Load Summary

Manual J8 Load Calculation

Project #:Benjamin Head v2

Project Information

Project #: Benjamin Head v2

Name: Benjamin Head v2

Location:

Notes:

Outdoor Conditions

Location:	(User Specified) Craig,,Colorado
Elevation:	7114'
Latitude:	41

	Heating	Cooling
Dry Bulb:	-9.0 °F	88.0 °F
Daily Range:		High
Wet Bulb:		57.0 °F

Infiltration

Method:	Simple
Stories:	2
Construction:	Tight
Exposure Category:	Three or Four Exposures
Num Fireplaces:	None
Net Air Changes (H/C):	0.13/0.07
Net Flow (H/C):	103 cfm/56 cfm

Indoor Conditions

	Heating	Cooling
Room Temp:	70 °F	75 °F
Design Temp Diff:	79.0 °F	13.0 °F
Humidity:	35	50
Moisture Diff (Grains):		-43.5

Ventilation

Num Occupants: 5

Heating		Cooling	
Type:	Heat Recovery	Type:	Heat Recovery
ACH:	0.28	ACH:	0.28
Outside Air:	223 cfm	Outside Air:	223 cfm
Sensible Eff:	75 %	Sensible Eff:	75 %

Floorplan/Levels

Ground Floor	2,344	ft²
Main Floor	2,427	ft²
Total Heated Area:	4,771	ft²
Total Cooled Area:	4,771	ft²

Total Heating: 36,524 Btu/hr

Total Sensible: 34,755 Btu/hr

Total Latent: 1,000 Btu/hr

Load Breakdown

Name	Heating	Sensible	Latent
Windows*	7,854	26,102	
Skylights*	0	0	
Doors	1,246	300	
Walls	10,290	1,267	
Below Grade Walls	0		
Ceilings	3,589	1,045	
Floors	101	78	
Infiltration	7,014	622	0
Internal		2,350	1,000
Other	0		
Duct Loads	0	0	0
Ventilation	3,777	622	0
Humidification	0		
Piping Load	0		
Radiant Back Loss	2,652		
Blower Heat		1,706	
AED*		665	
Total	36,524	34,755	1,000
Total Area	4,771 ft²	4,771 ft²	

*Average Load Procedure

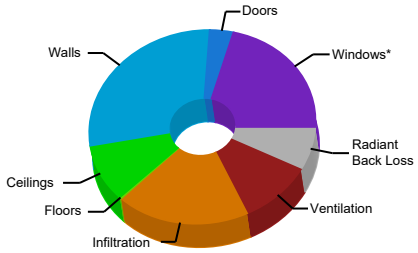
Heating ΔT¹: 70.0 JSHR: 0.97

Cooling ΔT¹: 18.0 MJ8 Tons: 2.98

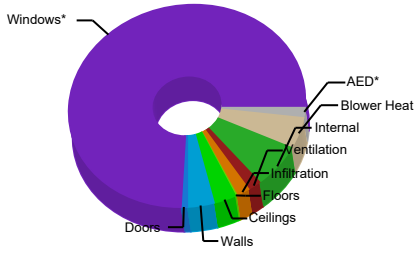
Est. Heating CFM²: 0 SqFt/Ton: 1601

Est. Cooling CFM²: 2097 CFM/SqFt: 0.44

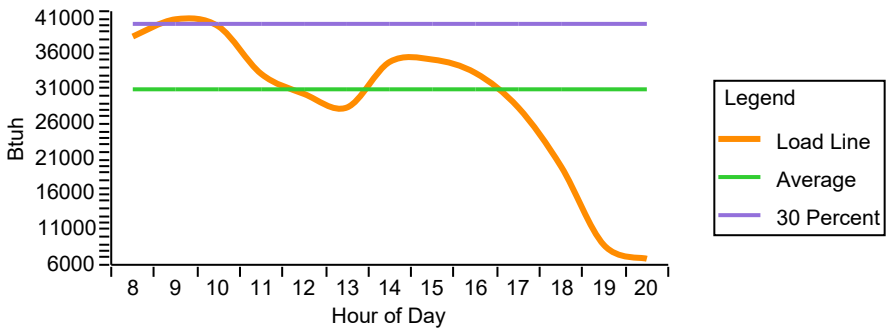
Heating Load Breakdown



Sensible Load Breakdown



Fenestration Load vs Hour of Day - Block Load (Summer)



Average Load: 30,916 Btu/hr

Excursion Limit: 40,191 Btu/hr

Peak Load: 40,855 Btu/hr

AED Load: 665 Btu/hr

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

Length = ft Area = ft² Temperature = °F Flowrate = USGPM Air Flow = cfm Heat Loss = Btu/hr
Unit Heat Loss = Btu/(hr·ft²) Rv = hr·ft²·°F/btu Head Loss = ft water RH = Radiant Floor Heating
BB = Baseboard FA = Forced Air OTH = Other Heating SM = Snowmelt N = Not Heated

Created Using LoopCAD 2021 (2021-08-19)
Version:21.0.0080 R

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

Warnings

This application has glass areas that produced relatively large cooling loads for part of the day. Zoning may be required to overcome spikes in solar load for one or more rooms. A zoned system may be required or some rooms may require zone control (provided by individual, motorized, thermostatically controlled dampers).

The sensible load for some rooms peak during late fall or early winter. This behavior is caused by glass that faces South East, South or South West. Room temperature may be difficult to control if zoning is not provided.

