

DES MOINES IA

Latitude = 41.53 N

WMO No. 725460

Longitude = 93.65 W

Elevation = 965 feet

Period of Record = 1973 to 1996

Average Pressure = 28.96 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	97	76	107	13.1	SSW
0.4% Occurrence	94	76	111	12.0	S
1.0% Occurrence	91	75	109	12.1	S
2.0% Occurrence	88	74	106	11.8	S
Mean Daily Range	18	-	-	-	-
97.5% Occurrence	4	3	5	10.6	NW
99.0% Occurrence	-3	-4	3	10.8	NW
99.6% Occurrence	-8	-9	2	10.6	NW
Median of Extreme Lows	-14	-15	1	12.1	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	80	91	138	11.4	S
0.4% Occurrence	78	89	129	11.2	S
1.0% Occurrence	77	88	125	11.0	S
2.0% Occurrence	75	85	118	10.7	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	146	89	0.94	11.1	S
0.4% Occurrence	136	86	0.88	9.7	S
1.0% Occurrence	127	84	0.82	9.8	S
2.0% Occurrence	122	82	0.79	9.0	S
Air Conditioning/ Humid Area Criteria	# of Hours	T ≥ 93°F	T ≥ 80°F	T _{wb} ≥ 73°F	T _{wb} ≥ 67°F
		54	748	413	1291

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
6	3.5	90	1.8 + 0.8
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 (#)
52.6	82	22	60

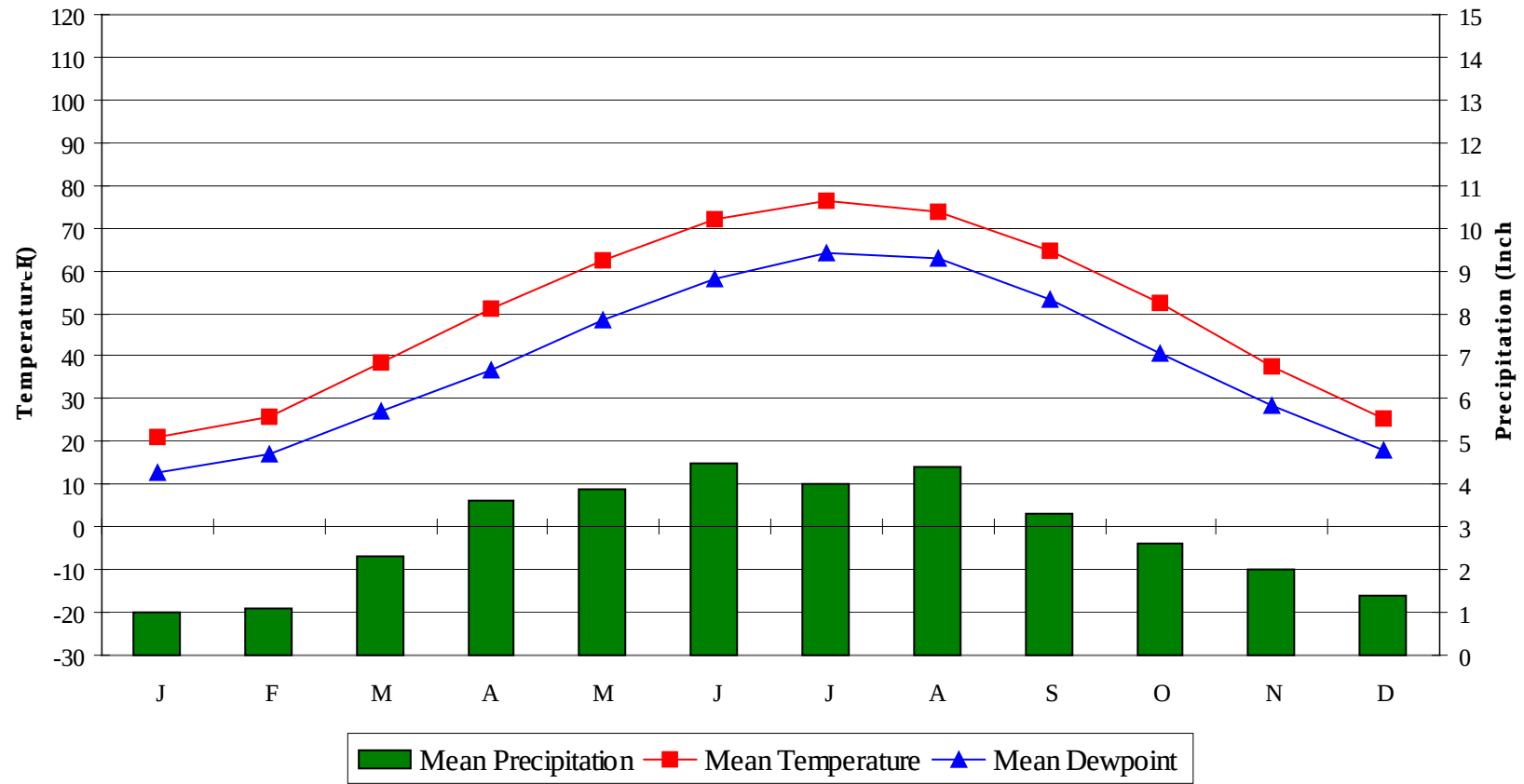
*Note: Temperatures at greater depths can be estimated by adding 1.5°F per 100 feet additional depth.

