



MULTI-ZONE HEAT LOSS DESIGN ANALYSIS

Page 1

DESIGNER:	DATE:	ENERGY CODE INFORMATION	JOB NAME:	POST FRAME PROJECT	Sports Complex
COMPANY:		FLOOR AREA: 11,200 SQ. FT.	COMPANY:		
ADDRESS:		WINDOW AREA: 45 SQ. FT.	ADDRESS:		
CITY, ST:		% OF GLASS TO FLOOR AREA: 0.4%	CITY, ST:		
PHONE:			PHONE:		

DESCRIPTION	"U"-VALUE or R-VALUE	ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6	UNITS	HEAT LOSS TOTALS
INSULATED WINDOW AREA (U-VALUE)	0.39	45						SQ. FT.	1,176 BTU/HR
INSULATED DOOR AREA (U-VALUE)	0.15	2,236						SQ. FT.	22,472 BTU/HR
INSULATED SKYLIGHTS (U-VALUE)	0.66							SQ. FT.	
EXTERIOR WALL HEIGHT----->		20.0						HEIGHT	
LENGTH OF UNHEATED EXTERIOR EDGE----->		440						LN. FT.	
INSULATED WALL AREA (R-VALUE)	19.00	6,519						SQ. FT.	22,988 BTU/HR
ADDITIONAL INSULATED WALL AREA	19.00							SQ. FT.	
TOTAL GROSS FLOOR AREA----->		11,200						SQ. FT.	
INSULATED FLOOR AREA (R-VALUE)	19.00							SQ. FT.	
INSULATED SLAB AREA* (R-VALUE)	10.00	8,000						SQ. FT.	17,496 BTU/HR
INSULATED CEILING AREA (R-VALUE)	30.00	8,000						SQ. FT.	17,867 BTU/HR
ADDITIONAL AIR VOLUME----->								CU. FT.	
TOTAL AIR VOLUME ----->		224,000						CU. FT.	486,259 BTU/HR
AIR CHANGES PER HOUR----->		1.80	1.80	1.80	1.80	1.80	1.80	ACH	
TOTAL HEAT LOSS PER ZONE----->		550,762						BTU/HR	568,258 BTU/HR

*SLAB LOSS FIGURED BELOW

KITEC® RADIANT DESIGN WORKSHEET

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INPUT VALUES	ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6	UNITS
To-OUTDOOR DESIGN TEMPERATURE	-7	-7	-7	-7	-7	-7	DEG. F
Ta-ROOM TEMPERATURE	60	60	60	60	60	60	DEG. F
Qr-RADIANT FLOOR LOAD AT DESIGN CONDITIONS	550,762						BTU/HR
A-NET RADIANT SLAB SURFACE AREA	11,200						SQ. FT.
Ua-ENERGY TRANSFER FROM RADIANT SURFACE	2	2	2	2	2	2	BTU/HR/SQ. FT./DEG. F
TYPE OF FLOOR or SURFACE COVERING	Bare Slab	Bare Slab	Bare Slab	Bare Slab	Bare Slab	Bare Slab	
Uc-U-VALUE OF FLOOR COVERING	30.00	30.00	30.00	30.00	30.00	30.00	BTU/HR/SQ. FT./DEG. F
Us-ESTIMATED U-VALUE WITHIN SLAB	1.01	1.01	1.01	1.01	1.01	1.01	BTU/HR/SQ. FT./DEG. F
De-DEPTH OF TUBING IN SLAB OR THICKNESS OF FLOOR	2.00	2.00	2.00	2.00	2.00	2.00	INCHES
Qi-INTERIOR SLAB HEAT LOSS	2.00	2.00	2.00	2.00	2.00	2.00	BTU/HR/SQ. FT.
Ue-U-VALUE AT SLAB EDGE	0.10	0.10	0.10	0.10	0.10	0.10	BTU/HR/SQ. FT./DEG. F
TYPE OF TRANSFER FLUID	25% Glycol	25% Glycol	25% Glycol	25% Glycol	25% Glycol	25% Glycol	FLUID
Df-DENSITY OF HEAT TRANSFER FLUID	8.55	8.55	8.55	8.55	8.55	8.55	LBS/GAL.
Cf-HEAT CAPACITY OF HEAT TRANSFER FLUID	0.93	0.93	0.93	0.93	0.93	0.93	BTU/LB/DEG. F
Td-FLUID TEMPERATURE DROP	20	20	20	20	20	20	DEG. F
Le-DESIRED LOOP LENGTH	250	250	250	250	250	250	FT.
Sp-AVERAGE PIPE SPACING	12	12	12	12	12	12	INCHES ON CENTER
INSTALLATION METHOD	Slab on Grade	Slab on Grade	Slab on Grade	Slab on Grade	Slab on Grade	Slab on Grade	
CALCULATED VALUES	ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6	
1. Tr-DESIGN TEMPERATURE DIFFERENTIAL	67	67	67	67	67	67	DEG. F
2. Qu-HEAT LOAD PER SQ. FT. OF RADIANT SURFACE	49.18						BTU/HR/SQ. FT.
3. Tc-SURFACE TEMPERATURE OF FLOOR COVERING	85						DEG. F

