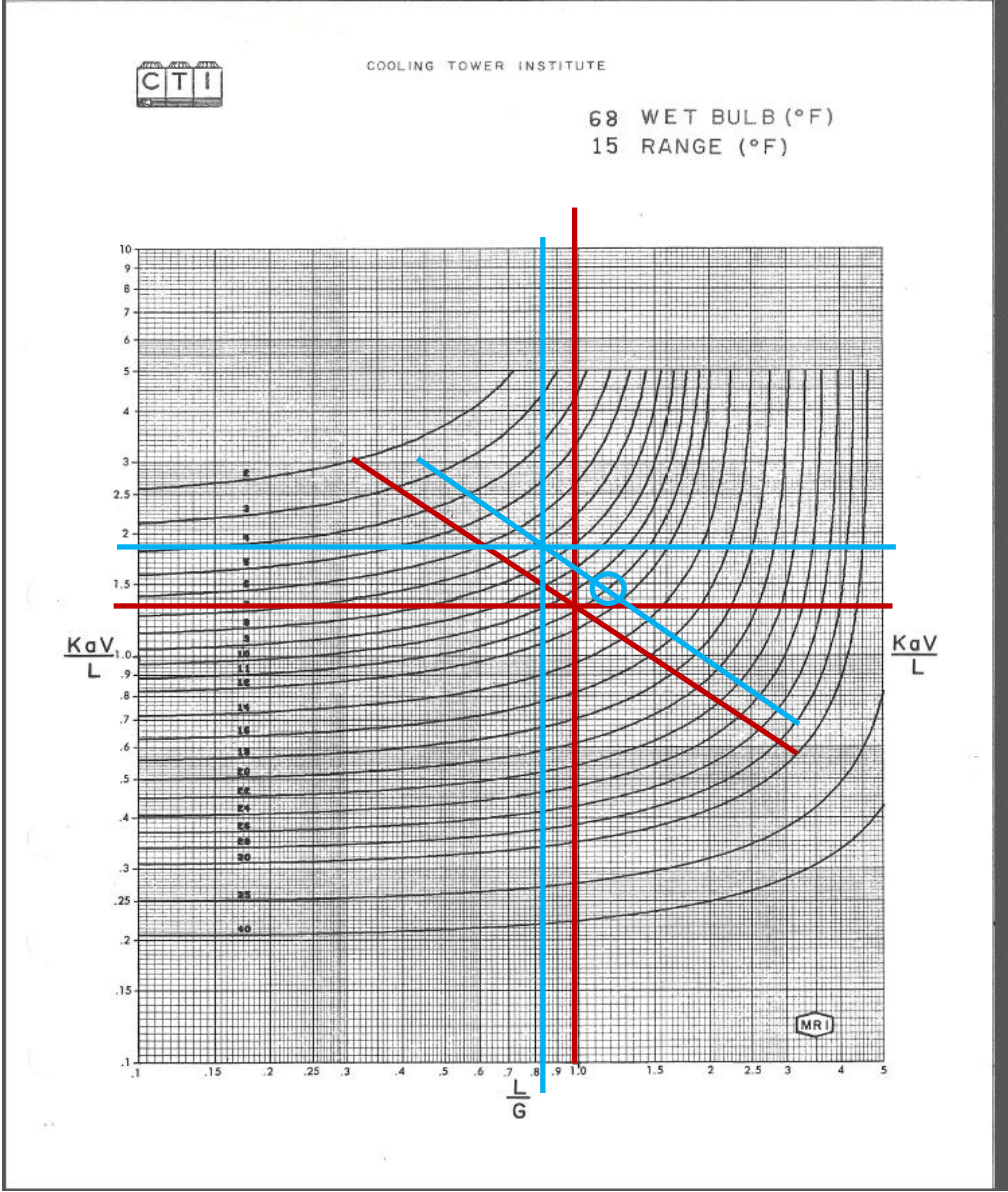


Design:
 $L/G = 1.0$
 $KaV/L = 1.35$
 Approach = 11
 °F
 Fill Slope = -.6



Test:
 $L/G = .8$
 $KaV/L = 1.8$
 Approach = 7.4 °F
 Fill Slope = -.6

Test characteristic line intercepts 11 °F design approach at 1.2 L/G.
 $1.2/1.0 = 120\%$

