

LONG BEACH CA

Latitude = 33.77 N

WMO No. 722974

Longitude = 118.10 W

Elevation = 10 feet

Period of Record = 1977 to 1989

Average Pressure = 29.52 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	103	74	79	10.4	W
0.4% Occurrence	94	70	74	7.7	W
1.0% Occurrence	89	68	74	7.2	W
2.0% Occurrence	86	68	74	7.2	W
Mean Daily Range	19	-	-	-	-
97.5% Occurrence	46	42	34	3.8	E
99.0% Occurrence	43	39	30	3.9	E
99.6% Occurrence	41	37	26	4.3	E
Median of Extreme Lows	36	33	22	3.2	E
	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	80	88	142	7.0	W
0.4% Occurrence	74	86	107	6.9	W
1.0% Occurrence	72	84	99	6.5	W
2.0% Occurrence	70	81	92	6.1	W
	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	149	84	0.97	6.7	W
0.4% Occurrence	113	80	0.74	5.4	W
1.0% Occurrence	105	77	0.69	5.0	W
2.0% Occurrence	98	75	0.65	4.8	W
Air Conditioning/ Humid Area Criteria	# of Hours	T ≥ 93°F	T ≥ 80°F	T _{wb} ≥ 73°F	T _{wb} ≥ 67°F
		44	584	75	731

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
9	1.8	85	0.7 + 0.6
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 (#)
65.8	0	0	0

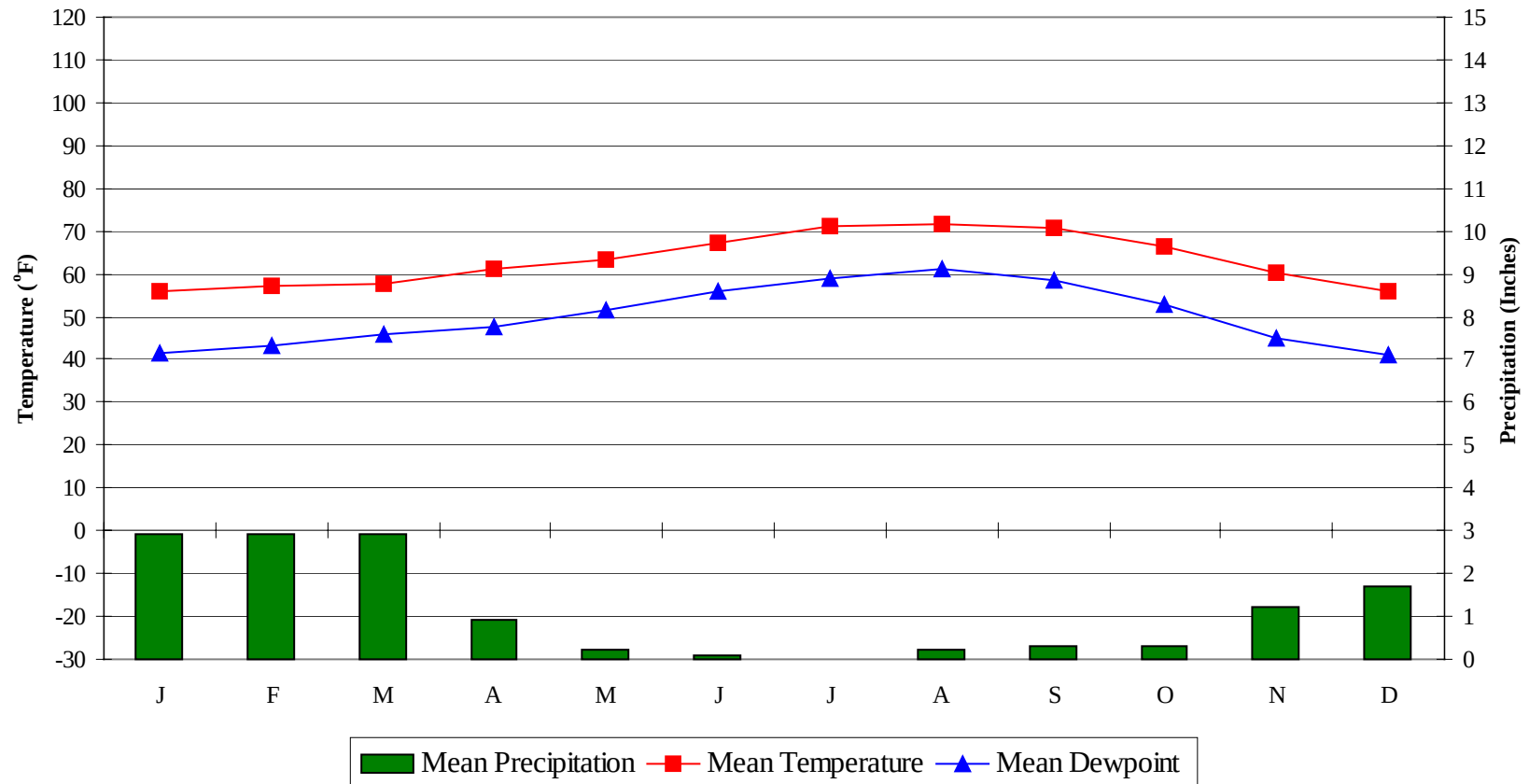
*Note: Temperatures at greater depths can be estimated by adding 1.5°F per 100 feet additional depth.