4. Ts-SURFACE TEMPERATURE OF RADIANT SURFACE	87						DEG. F		
5. Tf-AVERAGE TEMPERATURE OF TRANSFER FLUID	136						DEG. F		
6. Ti-SUPPLY TEMPERATURE OF TRANSFER FLUID	146						DEG. F		
7. Te-TEMPERATURE DIFFERENCE AT SLAB EDGE	94						DEG. F		
8. Qi-INTERIOR SLAB HEAT LOSS TO GROUND	13,360						BTU/HR		
9. Qe-EDGE SLAB HEAT LOSS TO GROUND	4,136						BTU/HR		
10. Qg-TOTAL SLAB HEAT LOSS TO GROUND	17,496						BTU/HR		
11. Qt-TOTAL HEAT LOAD AT DESIGN CONDITIONS	568,258						BTU/HR		
12. Qut-TOTAL HEAT LOAD PER SQ. FT.	50.74						BTU/HR/SQ. FT.		
13. V-HEAT TRANSFER FLUID FLOW RATE	59.55						GPM		
14. Pd-PRESSURE DROP ACROSS KITEC® PIPING	6.78						PSI		
SELECTED KITEC® PIPE SIZE†	1/2" KITEC®						SIZE		
TOTAL NUMBER OF LOOPS	45						LOOPS		
ESTIMATED TOTAL FEET OF KITEC® RADIANT PIPING	11,250						LN. FT.		
REQUIRED AUXILIARY HEAT OUTPUT AT DESIGN							BTU/HR		
HYDRONIC BASEBOARD (580 BTU/FT. @180 DEG. F)							LN. FT.		
OPTIONALLY INCREASE RADIANT SURFACE AREA							SQ. FT.		
ENTER ACTUAL SUPPLIED AUXILIARY HEAT OUTPUT---->							BTU/HR		
†For Larger Size Consult IPEX, Inc. Des Moines Weather Data Information							Data Summary Table No. 1		
FUEL TYPE	LOCAL FUEL COST	UNITS	COST PER MILLION BTU BASED ON 100% EFFICIENCY		Deg. Day Base	TOTAL Deg. Days	TOTAL RADIANT SURFACE: 11,200 SQ. FT.		
NATURAL GAS	\$0.95	THERM	\$9.50		65 DEG. F	6,588	REVISED HEAT LOSS: 568,258 BTU/HR		
ELECTRICITY	\$0.08	PER KWH	\$23.44		60 DEG. F	4,875	TOTAL FLOW RATE: 59.55 GPM		
OIL		PER GAL.			55 DEG. F	3,266	AVERAGE SUPPLY TEMP: 146 DEG. F		
PROPANE	\$2.05	PER GAL.	\$22.41		50 DEG. F	1,992	TOTAL NUMBER OF LOOPS: 45 LOOPS		
							TOTAL KITEC® FOOTAGE: 11,250 LN. FT.		
FUEL/ EFFICIENCY		TYPE	ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6	ZONE COST TOTAL
NATURAL GAS	90%	CENTRAL FORCED AIR	\$14,155.22						\$14,155.22
	90%	ZONED HYDRO-AIR™ HEAT	\$12,045.80						\$12,045.80
	90%	ZONED RADIANT FLOOR	\$10,474.61						\$10,474.61
ELECTRICITY	100%	CENTRAL FORCED AIR	\$31,433.53						\$31,433.53
	100%	ZONED HYDRO-AIR™ HEAT	\$26,749.28						\$26,749.28
	100%	ZONED RADIANT FLOOR	\$23,260.24						\$23,260.24
OIL	90%	CENTRAL FORCED AIR							
	90%	ZONED HYDRO-AIR™ HEAT							
	90%	ZONED RADIANT FLOOR							
PROPANE	90%	CENTRAL FORCED AIR	\$33,391.42						\$33,391.42
	90%	ZONED HYDRO-AIR™ HEAT	\$28,415.40						\$28,415.40
	90%	ZONED RADIANT FLOOR	\$24,709.05						\$24,709.05
NOTE-These calculated annual cost estimates are based on 20 year average weather data and do not represent a guarantee of performance. Estimates are for space heating only and do not include the effects of passive solar or other internal gains as these factors are impossible to predict or control. These estimates should be used for comparative purposes only! All area measurements and "U"-Values are supplied by the Builder and/or the Architect. IPEX, Inc. assumes no responsibility for the accuracy of these measurements. All calculations are based upon these figures. Local fuel cost are estimated as closely as possible from local sources. It is the responsibility of the owner to obtain a quote for the cost of these fuels from the various suppliers. Your actual cost will vary from these figures, based on lifestyle, meter charges, connection fees and other additional charges. These annual cost comparisons are for space heating only, and <u>do not</u> include the cost of Domestic Hot Water, lighting and other energy uses.									
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Worksheet No. 1

Provides total Heat Loss for each area in BTU/HR.

