

JOHANNESBURG INTL, SF

Latitude = 26.14 S

Longitude = 28.25 E

Period of Record = 1988 To 2017

Station ID = ICAO_FAJS

Elevation = 5558 Feet

Average Pressure = 24.62 inches Hg

Design Criteria Data

Dry Bulb Temperature (T)	Mean Coincident (Average) Values				
	Design Value (°F)	Wet Bulb Temperature (°F)	Humidity Ratio (gr/lb)	Wind Speed (mph)	Prevailing Direction (NSEW)
Median of Extreme Highs	88	59	45	11.1	NW
0.4% Occurrence	84	59	51	10.6	N
1.0% Occurrence	82	59	56	9.9	NW
2.0% Occurrence	81	59	57	9.9	NW
Mean Daily Range	20	-	-	-	SSW
97.5% Occurrence	39	35	29	8.1	SSW
99.0% Occurrence	36	33	27	8.6	SSW
99.6% Occurrence	32	29	23	8.9	SSW
Median of Extreme Lows	27	25	20	9.9	SSW

Wet Bulb Temperature (T_{wb})	Design Value (°F)	Dry Bulb Temperature (°F)	Humidity Ratio (gr/lb)	Wind Speed (mph)	Prevailing Direction (NSEW)
Median of Extreme Highs	68	76	109	8.7	NNW
0.4% Occurrence	67	75	105	8.8	NNW
1.0% Occurrence	66	74	100	8.9	N
2.0% Occurrence	65	73	96	9	N

Humidity Ratio (HR)	Design Value (gr/lb)	Dry Bulb Temperature (°F)	Vapor Pressure (in. Hg)	Wind Speed (mph)	Prevailing Direction (NSEW)
Median of Extreme Highs	113	71	0.62	8.2	NNW
0.4% Occurrence	111	71	0.61	8.7	N
1.0% Occurrence	104	68	0.57	8.6	N
2.0% Occurrence	101	68	0.56	8.1	NNE

Air Conditioning/ Humid Area Criteria	Threshold	T ≥ 93 °F	T ≥ 80 °F	Twb ≥ 73 °F	Twb ≥ 67 °F
	# of Hours	3	246	3	42

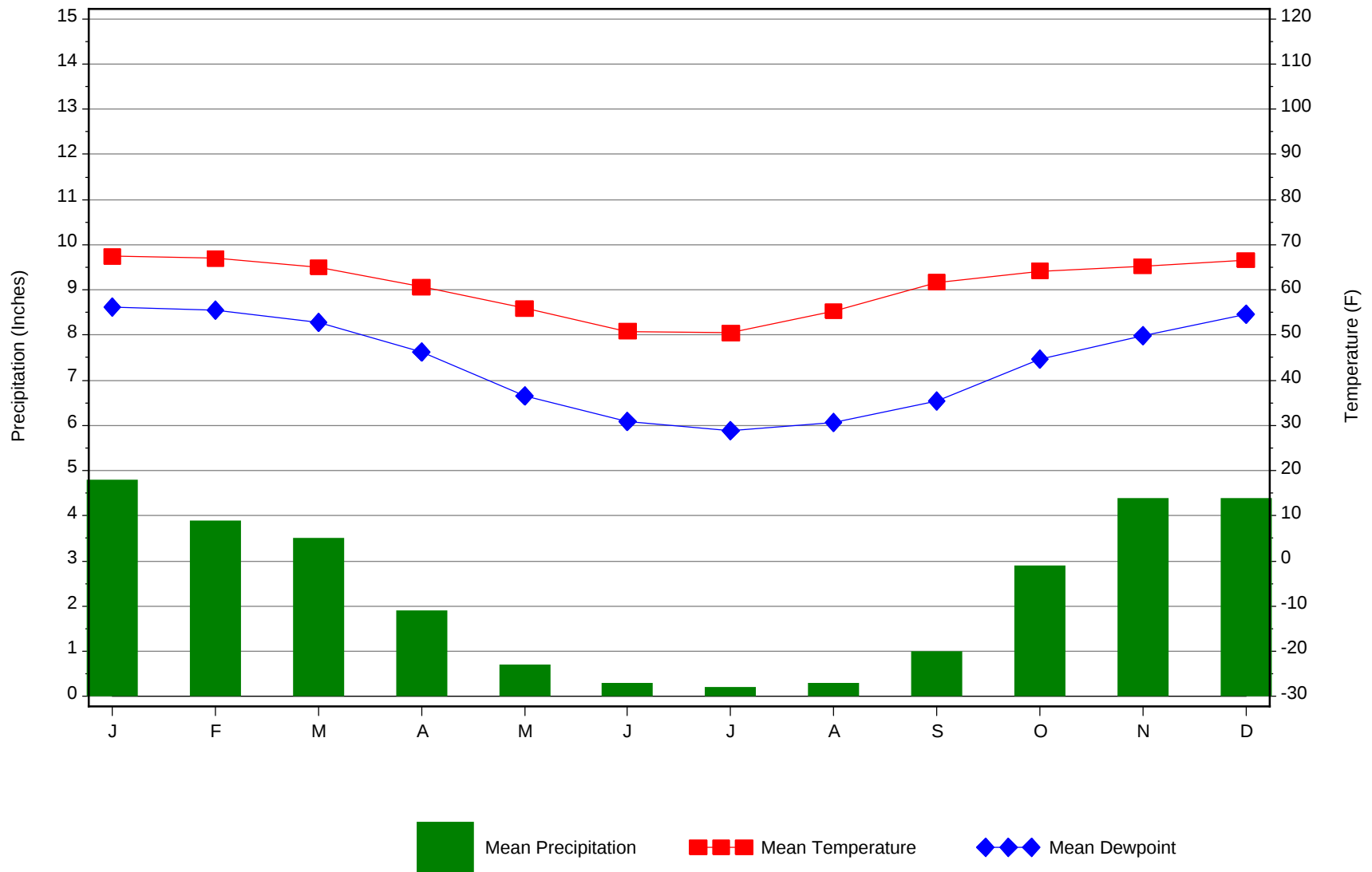
Other Site Data

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	0.1 + 0.3
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 (#)
63.3	N/A	N/A	5

