RESET

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COMMERCIAL HEAT GAIN - HEAT LOSS CALCULATION LOAD FORM

Job Name: _____

Address: _____

Phone/Fax/Email: _____

Contractor: _____

Address: _____

Phone/Fax/Email: _____

Heat Gain Summary

Sensible Heat (Btu/h)	
Latent Heat (Btu/h)	
Total Heat Gain (Btu/h)	

Total (Tons)

Heat Loss Summary

Total (Btu/h)	

COMMERCIAL HEAT GAIN CALCULATIONS

DESIGN CONDITIONS - HEAT GAIN (Cooling Load)

Indoor Design Temperature		A2	Outdoor Design Temperature		D2
Design Grains		B2	Daily Range		E2
Peak Time of Day		C2	Latitude		F2

Equation # HG1 --> Outdoor Design Temperature Adjustment G2)

=	Daily Range E2	x	Factor			
=		x		=		G2

Equation # HG2 --> Summer Design Temperature ΔT (H2) = D2 - G2 - A2

Outdoor Design Temperature			D2
Outdoor Design Temperature Adjustment	-		G2
Indoor Design Temperature	-		A2
Summer Design Temperature ΔT	=		H2

Equation # HG3 --> Equivalent Temperature Difference (ETD) Correction Factor (K2)

Steps a)	H2 - 20 =		=		I2
b)	0.5 x (20 - E2) =		=		J2
c)	I2 + J2 =		=		K2

COMMERCIAL HEAT GAIN CALCULATIONS

1. TRANSMISSION HEAT GAIN								SENSIBLE	LATENT
		Area	x	U-value	x	Temperature Difference		Btu/h	Btu/h
								---	---
a) Glass								---	---
			x		x		=		---
			x		x		=		---
			x		x		=		---
			x		x		=		---
								---	---
b) Net Walls								---	---
(Exterior)			x		x		=		---
Use ETD			x		x		=		---
			x		x		=		---
			x		x		=		---
								---	---
c) Doors								---	---
			x		x		=		---
			x		x		=		---
			x		x		=		---
			x		x		=		---
								---	---
d) Partitions								---	---
(Interior)			x		x		=		---
Use Actual			x		x		=		---
Temp. Diff.			x		x		=		---
			x		x		=		---

								---	
e) Floors			x		x		=		---
								---	---
								---	
f1) Roof			x		x		=		---
f2) Roof/Ceiling			x		x		=		---
f3) RA Ceiling	A3		x		x		=		A3
								---	---
		Δ	HEAT GAIN SUB TOTAL PAGE 3				Btu/h		---
		Δ	Place These Values on Page 8					SENSIBLE	LATENT

COMMERCIAL HEAT GAIN CALCULATIONS

2. SOLAR RADIATION HEAT GAIN THROUGH GLASS								---	---
Glass Type (W) (D) (O)		**Area**	**x**	**Solar Factor**	**x**	**Shading Factor**		--- ---	--- ---
			x		x		=		---
			x		x		=		---
			x		x		=		---
			x		x		=		---
			x		x		=		---
			x		x		=		---
			x		x		=		---
			x		x		=		---
3. INTERNAL HEAT GAINS								---	---
3a) Occupants Activity		**Number**	**x**	**Sensible**	**OR**	**Latent**		--- ---	--- ---
1)			x		x	---	=		---
2)			x		x	---	=		---
1)			x	---	x		=	---	
2)			x	---	x		=	---	
								---	---
3b) Lights		**Number of Fixtures**	**x**	**Watts per Fixture**	**x**	**Conversion Factor**		--- --- ---	--- --- ---
Incandescent			x		x	**3.4**	=		---
Fluorescent			x		x	**4.1**	=		---
								---	---
3c) Appliances/Motors		**Usage Factor**	**x**	**Sensible**	**OR**	**Latent**		---	---
			x		x	---	=		---
			x		x	---	=		---
			x		x	---	=		---
			x	---	x		=	---	
			x	---	x		=	---	
			x	---	x		=	---	
		Δ	**HEAT GAIN SUB TOTAL PAGE 4**				**Btu/h**		
		Δ	**Place These Values on Page 8**					**SENSIBLE**	**LATENT**

COMMERCIAL HEAT GAIN CALCULATIONS

4. INFILTRATION HEAT GAIN

4a) Structural Infiltration

Volume of Conditioned Space _____ A5

Pressure Condition _____ C5

Quality of Construction _____ B5

Air Changes/Hour _____ D5

Structrural Infiltration = AC/hr x Volume of Conditioned Space / 60 min/hr =

D5 x A5 / 60 = _____ / 60

_____ CFM E5

4b) Door Infiltration

Peak Time of Day Occupancy _____ F5

Number of Doors _____ H5

Average Length of Stay _____ G5

Number of Occupants _____ I5

Traffic Rate (TR) = # of Occupants x Openings / # of Doors x Average Length of Stay J5