Disclaimers

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LoopCAD® 2021

Load Report

Manual J8 Load Calculation

Project #:Benjamin Head v2

Project Information

Project #: Benjamin Head v2
Name: Benjamin Head v2
Location:

Notes:

Manual J Load Summary

Total Heating: 36,524 Btu/hr **Total Sensible: 34,755 Btu/hr** **Total Latent: 1,000 Btu/hr**

Outdoor Conditions

Location:		(User Specified) Craig,,Colorado
Elevation:		7114'
Latitude:		41
	Heating	**Cooling**
Dry Bulb:	-9.0 °F	88.0 °F
Daily Range:		High
Wet Bulb:		57.0 °F

Indoor Conditions

	Heating	**Cooling**
Room Temp:	70 °F	75 °F
Design Temp Diff:	79.0 °F	13.0 °F
Humidity:	35	50
Moisture Diff (Grains):		-43.5

Infiltration

Method:	Simple
Stories:	2
Construction:	Tight
Exposure Category:	Three or Four Exposures
Num Fireplaces:	None
Net Air Changes (Heat/Cool):	0.13 / 0.07
Net Flow (Heat/Cool):	103 cfm / 56 cfm

Ventilation

Num Occupants: 5

Heating		**Cooling**	
Type:	Heat Recovery	Type:	Heat Recovery
ACH:	0.28	ACH:	0.28
Outside Air:	223 cfm	Outside Air:	223 cfm
Sensible Eff:	75 %	Sensible Eff:	75 %

Floorplan/Levels

Ground Floor	2,344 ft²	Total Heated Area:	4,771 ft²
Main Floor	2,427 ft²	Total Cooled Area:	4,771 ft²

(1) ΔT: Difference between supply air and return air (2) Estimated air flow based on specified supply air ΔT
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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See end of report for important Notes and Disclaimers.

Constructions

Walls

Code	Description	R-Value	Area	Heating	Cooling
Custom		40.0	418	825	21
Custom		40.0	4,792	9,464	1,246

Doors

Code	Description	R-Value	Area	Heating	Cooling
Custom		10.0	66	525	126
Custom		16.0	146	721	173

Floors

Code	Description	R-Value	Area	Heating	Cooling
22D-24-r	22D - Vertical Board Insulation Covers Slab Edge, Turns Under the Slab and Extends Four Feet Horizontally, any Floor Cover	24.0	179'-6" (P)	1,586	0
22D-24-r	22D - Vertical Board Insulation Covers Slab Edge, Turns Under the Slab and Extends Four Feet Horizontally, any Floor Cover	24.0	69'-7" (P)	503	0
22D-24-r	22D - Vertical Board Insulation Covers Slab Edge, Turns Under the Slab and Extends Four Feet Horizontally, any Floor Cover	24.0	8'-11" (P)	85	0
22D-24-r	22D - Vertical Board Insulation Covers Slab Edge, Turns Under the Slab and Extends Four Feet Horizontally, any Floor Cover	24.0	5'-5" (P)	32	0
22D-24-r	22D - Vertical Board Insulation Covers Slab Edge, Turns Under the Slab and Extends Four Feet Horizontally, any Floor Cover	24.0	48'-3" (P)	249	0
22D-24-r	22D - Vertical Board Insulation Covers Slab Edge, Turns Under the Slab and Extends Four Feet Horizontally, any Floor Cover	24.0	10'-8" (P)	54	0
Prefab Board Product Above Sub-floor-r	Prefab Board Product Above Sub-floor -	6.3	53	59	25
20P-10cp	Carpet or Hardwood Cover; R-10 board Insulation	12.3	16	101	4
Prefab Board Product Above Sub-floor-r	Prefab Board Product Above Sub-floor -	6.3	58	45	27
Prefab Board Product Above Sub-floor-r	Prefab Board Product Above Sub-floor -	6.3	14	15	6
Prefab Board Product Above Sub-floor-r	Prefab Board Product Above Sub-floor -	6.3	2	2	1
Prefab Board Product Above Sub-floor-r	Prefab Board Product Above Sub-floor -	6.3	28	22	14

Ceilings

Code	Description	R-Value	Area	Heating	Cooling
Custom	Insulated Ceiling Under Attic or Attic Knee Wall (Vented w/ Radiant Barrier); R-60 Insulation; Roof Material: Asphalt Shingles; Roof Color: Dark or Heavy Bold Color;	54.4	2,472	3,589	1,045

Glazing

Windows

Code	Description	Exposure	R-Value	SHGC	Area	Heating	Cooling
Custom	, BlindsMedium45 (50%), 1', 1' above.	N	9	0.53	40	334	268
Custom	, BlindsMedium45 (50%), 1', 1' above.	NE	10	0.53	148	1,200	3,532
Custom	, BlindsMedium45 (50%), 1', 1' above.	SE	10	0.53	33	264	995
Custom	, BlindsMedium45 (50%), 1', 1' above.	SW	10	0.53	23	183	681
Custom	, BlindsMedium45 (50%), 1', 1' above.	SE	10	0.53	23	183	681
Custom	, BlindsMedium45 (50%), 1', 1' above.	SE	10	0.53	200	1,627	6,187
Custom	, BlindsMedium45 (50%), 14', 1' above.	NE	10	0.53	204	1,661	4,888
Custom	, BlindsMedium45 (50%), 1', 1' above.	SW	10	0.53	44	357	1,321
Custom	, BlindsMedium45 (50%), 1', 1' above.	SE	10	0.53	88	712	2,658
Custom	, BlindsMedium45 (50%), 1', 1' above.	NW	10	0.53	18	146	431
Custom	, BlindsMedium45 (50%), 1', 1' above.	SW	10	0.53	36	293	1,100
Custom	, BlindsMedium45 (50%), 1', 1' above.	SW	10	0.53	22	176	652
Custom	, BlindsMedium45 (50%), 1', 1' above.	SW	10	0.53	88	716	2,710

Internal Loads

Description	Sensible	Latent
Default (1,200 Btuh)	1,200	0
5 Occupants:	1,150	1,000
Total	2,350	1,000

Other Loads

Blower Load	1,706 Btu/hr

Load Breakdown

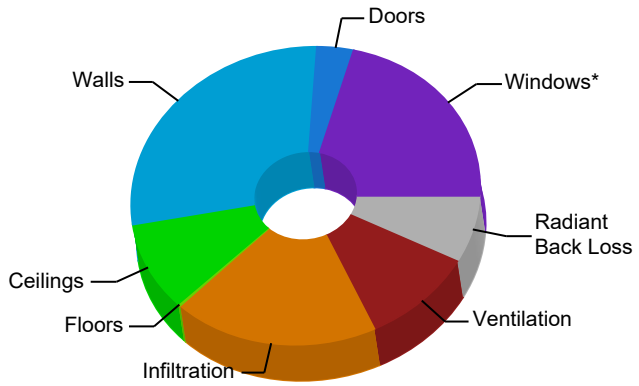
Name	Heating	Sensible	Latent
Windows*	7,854	26,102	
Skylights*	0	0	
Doors	1,246	300	
Walls	10,290	1,267	
Below Grade Walls	0		
Ceilings	3,589	1,045	
Floors	101	78	
Infiltration	7,014	622	0
Internal		2,350	1,000
Other	0		
Duct Loads	0	0	0
Ventilation	3,777	622	0
Humidification	0		
Piping Load	0		
Radiant Back Loss	2,652		
Blower Heat		1,706	
AED*		665	
Total	36,524	34,755	1,000
Total Area	4,771 ft²	4,771 ft²	