Figure D-1. Water Flow Rate = 51,113 gpm (90%)

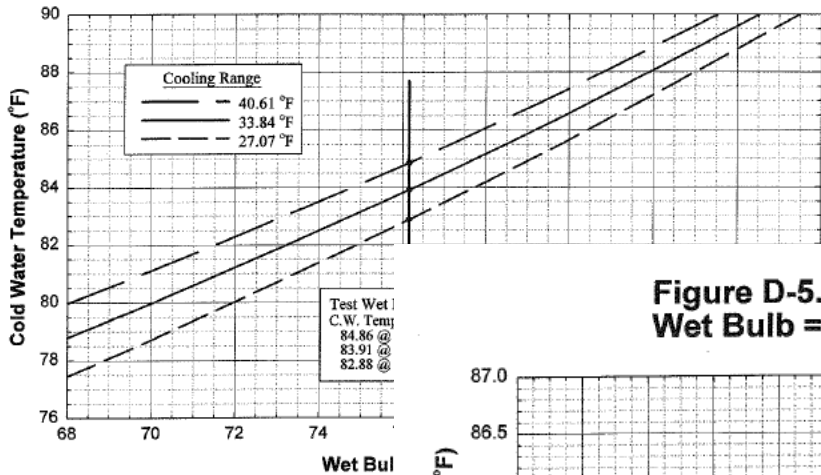
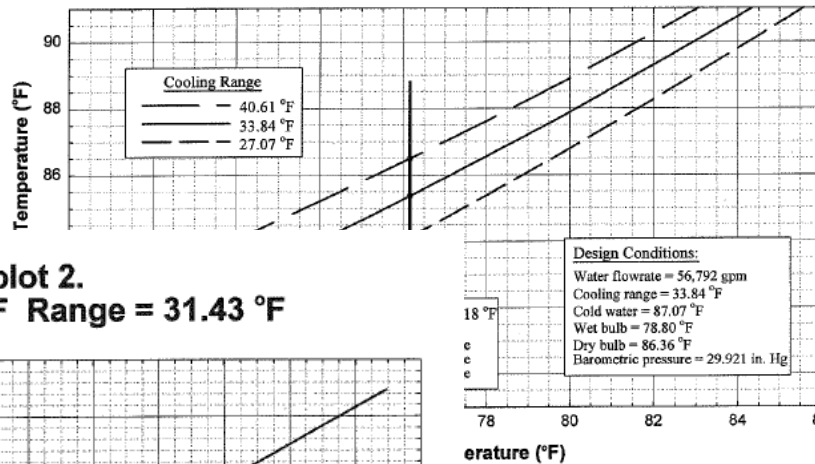


Figure D-2. Water Flow Rate = 56,792 gpm (100%)



**Figure D-5. Crossplot 2.
Wet Bulb = 76.18 °F Range = 31.43 °F**

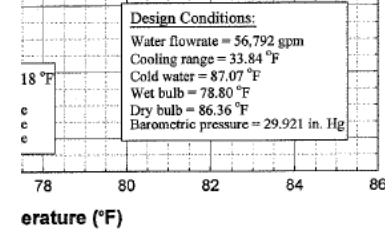
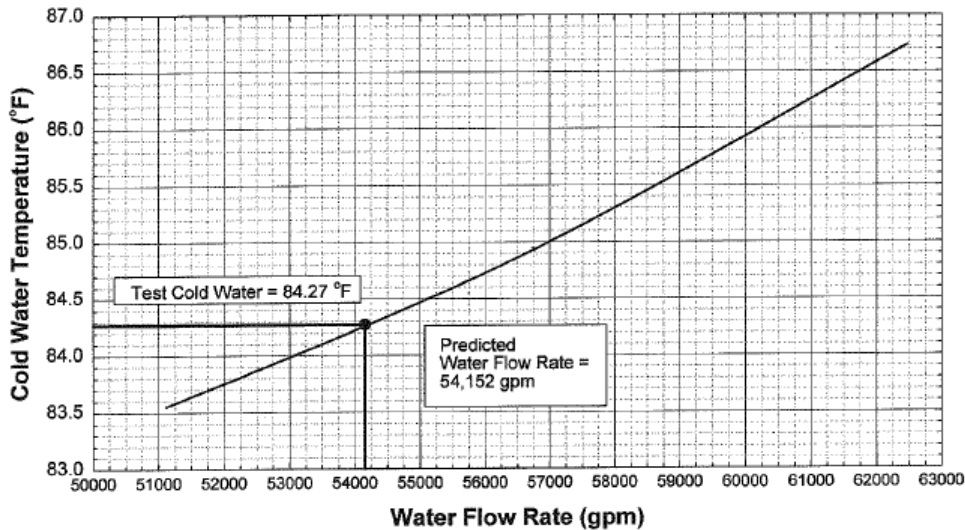
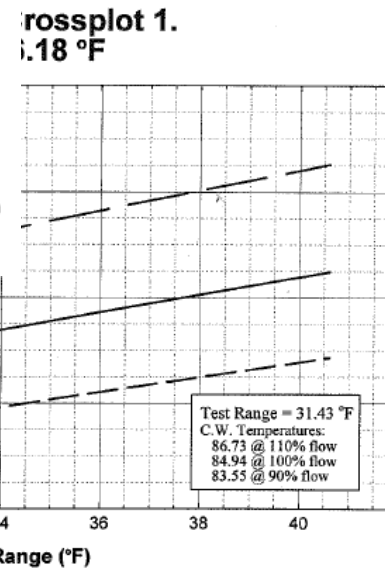
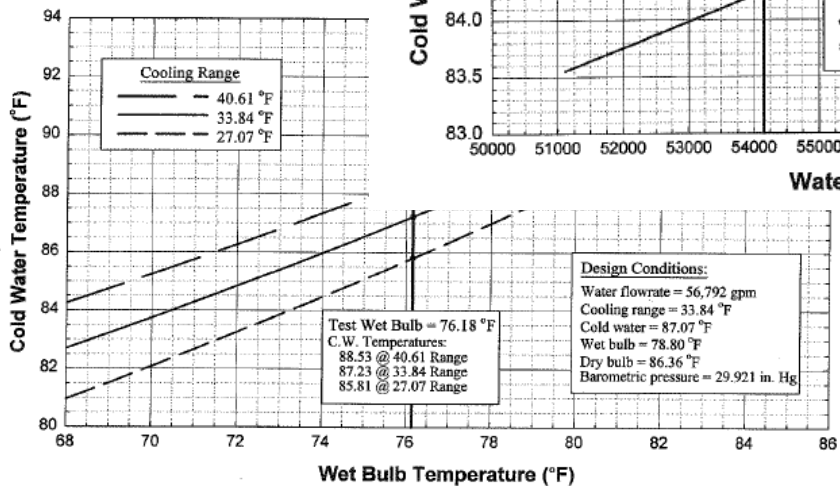