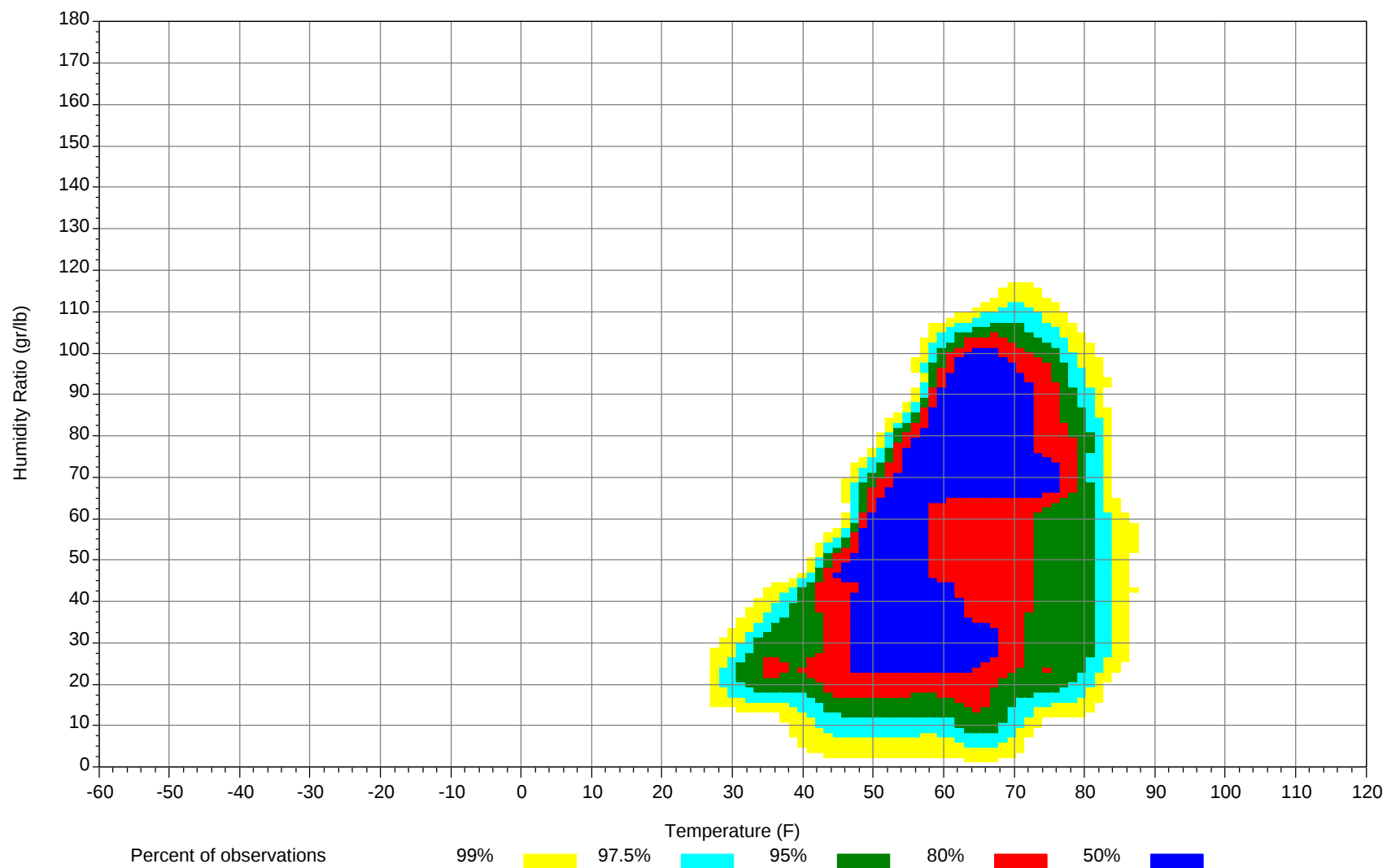
*Note: Temperatures at greater depths can be estimated by adding 1.5°F per 100 feet additional depth.