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Average Annual Climate

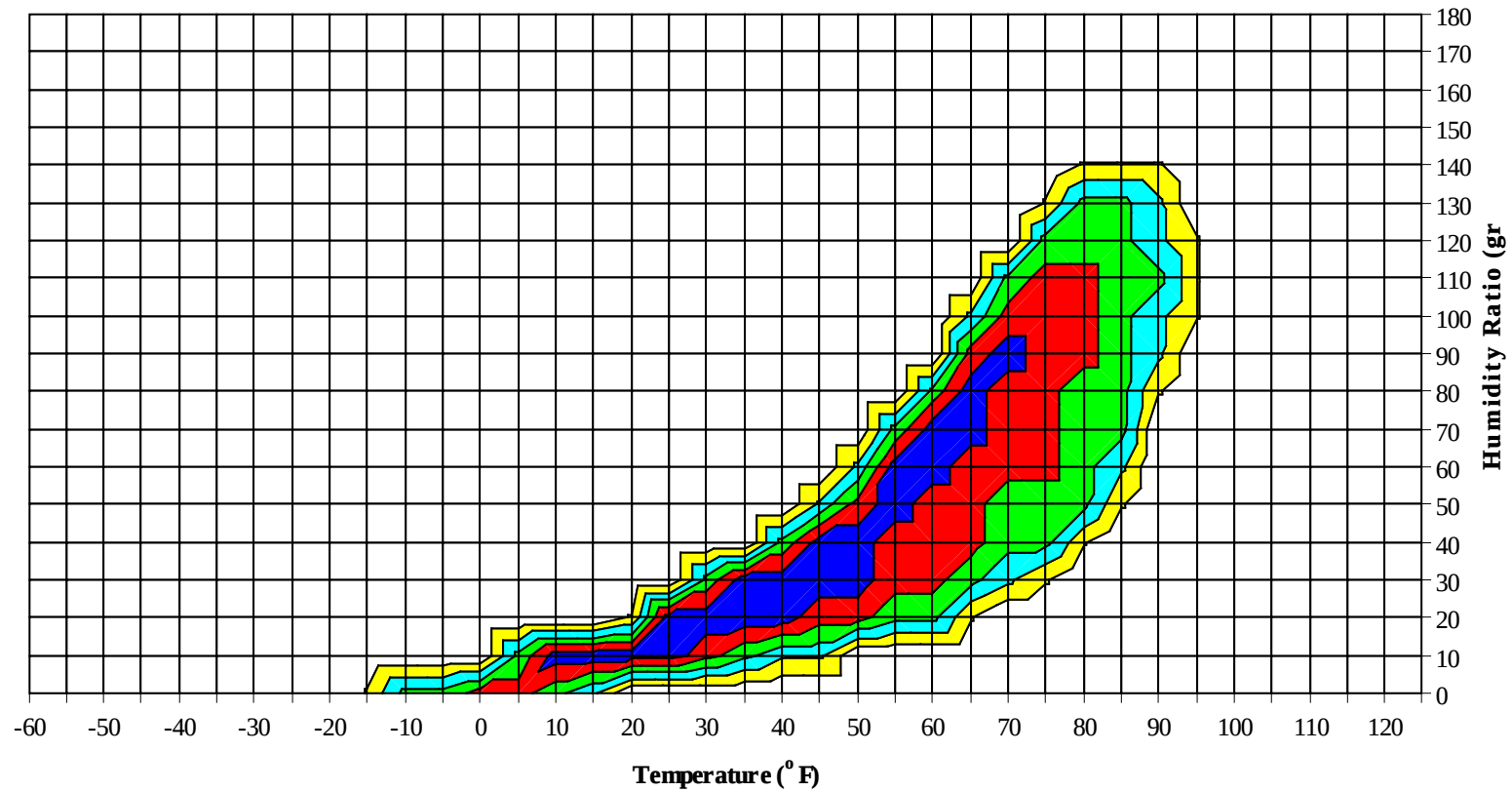


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Long Term Psychrometric Summary

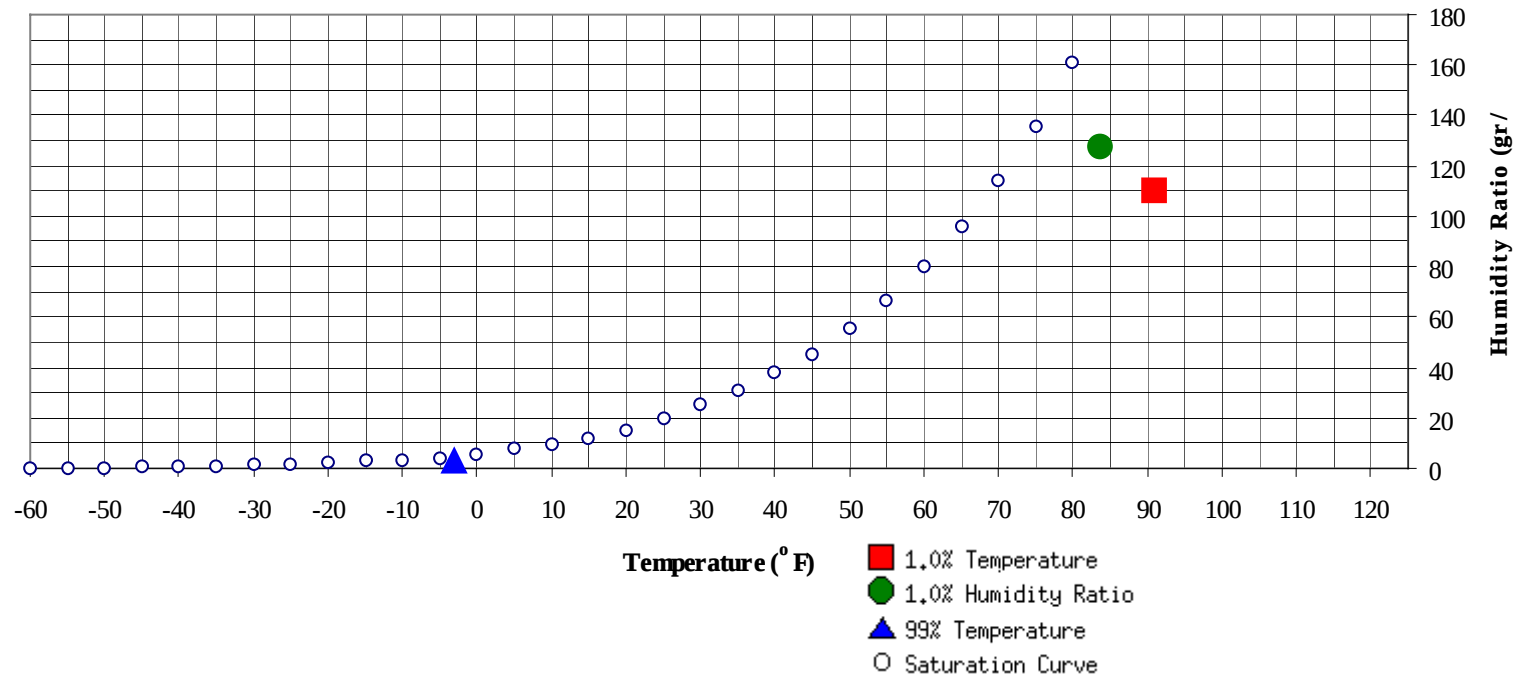


- 50% of all observations
- 80% of all observations
- 95% of all observations
- 97.5% of all observations
- 99% of all observations

