THERMAL MANAGEMENT HEATER CALCULATION SHEET

Project: ______________________________ **Project No.:** ____________________

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Follow Steps 1-5 to determine the heating requirement of an enclosure (US units – left column, metric – right)

STEP 1: Determine the Surface Area (A) of your enclosure which is exposed to open air

Enclosure Dimension: height =__________ feet __________meters
width = __________ feet __________meters
depth = __________ feet __________meters

Choose Mounting Option from next page, and calculate the surface area as indicated

A = __________ft^2	**or**	**__________m^2**

STEP 2: Choose the Heat Transmission Coefficient (k) for your enclosure's material of construction

painted steel =	________	0.511 W/(ft^2•K)	5.5 W/(m^2•K)
stainless steel =	________	0.344 W/(ft^2•K)	3.7 W/(m^2•K)
aluminum =	________	1.115 W/(ft^2•K)	12 W/(m^2•K)
plastic (or insulated stainless) =	______	0.325 W/(ft^2•K)	3.5 W/(m^2•K)

k = ________W/(ft^2•K)	**or**	**__________(m^2•K)**

STEP 3: Determine the Temperature Differential (△T)

A. Desired enclosure interior temp. =	__________	˚F	__________	˚C
B. Lowest ambient (outside) temp. =	__________	˚F	__________	˚C
Subtract B from A + Temp. differential (△T) =	__________	˚F	__________	˚C
			△T(˚C)=△T (K)	

For these calculations, △T must be in degrees Kelvin (K).
Therefore, divide △T(˚F) by 1.8

△T = __________K	**or**	**__________K**

STEP 4: Determine Heating Power (P_v), if any (generated from existing components, i.e. transformer)

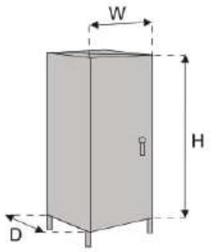
P_v = __________W	**or**	**__________W**

STEP 5: Calculate the Required Heating Power (P_v) for your enclosure based on the above values

If enclosure is located inside:	**P_H = (A x k x △T) - P_v = ______________W**
If enclosure is located outside:	**P_H = 2 x (A x k x △T) - P_v = ______________W**

ENCLOSURE MOUNTING AND SURFACE AREA CALCULATIONS

1. FREE-STANDING

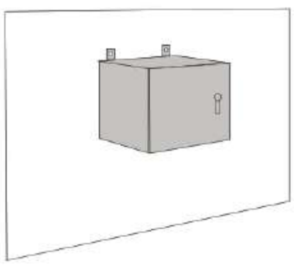


Area (A) = 1.8(H x W)
+ 1.8(H x D) + 1.8(W x D)

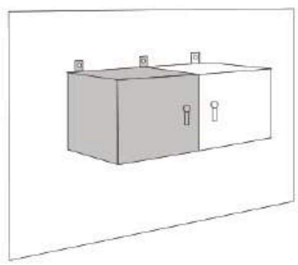
Area (A) = 1.8(H x W)
+ 1.4(H x D) + 1.8(W x D)

Area (A) = 1.8(H x W)
+ (H x D) + 1.8(W x D)

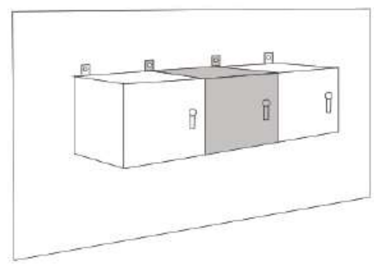
2. WALL-MOUNTED



Area (A) = 1.4(H x W)
+ 1.8(H x D) + 1.8(W x D)

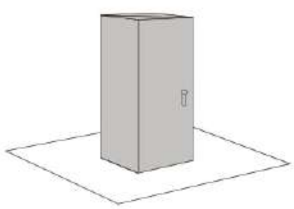


Area (A) = 1.4(H x W)
+ 1.4(H x D) + 1.8(W x D)