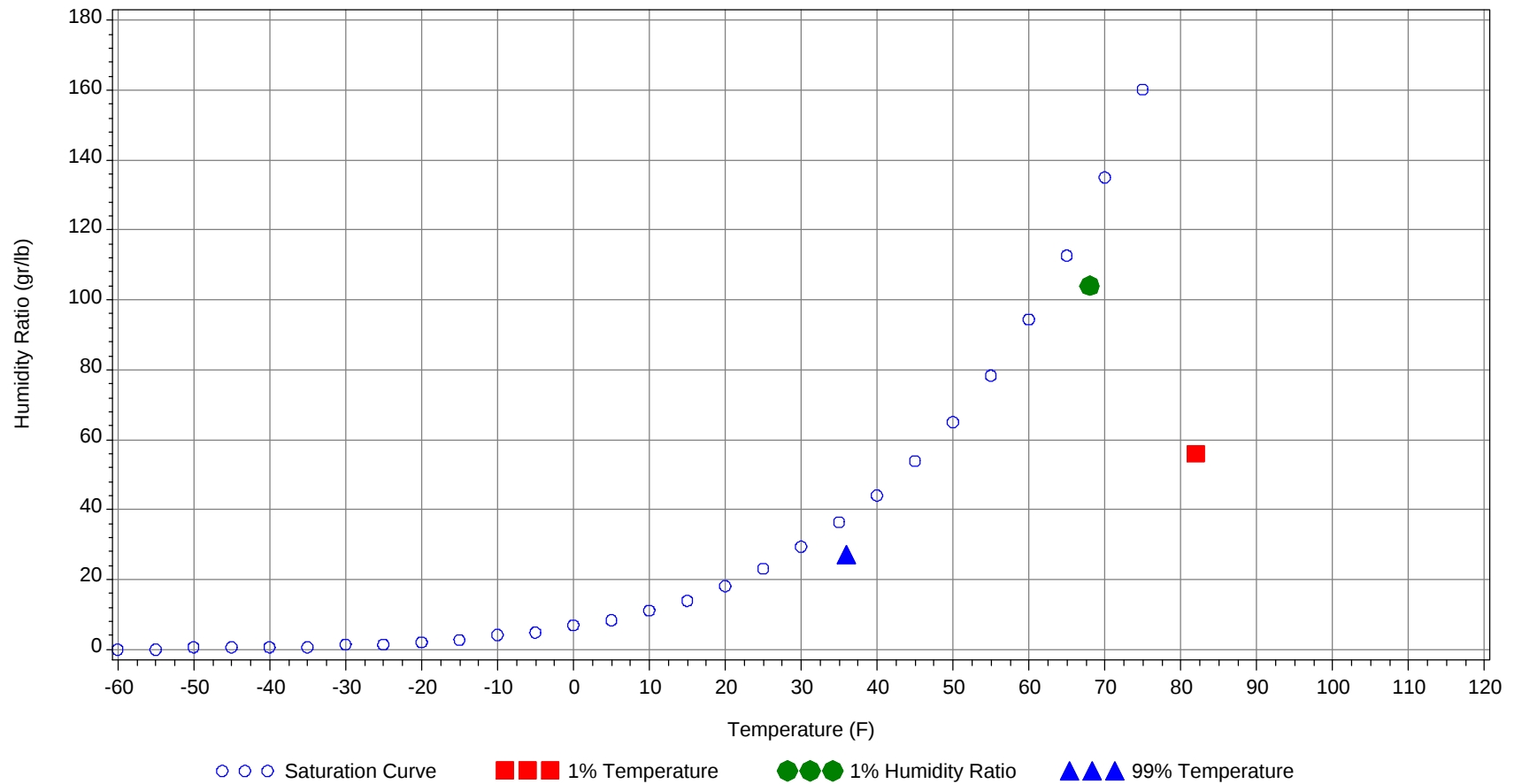
Average Annual Climate



Long Term Psychrometric Summary



Psychrometric Summary of Peak Design Values



	(° F) / (gr/lb)	MCDB (° F)	MCWB (° F)	MCDP (° F)	MCHR (gr/lb)	Enthalpy (btu/lb)
1.0% Dry Bulb	82.0		59		56.0	28.2
99.0% Dry Bulb	36.0				27.0	12.8
1.0% Humidity Ratio	104.0	68.0	64.4	62.6		32.7

Dry-Bulb Temperature Hours For An Average Year

	January					February					March				
Temperature Range (°F)	01 To 08 LST	09 To 16 LST	17 to 00 LST	Total Obs	M C W B (°F)	01 To 08 LST	09 To 16 LST	17 to 00 LST	Total Obs	M C W B (°F)	01 To 08 LST	09 To 16 LST	17 to 00 LST	Total Obs	M C W B (°F)
90/ 94		0	0	0	61.1		0		0	73					
85/ 89		4	1	5	61.5		4	1	5	60.1		1	0	1	59.7
80/ 84	0	26	8	34	62.2		24	8	32	61.6		14	3	17	59.4
75/ 79	1	76	31	108	62.6	0	62	26	88	61.8	0	58	17	75	59.8
70/ 74	7	75	57	139	61.9	5	69	49	123	61.3	1	81	44	126	59.6
65/ 69	37	40	62	139	60.7	27	38	57	122	60.3	17	49	61	127	58.8
60/ 64	126	22	72	220	59.3	108	23	65	196	59	82	34	80	196	57.7
55/ 59	70	5	16	91	56.2	73	4	17	94	55.9	118	10	37	165	55.2
50/ 54	7	0	2	9	51.3	11	0	1	12	51.8	27	1	5	33	51
45/ 49	2		0	2	45.5	0		0	0	43.9	3	0	0	3	44.6
40/ 44	0			0	43						0			0	39.6
35/ 39															
30/ 34															
25/ 29															
20/ 24															

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.

Dry-Bulb Temperature Hours For An Average Year

	April					May					June				
Temperature Range (° F)	01 To 08 LST	09 To 16 LST	17 to 00 LST	Total Obs	M C W B (° F)	01 To 08 LST	09 To 16 LST	17 to 00 LST	Total Obs	M C W B (° F)	01 To 08 LST	09 To 16 LST	17 to 00 LST	Total Obs	M C W B (° F)
90/ 94															
85/ 89															
80/ 84		2	0	2	58.8		0		0	57.8					
75/ 79		24	3	27	56.4		4	0	4	53.4					
70/ 74	0	67	18	85	55.7	0	35	3	38	51.2		4		4	48.3
65/ 69	4	61	40	105	54.8	1	67	16	84	49.9		27	2	29	46.9
60/ 64	29	52	73	154	53.7	7	71	50	128	48.9	0	77	17	94	45.9
55/ 59	82	26	69	177	52.2	37	42	78	157	47.1	6	67	50	123	44.6
50/ 54	86	7	29	122	49.3	78	20	59	157	45.4	38	41	76	155	42.7
45/ 49	30	1	7	38	44.4	75	6	30	111	42.2	73	17	57	147	40.3
40/ 44	6	0	1	7	38.6	32	2	8	42	38.4	66	5	26	97	37.2
35/ 39	2		0	2	35.5	13	1	3	17	33.7	40	2	11	53	33.5
30/ 34	0			0	30.8	4	0	0	4	29.1	15	0	2	17	29.3
25/ 29						1			1	24.8	2		0	2	25.8
20/ 24											0			0	21.9

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Dry-Bulb Temperature Hours For An Average Year

	July					August					September				
Temperature Range (°F)	01 To 08 LST	09 To 16 LST	17 to 00 LST	Total Obs	M C W B (°F)	01 To 08 LST	09 To 16 LST	17 to 00 LST	Total Obs	M C W B (°F)	01 To 08 LST	09 To 16 LST	17 to 00 LST	Total Obs	M C W B (°F)
90/ 94															
85/ 89												2		2	55.2
80/ 84							0		0	52.3		21	3	24	53.4
75/ 79							10	1	11	51.7	0	52	16	68	52.6
70/ 74		4	0	4	47		39	8	47	49.5	1	58	36	95	51.3
65/ 69		34	3	37	46.3	0	57	23	80	48	9	39	44	92	50.2
60/ 64		72	19	91	45.3	7	61	48	116	46.5	37	32	55	124	48.7
55/ 59	5	68	53	126	43.6	29	42	64	135	44.7	59	19	42	120	47.2
50/ 54	32	42	73	147	41.6	60	23	55	138	42.8	66	11	27	104	46.1
45/ 49	73	19	56	148	39.5	79	10	30	119	40.3	43	4	13	60	42.5
40/ 44	64	6	28	98	36.7	40	3	12	55	37	17	1	3	21	38.5
35/ 39	50	3	12	65	33.5	24	1	5	30	33.3	6	0	0	6	34.4
30/ 34	20	0	3	23	29.4	7	0	1	8	29.1	1		0	1	28.5
25/ 29	4		0	4	25.8	1		0	1	25.8					
20/ 24	0			0	20.8	0			0	17.8					