Summer TR I5 x 2 / H5 x G5 = _____ = _____ J5

Door(1) CFM x # of Doors = _____ CFM K5a

Door(2) CFM x # of Doors = _____ CFM K5b

4c) Total Infiltration CFM

Total Infiltrartion = Structural Infiltration + Door(s) Infiltration

= E5 + K5a + K5b = _____ CFM L5

COMMERCIAL HEAT GAIN CALCULATIONS

4d) Infiltration Heat Gain							---	---
							---	---
Sensible Loads Exterior	**Total Infiltration**	**x**	**Summer Design Temperature ΔT (H2)**	**x**	**1.1**		---	---
							---	---
	=		**x**	**x**	**1.1**	**=**		---
							---	---
							---	---
Sensible Loads Interior	**Total Infiltration**	**x**	**Actual Temperature Difference ΔT**	**x**	**1.1**		---	---
							---	---
a)	**=**		**x**	**x**	**1.1**	**=**		---
							---	---
b)	**=**		**x**	**x**	**1.1**	**=**		---
							---	---
							---	---
Latent Loads Exterior	**Total Infiltration (L5)**	**x**	**Design Grains (B2)**	**x**	**0.68**		---	---
							---	---
	=		**x**	**x**	**0.68**	**=**	---	
							---	---

Interior	**Total Infiltration**	**x**	**Design Grains**	**x**	**0.68**		---	---
							---	---
a)	**=**		**x**	**x**	**0.68**	**=**	---	
							---	---
b)	**=**		**x**	**x**	**0.68**	**=**	---	
							---	---
		Δ	**HEAT GAIN SUB TOTAL PAGE 6**			**Btu/h**		
		Δ	**Place These Values on Page 8**				**SENSIBLE**	**LATENT**

COMMERCIAL HEAT GAIN CALCULATIONS

5. DUCT HEAT GAIN

					SENSIBLE	LATENT
SENSIBLE HEAT GAIN SUB TOTAL PAGE 3 =		Page 3			---	
SENSIBLE HEAT GAIN SUB TOTAL PAGE 4 =		Page 4			---	---
SENSIBLE HEAT GAIN SUB TOTAL PAGE 6 =		Page 6			---	---
SENSIBLE SUB TOTAL Pages 3 & 4 & 6 =		A7			---	---
					---	---
	A7	x	Duct Factor		---	---
Supply Duct Heat Gain =		x		=		---
					---	---
Return Duct Heat Gain =		x		=		---
					---	---

6. VENTILATION

Number of Occupants		CFM per Person			---	---
	B7		C7		---	---
					---	---
Occupant CFM	B7 x	C7	Total CFM		---	---
=	x	=	CFM	D7	---	---
					---	---
Total Exhaust CFM =		(From Design Specifications)		E7	---	---
					---	---
Determine Total Ventilation					---	---
Select D7 OR E7 --> Whichever Is The Greatest			CFM	F7	---	---
					---	---
Sensible Load = Total Ventilation (F7) x Summer Design Temperature ΔT (H2) x 1.1					---	---
x		x 1.1		=		---
					---	---
Latent Load = Total Ventilation (F7) x Design Grains (B2) x 0.68					---	---
x		x 0.68		=	---	
					---	---

Δ	**HEAT GAIN SUB TOTAL PAGE 7**	Btu/h		
Δ	**Place These Values on Page 8**		SENSIBLE	LATENT

COMMERCIAL HEAT GAIN CALCULATIONS

7. RETURN AIR PLENUM HEAT GAIN

						Btu/h			
Incandescent Lights (Watts)			x 3.4 x 0.40 =				A8	---	---
Flourescent Lights (Watts)			x 4.1 x 0.40 =				B8	---	---
Walls	Area	x	U-Value		ETD			---	---
N)		x		x		=	C8	---	---
E)		x		x		=	D8	---	---
W)		x		x		=	E8	---	---
S)		x		x		=	F8	---	---
	Area	x	U-Value		ETD			---	---
Roof		x		x		=	G8	---	---
	Sub Total = A8 + B8 + C8 + D8 + E8 + F8 + G8					=	H8	---	---
					H8	-	A3	---	---
	Return Air Plenum Heat Gain =					-	=		---

Δ HEAT GAIN SUB TOTAL PAGE 8	Btu/h		---
		SENSIBLE	LATENT

8. TOTAL HEAT GAIN SUMMARY

		SENSIBLE	LATENT
Δ HEAT GAIN SUB TOTAL PAGE 3	=		
Δ HEAT GAIN SUB TOTAL PAGE 4	=		
Δ HEAT GAIN SUB TOTAL PAGE 6	=		
Δ HEAT GAIN SUB TOTAL PAGE 7	=		
Δ HEAT GAIN SUB TOTAL PAGE 8	=		
* TOTAL HEAT GAIN (Btu/h)	=		

* Place These Values on Front Cover Page (Page 1)

COMMERCIAL HEAT LOSS CALCULATIONS

Job Name: _____

DESIGN CONDITIONS - HEAT LOSS (Heating Load)

Indoor Design Temperature		A9	Indoor Design % RH		C9
Outdoor Design Temperature		B9			

Equation # HL1 --> Winter Design Temperature ΔT (D9) = A9 - B9

Indoor Design Temperature			A9
Outdoor Design Temperature	-		B9
Winter Design Temperature ΔT			D9