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Average Annual Climate

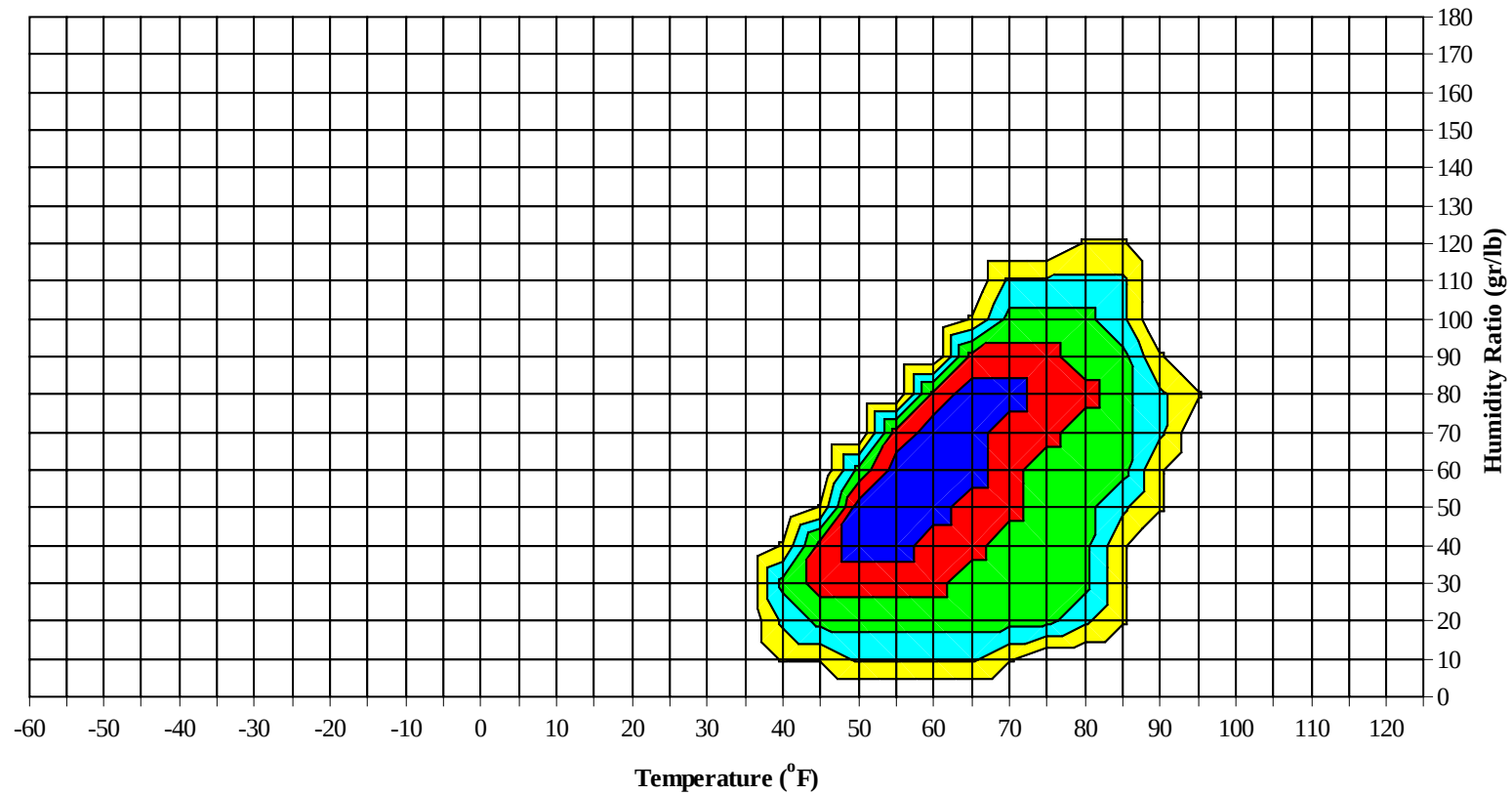


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Long Term Psychrometric Summary



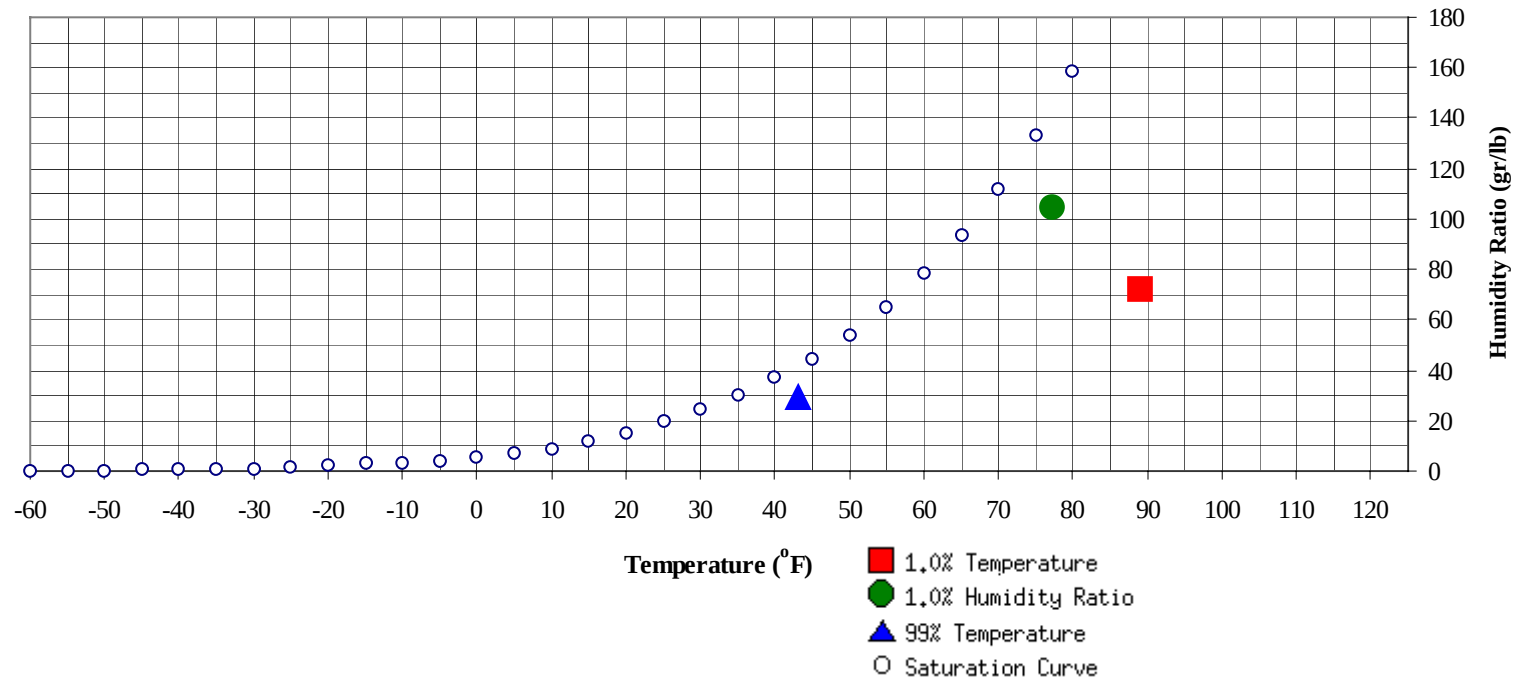
- 50% of all observations
- 80% of all observations
- 95% of all observations
- 97.5% of all observations
- 99% of all observations