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Dry-Bulb Temperature Hours For An Average Year

	October					November					December				
Temperature Range (°F)	01 To 08 LST	09 To 16 LST	17 to 00 LST	Total Obs	M C W B (°F)	01 To 08 LST	09 To 16 LST	17 to 00 LST	Total Obs	M C W B (°F)	01 To 08 LST	09 To 16 LST	17 to 00 LST	Total Obs	M C W B (°F)
90/ 94		0		0	56.5		0	0	0	57.1					
85/ 89		7	1	8	56.5		4	1	5	58.5		4	1	5	59.9
80/ 84	0	32	8	40	56.4	0	27	7	34	59.2	0	27	8	35	61.1
75/ 79	1	59	24	84	56.3	1	60	22	83	59	1	69	28	98	61.6
70/ 74	5	57	42	104	55.4	7	64	42	113	58.3	8	75	50	133	61
65/ 69	20	39	46	105	54.3	24	38	47	109	56.9	33	43	58	134	59.6
60/ 64	48	30	56	134	53.4	67	29	63	159	56.3	98	24	70	192	58.3
55/ 59	86	18	45	149	52.2	90	13	43	146	54.2	93	6	33	132	55.8
50/ 54	61	6	20	87	49.4	39	3	12	54	50.2	13	0	2	15	51.3
45/ 49	20	1	6	27	44.1	10	1	2	13	44.3	2		0	2	45.2
40/ 44	7	0	1	8	39.5	2		0	2	40.9	0			0	40.9
35/ 39	1	0		1	36.2	0			0	38	0			0	37
30/ 34						0			0	31					
25/ 29															
20/ 24															

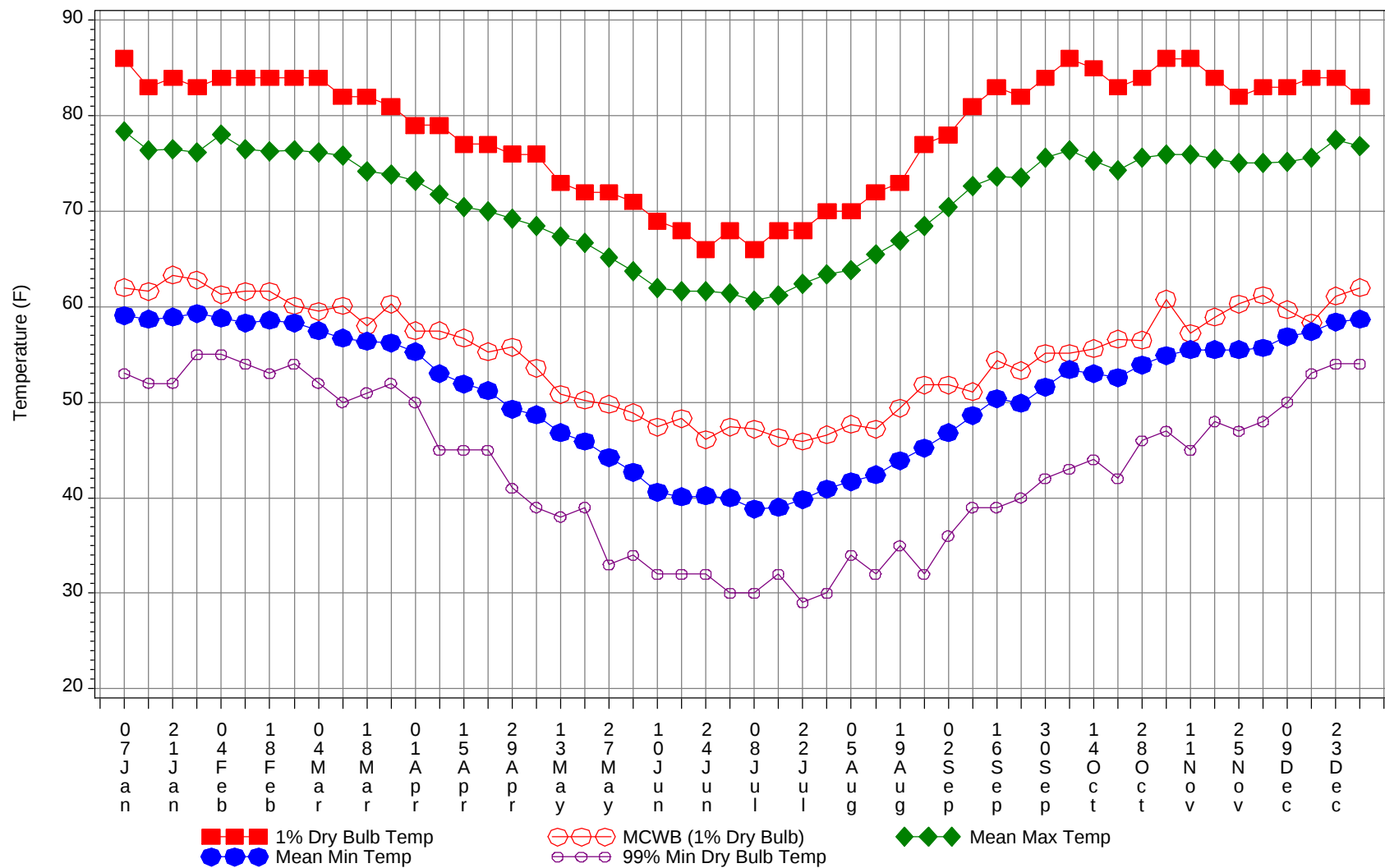
Caution: This summary reflects the typical distribution of temperature in a typical year. It does not reflect the typical moisture distribution. Because wet bulb temperatures are averaged, this summary understates the annual moisture load. For accurate moisture load data, see the long-term humidity summary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