AREA	ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6
WINDOW	1,176					
DOOR	22,472					
SKYLIGHT						
WALL 1	22,988					
WALL 2						
FLOOR						
SLAB	17,496					
CEILING	17,867					
AIR INFILTRATE	486,259					
TOTAL----->	568,258					

Notes:
Window Area

Triple Glazed ▼

Door Area

Insulated Core ▼

Skylight Area

Double Glazed ▼

Wall Area No. 1

6" Insulation ▼

Wall Area No. 2

6" Insulation ▼

Floor Loss Area

6" Insulation ▼

Slab Loss Area

2" Insulation ▼

Ceiling Loss Area

10" Fiberglass ▼

☐

CANAD

Calgary ▼

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U.S.A.

Des Moines ▼

Your project contains one or more of the following elements:

- | | | |
|---|--|---------------------------------------|
| <input type="checkbox"/> Commercial | <input type="checkbox"/> New Construction | <input type="checkbox"/> Natural Gas |
| <input type="checkbox"/> Residential | <input type="checkbox"/> Retrofit/Remodel | <input type="checkbox"/> Electricity |
| <input type="checkbox"/> Industrial | <input type="checkbox"/> System Upgrade | <input type="checkbox"/> Fuel Oil |
| <input type="checkbox"/> Radiant Floor | <input type="checkbox"/> Multi-Zone | <input type="checkbox"/> Propane |
| <input type="checkbox"/> Domestic Hot | <input type="checkbox"/> Hydro-Air Heat | <input type="checkbox"/> Wood Heat |
| <input type="checkbox"/> Domestic Cold | <input type="checkbox"/> Hydro-Air Cool | <input type="checkbox"/> Coal Heat |
| <input type="checkbox"/> Ground Loop | <input type="checkbox"/> Hydro-Baseboard | <input type="checkbox"/> Solar Heat |
| <input type="checkbox"/> Root Bed Heat | <input type="checkbox"/> Spa/Pool Heating | <input type="checkbox"/> Ice Storage |
| <input type="checkbox"/> Sports Field | <input type="checkbox"/> Sauna/Jacuzzi | <input type="checkbox"/> Heat Storage |
| <input type="checkbox"/> Sterilize Soil | <input type="checkbox"/> Outdoor Controls | <input type="checkbox"/> Waste Heat |
| <input type="checkbox"/> Eave Melting | <input type="checkbox"/> Heat Distribution | <input type="checkbox"/> Heat Pump |
| <input type="checkbox"/> Compressed Air | <input type="checkbox"/> Cool Distribution | <input type="checkbox"/> Chiller |

Floor Covering
Fluid Type
Installation Type
Desired Pipe Size
Notes:

ZONE 1	Bare Slab ▼	25% Glycol ▼	Slab on Grade ▼	1/2" KITEC® ▼
ZONE 2	Bare Slab ▼	25% Glycol ▼	Slab on Grade ▼	1/2" KITEC® ▼
ZONE 3	Bare Slab ▼	25% Glycol ▼	Slab on Grade ▼	1/2" KITEC® ▼
ZONE 4	Bare Slab ▼	25% Glycol ▼	Slab on Grade ▼	1/2" KITEC® ▼
ZONE 5	Bare Slab ▼	25% Glycol ▼	Slab on Grade ▼	1/2" KITEC® ▼
ZONE 6	Bare Slab ▼	25% Glycol ▼	Slab on Grade ▼	1/2" KITEC® ▼

RADIANT SELECTION CHART

Data Summary Table No. 2

Kitec® Summary for Multiple Unit projects.

ZONE OR AREA DESCRIPTION	RADIANT AREA (SQ.FT.)	HEAT LOAD (BTU/HR)	FLOW RATE (US GPM)	SUPPLY TEMP. (DEG. F)	NUMBER OF LOOPS	TOTAL FOOTAGE (LN. FT.)
ZONE 1	11,200	568,258	59.55	146	45	11,250
ZONE 2						
ZONE 3						
ZONE 4						
ZONE 5						
ZONE 6						
TOTAL OF PAGES	11,200	568,258	59.55		45	11,250

Notes: