

BRADSHAW AAF, HI	Station ID = ICAO_PHSF
Latitude = 19.76 N	Elevation = 6190 Feet
Longitude = 155.55 W	Average Pressure = 24.09 inches Hg
Period of Record = 1988 To 2017	

Design Criteria Data

	Mean Coincident (Average) Values				
Dry Bulb Temperature (T)	Design Value (°F)	Wet Bulb Temperature (°F)	Humidity Ratio (gr/lb)	Wind Speed (mph)	Prevailing Direction (NSEW)
Median of Extreme Highs	81	56	42	16.5	SE
0.4% Occurrence	78	57	52	15.2	SE
1.0% Occurrence	76	57	59	13.7	W
2.0% Occurrence	75	58	64	12.8	W
Mean Daily Range	21	-	-	-	SE
97.5% Occurrence	43	39	35	4.4	SE
99.0% Occurrence	40	35	30	4.6	SE
99.6% Occurrence	37	32	26	5	E
Median of Extreme Lows	31	26	18	4.9	E

	Design Value (°F)	Dry Bulb Temperature (°F)	Humidity Ratio (gr/lb)	Wind Speed (mph)	Prevailing Direction (NSEW)
Wet Bulb Temperature (T _{wb})					
Median of Extreme Highs	73	73	-	12	W
0.4% Occurrence	65	72	99	11.5	W
1.0% Occurrence	63	71	92	10.8	W
2.0% Occurrence	63	71	92	10.8	W

	Design Value (gr/lb)	Dry Bulb Temperature (°F)	Vapor Pressure (in. Hg)	Wind Speed (mph)	Prevailing Direction (NSEW)
Humidity Ratio (HR)					
Median of Extreme Highs	112	69	0.6	8.8	W
0.4% Occurrence	102	66	0.55	7.5	WSW
1.0% Occurrence	99	66	0.53	8.3	W
2.0% Occurrence	93	67	0.5	9.2	W

Air Conditioning/ Humid Area Criteria	Threshold	T ≥ 93 °F	T ≥ 80 °F	Twb ≥ 73 °F	Twb ≥ 67 °F
	# of Hours	0	6	2	5

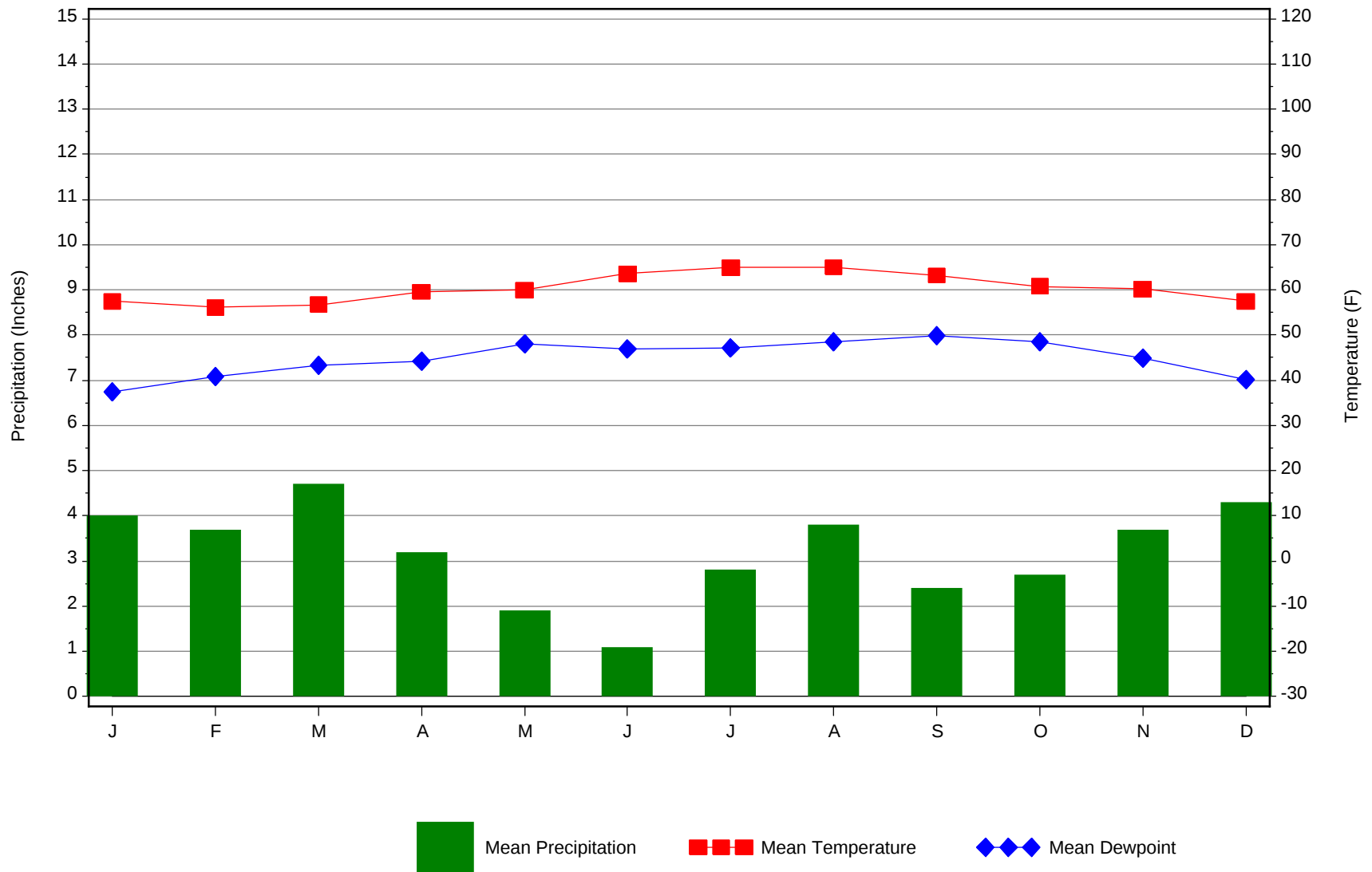
Other Site Data

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	6	105	0.0 + 0.0
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 (#)
62.6	0	0	1