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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)
	43	29.5	14.9		105	77.2	70.8	68	35.0

1.0% Dry Bulb	(°F)	MCHR (gr/lb)	MCWB (°F)	Enthalpy (btu/lb)
	89	72.5	68.3	32.8

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

Period of Record = 1977 to 1989

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												0		0	76.5
90 / 94												1		1	63.1
85 / 89							1		1	60.9		2	0	2	60.6
80 / 84		5		5	57.4		7	0	7	59.5	0	7	0	7	59.4
75 / 79	0	10	2	12	55.4	0	17	2	19	57.8	0	14	3	17	57.6
70 / 74	1	26	3	30	54.3	1	23	6	30	55.9	1	30	5	36	57.0
65 / 69	5	39	12	56	53.3	3	44	12	59	54.4	3	53	14	70	56.0
60 / 64	11	72	31	114	53.4	14	62	34	110	53.5	10	77	42	129	54.1
55 / 59	49	64	77	190	50.9	48	46	75	169	51.8	63	52	92	206	52.5
50 / 54	83	25	77	185	47.5	75	19	65	159	47.8	102	12	72	186	48.9
45 / 49	65	6	37	108	43.6	61	4	25	90	43.5	55	1	19	75	44.1
40 / 44	27	1	8	36	38.7	19	1	4	24	38.9	13		1	14	39.7
35 / 39	6		1	7	33.8	3		0	3	34.2	1		0	1	34.4
30 / 34	1		0	1	30.0										

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 = 1977 to 1989

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		0		0	67.8							0		0	68.0
100 / 104		0	0	0	66.8							2	0	2	67.7
95 / 99		1	0	1	65.0		1		1	64.2		3	1	4	67.0
90 / 94		1	0	1	62.8		2	0	2	65.8	0	3	1	4	68.1
85 / 89	0	6	1	7	62.0	0	5	1	6	63.9	1	11	2	14	67.9
80 / 84	1	13	2	16	61.0	0	12	2	14	64.1	1	28	6	35	67.0
75 / 79	1	23	5	29	60.0	1	37	5	43	63.4	3	58	13	74	65.1
70 / 74	3	42	10	55	58.8	2	63	14	79	61.1	6	70	30	106	62.7
65 / 69	5	69	22	96	57.0	11	72	38	121	58.6	31	48	58	137	60.3
60 / 64	27	62	59	148	54.8	77	49	98	223	56.5	126	17	101	244	58.2
55 / 59	94	21	96	211	52.8	111	7	75	192	53.5	63	0	26	89	54.8
50 / 54	81	2	38	121	48.8	41	0	15	56	49.2	8		2	10	50.2
45 / 49	26	0	7	33	44.4	5		0	5	44.1	1		0	1	44.1
40 / 44	3		0	3	40.3	0		0	0	42.0					
35 / 39															
30 / 34															

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Dry-Bulb Temperature Hours For An Average Year (Sheet 3 of 5)**Period of Record = 1977 to 1989**

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	70.7							0		0	75.0
100 / 104		1		1	69.9		0		0	74.2		3	0	3	73.3
95 / 99		2	0	2	71.0		3	0	3	72.6	0	7	1	8	71.7
90 / 94	0	10	1	11	69.6		10	1	11	71.0	0	15	2	17	71.3
85 / 89	0	28	3	31	68.5	0	31	4	35	70.8	1	25	6	32	69.9
80 / 84	1	73	11	85	68.1	2	69	12	83	69.3	2	43	12	57	68.6
75 / 79	7	84	34	125	66.2	8	82	35	125	67.2	10	55	26	91	66.0
70 / 74	23	35	58	116	64.3	34	40	63	137	65.5	29	60	47	136	64.1
65 / 69	92	12	88	192	62.3	112	10	95	217	62.9	75	27	82	184	61.8
60 / 64	99	3	49	151	59.0	76	2	36	114	59.9	89	5	58	152	59.0
55 / 59	25		4	29	55.0	16		2	18	56.0	31	1	7	39	54.7
50 / 54	1			1	50.6	0			0	51.3	2			2	51.0
45 / 49															
40 / 44															
35 / 39															
30 / 34															

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 4 of 5)

Period of Record = 1977 to 1989

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		0		0	66.3										
95 / 99		2		2	65.3										
90 / 94		3	0	3	63.8		0		0	63.0		0		0	58.0
85 / 89	0	12	1	13	63.3		3		3	59.1		2	0	2	58.7
80 / 84	1	24	4	29	63.0		11	0	11	59.7		2	1	3	57.2
75 / 79	3	54	9	66	62.6	0	28	2	30	57.5	0	12	1	13	56.4
70 / 74	9	75	24	108	61.4	3	38	8	49	56.6	1	24	3	28	54.8
65 / 69	34	61	68	163	59.8	9	66	22	96	55.6	3	46	9	58	54.0
60 / 64	108	17	105	230	57.7	29	63	58	149	54.3	13	74	31	118	52.9
55 / 59	74	1	34	109	53.5	83	26	90	199	51.9	39	52	78	169	50.7
50 / 54	18		3	21	48.9	82	5	47	134	47.9	89	26	80	195	47.1
45 / 49	1			1	45.7	30	0	13	43	43.0	72	8	35	115	43.0
40 / 44						5		1	6	39.3	24	1	10	35	38.1
35 / 39											7		1	8	33.0
30 / 34											0		0	0	28.8

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 5 of 5)

Period of Record = 1977 to 1989

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		1		1	70.1
100 / 104		6	0	6	71.0
95 / 99	0	19	2	21	69.7
90 / 94	0	47	6	53	69.4
85 / 89	3	128	18	149	67.9
80 / 84	8	297	51	356	66.6
75 / 79	35	480	138	653	64.1
70 / 74	114	528	274	916	61.8
65 / 69	389	547	527	1463	59.5
60 / 64	686	497	707	1889	56.5
55 / 59	696	265	651	1612	52.5
50 / 54	573	85	389	1047	48.1
45 / 49	309	18	132	459	43.5
40 / 44	88	2	23	113	38.8
35 / 39	17		3	20	33.6
30 / 34	1		0	1	29.6