Dry-Bulb Temperature Hours For An Average Year

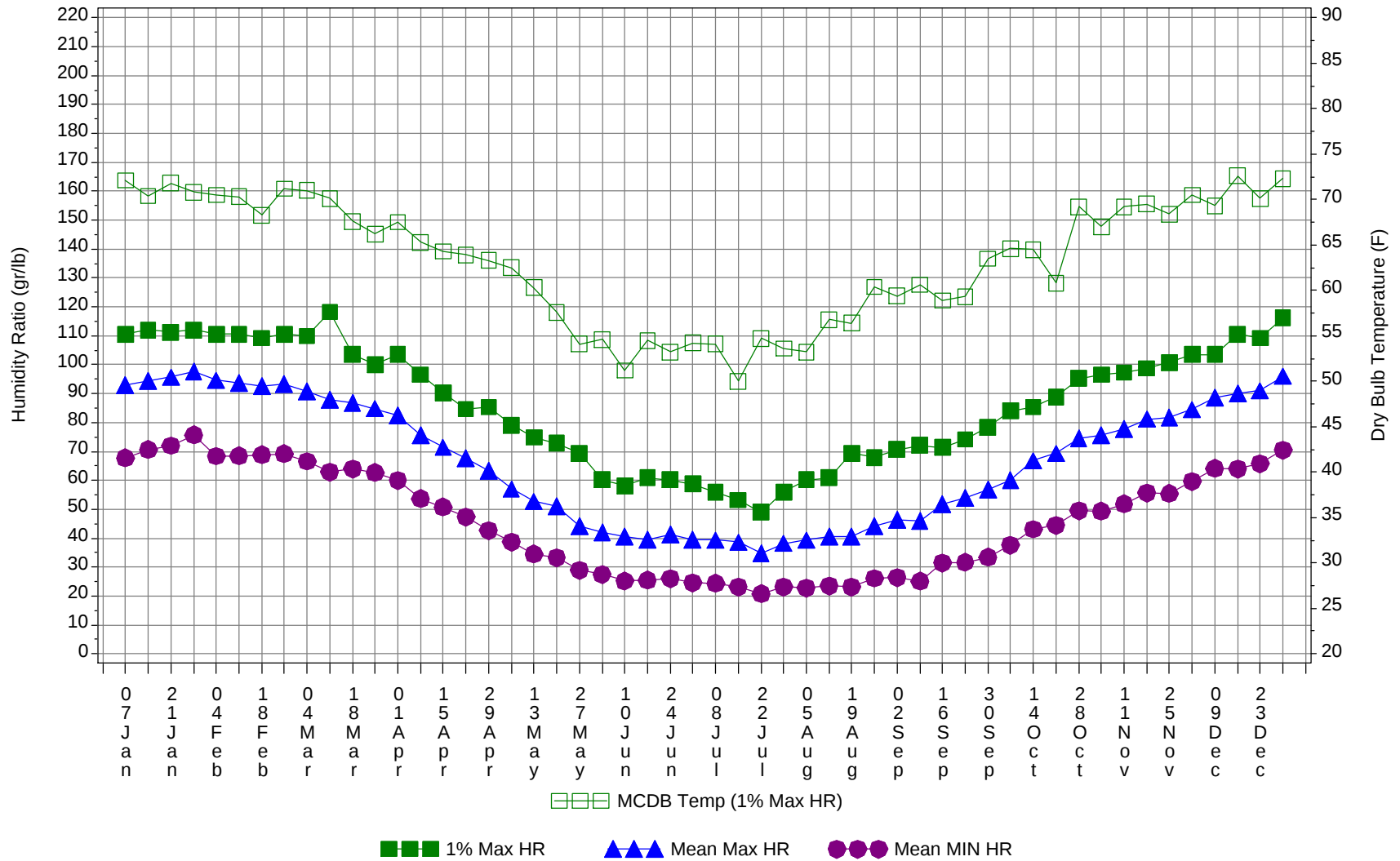
	Annual				
Temperature Range (°F)	01 To 08 LST	09 To 16 LST	17 to 00 LST	Total Obs	M C W B (°F)
90/ 94		1	0	1	59.2
85/ 89		25	4	29	58.8
80/ 84	0	174	44	218	59.2
75/ 79	3	474	169	646	59.1
70/ 74	35	627	349	1011	57.7
65/ 69	171	532	458	1161	55.5
60/ 64	607	528	667	1802	54.1
55/ 59	746	320	545	1611	50.6
50/ 54	517	155	362	1034	45.6
45/ 49	411	59	202	672	41.2
40/ 44	236	17	80	333	37.4
35/ 39	138	7	32	177	33.6
30/ 34	48	1	6	55	29.3
25/ 29	8		1	9	25.7
20/ 24	1			1	20.4

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.

Annual Summary of Temperatures



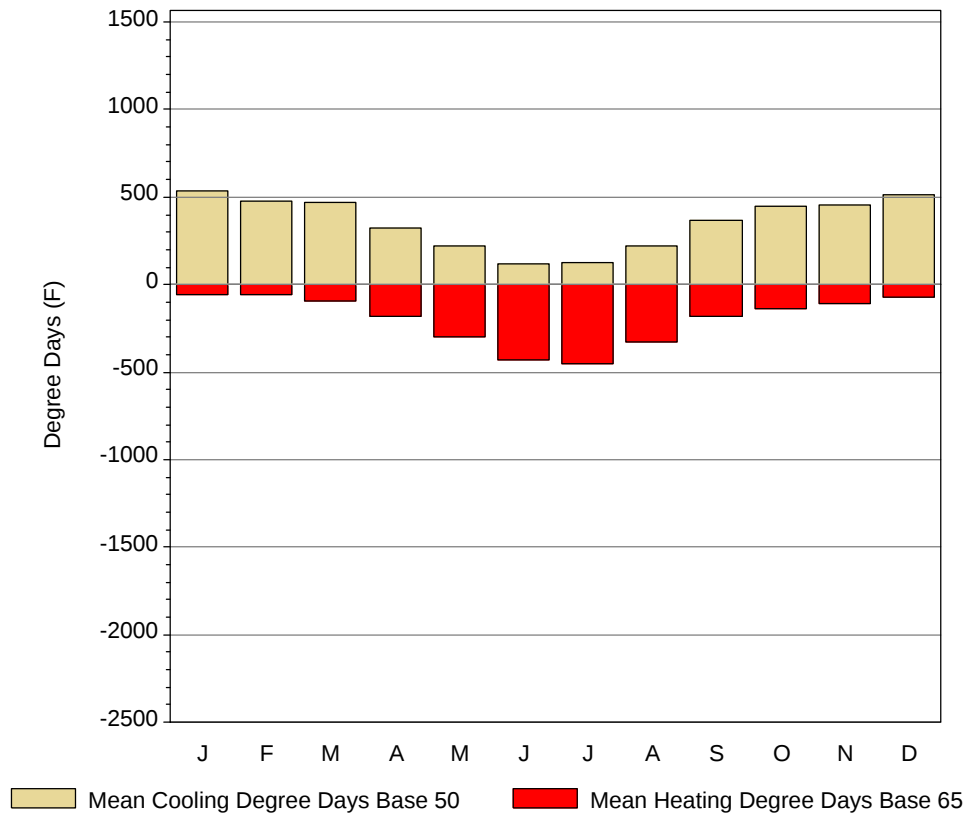
Long Term Humidity and Dry Bulb Temperature Summary