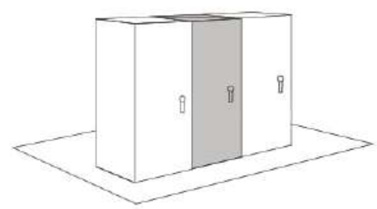
Area (A) = 1.4(H x W)
+ (H x D) + 1.8(W x D)

3. GROUND



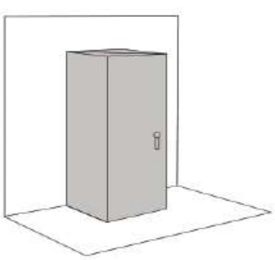
Area (A) = 1.8(H x W)
+ 1.8(H x D) + 1.4(W x D)

Area (A) = 1.8(H x W)
+ 1.4(H x D) + 1.4(W x D)

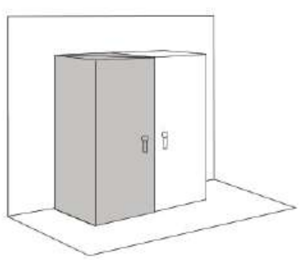


Area (A) = 1.8(H x W)
+ (H x D) + 1.4(W x D)

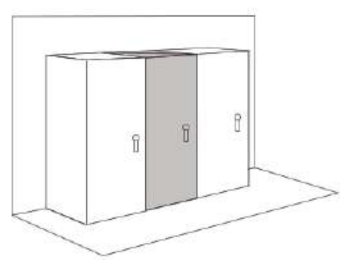
4. GROUND & WALL



Area (A) = 1.4(H x W)
+ 1.8(H x D) + 1.4(W x D)



Area (A) = 1.4(H x W)
+ 1.4(H x D) + 1.4(W x D)



Area (A) = 1.4(H x W)
+ (H x D) + 1.4(W x D)

THERMAL MANAGEMENT
FILTER FAN SIZING SHEET

Project: ______________________________ **Project No.:** ______________________

To determine the Filter Fan size for a given enclosure, use the following calculation

$$\text{Required air volume (V)} = \frac{\text{Internal heat load (Pv)}}{\text{Temperature difference } (\triangle T)} \times \text{Air constant (f)}$$

	US		Metric

STEP 1: Determine the Internal Heat Load of the enclosure (Pv)

Internal heat load, Pv (Watts) [Note: 1 Watt = 3.413 BTU/hr.]	**= ____________W**	**or**	**= ____________W**

STEP 2: Determine the Temperature Differential ($\triangle T$)

Temperature difference ($\triangle T$)	**= ____________°F**	**or**	**= ____________°C = K**

[Maximum temperature outside enclosure minus maximum allowable temperature inside enclosure]

STEP 3: Choose the Air Constant (f)

Air Constant (f)	**= ____________ft^3·°F/W min**	**or**	**= ____________m^3·K/W hr**

[Based on elevation, see below]

0 - 100 m	=>	3.3ft^3 • °F/W minor 3.1m^3 • K/W hr
100 - 250 m	=>	3.4ft^3 • °F/W minor 3.2m^3 • K/W hr
250 - 500 m	=>	3.5ft^3 • °F/W minor 3.3m^3 • K/W hr
500 - 750 m	=>	3.6ft^3 • °F/W minor 3.4m^3 • K/W hr
750 - 1000 m	=>	3.7ft^3 • °F/W minor 3.5m^3 • K/W hr

Example: 600 W internal heat load, $\triangle T$ = 15 K, at 75 m elevation

0 - 100 m => 3.3ft^3 • °F/W minor 3.1m^3 • K/W hr

$$V = \frac{600\ W}{15\ K} \times 3.3\ m^3\cdot K/W\ hr$$

$$V = 132\ m^3/hr$$