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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)
	-3	3	-0.3		127.4	83.6	75.9	73.1	40.0

1.0% Dry Bulb	(°F)	MCHR (gr/lb)	MCWB (°F)	Enthalpy (btu/lb)
	91	110.1	75.1	39.2

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WMO No. 725460

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												0		0	61.5
85 / 89												0	0	0	61.2
80 / 84												1	0	1	60.3
75 / 79												2	1	3	58.4
70 / 74							0		0	52.0		4	2	6	56.3
65 / 69		0		0	51.0		1	0	1	50.4	0	8	4	13	54.1
60 / 64		1		1	48.1		4	0	4	47.9	3	15	10	28	51.9
55 / 59		1	0	2	47.3	0	5	2	8	46.5	6	17	14	38	48.4
50 / 54	0	3	2	5	44.9	1	9	4	14	43.5	8	24	20	51	44.7
45 / 49	1	8	3	12	40.4	3	14	11	28	40.3	19	32	28	79	41.2
40 / 44	4	14	9	27	37.0	8	20	20	48	36.9	31	39	40	110	37.6
35 / 39	16	25	26	67	33.4	24	29	33	85	33.7	44	38	41	123	33.6
30 / 34	36	41	42	120	29.7	44	34	41	119	29.7	51	31	39	121	29.3
25 / 29	37	34	35	107	25.0	35	29	26	89	24.7	35	16	22	74	24.5
20 / 24	27	27	28	83	20.1	23	24	26	73	20.1	23	11	13	47	19.8
15 / 19	29	23	26	79	15.5	22	17	19	58	15.2	11	6	7	25	15.3
10 / 14	24	23	23	70	10.4	19	14	16	49	10.5	8	3	4	15	10.6
5 / 9	24	18	19	61	5.8	17	10	12	39	5.8	5	1	1	7	6.0
0 / 4	19	15	18	52	0.8	12	6	7	26	1.2	2	0	1	3	1.4
-5 / -1	11	6	9	26	-3.3	6	3	4	13	-3.3	1	0		1	-3.3
-10 / -6	13	4	4	21	-7.5	7	2	3	12	-7.3	0			0	-7.0
-15 / -11	4	2	2	8	-12.5	3	1	1	4	-12.6					
-20 / -16	1	1	0	3	-17.0	1	0	0	2	-17.2					
-25 / -21	1	0	0	1	-20.7	1	0	0	1	-21.3					
-30 / -26						0			0	-25.0					

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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WMO No. 725460

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		
105 / 109															
100 / 104												1	0	1	74.6
95 / 99												2	1	3	74.4
90 / 94		0		0	63.9		0		0	68.8	0	11	4	14	74.4
85 / 89		3	1	3	65.6		8	2	11	69.3	0	34	15	49	71.8
80 / 84		6	3	9	63.8	0	21	9	31	66.3	4	56	36	95	68.6
75 / 79	0	10	6	16	60.9	1	35	20	57	63.5	18	54	49	120	66.2
70 / 74	2	16	11	28	58.5	8	45	36	89	60.8	45	42	57	144	64.1
65 / 69	8	26	18	52	55.2	29	40	46	116	58.5	68	25	47	140	61.1
60 / 64	13	33	29	76	52.5	47	42	52	140	55.2	59	11	23	93	57.1
55 / 59	20	32	32	84	48.8	55	28	41	124	51.4	32	4	8	44	53.0
50 / 54	32	35	39	106	45.3	52	17	26	96	47.4	12	1	2	15	49.2
45 / 49	44	31	39	114	41.9	33	7	12	52	43.3	3		0	3	44.8
40 / 44	44	23	28	95	38.3	17	2	3	21	38.8					
35 / 39	36	14	19	69	33.9	5	0	1	6	34.0					
30 / 34	27	7	10	43	29.4	1			1	29.9					
25 / 29	9	3	4	15	24.5										
20 / 24	5	1	1	7	20.6										
15 / 19	0	0	0	1	15.6										
10 / 14	0			0	10.4										
5 / 9	0			0	8.0										
0 / 4															
-5 / -1															
-10 / -6															
-15 / -11															
-20 / -16															
-25 / -21															
-30 / -26															