Long Term Humidity and Dry Bulb Temperature Summary

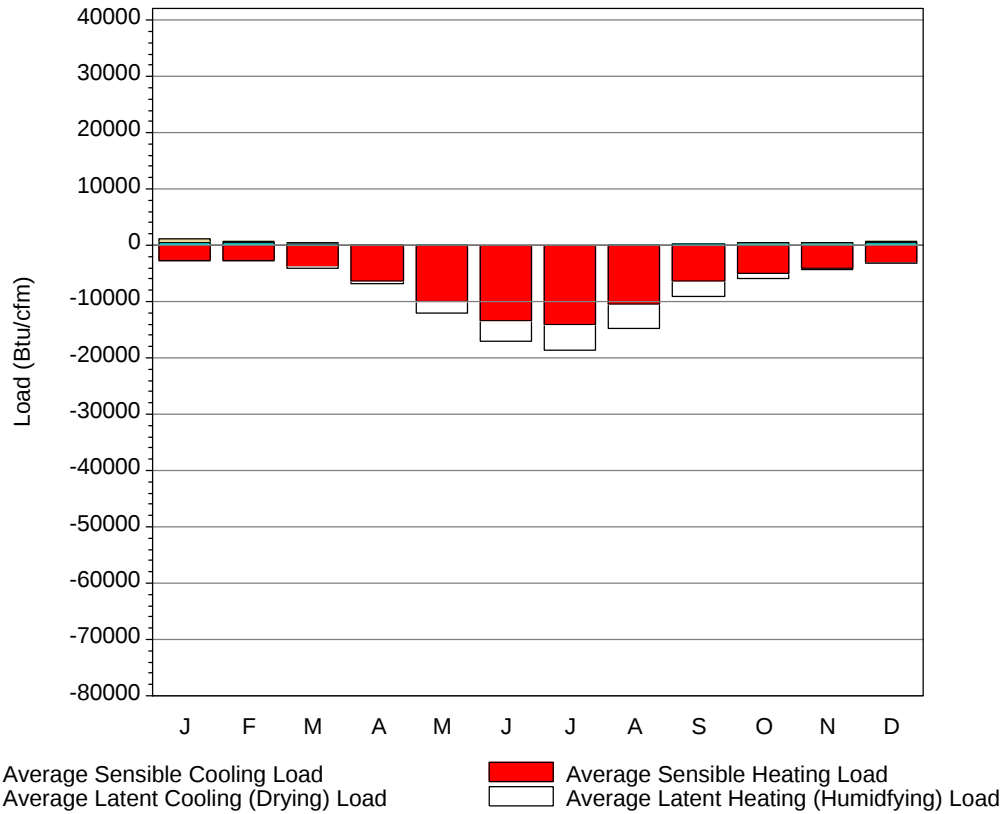
Week Ending	1.0% Temp (° F)	MCWB@ 1% Temp (° F)	Mean Max Temp (° F)	Mean Min Temp (° F)	99% Temp (° F)	1.0% HR (gr/lb)	MCDB@ 1% HR (° F)	Mean Max HR (gr/lb)	Mean Min HR (gr/lb)
7-Jan	86	62	78.4	59.1	53	110.6	72.1	93	67.7
14-Jan	83	61.6	76.4	58.7	52	112	70.4	94.5	70.7
21-Jan	84	63.3	76.5	58.9	52	111.3	71.8	95.7	72
28-Jan	83	62.8	76.2	59.3	55	112	70.8	97.8	75.7
4-Feb	84	61.3	78	58.8	55	110.6	70.5	94.6	68.4
11-Feb	84	61.6	76.5	58.3	54	110.6	70.3	93.6	68.5
18-Feb	84	61.6	76.3	58.6	53	109.2	68.3	92.5	68.9
25-Feb	84	60.1	76.4	58.3	54	110.6	71.2	93.3	69.2
4-Mar	84	59.5	76.2	57.5	52	109.9	71	90.7	66.6
11-Mar	82	60.1	75.8	56.7	50	118.3	70.1	87.9	62.9
18-Mar	82	58	74.2	56.4	51	103.6	67.6	86.9	63.9
25-Mar	81	60.3	73.9	56.2	52	100.1	66.2	84.8	62.7
1-Apr	79	57.5	73.2	55.3	50	103.6	67.5	82.5	60
8-Apr	79	57.5	71.8	53	45	96.6	65.3	75.7	53.7
15-Apr	77	56.7	70.5	51.9	45	90.3	64.3	71.5	50.8
22-Apr	77	55.3	70	51.2	45	84.7	63.9	67.6	47.4
29-Apr	76	55.8	69.2	49.3	41	85.4	63.3	63.3	42.6
6-May	76	53.6	68.5	48.7	39	79.1	62.5	57	38.6
13-May	73	50.8	67.4	46.8	38	74.9	60.3	52.7	34.5
20-May	72	50.2	66.7	45.9	39	72.8	57.6	51	33.3
27-May	72	49.8	65.2	44.2	33	69.3	54.1	44.3	28.9
4-Jun	71	48.9	63.7	42.7	34	60.2	54.6	42.1	27.4
10-Jun	69	47.4	62	40.6	32	58.1	51.2	40.5	25.2
17-Jun	68	48.3	61.6	40.1	32	60.9	54.5	39.4	25.5
24-Jun	66	46.1	61.6	40.2	32	60.2	53.2	41.2	26
1-Jul	68	47.4	61.4	40	30	58.8	54.2	39.4	24.6
8-Jul	66	47.2	60.6	38.8	30	56	54.1	39.3	24.4
15-Jul	68	46.3	61.2	39	32	53.2	50	38.6	23.2
22-Jul	68	45.9	62.4	39.8	29	49	54.7	34.8	20.8
29-Jul	70	46.6	63.4	40.9	30	56	53.6	38.2	23.2
5-Aug	70	47.7	63.8	41.7	34	60.2	53.2	39.3	22.7
12-Aug	72	47.2	65.5	42.4	32	60.9	56.8	40.7	23.5
19-Aug	73	49.4	66.9	43.9	35	69.3	56.4	40.7	23.1
26-Aug	77	51.8	68.5	45.2	32	67.9	60.4	44.2	26.1
2-Sep	78	51.8	70.4	46.8	36	70.7	59.4	46.4	26.4
9-Sep	81	51.1	72.6	48.6	39	72.1	60.6	45.9	25.1
16-Sep	83	54.4	73.6	50.4	39	71.4	58.9	51.9	31.4
23-Sep	82	53.3	73.5	49.9	40	74.2	59.3	54	31.7
30-Sep	84	55.1	75.6	51.6	42	78.4	63.5	56.8	33.5
7-Oct	86	55.1	76.4	53.4	43	84	64.6	60	37.5
14-Oct	85	55.6	75.3	53	44	85.4	64.5	66.8	43.1
21-Oct	83	56.6	74.3	52.6	42	88.9	60.8	69.3	44.5
28-Oct	84	56.5	75.6	53.9	46	95.2	69.2	74.6	49.5
4-Nov	86	60.8	75.9	54.9	47	96.6	67	75.5	49.4
11-Nov	86	57.2	75.9	55.5	45	97.3	69.2	77.7	51.9
18-Nov	84	58.9	75.5	55.5	48	98.7	69.5	81.2	55.7
25-Nov	82	60.3	75.1	55.5	47	100.8	68.4	81.8	55.5
2-Dec	83	61.2	75.1	55.7	48	103.6	70.5	84.5	59.7
9-Dec	83	59.7	75.2	56.9	50	103.6	69.3	88.7	64.1
16-Dec	84	58.3	75.6	57.4	53	110.6	72.6	90	64
23-Dec	84	61.1	77.5	58.4	54	109.2	70.1	91	65.7
31-Dec	82	62	76.8	58.7	54	116.2	72.3	96	70.4

