

LISBON, PORTUGAL

Latitude = 38.78 N

Longitude = 9.13 W

Period of Record = 1973 to 1996

WMO No. 085360

Elevation = 404 feet

Average Pressure = 29.62 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	99	71	70	7.9	E
0.4% Occurrence	93	70	75	8.9	NNW
1.0% Occurrence	90	69	75	9.1	NNW
2.0% Occurrence	86	68	74	9.7	NNW
Mean Daily Range	14	-	-	-	-
97.5% Occurrence	45	43	37	6.0	N
99.0% Occurrence	41	38	30	4.9	NE
99.6% Occurrence	39	37	28	4.5	NE
Median of Extreme Lows	36	34	25	4.6	NE
	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	77	92	114	8.9	NNW
0.4% Occurrence	73	87	98	9.1	NNW
1.0% Occurrence	71	83	93	9.4	NNW
2.0% Occurrence	69	80	88	9.8	NNW
	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	118	85	0.78	9.4	WSW
0.4% Occurrence	104	76	0.69	8.7	SW
1.0% Occurrence	98	74	0.65	8.3	NNW
2.0% Occurrence	97	75	0.65	8.1	NNW
Air Conditioning/ Humid Area Criteria	# of Hours	T ≥ 93°F	T ≥ 80°F	T _{wb} ≥ 73°F	T _{wb} ≥ 67°F
		38	419	37	533

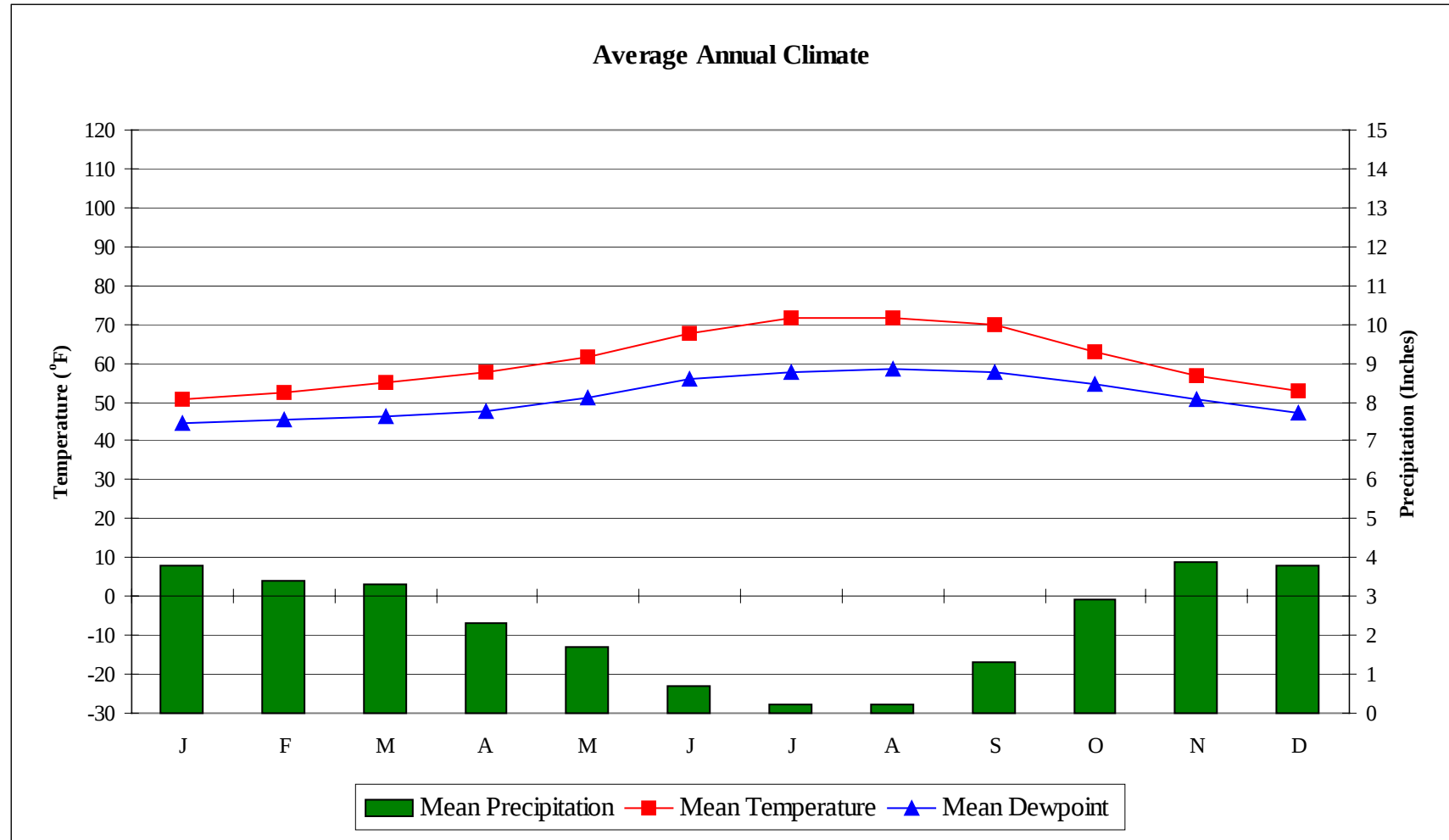
Other Site Data

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
8	N/A	N/A	0.5 + 0.4
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 (#)
63.5	N/A	N/A	0