Figure D-3. Water I



$$GPM * 500 * Range$$

=

$$Q, Btu/h$$

=

$$\left(\frac{K}{L}\right) * (a * V) * LMTD$$

$$LMTD = \frac{Approach - TTD}{\ln\left(\frac{Approach}{TTD}\right)}$$

$$HWT - \text{EXT} = TTD$$
$$CWT - WBT = APP$$

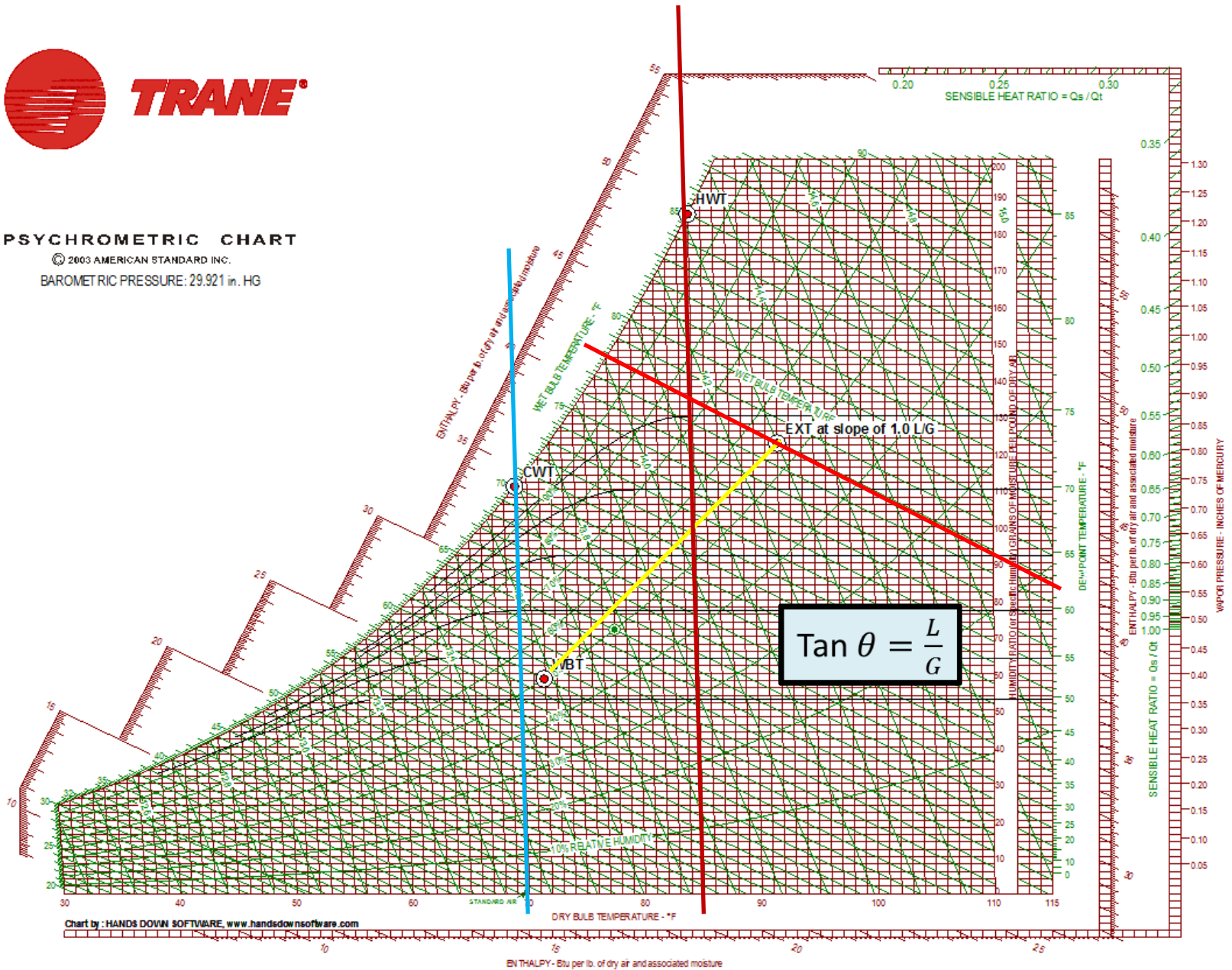


TRANE

PSYCHROMETRIC CHART

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BAROMETRIC PRESSURE: 29.921 in. HG



