

MADRID, SPAIN

Latitude = 40.45 N

Longitude = 3.55 W

Period of Record = 1973 to 1996

WMO No. 082210

Elevation = 1910 feet

Average Pressure = 28.03 inches Hg

Design Criteria Data

	Design Value	Mean Coincident (Average) Values			
		Wet Bulb Temperature (°F)	Humidity Ratio (gr/lb)	Wind Speed (mph)	Prevailing Direction (NSEW)
Dry Bulb Temperature (T)	(°F)				
Median of Extreme Highs	102	71	73	10.2	WSW
0.4% Occurrence	97	69	71	8.4	WSW
1.0% Occurrence	95	69	69	8.4	WSW
2.0% Occurrence	91	67	68	7.3	WSW
Mean Daily Range	23	-	-	-	-
97.5% Occurrence	30	29	22	1.3	N
99.0% Occurrence	27	26	20	1.0	N
99.6% Occurrence	25	24	18	0.9	N
Median of Extreme Lows	21	20	15	0.8	N
	Design Value	Mean Coincident (Average) Values			
		Dry Bulb Temperature (°F)	Humidity Ratio (gr/lb)	Wind Speed (mph)	Prevailing Direction (NSEW)
Wet Bulb Temperature (T_{wb})	(°F)				
Median of Extreme Highs	74	95	96	7.6	WSW
0.4% Occurrence	72	93	88	6.8	WSW
1.0% Occurrence	70	91	81	6.6	WSW
2.0% Occurrence	69	90	78	6.5	WSW
	Design Value	Mean Coincident (Average) Values			
		Dry Bulb Temperature (°F)	Vapor Pressure (in. Hg)	Wind Speed (mph)	Prevailing Direction (NSEW)
Humidity Ratio (HR)	(gr/lb)				
Median of Extreme Highs	108	86	0.68	6.4	WNW
0.4% Occurrence	94	83	0.59	5.5	SW
1.0% Occurrence	90	80	0.57	4.5	S
2.0% Occurrence	85	79	0.54	4.8	S
Air Conditioning/ Humid Area Criteria	# of Hours	T ≥ 93°F	T ≥ 80°F	T _{wb} ≥ 73°F	T _{wb} ≥ 67°F
		145	900	19	384

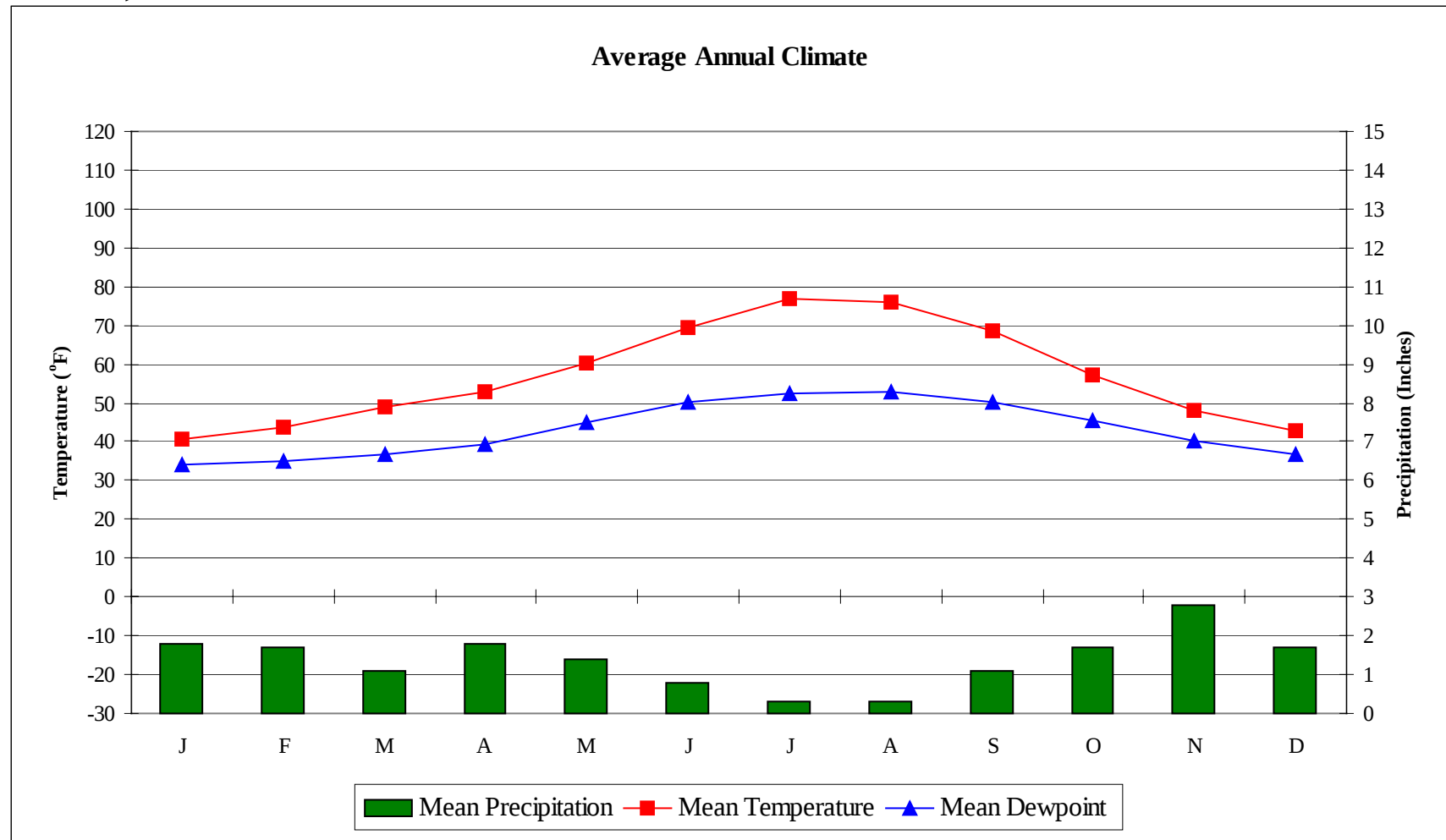
Other Site Data

Weather Region	Rain Rate 100 Year Recurrence (in./hr)	Basic Wind Speed 3 sec gust @ 33 ft 50 Year Recurrence (mph)	Ventilation Cooling Load Index (Ton-hr/cfm/yr) Base 75°F-RH 60% Latent + Sensible
7	N/A	N/A	0.1 + 1.0
Ground Water Temperature (°F) 50 Foot Depth *	Frost Depth 50 Year Recurrence (in.)	Ground Snow Load 50 Year Recurrence (lb/ft ²)	Average Annual Freeze-Thaw Cycles (#)
59.7	N/A	N/A	44

*Note: Temperatures at greater depths can be estimated by adding 1.5°F per 100 feet additional depth.