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

LISBON, PORTUGAL

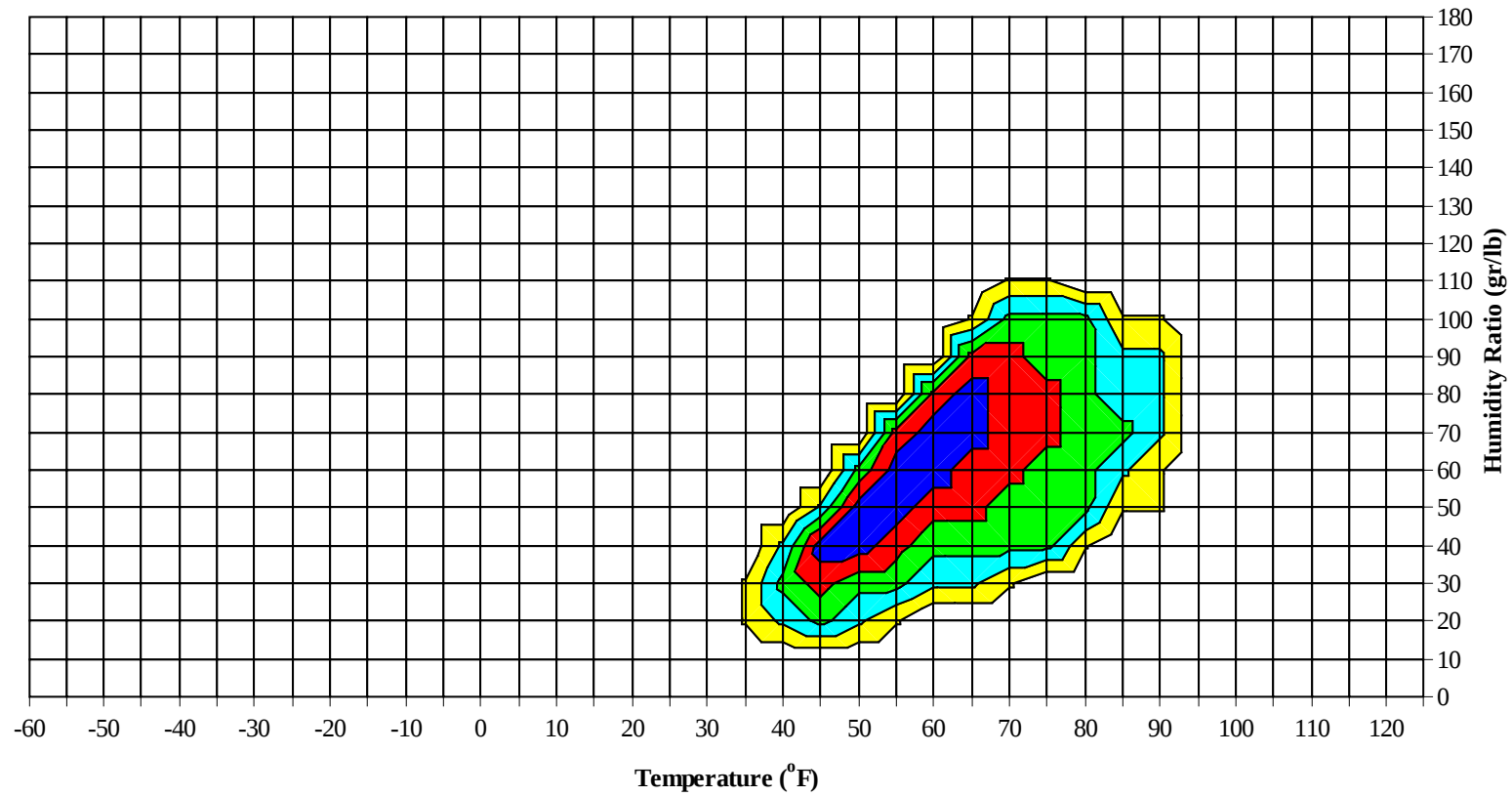
WMO No. 085360



LISBON, PORTUGAL

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Long Term Psychrometric Summary

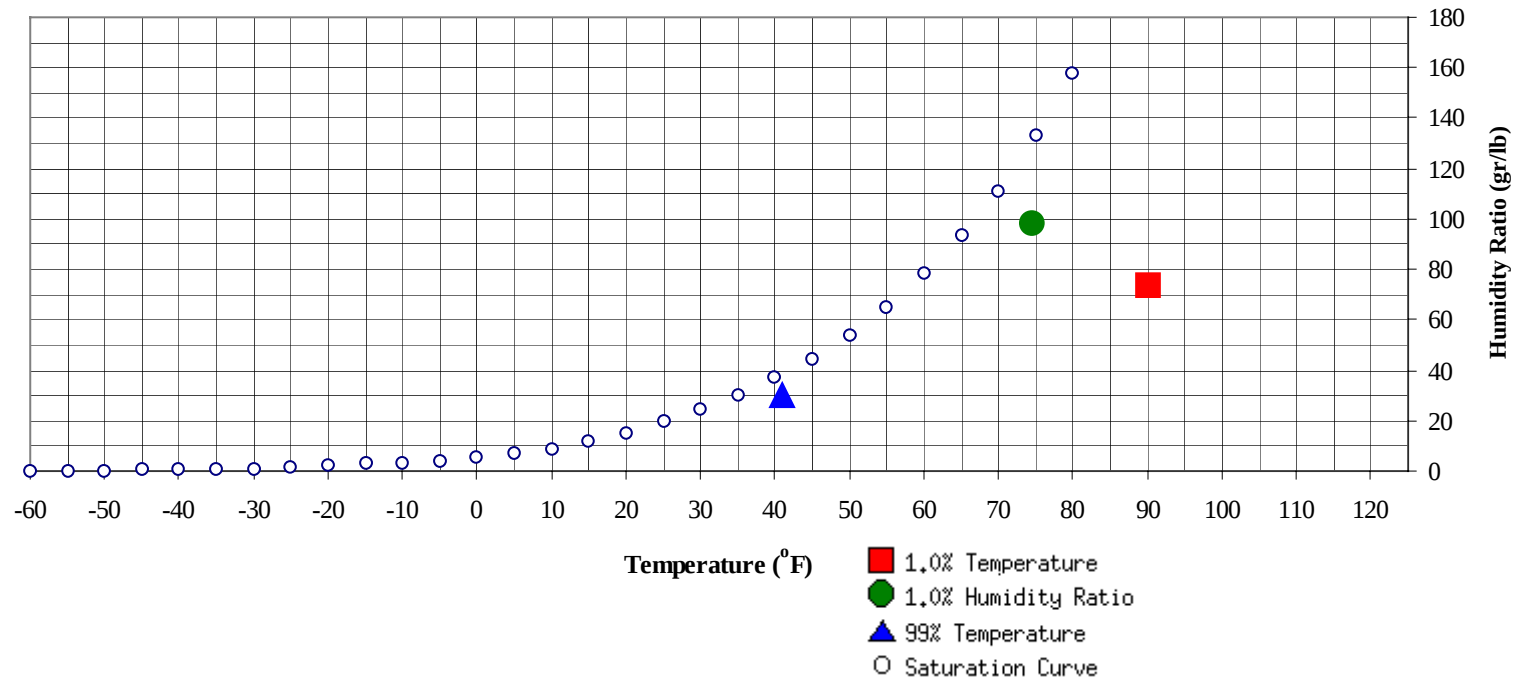


- 50% of all observations
- 80% of all observations
- 95% of all observations
- 97.5% of all observations
- 99% of all observations

LISBON, PORTUGAL

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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)
	41	30.3	14.5		98	74.4	68.8	66.2	33.2

1.0% Dry Bulb	(°F)	MCHR (gr/lb)	MCWB (°F)	Enthalpy (btu/lb)
	90	74	68.9	33.2

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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												0	0	0	58.3
75 / 79												2	2	4	59.5
70 / 74							0	0	0	61.4		0	10	9	19 58.4
65 / 69		0	0	0	58.0		2	2	4	56.7		1	16	13	30 57.1
60 / 64	3	15	11	29	57.5	1	25	19	45	55.7	7	54	40	101	55.1
55 / 59	31	76	72	178	53.2	37	83	83	204	53.0	52	91	87	230	52.3
50 / 54	71	77	104	252	48.6	82	68	82	232	48.6	109	57	78	244	48.6
45 / 49	94	52	52	199	43.9	80	35	33	148	43.8	70	16	18	105	44.0
40 / 44	35	18	7	61	39.5	17	8	4	29	39.2	8	1	1	10	39.7
35 / 39	12	8	2	22	35.6	7	2	1	10	35.4	1	0		1	36.6
30 / 34	2	1		3	30.6	0	0		0	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 = 1973 to 1996

April						May					June				
Temperature Range (°F)	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 0 77.0				
100 / 104											0 0 0 78.1				
95 / 99						0 0 70.0					1 1 2 72.3				
90 / 94						1 1 2 69.1					6 4 10 69.5				
85 / 89	0 0 0 65.3					2 1 3 65.1					0 10 5 15 68.2				
80 / 84	2 1 3 61.7					7 4 11 63.8					1 23 15 39 66.9				
75 / 79	5 4 9 60.4					0 20 12 32 62.4					5 44 26 75 64.6				
70 / 74	0	20	13	33	58.8	3	40	23	66	60.4	14	67	49	130	62.2
65 / 69	1	26	17	44	57.2	6	43	29	78	58.7	24	46	43	113	60.7
60 / 64	10	71	49	130	55.3	44	87	78	209	56.8	98	39	71	209	58.7
55 / 59	74	83	89	246	52.6	108	42	76	226	53.6	90	3	24	118	54.9
50 / 54	115	29	58	201	49.0	79	5	23	107	49.7	8	0	1	9	50.6
45 / 49	38	4	9	51	44.5	8	0	1	9	44.8					
40 / 44	3	0	0	3	40.0										
35 / 39	0			0	37.5										
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 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	0	72.5										
100 / 104		1	1	2	72.6		1	1	2	70.7		0	0	0	75.0
95 / 99		5	3	8	71.2		4	2	6	69.0		2	1	3	70.6
90 / 94	0	15	10	25	69.8		12	7	19	69.1		7	4	11	69.0
85 / 89	1	16	10	27	68.6	0	14	9	23	68.0		10	6	16	68.2
80 / 84	3	36	25	64	67.4	3	45	25	73	67.1	1	30	18	49	67.0
75 / 79	15	70	44	129	65.0	10	74	53	137	65.4	8	56	39	103	64.8
70 / 74	26	65	59	149	63.0	33	63	70	166	63.7	28	71	64	162	63.3
65 / 69	47	29	49	125	61.9	71	25	49	145	62.5	54	38	55	147	62.1
60 / 64	128	11	44	184	59.4	118	9	32	158	59.4	111	23	49	183	59.3
55 / 59	28	0	3	31	55.6	14	0	1	15	55.3	37	2	5	44	54.8
50 / 54						0	0		0	50.7	2	0	0	2	49.2
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.

LISBON, PORTUGAL

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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		0	0	0	66.8										
85 / 89		1	1	2	67.8										
80 / 84		5	3	8	65.9										
75 / 79	0	18	12	30	64.5		1	0	1	63.0					
70 / 74	4	47	31	82	62.6	0	9	5	14	63.0		0	0	0	62.0
65 / 69	20	55	45	120	61.4	3	21	15	39	61.7		2	1	3	61.2
60 / 64	84	81	98	263	58.6	30	76	68	173	58.4	17	41	30	88	59.4
55 / 59	99	32	49	181	54.2	85	76	91	252	53.9	53	79	87	220	53.9
50 / 54	39	8	8	55	49.6	81	41	49	170	49.4	79	71	86	237	49.1
45 / 49	2	0	0	2	44.4	35	14	12	62	44.1	68	39	38	145	43.8
40 / 44						6	2	0	8	39.7	22	12	4	38	39.5
35 / 39						1	0		1	35.1	9	4	1	14	36.1
30 / 34											0	0		0	31.9

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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Period of Record = 1973 to 1996

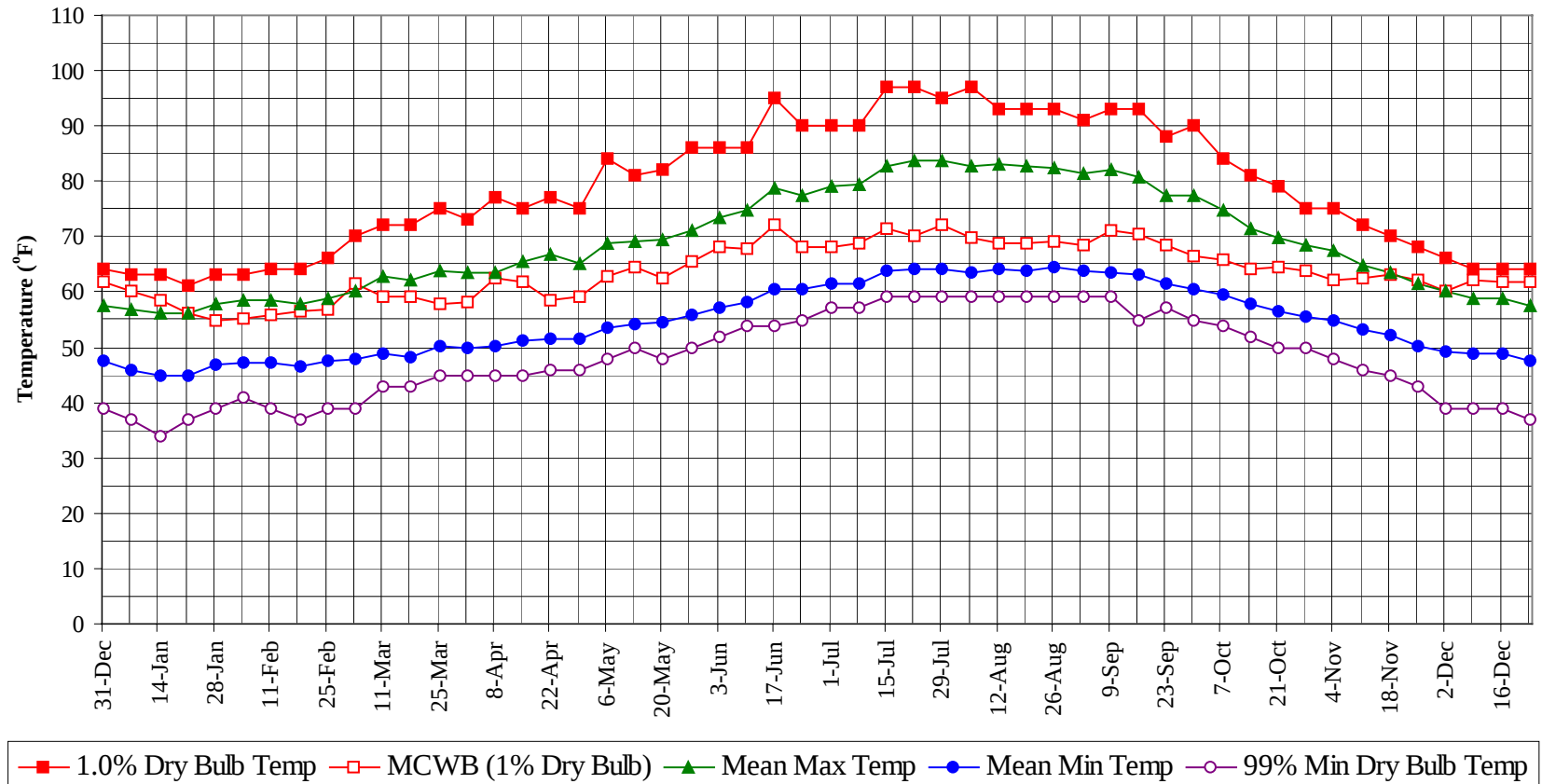
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Caution: This summary reflects the typical distribution of temperature in a typical year. It does not reflect the typical moisture distribution. Because wet bulb temperatures are averaged, this summary understates the annual moisture load. For accurate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

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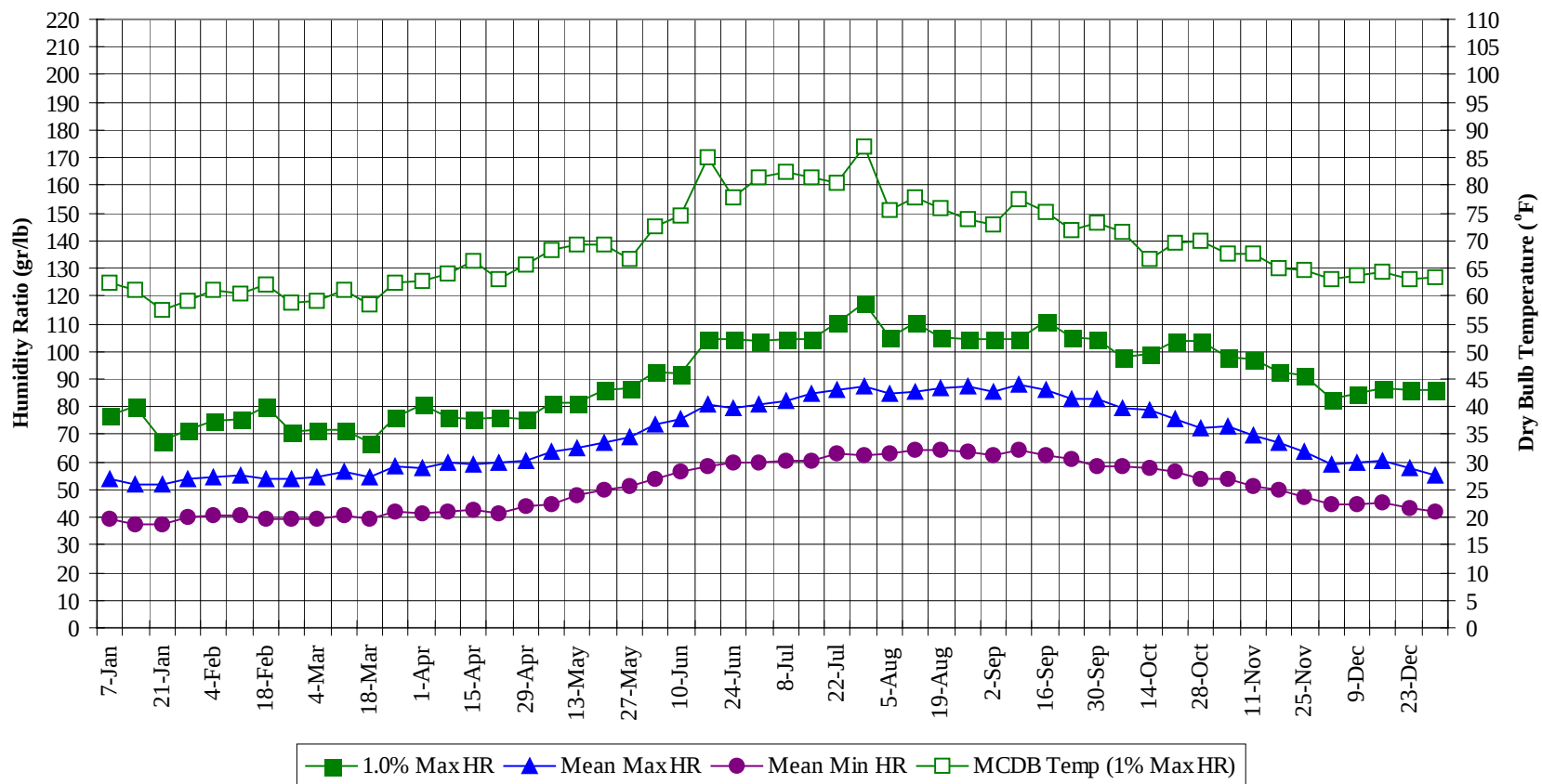
Annual Summary of Temperatures



LISBON, PORTUGAL

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Long Term Humidity and Dry Bulb Temperature Summary



LISBON, PORTUGAL

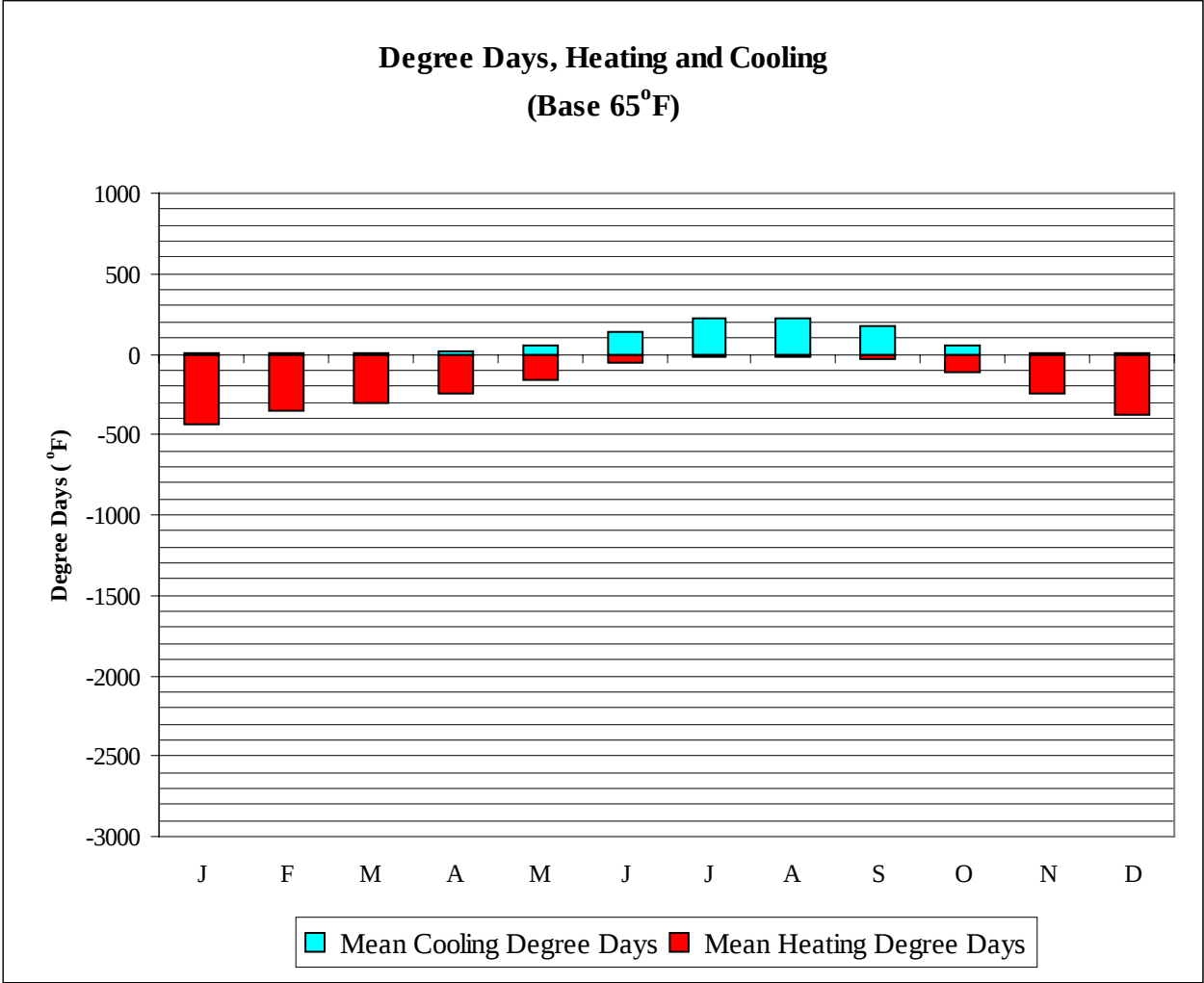
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Long Term Dry Bulb Temperature and Humidity Summary