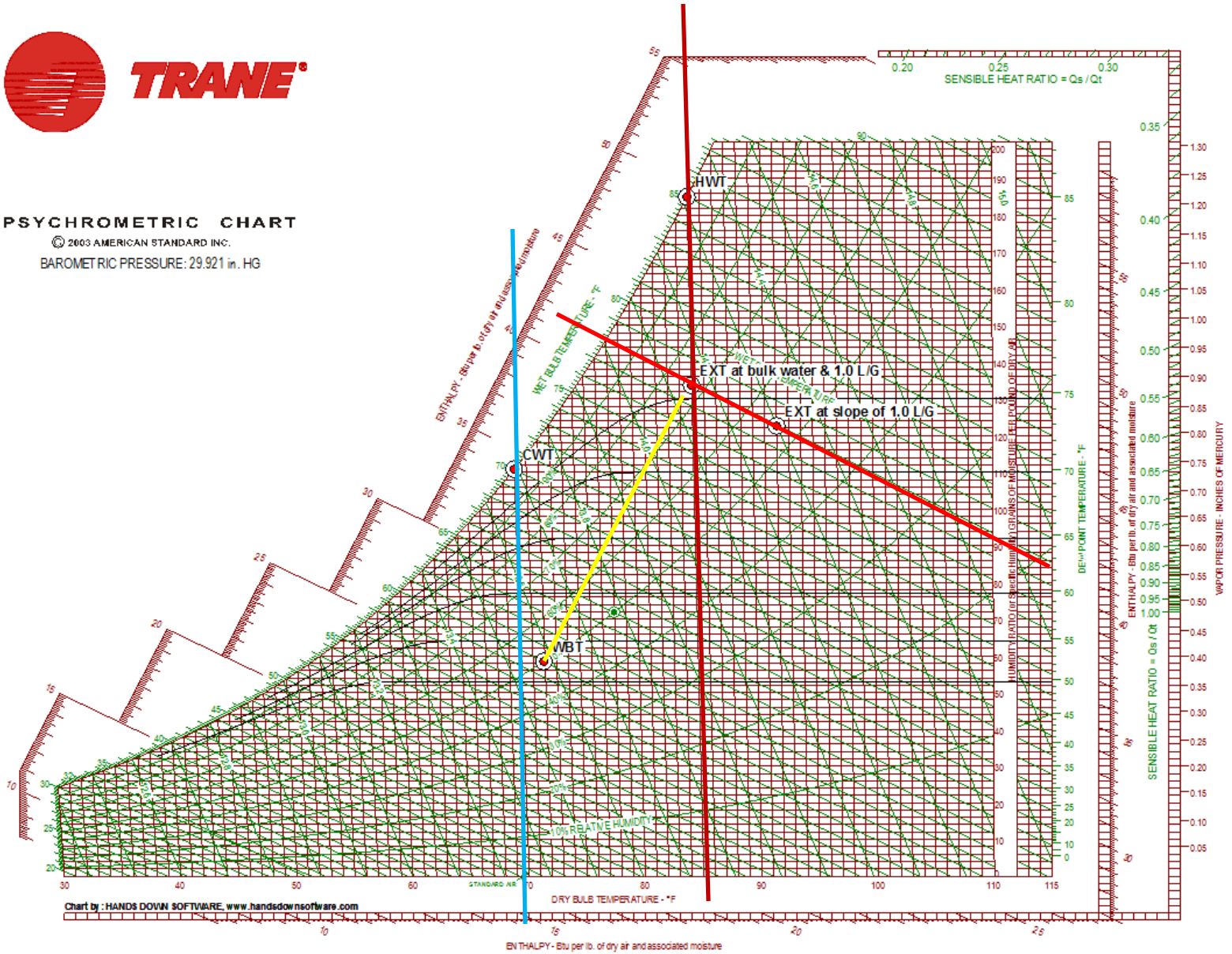
$$\tan \theta = \frac{L}{G}$$



PSYCHROMETRIC CHART

© 2003 AMERICAN STANDARD INC.