Degree Days, Heating and Cooling (Base 65 F) & Cooling (Base 50F)



Month	Mean Cooling Degree Days (°F) Base 50	Mean Cooling Degree Days (°F) Base 65	Mean Heating Degree Days (°F) Base 65
JAN	537.6	130.8	58.4
FEB	478.9	113.8	59
MAR	466.1	94.9	94.3
APR	322.2	45.1	180.7
MAY	221.7	18.5	301.3
JUN	118	2.8	428.7
JUL	122.9	3.4	452.3
AUG	220.6	24.5	326.2
SEP	369.9	86	184.9
OCT	446.4	113.5	138.1
NOV	456.7	110.4	105.9
DEC	514.7	123	73.6
ANN	4275.7	866.7	2403.4

Average Ventilation and Infiltration Loads (Outside Air vs 75F, 60% RH summer; 68F, 30% RH winter)



Month	Average Sensible Cooling Load (Btu/cfm)	Average Sensible Heating Load (Btu/cfm)	Average Latent Cooling Load (Btu/cfm)	Average Latent Heating Load (Btu/cfm)
JAN	514	-2727	538	-9
FEB	443	-2682	313	-29
MAR	259	-3885	222	-83
APR	47	-6443	4	-294
MAY	7	-9925	0	-1991
JUN	0	-13387	0	-3725
JUL	0	-14063	0	-4649
AUG	18	-10518	0	-4227
SEP	312	-6320	0	-2729
OCT	542	-5015	4	-833
NOV	474	-4093	38	-289
DEC	473	-3183	322	-59
ANN	3089	-82241	1441	-18917

Station Information		Shading Geometry in Dimensionless Units	
City, State, WBAN	N/A	N/A	N/A
Lat, Lon, Elev	N/A	N/A	N/A
Press Stn Type	N/A	N/A	N/A

AVERAGE INCIDENT SOLAR RADIATION (Btu/sq.ft./day), Percentage Uncertainty = 9														
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
HORIZ.	Global													
	Std.Dev.													
	Minimum													
	Maximum													
	Diffuse													
Clear Day	Global													
NORTH	Global													
	Diffuse													
Clear Day	Global													
EAST	Global													
	Diffuse													
Clear Day	Global													
SOUTH	Global													
	Diffuse													
Clear Day	Global													
WEST	Global													
	Diffuse													
Clear Day	Global													