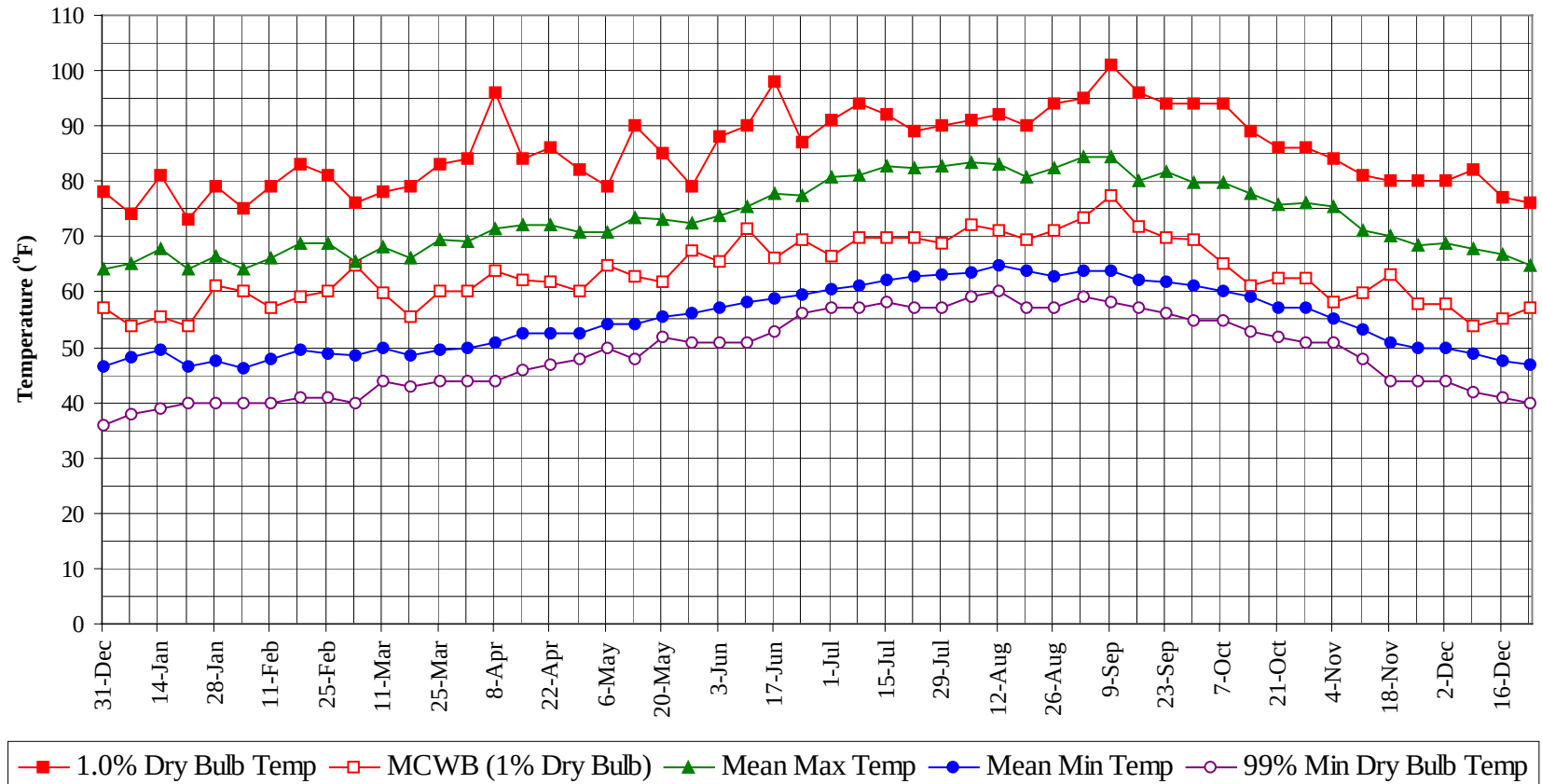
Caution: This summary reflects the typical distribution of temperature in a typical year. It does not reflect the typical moisture distribution. Because wet bulb temperatures are averaged, this summary understates the annual moisture load. For accurate moisture load data, see the long-term humidity summary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

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Annual Summary of Temperatures

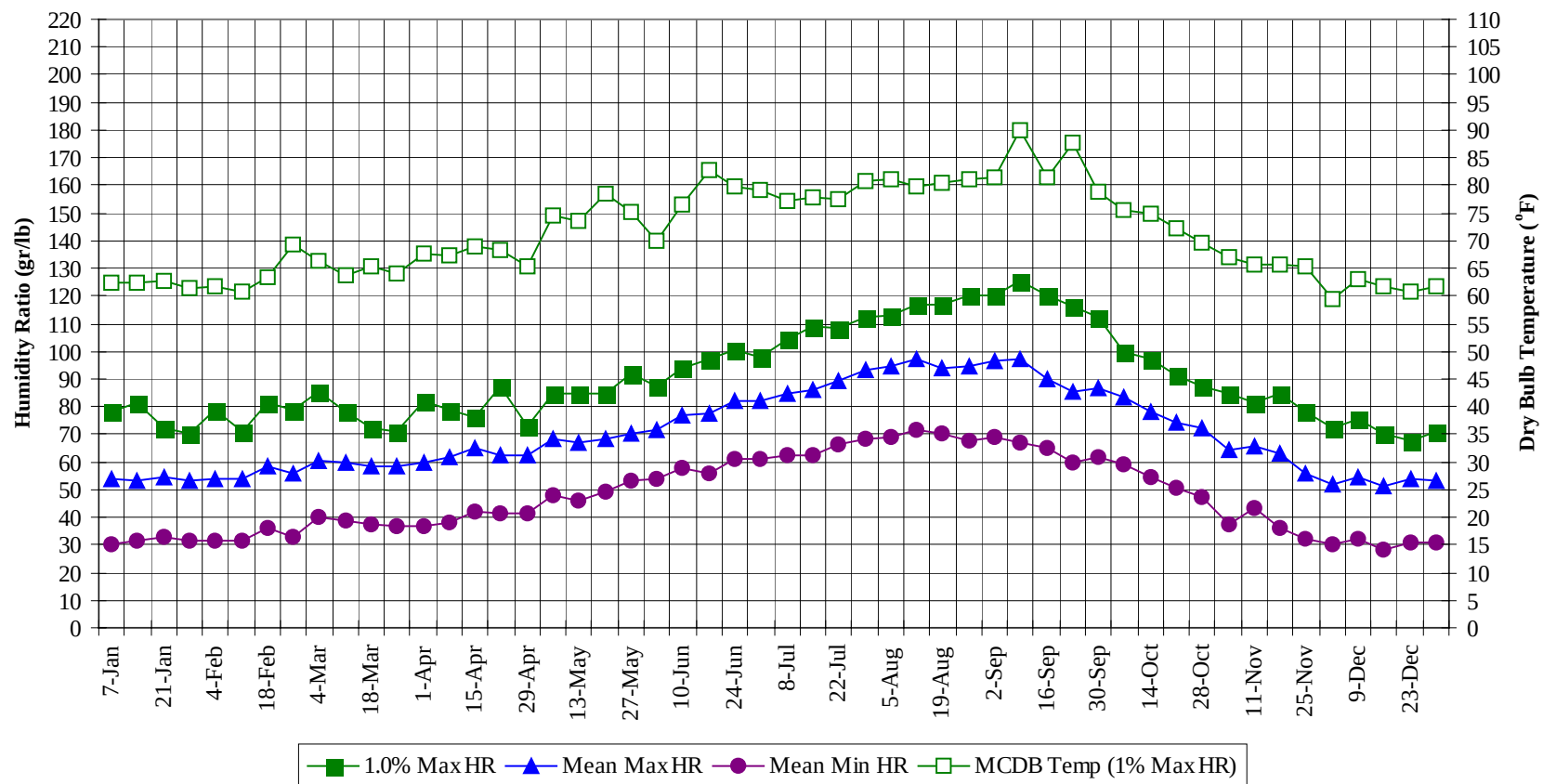


LONG BEACH

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WMO No. 722974

Long Term Humidity and Dry Bulb Temperature Summary



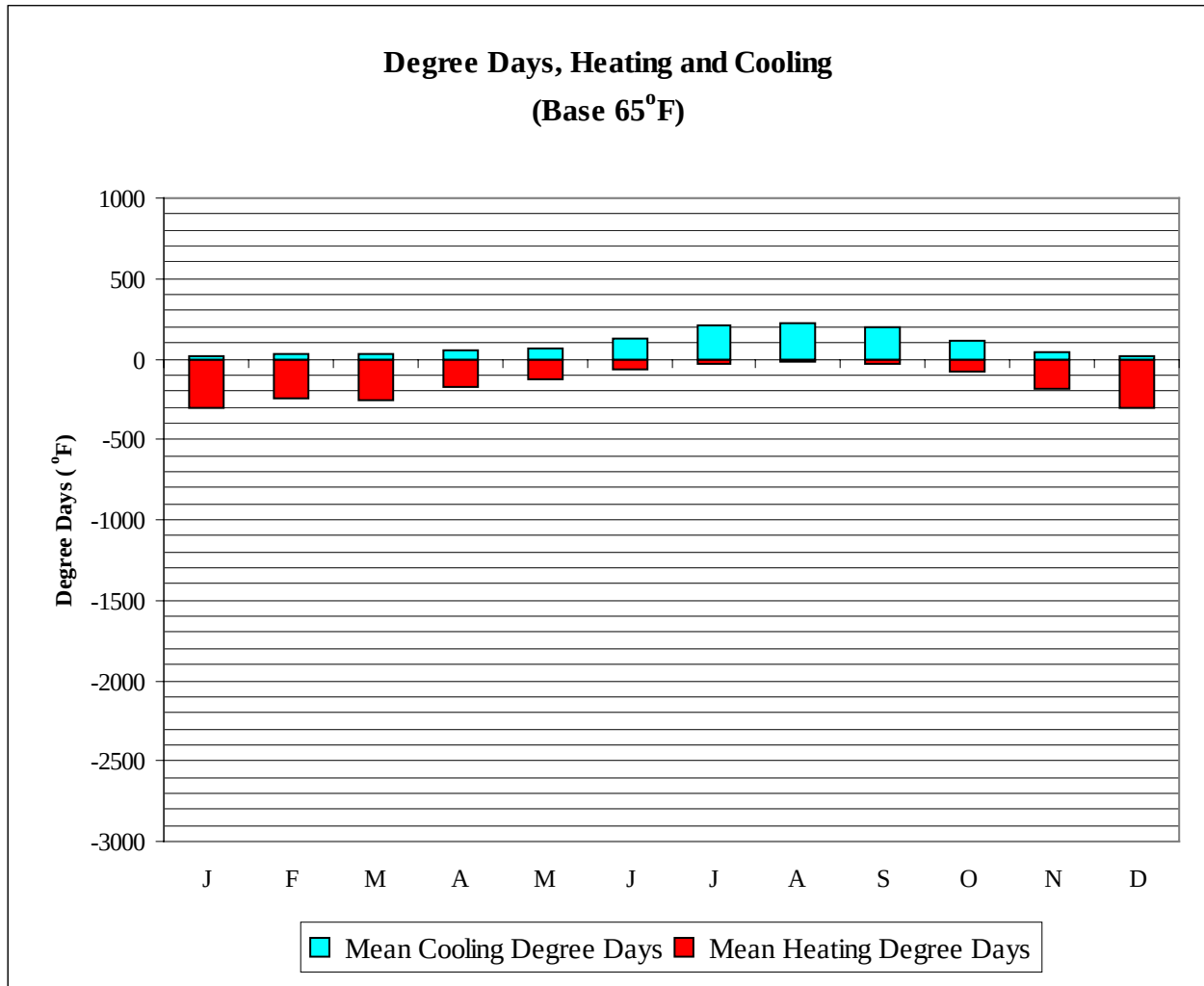
LONG BEACH**CA****WMO No. 722974****Long Term Dry Bulb Temperature and Humidity Summary**