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	63.0	60.1	57.0	45.7	37.0	77.0	62.5	53.8	39.5
14-Jan	63.0	58.6	56.0	45.0	34.0	79.8	61.0	52.0	37.5
21-Jan	61.0	56.2	56.0	44.9	37.0	67.9	57.6	51.7	37.6
28-Jan	63.0	54.8	57.8	46.8	39.0	71.4	59.0	54.1	39.8
4-Feb	63.0	55.2	58.4	47.1	41.0	74.9	61.2	54.4	40.6
11-Feb	64.0	55.8	58.5	47.3	39.0	75.6	60.6	55.2	40.5
18-Feb	64.0	56.5	57.9	46.6	37.0	79.8	62.0	54.0	39.2
25-Feb	66.0	57.0	58.9	47.5	39.0	70.7	58.9	53.6	39.4
4-Mar	70.0	61.6	60.2	47.9	39.0	71.4	59.1	54.7	39.6
11-Mar	72.0	59.0	63.0	49.0	43.0	71.4	60.9	56.6	40.9
18-Mar	72.0	59.3	62.2	48.2	43.0	67.2	58.6	54.6	39.4
25-Mar	75.0	57.9	63.7	50.2	45.0	76.3	62.3	58.4	41.7
1-Apr	73.0	58.1	63.6	49.8	45.0	80.5	62.8	58.1	41.1
8-Apr	77.0	62.5	63.6	50.1	45.0	76.3	64.2	59.8	42.3
15-Apr	75.0	61.7	65.4	51.2	45.0	75.6	66.4	58.8	42.5
22-Apr	77.0	58.5	66.8	51.4	46.0	76.3	63.0	59.8	41.7
29-Apr	75.0	59.2	65.1	51.4	46.0	75.6	65.7	60.4	44.3
6-May	84.0	62.8	68.7	53.5	48.0	81.2	68.1	63.6	44.6
13-May	81.0	64.3	69.1	54.3	50.0	81.2	69.2	64.9	47.8
20-May	82.0	62.5	69.4	54.4	48.0	86.1	69.2	67.0	49.6
27-May	86.0	65.5	71.2	55.7	50.0	86.8	66.6	69.3	50.9
3-Jun	86.0	68.2	73.3	57.1	52.0	92.4	72.6	73.8	54.1
10-Jun	86.0	67.9	74.7	58.2	54.0	91.7	74.4	75.5	56.5
17-Jun	95.0	72.1	78.7	60.5	54.0	104.3	85.0	80.8	58.6
24-Jun	90.0	68.3	77.3	60.5	55.0	104.3	77.8	79.7	59.9
1-Jul	90.0	68.3	79.0	61.6	57.0	103.6	81.6	81.1	59.8
8-Jul	90.0	69.0	79.5	61.5	57.0	104.3	82.3	81.9	60.6
15-Jul	97.0	71.4	82.8	63.7	59.0	104.3	81.4	85.0	60.7
22-Jul	97.0	70.2	83.8	64.2	59.0	110.6	80.6	86.2	63.2
29-Jul	95.0	72.2	83.7	64.2	59.0	117.6	86.9	87.6	62.1
5-Aug	97.0	69.9	82.7	63.6	59.0	105.0	75.6	84.4	63.3
12-Aug	93.0	68.7	83.1	64.0	59.0	110.6	77.7	85.5	64.4
19-Aug	93.0	68.7	82.7	63.7	59.0	105.0	76.0	86.9	64.2
26-Aug	93.0	69.1	82.5	64.3	59.0	104.3	74.0	87.6	63.7
2-Sep	91.0	68.6	81.3	63.7	59.0	104.3	72.9	85.2	62.4
9-Sep	93.0	71.3	82.1	63.6	59.0	104.3	77.5	88.2	64.4
16-Sep	93.0	70.4	80.7	63.1	55.0	111.3	75.2	86.2	62.3
23-Sep	88.0	68.5	77.3	61.6	57.0	105.0	72.0	83.1	61.0
30-Sep	90.0	66.5	77.5	60.6	55.0	104.3	73.4	83.1	58.2
7-Oct	84.0	65.8	74.7	59.5	54.0	98.0	71.6	79.5	58.5
14-Oct	81.0	64.0	71.5	57.7	52.0	99.4	66.6	78.9	57.7
21-Oct	79.0	64.6	69.7	56.5	50.0	103.6	69.8	75.5	56.2
28-Oct	75.0	63.8	68.6	55.4	50.0	103.6	69.9	72.4	53.9
4-Nov	75.0	62.2	67.6	54.7	48.0	98.0	67.6	72.8	54.0
11-Nov	72.0	62.6	64.9	53.3	46.0	97.3	67.6	69.9	51.3
18-Nov	70.0	63.0	63.5	52.2	45.0	92.4	64.9	67.0	49.7
25-Nov	68.0	62.2	61.3	50.3	43.0	91.0	64.7	63.4	47.1
2-Dec	66.0	60.1	60.0	49.2	39.0	82.6	63.2	59.4	44.5
9-Dec	64.0	62.2	58.7	48.8	39.0	84.7	63.7	59.6	44.8
16-Dec	64.0	61.8	58.8	49.0	39.0	86.8	64.3	60.3	45.3
23-Dec	64.0	62.0	57.6	47.7	37.0	86.1	63.2	58.0	43.5
31-Dec	64.0	61.9	57.5	47.5	39.0	86.1	63.2	55.4	42.0