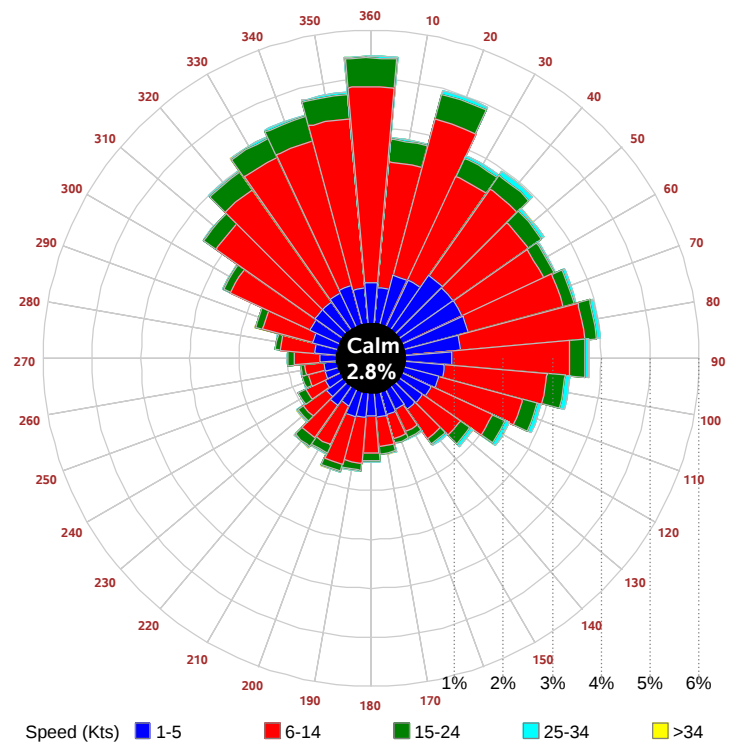
Average Annual Solar Radiation - Nearest Available Site Source: National Renewable Energy Laboratory, Golden CO, 1995

AVERAGE TRANSMITTED SOLAR RADIATION (Btu/sq.ft./day) FOR DOUBLE GLAZING, Percentage Uncertainty = 9														
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
HORIZ.	Unshaded													
NORTH	Unshaded													
	Shaded													
EAST	Unshaded													
	Shaded													
SOUTH	Unshaded													
	Shaded													
WEST	Unshaded													
	Shaded													

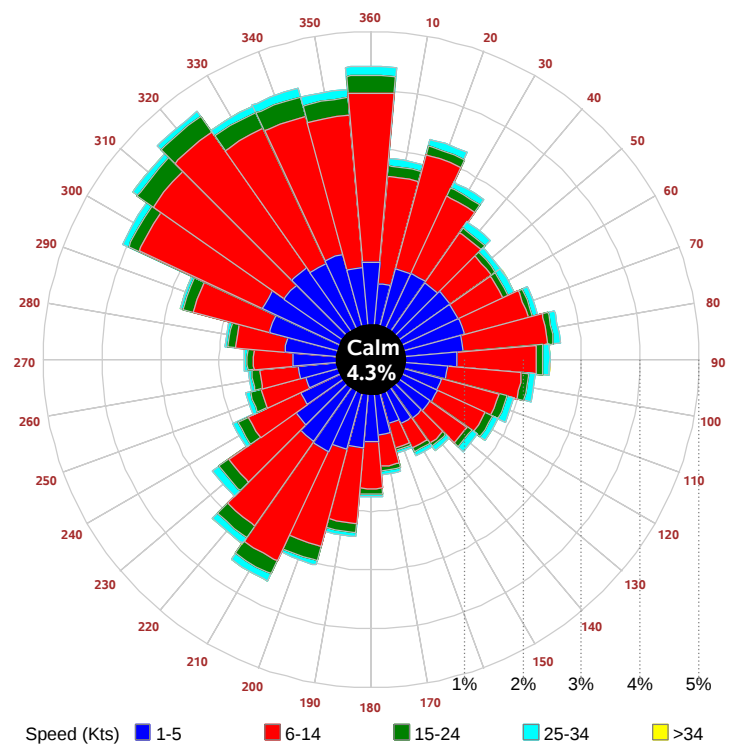
AVERAGE INCIDENT ILLUMINANCE (klux-hr) FOR MOSTLY CLEAR AND MOSTLY CLOUDY CONDITIONS, Percentage Uncertainty = 9												
		March						June				
		9am	11am	1pm	3pm	5pm		9am	11am	1pm	3pm	5pm
HORIZ.	M.Clear											
	M.Cloudy											
NORTH	M.Clear											
	M.Cloudy											
EAST	M.Clear											
	M.Cloudy											
SOUTH	M.Clear											
	M.Cloudy											
WEST	M.Clear											
	M.Cloudy											
M.Clear	(% hrs)											

		Sept						Dec				
		9am	11am	1pm	3pm	5pm		9am	11am	1pm	3pm	5pm
HORIZ.	M.Clear											
	M.Cloudy											
NORTH	M.Clear											
	M.Cloudy											
EAST	M.Clear											
	M.Cloudy											
SOUTH	M.Clear											
	M.Cloudy											
WEST	M.Clear											
	M.Cloudy											
M.Clear	(% hrs)											

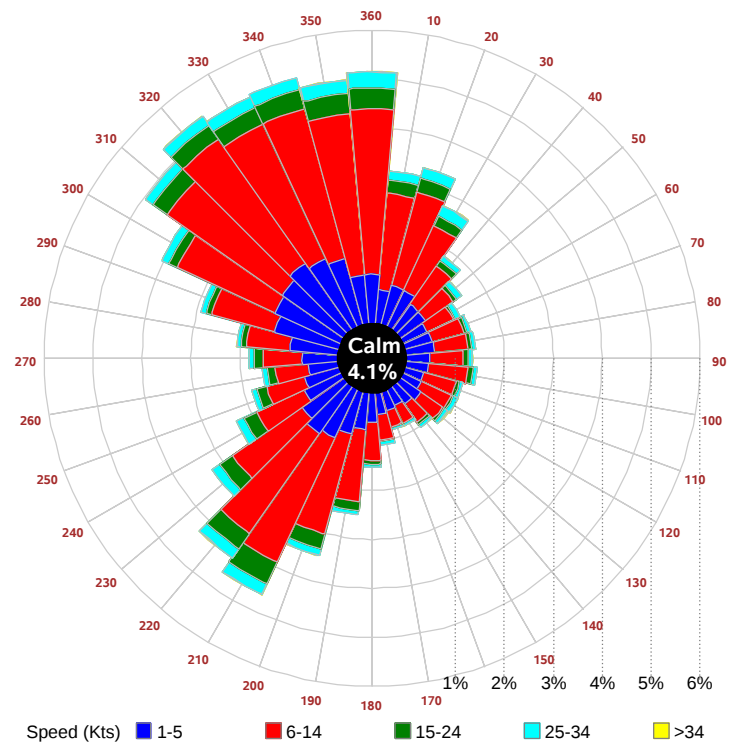
Wind Summary - December, January, and February



Wind Summary - March, April, and May



Wind Summary - June, July, and August



Wind Summary - September, October, and November