BAROMETRIC PRESSURE: 29.921 in. HG





TRANE

PSYCHROMETRIC CHART

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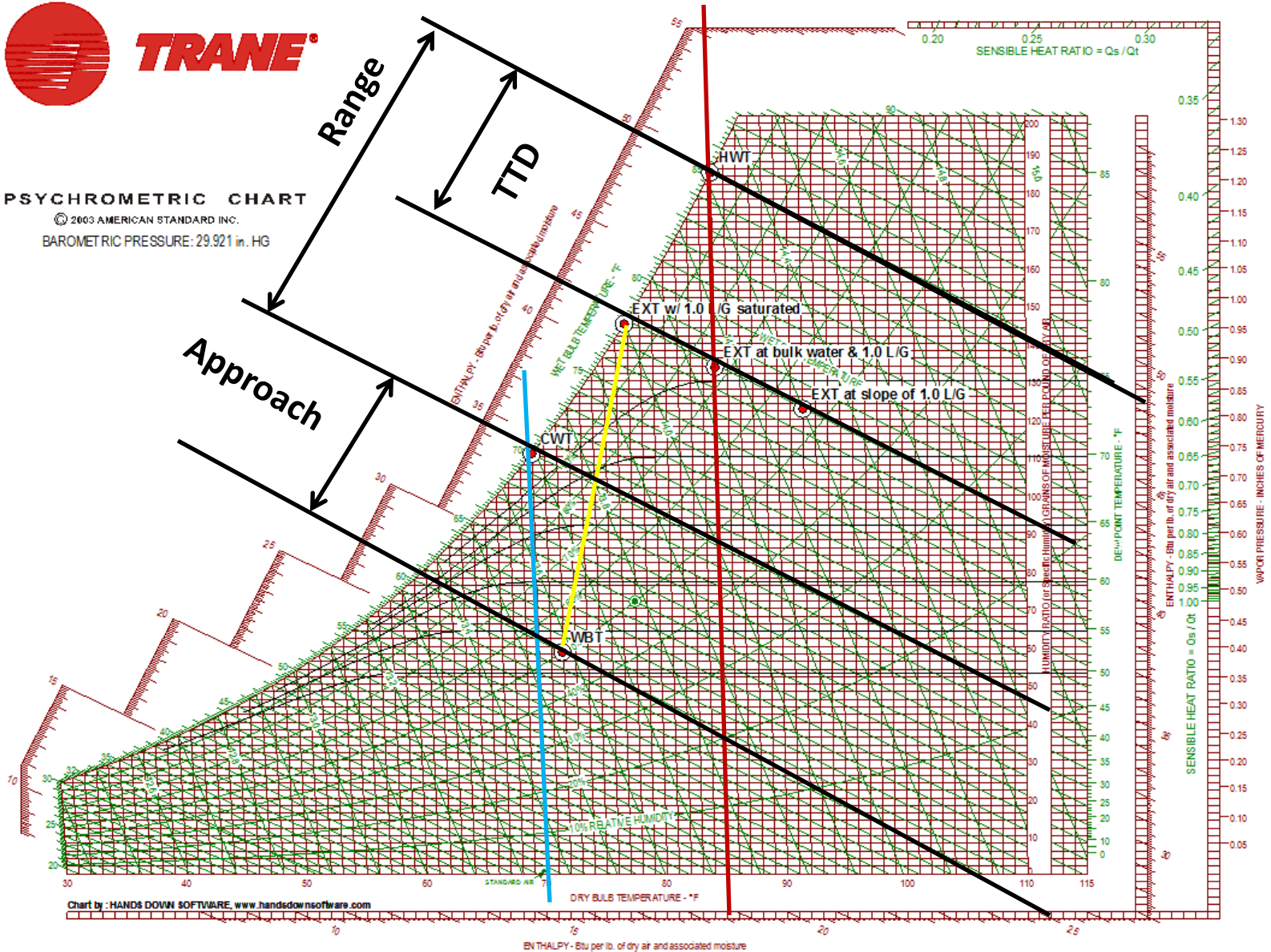


