

## MULTI-ZONE HEAT LOSS DESIGN ANALYSIS Page 1 DATE: **ENERGY CODE INFORMATION** DESIGNER: Donald JOB NAME: McGreal Farms COMPANY: FLOOR AREA: 11.200 SQ. FT. COMPANY: Consolidated Building Centers Radian ADDRESS: 1035 W WINDOW AREA: 45 SQ. FT. ADDRESS: CITY, ST: % OF GLASS TO CITY, ST: Wausa PHONE: FLOOR AREA: 0.4% PHONE: 715-85 ZONE 1 ZONE 2 ZONE 3 **ZONE 4** ZONE 5 ZONE 6 DESCRIPTION UNITS HEAT LOSS "U"-VALUE or R-VALUE **TOTALS** 45 SQ. FT. 983 BTU/HR INSULATED WINDOW AREA (U-VALUE) 0.39 INSULATED DOOR AREA (U-VALUE) 0.15 2.236 SQ. FT. 18.782 BTU/HR INSULATED SKYLIGHTS (U-VALUE) 0.66 SQ. FT. BTU/HR EXTERIOR WALL HEIGHT-----20.0 HEIGHT LENGTH OF UNHEATED EXTERIOR EDGE-----> 440 LN. FT. INSULATED WALL AREA (R-VALUE) 6,519 SQ. FT. **19,214** BTU/HR 19.00 ADDITIONAL INSULATED WALL AREA 19.00 SQ. FT. BTU/HR TOTAL GROSS FLOOR AREA------11,200 SQ. FT. INSULATED FLOOR AREA (R-VALUE) SQ. FT. BTU/HR 19.00 INSULATED SLAB AREA\* (R-VALUE) 10.00 SQ. FT. BTU/HR INSULATED CEILING AREA (R-VALUE) 30.00 SQ. FT. BTU/HR ADDITONAL AIR VOLUME----CU. FT. TOTAL AIR VOLUME -----224.000 CU. FT. 225,792 BTU/HR AIR CHANGES PER HOUR-----1.00 0.09 0.090.50 0.50 0.50 ACH TOTAL HEAT LOSS PER ZONE-----> 264,771 BTU/HR **264,771** BTU/HR KITEC® RADIANT DESIGN WORKSHEET \*SLAB LOSS FIGURED BELOW © Copyright 1997-98 Bio-Radiant Energy, Inc. All Rights Reserved INPUT VALUES ZONE 1 ZONE 3 ZONE 4 UNITS ZONE 2 ZONE 5 **ZONE 6** To-OUTDOOR DESIGN TEMPERATURE 4 4 4 4 DEG. F 60 70 70 70 70 Ta-ROOM TEMPERATURE 70 DEG. F Qr-RADIANT FLOOR LOAD AT DESIGN CONDITIONS 264,771 BTU/HR A-NET RADIANT SLAB SURFACE AREA 11.200 SQ. FT. Ua-ENERGY TRANSFER FROM RADIANT SURFACE 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 30.00 Uc-U-VALUE OF FLOOR COVERING 30.00 30.00 30.00 30.00 30.00 BTU/HR/SQ. FT./DEG. F Us-ESTIMATED U-VALUE WITHIN SLAB 1.21 1.21 1.21 1.21 1.21 1.21 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 INCHES ON CENTER **INSTALLATION METHOD** Slab on Grade **CALCULATED VALUES** ZONE 1 ZONE 5 ZONE 2 ZONE 3 ZONE 4 ZONE 6 1. Tr-DESIGN TEMPERATURE DIFFERENTIAL 56 66 66 66 66 **66** DEG. F

BTU/HR/SQ. FT.