LISBON, PORTUGAL

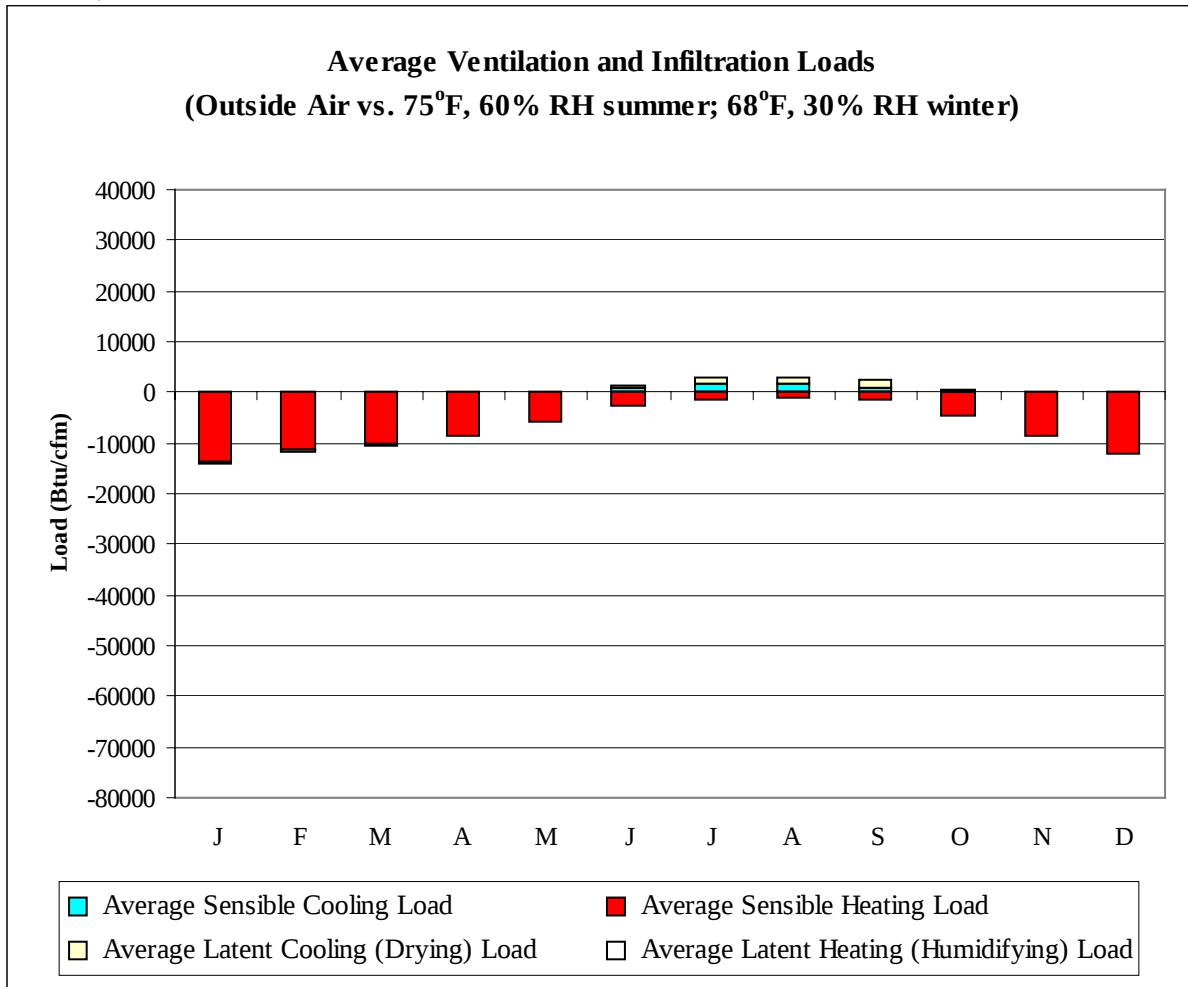
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	Mean Cooling Degree Days (°F)	Mean Heating Degree Days (°F)
JAN	0	436
FEB	0	355
MAR	9	310
APR	18	245
MAY	50	157
JUN	132	58
JUL	225	23
AUG	227	16
SEP	169	29
OCT	51	111
NOV	7	248
DEC	0	373
ANN	888	2361

LISBON, PORTUGAL

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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	-13694	6	-209
FEB	0	-11378	3	-190
MAR	6	-10298	9	-103
APR	38	-8445	14	-53
MAY	201	-5949	90	-31
JUN	783	-2683	517	0
JUL	1713	-1388	1174	-1
AUG	1554	-1090	1488	0
SEP	959	-1616	1359	-4
OCT	123	-4658	579	-13
NOV	0	-8641	213	-31
DEC	0	-12082	46	-149
ANN	5377	-81922	5498	-784

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

No Solar Radiation
Data Available

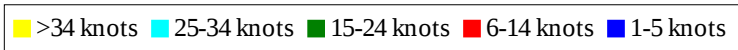
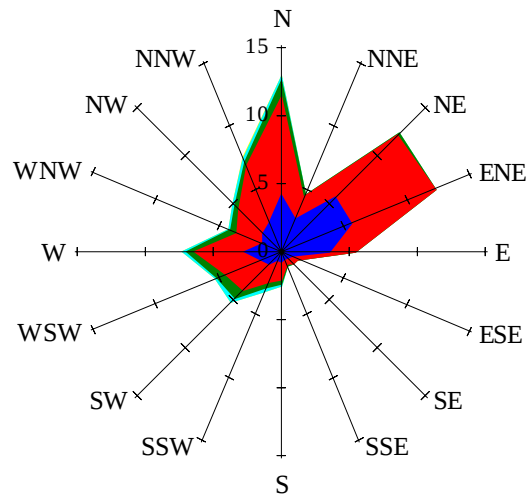


Average Annual Solar Heat and Illumination – Nearest Available Site

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

Wind Summary - December, January, and February

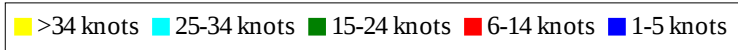
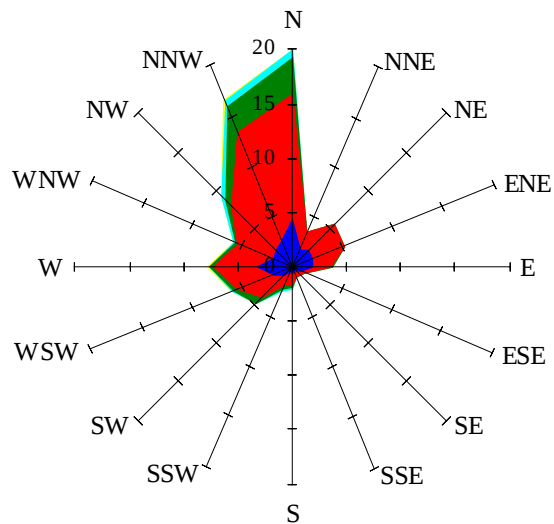
Labels of Percent Frequency on North Axis



Percent Calm = 9.82

Wind Summary - March, April, and May

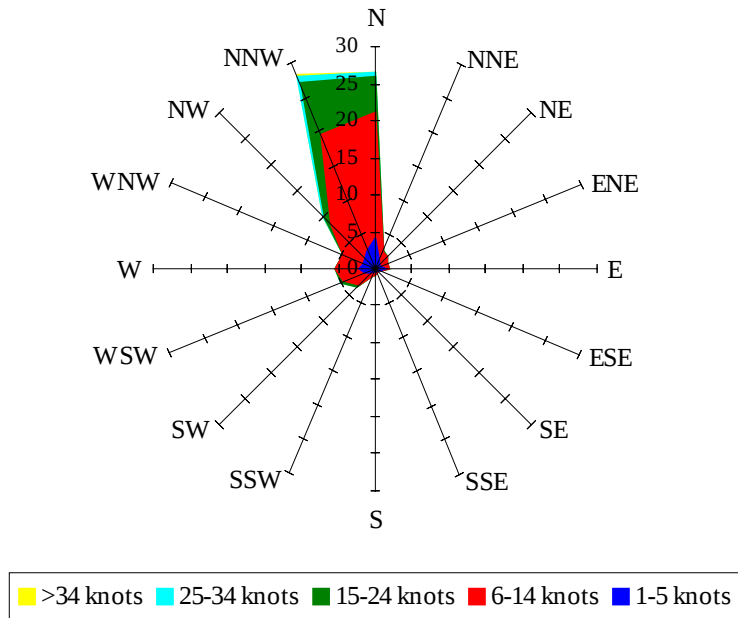
Labels of Percent Frequency on North Axis



Percent Calm = 5.94

Wind Summary - June, July, and August

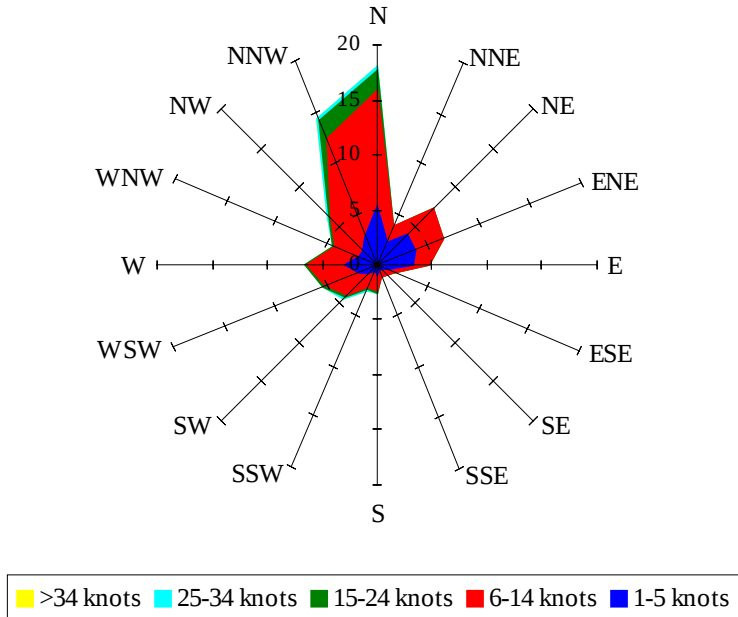
Labels of Percent Frequency on North Axis



Percent Calm = 4.31

Wind Summary - September, October, and November

Labels of Percent Frequency on North Axis



Percent Calm = 9.19