2.0
Floor	-	-	1,269	C5	19.0 (panel Insulation)	7,788	6.4
Exposed Ceiling	-	-	1,109	C4	49.0	1,923	1.6
Total	-	-	-	-	-	24,536	20.0

KITCHEN

Total Area: 2,188 ft²
Ceiling Height: 10'-4" ft
Volume: 22,579 ft³
Exposed Perimeter: 115'-4" ft
Room Temperature: 70 °F
Space Above: Second Floor
Space Below: Basement/Open or Vented Crawlspace

Infiltration/Ventilation Load: 30,174 Btu/hr
Component Losses: 29,486 Btu/hr
Additional Losses: 0 Btu/hr
Total Room Loss: 59,660 Btu/hr
Recovered Floor Loss: 0 Btu/hr
Net Room Load: 59,660 Btu/hr

Heating System

Heating Type: Radiant
Floor Area: 2,132 ft²
Unheated Area: 338 ft²
Net Heated Area: 1,793 ft²
Floor Cover Rv: 1.0 hr·ft²·°F/btu
Panel Type: Warmboard

Supplemental Heating Type: Other
Required Supply Temp: 120 °F

Surface Temp: 84 °F
Net Room Load: 59,660 Btu/hr
Floor Back Loss: 14,389 Btu/hr
Recovered Floor Loss: 0 Btu/hr
Gross Upward Load: 46,837 Btu/hr

Supplemental Heat Supply: 0 Btu/hr
Net Upward Load: 46,837 Btu/hr
Total Radiant Load: 59,660 Btu/hr

Component Losses

Component	Length	Width/Height	Area	Construction	Rv	Heat Loss	Unit Loss
Window	3'	7'	21	C3	3.3	541	0.3
Window	3'	7'	21	C3	3.3	541	0.3
Window	3'	5'	15	C3	3.3	386	0.2
Window	3'	5'	15	C3	3.3	386	0.2
Door	5'-6"	8'	44	C6	2.6	1,456	0.7
Window	3'	7'	21	C3	3.3	541	0.3
Window	3'	7'	21	C3	3.3	541	0.3
Window	3'	7'	21	C3	3.3	541	0.3
Window	2'	4'	8	C3	3.3	206	0.1
Window	3'	7'	21	C3	3.3	541	0.3
Window	3'	7'	21	C3	3.3	541	0.3
Door	2'-10"	8'	22	C6	2.6	739	0.3
Window	2'-8"	8'	21	C3	3.3	549	0.3
Door	3'	8'	24	C6	2.6	794	0.4
Window	3'	5'	15	C3	3.3	386	0.2
Window	3'	5'	15	C3	3.3	386	0.2
Exposed Walls Above Grade	115'-4"	10'-7"	897	C2	27.0	2,825	1.3
Floor	-	-	2,188	C5	19.0 (panel Insulation)	14,389	6.8
Exposed Ceiling	-	-	1,843	C4	49.0	3,197	1.5
Total	-	-	-	-	-	29,486	13.8

MAIN FL OFFICE

Total Area: 290 ft²
Ceiling Height: 10'-9" ft
Volume: 3,121 ft³
Exposed Perimeter: 50'-7" ft
Room Temperature: 70 °F
Space Above: Second Floor
Space Below: Basement/Open or Vented Crawlspace

Infiltration/Ventilation Load: 4,171 Btu/hr
Component Losses: 5,888 Btu/hr
Additional Losses: 0 Btu/hr
Total Room Loss: 10,059 Btu/hr
Recovered Floor Loss: 0 Btu/hr
Net Room Load: 10,059 Btu/hr

Heating System

Heating Type:	Radiant	Surface Temp:	83 °F
Floor Area:	271 ft²	Net Room Load:	10,059 Btu/hr
Unheated Area:	0 ft²	Floor Back Loss:	1,918 Btu/hr
Net Heated Area:	271 ft²	Recovered Floor Loss:	0 Btu/hr
Floor Cover Rv:	1.0 hr·ft²·°F/btu	Gross Upward Load:	8,141 Btu/hr
Panel Type:	Warmboard		
Supplemental Heating Type:	Other	Supplemental Heat Supply:	1,096 Btu/hr
Required Supply Temp:	120 °F	Net Upward Load:	7,045 Btu/hr
		Total Radiant Load:	8,962 Btu/hr

Component Losses

Component	Length	Width/Height	Area	Construction	Rv	Heat Loss	Unit Loss
Door	3'	7'-10"	24	C6	2.6	777	2.9
Window	4'	5'	20	C3	3.3	515	1.9
Window	4'	5'	20	C3	3.3	515	1.9
Window	4'	5'	20	C3	3.3	515	1.9
Window	4'	5'	20	C3	3.3	515	1.9
Exposed Walls Above Grade	50'-7"	11'	453	C8	34.0	1,132	4.2
Floor	-	-	290	C5	19.0 (panel Insulation)	1,918	7.1
Exposed Ceiling	-	-	0	-	49.0	0	0.0
Total	-	-	-	-	-	5,888	21.7

NORHT CLOSET

Total Area:	432 ft²	Infiltration/Ventilation Load:	5,780 Btu/hr
Ceiling Height:	10' ft	Component Losses:	1,938 Btu/hr
Volume:	4,325 ft³	Additional Losses:	0 Btu/hr
Exposed Perimeter:	28' ft	Total Room Loss:	7,718 Btu/hr
Room Temperature:	70 °F	Recovered Floor Loss:	-628 Btu/hr
Space Above:	Second Floor	Net Room Load:	7,090 Btu/hr

Heating System

Heating Type:	Radiant	Surface Temp:	80 °F
Floor Area:	411 ft²	Net Room Load:	7,090 Btu/hr
Unheated Area:	25 ft²	Floor Back Loss:	628 Btu/hr
Net Heated Area:	387 ft²	Recovered Floor Loss:	-628 Btu/hr
Floor Cover Rv:	1.0 hr-ft²-°F/btu	Gross Upward Load:	7,090 Btu/hr
Panel Type:	Warmboard		
Supplemental Heating Type:	Other	Supplemental Heat Supply:	0 Btu/hr
Required Supply Temp:	109 °F	Net Upward Load:	7,090 Btu/hr
		Total Radiant Load:	7,718 Btu/hr

Component Losses

Component	Length	Width/Height	Area	Construction	Rv	Heat Loss	Unit Loss
Window	3'	5'	15	C3	3.3	386	0.9
Exposed Walls Above Grade	28'	10'	265	C2	27.0	835	2.0
Floor	-	-	432	C5	19.0 (panel Insulation)	628	1.5
Exposed Ceiling	-	-	51	C4	49.0	89	0.2
Total	-	-	-	-	-	1,938	4.7

PRIMARY BATH

Total Area:	300 ft²	Infiltration/Ventilation Load:	4,068 Btu/hr
Ceiling Height:	10'-2" ft	Component Losses:	4,541 Btu/hr
Volume:	3,044 ft³	Additional Losses:	0 Btu/hr
Exposed	47'-9" ft	Total Room Loss:	8,609 Btu/hr
Perimeter:		Recovered Floor Loss:	-480 Btu/hr
Room	70 °F	Net Room Load:	8,129 Btu/hr
Temperature:			
Space Above:	Second Floor		

Heating System

Heating Type:	Radiant	Surface Temp:	86 °F
Floor Area:	278 ft²	Net Room Load:	8,129 Btu/hr
Unheated Area:	4 ft²	Floor Back Loss:	480 Btu/hr
Net Heated Area:	274 ft²	Recovered Floor Loss:	-480 Btu/hr
Floor Cover Rv:	0.5 hr-ft²·°F/btu	Gross Upward Load:	8,129 Btu/hr
Panel Type:	Warmboard		
Supplemental Heating Type:	Other	Supplemental Heat Supply:	0 Btu/hr
Required Supply Temp:	113 °F	Net Upward Load:	8,129 Btu/hr
		Total Radiant Load:	8,609 Btu/hr

Component Losses

Component	Length	Width/Height	Area	Construction	Rv	Heat Loss	Unit Loss
Window	1'-8"	4'-7"	8	C3	3.3	197	0.7
Window	2'	5'	10	C3	3.3	258	0.9
Window	2'-6"	5'	13	C3	3.3	322	1.2
Door	3'	8'	24	C6	2.6	794	2.9
Window	3'-6"	5'	18	C3	3.3	451	1.6
Window	2'-6"	5'	13	C3	3.3	322	1.2
Exposed Walls Above Grade	47'-9"	10'-3"	406	C2	27.0	1,277	4.6
Floor	-	-	300	C5	19.0 (panel Insulation)	480	1.7
Exposed Ceiling	-	-	254	C4	49.0	441	1.6
Total	-	-	-	-	-	4,541	16.3

PRIMARY BED/HEARTH ROOM

Total Area:	545 ft²	Infiltration/Ventilation Load:	8,735 Btu/hr
Ceiling Height:	12' ft	Component Losses:	11,561 Btu/hr
Volume:	6,536 ft³	Additional Losses:	0 Btu/hr
Exposed Perimeter:	72'-11" ft	Total Room Loss:	20,296 Btu/hr
Room Temperature:	70 °F	Recovered Floor Loss:	-1,082 Btu/hr
Space Above:	Second Floor	Net Room Load:	19,214 Btu/hr

Heating System

Heating Type:	Radiant	Surface Temp:	83 °F
Floor Area:	515 ft²	Net Room Load:	19,214 Btu/hr
Unheated Area:	6 ft²	Floor Back Loss:	1,082 Btu/hr
Net Heated Area:	508 ft²	Recovered Floor Loss:	-1,082 Btu/hr
Floor Cover Rv:	1.0 hr-ft²·°F/btu	Gross Upward Load:	19,214 Btu/hr
Panel Type:	Warmboard		
Supplemental Heating Type:	Other	Supplemental Heat Supply:	6,499 Btu/hr
Required Supply Temp:	121 °F	Net Upward Load:	12,715 Btu/hr
		Total Radiant Load:	13,797 Btu/hr