*Average Load Procedure

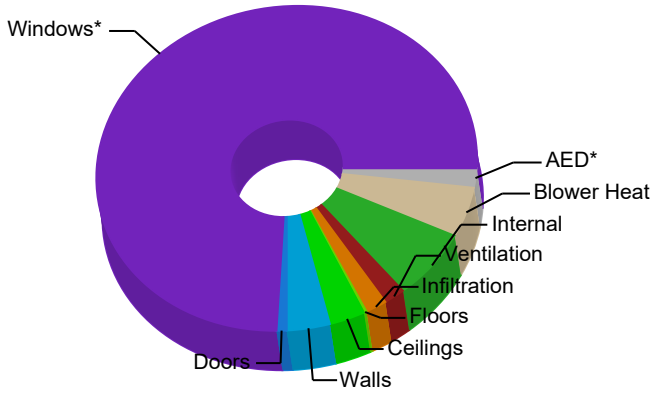
Heating ΔT[1]: 70.0
Cooling ΔT[1]: 18.0
Est. Heating CFM[2]: 0
Est. Cooling CFM[2]: 2097

JSHR: 0.97
MJ8 Tons: 2.98
SqFt/Ton: 1601
CFM/SqFt: 0.44

Heating Load Breakdown



Sensible Load Breakdown



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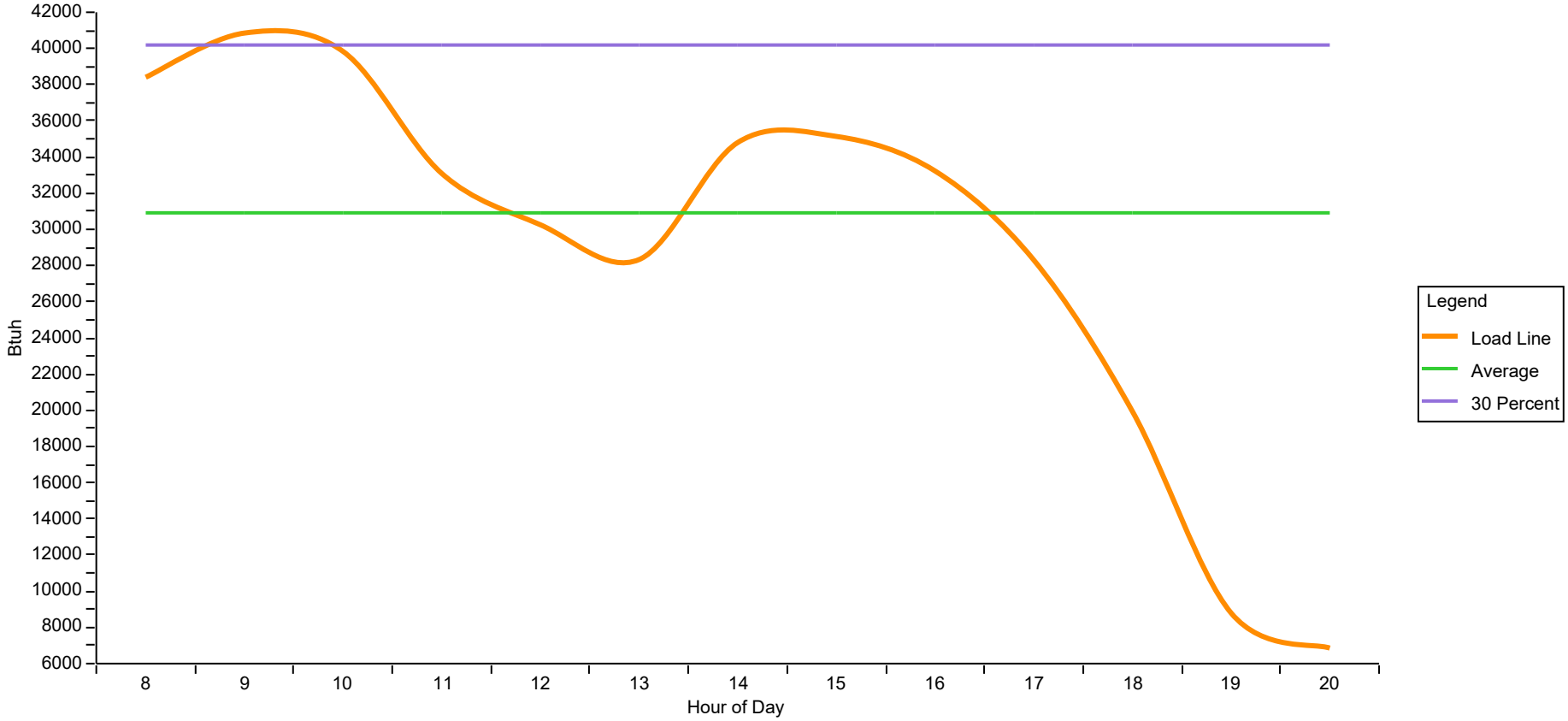
Head Loss = ft water RH = Radiant Floor Heating BB = Baseboard FA = Forced Air OTH = Other Heating SM = Snowmelt N = Not Heated

See end of report for important Notes and Disclaimers.

AED

Fenestration Load vs Hour of Day - Block Load (Summer)



Average Load: 30,916 Btu/hr
Peak Load: 40,855 Btu/hr
Excursion Limit: 40,191 Btu/hr
AED Load: 665 Btu/hr

Heating Zones

Zone	Area	Room Temp	Total Load
Zone 101	564	70	3,856
Zone 102	1,518	70	13,476
Zone 103	262	70	1,905
Zone 201	922	70	6,185
Zone 202	675	70	4,854
Zone 203	830	70	6,248

Heating Rooms

Room	Area	Room Temp	Total Load*
Bathroom	52	70	246
Bathroom	57	70	302
Bed 2	156	70	1,058
Bed 3	153	70	822
Bed 4	166	70	653
Garage	564	70	3,856
Laundry	85	70	492
Loft Living	830	70	6,248
Master	675	70	4,854
Office/Loft	471	70	3,510
Powder	29	70	415
Room 1	1,270	70	12,163
Theater	262	70	1,905

* The sum of room loads may not be equal to the project total due to additional system loads.