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	74.0	53.8	65.3	48.1	38.0	78.4	62.4	53.9	30.1
14-Jan	81.0	55.6	67.8	49.5	39.0	81.2	62.5	53.4	31.4
21-Jan	73.0	53.7	64.1	46.7	40.0	72.1	62.6	54.7	33.1
28-Jan	79.0	61.0	66.4	47.5	40.0	70.0	61.4	53.4	31.5
4-Feb	75.0	60.1	64.2	46.3	40.0	79.1	61.7	54.0	31.8
11-Feb	79.0	57.3	66.3	47.9	40.0	70.7	60.8	53.8	31.5
18-Feb	83.0	59.0	68.9	49.5	41.0	81.2	63.4	58.2	35.8
25-Feb	81.0	60.1	68.9	48.9	41.0	79.1	69.4	56.0	32.6
4-Mar	76.0	64.7	65.6	48.5	40.0	85.4	66.4	60.5	39.9
11-Mar	78.0	59.8	68.3	49.8	44.0	78.4	63.8	60.0	38.7
18-Mar	79.0	55.5	66.2	48.4	43.0	72.1	65.5	58.3	37.5
25-Mar	83.0	60.1	69.5	49.5	44.0	70.7	63.9	58.1	36.5
1-Apr	84.0	60.0	69.2	49.7	44.0	81.9	67.5	59.7	37.1
8-Apr	96.0	63.8	71.6	50.8	44.0	79.1	67.5	61.7	37.8
15-Apr	84.0	62.3	72.1	52.5	46.0	76.3	68.9	65.1	42.2
22-Apr	86.0	61.8	72.1	52.4	47.0	87.5	68.3	62.4	41.5
29-Apr	82.0	60.2	71.0	52.4	48.0	72.8	65.5	62.3	41.4
6-May	79.0	64.9	71.0	54.3	50.0	84.7	74.4	68.1	47.9
13-May	90.0	62.7	73.4	54.3	48.0	84.7	73.7	66.8	45.9
20-May	85.0	61.8	73.1	55.5	52.0	84.7	78.5	68.5	48.9
27-May	79.0	67.5	72.6	56.2	51.0	91.7	75.2	70.3	53.0
3-Jun	88.0	65.5	73.9	57.0	51.0	87.5	69.9	71.4	53.7
10-Jun	90.0	71.5	75.6	58.3	51.0	93.8	76.6	77.1	57.6
17-Jun	98.0	66.3	77.6	58.9	53.0	97.3	82.9	77.5	56.0
24-Jun	87.0	69.6	77.5	59.4	56.0	100.8	79.9	81.8	61.1
1-Jul	91.0	66.3	80.7	60.6	57.0	98.0	79.1	82.3	61.0
8-Jul	94.0	69.9	81.0	61.3	57.0	104.3	77.3	84.6	62.3
15-Jul	92.0	69.9	82.8	62.3	58.0	109.2	77.9	86.1	62.3
22-Jul	89.0	69.7	82.4	62.9	57.0	108.5	77.5	89.2	66.1
29-Jul	90.0	68.9	82.8	63.0	57.0	112.0	80.9	93.1	68.5
5-Aug	91.0	72.0	83.5	63.6	59.0	112.7	81.0	94.4	69.3
12-Aug	92.0	71.0	83.1	64.6	60.0	116.9	79.7	97.2	71.6
19-Aug	90.0	69.4	80.6	63.9	57.0	116.9	80.5	94.0	70.6
26-Aug	94.0	71.2	82.5	62.7	57.0	120.4	81.0	94.6	67.7
2-Sep	95.0	73.3	84.4	63.9	59.0	120.4	81.5	96.3	68.8
9-Sep	101.0	77.4	84.4	63.7	58.0	125.3	89.9	97.0	67.2
16-Sep	96.0	71.8	80.2	62.3	57.0	120.4	81.4	90.0	65.2
23-Sep	94.0	69.8	81.6	61.9	56.0	116.2	87.7	85.7	59.8
30-Sep	94.0	69.4	79.9	61.3	55.0	112.0	78.9	86.9	61.4
7-Oct	94.0	65.0	79.7	60.1	55.0	100.1	75.6	83.2	58.9
14-Oct	89.0	61.0	77.7	59.3	53.0	97.3	74.9	78.3	54.7
21-Oct	86.0	62.3	75.8	57.3	52.0	91.0	72.3	74.0	50.5
28-Oct	86.0	62.4	76.0	57.0	51.0	87.5	69.8	72.0	47.6
4-Nov	84.0	58.3	75.4	55.1	51.0	84.7	67.1	64.7	37.7
11-Nov	81.0	59.9	71.2	53.1	48.0	81.2	65.6	65.6	43.5
18-Nov	80.0	63.0	70.2	50.8	44.0	84.7	65.7	62.8	36.0
25-Nov	80.0	57.8	68.4	49.8	44.0	78.4	65.4	55.8	32.2
2-Dec	80.0	57.7	68.9	49.9	44.0	72.1	59.3	51.8	30.1
9-Dec	82.0	54.0	67.8	48.7	42.0	75.6	63.2	54.2	32.4
16-Dec	77.0	55.3	66.9	47.4	41.0	70.0	61.8	51.2	28.1
23-Dec	76.0	57.0	64.7	46.8	40.0	67.9	60.7	53.8	31.1
31-Dec	78.0	57.3	64.1	46.5	36.0	70.7	61.9	52.9	30.7