TOTAL HEAT LOSS SUMMARY

			SENSIBLE	
Δ	HEAT LOSS SUB TOTAL PAGE 10	=		
Δ	HEAT LOSS SUB TOTAL PAGE 12	=		
Δ	HEAT LOSS SUB TOTAL PAGE 13	=		
	* TOTAL HEAT LOSS (Btu/h)	=		

* Place This Value on Front Cover Page (Page 1)

COMMERCIAL HEAT LOSS CALCULATIONS

1. TRANSMISSION HEAT LOSS								SENSIBLE	
		Area	x	U-value	x	Temperature Difference		Btu/h	
								---	---
a) Glass			x		x		=		---
			x		x		=		---
			x		x		=		---
			x		x		=		---
b) Net Walls			x		x		=		---
Exterior			x		x		=		---
Use Actual			x		x		=		---
Temp. Diff.			x		x		=		---
c) Doors			x		x		=		---
			x		x		=		---
			x		x		=		---
			x		x		=		---
d) Partitions			x		x		=		---
(Interior)			x		x		=		---
Use Actual			x		x		=		---
Temp. Diff.			x		x		=		---
e) Floors			x		x		=		---
f1) Roof			x		x		=		---
f2) Roof/Ceiling			x		x		=		---
g) Slab Floors		Exposed Perimeter	x	U-value	x	Temperature Difference		---	---
								---	---
			x		x		=		---
h) Below Grade Walls				Area	x	Factor		---	---
h1) 2 - 5 Feet Below Grade							=		---
h2) More than 5 Feet Below Grade							=		---
h3) Basement Floor							=		---
		Δ	HEAT LOSS SUB TOTAL PAGE 10				Btu/h		A10
		Δ	Place This Value on Page 9					SENSIBLE	

COMMERCIAL HEAT LOSS CALCULATIONS

2. INFILTRATION LOSS GAIN

2a) Structural Infiltration

Volume of Conditioned Space: _____ A11

Pressure Condition: _____ C11

Quality of Construction: _____ B11

Air Changes/Hour: _____ D11

Structrural Infiltration = AC/hr x Volume of Conditioned Space / 60 min/hr

$$\frac{A11 \times D11}{60} = \frac{\quad}{60}$$

_____ CFM E11

2b) Door Infiltration

Peak Time of Day Occupancy: _____ F11

Number of Doors: _____ H11

Average Length of Stay: _____ G11

Number of Occupants: _____ I11

Traffic Rate (TR) = # of Occupants x Openings / # of Doors x Average Length of Stay J11

Winter TR $\frac{I11 \times 2}{H11 \times G11} =$ _____ = J11

Door(1) CFM x # of Doors = _____ CFM K11a

Door(2) CFM x # of Doors = _____ CFM K11b

2c) Total Infiltration CFM

Total Infiltrartion CFM = Structural Infiltration + Door(s) Infiltration

= E11 + K11a + K11b = _____ CFM L11

COMMERCIAL HEAT LOSS CALCULATIONS

2d) Infiltration Heat Loss

Sensible Loads Exterior

Total Infiltration x Winter Design Temperature ΔT (D9) x 1.1

= [ ] x [ ] x 1.1 =

Sensible Loads Interior

Total Infiltration x Actual Temperature Difference (ΔT) x 1.1

a) = [ ] x [ ] x 1.1 =

b) = [ ] x [ ] x 1.1 =

USE THIS VALUE ONLY TO DETERMINE SUBTOTAL **A12**

3. DUCT HEAT LOSS

SENSIBLE HEAT LOSS SUB TOTAL A10 (page 10)	=			
INFILTRATION HEAT LOSS A12 (Page 12)	=			
SENSIBLE SUB TOTAL (A10 + A12)	=		B12	

	B12	x	Duct Factor		
Supply Duct Heat Loss =		x		=	
Return Duct Heat Loss =		x		=	

Δ **HEAT LOSS SUB TOTAL PAGE 12** Btu/h

Δ **Place This Value on Page 9** SENSIBLE

COMMERCIAL HEAT LOSS CALCULATIONS

4. VENTILATION

Number of Occupants | CFM per Person

	A13		B13

Occupant CFM = A13 x B13 = Total CFM

=		x	=	CFM	C13

Total Exhaust CFM = _____ (From Design Specifications) D13

Determine Total Ventilation

Select C13 OR D13 --> Whichever Is The Greatest _____ CFM E13

Sensible Load = Total Ventilation (E13) x Winter Design Temperature ΔT (D9) x 1.1

	x	x 1.1	=

5. HUMIDIFICATION REQUIREMENTS

Total Infiltration CFM (L11) + Total Ventilation CFM (E13) = Total CFM

	+		F13

Sensible Heat Loss = $\frac{\text{Total CFM (F13) x Humidification Heat Loss}}{100}$

=	x	G13	=	
	100			

Δ	**HEAT LOSS SUB TOTAL PAGE 13**	Btu/h		---
Δ	**Place This Value on Page 9**		SENSIBLE	

COMMERCIAL HEAT GAIN - HEAT LOSS CALCULATION LOAD FORM

CALCULATIONS AND NOTES

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