Cooling Zones

Zone	Area	Room Temp	AED	Sensible Load
Entire Building	4,771	75	NO	32,428

(Average Load Procedure)

Cooling Rooms

Room	Area	Room Temp	AED	Sensible Load*
Bathroom	52	75	YES	46
Bathroom	57	75	YES	73
Bed 2	156	75	NO	1,833
Bed 3	153	75	NO	958

Bed 4	166	75	NO	1,825
Garage	564	75	NO	3,324
Laundry	85	75	YES	135
Loft Living	830	75	NO	3,867
Master	675	75	NO	7,964
Office/Loft	471	75	NO	4,579
Powder	29	75	YES	54
Room 1	1,270	75	NO	20,520
Theater	262	75	YES	261

* (Average Load Procedure) The sum of room loads may not equal the project total due to variations in solar gain and system loads.

Warnings

This application has glass areas that produced relatively large cooling loads for part of the day. Zoning may be required to overcome spikes in solar load for one or more rooms. A zoned system may be required or some rooms may require zone control (provided by individual, motorized, thermostatically controlled dampers).

The sensible load for some rooms peak during late fall or early winter. This behavior is caused by glass that faces South East, South or South West. Room temperature may be difficult to control if zoning is not provided.

Design Locaton

Location:	Craig,	Altitude:	7114' ft
Province/State:	Colorado	Latitude:	41
Country:	United States		
Outdoor Heating Design Temp:	-9.0 °F	Wet Bulb Temperature:	57.0 °F
Outdoor Cooling Design Temp:	88.0 °F	Daily Range:	High

MJ8Custom

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LoopCAD® 2021

Heating System Summary

Project #:Benjamin Head v2
August 11, 2021

Project Information

Project #: Benjamin Head v2
Name: Benjamin Head v2
Location:

Notes:

Project Summary

Load Calculation Method:	Manual J8	Total Circuit Lengths:		Component Losses:	23,080	Btu/hr
Design Location:	(User Specified) Craig,, Colorado	Barrier PEX 1/2"	5,433 ft	Infiltration/Ventilation:	10,791	Btu/hr
Outdoor Temperature:	-9.0 °F			Radiant Back Losses:	2,652	Btu/hr
Floorplans / Levels:		Total RH Circuits:	23	Total Heating Load:	36,524	Btu/hr
Ground Floor	2,344 ft²	Total Manifolds:	3			
Main Floor	2,427 ft²	Total Zones:	6	Radiant Heating:	27,624	Btu/hr
Total Area:	4,771 ft²			Radiant Back Losses:	2,652	Btu/hr
		Fluid Type:	30% Propylene Glycol	Other:	6,248	Btu/hr
		Total Tubing Volume:	50.01 USG	Total Heating Load:	36,524	Btu/hr
		Glycol Volume:	15.00 USG			
		Surface Temperature:	80 - 84 °F			

Zone Heating Summary

Zone #	Gross Area	Construction	Heating Types	RH[1] Circuits	Total Tubing	Manifolds	Flowrate	Head Loss (Circuit Only)	RH Load[2]	Supplemental	Zone Load[3]
Zone 101	564	Embedded Slab	RH	3	717	1	1.47	3.5	3,856	0	3,856
Zone 102	1,518	Embedded Slab	RH	9	2,173	1	4.64	6.8	13,476	0	13,476
Zone 103	262	Embedded Slab	RH	2	355	1	0.98	2.6	1,905	0	1,905
Zone 201	922	Prefab Board Product Above Sub-floor	RH	5	1,097	1	2.45	3.2	6,964	0	6,964
Zone 202	675	Prefab Board Product Above Sub-floor	RH	4	1,091	1	1.96	4.1	5,566	0	5,566
Zone 203	830	N/A	OTH	0	0	0	0.00	0.0	0	6,248	6,248

(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	Garage	RH	537	537	Manifold Garage/Theater	1/2"	3	12	570	0.5	86	7.2	3,856	0	3,856
Zone 102	Bathroom	RH	47	18	Manifold Main floor	1/2"	1	9	22	0.5	95	13.8	246	0	246
Zone 102	Bed 4	RH	155	155	n/a	n/a	0	9	216	0.5	0	4.2	653	0	653
Zone 102	Powder	RH	24	15	Manifold Main floor	1/2"	1	9	22	0.5	113	27.1	415	0	415
Zone 102	Room 1	RH	1,203	1,139	Manifold Main floor	1/2"	7	9	1,757	0.5	90	10.7	12,163	0	12,163
Zone 103	Theater	RH	245	245	Manifold Garage/Theater	1/2"	2	9	320	0.5	86	7.8	1,905	0	1,905

(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.

Prefab Board Product Above Sub-floor

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	Bathroom	RH	51	21	n/a	n/a	0	9	40	0.5	0	16.4	347	0	347
Zone 201	Bed 2	RH	144	144	Manifold Upstairs (Located below floor in Mech Rm)	1/2"	2	9	190	0.5	86	8.5	1,215	0	1,215
Zone 201	Bed 3	RH	142	142	Manifold Upstairs (Located below floor in Mech Rm)	1/2"	1	9	195	0.5	83	6.5	919	0	919
Zone 201	Laundry	RH	78	78	n/a	n/a	0	9	215	0.5	0	6.6	514	0	514
Zone 201	Office/Loft	RH	438	373	Manifold Upstairs (Located below floor in Mech Rm)	1/2"	2	9	542	0.5	89	10.6	3,969	0	3,969
Zone 202	Master	RH	643	589	Manifold Upstairs (Located below floor in Mech Rm)	1/2"	4	9	830	0.5	87	9.5	5,566	0	5,566

(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.