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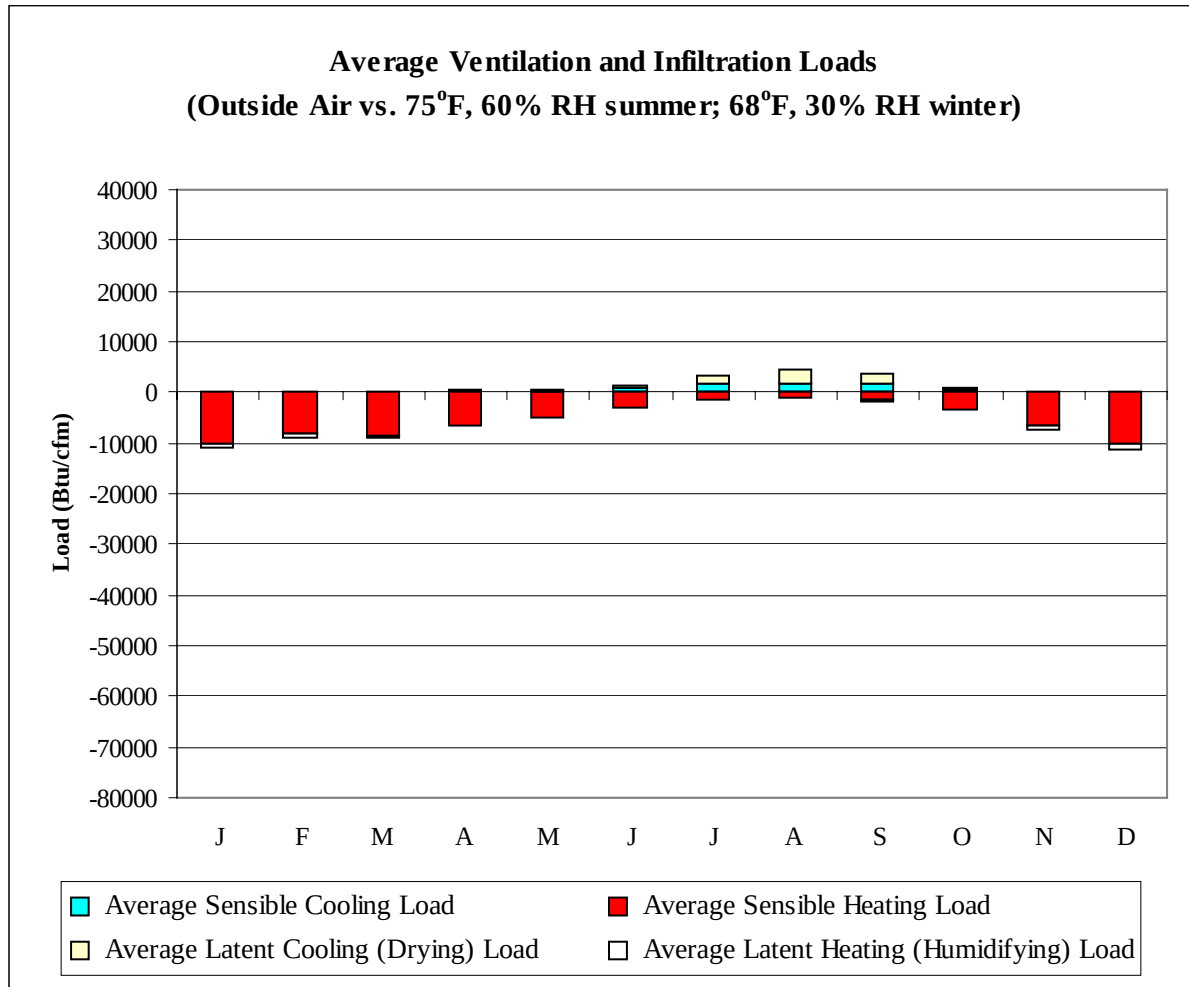


	Mean Cooling Degree Days (°F)	Mean Heating Degree Days (°F)
JAN	20	301
FEB	27	244
MAR	31	253
APR	59	178
MAY	70	125
JUN	125	63
JUL	215	25
AUG	227	17
SEP	201	29
OCT	113	72
NOV	45	190
DEC	20	306
ANN	1153	1803

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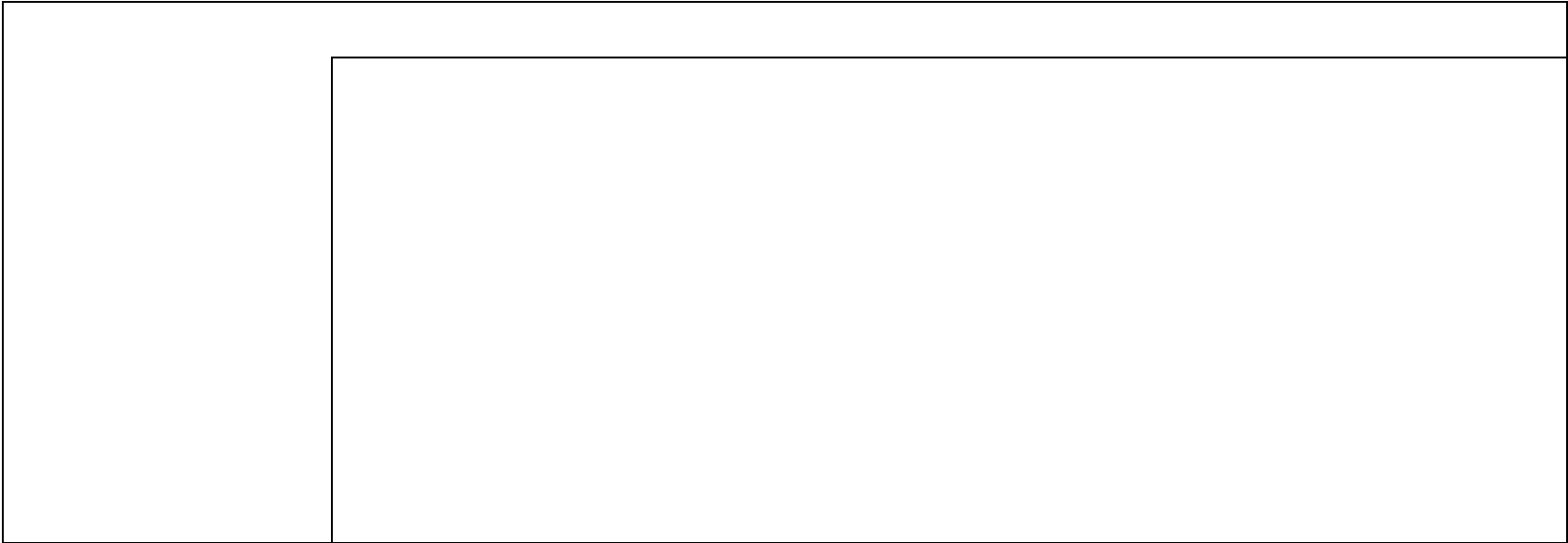
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	Average Sensible Cooling Load	Average Sensible Heating Load	Average Latent Cooling Load	Average Latent Heating Load
	(Btu/cfm)	(Btu/cfm)	(Btu/cfm)	(Btu/cfm)
JAN	51	-9957	11	-1038
FEB	91	-8191	21	-735
MAR	129	-8662	21	-468
APR	348	-6410	36	-160
MAY	302	-4961	107	-34
JUN	754	-2953	496	-11
JUL	1554	-1507	1747	0
AUG	1586	-1146	3008	0
SEP	1586	-1635	2011	-23
OCT	597	-3283	456	-240
NOV	171	-6769	27	-692
DEC	70	-10090	1	-1135
ANN	7239	-65564	7942	-4536