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WMO No. 725460

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	75.7						
100 / 104		3	0	3	75.9	2	0	2	76.5						
95 / 99		9	3	12	76.5	7	2	8	76.6		1	0	1	74.5	
90 / 94		28	11	39	75.5	19	7	26	75.6		5	1	6	73.7	
85 / 89	1	50	27	79	73.5	0	37	17	73.7		15	4	18	72.0	
80 / 84	13	64	53	131	71.0	7	57	41	105	71.1	1	30	14	44	69.3
75 / 79	41	52	61	154	69.0	28	56	55	139	69.0	6	35	25	67	67.1
70 / 74	77	29	55	162	66.7	62	43	64	169	66.4	23	42	37	103	64.1
65 / 69	69	10	28	107	63.1	70	18	40	127	62.9	35	42	45	122	60.6
60 / 64	37	2	7	46	59.3	49	7	20	75	58.7	45	35	46	126	56.6
55 / 59	10	0	1	11	55.1	25	1	5	30	54.6	48	19	33	99	52.7
50 / 54	1			1	50.7	7	0	0	7	50.6	38	11	21	70	48.2
45 / 49						1		0	1	46.2	26	4	9	39	44.0
40 / 44						0			0	42.0	13	1	4	17	39.6
35 / 39											5		1	6	35.0
30 / 34											1		0	1	31.3
25 / 29											0			0	28.0
20 / 24															
15 / 19															
10 / 14															
5 / 9															
0 / 4															
-5 / -1															
-10 / -6															
-15 / -11															
-20 / -16															
-25 / -21															
-30 / -26															

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WMO No. 725460

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	63.0										
85 / 89		1	0	1	67.6										
80 / 84		5	1	6	65.6										
75 / 79	0	11	3	14	62.9		0		0	62.2					
70 / 74	2	21	9	31	60.0		2	0	2	59.5					
65 / 69	7	32	19	57	57.6	0	5	1	7	57.7		0	0	1	60.1
60 / 64	18	41	35	94	54.5	3	13	7	23	54.8	0	2	1	2	54.5
55 / 59	29	42	40	112	50.5	8	20	13	41	50.6	1	2	1	5	50.6
50 / 54	42	40	50	133	46.6	12	26	23	61	46.2	1	6	3	10	45.4
45 / 49	46	28	39	113	42.4	16	28	25	69	41.8	2	10	5	17	41.0
40 / 44	39	15	28	82	38.3	26	34	35	95	37.8	6	17	11	35	37.4
35 / 39	37	7	16	61	34.2	44	40	46	129	33.7	21	38	36	94	33.8
30 / 34	21	3	6	31	29.8	52	33	42	127	29.5	50	52	54	156	30.0
25 / 29	5	0	2	7	25.4	30	17	22	70	24.6	47	35	41	123	25.1
20 / 24	2		0	2	21.2	22	10	14	46	20.1	34	26	32	92	20.5
15 / 19						13	6	8	27	15.8	24	18	21	62	15.5
10 / 14						6	3	4	13	11.0	20	15	14	48	10.7
5 / 9						3	1	1	6	5.9	13	11	10	34	5.9
0 / 4						2	0	1	3	1.3	12	7	10	29	1.1
-5 / -1						0	0		1	-2.0	7	3	5	15	-3.2
-10 / -6											5	2	3	10	-7.3
-15 / -11											3	2	1	6	-12.3
-20 / -16											1	1	1	3	-16.9
-25 / -21											0			0	-20.7
-30 / -26															

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DES MOINES IA WMO No. 725460
Dry-Bulb Temperature Hours For An Average Year (Sheet 5 of 5)
Period of Record = 1973 to 1996

Temperature Range (°F)	Annual Totals				
	Hour Group (LST)			Total Obs	M C W B (°F)
	01 To 08	09 To 16	17 To 00		
105 / 109		0	0	0	75.7
100 / 104		5	1	6	76.0
95 / 99		18	6	24	76.2
90 / 94	0	63	23	86	75.1
85 / 89	2	147	66	215	72.7
80 / 84	24	239	156	419	69.7
75 / 79	95	254	219	568	67.2
70 / 74	217	242	270	730	64.3
65 / 69	284	209	248	741	60.3
60 / 64	273	204	231	708	55.8
55 / 59	232	173	191	596	51.1
50 / 54	207	173	191	571	46.5
45 / 49	194	163	172	528	42.1
40 / 44	189	164	178	532	37.9
35 / 39	232	190	220	642	33.7
30 / 34	285	202	235	721	29.7
25 / 29	199	135	153	486	24.8
20 / 24	136	100	114	350	20.2
15 / 19	100	71	82	253	15.4
10 / 14	78	58	61	197	10.6
5 / 9	62	41	44	147	5.9
0 / 4	47	29	37	113	1.0
-5 / -1	26	13	18	57	-3.3
-10 / -6	25	8	10	43	-7.4
-15 / -11	10	4	4	19	-12.4
-20 / -16	4	1	2	7	-17.0
-25 / -21	1	0	0	2	-20.9
-30 / -26	0			0	-25.0