Component Losses

Component	Length	Width/Height	Area	Construction	Rv	Heat Loss	Unit Loss
Window	5'	5'	25	C3	3.3	644	1.3
Window	5'	5'	25	C3	3.3	644	1.3
Window	2'	5'	10	C3	3.3	258	0.5
Window	5'	5'	25	C3	3.3	644	1.3
Window	5'	5'	25	C3	3.3	644	1.3
Window	5'	9'	45	C3	3.3	1,159	2.3
Window	5'	9'	45	C3	3.3	1,159	2.3
Window	2'	5'	10	C3	3.3	258	0.5
Window	2'	5'	10	C3	3.3	258	0.5
Window	3'	5'	15	C3	3.3	386	0.8
Window	3'	5'	15	C3	3.3	386	0.8
Window	3'	5'	15	C3	3.3	386	0.8
Wall	10'	3'	10	C2	27.0	31	0.1
Window	5'	2'	10	C3	3.3	258	0.5
Window	5'	2'	10	C3	3.3	258	0.5
Wall	10'	3'	10	C2	27.0	31	0.1
Window	5'	2'	10	C3	3.3	258	0.5
Window	5'	2'	10	C3	3.3	258	0.5
Exposed Walls Above Grade	72'-11"	10'-8"	513	C2	27.0	1,616	3.1
Floor	-	-	545	C5	19.0 (panel Insulation)	1,082	2.1
Exposed Ceiling	-	-	545	C4	49.0	945	1.8
Total	-	-	-	-	-	11,561	22.5

SOUTH CLOSETR

Total Area: 432 ft²
Ceiling Height: 10' ft
Volume: 4,318 ft³
Exposed Perimeter: 40'-11" ft
Room Temperature: 70 °F
Space Above: Second Floor

Infiltration/Ventilation Load: 5,771 Btu/hr
Component Losses: 4,180 Btu/hr
Additional Losses: 0 Btu/hr
Total Room Loss: 9,951 Btu/hr
Recovered Floor Loss: -807 Btu/hr
Net Room Load: 9,144 Btu/hr

Heating System

Heating Type: Radiant
Floor Area: 410 ft²
Unheated Area: 14 ft²
Net Heated Area: 396 ft²
Floor Cover Rv: 1.0 hr·ft²·°F/btu
Panel Type: Warmboard

Surface Temp: 82 °F
Net Room Load: 9,144 Btu/hr
Floor Back Loss: 807 Btu/hr
Recovered Floor Loss: -807 Btu/hr
Gross Upward Load: 9,144 Btu/hr

Supplemental Heating Type: Other
Required Supply Temp: 119 °F

Supplemental Heat Supply: 0 Btu/hr
Net Upward Load: 9,144 Btu/hr
Total Radiant Load: 9,951 Btu/hr

Component Losses

Component	Length	Width/Height	Area	Construction	Rv	Heat Loss	Unit Loss
Window	2'	5'	10	C3	3.3	258	0.6
Window	2'	5'	10	C3	3.3	258	0.6
Window	2'	5'	10	C3	3.3	258	0.6
Window	3'	5'	15	C3	3.3	386	0.9
Window	3'	5'	15	C3	3.3	386	0.9
Window	3'	5'	15	C3	3.3	386	0.9
Window	2'	5'	10	C3	3.3	258	0.6
Exposed Walls Above Grade	40'-11"	10'	324	C2	27.0	1,020	2.5
Floor	-	-	432	C5	19.0 (panel Insulation)	807	2.0
Exposed Ceiling	-	-	94	C4	49.0	163	0.4
Total	-	-	-	-	-	4,180	10.2

Second Floor

MEZZANIE

Total Area:	674 ft²	Infiltration/Ventilation Load:	9,006 Btu/hr
Ceiling Height:	10' ft	Component Losses:	5,748 Btu/hr
Volume:	6,739 ft³	Additional Losses:	0 Btu/hr
Exposed Perimeter:	117'-6" ft	Total Room Loss:	14,754 Btu/hr
Room Temperature:	70 °F	Recovered Floor Loss:	-1,150 Btu/hr
Space Above:	Third Floor	Net Room Load:	13,605 Btu/hr

Heating System

Heating Type:	Radiant	Surface Temp:	84 °F
Floor Area:	632 ft²	Net Room Load:	13,605 Btu/hr
Unheated Area:	126 ft²	Floor Back Loss:	1,150 Btu/hr
Net Heated Area:	507 ft²	Recovered Floor Loss:	-1,150 Btu/hr
Floor Cover Rv:	1.0 hr·ft²·°F/btu	Gross Upward Load:	13,605 Btu/hr
Panel Type:	Warmboard	Supplemental Heat Supply:	86 Btu/hr
Supplemental Heating Type:	Other	Net Upward Load:	13,519 Btu/hr
Required Supply Temp:	120 °F	Total Radiant Load:	14,668 Btu/hr

Component Losses

Component	Length	Width/Height	Area	Construction	Rv	Heat Loss	Unit Loss
Exposed Walls Above Grade	117'-6"	10'	1,175	C2	27.0	3,699	5.9
Floor	-	-	674	C5	19.0 (panel Insulation)	1,150	1.8
Exposed Ceiling	-	-	519	C4	49.0	900	1.4
Total	-	-	-	-	-	5,748	9.1

PARLOR

Total Area: 466 ft²
Ceiling Height: 10'-6" ft
Volume: 4,908 ft³
Exposed: 62'-4" ft
Perimeter:
Room: 70 °F
Temperature:
Space Above: Third Floor

Infiltration/Ventilation Load: 6,559 Btu/hr
Component Losses: 6,673 Btu/hr
Additional Losses: 0 Btu/hr
Total Room Loss: 13,232 Btu/hr
Recovered Floor Loss: -787 Btu/hr
Net Room Load: 12,444 Btu/hr

Heating System

Heating Type: Radiant
Floor Area: 440 ft²
Unheated Area: 86 ft²
Net Heated Area: 354 ft²
Floor Cover Rv: 1.0 hr·ft²·°F/btu
Panel Type: Warmboard

Surface Temp: 84 °F
Net Room Load: 12,444 Btu/hr
Floor Back Loss: 787 Btu/hr
Recovered Floor Loss: -787 Btu/hr
Gross Upward Load: 12,444 Btu/hr

Supplemental Heating Type: Other
Required Supply Temp: 120 °F

Supplemental Heat Supply: 3,181 Btu/hr
Net Upward Load: 9,264 Btu/hr
Total Radiant Load: 10,051 Btu/hr

Component Losses

Component	Length	Width/Height	Area	Construction	Rv	Heat Loss	Unit Loss
Window	3'	7'	21	C3	3.3	541	1.2
Window	3'	7'	21	C3	3.3	541	1.2
Window	3'	7'	21	C3	3.3	541	1.2
Window	5'-4"	2'-6"	13	C3	3.3	343	0.8
Window	3'	5'	15	C3	3.3	386	0.9
Window	3'	5'	15	C3	3.3	386	0.9
Window	2'-8"	2'-8"	7	C3	3.3	183	0.4
Window	2'-8"	2'-8"	7	C3	3.3	183	0.4
Window	2'-8"	2'-8"	7	C3	3.3	183	0.4
Window	2'-8"	2'-8"	7	C3	3.3	183	0.4
Exposed Walls Above Grade	62'-4"	10'-10"	541	C2	27.0	1,704	3.9
Floor	-	-	466	C5	19.0 (panel Insulation)	787	1.8
Exposed Ceiling	-	-	409	C4	49.0	710	1.6
Total	-	-	-	-	-	6,673	15.2

RANCH SUITE

Total Area: 254 ft²
Ceiling Height: 10' ft
Volume: 2,540 ft³
Exposed Perimeter: 34'-4" ft
Room Temperature: 70 °F
Space Above: Third Floor

Infiltration/Ventilation Load: 3,394 Btu/hr
Component Losses: 3,611 Btu/hr
Additional Losses: 0 Btu/hr
Total Room Loss: 7,006 Btu/hr
Recovered Floor Loss: -525 Btu/hr
Net Room Load: 6,481 Btu/hr

Heating System

Heating Type:	Radiant	Surface Temp:	83 °F
Floor Area:	237 ft²	Net Room Load:	6,481 Btu/hr
Unheated Area:	0 ft²	Floor Back Loss:	525 Btu/hr
Net Heated Area:	237 ft²	Recovered Floor Loss:	-525 Btu/hr
Floor Cover Rv:	1.0 hr-ft²·°F/btu	Gross Upward Load:	6,481 Btu/hr
Panel Type:	Warmboard		
		Supplemental Heat Supply:	306 Btu/hr
Supplemental Heating Type:	Other	Net Upward Load:	6,175 Btu/hr
Required Supply Temp:	121 °F	Total Radiant Load:	6,699 Btu/hr

Component Losses

Component	Length	Width/Height	Area	Construction	Rv	Heat Loss	Unit Loss
Window	2'-6"	2'-6"	6	C3	3.3	161	0.7
Window	3'	7'	21	C3	3.3	541	2.3
Window	3'	7'	21	C3	3.3	541	2.3
Window	3'	7'	21	C3	3.3	541	2.3
Exposed Walls Above Grade	34'-4"	10'	274	C2	27.0	862	3.6
Floor	-	-	254	C5	19.0 (panel Insulation)	525	2.2
Exposed Ceiling	-	-	254	C4	49.0	441	1.9
Total	-	-	-	-	-	3,611	15.2

SUITE BATHROOM

Total Area:	215 ft²	Infiltration/Ventilation Load:	2,880 Btu/hr
Ceiling Height:	10' ft	Component Losses:	2,434 Btu/hr
Volume:	2,155 ft³	Additional Losses:	0 Btu/hr
Exposed Perimeter:	47'-7" ft	Total Room Loss:	5,314 Btu/hr
Room Temperature:	70 °F	Recovered Floor Loss:	-294 Btu/hr
Space Above:	Third Floor	Net Room Load:	5,020 Btu/hr
Space Below:	Main Floor/Open or Vented Crawlspace		

Heating System

Heating Type:	Radiant	Surface Temp:	84 °F
Floor Area:	195 ft²	Net Room Load:	5,020 Btu/hr
Unheated Area:	2 ft²	Floor Back Loss:	308 Btu/hr
Net Heated Area:	193 ft²	Recovered Floor Loss:	-294 Btu/hr
Floor Cover Rv:	0.5 hr·ft²·°F/btu	Gross Upward Load:	5,006 Btu/hr
Panel Type:	Warmboard		
		Supplemental Heat Supply:	0 Btu/hr
Supplemental Heating Type:	Other	Net Upward Load:	5,006 Btu/hr
Required Supply Temp:	107 °F	Total Radiant Load:	5,314 Btu/hr

