

COLUMBIA MO

Latitude = 38.82 N

Longitude = 92.22 W

Period of Record = 1973 to 1996

WMO No. 724450

Elevation = 899 feet

Average Pressure = 29.04 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	98	75	100	10.2	SW
0.4% Occurrence	95	76	106	10.5	S
1.0% Occurrence	92	76	111	10.4	S
2.0% Occurrence	89	74	109	10.3	S
Mean Daily Range	19	-	-	-	-
97.5% Occurrence	12	11	7	10.1	WNW
99.0% Occurrence	5	4	5	10.1	WNW
99.6% Occurrence	-1	-2	3	10.1	WNW
Median of Extreme Lows	-6	-7	2	10.6	WNW
	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	81	91	145	9.7	S
0.4% Occurrence	79	89	135	10.0	S
1.0% Occurrence	77	87	126	9.9	S
2.0% Occurrence	76	86	122	9.7	S
	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	151	88	0.97	9.3	S
0.4% Occurrence	140	85	0.90	8.9	S
1.0% Occurrence	132	83	0.85	9.1	S
2.0% Occurrence	127	82	0.82	9.0	S
Air Conditioning/ Humid Area Criteria	# of Hours	T ≥ 93°F	T ≥ 80°F	T _{wb} ≥ 73°F	T _{wb} ≥ 67°F
		73	865	610	1692

Other Site Data

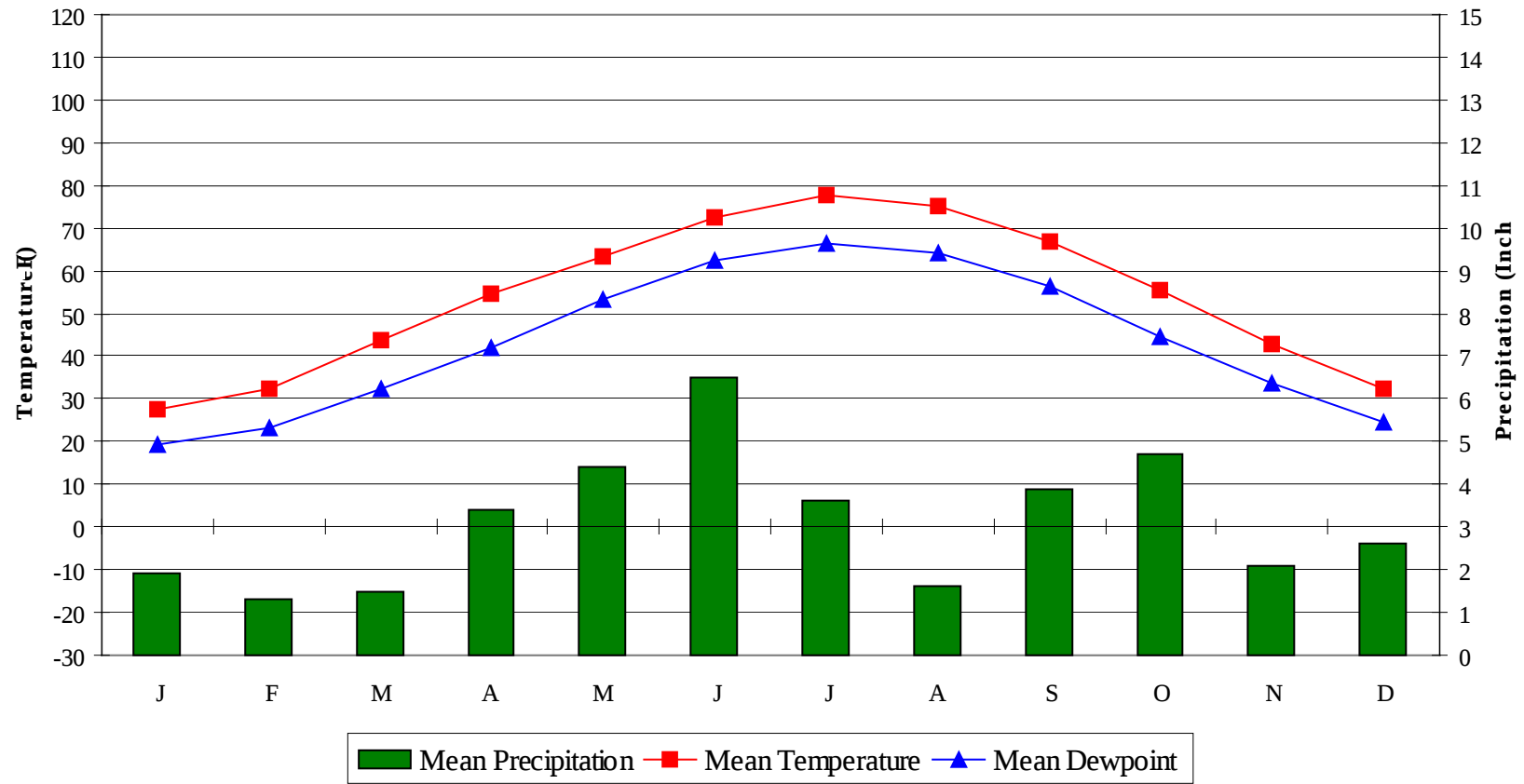
Weather Region	Rain Rate 100 Year Recurrence (in./hr)	Basic Wind Speed 3 sec gust @ 33 ft 50 Year Recurrence (mph)	Ventilation Cooling Load Index (Ton-hr/cfm/yr) Base 75°F-RH 60% Latent + Sensible
7	3.3	90	2.6 + 0.9
Ground Water Temperature (°F) 50 Foot Depth *	Frost Depth 50 Year Recurrence (in.)	Ground Snow Load 50 Year Recurrence (lb/ft ²)	Average Annual Freeze-Thaw Cycles (#)
56.2	N/A	20	56

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

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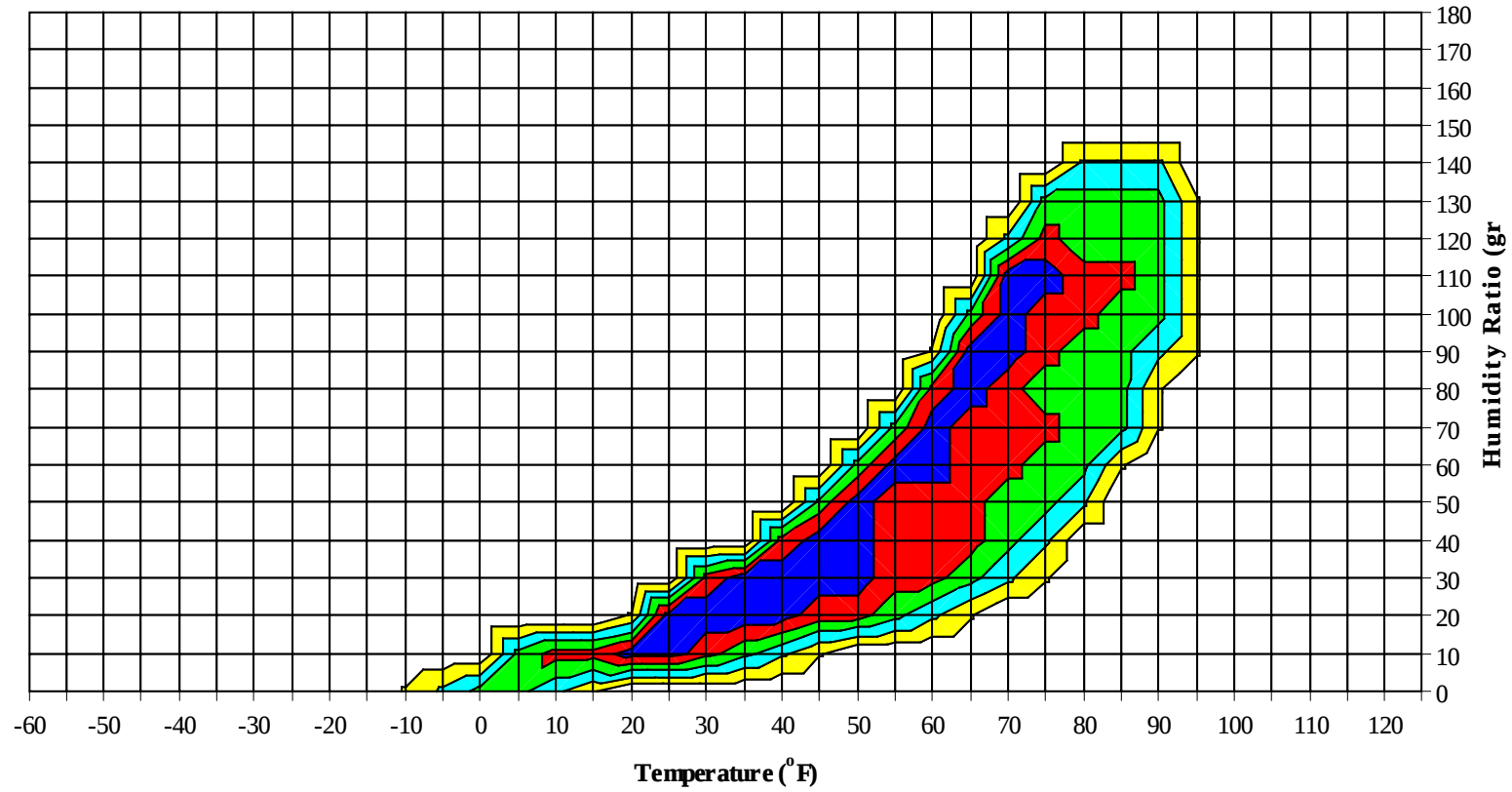
Average Annual Climate



COLUMBIA MO

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Long Term Psychrometric Summary

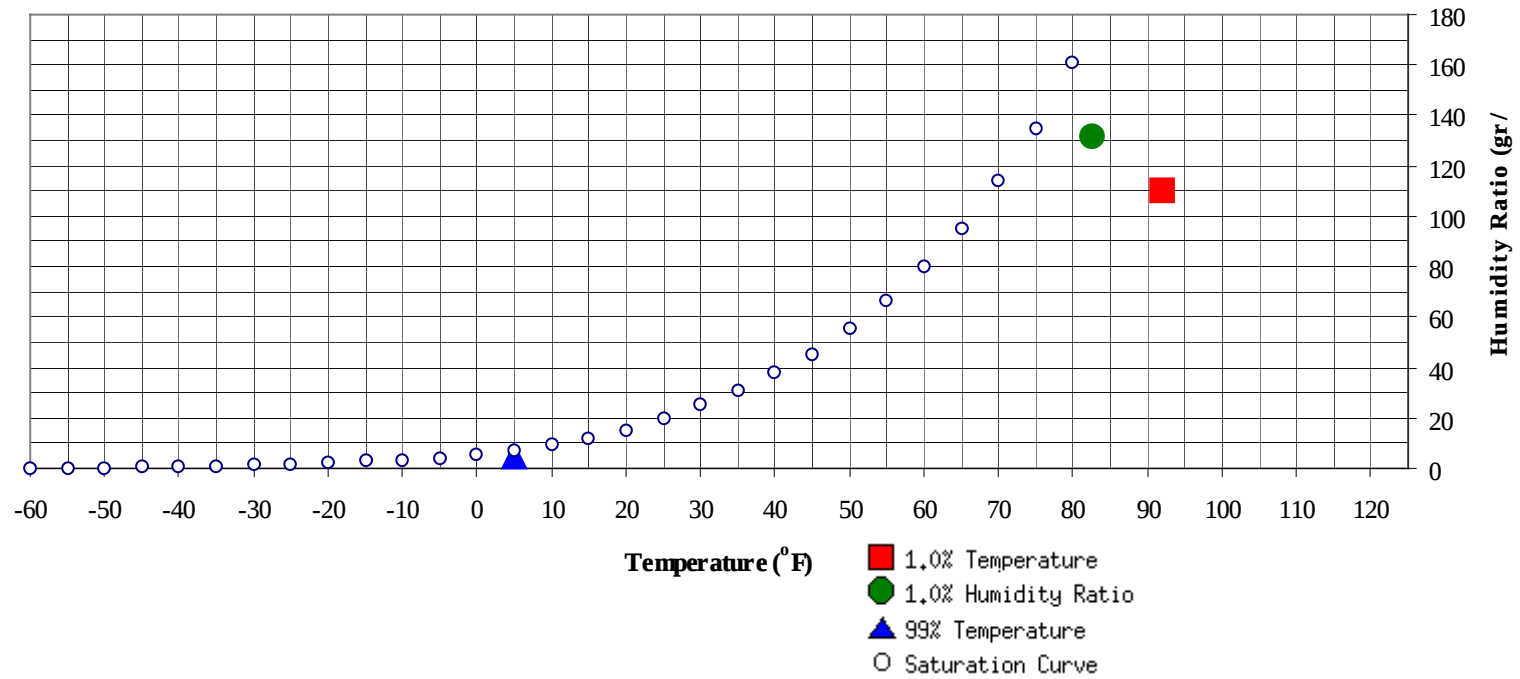


- 50% of all observations
- 80% of all observations
- 95% of all observations
- 97.5% of all observations
- 99% of all observations

COLUMBIA MO

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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)
	5	5.1	2.0		131.6	82.7	76.3	74	40.5

1.0% Dry Bulb	(°F)	MCHR (gr/lb)	MCWB (°F)	Enthalpy (btu/lb)
	92	110.6	75.5	39.5

COLUMBIA MO

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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		
110 / 114															
105 / 109															
100 / 104															
95 / 99															
90 / 94															
85 / 89												0		0	62.0
80 / 84												2	0	3	61.9
75 / 79							0		0	54.2		7	2	9	59.9
70 / 74		0	0	0	51.0		2	0	2	55.7	0	13	6	19	58.2
65 / 69		1	0	1	56.4		5	1	7	53.5	2	16	10	28	55.8
60 / 64	0	3	0	3	51.4	1	9	4	14	50.9	6	20	18	44	52.6
55 / 59	1	6	3	10	49.1	3	12	7	22	48.5	12	24	22	58	49.2
50 / 54	3	12	6	20	45.7	4	16	15	35	45.0	21	29	30	80	45.8
45 / 49	5	16	11	31	41.3	10	19	20	49	41.4	30	33	38	100	42.1
40 / 44	12	23	23	59	37.7	18	21	24	64	37.8	39	35	36	110	38.2
35 / 39	25	34	34	93	33.6	31	31	32	94	33.9	36	28	33	97	33.6
30 / 34	46	44	51	141	29.9	45	36	40	121	29.7	41	23	29	94	29.4
25 / 29	43	30	32	104	25.1	35	23	27	84	25.0	31	11	16	57	24.9
20 / 24	31	28	30	89	20.1	24	20	20	65	20.1	18	4	6	29	20.2
15 / 19	23	19	22	65	15.4	16	12	14	42	15.3	7	2	2	11	15.7
10 / 14	23	16	17	56	10.6	14	8	11	34	10.5	2	1	1	3	10.6
5 / 9	15	8	11	34	6.1	10	4	5	19	6.0	1	0	1	1	6.2
0 / 4	11	4	6	21	1.0	7	2	3	12	1.3	1	0	0	1	1.2
-5 / -1	6	2	2	9	-3.2	3	1	1	5	-3.0	0			0	-2.0
-10 / -6	3	1	1	5	-7.4	2	0	0	2	-7.4	0			0	-5.0
-15 / -11	1	0	1	2	-12.0	1	0	0	1	-12.0					
-20 / -16	1			1	-16.4										
-25 / -21															

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.

COLUMBIA MO

WMO No. 724450

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		
110 / 114															
105 / 109															
100 / 104												1	0	1	75.5
95 / 99											2	1		3	74.3
90 / 94							0		0	73.5	11	3		14	75.2
85 / 89		2	0	2	67.7		6	1	7	72.7	0	43	15	58	73.6
80 / 84		11	3	14	65.4	0	26	7	33	69.8	3	65	32	100	70.8
75 / 79		19	7	26	62.4	1	43	19	64	65.8	18	53	49	121	68.4
70 / 74	2	27	17	46	60.0	10	50	36	95	63.5	54	38	62	155	66.7
65 / 69	11	30	25	67	57.2	32	50	52	133	60.7	71	18	47	137	63.5
60 / 64	22	37	33	92	54.1	61	39	58	157	57.6	50	7	25	81	58.9
55 / 59	31	35	39	104	50.4	54	19	39	112	53.1	30	2	7	39	54.7
50 / 54	39	29	40	108	46.7	47	11	24	83	48.6	8	0	2	10	50.4
45 / 49	47	23	35	105	43.0	28	3	10	41	44.2	2		0	2	46.8
40 / 44	38	17	24	79	38.6	11	1	3	15	40.0	0			0	42.4
35 / 39	29	7	12	48	34.4	3		0	3	35.4					
30 / 34	14	3	6	23	29.7	0			0	31.2					
25 / 29	5	0	1	7	25.0	0			0	28.0					
20 / 24	1			1	21.1										
15 / 19	0			0	17.0										
10 / 14															
5 / 9															
0 / 4															
-5 / -1															
-10 / -6															
-15 / -11															
-20 / -16															
-25 / -21															

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COLUMBIA MO

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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		
110 / 114		0		0	70.0		0		0	78.0					
105 / 109		1	0	2	74.1		0	0	0	72.6					
100 / 104		3	1	4	74.6		2	0	3	75.5					
95 / 99		11	3	13	76.0		11	3	14	75.4		1	0	2	73.2
90 / 94	0	44	14	58	75.8		33	9	42	75.3		9	1	10	73.3
85 / 89	2	67	29	98	74.0	1	51	19	71	73.0		24	5	29	71.7
80 / 84	13	62	47	122	72.2	6	60	36	102	71.4	1	39	14	54	69.6
75 / 79	47	35	64	146	70.8	33	47	55	134	70.0	7	40	29	76	67.4
70 / 74	88	17	56	160	68.4	71	29	66	166	67.8	30	45	45	120	65.4
65 / 69	61	6	26	93	64.4	70	11	38	118	63.9	44	34	46	124	62.1
60 / 64	29	2	8	39	59.8	44	3	17	65	59.6	46	25	41	113	57.6
55 / 59	7	0	1	8	55.4	18	0	4	23	55.4	47	15	29	90	53.5
50 / 54	0		0	0	50.3	4		1	5	50.8	34	6	20	60	49.2
45 / 49	0			0	45.0	1		0	1	45.5	16	2	8	26	44.4
40 / 44						0			0	42.4	11	0	2	13	40.3
35 / 39											3		0	3	35.9
30 / 34											0			0	32.6
25 / 29															
20 / 24															
15 / 19															
10 / 14															
5 / 9															
0 / 4															
-5 / -1															
-10 / -6															
-15 / -11															
-20 / -16															
-25 / -21															

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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		
110 / 114															
105 / 109															
100 / 104															
95 / 99															
90 / 94		0		0	67.2										
85 / 89		2	0	2	65.2										
80 / 84		9	1	10	66.5		0		0	65.0					
75 / 79	0	19	4	23	63.6		2		2	61.3		0		0	61.0
70 / 74	2	35	13	50	61.4	0	8	1	9	60.1	0	0		1	62.3
65 / 69	10	40	28	77	59.0	1	15	6	21	58.0	1	3	1	4	59.5
60 / 64	24	43	46	113	55.6	9	22	16	47	55.8	1	6	2	9	55.2
55 / 59	43	39	44	126	51.7	18	26	22	67	51.4	4	10	6	21	50.7
50 / 54	43	30	43	115	47.1	17	28	26	71	46.6	6	16	8	30	45.9
45 / 49	43	20	35	98	43.0	22	31	32	85	42.4	8	22	18	48	41.7
40 / 44	38	8	24	70	39.0	36	34	37	108	38.4	19	31	29	79	38.0
35 / 39	29	3	9	40	34.8	42	34	40	116	34.1	34	45	43	122	34.1
30 / 34	13	1	2	16	30.4	43	21	34	98	29.6	56	47	55	157	29.9
25 / 29	3	0	1	3	25.7	28	12	18	57	25.1	41	24	33	98	25.1
20 / 24	0		0	0	22.1	14	4	6	24	20.5	27	18	21	66	20.2
15 / 19						5	1	2	8	15.9	19	11	14	45	15.5
10 / 14						2	0	1	3	10.9	10	7	8	25	10.9
5 / 9						1	0	0	1	6.6	8	4	5	17	6.1
0 / 4						0	0		0	2.1	6	2	3	12	1.3
-5 / -1											2	1	2	5	-3.1
-10 / -6											1	1	1	3	-7.9
-15 / -11											1	1	1	2	-11.7
-20 / -16											1	0	0	1	-17.0
-25 / -21											0			0	-20.0

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COLUMBIA MO

WMO No. 724450

Dry-Bulb Temperature Hours For An Average Year (Sheet 5 of 5)**Period of Record = 1973 to 1996**

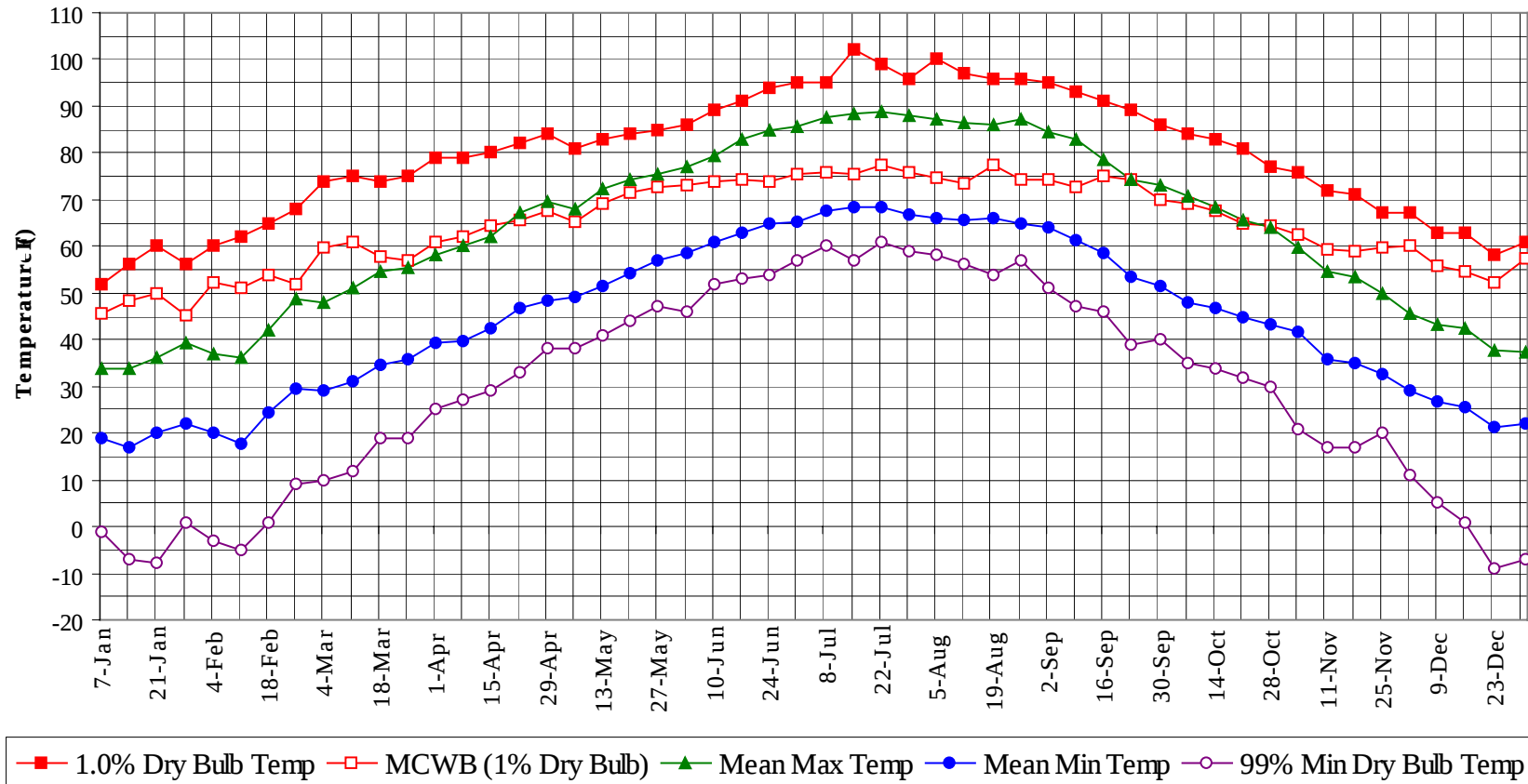
Annual Totals						
Temperature Range (°F)	Hour Group (LST)			Total Obs	M C W B (°F)	
	01 To 08	09 To 16	17 To 00			
110 / 114	0			0	72.0	
105 / 109	2			1	2	73.8
100 / 104	6			1	7	75.0
95 / 99	25			6	31	75.4
90 / 94	0	98	27	125	75.3	
85 / 89	3	194	69	267	73.3	
80 / 84	23	273	140	435	70.8	
75 / 79	106	263	227	597	68.3	
70 / 74	256	262	300	818	65.7	
65 / 69	301	227	276	804	61.5	
60 / 64	291	213	268	772	56.8	
55 / 59	266	188	223	677	51.9	
50 / 54	226	178	213	616	47.1	
45 / 49	211	169	207	587	42.6	
40 / 44	224	172	203	599	38.4	
35 / 39	233	183	205	621	34.0	
30 / 34	261	177	219	657	29.7	
25 / 29	187	101	128	415	25.1	
20 / 24	117	75	84	276	20.2	
15 / 19	71	47	55	173	15.5	
10 / 14	52	32	38	123	10.6	
5 / 9	35	17	22	73	6.1	
0 / 4	25	9	13	47	1.2	
-5 / -1	12	3	4	20	-3.1	
-10 / -6	6	2	3	11	-7.5	
-15 / -11	3	1	1	5	-11.9	
-20 / -16	1	0	0	2	-16.9	
-25 / -21	0			0	-20.0	

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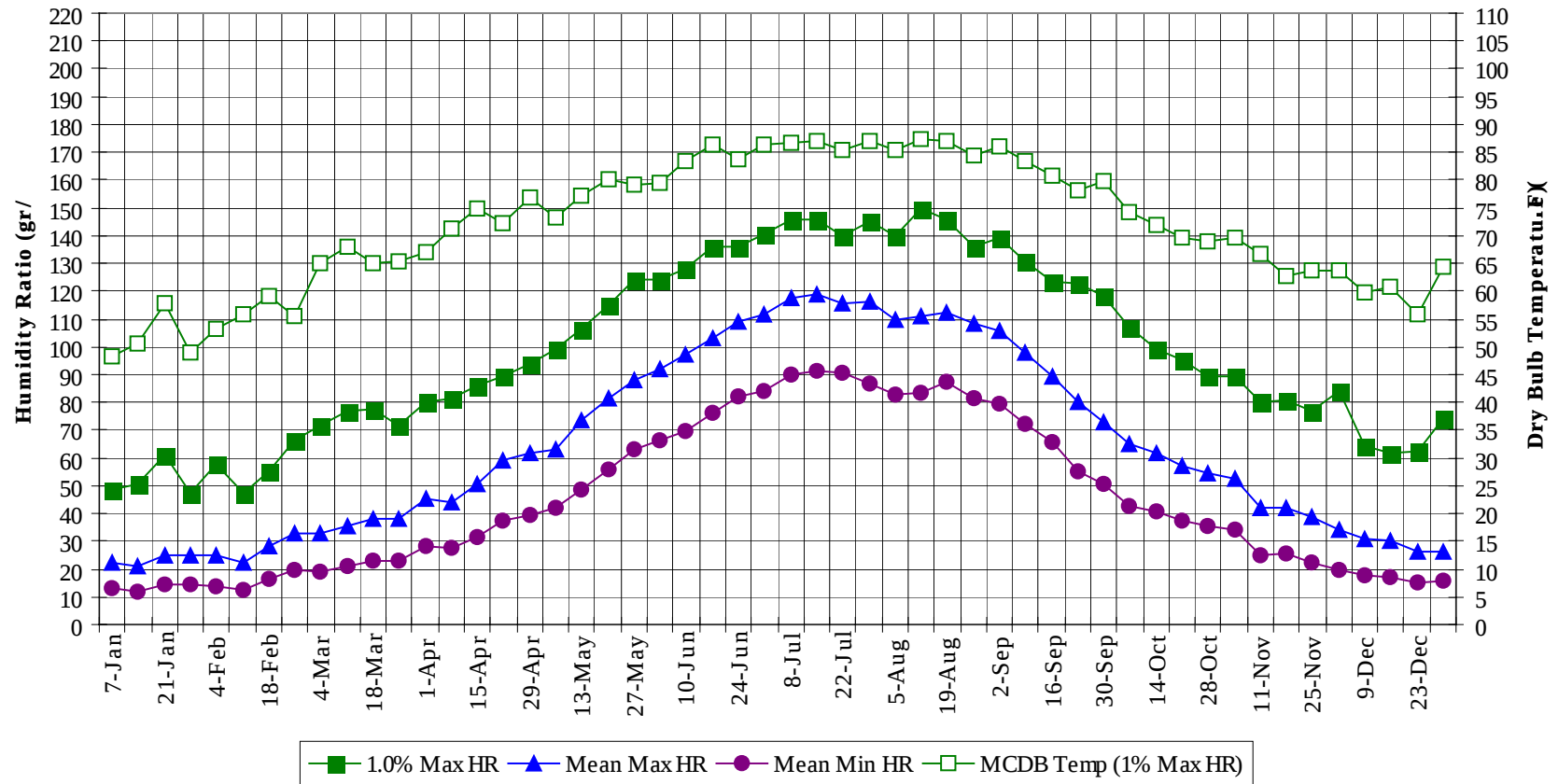
Annual Summary of Temperatures



COLUMBIA MO

WMO No. 724450

Long Term Humidity and Dry Bulb Temperature Summary



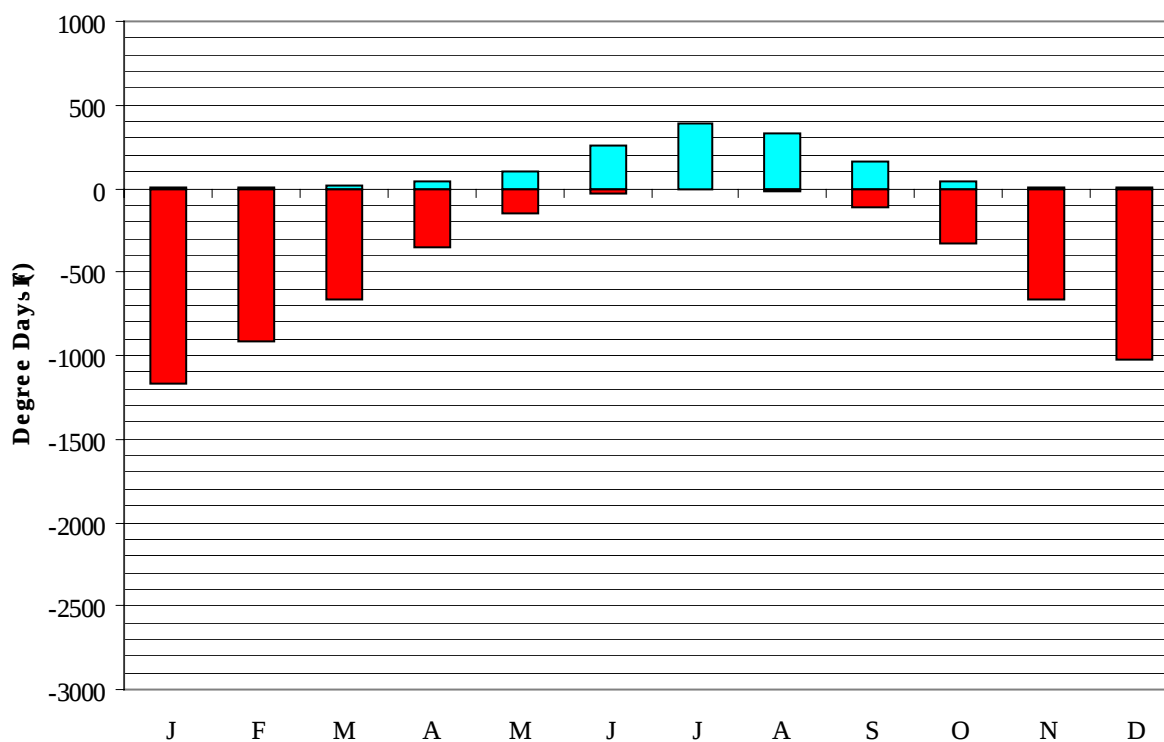
COLUMBIA**MO****WMO No. 724450****Long Term Dry Bulb Temperature and Humidity Summary**

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	52.0	45.6	33.7	18.9	-1.0	48.3	48.3	22.3	13.0
14-Jan	56.0	48.2	33.7	16.9	-7.0	50.4	50.5	21.2	11.5
21-Jan	60.0	49.9	36.3	20.0	-8.0	60.9	57.8	24.9	14.3
28-Jan	56.0	45.3	39.4	22.1	1.0	47.6	48.8	24.7	14.1
4-Feb	60.0	52.1	37.1	20.2	-3.0	58.1	53.3	24.7	14.1
11-Feb	62.0	51.0	36.0	17.8	-5.0	47.6	55.8	22.2	12.4
18-Feb	65.0	54.0	42.1	24.4	1.0	55.3	59.0	28.0	16.6
25-Feb	68.0	51.9	48.7	29.6	9.0	66.5	55.6	32.9	19.4
4-Mar	74.0	59.6	48.0	29.2	10.0	71.4	64.9	32.7	19.3
11-Mar	75.0	61.0	50.9	31.0	12.0	77.0	67.9	35.8	20.8
18-Mar	74.0	57.8	54.7	34.4	19.0	77.7	65.1	38.3	23.1
25-Mar	75.0	57.1	55.4	35.8	19.0	71.4	65.5	38.1	23.1
1-Apr	79.0	60.9	58.1	39.2	25.0	79.8	67.1	45.2	28.1
8-Apr	79.0	62.2	60.0	39.5	27.0	81.2	71.2	43.9	27.3
15-Apr	80.0	64.6	62.2	42.6	29.0	86.1	74.9	50.7	31.5
22-Apr	82.0	65.5	67.3	46.9	33.0	89.6	72.2	59.4	37.7
29-Apr	84.0	67.7	69.4	48.4	38.0	93.8	76.8	61.7	39.6
6-May	81.0	65.3	68.0	49.0	38.0	99.4	73.4	63.2	42.2
13-May	83.0	69.2	72.4	51.7	41.0	106.4	77.1	73.6	48.4
20-May	84.0	71.6	74.3	54.4	44.0	114.8	80.2	81.3	56.1
27-May	85.0	72.7	75.4	56.9	47.0	123.9	79.2	87.8	62.9
3-Jun	86.0	72.9	77.0	58.4	46.0	123.9	79.5	91.6	66.1
10-Jun	89.0	73.9	79.4	60.7	52.0	128.1	83.3	97.0	69.9
17-Jun	91.0	74.3	83.0	62.8	53.0	135.8	86.2	102.8	75.9
24-Jun	94.0	73.9	84.7	64.6	54.0	135.8	83.7	109.2	82.0
1-Jul	95.0	75.4	85.5	65.3	57.0	140.7	86.4	111.6	84.1
8-Jul	95.0	76.0	87.7	67.5	60.0	145.6	86.7	117.3	89.7
15-Jul	102.0	75.3	88.2	68.3	57.0	145.6	87.1	119.2	91.5
22-Jul	99.0	77.3	88.9	68.4	61.0	140.0	85.4	115.7	90.4
29-Jul	96.0	75.9	87.9	66.7	59.0	144.9	87.0	115.9	86.7
5-Aug	100.0	74.8	87.1	66.0	58.0	140.0	85.5	110.0	82.9
12-Aug	97.0	73.6	86.5	65.6	56.0	149.8	87.3	111.0	83.6
19-Aug	96.0	77.5	86.1	66.0	54.0	145.6	87.0	112.6	87.6
26-Aug	96.0	74.1	87.1	65.0	57.0	135.8	84.5	108.1	81.4
2-Sep	95.0	74.1	84.5	64.0	51.0	139.3	85.9	105.9	79.4
9-Sep	93.0	72.9	82.9	61.3	47.0	130.9	83.5	97.9	72.4
16-Sep	91.0	74.9	78.4	58.6	46.0	123.2	80.7	89.6	65.4
23-Sep	89.0	74.1	74.3	53.4	39.0	122.5	78.2	80.0	55.2
30-Sep	86.0	70.0	73.2	51.5	40.0	118.3	79.7	72.7	50.5
7-Oct	84.0	69.1	70.8	47.9	35.0	107.1	74.2	65.3	42.4
14-Oct	83.0	67.4	68.4	46.6	34.0	99.4	72.0	61.5	40.9
21-Oct	81.0	64.7	65.5	44.7	32.0	95.2	69.6	57.3	37.2
28-Oct	77.0	64.3	64.0	43.3	30.0	89.6	69.0	54.7	35.2
4-Nov	76.0	62.6	59.7	41.6	21.0	89.6	69.8	52.5	34.2
11-Nov	72.0	59.4	54.7	36.0	17.0	79.8	66.5	41.7	25.3
18-Nov	71.0	59.1	53.6	35.2	17.0	80.5	62.7	42.0	25.7
25-Nov	67.0	59.7	50.0	32.7	20.0	77.0	63.6	38.9	22.5
2-Dec	67.0	60.0	45.6	29.1	11.0	84.0	63.6	34.2	20.0
9-Dec	63.0	55.8	43.4	26.9	5.0	64.4	59.8	30.8	18.1
16-Dec	63.0	54.4	42.3	25.5	1.0	61.6	60.7	30.0	17.3
23-Dec	58.0	52.2	37.8	21.2	-9.0	62.3	55.7	26.1	14.9
31-Dec	61.0	57.5	37.3	22.0	-7.0	74.2	64.5	26.1	15.5

COLUMBIA MO

WMO No. 724450

Degree Days, Heating and Cooling
(Base 65°F)



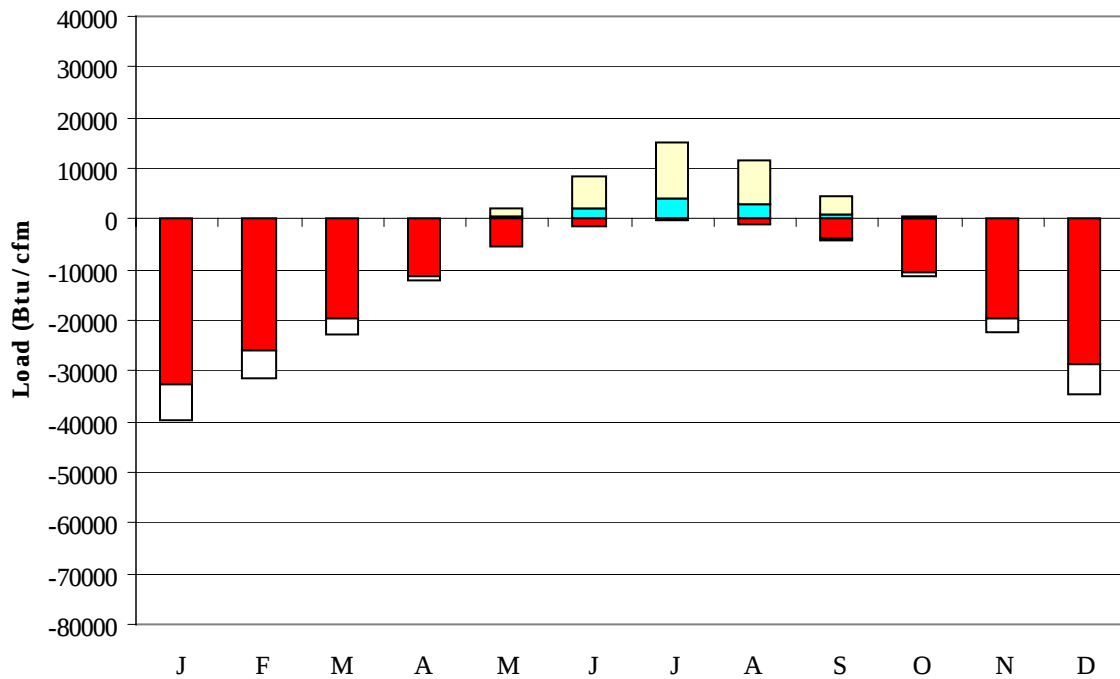
■ Mean Cooling Degree Days ■ Mean Heating Degree Days

	Mean Cooling Degree Days (°F)	Mean Heating Degree Days (°F)
JAN	0	1162
FEB	1	919
MAR	13	670
APR	40	358
MAY	98	147
JUN	257	28
JUL	394	7
AUG	332	17
SEP	158	111
OCT	39	332
NOV	5	666
DEC	0	1020
ANN	1338	5437

COLUMBIA MO

WMO No. 724450

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

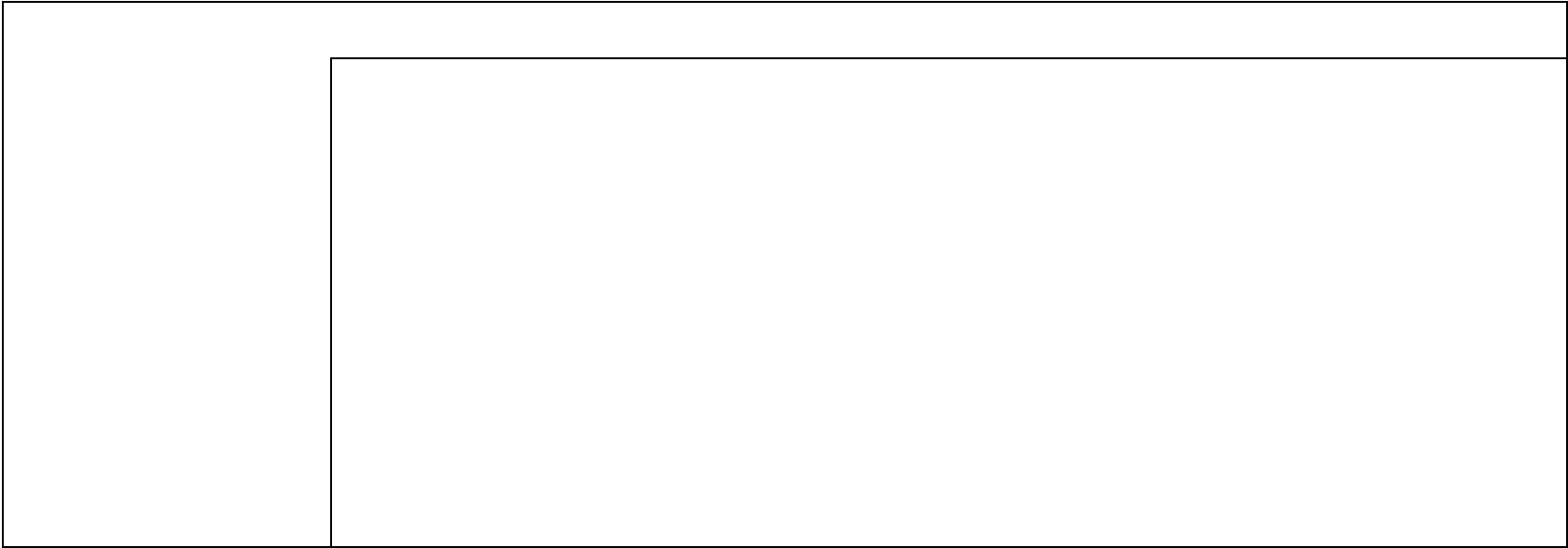


■ Average Sensible Cooling Load	■ Average Sensible Heating Load
■ Average Latent Cooling (Drying) Load	■ Average Latent Heating (Humidifying) Load

	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	0	-32533	0	-7122
FEB	0	-25997	1	-5422
MAR	30	-19625	2	-3289
APR	163	-11232	95	-1009
MAY	427	-5308	1687	-95
JUN	1986	-1304	6307	0
JUL	3967	-415	11069	0
AUG	3085	-858	8662	0
SEP	1106	-4012	3237	-41
OCT	136	-10609	339	-730
NOV	3	-19513	23	-2928
DEC	0	-28841	5	-5653
ANN	10903	-160247	31427	-26289

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

No Solar Radiation
Data Available

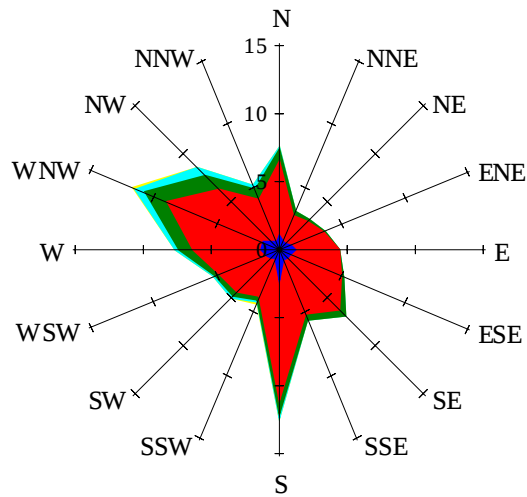


Average Annual Solar Heat and Illumination – Nearest Available Site

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

Wind Summary - December, January, and February

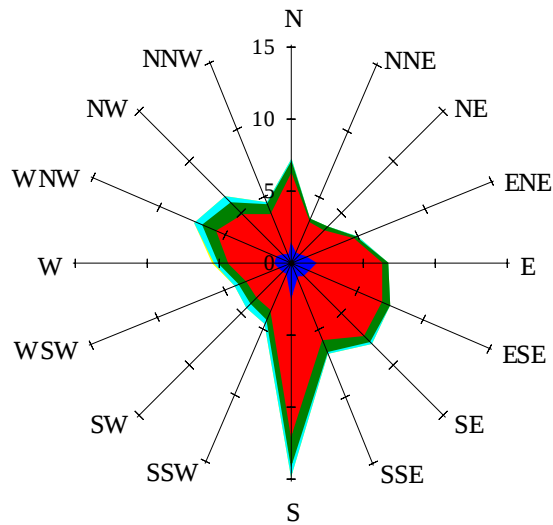
Labels of Percent Frequency on North Axis



Percent Calm = 1.88

Wind Summary - March, April, and May

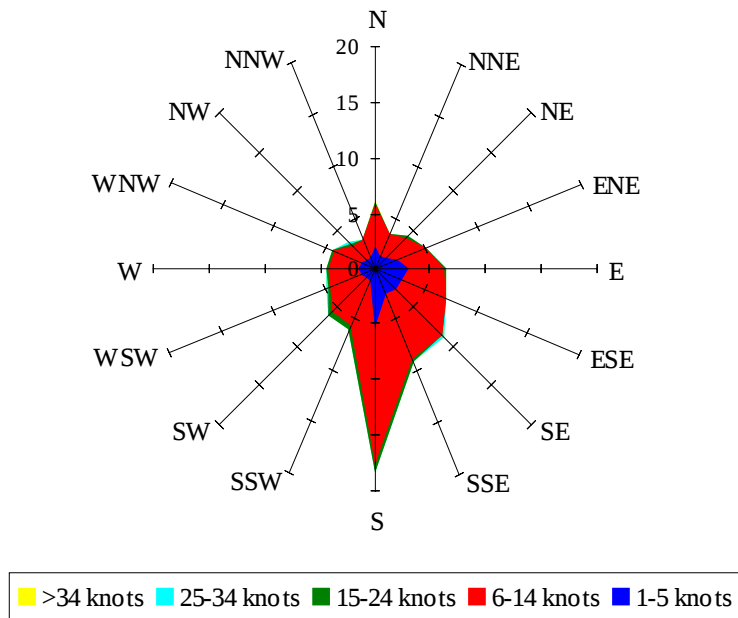
Labels of Percent Frequency on North Axis



Percent Calm = 1.99

Wind Summary - June, July, and August

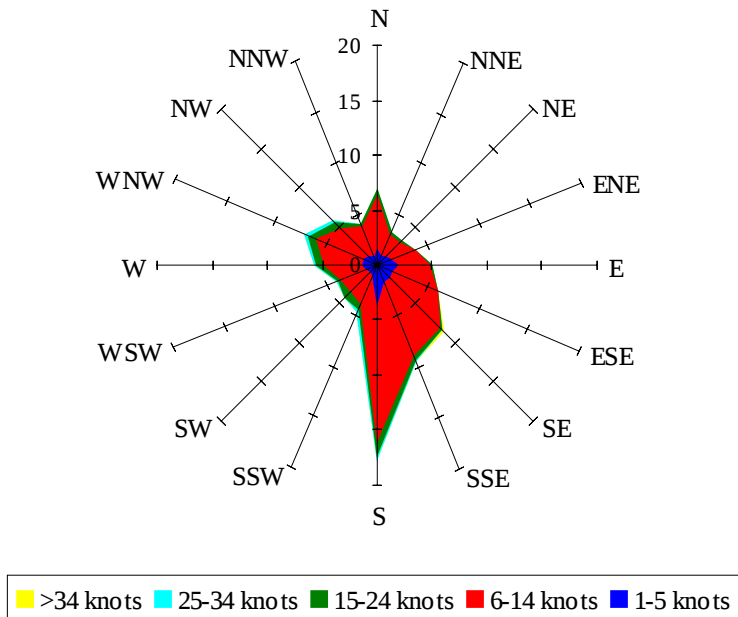
Labels of Percent Frequency on North Axis



Percent Calm = 2.56

Wind Summary - September, October, and November

Labels of Percent Frequency on North Axis



Percent Calm = 2.30