DEG. F

2. Qu-HEAT LOAD PER SQ. FT. OF RADIANT SURFACE

3. Tc-SURFACE TEMPERATURE OF FLOOR COVERING

23.64

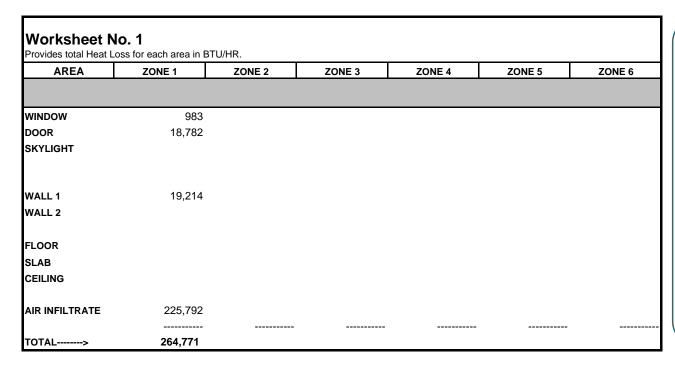
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4. Ts-SURFA	ACE TEMPERATURE OF RA	DIANT SURFACE	73						DEG. F	
5. Tf-AVERAGE TEMPERATURE OF TRANSFER FLUID		93						DEG. F		
6. Ti-SUPPLY TEMPERATURE OF TRANSFER FLUID		103	103					DEG. F		
7. Te-TEMPE	ERATURE DIFFERENCE AT	SLAB EDGE	69						DEG. F	
8. Qi-INTERIOR SLAB HEAT LOSS TO GROUND								BTU/HR		
9. Qe-EDGE	SLAB HEAT LOSS TO GRO	UND						BTU/HR		
10. Qg-TOTAL	_ SLAB HEAT LOSS TO GRO	DUND						BTU/HR		
11. Qt-TOTAL	HEAT LOAD AT DESIGN CO	ONDITIONS	264,771					BTU/HR		
12. Qut-TOTA	L HEAT LOAD PER SQ. FT.		23.64					BTU/HR/SQ. FT.		<del>-</del> T.
	RANSFER FLUID FLOW RA		27.75					GPM		
14. Pd-PRESS	SURE DROP ACROSS <b>KITE</b>	<b>C</b> ® PIPING	0.76					PSI		
SELECTED K	ITEC® PIPE SIZE†		1/2" KITEC®					SIZE		
TOTAL NUMB	BER OF LOOPS		67					LOOPS		
ESTIMATED T	TOTAL FEET OF <b>KITEC</b> ® RA	ADIANT PIPING	16,750						LN. FT.	
REQUIRED A	<b>UXILIARY HEAT</b> OUTPUT A	AT DESIGN							BTU/HR	
HYDRONIC BASEBOARD (580 BTU/FT. @180 DEG. F)		@180 DEG. F)							LN. FT.	
OPTIONALLY INCREASE RADIANT SURFACE AREA		FACE AREA							SQ. FT.	
ENTER ACTUAL SUPPLIED AUXILIARY HEAT OUTPUT>								BTU/HR		
†For Larger Si	ize Consult IPEX, Inc.	St. Louis	Weather Data Information Data S				Data Sun	ummary Table No. 1		
FUEL TYPE LOCAL UNITS			COST PER MILLION BTU					TOTAL RADIANT		11,200 SQ. FT.
	FUEL COST		BASED	ON 100% EFFICIE	NCY	Base	Deg. Days	REVISED HEAT L	OSS:	264,771 BTU/HR
NATURAL GA	S \$0.95	THERM		\$9.50		65 DEG. F	4,900	TOTAL FLOW RAT	TE:	<b>27.75</b> GPM
ELECTRICITY	( \$0.08	PER KWH		\$23.44		60 DEG. F	3,626	AVERAGE SUPPL	Y TEMP:	103 DEG. F
OIL		PER GAL.				55 DEG. F	2,429	TOTAL NUMBER		67 LOOPS
PROPANE	\$2.05	PER GAL.		\$22.41		50 DEG. F	1,482	TOTAL <b>KITEC</b> ® F	OOTAGE:	<b>16,750</b> LN. FT.
FUEL/ EFFICI			ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6	ZONE	COST TOTAL
NATURAL	90% CENTRAL FORCE		\$5,869.09							\$5,869.09
GAS	90% ZONED HYDRO-AII		\$4,994.60							\$4,994.60
	90% ZONED RADIANT F		\$4,343.13							\$4,343.13
ELECTRICITY			\$13,033.09							\$13,033.09
	100% ZONED HYDRO-AII		\$11,091.16							\$11,091.16
OII	100% ZONED RADIANT F		\$9,644.48							\$9,644.48
OIL	90% CENTRAL FORCE									
	90% ZONED HYDRO-AII									
PROPANE	90% ZONED RADIANT F		642 044 00							¢42 044 00
PROPANE	90% ZONED HYDRO-All		\$13,844.88 \$11,781.99							\$13,844.88 \$11,781.99
	90% ZONED HYDRO-AII		\$11,781.99 \$10,245.21							\$11,781.99 \$10,245.21
	90% ZONED RADIANT F	LOOK	φ1U,Z43.Z1							φ 1U,Z4J.Z I

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 do not include the effects of passive solution. These estimates are for space heating only and do not include the effects of passive solution. These estimates are for space heating only and do not include the effects of passive solution. All Rights Reserved.



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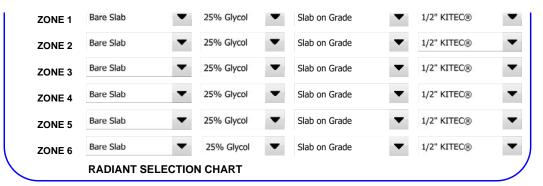
Notes	:		

				$\overline{}$
/	Window Area	a	Triple Glazed	•
	Door Area		Insulated Core	•
	Skylight Area	а	Double Glazed	$\overline{}$
	Wall Area No	o. 1	6" Insulation	•
	Wall Area No. 2		6" Insulation	
	Floor Loss Area		6" Insulation	•
	Slab Loss Ar	rea	2" Insulation	•
	Ceiling Loss Area		10" Fiberglass	•
	$\circ$	CANAD	Calgary	•
/	• (	J.S.A.	St. Louis	•

Your project contains one or more of the following elements:								
	Commercial	New Construction		Natural Gas				
	Residential	Retrofit/Remodel		Electricity				
	Industrial	System Upgrade		Fuel Oil				
	Radiant Floor	Multi-Zone		Propane				
	Domestic Hot	Hydro-Air Heat		Wood Heat				
	Domestic Cold	Hydro-Air Cool		Coal Heat				
	Ground Loop	Hydro-Baseboard		Solar Heat				
	Root Bed Heat	Spa/Pool Heating		Ice Storage				
	Sports Field	Sauna/Jacuzzi		Heat Storage				
	Sterilize Soil	Outdoor Controls		Waste Heat				
	Eave Melting	Heat Distribution		Heat Pump				
	Compressed Air	Cool Distribution		Chiller				

Floor Covering Fluid Type Installation Type Desired Pipe Size

Notes:



## Data Summary Table No. 2 Kitec® Summary for Multiple Unit projects. RADIANT AREA NUMBER OF ZONE OR AREA HEAT LOAD FLOW RATE SUPPLY TEMP. TOTAL FOOTAGE **DESCRIPTION** (US GPM) LOOPS (SQ.FT.) (BTU/HR) (DEG. F) (LN. FT.) ZONE 1 11,200 264,771 27.75 103 67 16,750 **ZONE 2** ZONE 3 **ZONE 4** ZONE 5 **ZONE 6**

Notes:

TOTAL OF PAGES 11,200 264,771 27.75 67 16,750