Component Losses

Component	Length	Width/Height	Area	Construction	Rv	Heat Loss	Unit Loss
Window	2'-6"	2'-6"	6	C3	3.3	161	0.8
Window	2'-6"	2'-6"	6	C3	3.3	161	0.8
Window	2'-6"	2'-6"	6	C3	3.3	161	0.8
Window	3'	3'	9	C3	3.3	232	1.2
Exposed Walls Above Grade	47'-7"	10'	449	C2	27.0	1,412	7.3
Floor	-	-	215	C5	19.0 (panel Insulation)	308	1.6
Exposed Ceiling	-	-	0	-	49.0	0	0.0
Total	-	-	-	-	-	2,434	12.5

UPPER OFFICE

Total Area:	292 ft²	Infiltration/Ventilation Load:	3,900 Btu/hr
Ceiling Height:	10' ft	Component Losses:	5,431 Btu/hr
Volume:	2,918 ft³	Additional Losses:	0 Btu/hr
Exposed Perimeter:	51'-1" ft	Total Room Loss:	9,331 Btu/hr
Room Temperature:	70 °F	Recovered Floor Loss:	-599 Btu/hr
Space Above:	Third Floor	Net Room Load:	8,732 Btu/hr
Space Below:	Main Floor/Open or Vented Crawlspace		

Heating System

Heating Type:	Radiant	Surface Temp:	83 °F
Floor Area:	272 ft²	Net Room Load:	8,732 Btu/hr
Unheated Area:	0 ft²	Floor Back Loss:	603 Btu/hr
Net Heated Area:	272 ft²	Recovered Floor Loss:	-599 Btu/hr
Floor Cover Rv:	1.0 hr-ft²·°F/btu	Gross Upward Load:	8,727 Btu/hr
Panel Type:	Warmboard		
Supplemental Heating Type:	Other	Supplemental Heat Supply:	1,665 Btu/hr
Required Supply Temp:	120 °F	Net Upward Load:	7,062 Btu/hr
		Total Radiant Load:	7,666 Btu/hr

Component Losses

Component	Length	Width/Height	Area	Construction	Rv	Heat Loss	Unit Loss
Window	4'	5'	20	C3	3.3	515	1.9
Window	4'	5'	20	C3	3.3	515	1.9
Window	4'	5'	20	C3	3.3	515	1.9
Window	4'	5'	20	C3	3.3	515	1.9
Window	4'	5'	20	C3	3.3	515	1.9
Window	4'	5'	20	C3	3.3	515	1.9
Exposed Walls Above Grade	51'-1"	10'	391	C2	27.0	1,230	4.5
Floor	-	-	292	C5	19.0 (panel Insulation)	603	2.2
Exposed Ceiling	-	-	292	C4	49.0	506	1.9
Total	-	-	-	-	-	5,431	19.9

Third Floor

upper stairs

Total Area: 155 ft²
Ceiling Height: 8' ft
Volume: 1,242 ft³
Exposed Perimeter: 52'-6" ft
Room Temperature: 70 °F
Space Above: Not Heated
Space Below: Second Floor/Open or Vented Crawlspace

Infiltration/Ventilation Load: 1,660 Btu/hr
Component Losses: 5,147 Btu/hr
Additional Losses: 0 Btu/hr
Total Room Loss: 6,807 Btu/hr
Recovered Floor Loss: -162 Btu/hr
Net Room Load: 6,645 Btu/hr

Heating System

Heating Type: Radiant
Floor Area: 138 ft²
Unheated Area: 58 ft²
Net Heated Area: 81 ft²
Floor Cover Rv: 0.5 hr-ft²-°F/btu
Panel Type: Warmboard

Supplemental Heating Type: Other
Required Supply Temp: 120 °F

Surface Temp: 89 °F
Net Room Load: 6,645 Btu/hr
Floor Back Loss: 187 Btu/hr
Recovered Floor Loss: -162 Btu/hr
Gross Upward Load: 6,625 Btu/hr

Supplemental Heat Supply: 3,656 Btu/hr
Net Upward Load: 2,969 Btu/hr
Total Radiant Load: 3,151 Btu/hr

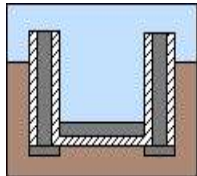
Component Losses

Component	Length	Width/Height	Area	Construction	Rv	Heat Loss	Unit Loss
Window	5'	3'-6"	18	C3	3.3	451	3.3
Window	4'	3'-6"	14	C3	3.3	361	2.6
Door	3'	6'-8"	20	C6	2.6	662	4.8
Window	3'	3'-6"	11	C3	3.3	270	2.0
Window	3'	3'-6"	11	C3	3.3	270	2.0
Window	3'	3'-6"	11	C3	3.3	270	2.0
Window	3'	3'-6"	11	C3	3.3	270	2.0
Window	5'	3'-6"	18	C3	3.3	451	3.3
Window	5'	3'-6"	18	C3	3.3	451	3.3
Window	4'	3'-6"	14	C3	3.3	361	2.6
Exposed Walls Above Grade	52'-6"	8'	278	C2	27.0	874	6.3
Floor	-	-	155	C5	19.0 (panel Insulation)	187	1.4
Exposed Ceiling	-	-	155	C4	49.0	269	1.9
Total	-	-	-	-	-	5,147	37.2

Construction Legend

Construction Code	Component	R-Value	Source	Description
C1	Basement with Walls	Exterior Wall Insulation: 10.0 hr-ft ² ·°F/btu Interior Wall Insulation: 19.0 hr-ft ² ·°F/btu Slab Insulation: 10.0 hr-ft ² ·°F/btu	CSA 2012	BCCB_4 - concrete walls and floor - interior surface of wall insulated over full-height - exterior surface of wall insulated over full-height - sub-surface of floor slab fully insulated but no insulation under footings - thermal-break between walls and floor slab - any first storey construction type
C2	Wall	27.0	User Specified	CUSTOM
C3	Window	3.3	User Specified	Operable windows - Double Glazing (e = 0.05 on surface 2 or 3), 6 mm air space, Aluminum With Thermal Break
C4	Ceiling	49.0	User Specified	CUSTOM
C5	Heated Floor	19.0 (panel Insulation)	User Specified	Warmboard
C6	Door	2.6	ASHRAE	Swinging Door (Rough Opening = 970 x 2080 mm), Wood slab in wood frame, 45% glazing (560 x 1620 lite), Double Glazing with e = 0.10, 12.7 mm argon space, Thermally broken sill
C7	Door	2.2	ASHRAE	Swinging Door (Rough Opening = 970 x 2080 mm), Wood slab in wood frame, Thermally broken sill
C8	Wall	34.0	User Specified	CUSTOM
C9	Floor	20.6	CSA	Headers, 140 mm Glass fibre batts, 19 mm Fibreboard sheathing

CSA Construction Legend



C1

Description

BCCB_4

- concrete walls and floor
- interior surface of wall insulated over full-height
- exterior surface of wall insulated over full-height
- sub-surface of floor slab fully insulated but no insulation under footings
- thermal-break between walls and floor slab

Options

Exterior Wall Insulation: 10.0 hr-ft²·°F/btu
Interior Wall Insulation: 19.0 hr-ft²·°F/btu
Slab Insulation: 10.0 hr-ft²·°F/btu

Design Locaton

Location:	steamboat springs	Altitude:	7000' ft
Province/State:	Colorado	Standard Pressure:	11.7 Psi
Country:	United States		
Outdoor Heating Design Temp:	-15.0 °F	Humidity Ratio:	0.0004
Heating Degree Days:	4731	Mean Soil Temp:	47.2 °F
Average Air Temperatures:			
January:	0.0 °F	July:	67.1 °F
February:	10.0 °F	August:	65.1 °F
March:	33.3 °F	September:	56.1 °F
April:	42.1 °F	October:	43.9 °F
May:	51.3 °F	November:	30.2 °F
June:	59.7 °F	December:	18.0 °F
ASHRAECustom			

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Heating System Summary

Project #:ACTION/HOMERANCH

March 09, 2023

Project Information

Project #: ACTION/HOMERANCH
Name: HOMERANCH/ACTION
Location: 27315 HOME RANCH ROAD

Notes:

Project Summary

Load Calculation Method:	ASHRAE	Total Circuit Lengths:		Component Losses:	156,263 Btu/hr
Design Location:	(User Specified) steamboat springs , Colorado	1/2" BPEX	1,830 ft	Infiltration/Ventilation:	184,121 Btu/hr
Outdoor Temperature:	-15.0 °F	3/4" BPEX	160 ft	Radiant Back Losses:	48,251 Btu/hr
Floorplans / Levels:		1/2" InfloorPERT	10,062 ft	Total Heating Load:	388,635 Btu/hr
Basement	1,989 ft²	1" BPEX	1,850 ft		
Main Floor	9,163 ft²	Total RH Circuits:	55	Radiant Heating:	292,975 Btu/hr
Second Floor	1,902 ft²	Total Manifolds:	16	Radiant Back Losses:	48,251 Btu/hr
Third Floor	155 ft²	Total Zones:	13	Other:	47,410 Btu/hr
Total Area:	13,209 ft²			Total Heating Load:	388,635 Btu/hr
		Fluid Type:	100% Water		
		Total Tubing Volume:	169.84 USG		
		Surface Temperature:	83 - 90 °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	1,989	Embedded Slab	RH	7	1,830	1	3.32	2.7	33,063	0	33,063
Zone 201	545	Warmboard	RH,OTH	3	496	1	1.34	1.7	13,797	6,499	20,296
Zone 202	1,269	Warmboard	RH,OTH	5	1,112	1	3.50	5.3	35,916	6,355	42,271
Zone 203	4,638	Warmboard	RH,OTH	17	4,159	3	13.30	9.6	134,832	24,565	159,397
Zone 204	290	Warmboard	RH,OTH	1	269	1	0.87	8.4	8,962	1,096	10,059
Zone 205	1,256	Warmboard	RH	6	1,247	1	4.77	5.9	47,549	0	47,549
Zone 206	432	Warmboard	RH	2	391	1	0.77	1.8	7,718	0	7,718
Zone 207	432	Warmboard	RH	2	390	1	1.00	2.3	9,951	0	9,951

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

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Zone 208	300	Warmboard	RH	2	280	1	0.86	1.4	8,609	0	8,609
Zone 301	720	Warmboard	RH,OTH	4	603	2	1.63	2.2	16,751	3,487	20,237
Zone 302	215	Warmboard	RH	1	219	1	0.53	2.9	5,314	0	5,314
Zone 303	829	Warmboard	RH,OTH	4	625	2	1.73	2.1	17,819	3,743	21,561
Zone 304	292	Warmboard	RH,OTH	1	270	1	0.74	6.4	7,666	1,665	9,331

(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	BASMENT	RH	1,873	1,833	BASMENT	1/2"	7	12	1,772	0.0	102	18.0	33,063	0	33,063

(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.

Warmboard

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	PRIMARY BED/HEARTH ROOM	RH, OTH	515	508	PRIMARY BED/HEARTH ROOM	1/2"	3	12	474	1.0	121	27.1	13,797	6,499	20,296
Zone 202	GREAT ROOM/BILLARD	RH, OTH	1,225	1,101	N. CLOSET MAN	1/2"	5	12	1,064	1.0	120	32.6	35,916	6,355	42,271
Zone 203	FORMAL ENTRY/PWDR	RH, OTH	998	911	FORMAL ENTRY/BAR	1/2"	4	12	929	1.0	122	33.8	30,766	5,487	36,253
Zone 203	GREAT HALL	RH, OTH	1,367	1,367	GREAT HALL	1/2"	6	12	1,295	1.0	120	32.5	44,407	19,078	63,485
Zone 203	KITCHEN	RH	2,132	1,793	kitchen/locker rooms	1/2"	7	12	1,815	1.0	120	33.3	59,660	0	59,660
Zone 204	MAIN FL OFFICE	RH, OTH	271	271	MAIN FL OFFICE	1/2"	1	12	262	1.0	120	33.1	8,962	1,096	10,059
Zone 205	GARAGE	RH	1,212	1,212	GARAGE	1/2"	6	12	1,201	0.0	115	39.2	47,549	0	47,549
Zone 206	NORHT CLOSET	RH	411	387	N. CLOSET MAN	1/2"	2	12	377	1.0	109	20.0	7,718	0	7,718
Zone 207	SOUTH CLOSETR	RH	410	396	S CLOSET MAN	1/2"	2	12	376	1.0	119	25.1	9,951	0	9,951
Zone 208	PRIMARY BATH	RH	278	274	MAIN BATH	1/2"	2	12	265	0.5	113	31.4	8,609	0	8,609
Zone 301	PARLOR	RH, OTH	440	354	PARLOR	1/2"	2	12	345	1.0	120	28.4	10,051	3,181	13,232
Zone 301	RANCH SUITE	RH, OTH	237	237	RANCH SUITE	1/2"	2	12	230	1.0	121	28.2	6,699	306	7,006
Zone 302	SUITE BATHROOM	RH	195	193	SUITE BATH ROOM	1/2"	1	12	206	0.5	107	27.6	5,314	0	5,314
Zone 303	MEZZANIE	RH, OTH	632	507	MEZZANINE MAN	1/2"	3	12	504	1.0	120	29.0	14,668	86	14,754
Zone 303	upper stairs	RH, OTH	138	81	hawks nest stairs	1/2"	1	13	73	0.5	120	39.1	3,151	3,656	6,807
Zone 304	UPPER OFFICE	RH, OTH	272	272	UPPER OFFICE	1/2"	1	12	263	1.0	120	28.2	7,666	1,665	9,331

(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
BASMENT	1	7	3.32	6.2	102	122	20	1" Stainless Steel manifold with Flow Meters	Manifold	0	25	3/4" BPEX
FORMAL ENTRY/BAR	1	4	3.02	12.0	122	122	20	1" Stainless Steel manifold with Flow Meters	Manifold	0	50	1" BPEX
GARAGE	1	6	4.77	20.6	115	122	20	1" Stainless Steel manifold with Flow Meters	Manifold	0	200	1" BPEX
GREAT HALL	1	6	4.33	6.4	120	122	20	1" Stainless Steel manifold with Flow Meters	Manifold	0	-	-
hawks nest stairs	1	1	0.31	0.7	120	122	20	1" Stainless Steel manifold with Flow Meters	Manifold	0	-	-
kitchen/locker rooms	1	7	5.95	16.2	120	122	20	1" Stainless Steel manifold with Flow Meters	Manifold	0	50	1" BPEX
MAIN BATH	1	2	0.86	1.8	113	122	20	1" Stainless Steel manifold with Flow Meters	Manifold	0	-	-
MAIN FL OFFICE	1	1	0.87	10.5	120	122	20	1" Stainless Steel manifold with Flow Meters	Manifold	0	150	1" BPEX
MEZZANINE MAN	1	3	1.43	3.6	120	122	20	1" Stainless Steel manifold with Flow Meters	Manifold	0	125	1" BPEX
N. CLOSET MAN	2	7	4.28	10.9	120	122	20	1" Stainless Steel manifold with Flow Meters	Circuit	7	25	3/4" BPEX
PARLOR	1	2	0.98	3.2	120	122	20	1" Stainless Steel manifold with Flow Meters	Manifold	0	100	1" BPEX
PRIMARY BED/HEARTH ROOM	1	3	1.34	2.2	121	122	20	1" Stainless Steel manifold with Flow Meters	Manifold	0	-	-
RANCH SUITE	1	2	0.65	1.1	121	122	20	1" Stainless Steel manifold with Flow Meters	Manifold	0	100	1" BPEX
S CLOSET MAN	1	2	1.00	3.3	119	122	20	1" Stainless Steel manifold with Flow Meters	Manifold	0	30	3/4" BPEX
SUITE BATH ROOM	1	1	0.53	3.5	107	122	20	1" Stainless Steel manifold with Flow Meters	Manifold	0	-	-
UPPER OFFICE	1	1	0.74	7.9	120	122	20	1" Stainless Steel manifold with Flow Meters	Manifold	0	150	1" BPEX
Total	13	55	34.37	20.6	-	-	-	-	-	7	-	-

(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 Detail

Project #:ACTION/HOMERANCH

March 09, 2023

Project Information

Project #: ACTION/HOMERANCH
Name: HOMERANCH/ACTION
Location: 27315 HOME RANCH ROAD

Notes:

Design Conditions and Summary

Load Calculation Method:	ASHRAE	Total Tubing Lengths:		Component Losses:	156,263 Btu/hr
Design Location:	(User Specified) steamboat springs , Colorado	1/2" BPEX	1,830 ft	Infiltration/Ventilation:	184,121 Btu/hr
Outdoor Temperature:	-15.0 °F	3/4" BPEX	160 ft	Radiant Back Losses:	48,251 Btu/hr
Floorplans / Levels:		1/2" InfloorPERT	10,062 ft	Total Heating Load:	388,635 Btu/hr
Basement	1,989 ft²	1" BPEX	1,850 ft		
Main Floor	9,163 ft²	Total RH Circuits:	55	Radiant Heating:	292,975 Btu/hr
Second Floor	1,902 ft²	Total Manifolds:	16	Radiant Back Losses:	48,251 Btu/hr
Third Floor	155 ft²	Total Zones:	13	Other:	47,410 Btu/hr
Total Area:	13,209 ft²			Total Heating Load:	388,635 Btu/hr
		Fluid Type:	100% Water		
		Total Tubing Volume:	169.84 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	1,989	RH	7	3.32	6.2	0	BASMENT
201	545	RH,OTH	3	1.34	2.2	6,499	PRIMARY BED/HEARTH ROOM
202	1,269	RH,OTH	5	3.50	10.9	6,355	GREAT ROOM/BILLARD
203	4,638	RH,OTH	17	13.30	16.2	24,565	KITCHEN , GREAT HALL, FORMAL ENTRY/PWDR
204	290	RH,OTH	1	0.87	10.5	1,096	MAIN FL OFFICE
205	1,256	RH	6	4.77	20.6	0	GARAGE
206	432	RH	2	0.77	7.4	0	NORHT CLOSET
207	432	RH	2	1.00	3.3	0	SOUTH CLOSETR
208	300	RH	2	0.86	1.8	0	PRIMARY BATH

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

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301	720	RH,OTH	4	1.63	3.2	3,487	PARLOR , RANCH SUITE
302	215	RH	1	0.53	3.5	0	SUITE BATHROOM
303	829	RH,OTH	4	1.73	3.6	3,743	MEZZANIE, upper stairs
304	292	RH,OTH	1	0.74	7.9	1,665	UPPER OFFICE
Total	13,209	RH,OTH	55	34.37	20.6	47,410	

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

Room Heating Summary

Basement

BASMENT

Total Area: 1,989 ft²
Heated by: RH
Room Temperature: 70 °F
Floor Covering (Rv): 0.0 - CUSTOM

Radiant Heating:
Heated Area: 1,833 ft²
Tubing in Floor: 1,817 ft
Circuits in Room: 7
Tube Spacing: 12
Required Surface Temp: 79 °F
Required Water Temp: 102 °F
Est. Peak Output: 49,127 Btu/hr

Load/Loss Summary:
Room Design Load: 29,961 Btu/hr

Radiant Load: 33,063 Btu/hr
Baseboard Load: 0 Btu/hr
Forced Air Load: 0 Btu/hr
Other Load: 0 Btu/hr

Radiant Back Loss: 3,102 Btu/hr
Recovered Back Loss: 0 Btu/hr
Total Heat Loss: 33,063 Btu/hr

Main Floor

FORMAL ENTRY/PWDR

Total Area: 1,034 ft²
Heated by: RH,OTH
Room Temperature: 70 °F
Floor Covering (Rv): 1.0 - WOOD

Radiant Heating:
Heated Area: 911 ft²
Tubing in Floor: 945 ft
Circuits in Room: 4
Tube Spacing: 12
Required Surface Temp: 84 °F
Required Water Temp: 122 °F
Est. Peak Output: 24,254 Btu/hr

Supplemental Req'd: 5,487 Btu/hr

Load/Loss Summary:
Room Design Load: 24,254 Btu/hr

Radiant Load: 30,766 Btu/hr
Baseboard Load: 0 Btu/hr
Forced Air Load: 0 Btu/hr
Other Load: 5,487 Btu/hr

Radiant Back Loss: 6,512 Btu/hr
Recovered Back Loss: 0 Btu/hr
Total Heat Loss: 36,253 Btu/hr

GARAGE

Total Area: 1,256 ft²
Heated by: RH
Room Temperature: 70 °F
Floor Covering (Rv): 0.0 - CUSTOM

Radiant Heating:
Heated Area: 1,212 ft²
Tubing in Floor: 1,226 ft
Circuits in Room: 6
Tube Spacing: 12
Required Surface Temp: 88 °F
Required Water Temp: 115 °F
Est. Peak Output: 47,276 Btu/hr

Load/Loss Summary:
Room Design Load: 40,427 Btu/hr

Radiant Load: 47,549 Btu/hr
Baseboard Load: 0 Btu/hr
Forced Air Load: 0 Btu/hr
Other Load: 0 Btu/hr

Radiant Back Loss: 7,122 Btu/hr
Recovered Back Loss: 0 Btu/hr
Total Heat Loss: 47,549 Btu/hr

GREAT HALL

Total Area: 1,416 ft²
Heated by: RH,OTH
Room Temperature: 70 °F
Floor Covering (Rv): 1.0 - WOOD

Radiant Heating:
Heated Area: 1,367 ft²
Tubing in Floor: 1,314 ft
Circuits in Room: 6
Tube Spacing: 12
Required Surface Temp: 83 °F
Required Water Temp: 120 °F
Est. Peak Output: 34,792 Btu/hr

Supplemental Req'd: 19,078 Btu/hr

Load/Loss Summary:
Room Design Load: 34,792 Btu/hr

Radiant Load: 44,407 Btu/hr
Baseboard Load: 0 Btu/hr
Forced Air Load: 0 Btu/hr
Other Load: 19,078 Btu/hr

Radiant Back Loss: 9,615 Btu/hr
Recovered Back Loss: 0 Btu/hr
Total Heat Loss: 63,485 Btu/hr

GREAT ROOM/BILLARD

Total Area: 1,269 ft²
Heated by: RH,OTH
Room Temperature: 70 °F
Floor Covering (Rv): 1.0 - WOOD

Radiant Heating:
Heated Area: 1,101 ft²
Tubing in Floor: 1,086 ft
Circuits in Room: 5
Tube Spacing: 12
Required Surface Temp: 83 °F
Required Water Temp: 120 °F
Est. Peak Output: 28,587 Btu/hr

Supplemental Req'd: 6,355 Btu/hr

Load/Loss Summary:
Room Design Load: 28,587 Btu/hr

Radiant Load: 35,916 Btu/hr
Baseboard Load: 0 Btu/hr
Forced Air Load: 0 Btu/hr
Other Load: 6,355 Btu/hr

Radiant Back Loss: 7,329 Btu/hr
Recovered Back Loss: -209 Btu/hr
Total Heat Loss: 42,062 Btu/hr

KITCHEN

Total Area: 2,188 ft²
Heated by: RH
Room Temperature: 70 °F
Floor Covering (Rv): 1.0 - WOOD

Radiant Heating:
Heated Area: 1,793 ft²
Tubing in Floor: 1,856 ft
Circuits in Room: 7
Tube Spacing: 12
Required Surface Temp: 84 °F
Required Water Temp: 120 °F
Est. Peak Output: 48,165 Btu/hr

Load/Loss Summary:
Room Design Load: 46,837 Btu/hr

Radiant Load: 59,660 Btu/hr
Baseboard Load: 0 Btu/hr
Forced Air Load: 0 Btu/hr
Other Load: 0 Btu/hr

Radiant Back Loss: 12,823 Btu/hr
Recovered Back Loss: 0 Btu/hr
Total Heat Loss: 59,660 Btu/hr

MAIN FL OFFICE

Total Area: 290 ft²
Heated by: RH,OTH
Room Temperature: 70 °F
Floor Covering (Rv): 1.0 - WOOD

Radiant Heating:
Heated Area: 271 ft²
Tubing in Floor: 269 ft
Circuits in Room: 1
Tube Spacing: 12
Required Surface Temp: 83 °F
Required Water Temp: 120 °F
Est. Peak Output: 7,045 Btu/hr

Supplemental Req'd: 1,096 Btu/hr

Load/Loss Summary:
Room Design Load: 7,045 Btu/hr

Radiant Load: 8,962 Btu/hr
Baseboard Load: 0 Btu/hr
Forced Air Load: 0 Btu/hr
Other Load: 1,096 Btu/hr

Radiant Back Loss: 1,918 Btu/hr
Recovered Back Loss: 0 Btu/hr
Total Heat Loss: 10,059 Btu/hr

NORHT CLOSET

Total Area: 432 ft²
Heated by: RH
Room Temperature: 70 °F
Floor Covering (Rv): 1.0 - Light carpet with rubber pad

Radiant Heating:
Heated Area: 387 ft²
Tubing in Floor: 392 ft
Circuits in Room: 2
Tube Spacing: 12
Required Surface Temp: 80 °F
Required Water Temp: 109 °F
Est. Peak Output: 9,458 Btu/hr

Load/Loss Summary:
Room Design Load: 7,090 Btu/hr
Radiant Load: 7,718 Btu/hr
Baseboard Load: 0 Btu/hr
Forced Air Load: 0 Btu/hr
Other Load: 0 Btu/hr
Radiant Back Loss: 628 Btu/hr
Recovered Back Loss: -628 Btu/hr
Total Heat Loss: 7,090 Btu/hr

PRIMARY BATH

Total Area: 300 ft²
Heated by: RH
Room Temperature: 70 °F
Floor Covering (Rv): 0.5

Radiant Heating:
Heated Area: 274 ft²
Tubing in Floor: 278 ft
Circuits in Room: 2
Tube Spacing: 12
Required Surface Temp: 86 °F
Required Water Temp: 113 °F
Est. Peak Output: 10,105 Btu/hr

Load/Loss Summary:
Room Design Load: 8,129 Btu/hr
Radiant Load: 8,609 Btu/hr
Baseboard Load: 0 Btu/hr
Forced Air Load: 0 Btu/hr
Other Load: 0 Btu/hr
Radiant Back Loss: 480 Btu/hr
Recovered Back Loss: -480 Btu/hr
Total Heat Loss: 8,129 Btu/hr

PRIMARY BED/HEARTH ROOM

Total Area: 545 ft²
Heated by: RH,OTH
Room Temperature: 70 °F
Floor Covering (Rv): 1.0 - Light carpet with rubber pad

Radiant Heating:
Heated Area: 508 ft²
Tubing in Floor: 489 ft
Circuits in Room: 3
Tube Spacing: 12
Required Surface Temp: 83 °F
Required Water Temp: 121 °F
Est. Peak Output: 12,715 Btu/hr

Supplemental Req'd: 6,499 Btu/hr

Load/Loss Summary:
Room Design Load: 12,715 Btu/hr
Radiant Load: 13,797 Btu/hr
Baseboard Load: 0 Btu/hr
Forced Air Load: 0 Btu/hr
Other Load: 6,499 Btu/hr
Radiant Back Loss: 1,082 Btu/hr
Recovered Back Loss: -1,082 Btu/hr
Total Heat Loss: 19,214 Btu/hr

SOUTH CLOSETR

Total Area: 432 ft²
Heated by: RH
Room Temperature: 70 °F
Floor Covering (Rv): 1.0 - Light carpet with rubber pad

Radiant Heating:
Heated Area: 396 ft²
Tubing in Floor: 387 ft
Circuits in Room: 2
Tube Spacing: 12
Required Surface Temp: 82 °F
Required Water Temp: 119 °F
Est. Peak Output: 9,959 Btu/hr

Load/Loss Summary:
Room Design Load: 9,144 Btu/hr

Radiant Load: 9,951 Btu/hr
Baseboard Load: 0 Btu/hr
Forced Air Load: 0 Btu/hr
Other Load: 0 Btu/hr

Radiant Back Loss: 807 Btu/hr
Recovered Back Loss: -807 Btu/hr
Total Heat Loss: 9,144 Btu/hr

Second Floor

MEZZANIE

Total Area: 674 ft²
Heated by: RH,OTH
Room Temperature: 70 °F
Floor Covering (Rv): 1.0 - WOOD

Radiant Heating:
Heated Area: 507 ft²
Tubing in Floor: 525 ft
Circuits in Room: 3
Tube Spacing: 12
Required Surface Temp: 84 °F
Required Water Temp: 120 °F
Est. Peak Output: 13,519 Btu/hr

Supplemental Req'd: 86 Btu/hr

Load/Loss Summary:
Room Design Load: 13,519 Btu/hr

Radiant Load: 14,668 Btu/hr
Baseboard Load: 0 Btu/hr
Forced Air Load: 0 Btu/hr
Other Load: 86 Btu/hr

Radiant Back Loss: 1,150 Btu/hr
Recovered Back Loss: -1,150 Btu/hr
Total Heat Loss: 13,605 Btu/hr

PARLOR

Total Area: 466 ft²
Heated by: RH,OTH
Room Temperature: 70 °F
Floor Covering (Rv): 1.0 - CUSTOM

Radiant Heating:
Heated Area: 354 ft²
Tubing in Floor: 359 ft
Circuits in Room: 2
Tube Spacing: 12
Required Surface Temp: 84 °F
Required Water Temp: 120 °F
Est. Peak Output: 9,264 Btu/hr

Supplemental Req'd: 3,181 Btu/hr

Load/Loss Summary:
Room Design Load: 9,264 Btu/hr

Radiant Load: 10,051 Btu/hr
Baseboard Load: 0 Btu/hr
Forced Air Load: 0 Btu/hr
Other Load: 3,181 Btu/hr

Radiant Back Loss: 787 Btu/hr
Recovered Back Loss: -787 Btu/hr
Total Heat Loss: 12,444 Btu/hr

RANCH SUITE

Total Area: 254 ft²
Heated by: RH,OTH
Room Temperature: 70 °F
Floor Covering (Rv): 1.0 - Light carpet with rubber pad

Radiant Heating:
Heated Area: 237 ft²
Tubing in Floor: 242 ft
Circuits in Room: 2
Tube Spacing: 12
Required Surface Temp: 83 °F
Required Water Temp: 121 °F
Est. Peak Output: 6,175 Btu/hr

Supplemental Req'd: 306 Btu/hr

Load/Loss Summary:
Room Design Load: 6,175 Btu/hr

Radiant Load: 6,699 Btu/hr
Baseboard Load: 0 Btu/hr
Forced Air Load: 0 Btu/hr
Other Load: 306 Btu/hr

Radiant Back Loss: 525 Btu/hr
Recovered Back Loss: -525 Btu/hr
Total Heat Loss: 6,481 Btu/hr

SUITE BATHROOM

Total Area: 215 ft²
Heated by: RH
Room Temperature: 70 °F
Floor Covering (Rv): 0.5

Radiant Heating:
Heated Area: 193 ft²
Tubing in Floor: 212 ft
Circuits in Room: 1
Tube Spacing: 12
Required Surface Temp: 84 °F
Required Water Temp: 107 °F
Est. Peak Output: 7,110 Btu/hr

Load/Loss Summary:
Room Design Load: 5,006 Btu/hr
Radiant Load: 5,314 Btu/hr
Baseboard Load: 0 Btu/hr
Forced Air Load: 0 Btu/hr
Other Load: 0 Btu/hr
Radiant Back Loss: 308 Btu/hr
Recovered Back Loss: -294 Btu/hr
Total Heat Loss: 5,020 Btu/hr

UPPER OFFICE

Total Area: 292 ft²
Heated by: RH,OTH
Room Temperature: 70 °F
Floor Covering (Rv): 1.0 - WOOD

Radiant Heating:
Heated Area: 272 ft²
Tubing in Floor: 270 ft
Circuits in Room: 1
Tube Spacing: 12
Required Surface Temp: 83 °F
Required Water Temp: 120 °F
Est. Peak Output: 7,062 Btu/hr

Supplemental Req'd: 1,665 Btu/hr

Load/Loss Summary:
Room Design Load: 7,062 Btu/hr
Radiant Load: 7,666 Btu/hr
Baseboard Load: 0 Btu/hr
Forced Air Load: 0 Btu/hr
Other Load: 1,665 Btu/hr
Radiant Back Loss: 603 Btu/hr
Recovered Back Loss: -599 Btu/hr
Total Heat Loss: 8,732 Btu/hr

Third Floor

upper stairs

Total Area: 155 ft²
Heated by: RH,OTH
Room Temperature: 70 °F
Floor Covering (Rv): 0.5

Radiant Heating:
Heated Area: 81 ft²
Tubing in Floor: 82 ft
Circuits in Room: 1
Tube Spacing: 13
Required Surface Temp: 89 °F
Required Water Temp: 120 °F
Est. Peak Output: 2,969 Btu/hr

Supplemental Req'd: 3,656 Btu/hr

Load/Loss Summary:
Room Design Load: 2,969 Btu/hr
Radiant Load: 3,151 Btu/hr
Baseboard Load: 0 Btu/hr
Forced Air Load: 0 Btu/hr
Other Load: 3,656 Btu/hr
Radiant Back Loss: 182 Btu/hr
Recovered Back Loss: -162 Btu/hr
Total Heat Loss: 6,645 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
BASMENT	1	7	3.32	6.2	102	122	20	1" Stainless Steel manifold with Flow Meters	Manifold	0	25	3/4" BPEX
FORMAL ENTRY/BAR	1	4	3.02	12.0	122	122	20	1" Stainless Steel manifold with Flow Meters	Manifold	0	50	1" BPEX
GARAGE	1	6	4.77	20.6	115	122	20	1" Stainless Steel manifold with Flow Meters	Manifold	0	200	1" BPEX
GREAT HALL	1	6	4.33	6.4	120	122	20	1" Stainless Steel manifold with Flow Meters	Manifold	0	-	-
hawks nest stairs	1	1	0.31	0.7	120	122	20	1" Stainless Steel manifold with Flow Meters	Manifold	0	-	-
kitchen/locker rooms	1	7	5.95	16.2	120	122	20	1" Stainless Steel manifold with Flow Meters	Manifold	0	50	1" BPEX
MAIN BATH	1	2	0.86	1.8	113	122	20	1" Stainless Steel manifold with Flow Meters	Manifold	0	-	-
MAIN FL OFFICE	1	1	0.87	10.5	120	122	20	1" Stainless Steel manifold with Flow Meters	Manifold	0	150	1" BPEX
MEZZANINE MAN	1	3	1.43	3.6	120	122	20	1" Stainless Steel manifold with Flow Meters	Manifold	0	125	1" BPEX
N. CLOSET MAN	2	7	4.28	10.9	120	122	20	1" Stainless Steel manifold with Flow Meters	Circuit	7	25	3/4" BPEX
PARLOR	1	2	0.98	3.2	120	122	20	1" Stainless Steel manifold with Flow Meters	Manifold	0	100	1" BPEX
PRIMARY BED/HEARTH ROOM	1	3	1.34	2.2	121	122	20	1" Stainless Steel manifold with Flow Meters	Manifold	0	-	-
RANCH SUITE	1	2	0.65	1.1	121	122	20	1" Stainless Steel manifold with Flow Meters	Manifold	0	100	1" BPEX
S CLOSET MAN	1	2	1.00	3.3	119	122	20	1" Stainless Steel manifold with Flow Meters	Manifold	0	30	3/4" BPEX
SUITE BATH ROOM	1	1	0.53	3.5	107	122	20	1" Stainless Steel manifold with Flow Meters	Manifold	0	-	-
UPPER OFFICE	1	1	0.74	7.9	120	122	20	1" Stainless Steel manifold with Flow Meters	Manifold	0	150	1" BPEX
Total	13	55	34.37	20.6	122	-	-	-	-	7	-	-

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

Tubing Circuit Details

BASMENT

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss¹	Temp Drop	Load	Actuator
A-1	BASMENT	265	12	265	1/2" BPEX	0.48	2.5	20	4,778	No
A-2	BASMENT	255	12	257	1/2" BPEX	0.46	2.3	20	4,626	No
A-3	BASMENT	264	12	266	1/2" BPEX	0.48	2.5	20	4,790	No
A-4	BASMENT	257	12	258	1/2" BPEX	0.47	2.4	20	4,646	No
A-5	BASMENT	256	12	257	1/2" BPEX	0.46	2.3	20	4,628	No
A-6	BASMENT	260	12	260	1/2" BPEX	0.47	2.4	20	4,683	No
A-7	BASMENT	273	12	272	1/2" BPEX	0.49	2.7	20	4,912	No
Total	-	1,830		1,833	-	3.32	2.7		33,063	0

(1) Head loss for circuit tubing only

FORMAL ENTRY/BAR

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss¹	Temp Drop	Load	Actuator
B-10	FORMAL ENTRY/PWDR	278	12	266	1/2" InfloorPERT	0.88	8.8	20	8,800	No
B-11	FORMAL ENTRY/PWDR	263	12	252	1/2" InfloorPERT	0.84	7.6	20	8,344	No
B-12	FORMAL ENTRY/PWDR	209	12	212	1/2" InfloorPERT	0.70	4.5	20	7,020	No
B-13	FORMAL ENTRY/PWDR	202	12	179	1/2" InfloorPERT	0.60	3.2	20	5,930	No
Total	-	953		911	-	3.02	8.8		30,093	0

(1) Head loss for circuit tubing only

GARAGE

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss¹	Temp Drop	Load	Actuator
B-1	GARAGE	203	12	196	1/2" InfloorPERT	0.77	5.1	20	7,692	No
B-2	GARAGE	212	12	207	1/2" InfloorPERT	0.82	5.9	20	8,136	No
B-3	GARAGE	208	12	203	1/2" InfloorPERT	0.80	5.5	20	7,945	No
B-4	GARAGE	213	12	208	1/2" InfloorPERT	0.82	5.9	20	8,145	No
B-5	GARAGE	202	12	197	1/2" InfloorPERT	0.78	5.1	20	7,737	No
B-6	GARAGE	208	12	201	1/2" InfloorPERT	0.79	5.5	20	7,895	No
Total	-	1,247		1,212	-	4.77	5.9		47,549	0

(1) Head loss for circuit tubing only

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

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GREAT HALL

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss ¹	Temp Drop	Load	Actuator
B-21	GREAT HALL	225	12	225	1/2" InfloorPERT	0.71	4.9	20	7,119	No
B-22	GREAT HALL	226	12	230	1/2" InfloorPERT	0.73	5.2	20	7,276	No
B-23	GREAT HALL	222	12	228	1/2" InfloorPERT	0.72	5.0	20	7,195	No
B-24	GREAT HALL	221	12	226	1/2" InfloorPERT	0.72	4.9	20	7,134	No
B-25	GREAT HALL	228	12	231	1/2" InfloorPERT	0.73	5.2	20	7,308	No
B-26	GREAT HALL	226	12	226	1/2" InfloorPERT	0.72	5.0	20	7,125	No
Total	-	1,349		1,367	-	4.33	5.2		43,158	0

(1) Head loss for circuit tubing only

hawks nest stairs

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss ¹	Temp Drop	Load	Actuator
D-1	upper stairs	99	13	81	1/2" InfloorPERT	0.31	0.5	20	3,047	No
Total	-	99		81	-	0.31	0.5	21	3,047	0

(1) Head loss for circuit tubing only

kitchen/locker rooms

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss ¹	Temp Drop	Load	Actuator
B-14	KITCHEN	254	12	244	1/2" InfloorPERT	0.81	6.9	20	8,069	No
B-15	KITCHEN	248	12	236	1/2" InfloorPERT	0.78	6.4	20	7,806	No
B-16	KITCHEN	283	12	275	1/2" InfloorPERT	0.91	9.6	20	9,103	No
B-17	KITCHEN	278	12	269	1/2" InfloorPERT	0.89	9.0	20	8,878	No
B-18	KITCHEN	275	12	266	1/2" InfloorPERT	0.88	8.7	20	8,786	No
B-19	KITCHEN	251	12	245	1/2" InfloorPERT	0.81	6.9	20	8,105	No
B-20	KITCHEN	266	12	258	1/2" InfloorPERT	0.85	8.0	20	8,514	No
Total	-	1,857		1,793	-	5.95	9.6		59,260	0

(1) Head loss for circuit tubing only

MAIN BATH

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss ¹	Temp Drop	Load	Actuator
B-34	PRIMARY BATH	148	12	139	1/2" InfloorPERT	0.44	1.4	20	4,366	No
B-35	PRIMARY BATH	132	12	135	1/2" InfloorPERT	0.43	1.2	20	4,243	No
Total	-	280		274	-	0.86	1.4		8,609	0

(1) Head loss for circuit tubing only

MAIN FL OFFICE

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss ¹	Temp Drop	Load	Actuator
B-7	MAIN FL OFFICE	269	12	271	1/2" InfloorPERT	0.87	8.4	20	8,710	No
Total	-	269		271	-	0.87	8.4	21	8,710	0

(1) Head loss for circuit tubing only

MEZZANINE MAN

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss ¹	Temp Drop	Load	Actuator
C-6	MEZZANIE	180	12	174	1/2" InfloorPERT	0.49	2.0	20	4,869	No
C-7	MEZZANIE	162	12	157	1/2" InfloorPERT	0.44	1.5	20	4,417	No
C-8	MEZZANIE	184	12	175	1/2" InfloorPERT	0.49	2.1	20	4,923	No
Total	-	527		507	-	1.43	2.1		14,210	0

(1) Head loss for circuit tubing only

N. CLOSET MAN

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss ¹	Temp Drop	Load	Actuator
B-8	NORHT CLOSET	207	12	208	1/2" InfloorPERT	0.42	1.8	20	4,151	Yes
B-9	GREAT ROOM/BILLARD	232	12	226	1/2" InfloorPERT	0.72	5.1	20	7,171	Yes
B-27	NORHT CLOSET	185	12	179	1/2" InfloorPERT	0.36	1.2	20	3,567	Yes
B-28	GREAT ROOM/BILLARD	232	12	229	1/2" InfloorPERT	0.73	5.3	20	7,256	Yes
B-29	GREAT ROOM/BILLARD	220	12	218	1/2" InfloorPERT	0.69	4.6	20	6,900	Yes
B-30	GREAT ROOM/BILLARD	214	12	214	1/2" InfloorPERT	0.68	4.3	20	6,779	Yes
B-31	GREAT ROOM/BILLARD	214	12	214	1/2" InfloorPERT	0.68	4.3	20	6,787	Yes
Total	-	1,503		1,487	-	4.28	5.3		42,611	7

(1) Head loss for circuit tubing only

PARLOR

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss ¹	Temp Drop	Load	Actuator
C-1	PARLOR	173	12	171	1/2" InfloorPERT	0.47	1.8	20	4,693	No
C-2	PARLOR	187	12	183	1/2" InfloorPERT	0.51	2.2	20	5,035	No
Total	-	359		354	-	0.98	2.2		9,728	0

(1) Head loss for circuit tubing only

PRIMARY BED/HEARTH ROOM

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss ¹	Temp Drop	Load	Actuator
B-36	PRIMARY BED/HEARTH ROOM	173	12	173	1/2" InfloorPERT	0.45	1.7	20	4,533	No
B-37	PRIMARY BED/HEARTH ROOM	165	12	169	1/2" InfloorPERT	0.44	1.6	20	4,426	No
B-38	PRIMARY BED/HEARTH ROOM	159	12	167	1/2" InfloorPERT	0.44	1.5	20	4,394	No
Total	-	496		508	-	1.34	1.7		13,353	0

(1) Head loss for circuit tubing only

RANCH SUITE

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss ¹	Temp Drop	Load	Actuator
C-3	RANCH SUITE	122	12	117	1/2" InfloorPERT	0.32	0.7	20	3,204	No
C-4	RANCH SUITE	122	12	120	1/2" InfloorPERT	0.33	0.7	20	3,280	No
Total	-	244		237	-	0.65	0.7		6,484	0

(1) Head loss for circuit tubing only

S CLOSET MAN

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss ¹	Temp Drop	Load	Actuator
B-32	SOUTH CLOSETR	198	12	194	1/2" InfloorPERT	0.49	2.3	20	4,883	No
B-33	SOUTH CLOSETR	191	12	202	1/2" InfloorPERT	0.51	2.3	20	5,068	No
Total	-	390		396	-	1.00	2.3		9,951	0

(1) Head loss for circuit tubing only

SUITE BATH ROOM

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss ¹	Temp Drop	Load	Actuator
C-5	SUITE BATHROOM	219	12	193	1/2" InfloorPERT	0.53	2.9	20	5,314	No
Total	-	219		193	-	0.53	2.9	28	5,314	0

(1) Head loss for circuit tubing only

UPPER OFFICE

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss ¹	Temp Drop	Load	Actuator
C-9	UPPER OFFICE	270	12	272	1/2" InfloorPERT	0.74	6.4	20	7,419	No
Total	-	270		272	-	0.74	6.4	21	7,419	0

(1) Head loss for circuit tubing only

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Water Supply Summary

Project #:ACTION/HOMERANCH

March 09, 2023

Project Information

Project #: ACTION/HOMERANCH
Name: HOMERANCH/ACTION
Location: 27315 HOME RANCH ROAD

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	122	169.84	34.37	20.6	342,557	55	13

(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
BASMENT	7	3.32	102	122	1" Stainless Steel manifold with Flow Meters	25	3/4" BPEX	0.5	2.7	2.9	6.2
FORMAL ENTRY/BAR	4	3.02	122	122	1" Stainless Steel manifold with Flow Meters	50	1" BPEX	1.6	8.8	1.5	12.0
GARAGE	6	4.77	115	122	1" Stainless Steel manifold with Flow Meters	200	1" BPEX	1.4	5.9	13.3	20.6
GREAT HALL	6	4.33	120	122	1" Stainless Steel manifold with Flow Meters	-	-	1.1	5.2	0.0	6.4
hawks nest stairs	1	0.31	120	122	1" Stainless Steel manifold with Flow Meters	-	-	0.2	0.5	0.0	0.7
kitchen/locker rooms	7	5.95	120	122	1" Stainless Steel manifold with Flow Meters	50	1" BPEX	1.8	9.6	4.9	16.2
MAIN BATH	2	0.86	113	122	1" Stainless Steel manifold with Flow Meters	-	-	0.4	1.4	0.0	1.8
MAIN FL OFFICE	1	0.87	120	122	1" Stainless Steel manifold with Flow Meters	150	1" BPEX	1.6	8.4	0.5	10.5
MEZZANINE MAN	3	1.43	120	122	1" Stainless Steel manifold with Flow Meters	125	1" BPEX	0.5	2.1	1.0	3.6
N. CLOSET MAN	7	4.28	120	122	1" Stainless Steel manifold with Flow Meters	25	3/4" BPEX	1.1	5.3	4.5	10.9
PARLOR	2	0.98	120	122	1" Stainless Steel manifold with Flow Meters	100	1" BPEX	0.5	2.2	0.4	3.2
PRIMARY BED/HEARTH ROOM	3	1.34	121	122	1" Stainless Steel manifold with Flow Meters	-	-	0.4	1.7	0.0	2.2
RANCH SUITE	2	0.65	121	122	1" Stainless Steel manifold with Flow Meters	100	1" BPEX	0.2	0.7	0.2	1.1
S CLOSET MAN	2	1.00	119	122	1" Stainless Steel manifold with Flow Meters	30	3/4" BPEX	0.5	2.3	0.4	3.3
SUITE BATH ROOM	1	0.53	107	122	1" Stainless Steel manifold with Flow Meters	-	-	0.6	2.9	0.0	3.5
UPPER OFFICE	1	0.74	120	122	1" Stainless Steel manifold with Flow Meters	150	1" BPEX	1.1	6.4	0.4	7.9
Total	55	34.37	-	-	-	-	-	1.8	9.6	20.6	20.6

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

Water Temperature (122 °F)

BASMENT (122 °F, 1" Stainless Steel manifold with Flow Meters, 7 Circuits)

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss ¹	Temp Drop ²	Load ³	Actuator
A-1	BASMENT	265	12	265	1/2" BPEX	0.48	2.5	20	4,778	No
A-2	BASMENT	255	12	257	1/2" BPEX	0.46	2.3	20	4,626	No
A-3	BASMENT	264	12	266	1/2" BPEX	0.48	2.5	20	4,790	No
A-4	BASMENT	257	12	258	1/2" BPEX	0.47	2.4	20	4,646	No
A-5	BASMENT	256	12	257	1/2" BPEX	0.46	2.3	20	4,628	No
A-6	BASMENT	260	12	260	1/2" BPEX	0.47	2.4	20	4,683	No
A-7	BASMENT	273	12	272	1/2" BPEX	0.49	2.7	20	4,912	No
Total	-	1,830		1,833	-	3.32	2.7	-	33,063	0

(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.

FORMAL ENTRY/BAR (122 °F, 1" Stainless Steel manifold with Flow Meters, 4 Circuits)

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss ¹	Temp Drop ²	Load ³	Actuator
B-10	FORMAL ENTRY/PWDR	278	12	266	1/2" InfloorPERT	0.88	8.8	20	8,800	No
B-11	FORMAL ENTRY/PWDR	263	12	252	1/2" InfloorPERT	0.84	7.6	20	8,344	No
B-12	FORMAL ENTRY/PWDR	209	12	212	1/2" InfloorPERT	0.70	4.5	20	7,020	No
B-13	FORMAL ENTRY/PWDR	202	12	179	1/2" InfloorPERT	0.60	3.2	20	5,930	No
Total	-	953		911	-	3.02	8.8	-	30,093	0

(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.

GARAGE (122 °F, 1" Stainless Steel manifold with Flow Meters, 6 Circuits)

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss ¹	Temp Drop ²	Load ³	Actuator
B-1	GARAGE	203	12	196	1/2" InfloorPERT	0.77	5.1	20	7,692	No
B-2	GARAGE	212	12	207	1/2" InfloorPERT	0.82	5.9	20	8,136	No
B-3	GARAGE	208	12	203	1/2" InfloorPERT	0.80	5.5	20	7,945	No
B-4	GARAGE	213	12	208	1/2" InfloorPERT	0.82	5.9	20	8,145	No
B-5	GARAGE	202	12	197	1/2" InfloorPERT	0.78	5.1	20	7,737	No
B-6	GARAGE	208	12	201	1/2" InfloorPERT	0.79	5.5	20	7,895	No
Total	-	1,247		1,212	-	4.77	5.9	-	47,549	0

(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.