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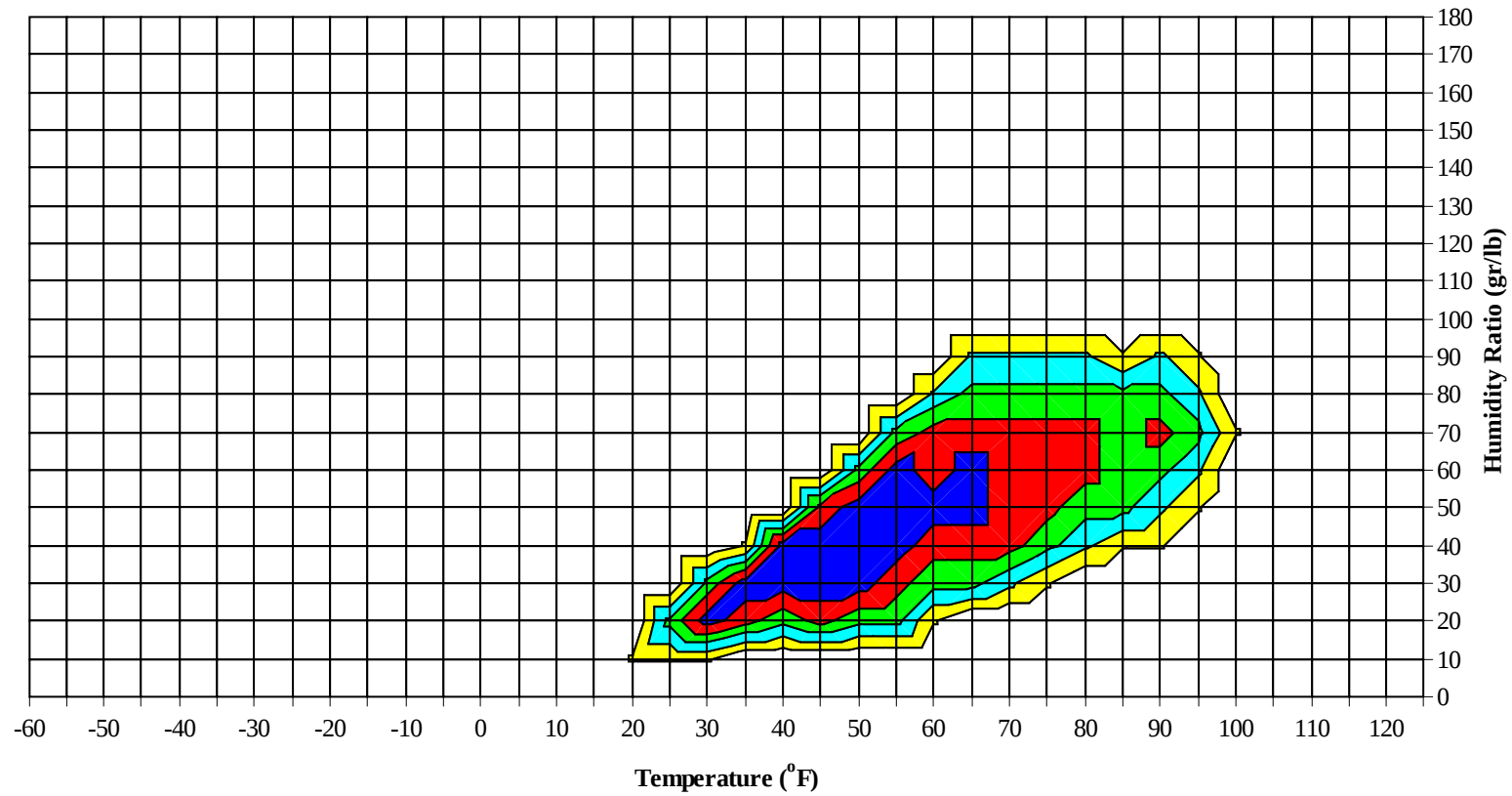
WMO No. 082210



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Long Term Psychrometric Summary

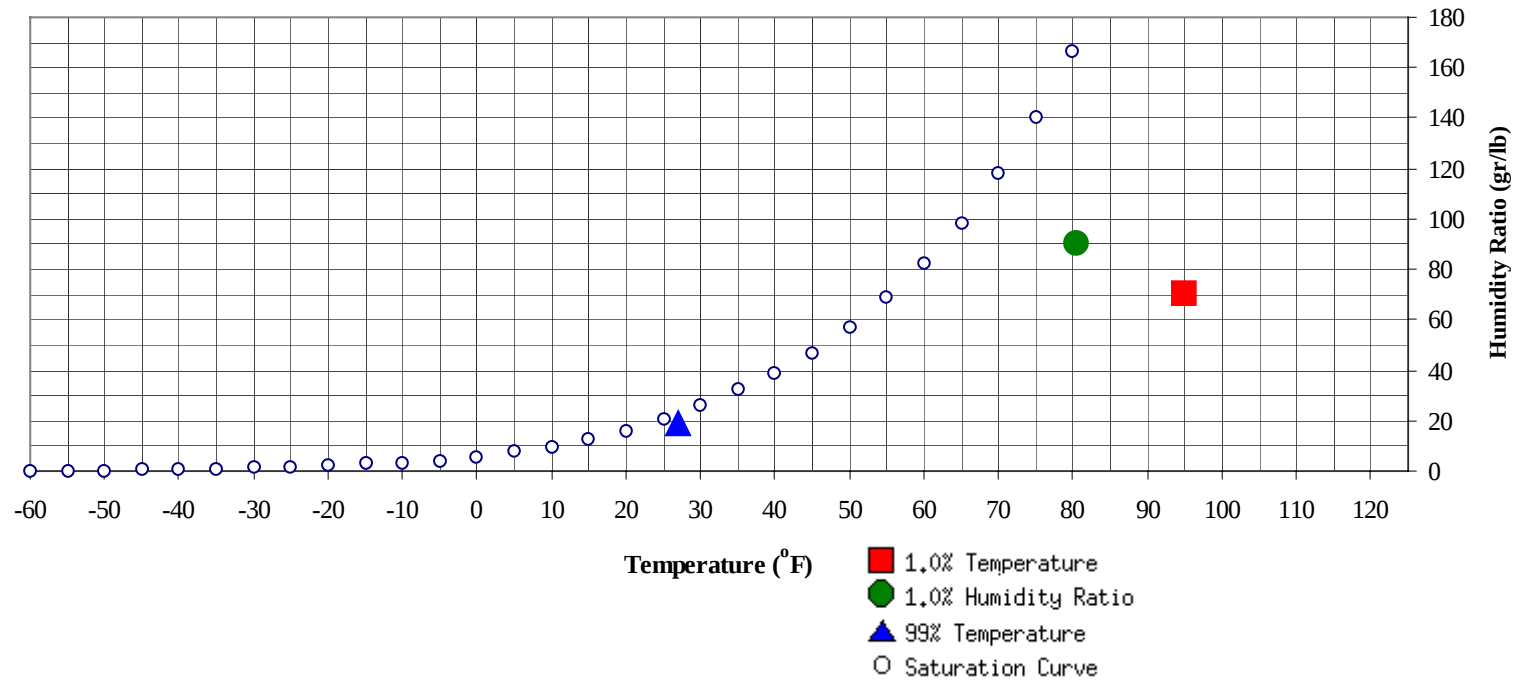


- 50% of all observations
- 80% of all observations
- 95% of all observations
- 97.5% of all observations
- 99% of all observations

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Psychrometric Summary of Peak Design Values



99% Dry Bulb	(°F)	MCHR (gr/lb)	Enthalpy (btu/lb)	1.0% Humidity Ratio	(gr/lb)	MCDB (°F)	MCWB (°F)	MC Dewpt (°F)	Enthalpy (btu/lb)
	27	19.1	9.4		90.3	80.3	68.2	62.6	33.4

1.0% Dry Bulb	(°F)	MCHR (gr/lb)	MCWB (°F)	Enthalpy (btu/lb)
	95	70.3	69	33.9

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Dry-Bulb Temperature Hours For An Average Year (Sheet 1 of 5)

Period of Record = 1973 to 1996

Temperature Range (°F)	January					February					March				
	Hour Group (LST)			Total Obs	M C W B (°F)	Hour Group (LST)			Total Obs	M C W B (°F)	Hour Group (LST)			Total Obs	M C W B (°F)
	01 To 08	09 To 16	17 To 00			01 To 08	09 To 16	17 To 00			01 To 08	09 To 16	17 To 00		
105 / 109															
100 / 104															
95 / 99															
90 / 94															
85 / 89															
80 / 84															
75 / 79												1	1	2	57.7
70 / 74								0	0	56.0	0	8	7	15	55.5
65 / 69		0	0	0	51.9		1	1	2	53.3	0	13	12	25	53.4
60 / 64	0	2	1	3	50.3		8	7	15	50.7	0	34	28	62	51.1
55 / 59	0	16	10	26	48.3	1	28	24	53	48.7	4	48	50	102	48.2
50 / 54	10	49	43	102	46.1	11	52	48	111	45.8	24	62	67	153	45.3
45 / 49	34	66	66	166	42.8	37	58	68	163	42.4	64	47	53	164	42.2
40 / 44	33	38	48	119	39.1	42	31	38	111	38.8	55	19	20	94	38.5
35 / 39	47	37	52	136	35.0	59	27	26	112	35.0	65	12	9	87	34.7
30 / 34	62	24	24	110	30.5	48	14	9	71	30.5	29	3	1	33	30.4
25 / 29	51	14	4	69	26.1	22	5	2	29	25.7	7	0	0	7	25.7
20 / 24	8	2	0	10	21.6	4	1	0	5	21.2	0			0	21.9
15 / 19	2	0		2	17.6	1	0		1	16.8					
10 / 14	0			0	14.0	0			0	14.0					

Caution: This summary reflects the typical distribution of temperature in a typical year. It does not reflect the typical moisture distribution. Because wet bulb temperatures are averaged, this summary understates the annual moisture load. For accurate moisture load data, see the long-term humidity summary and the ventilation and infiltration load pages in this manual.

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Dry-Bulb Temperature Hours For An Average Year (Sheet 2 of 5)

Period of Record = 1973 to 1996

Temperature Range (°F)	April					May					June				
	Hour Group (LST)			Total Obs	M C W B (°F)	Hour Group (LST)			Total Obs	M C W B (°F)	Hour Group (LST)			Total Obs	M C W B (°F)
	01 To 08	09 To 16	17 To 00			01 To 08	09 To 16	17 To 00			01 To 08	09 To 16	17 To 00		
105 / 109															
100 / 104												0	0	0	71.5
95 / 99											3	3		6	69.6
90 / 94							0	0	0	66.5	12	12		24	67.2
85 / 89		0		0	60.0		3	2	5	64.0	22	18		40	65.2
80 / 84		1	1	2	61.4		12	11	23	61.9	0	41	36	77	63.4
75 / 79		6	6	12	58.3		25	22	47	59.4	2	48	43	93	61.3
70 / 74		15	13	28	55.9	0	42	36	78	57.1	13	49	45	107	59.2
65 / 69		19	17	36	53.5	2	37	31	70	55.4	29	27	31	87	57.3
60 / 64	2	44	37	83	51.3	19	54	51	124	53.5	72	26	31	130	55.6
55 / 59	12	57	54	124	49.0	59	46	51	156	51.3	75	10	15	100	52.7
50 / 54	41	56	62	159	46.4	81	23	31	135	47.8	40	2	4	46	48.8
45 / 49	85	32	38	155	42.9	57	5	10	72	43.7	8	0	1	9	44.6
40 / 44	55	7	8	70	39.1	21	0	2	23	39.3	1			1	40.9
35 / 39	36	2	3	41	35.2	8	0	0	8	36.0	0			0	39.0
30 / 34	9	0	0	9	30.7	1			1	31.0					
25 / 29	1			1	26.5										
20 / 24															
15 / 19															
10 / 14															

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Dry-Bulb Temperature Hours For An Average Year (Sheet 3 of 5)

Period of Record = 1973 to 1996

Temperature Range (°F)	July					August					September				
	Hour Group (LST)			Total Obs	M C W B (°F)	Hour Group (LST)			Total Obs	M C W B (°F)	Hour Group (LST)			Total Obs	M C W B (°F)
	01 To 08	09 To 16	17 To 00			01 To 08	09 To 16	17 To 00			01 To 08	09 To 16	17 To 00		
105 / 109		0		0	73.0		0		0	72.0					
100 / 104		3	3	6	71.1		2	2	4	71.4		0	0	0	69.3
95 / 99		20	22	42	69.3		14	14	28	69.5		1	1	2	68.7
90 / 94		42	43	86	67.4	0	38	39	77	67.6		12	10	22	67.4
85 / 89	0	36	34	70	65.6	0	39	35	74	66.1		18	15	33	65.9
80 / 84	3	51	49	104	63.9	2	51	50	103	64.4		37	32	70	64.0
75 / 79	17	47	44	109	61.9	15	47	51	113	62.4	2	46	46	94	61.8
70 / 74	53	32	30	115	59.7	47	35	35	117	60.1	11	46	50	107	59.4
65 / 69	61	10	13	84	58.0	62	13	14	89	58.1	24	30	33	87	57.3
60 / 64	75	6	7	88	55.6	82	7	8	97	55.5	76	29	33	138	55.5
55 / 59	32	0	1	33	52.3	35	1	1	37	51.7	72	15	15	102	51.9
50 / 54	7		0	7	48.8	6			6	47.8	41	4	4	49	48.0
45 / 49	0			0	45.8	0			0	43.8	13	1	0	14	43.9
40 / 44											2			2	39.2
35 / 39											0			0	35.8
30 / 34															
25 / 29															
20 / 24															
15 / 19															
10 / 14															

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Dry-Bulb Temperature Hours For An Average Year (Sheet 4 of 5)

Period of Record = 1973 to 1996

Temperature Range (°F)	October					November					December				
	Hour Group (LST)			Total Obs	M C W B (°F)	Hour Group (LST)			Total Obs	M C W B (°F)	Hour Group (LST)			Total Obs	M C W B (°F)
	01 To 08	09 To 16	17 To 00			01 To 08	09 To 16	17 To 00			01 To 08	09 To 16	17 To 00		
105 / 109															
100 / 104															
95 / 99															
90 / 94															
85 / 89		0	0	0	65.5										
80 / 84		5	3	8	63.4										
75 / 79	0	15	10	25	60.9										
70 / 74	0	30	22	52	58.2		3	1	4	57.3		0		0	56.0
65 / 69	1	32	26	59	56.3	0	9	4	13	55.9	0	0	0	0	54.4
60 / 64	14	56	55	126	54.5	1	29	19	49	53.7	0	5	2	7	53.2
55 / 59	51	53	65	169	51.8	11	51	45	107	51.1	4	25	17	46	50.9
50 / 54	75	36	49	160	48.3	39	58	64	161	47.9	21	57	47	125	47.3
45 / 49	66	15	15	96	43.9	50	45	58	153	43.4	43	67	73	183	43.4
40 / 44	28	3	2	33	39.9	43	19	27	89	39.4	38	33	47	118	39.4
35 / 39	11	1	0	12	35.8	51	15	17	83	35.7	52	33	42	127	35.5
30 / 34	3	0		3	31.5	33	8	4	45	30.9	48	18	18	84	30.8
25 / 29	0			0	26.5	12	2	0	14	26.3	37	9	2	48	26.3
20 / 24						1	0		1	21.5	5	1		6	21.7
15 / 19						0			0	19.0	0	0		0	18.5
10 / 14															

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Dry-Bulb Temperature Hours For An Average Year (Sheet 5 of 5)

Period of Record = 1973 to 1996

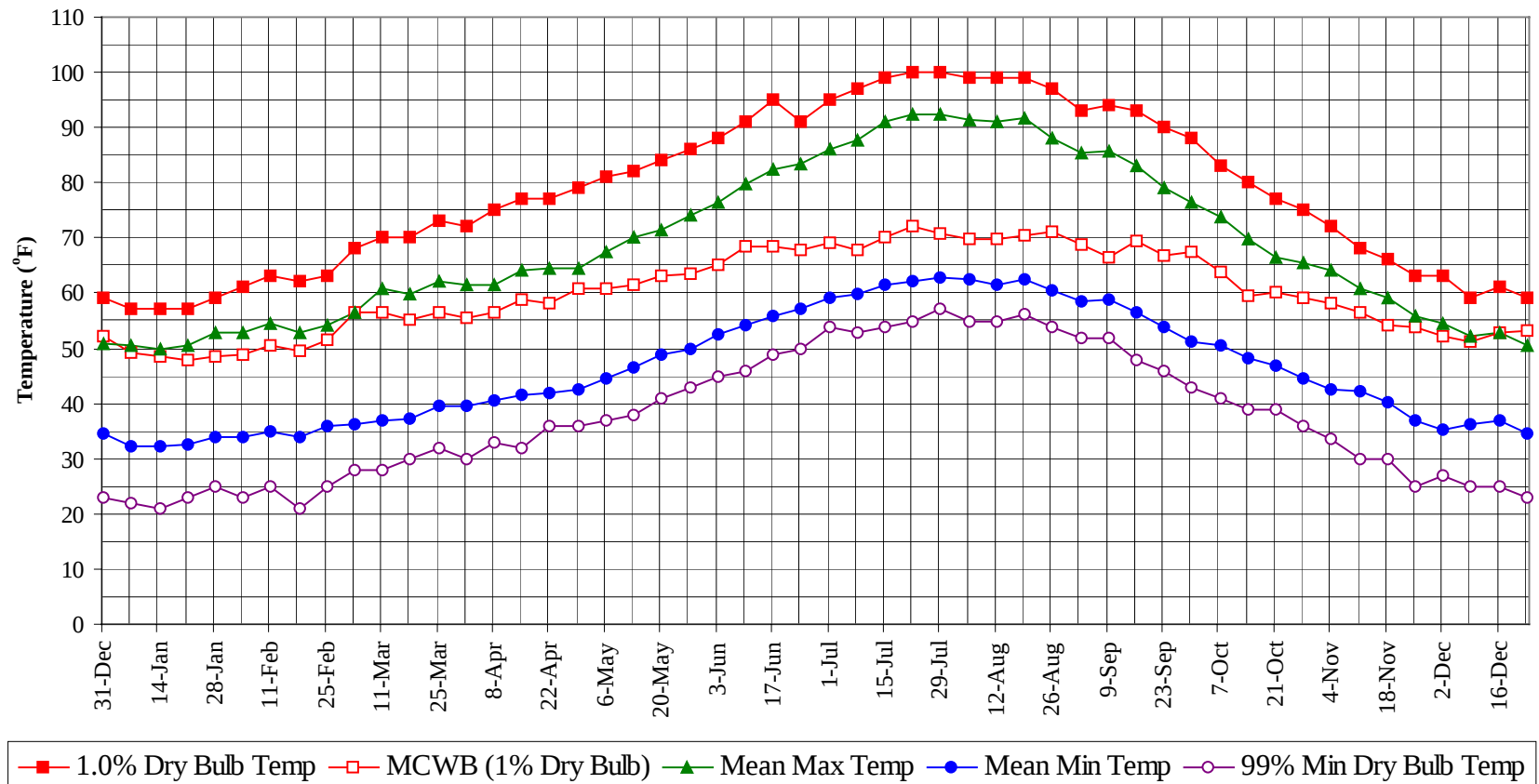
Annual Totals					
Temperature Range (°F)	Hour Group (LST)			Total Obs	M C W B (°F)
	01 To 08	09 To 16	17 To 00		
105 / 109	0			0	72.5
100 / 104	5			4	9
95 / 99	38			40	78
90 / 94	0	104	105	210	67.5
85 / 89	0	117	105	223	65.7
80 / 84	5	198	184	387	63.8
75 / 79	36	236	222	494	61.5
70 / 74	125	261	238	624	58.9
65 / 69	179	192	183	554	56.7
60 / 64	339	301	281	921	54.2
55 / 59	356	352	350	1058	50.8
50 / 54	393	399	419	1211	47.0
45 / 49	457	336	384	1177	43.0
40 / 44	317	152	191	660	39.1
35 / 39	330	127	150	607	35.2
30 / 34	232	67	56	355	30.6
25 / 29	129	29	8	166	26.1
20 / 24	19	4	0	23	21.5
15 / 19	3	1		4	17.4
10 / 14	0			0	14.0
				</	

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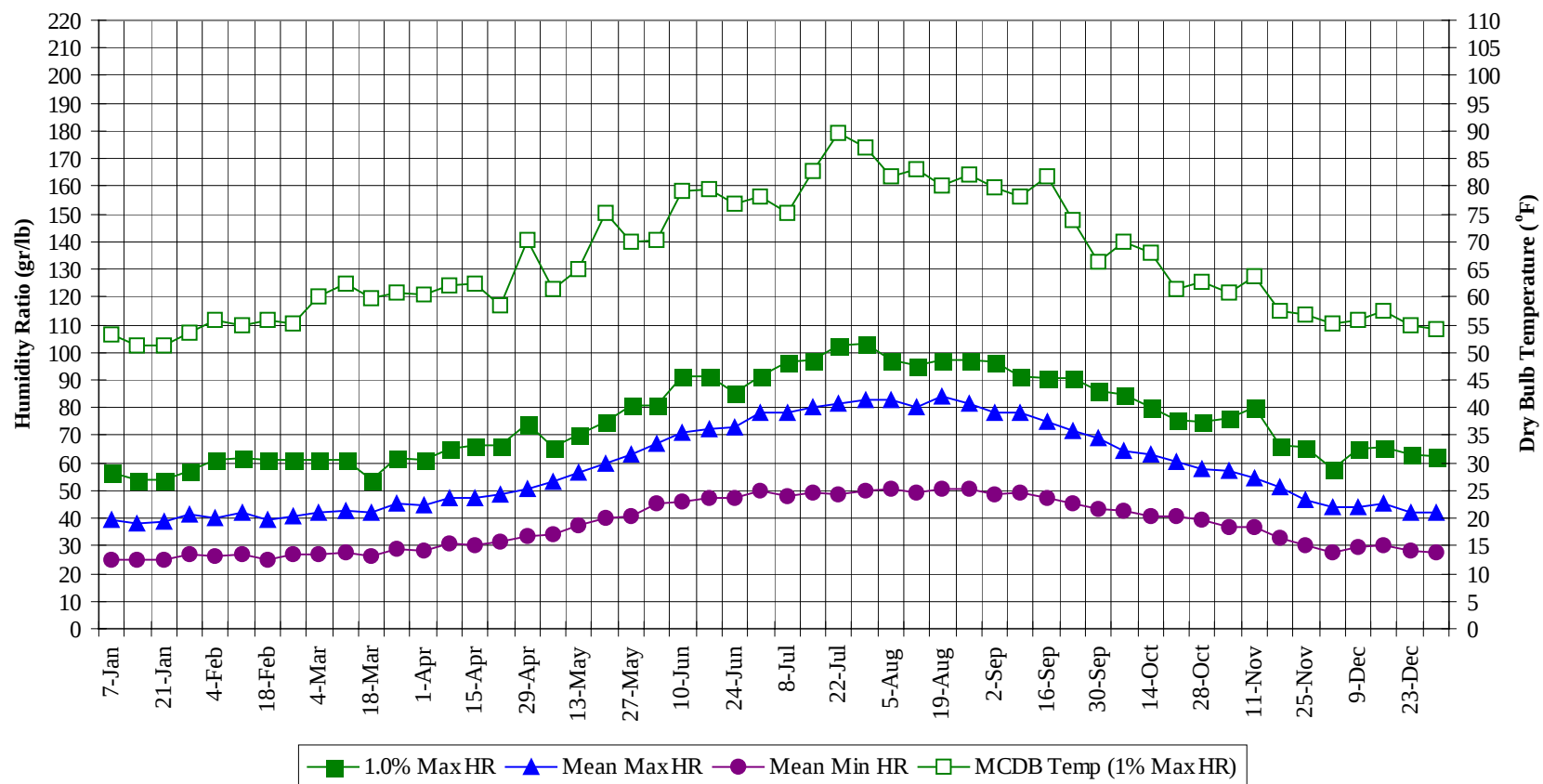
Annual Summary of Temperatures



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Long Term Humidity and Dry Bulb Temperature Summary



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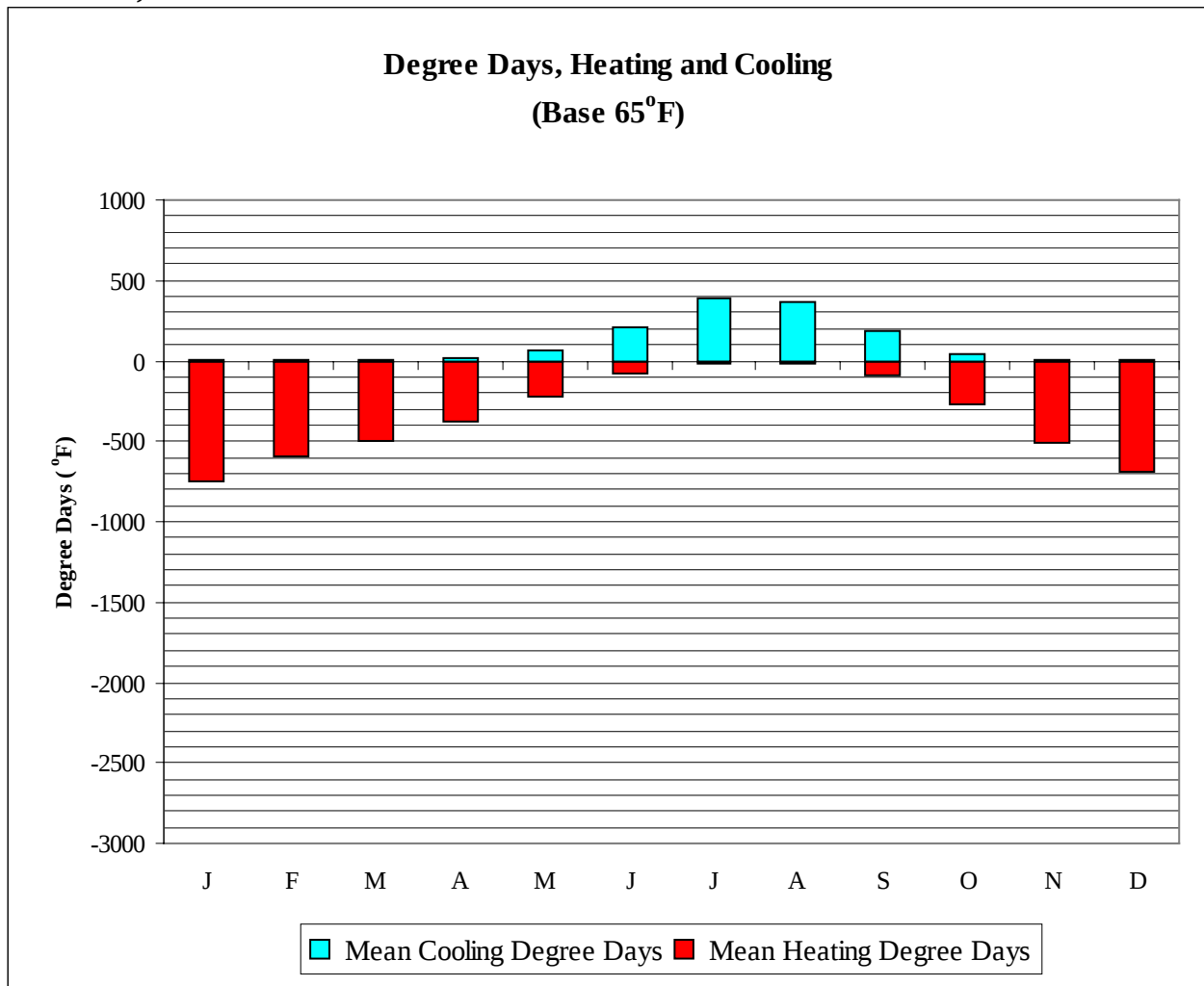
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Long Term Dry Bulb Temperature and Humidity Summary

Week Ending	1.0% Temp (°F)	MCWB @ 1% Temp (°F)	Mean Max Temp (°F)	Mean Min Temp (°F)	99% Temp (°F)	1.0% HR (gr/lb)	MCDB @ 1% HR (°F)	Mean Max HR (gr/lb)	Mean Min HR (gr/lb)
7-Jan	57.0	49.1	50.4	32.2	22.0	56.7	53.3	39.5	24.9
14-Jan	57.0	48.6	49.9	32.3	21.0	53.9	51.1	38.4	24.9
21-Jan	57.0	48.0	50.6	32.6	23.0	53.9	51.1	38.9	24.7
28-Jan	59.0	48.6	52.8	34.0	25.0	57.4	53.6	41.2	26.7
4-Feb	61.0	48.9	52.9	33.9	23.0	60.9	55.7	40.4	26.3
11-Feb	63.0	50.6	54.6	35.0	25.0	61.6	54.8	42.0	26.7
18-Feb	62.0	49.6	53.0	34.1	21.0	60.9	55.7	39.3	25.2
25-Feb	63.0	51.5	54.3	35.8	25.0	60.9	55.2	40.6	27.0
4-Mar	68.0	56.5	56.4	36.4	28.0	60.9	60.2	42.3	27.1
11-Mar	70.0	56.3	60.7	36.8	28.0	60.9	62.3	42.9	27.3
18-Mar	70.0	55.1	59.9	37.4	30.0	53.9	59.6	41.8	26.6
25-Mar	73.0	56.5	62.0	39.4	32.0	61.6	60.8	45.6	28.9
1-Apr	72.0	55.5	61.6	39.6	30.0	60.9	60.5	44.6	28.1
8-Apr	75.0	56.3	61.6	40.6	33.0	65.1	62.1	47.0	30.8
15-Apr	77.0	58.7	64.0	41.6	32.0	66.5	62.2	47.5	30.1
22-Apr	77.0	58.1	64.6	41.8	36.0	66.5	58.6	48.7	31.5
29-Apr	79.0	60.9	64.4	42.6	36.0	74.2	70.2	50.5	33.3
6-May	81.0	60.9	67.5	44.5	37.0	65.8	61.3	53.2	33.9
13-May	82.0	61.4	70.0	46.4	38.0	70.0	64.9	56.7	37.4
20-May	84.0	63.1	71.6	48.8	41.0	74.9	75.2	60.0	40.0
27-May	86.0	63.3	74.0	49.9	43.0	80.5	69.8	63.0	40.9
3-Jun	88.0	65.1	76.3	52.4	45.0	80.5	70.4	67.2	45.3
10-Jun	91.0	68.3	79.8	54.1	46.0	91.0	79.3	70.8	46.2
17-Jun	95.0	68.5	82.5	56.0	49.0	91.0	79.4	72.5	47.3
24-Jun	91.0	67.7	83.4	57.3	50.0	85.4	76.7	73.0	47.3
1-Jul	95.0	69.3	86.0	59.0	54.0	91.0	78.3	78.3	50.0
8-Jul	97.0	67.8	87.6	59.8	53.0	96.6	75.2	77.8	47.9
15-Jul	99.0	70.2	91.2	61.4	54.0	97.3	82.6	80.4	49.3
22-Jul	100.0	72.0	92.4	62.2	55.0	102.2	89.6	81.4	48.4
29-Jul	100.0	70.8	92.4	62.9	57.0	102.9	87.1	82.5	49.7
5-Aug	99.0	69.9	91.5	62.5	55.0	97.3	81.8	82.7	50.6
12-Aug	99.0	69.6	91.0	61.4	55.0	95.2	83.0	79.8	49.2
19-Aug	99.0	70.6	91.8	62.4	56.0	97.3	80.2	83.9	50.3
26-Aug	97.0	71.3	88.0	60.6	54.0	97.3	82.2	81.4	50.4
2-Sep	93.0	68.7	85.4	58.3	52.0	96.6	79.8	78.4	48.5
9-Sep	94.0	66.6	85.8	58.9	52.0	91.0	78.0	78.1	49.5
16-Sep	93.0	69.3	83.2	56.5	48.0	90.3	81.9	74.8	47.0
23-Sep	90.0	66.8	79.2	53.8	46.0	90.3	73.8	71.6	45.1
30-Sep	88.0	67.4	76.5	51.3	43.0	86.1	66.5	69.1	43.2
7-Oct	83.0	63.7	73.8	50.4	41.0	84.7	69.8	64.1	42.4
14-Oct	80.0	59.5	69.7	48.3	39.0	79.8	68.0	62.9	40.8
21-Oct	77.0	60.2	66.6	46.9	39.0	75.6	61.5	60.4	40.9
28-Oct	75.0	59.3	65.6	44.6	36.0	74.9	62.9	58.1	39.2
4-Nov	72.0	58.2	64.2	42.4	33.5	76.3	60.6	57.0	37.0
11-Nov	68.0	56.6	61.0	42.1	30.0	79.8	63.6	54.5	36.7
18-Nov	66.0	54.3	59.1	40.1	30.0	66.5	57.5	51.2	32.7
25-Nov	63.0	53.9	55.9	37.0	25.0	65.8	56.7	46.7	30.2
2-Dec	63.0	52.3	54.5	35.1	27.0	58.1	55.1	43.7	27.5
9-Dec	59.0	51.2	52.3	36.3	25.0	65.1	55.8	44.3	29.4
16-Dec	61.0	52.8	53.0	36.8	25.0	65.8	57.5	45.5	30.3
23-Dec	59.0	53.2	50.6	34.7	23.0	63.0	55.0	42.2	28.0
31-Dec	59.0	52.1	50.9	34.6	23.0	62.3	54.3	42.2	27.8

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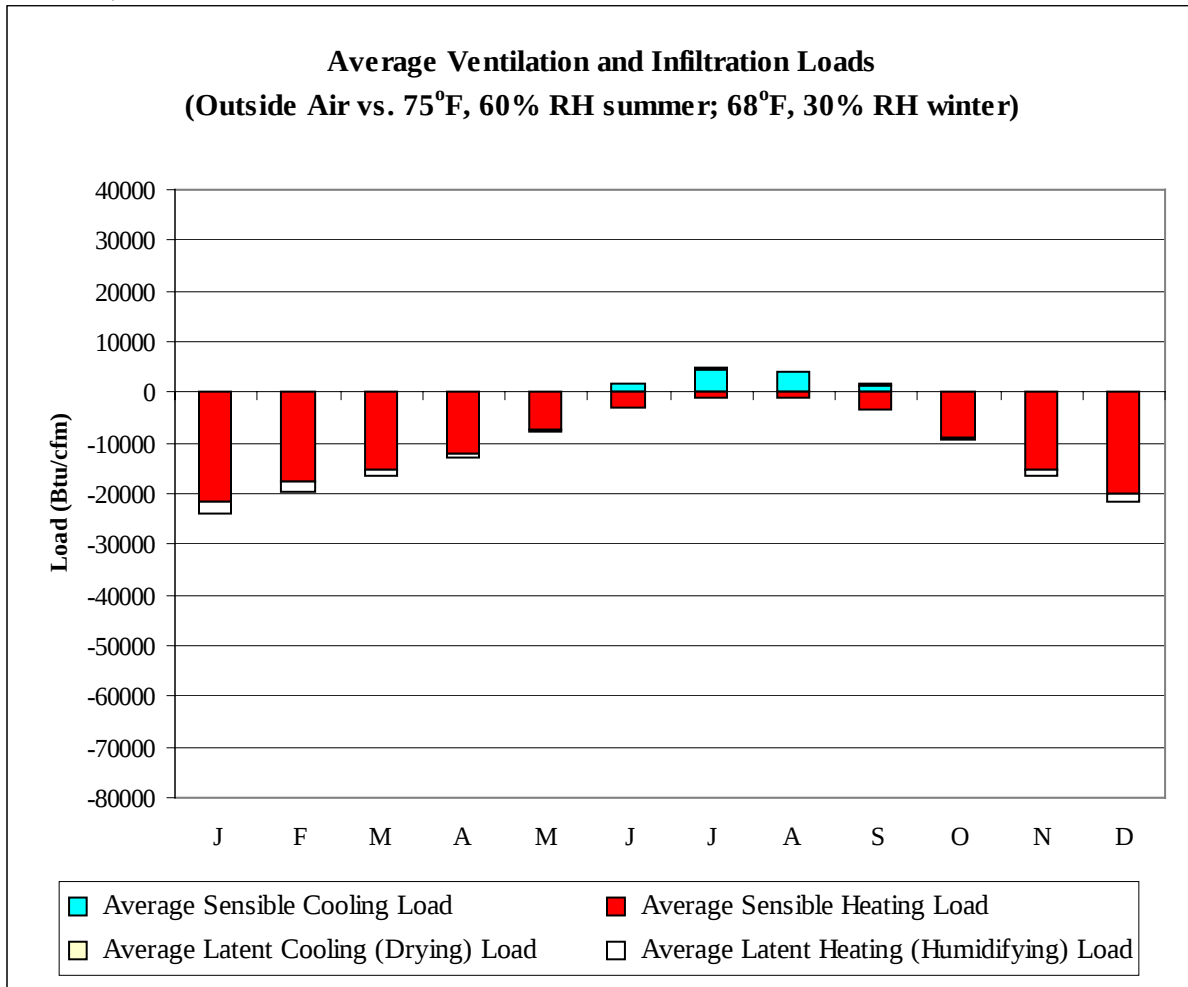
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	Mean Cooling Degree Days (°F)	Mean Heating Degree Days (°F)
JAN	0	744
FEB	0	598
MAR	6	497
APR	17	380
MAY	70	221
JUN	208	72
JUL	390	21
AUG	364	23
SEP	183	84
OCT	36	274
NOV	2	507
DEC	0	684
ANN	1276	4105

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	Average Sensible Cooling Load	Average Sensible Heating Load	Average Latent Cooling Load	Average Latent Heating Load
	(Btu/cfm)	(Btu/cfm)	(Btu/cfm)	(Btu/cfm)
JAN	0	-21686	0	-2261
FEB	0	-17688	0	-1732
MAR	2	-15182	0	-1461
APR	34	-11983	1	-732
MAY	321	-7492	3	-187
JUN	1782	-2871	70	-17
JUL	4517	-1036	266	-6
AUG	3998	-1110	244	-11
SEP	1504	-3285	78	-35
OCT	112	-9144	5	-161
NOV	0	-15449	2	-897
DEC	0	-20146	0	-1596
ANN	12270	-127072	669	-9096

Average Annual Solar Radiation – Nearest Available Site
(Source: National Renewable Energy Laboratory, Golden CO, 1995)

No Solar Radiation
Data Available

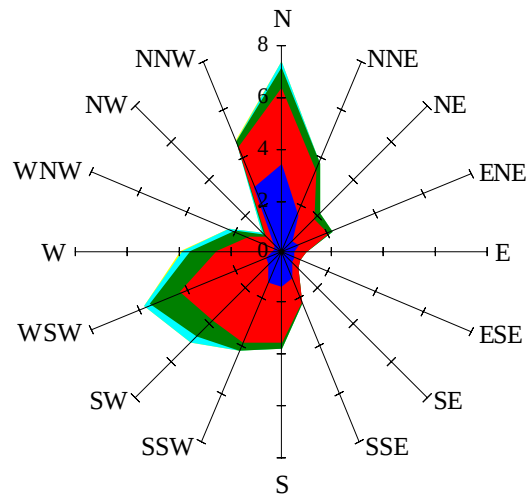


Average Annual Solar Heat and Illumination – Nearest Available Site

(Source: National Renewable Energy Laboratory, Golden CO, 1995)

Wind Summary - December, January, and February

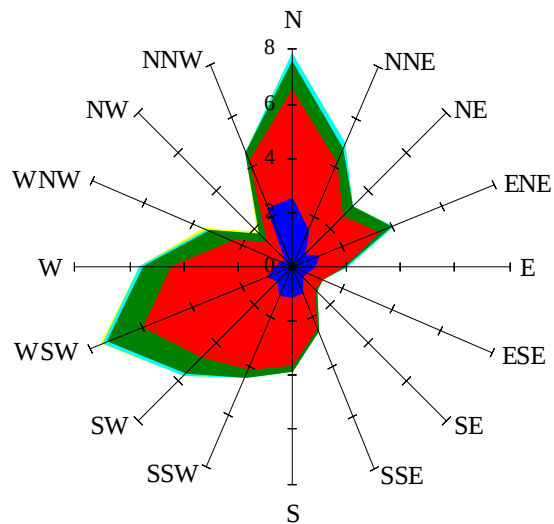
Labels of Percent Frequency on North Axis



Percent Calm = 49.64

Wind Summary - March, April, and May

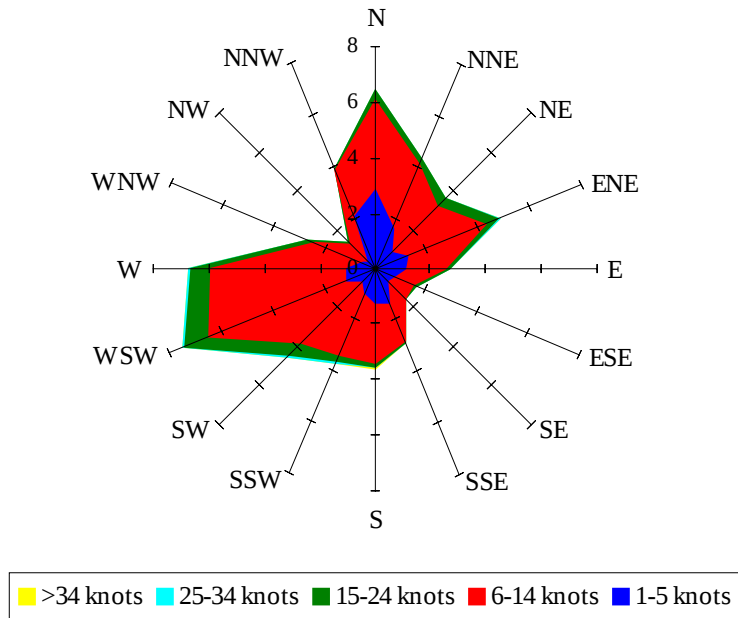
Labels of Percent Frequency on North Axis



Percent Calm = 36.58

Wind Summary - June, July, and August

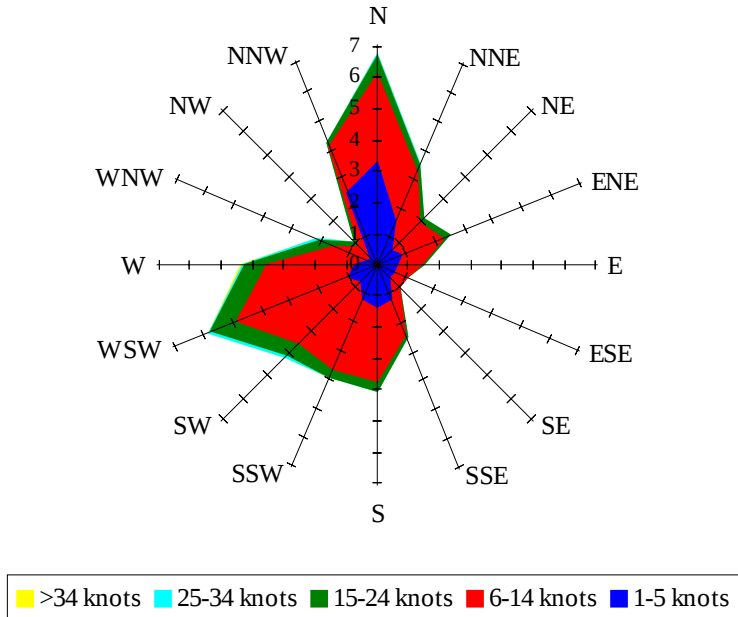
Labels of Percent Frequency on North Axis



Percent Calm = 38.36

Wind Summary - September, October, and November

Labels of Percent Frequency on North Axis



Percent Calm = 49.82