Non-Radiant Heated Rooms

Zone #	Room Name	Heating Type	Floor Area	Heated Area	Manifold #	Tube Size	RH Circuits	Tube Spacing	Tubing In Room	Floor Cover RV	Required Temp.	Unit RH Load	RH Load	Supplemental	Total Load
Zone 203	Loft Living	OTH	790	0	n/a	n/a	0	n/a	0	0.5	-	-	-	-	-

Manifold Summary

Manifold Name	# Zones	# Circuits	Flow	Head Loss[1]	Required Temp.	Supplied Temp.	Temp Drop	Manifold Type	Control Type	# Actuators	S/R Length[2]	S/R Pipe
Manifold Garage/Theater	2	5	2.45	3.9	86	113	10	Stainless Steel	Circuit	5	-	-
Manifold Main floor	1	9	4.64	7.8	113	113	10	Stainless Steel	Manifold	0	-	-
Manifold Upstairs (Located below floor in Mech Rm)	2	9	4.41	4.6	89	113	10	Stainless Steel	Circuit	9	-	-
Total	5	23	11.49	7.8	-	-	-	-	-	14	-	-

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

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LoopCAD® 2021

Heating System Detail

Project #:Benjamin Head v2
August 11, 2021

Project Information

Project #: Benjamin Head v2
Name: Benjamin Head v2
Location:

Notes:

Design Conditions and Summary

Load Calculation Method:	Manual J8
Design Location:	(User Specified) Craig,, Colorado
Outdoor Temperature:	-9.0 °F
Floorplans / Levels:	
Ground Floor	2,344 ft²
Main Floor	2,427 ft²
Total Area:	4,771 ft²

Total Tubing Lengths:	
Barrier PEX 1/2"	5,433 ft
Total RH Circuits:	23
Total Manifolds:	3
Total Zones:	6
Fluid Type:	30% Propylene Glycol
Total Tubing Volume:	50.01 USG
Glycol Volume:	15.00 USG

Component Losses:	23,080 Btu/hr
Infiltration/Ventilation:	10,791 Btu/hr
Radiant Back Losses:	2,652 Btu/hr
Total Heating Load:	36,524 Btu/hr
Radiant Heating:	27,624 Btu/hr
Radiant Back Losses:	2,652 Btu/hr
Other:	6,248 Btu/hr
Total Heating Load:	36,524 Btu/hr

Zone Heating Summary

Zone #	Area	Heating Types	RH Circuits	Flowrate	Head Loss	Supplemental	Rooms
101	564	RH	3	1.47	3.9	0	Garage
102	1,518	RH	9	4.64	7.8	0	Room 1, Bed 4, Bathroom, Powder
103	262	RH	2	0.98	3.0	0	Theater
201	922	RH	5	2.45	3.7	0	Office/Loft, Laundry, Bathroom, Bed 2, Bed 3
202	675	RH	4	1.96	4.6	0	Master
203	830	OTH	0	0.00	0.0	6,248	Loft Living
Total	4,771	RH,OTH	23	11.49	7.8	6,248	

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

Room Heating Summary

Ground Floor

Bathroom

Total Area:	52	ft²	Radiant Heating:			Load/Loss Summary:	
Heated by:	RH		Heated Area:	18	ft²	**Room Design Load:**	214 Btu/hr
Room Temperature:	70	°F	Tubing in Floor:	22	ft		
Floor Covering (Rv):	0.5		Circuits in Room:	1		Radiant Load:	246 Btu/hr
			Tube Spacing:	9		Baseboard Load:	0 Btu/hr
			Required Surface Temp:	77	°F	Forced Air Load	0 Btu/hr
			Required Water Temp:	95	°F	Other Load:	0 Btu/hr
			Est. Peak Output:	375	Btu/hr		
						Radiant Back Loss:	32 Btu/hr
						Recovered Back Loss:	0 Btu/hr
						Total Heat Loss:	246 Btu/hr

Bed 4

Total Area:	166	ft²	Radiant Heating:			Load/Loss Summary:	
Heated by:	RH		Heated Area:	155	ft²	**Room Design Load:**	568 Btu/hr
Room Temperature:	70	°F	Tubing in Floor:	222	ft		
Floor Covering (Rv):	0.5		Circuits in Room:	0		Radiant Load:	653 Btu/hr
			Tube Spacing:	9		Baseboard Load:	0 Btu/hr
			Required Surface Temp:	72	°F	Forced Air Load	0 Btu/hr
			Required Water Temp:	81	°F	Other Load:	0 Btu/hr
			Est. Peak Output:	3,364	Btu/hr		
						Radiant Back Loss:	85 Btu/hr
						Recovered Back Loss:	0 Btu/hr
						Total Heat Loss:	653 Btu/hr

Garage

Total Area:	564 ft²	Radiant Heating:		Load/Loss Summary:	
Heated by:	RH	Heated Area:	537 ft²	**Room Design Load:**	3,353 Btu/hr
Room Temperature:	70 °F	Tubing in Floor:	579 ft		
Floor Covering (Rv):	0.5	Circuits in Room:	3	Radiant Load:	3,856 Btu/hr
		Tube Spacing:	12	Baseboard Load:	0 Btu/hr
		Required Surface Temp:	73 °F	Forced Air Load	0 Btu/hr
		Required Water Temp:	86 °F	Other Load:	0 Btu/hr
		Est. Peak Output:	10,320 Btu/hr		
				Radiant Back Loss:	503 Btu/hr
				Recovered Back Loss:	0 Btu/hr
				Total Heat Loss:	3,856 Btu/hr

Powder

Total Area:	29 ft²	Radiant Heating:		Load/Loss Summary:	
Heated by:	RH	Heated Area:	15 ft²	**Room Design Load:**	361 Btu/hr
Room Temperature:	70 °F	Tubing in Floor:	23 ft		
Floor Covering (Rv):	0.5	Circuits in Room:	1	Radiant Load:	415 Btu/hr
		Tube Spacing:	9	Baseboard Load:	0 Btu/hr
		Required Surface Temp:	83 °F	Forced Air Load	0 Btu/hr
		Required Water Temp:	113 °F	Other Load:	0 Btu/hr
		Est. Peak Output:	361 Btu/hr		
				Radiant Back Loss:	54 Btu/hr
				Recovered Back Loss:	0 Btu/hr
				Total Heat Loss:	415 Btu/hr