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

No Solar Radiation
Data Available

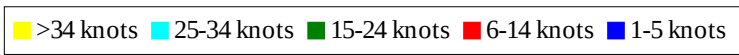
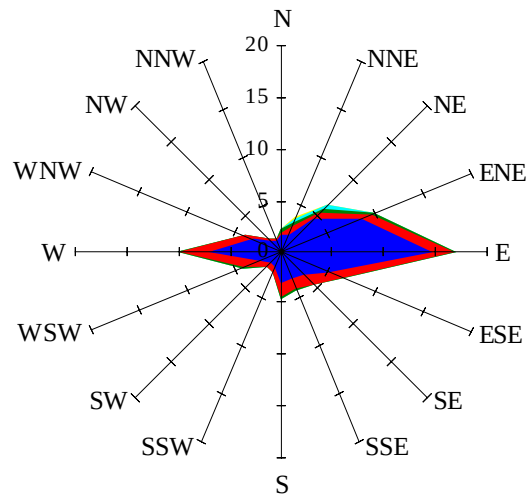


Average Annual Solar Heat and Illumination – Nearest Available Site

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

Wind Summary - December, January, and February

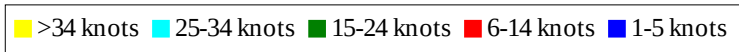
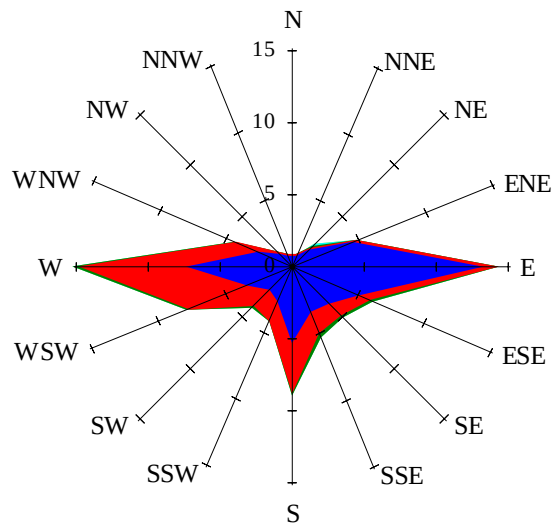
Labels of Percent Frequency on North Axis



Percent Calm = 17.64

Wind Summary - March, April, and May

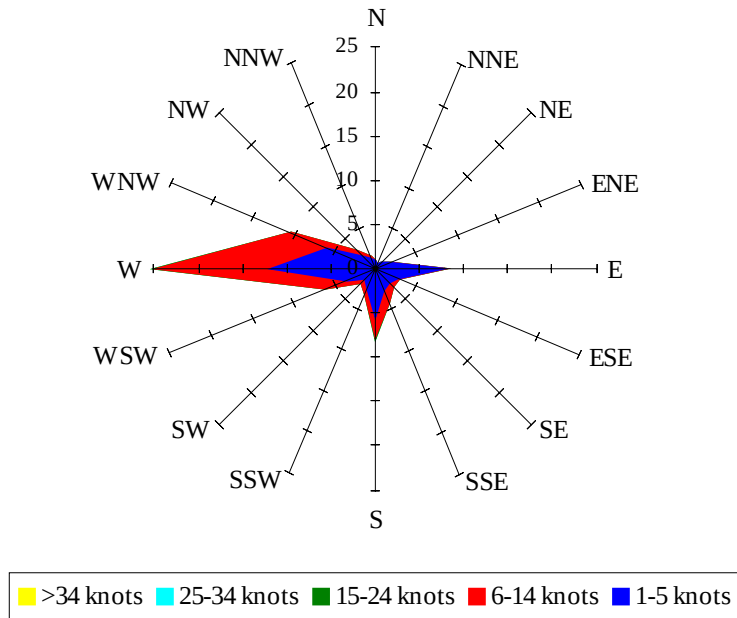
Labels of Percent Frequency on North Axis



Percent Calm = 15.70

Wind Summary - June, July, and August

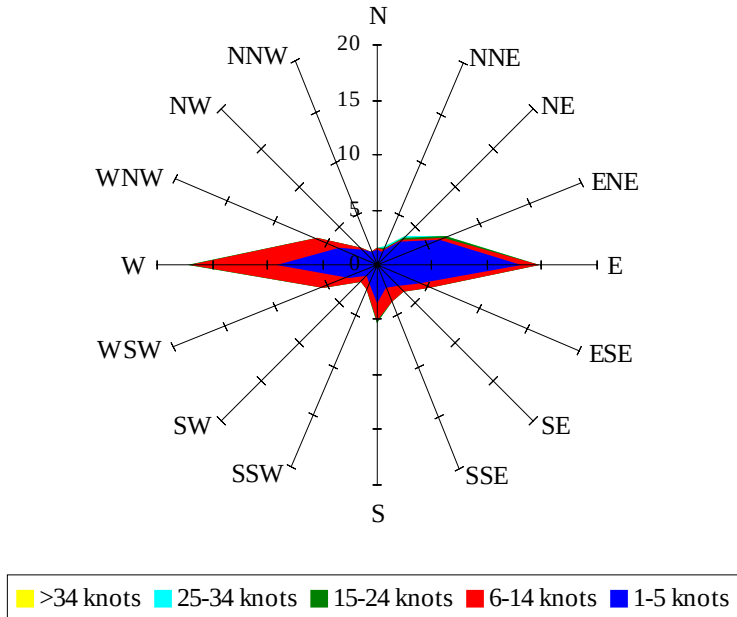
Labels of Percent Frequency on North Axis



Percent Calm = 19.28

Wind Summary - September, October, and November

Labels of Percent Frequency on North Axis



Percent Calm = 18.84