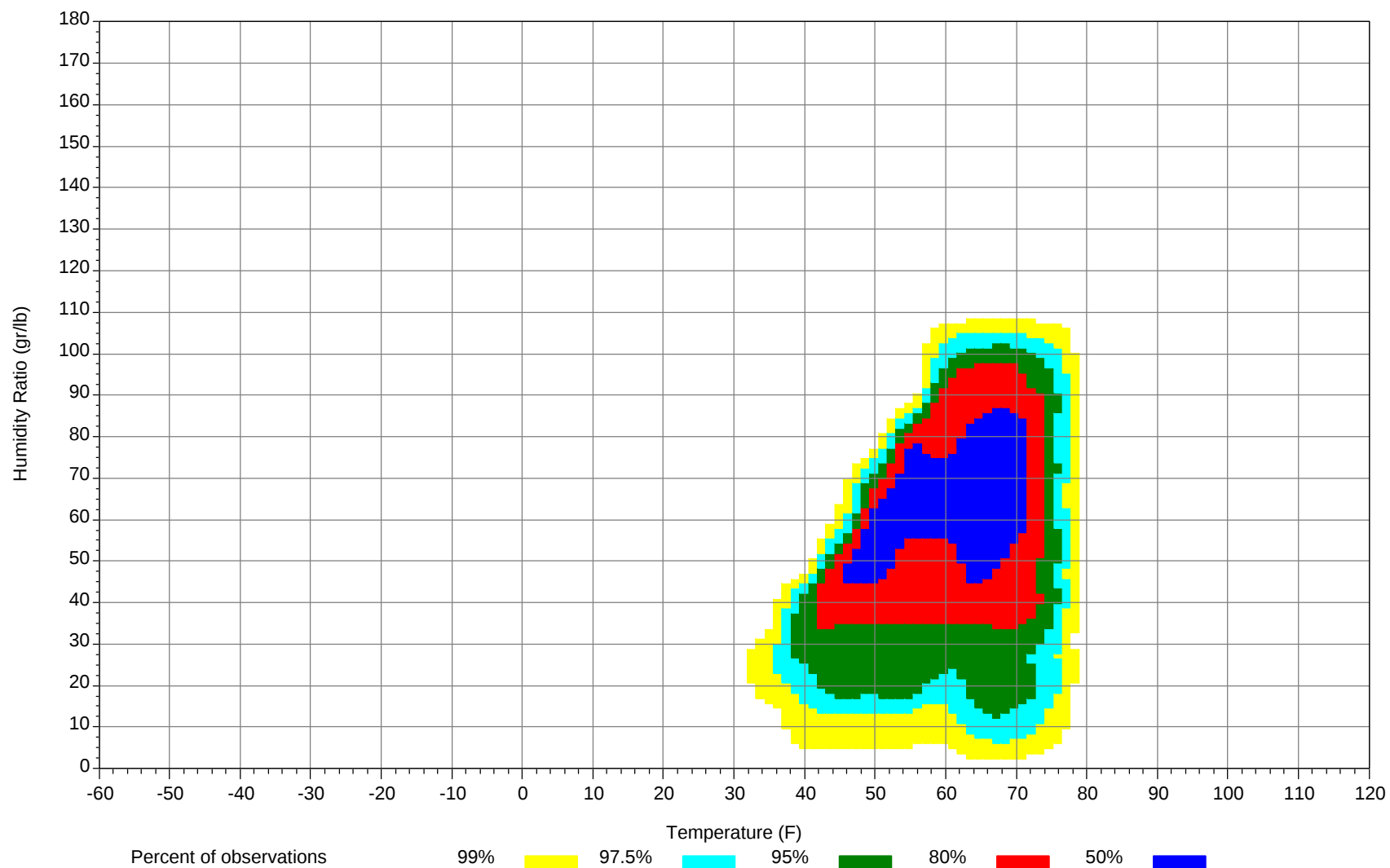
*Note: Temperatures at greater depths can be estimated by adding 1.5°F per 100 feet additional depth.



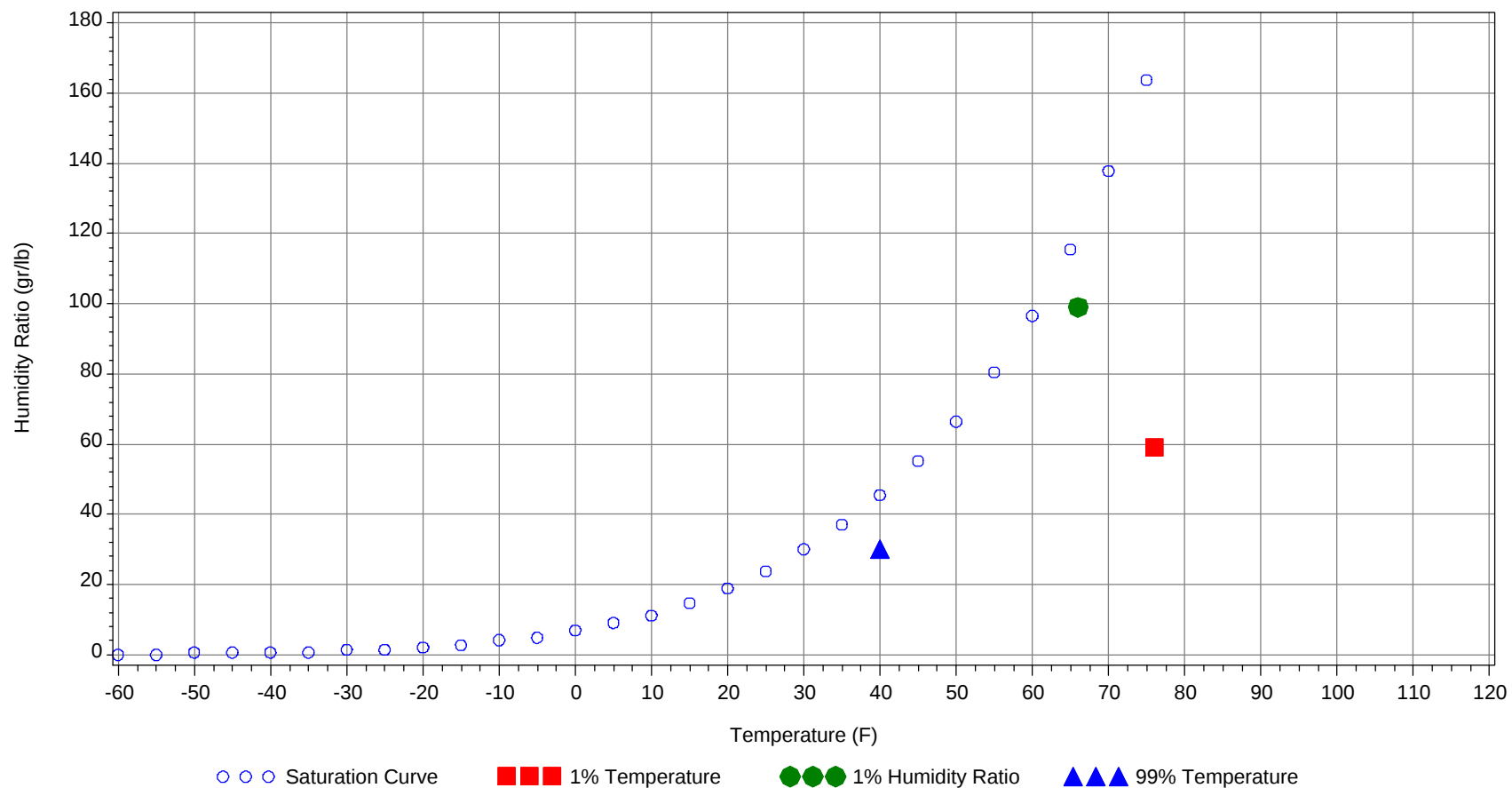
Average Annual Climate



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	76.0		57		59.0	28.1
99.0% Dry Bulb	40.0				30.0	14.3
1.0% Humidity Ratio	99.0	66.0	62.4	60.7		31.2

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)
80/ 84		0		0	56.8										
75/ 79		3		3	53.1		2		2	55.4		2		2	54.6
70/ 74		28	1	29	51.8	0	18	1	19	53		26	0	26	54.4
65/ 69	1	67	9	77	52.5	0	60	4	64	53	0	73	5	78	54.4
60/ 64	4	91	24	119	51.2	5	87	23	115	51.5	5	97	26	128	52.4
55/ 59	26	43	56	125	48.8	25	46	63	134	50.2	31	40	62	133	50.5
50/ 54	62	13	79	154	45.9	58	10	82	150	47.5	68	9	96	173	47.7
45/ 49	64	2	53	119	40.6	63	1	41	105	42.7	77	0	52	129	43.6
40/ 44	59	0	24	83	36	38	0	10	48	37.4	52	0	6	58	38.4
35/ 39	26		2	28	32.5	27	0	1	28	32.7	15		1	16	33.7
30/ 34	5			5	28.4	6	0	0	6	27.2					
25/ 29						0			0	25					

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)
80/ 84		0		0	51		0		0	53		1		1	56
75/ 79		4	0	4	54.4	0	8		8	57.3	0	19		19	56.6
70/ 74	0	32	1	33	55.8	1	56	1	58	57.3	4	93	4	101	57.6
65/ 69	1	92	9	102	55	5	103	14	122	56.5	10	92	24	126	56.3
60/ 64	17	87	34	138	52.7	26	72	56	154	55.1	47	34	54	135	53.9
55/ 59	47	23	67	137	50.4	51	9	95	155	53.2	50	2	81	133	51.6
50/ 54	63	2	90	155	47.5	63	1	64	128	49.1	65		62	127	47.1
45/ 49	72	0	36	108	42.8	70		17	87	44.1	53		14	67	43.3
40/ 44	35	0	4	39	38.5	30		1	31	39.5	11		0	11	39.2
35/ 39	4			4	34.1	3			3	36.6					
30/ 34															
25/ 29															

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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)
80/ 84		3		3	55.2		1		1	56.6		0		0	59
75/ 79	0	41	1	42	57.4		36	1	37	58.5		15		15	59.5
70/ 74	4	107	8	119	57.7	3	125	8	136	58.7	1	108	1	110	59
65/ 69	19	69	36	124	56.6	16	64	36	116	56.9	9	83	20	112	57.6
60/ 64	54	27	72	153	54.4	55	21	77	153	55	40	32	66	138	55.6
55/ 59	60	1	83	144	51.9	60	1	85	146	52.3	58	1	92	151	53.2
50/ 54	67	0	43	110	47.2	69		37	106	47.7	76	0	55	131	48.6
45/ 49	40		4	44	43	39		5	44	42.3	54		7	61	43.6
40/ 44	3			3	40.3	6			6	38.2	2			2	40.6
35/ 39															
30/ 34															
25/ 29															

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

	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)
80/ 84		0		0	51		0		0	52.6					
75/ 79		11		11	57.6		5		5	54.1		2		2	49.6
70/ 74	1	88	0	89	58	0	51	0	51	56.5		26	0	26	52.1
65/ 69	6	99	12	117	57.1	3	95	5	103	55.9	1	71	2	74	53.2
60/ 64	35	46	54	135	55.5	20	68	30	118	53.7	7	98	22	127	51.9
55/ 59	52	4	97	153	52.9	63	18	83	164	51.1	32	44	66	142	49.8
50/ 54	75	0	71	146	48.7	64	1	78	143	47.1	79	7	90	176	47
45/ 49	68	0	12	80	43.4	58	0	37	95	42.5	63	0	51	114	42
40/ 44	11		0	11	39.4	25		6	31	37.7	47	0	16	63	36.8
35/ 39	0		0	0	36.2	5		1	6	33.9	18		1	19	32.5
30/ 34						0			0	25.7	0			0	32
25/ 29															

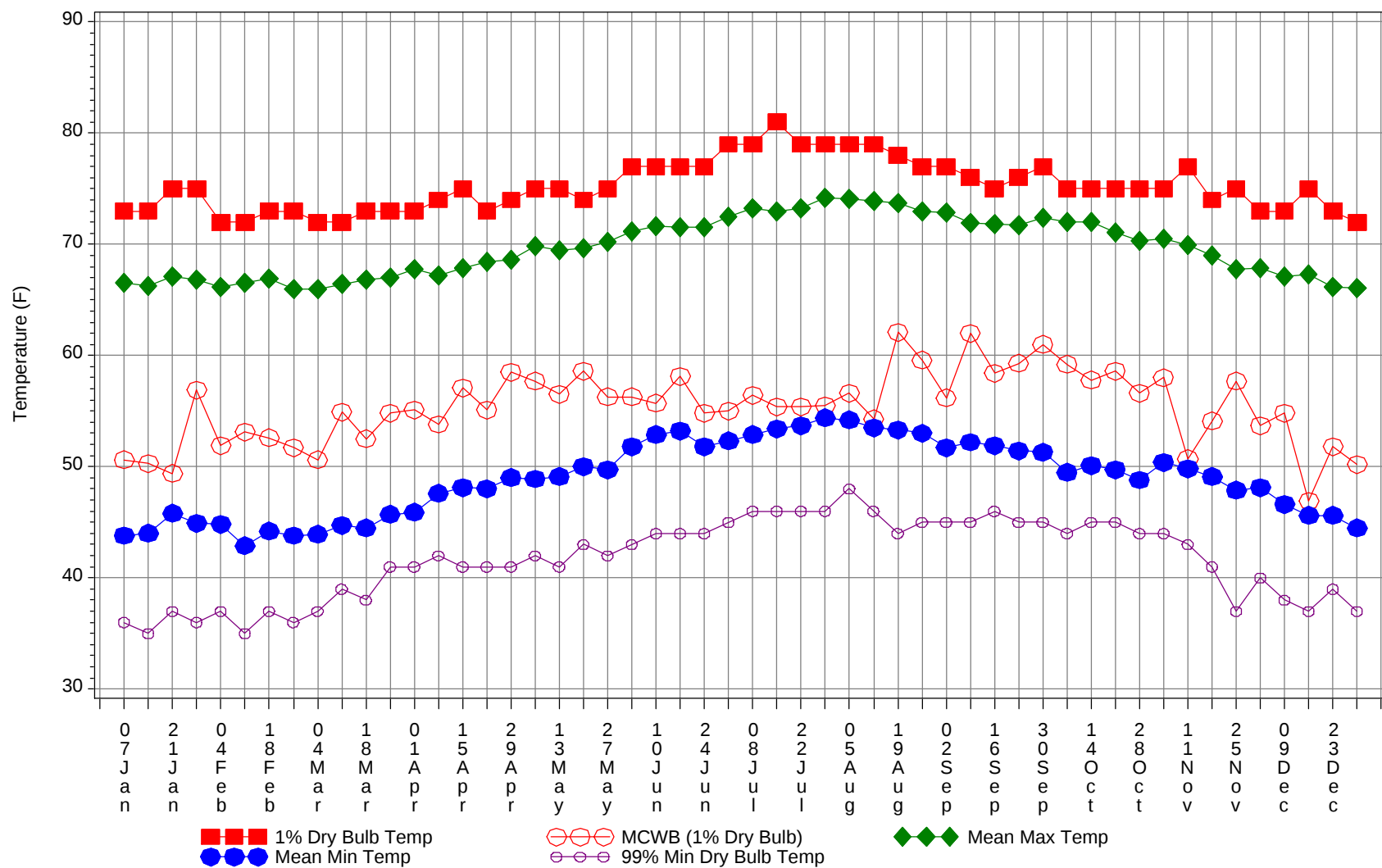
Caution: This summary reflects the typical distribution of temperature in a typical year. It does not reflect the typical moisture distribution. Because wet bulb temperatures are averaged, this summary understates the annual moisture load. For accurate moisture load data, see the long-term humidity summary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

Dry-Bulb Temperature Hours For An Average Year

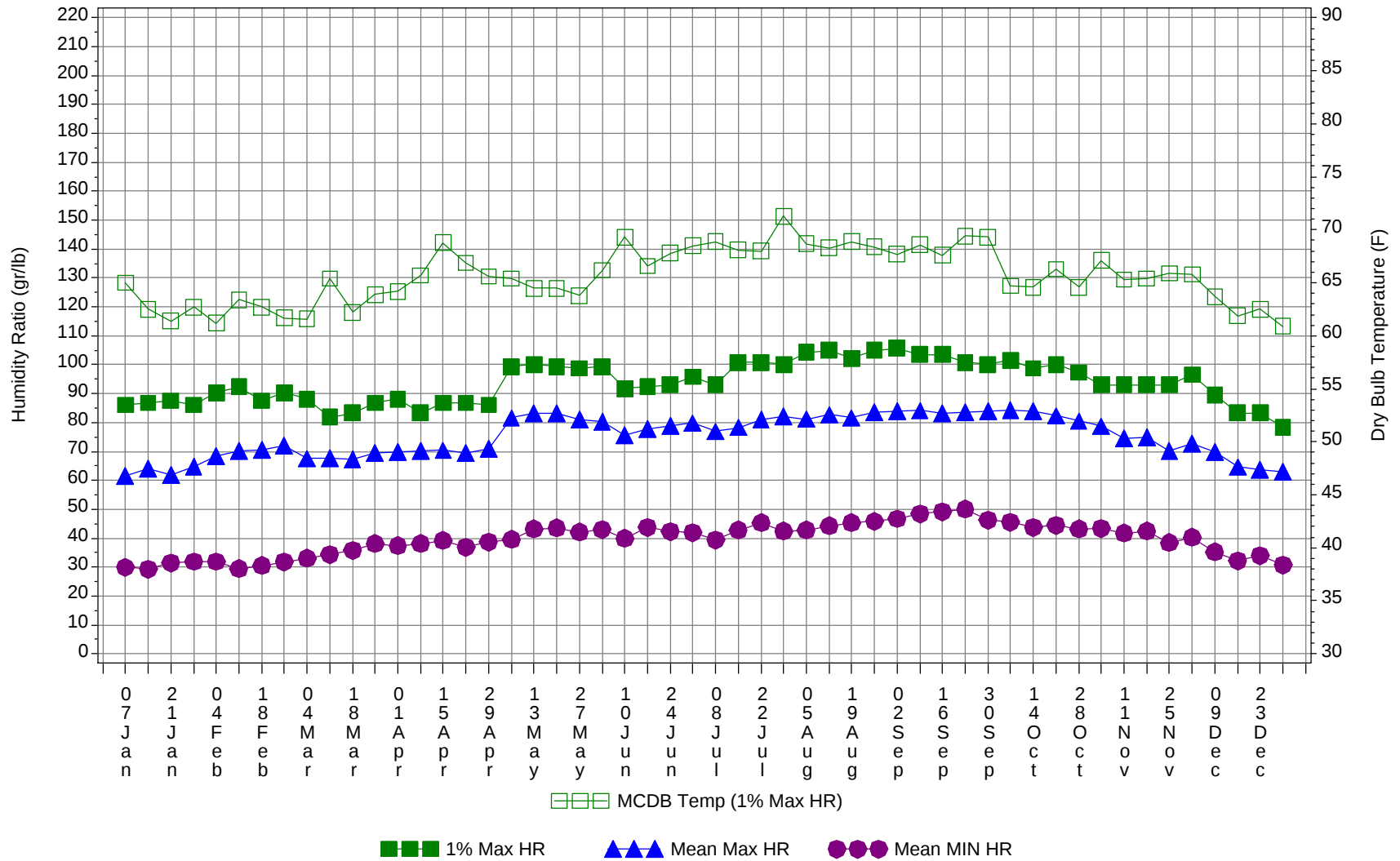
	Annual				
Temperature Range (°F)	01 To 08 LST	09 To 16 LST	17 to 00 LST	Total Obs	M C W B (°F)
80/ 84		6		6	55.4
75/ 79	0	145	1	146	57.4
70/ 74	14	753	16	783	57.3
65/ 69	71	969	143	1183	55.6
60/ 64	310	764	506	1580	53.5
55/ 59	551	235	941	1727	51.4
50/ 54	809	44	896	1749	47.8
45/ 49	730	4	351	1085	42.9
40/ 44	323	0	60	383	37.8
35/ 39	100	0	6	106	33
30/ 34	12	0	0	12	27.7
25/ 29	0			0	25

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



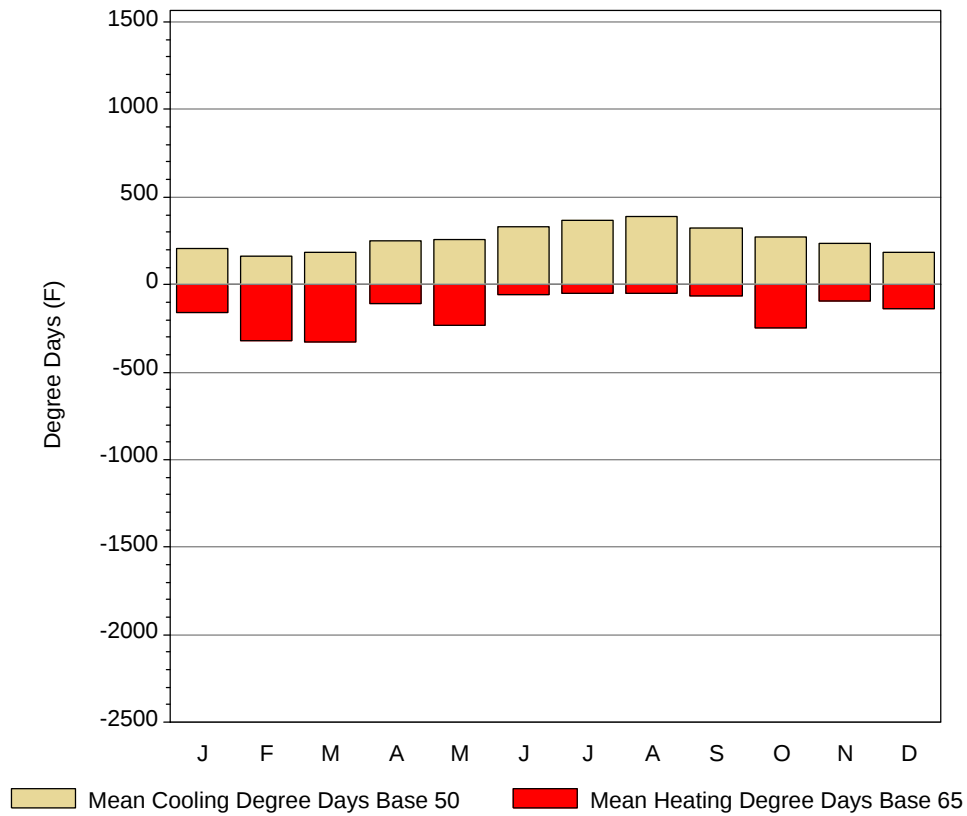
Long Term Humidity and Dry Bulb Temperature Summary



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	73	50.6	66.5	43.8	36	86.1	65	61.5	29.9
14-Jan	73	50.3	66.3	44	35	86.8	62.5	64	29.3
21-Jan	75	49.4	67.1	45.8	37	87.5	61.4	62	31.4
28-Jan	75	56.9	66.8	44.9	36	86.1	62.7	64.7	31.9
4-Feb	72	51.9	66.2	44.8	37	90.3	61.2	68.4	31.9
11-Feb	72	53.1	66.5	42.9	35	92.4	63.4	70.2	29.5
18-Feb	73	52.6	66.9	44.2	37	87.5	62.7	70.7	30.6
25-Feb	73	51.7	66	43.8	36	90.3	61.7	71.9	31.8
4-Mar	72	50.6	66	43.9	37	88.2	61.6	67.5	33
11-Mar	72	54.9	66.4	44.7	39	81.9	65.4	67.8	34.3
18-Mar	73	52.5	66.8	44.5	38	83.3	62.2	67.4	35.7
25-Mar	73	54.8	67	45.7	41	86.8	63.9	69.5	38.1
1-Apr	73	55.1	67.8	45.9	41	88.2	64.2	69.8	37.4
8-Apr	74	53.8	67.2	47.6	42	83.3	65.7	70.2	38.2
15-Apr	75	57.1	67.9	48.1	41	86.8	68.8	70.4	39.2
22-Apr	73	55.1	68.4	48	41	86.8	66.9	69.6	36.8
29-Apr	74	58.5	68.6	49	41	86.1	65.6	70.9	38.6
6-May	75	57.7	69.8	48.9	42	99.4	65.4	81.6	39.5
13-May	75	56.5	69.5	49.1	41	100.1	64.5	83.2	43.2
20-May	74	58.6	69.7	50	43	99.4	64.5	83.2	43.6
27-May	75	56.3	70.2	49.7	42	98.7	63.8	81.1	42.1
4-Jun	77	56.3	71.2	51.8	43	99.4	66.2	80.2	43
10-Jun	77	55.7	71.6	52.9	44	91.7	69.3	75.6	39.9
17-Jun	77	58.1	71.5	53.2	44	92.4	66.6	77.9	43.8
24-Jun	77	54.8	71.5	51.8	44	93.1	67.8	78.8	42.2
1-Jul	79	55	72.5	52.3	45	95.9	68.5	79.8	41.9
8-Jul	79	56.4	73.2	52.9	46	93.1	68.9	76.9	39.4
15-Jul	81	55.4	73	53.4	46	100.8	68.1	78.3	42.9
22-Jul	79	55.4	73.2	53.7	46	100.8	68	81	45.4
29-Jul	79	55.5	74.2	54.4	46	100.1	71.3	82.1	42.5
5-Aug	79	56.6	74.1	54.2	48	104.3	68.7	81.2	42.8
12-Aug	79	54.3	73.9	53.5	46	105	68.3	82.7	44.3
19-Aug	78	62.1	73.7	53.3	44	102.2	68.9	81.6	45.4
26-Aug	77	59.6	73	53	45	105	68.4	83.7	45.8
2-Sep	77	56.2	72.9	51.7	45	105.7	67.7	83.8	46.7
9-Sep	76	62	71.9	52.2	45	103.6	68.6	84.1	48.5
16-Sep	75	58.4	71.8	51.9	46	103.6	67.6	83.3	49.1
23-Sep	76	59.3	71.7	51.4	45	100.8	69.4	83.6	50.1
30-Sep	77	61	72.4	51.3	45	100.1	69.3	84	46.3
7-Oct	75	59.2	72	49.5	44	101.5	64.7	84.3	45.6
14-Oct	75	57.8	72	50.1	45	98.7	64.6	83.8	43.8
21-Oct	75	58.6	71.1	49.7	45	100.1	66.3	82.3	44.5
28-Oct	75	56.6	70.3	48.8	44	97.3	64.6	80.5	43.2
4-Nov	75	58	70.5	50.4	44	93.1	67.1	78.7	43.3
11-Nov	77	50.7	69.9	49.8	43	93.1	65.3	74.6	41.8
18-Nov	74	54.1	69	49.1	41	93.1	65.4	75	42.5
25-Nov	75	57.7	67.8	47.9	37	93.1	65.9	70.2	38.5
2-Dec	73	53.7	67.9	48.1	40	96.6	65.8	72.6	40.3
9-Dec	73	54.8	67.1	46.6	38	89.6	63.7	69.8	35.3
16-Dec	75	46.9	67.3	45.6	37	83.3	61.9	64.6	32.2
23-Dec	73	51.8	66.2	45.6	39	83.3	62.5	63.8	34
31-Dec	72	50.2	66.1	44.5	37	78.4	60.9	63.1	30.7

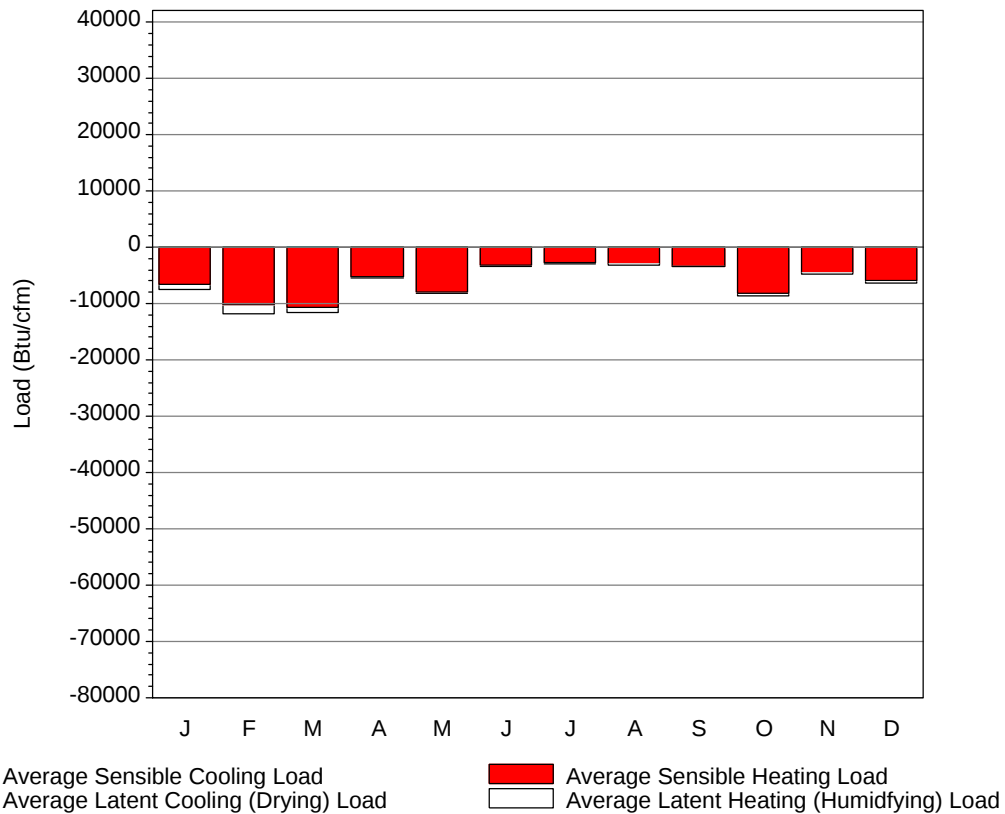
Degree Days, Heating and Cooling (Base 65 F) & Cooling (Base 50F)



Month	Mean Cooling Degree Days (°F) Base 50	Mean Cooling Degree Days (°F) Base 65	Mean Heating Degree Days (°F) Base 65
JAN	204.5	11.6	158.5
FEB	163	9.4	319.5
MAR	185.8	11.5	325.9
APR	248.6	15.3	110.9
MAY	259	24.1	229.3
JUN	330.4	49.8	54.8
JUL	367.9	70.3	46.1
AUG	388.9	73.8	46.9
SEP	322.6	46.5	61.1
OCT	270.8	37.8	249.2
NOV	238.9	20.1	94.2
DEC	186.2	9.2	137.2
ANN	3166.6	379.4	1833.6

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	5	-6663	66	-864
FEB	1	-10305	22	-1394
MAR	1	-10622	0	-870
APR	6	-5292	21	-237
MAY	6	-7877	31	-199
JUN	21	-3190	29	-163
JUL	51	-2811	41	-208
AUG	34	-2945	59	-149
SEP	10	-3437	87	-59
OCT	10	-8269	55	-358
NOV	6	-4476	13	-281
DEC	1	-5822	24	-604
ANN	152	-71709	448	-5386

Station Information		Shading Geometry in Dimensionless Units	
City, State, WBAN	HILO, HI 21504	Window:	1.000
Lat, Lon, Elev	19.72N 155.07W 36ft	Overhang:	1.128
Press, Stn_Type	14.7psia Secondary	Vert Gap:	0.200

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	1190	1350	1450	1520	1630	1710	1650	1680	1590	1380	1170	1110	1450
	Std.Dev.	125	151	162	124	134	105	137	119	134	128	126	115	56
	Minimum	890	1090	1120	1330	1320	1470	1400	1390	1340	1160	920	880	1340
	Maximum	1460	1620	1730	1770	1830	1880	2020	1970	1800	1720	1410	1330	1590
	Diffuse	490	570	710	800	800	790	790	730	680	630	560	490	670
Clear Day	Global	1720	1980	2280	2500	2580	2590	2580	2510	2330	2050	1760	1620	2210
NORTH	Global	320	360	410	460	570	680	620	490	410	380	330	310	440
	Diffuse	320	360	410	440	480	510	490	440	410	380	330	310	410
Clear Day	Global	290	310	350	430	710	970	850	510	350	320	290	270	470
EAST	Global	710	780	800	820	850	860	820	860	860	780	670	650	790
	Diffuse	390	430	490	540	550	550	540	530	510	470	400	370	480
Clear Day	Global	1040	1170	1310	1390	1400	1390	1380	1380	1320	1210	1070	1000	1250
SOUTH	Global	1190	1080	810	580	460	450	440	510	730	950	1050	1160	780
	Diffuse	480	500	500	480	450	450	440	450	480	510	490	470	470
Clear Day	Global	1980	1740	1270	680	390	380	380	520	1010	1580	1910	2020	1150
WEST	Global	650	720	760	770	820	870	850	880	840	730	640	610	760
	Diffuse	390	430	500	540	550	560	550	540	510	460	410	380	480
Clear Day	Global	1040	1170	1310	1390	1400	1390	1380	1380	1320	1210	1070	1000	1250

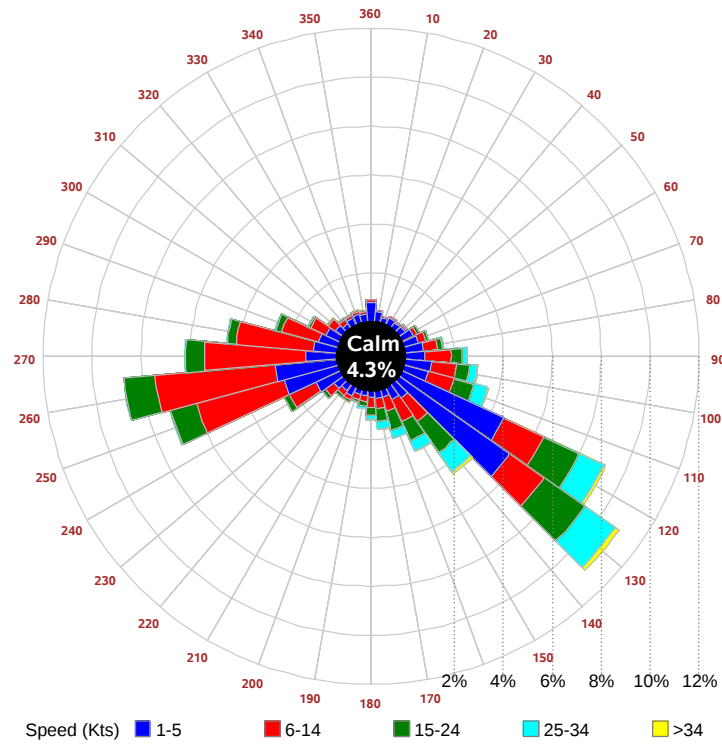
Average Annual Solar Radiation - Nearest Available Site Source: National Renewable Energy Laboratory, Golden CO, 1995

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	840	970	1050	1100	1190	1240	1200	1230	1160	990	830	780	1050
NORTH	Unshaded	220	250	280	310	350	410	380	320	280	260	230	210	290
	Shaded	160	180	200	220	240	260	250	230	210	190	170	150	200
EAST	Unshaded	490	550	570	580	600	600	580	610	610	550	470	460	560
	Shaded	300	330	330	330	340	340	330	350	350	320	280	280	320
SOUTH	Unshaded	850	730	510	360	310	310	310	320	430	620	740	840	530
	Shaded	270	230	230	230	230	230	220	230	240	230	240	290	240
WEST	Unshaded	450	500	530	540	580	610	600	630	590	510	440	430	540
	Shaded	270	300	310	310	330	340	340	350	340	300	260	250	310

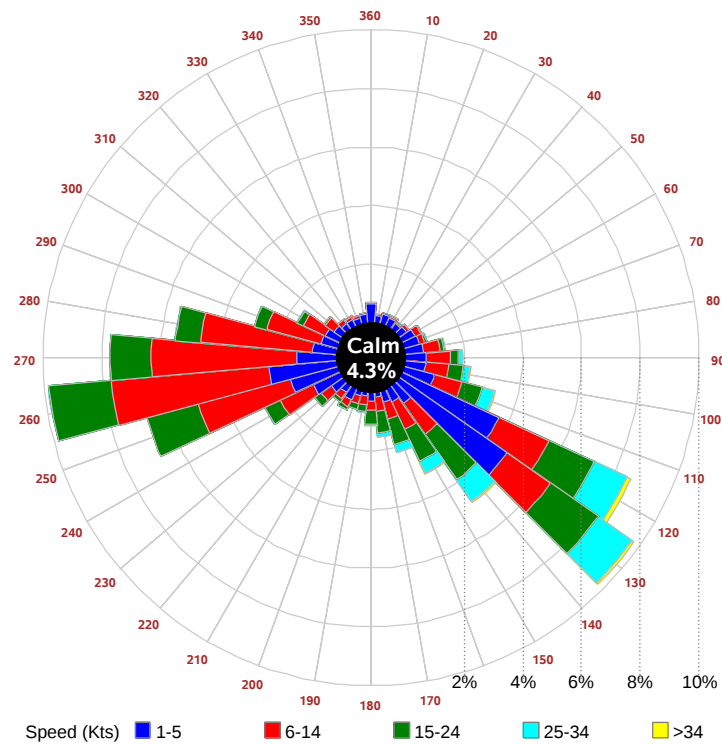
AVERAGE INCIDENT ILLUMINANCE (klux-hr) FOR MOSTLY CLEAR AND MOSTLY CLOUDY CONDITIONS Percentage Uncertainty = 9												
		March					June					
		9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	
HORIZ.	M.Clear	43	84	100	83	41	57	91	104	87	49	
	M.Cloudy	26	51	65	53	24	37	61	75	62	32	
NORTH	M.Clear	11	15	16	16	11	30	25	21	26	30	
	M.Cloudy	11	16	19	18	10	20	22	21	24	19	
EAST	M.Clear	80	65	17	16	11	78	58	15	16	12	
	M.Cloudy	31	36	19	18	10	39	40	17	18	12	
SOUTH	M.Clear	27	48	56	48	26	13	16	15	16	12	
	M.Cloudy	15	29	38	31	14	13	17	17	18	12	
WEST	M.Clear	11	15	17	65	75	13	16	19	64	76	
	M.Cloudy	11	16	19	38	28	13	17	20	45	36	
M.Clear	(% hrs)	23	26	25	21	18	17	21	22	20	16	

		Sept					Dec					
		9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	
HORIZ.	M.Clear	51	90	101	82	39	32	68	78	60	20	
	M.Cloudy	32	58	71	56	25	19	40	52	39	13	
NORTH	M.Clear	12	16	16	16	11	9	14	15	13	7	
	M.Cloudy	12	17	18	17	10	8	14	17	14	6	
EAST	M.Clear	81	61	16	16	11	64	53	15	13	7	
	M.Cloudy	37	39	18	17	10	23	28	17	14	6	
SOUTH	M.Clear	23	41	46	37	17	48	76	82	69	34	
	M.Cloudy	16	29	36	29	12	19	37	47	36	12	
WEST	M.Clear	12	16	23	69	75	9	14	21	58	51	
	M.Cloudy	12	17	22	45	32	8	14	19	32	17	
M.Clear	(% hrs)	27	29	28	26	21	33	35	35	30	24	

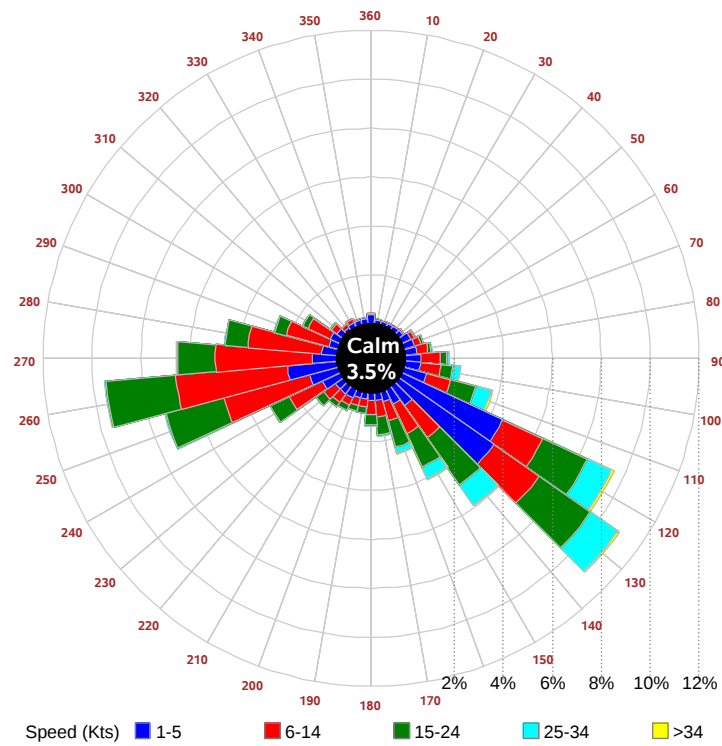
Wind Summary - December, January, and February



Wind Summary - March, April, and May



Wind Summary - June, July, and August



Wind Summary - September, October, and November