Room 1

Total Area:	1,270 ft²	Radiant Heating:		Load/Loss Summary:	
Heated by:	RH	Heated Area:	1,139 ft²	**Room Design Load:**	10,576 Btu/hr
Room Temperature:	70 °F	Tubing in Floor:	1,787 ft		
Floor Covering (Rv):	0.5	Circuits in Room:	7	Radiant Load:	12,163 Btu/hr
		Tube Spacing:	9	Baseboard Load:	0 Btu/hr
		Required Surface Temp:	75 °F	Forced Air Load	0 Btu/hr
		Required Water Temp:	90 °F	Other Load:	0 Btu/hr
		Est. Peak Output:	25,753 Btu/hr		
				Radiant Back Loss:	1,586 Btu/hr
				Recovered Back Loss:	0 Btu/hr
				Total Heat Loss:	12,163 Btu/hr

Theater

Total Area:	262 ft²	Radiant Heating:		Load/Loss Summary:	
Heated by:	RH	Heated Area:	245 ft²	**Room Design Load:**	1,657 Btu/hr
Room Temperature:	70 °F	Tubing in Floor:	327 ft		
Floor Covering (Rv):	0.5	Circuits in Room:	2	Radiant Load:	1,905 Btu/hr
		Tube Spacing:	9	Baseboard Load:	0 Btu/hr
		Required Surface Temp:	74 °F	Forced Air Load	0 Btu/hr
		Required Water Temp:	86 °F	Other Load:	0 Btu/hr
		Est. Peak Output:	5,467 Btu/hr		
				Radiant Back Loss:	249 Btu/hr
				Recovered Back Loss:	0 Btu/hr
				Total Heat Loss:	1,905 Btu/hr

Main Floor

Bathroom

Total Area:	57 ft²	Radiant Heating:		Load/Loss Summary:	
Heated by:	RH	Heated Area:	21 ft²	**Room Design Load:**	302 Btu/hr
Room Temperature:	70 °F	Tubing in Floor:	54 ft		
Floor Covering (Rv):	0.5	Circuits in Room:	0	Radiant Load:	347 Btu/hr
		Tube Spacing:	6	Baseboard Load:	0 Btu/hr
		Required Surface Temp:	78 °F	Forced Air Load	0 Btu/hr
		Required Water Temp:	92 °F	Other Load:	0 Btu/hr
		Est. Peak Output:	527 Btu/hr		
				Radiant Back Loss:	45 Btu/hr
				Recovered Back Loss:	-45 Btu/hr
				Total Heat Loss:	302 Btu/hr

Bed 2

Total Area:	156 ft²	Radiant Heating:		Load/Loss Summary:	
Heated by:	RH	Heated Area:	144 ft²	**Room Design Load:**	1,056 Btu/hr
Room Temperature:	70 °F	Tubing in Floor:	196 ft		
Floor Covering (Rv):	0.5	Circuits in Room:	2	Radiant Load:	1,215 Btu/hr
		Tube Spacing:	9	Baseboard Load:	0 Btu/hr
		Required Surface Temp:	74 °F	Forced Air Load	0 Btu/hr
		Required Water Temp:	86 °F	Other Load:	0 Btu/hr
		Est. Peak Output:	3,358 Btu/hr		
				Radiant Back Loss:	158 Btu/hr
				Recovered Back Loss:	-156 Btu/hr
				Total Heat Loss:	1,058 Btu/hr

Bed 3

Total Area:	153 ft²	Radiant Heating:		Load/Loss Summary:	
Heated by:	RH	Heated Area:	142 ft²	**Room Design Load:**	799 Btu/hr
Room Temperature:	70 °F	Tubing in Floor:	200 ft		
Floor Covering (Rv):	0.5	Circuits in Room:	1	Radiant Load:	919 Btu/hr
		Tube Spacing:	9	Baseboard Load:	0 Btu/hr
		Required Surface Temp:	73 °F	Forced Air Load	0 Btu/hr
		Required Water Temp:	83 °F	Other Load:	0 Btu/hr
		Est. Peak Output:	3,350 Btu/hr		
				Radiant Back Loss:	120 Btu/hr
				Recovered Back Loss:	-98 Btu/hr
				Total Heat Loss:	822 Btu/hr

Laundry

Total Area:	85	ft²	Radiant Heating:			Load/Loss Summary:	
Heated by:	RH		Heated Area:	78	ft²	**Room Design Load:**	447 Btu/hr
Room Temperature:	70	°F	Tubing in Floor:	220	ft		
Floor Covering (Rv):	0.5		Circuits in Room:	0		Radiant Load:	514 Btu/hr
			Tube Spacing:	4		Baseboard Load:	0 Btu/hr
			Required Surface Temp:	73	°F	Forced Air Load	0 Btu/hr
			Required Water Temp:	81	°F	Other Load:	0 Btu/hr
			Est. Peak Output:	1,960	Btu/hr		
						Radiant Back Loss:	67 Btu/hr
						Recovered Back Loss:	-22 Btu/hr
						Total Heat Loss:	492 Btu/hr

Loft Living

Total Area:	830	ft²	Radiant Heating:			Load/Loss Summary:	
Heated by:	OTH		Heated Area:	313	ft²	**Room Design Load:**	0 Btu/hr
Room Temperature:	70	°F	Tubing in Floor:	0	ft		
Floor Covering (Rv):	0.5		Circuits in Room:	0		Radiant Load:	0 Btu/hr
			Tube Spacing:	9		Baseboard Load:	0 Btu/hr
			Required Surface Temp:	70	°F	Forced Air Load	0 Btu/hr
			Required Water Temp:	109	°F	Other Load:	6,248 Btu/hr
			Est. Peak Output:	0	Btu/hr		
						Radiant Back Loss:	0 Btu/hr
			Supplemental Req'd:	6,248	Btu/hr	Recovered Back Loss:	0 Btu/hr
						Total Heat Loss:	6,248 Btu/hr

Master

Total Area:	675	ft²	Radiant Heating:			Load/Loss Summary:	
Heated by:	RH		Heated Area:	589	ft²	**Room Design Load:**	4,840 Btu/hr
Room Temperature:	70	°F	Tubing in Floor:	848	ft		
Floor Covering (Rv):	0.5		Circuits in Room:	4		Radiant Load:	5,566 Btu/hr
			Tube Spacing:	9		Baseboard Load:	0 Btu/hr
			Required Surface Temp:	75	°F	Forced Air Load	0 Btu/hr
			Required Water Temp:	87	°F	Other Load:	0 Btu/hr
			Est. Peak Output:	13,889	Btu/hr		
						Radiant Back Loss:	726 Btu/hr
						Recovered Back Loss:	-711 Btu/hr
						Total Heat Loss:	4,854 Btu/hr