Chart by: HANDS DOWN SOFTWARE, www.handsdownsoftware.com

ENTHALPY - Btu per lb. of dry air and associated moisture

$$EXT_h = WBT_h + \left(\frac{L}{G}\right) * (HWT - CWT)$$

$$GPM * 500 * Range = Q, \frac{Btu}{h} = \left(\frac{K}{L}\right) * (a * V) * LMTD$$

$$LMTD = \frac{Approach - TTD}{\ln\left(\frac{Approach}{TTD}\right)}$$

KaV based on LMTD						
Design						
	DB	WB	RH	W	h	d
HWT des	110.0	110.0	100.0		92.41	
CWT des	90.0	90.0	100.0		55.95	
WBT des	96.2	80.0	50.0	129.6	43.51	0.0706
EXT des w/ 1.37 L/G	99.5	99.5	100.0	297.8	70.91	0.0694
Approach	10.00			0.02404	27.4	
TTD	10.50					
LMTD	10.25			L	5,000,000	1.37
gpm	10,000			G	3,649,635	
E6 Btu/h	100.00					
KaV_{lmtd}	48.79					

$$Q, \frac{Btu}{h} = \frac{KaV}{L} * LMTD$$

KaV based on Tchebycheff				
Design				
h _w			h _a	1/Δh
20.00	90.00		43.51	
2.00	92.00	58.79	46.25	0.0797
8.00	98.00	68.26	54.47	0.0725
8.00	102.00	75.46	59.95	0.0645
2.00	108.00	87.82	68.17	0.0509
	110.00		70.91	0.2676
			KaV/L_{CTI}	1.34
			KaV_{CTI}	6.69
KaV_{lmtd} / KaV_{CTI}				7.29

Tested						
	DB	WB	RH	W	h	d
HWT act	110.0	110.0	100.0		92.41	
CWT act	84.0	84.0	100.0		48.23	
WBT act	82.8	69.0	50.0	84.4	33.12	0.0726
EXT act w/ 1.30 L/G	97.2	97.2	100.0	276.3	66.92	0.0698
Approach	15.00			0.02742	33.8	
TTD	12.80					
LMTD	13.87			L	4,475,000	0.895 1.30
gpm	8,950			G	3,442,308	0.9432
E6 Btu/h	116.35					
KaV_{lmtd}	37.54					

Tested				
h _w			h _a	1/Δh
26.00	84.00		33.12	
2.60	86.60	51.43	36.50	0.0670
10.40	94.40	62.40	46.64	0.0635
10.40	99.60	71.05	53.40	0.0567
2.60	107.40	86.49	63.54	0.0436
	110.00		66.92	0.2307
			KaV/L_{CTI}	1.50
			KaV_{CTI}	6.71
KaV_{lmtd} / KaV_{CTI}				5.59

76.93%

cells	10	14	4	14
gpm	145,905	265,125	36,500	148,000
L	72,952,500	132,562,500	18,250,000	74,000,000
L/G	1.648	1.499	1.267	0.955
G	44,267,294	88,433,956	14,404,104	77,486,911
density	0.0559	0.0763	0.0763	0.0763
a	45	45	45	45
V	138,240	204,120	36,288	158,700
A	6,220,800	9,185,400	1,632,960	7,141,500
depth	72.00	60.00	72.00	72.00
Inlet Area, sf	12,960	19,656	3,696	15,036
G, acfm	13,195,530	19,317,159	3,146,375	16,925,931
all fan, acfm	13,195,530	21,450,786	3,808,232	17,878,000
Vel, acfm	12,765,600	21,450,786	3,808,232	17,878,000
fpm	985.00	1,091	1,030	1,189.01
HWT	102.00	98.20	123.00	81.90
CWT	81.70	77.80	85.00	64.40
Range	20.30	20.40	38.00	17.50
WBT	72.00	60.60	75.00	50.87
EXT	95.00	91.02	107.45	73.80
TTD	7.00	7.18	15.55	8.10
APP	9.70	17.20	10.00	13.53
LMTD	8.28	11.47	12.57	10.58
KaV/L	1.978	1.803	2.442	2.185
K/L	28.763	25.669	33.782	17.133