GREAT HALL (122 °F, 1" Stainless Steel manifold with Flow Meters, 6 Circuits)

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss ¹	Temp Drop ²	Load ³	Actuator
B-21	GREAT HALL	225	12	225	1/2" InfloorPERT	0.71	4.9	20	7,119	No
B-22	GREAT HALL	226	12	230	1/2" InfloorPERT	0.73	5.2	20	7,276	No
B-23	GREAT HALL	222	12	228	1/2" InfloorPERT	0.72	5.0	20	7,195	No
B-24	GREAT HALL	221	12	226	1/2" InfloorPERT	0.72	4.9	20	7,134	No
B-25	GREAT HALL	228	12	231	1/2" InfloorPERT	0.73	5.2	20	7,308	No
B-26	GREAT HALL	226	12	226	1/2" InfloorPERT	0.72	5.0	20	7,125	No
Total	-	1,349		1,367	-	4.33	5.2	-	43,158	0

(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.

hawks nest stairs (122 °F, 1" Stainless Steel manifold with Flow Meters, 1 Circuits)

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss ¹	Temp Drop ²	Load ³	Actuator
D-1	upper stairs	99		81	1/2" InfloorPERT	0.31	0.5	20	3,047	No
Total	-	99		81	-	0.31	0.5	-	3,047	0

(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.

kitchen/locker rooms (122 °F, 1" Stainless Steel manifold with Flow Meters, 7 Circuits)

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss ¹	Temp Drop ²	Load ³	Actuator
B-14	KITCHEN	254	12	244	1/2" InfloorPERT	0.81	6.9	20	8,069	No
B-15	KITCHEN	248	12	236	1/2" InfloorPERT	0.78	6.4	20	7,806	No
B-16	KITCHEN	283	12	275	1/2" InfloorPERT	0.91	9.6	20	9,103	No
B-17	KITCHEN	278	12	269	1/2" InfloorPERT	0.89	9.0	20	8,878	No
B-18	KITCHEN	275	12	266	1/2" InfloorPERT	0.88	8.7	20	8,786	No
B-19	KITCHEN	251	12	245	1/2" InfloorPERT	0.81	6.9	20	8,105	No
B-20	KITCHEN	266	12	258	1/2" InfloorPERT	0.85	8.0	20	8,514	No
Total	-	1,857		1,793	-	5.95	9.6	-	59,260	0

(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.

MAIN BATH (122 °F, 1" Stainless Steel manifold with Flow Meters, 2 Circuits)

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss ¹	Temp Drop ²	Load ³	Actuator
B-34	PRIMARY BATH	148	12	139	1/2" InfloorPERT	0.44	1.4	20	4,366	No
B-35	PRIMARY BATH	132	12	135	1/2" InfloorPERT	0.43	1.2	20	4,243	No
Total	-	280		274	-	0.86	1.4	-	8,609	0

(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.

MAIN FL OFFICE (122 °F, 1" Stainless Steel manifold with Flow Meters, 1 Circuits)

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss ¹	Temp Drop ²	Load ³	Actuator
B-7	MAIN FL OFFICE	269	12	271	1/2" InfloorPERT	0.87	8.4	20	8,710	No
Total	-	269		271	-	0.87	8.4	-	8,710	0

(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.

MEZZANINE MAN (122 °F, 1" Stainless Steel manifold with Flow Meters, 3 Circuits)

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss ¹	Temp Drop ²	Load ³	Actuator
C-6	MEZZANIE	180	12	174	1/2" InfloorPERT	0.49	2.0	20	4,869	No
C-7	MEZZANIE	162	12	157	1/2" InfloorPERT	0.44	1.5	20	4,417	No
C-8	MEZZANIE	184	12	175	1/2" InfloorPERT	0.49	2.1	20	4,923	No
Total	-	527		507	-	1.43	2.1	-	14,210	0

(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.

N. CLOSET MAN (122 °F, 1" Stainless Steel manifold with Flow Meters, 7 Circuits)

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss ¹	Temp Drop ²	Load ³	Actuator
B-8	NORHT CLOSET	207	12	208	1/2" InfloorPERT	0.42	1.8	20	4,151	Yes
B-9	GREAT ROOM/BILLARD	232	12	226	1/2" InfloorPERT	0.72	5.1	20	7,171	Yes
B-27	NORHT CLOSET	185	12	179	1/2" InfloorPERT	0.36	1.2	20	3,567	Yes
B-28	GREAT ROOM/BILLARD	232	12	229	1/2" InfloorPERT	0.73	5.3	20	7,256	Yes
B-29	GREAT ROOM/BILLARD	220	12	218	1/2" InfloorPERT	0.69	4.6	20	6,900	Yes
B-30	GREAT ROOM/BILLARD	214	12	214	1/2" InfloorPERT	0.68	4.3	20	6,779	Yes
B-31	GREAT ROOM/BILLARD	214	12	214	1/2" InfloorPERT	0.68	4.3	20	6,787	Yes
Total	-	1,503		1,487	-	4.28	5.3	-	42,611	7

(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.

PARLOR (122 °F, 1" Stainless Steel manifold with Flow Meters, 2 Circuits)

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss ¹	Temp Drop ²	Load ³	Actuator
C-1	PARLOR	173	12	171	1/2" InfloorPERT	0.47	1.8	20	4,693	No
C-2	PARLOR	187	12	183	1/2" InfloorPERT	0.51	2.2	20	5,035	No
Total	-	359		354	-	0.98	2.2	-	9,728	0

(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.

PRIMARY BED/HEARTH ROOM (122 °F, 1" Stainless Steel manifold with Flow Meters, 3 Circuits)

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss ¹	Temp Drop ²	Load ³	Actuator
B-36	PRIMARY BED/HEARTH ROOM	173	12	173	1/2" InfloorPERT	0.45	1.7	20	4,533	No
B-37	PRIMARY BED/HEARTH ROOM	165	12	169	1/2" InfloorPERT	0.44	1.6	20	4,426	No
B-38	PRIMARY BED/HEARTH ROOM	159	12	167	1/2" InfloorPERT	0.44	1.5	20	4,394	No
Total	-	496		508	-	1.34	1.7	-	13,353	0

(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.

RANCH SUITE (122 °F, 1" Stainless Steel manifold with Flow Meters, 2 Circuits)

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss ¹	Temp Drop ²	Load ³	Actuator
C-3	RANCH SUITE	122	12	117	1/2" InfloorPERT	0.32	0.7	20	3,204	No
C-4	RANCH SUITE	122	12	120	1/2" InfloorPERT	0.33	0.7	20	3,280	No
Total	-	244		237	-	0.65	0.7	-	6,484	0

(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.

S CLOSET MAN (122 °F, 1" Stainless Steel manifold with Flow Meters, 2 Circuits)

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss ¹	Temp Drop ²	Load ³	Actuator
B-32	SOUTH CLOSETR	198	12	194	1/2" InfloorPERT	0.49	2.3	20	4,883	No
B-33	SOUTH CLOSETR	191	12	202	1/2" InfloorPERT	0.51	2.3	20	5,068	No
Total	-	390		396	-	1.00	2.3	-	9,951	0

(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.

SUITE BATH ROOM (122 °F, 1" Stainless Steel manifold with Flow Meters, 1 Circuits)

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss ¹	Temp Drop ²	Load ³	Actuator
C-5	SUITE BATHROOM	219	12	193	1/2" InfloorPERT	0.53	2.9	20	5,314	No
Total	-	219		193	-	0.53	2.9	-	5,314	0

(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.

UPPER OFFICE (122 °F, 1" Stainless Steel manifold with Flow Meters, 1 Circuits)

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss ¹	Temp Drop ²	Load ³	Actuator
C-9	UPPER OFFICE	270	12	272	1/2" InfloorPERT	0.74	6.4	20	7,419	No
Total	-	270		272	-	0.74	6.4	-	7,419	0

(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.

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Project Information

Project #: ACTION/HOMERANCH
 Name: HOMERANCH/ACTION
 Location: 27315 HOME RANCH ROAD

Notes:

Design Conditions and Summary

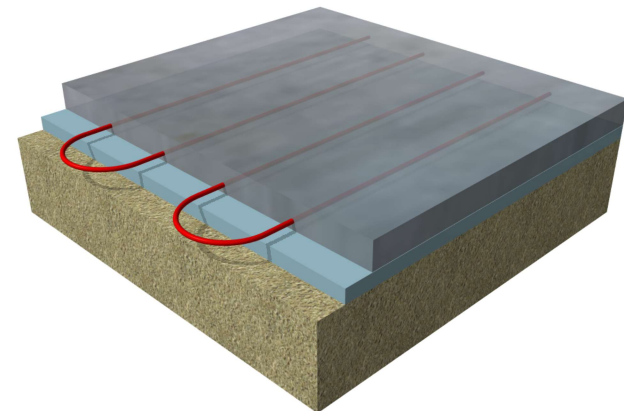
Load Calculation Method:	ASHRAE	Component Losses:	156,263 Btu/hr
Design Location:	(User Specified) steamboat springs , Colorado	Infiltration/Ventilation:	184,121 Btu/hr
Outdoor Temperature:	-15.0 °F	Radiant Back Losses:	48,251 Btu/hr
Floorplans / Levels:		Total Heating Load:	388,635 Btu/hr
Basement	1,989 ft²	Radiant Heating:	292,975 Btu/hr
Main Floor	9,163 ft²	Radiant Back Losses:	48,251 Btu/hr
Second Floor	1,902 ft²	Other:	47,410 Btu/hr
Third Floor	155 ft²	Total Heating Load:	388,635 Btu/hr
Total Area:	13,209 ft²		

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:	12 in
Fastener:	5" Wire Ties
Floorplans:	
Basement	1,873 ft²



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

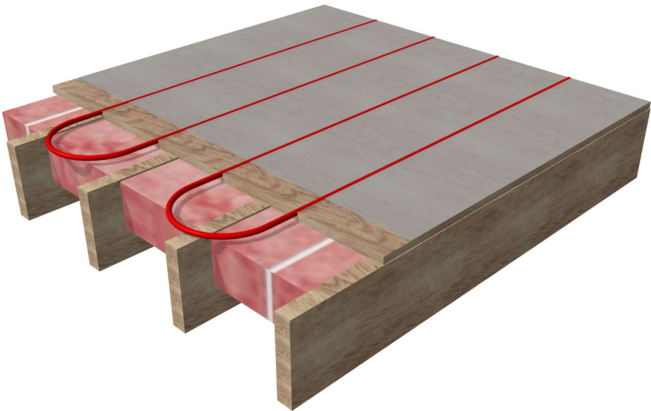
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 Version:22.0.0781 R

See end of report for important Notes and Disclaimers.

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Panel Type #2 - Warmboard

Panel Thickness:	1.125 in
Aluminum Layer:	Yes
Aluminum Thickness:	0.0150 in
Joist Construction:	Joist 2"x10" pine, 16" OC
Joist Spacing:	16 in
Joist Insulation Rv:	19.0 hr·ft²·°F/btu
Spacing:	12 in, 13 in
Floorplans:	
Main Floor	8,818 ft²
Second Floor	1,776 ft²
Third Floor	138 ft²



Disclaimers

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