Office/Loft

Total Area:	471 ft²	Radiant Heating:		Load/Loss Summary:	
Heated by:	RH	Heated Area:	373 ft²	**Room Design Load:**	3,452 Btu/hr
Room Temperature:	70 °F	Tubing in Floor:	573 ft		
Floor Covering (Rv):	0.5	Circuits in Room:	2	Radiant Load:	3,969 Btu/hr
		Tube Spacing:	9	Baseboard Load:	0 Btu/hr
		Required Surface Temp:	75 °F	Forced Air Load	0 Btu/hr
		Required Water Temp:	89 °F	Other Load:	0 Btu/hr
		Est. Peak Output:	8,780 Btu/hr		
				Radiant Back Loss:	518 Btu/hr
				Recovered Back Loss:	-459 Btu/hr
				Total Heat Loss:	3,510 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 Garage/Theater	2	5	2.45	3.9	86	113	10	Stainless Steel	Circuit	5	-	-
Manifold Main floor	1	9	4.64	7.8	113	113	10	Stainless Steel	Manifold	0	-	-
Manifold Upstairs (Located below floor in Mech Rm)	2	9	4.41	4.6	89	113	10	Stainless Steel	Circuit	9	-	-
Total	5	23	11.49	7.8	113	-	-	-	-	14	-	-

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

Tubing Circuit Details

Manifold Garage/Theater

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss[1]	Temp Drop	Load	Actuator
A-1	Garage	241	12	217	Barrier PEX 1/2"	0.49	3.5	10	1,652	Yes
A-2	Garage	244	12	229	Barrier PEX 1/2"	0.49	3.5	10	1,739	Yes
A-3	Garage	233	12	172	Barrier PEX 1/2"	0.49	3.3	10	1,327	Yes
A-13	Theater	176	9	132	Barrier PEX 1/2"	0.49	2.5	10	976	Yes
A-14	Theater	179	9	124	Barrier PEX 1/2"	0.49	2.6	10	930	Yes
Total	-	1,072		874	-	2.45	3.5		6,623	5

(1) Head loss for circuit tubing only

Manifold Main floor

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss[1]	Temp Drop	Load	Actuator
A-5	Room 1	246	9	123	Barrier PEX 1/2"	0.49	3.5	10	1,313	No
A-6	Room 1	257	9	141	Barrier PEX 1/2"	0.49	3.7	10	1,506	No
A-7	Room 1	245	9	132	Barrier PEX 1/2"	0.49	3.5	10	1,414	No
A-8	Room 1	246	9	133	Barrier PEX 1/2"	0.49	3.5	10	1,424	No
A-9	Room 1	245	9	139	Barrier PEX 1/2"	0.49	3.5	10	1,418	No
A-10	Powder	244	9	149	Barrier PEX 1/2"	0.72	6.8	10	1,683	No
A-11	Room 1	228	9	156	Barrier PEX 1/2"	0.49	3.3	10	1,165	No
A-12	Bathroom	238	9	151	Barrier PEX 1/2"	0.49	3.4	10	1,369	No
A-15	Room 1	223	9	142	Barrier PEX 1/2"	0.49	3.2	10	1,324	No
Total	-	2,173		1,267	-	4.64	6.8		12,614	0

(1) Head loss for circuit tubing only

Manifold Upstairs (Located below floor in Mech Rm)

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss[1]	Temp Drop	Load	Actuator
B-1	Bed 2	224	9	140	Barrier PEX 1/2"	0.49	3.2	10	1,412	Yes
B-2	Bed 2	226	9	150	Barrier PEX 1/2"	0.49	3.2	10	1,273	Yes
B-3	Bed 3	217	9	152	Barrier PEX 1/2"	0.49	3.1	10	1,091	Yes
B-4	Office/Loft	211	9	140	Barrier PEX 1/2"	0.49	3.0	10	1,366	Yes
B-5	Office/Loft	219	9	158	Barrier PEX 1/2"	0.49	3.1	10	1,640	Yes
B-6	Master	285	9	168	Barrier PEX 1/2"	0.49	4.1	10	1,605	Yes
B-7	Master	270	9	145	Barrier PEX 1/2"	0.49	3.9	10	1,373	Yes
B-8	Master	269	9	151	Barrier PEX 1/2"	0.49	3.8	10	1,427	Yes
B-9	Master	268	9	142	Barrier PEX 1/2"	0.49	3.8	10	1,342	Yes
Total	-	2,188		1,347	-	4.41	4.1		12,530	9

(1) Head loss for circuit tubing only

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LoopCAD® 2021

Water Supply Summary

Project #:Benjamin Head v2
August 11, 2021

Project Information

Project #: Benjamin Head v2
Name: Benjamin Head v2
Location:

Notes:

Supply Summary

Name	Temp	Total Fluid Vol	Total Flow	Head Loss[1]	Load[2]	# Circuits	# Zones
Water Temperature	113	50.01	11.49	7.8	31,767	23	5

(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 Garage/Theater	5	2.45	86	113	Stainless Steel	-	-	0.4	3.5	0.0	3.9
Manifold Main floor	9	4.64	113	113	Stainless Steel	-	-	1.0	6.8	0.0	7.8
Manifold Upstairs (Located below floor in Mech Rm)	9	4.41	89	113	Stainless Steel	-	-	0.5	4.1	0.0	4.6
Total	23	11.49	-	-	-	-	-	1.0	6.8	0.0	7.8

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

Water Temperature (113 °F)

Manifold Garage/Theater (113 °F, Stainless Steel, 5 Circuits)

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss[1]	Temp Drop[2]	Load[3]	Actuator
A-1	Garage	241	12	217	Barrier PEX 1/2"	0.49	3.5	10	1,652	Yes
A-2	Garage	244	12	229	Barrier PEX 1/2"	0.49	3.5	10	1,739	Yes
A-3	Garage	233	12	172	Barrier PEX 1/2"	0.49	3.3	10	1,327	Yes
A-13	Theater	176	9	126	Barrier PEX 1/2"	0.49	2.5	10	976	Yes
A-14	Theater	179	9	120	Barrier PEX 1/2"	0.49	2.6	10	930	Yes
Total	-	1,072		863	-	2.45	3.5	-	6,623	5

(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.

Manifold Main floor (113 °F, Stainless Steel, 9 Circuits)

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss[1]	Temp Drop[2]	Load[3]	Actuator
A-5	Room 1	246	9	123	Barrier PEX 1/2"	0.49	3.5	10	1,313	No
A-6	Room 1	257	9	141	Barrier PEX 1/2"	0.49	3.7	10	1,506	No
A-7	Room 1	245	9	132	Barrier PEX 1/2"	0.49	3.5	10	1,414	No
A-8	Room 1	246	9	133	Barrier PEX 1/2"	0.49	3.5	10	1,424	No
A-9	Room 1	245	9	133	Barrier PEX 1/2"	0.49	3.5	10	1,418	No
A-10	Powder	244	9	134	Barrier PEX 1/2"	0.72	6.8	10	1,683	No
A-11	Room 1	228	9	156	Barrier PEX 1/2"	0.49	3.3	10	1,165	No
A-12	Bathroom	238	9	151	Barrier PEX 1/2"	0.49	3.4	10	1,369	No
A-15	Room 1	223	9	142	Barrier PEX 1/2"	0.49	3.2	10	1,324	No
Total	-	2,173		1,246	-	4.64	6.8	-	12,614	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.

Manifold Upstairs (Located below floor in Mech Rm) (113 °F, Stainless Steel, 9 Circuits)

Circuit	Rooms Served	Total Length	Tube Spacing	Area Covered	Tubing	Flowrate	Head Loss[1]	Temp Drop[2]	Load[3]	Actuator
B-1	Bed 2	224	9	140	Barrier PEX 1/2"	0.49	3.2	10	1,412	Yes
B-2	Bed 2	226	9	150	Barrier PEX 1/2"	0.49	3.2	10	1,273	Yes
B-3	Bed 3	217	9	152	Barrier PEX 1/2"	0.49	3.1	10	1,091	Yes
B-4	Office/Loft	211	9	140	Barrier PEX 1/2"	0.49	3.0	10	1,366	Yes
B-5	Office/Loft	219	9	158	Barrier PEX 1/2"	0.49	3.1	10	1,640	Yes
B-6	Master	285	9	168	Barrier PEX 1/2"	0.49	4.1	10	1,605	Yes
B-7	Master	270	9	145	Barrier PEX 1/2"	0.49	3.9	10	1,373	Yes
B-8	Master	269	9	151	Barrier PEX 1/2"	0.49	3.8	10	1,427	Yes
B-9	Master	268	9	142	Barrier PEX 1/2"	0.49	3.8	10	1,342	Yes
Total	-	2,188		1,347	-	4.41	4.1	-	12,530	9

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

Disclaimers

Cold weather humidification, or some lifestyles that produce excessive moisture, may cause condensation to occur if the absolute humidity of the indoor air is too high for the momentary circumstances. Condensation can occur on surfaces or concealed within the structure, and can lead to mold, mildew, frost damage, and moisture damage. The software does not perform calculations for the estimation or detection of possible condensation problems, and it is the designers (i.e. software users) responsibility to do so independently if required. For guidance and additional cautions refer to ACCA Manual J 8th Edition, including Section 1-11 and Section 27.

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

Radiant Panel Schedule

Project #:Benjamin Head v2
August 11, 2021

Project Information

Project #: Benjamin Head v2
Name: Benjamin Head v2
Location:

Notes:

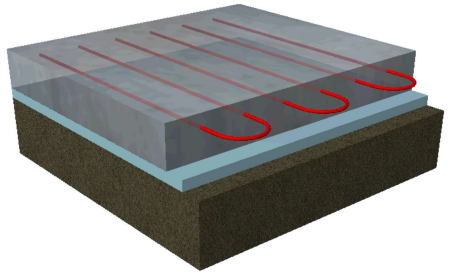
Design Conditions and Summary

Load Calculation Method:	Manual J8	Component Losses:	23,080 Btu/hr
Design Location:	(User Specified) Craig,, Colorado	Infiltration/Ventilation:	10,791 Btu/hr
Outdoor Temperature:	-9.0 °F	Radiant Back Losses:	2,652 Btu/hr
Floorplans / Levels:		Total Heating Load:	36,524 Btu/hr
Ground Floor	2,344 ft²		
Main Floor	2,427 ft²	Radiant Heating:	27,624 Btu/hr
Total Area:	4,771 ft²	Radiant Back Losses:	2,652 Btu/hr
		Other:	6,248 Btu/hr
		Total Heating Load:	36,524 Btu/hr

Radiant Panel Details

Panel Type #1 - Embedded Slab

Slab Thickness:	8.0 in
Tube Depth:	2.5 in
Slab R per Inch (Embedding Material):	0.15 °F•ft²•hr/(Btu•in)
Spacing:	9 in, 12 in
Floorplans:	
Ground Floor	2,210 ft²



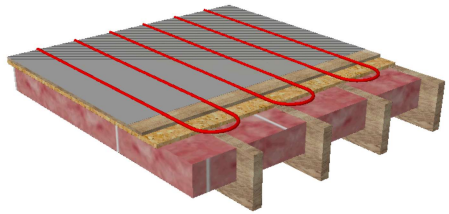
Note: Tube depth is measured from top of embedded layer to the centerline of the tubing.

Created Using LoopCAD 2021 (2021-08-19)
Version:21.0.0080 R

See end of report for important Notes and Disclaimers.

Panel Type #2 - Prefab Board Product Above Sub-floor

Panel Thickness:	0'- 3/4"
Aluminum Layer:	Yes
Aluminum Thickness:	0'- 1/64"
Sub-Floor Thickness:	0'- 3/4"
Sub-Floor Rv:	0.9 hr·ft²·°F/btu
Joist Construction:	Joist 2"x10" pine, 16" OC
Joist Spacing:	16 in
Joist Insulation Rv:	5.0 hr·ft²·°F/btu
Spacing:	9 in
Floorplans:	
Main Floor	1,496 ft²



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