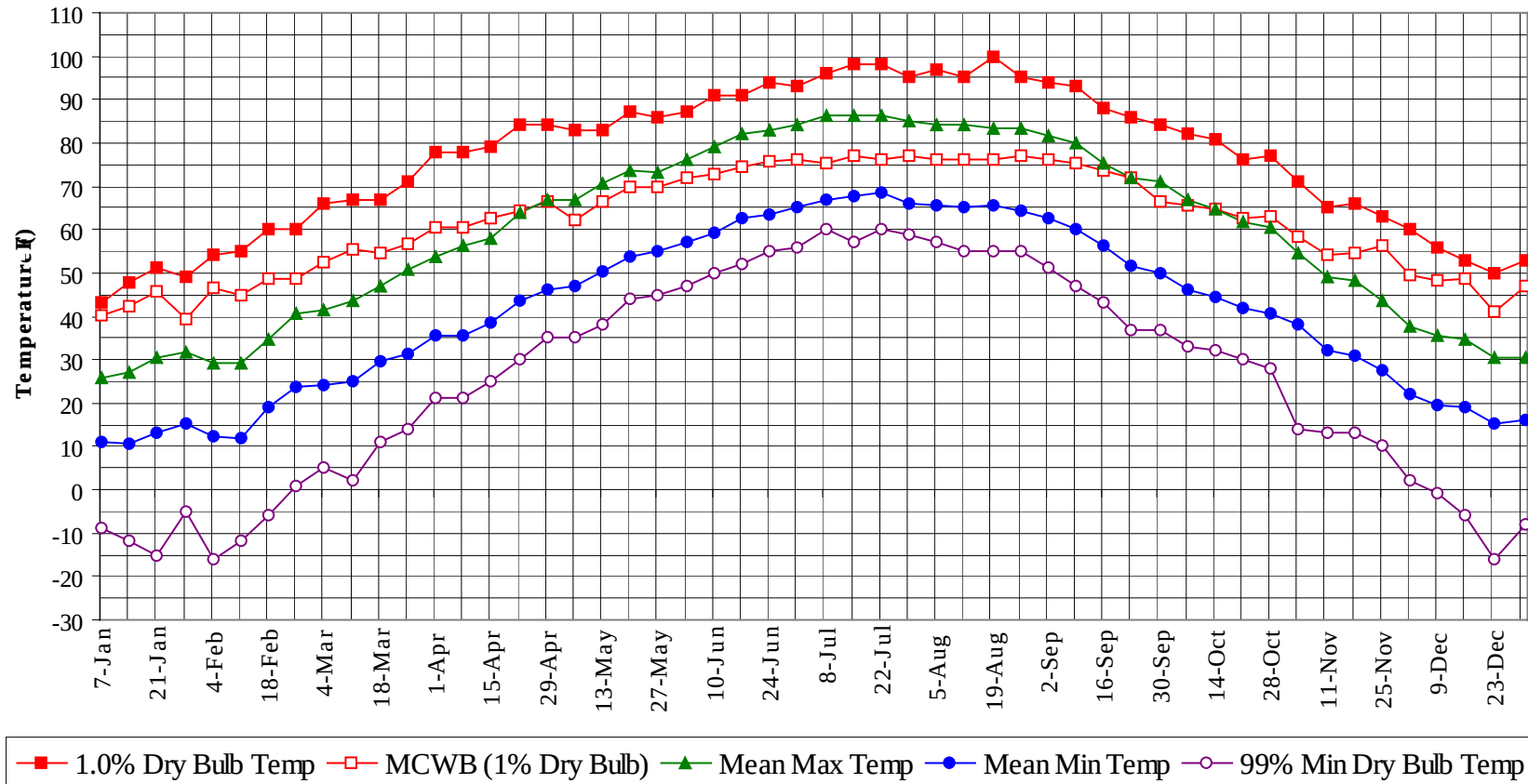
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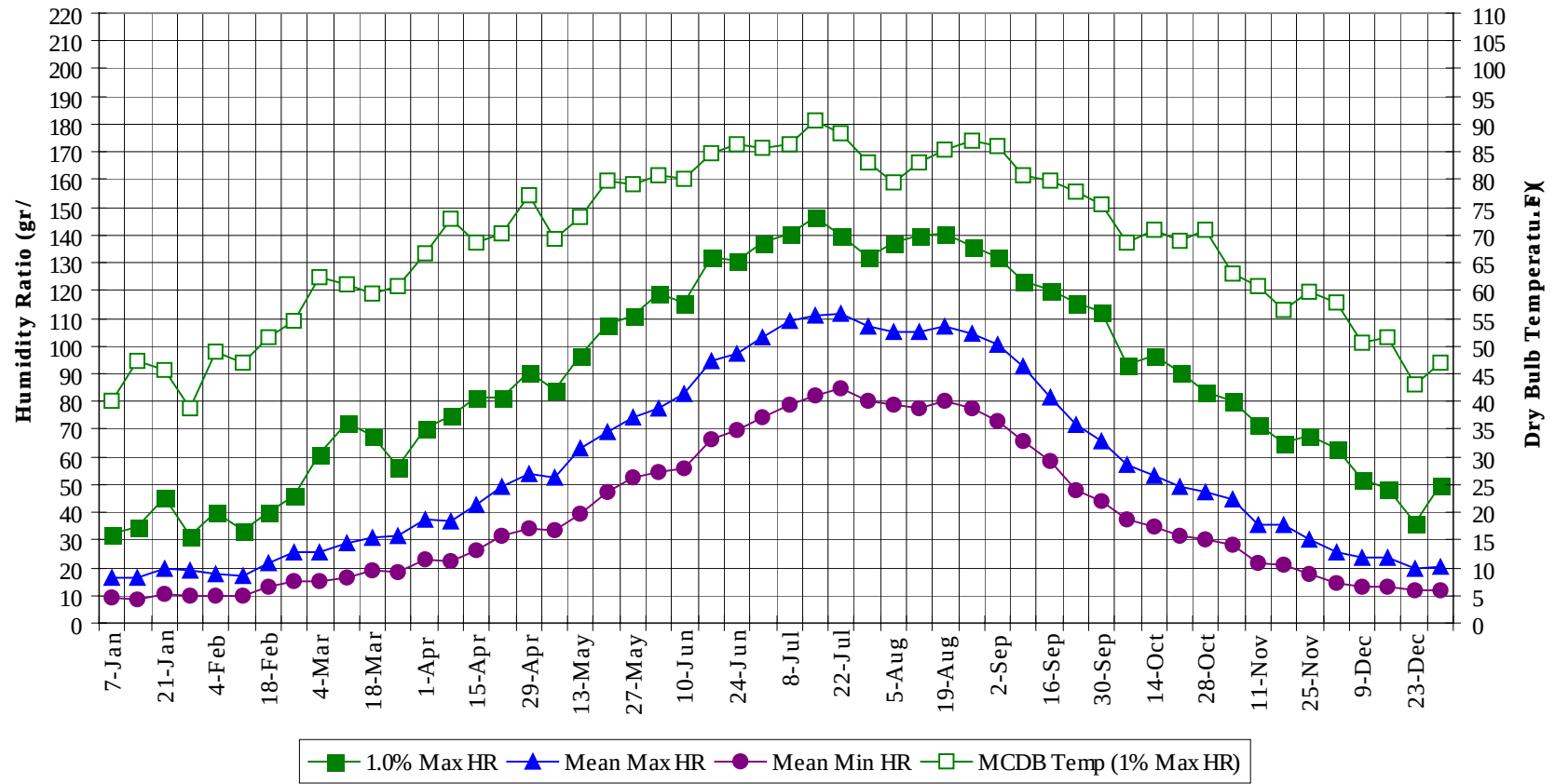
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Annual Summary of Temperatures



Long Term Humidity and Dry Bulb Temperature Summary

DES MOINES**IA****WMO No. 725460****Long Term Dry Bulb Temperature and Humidity Summary**

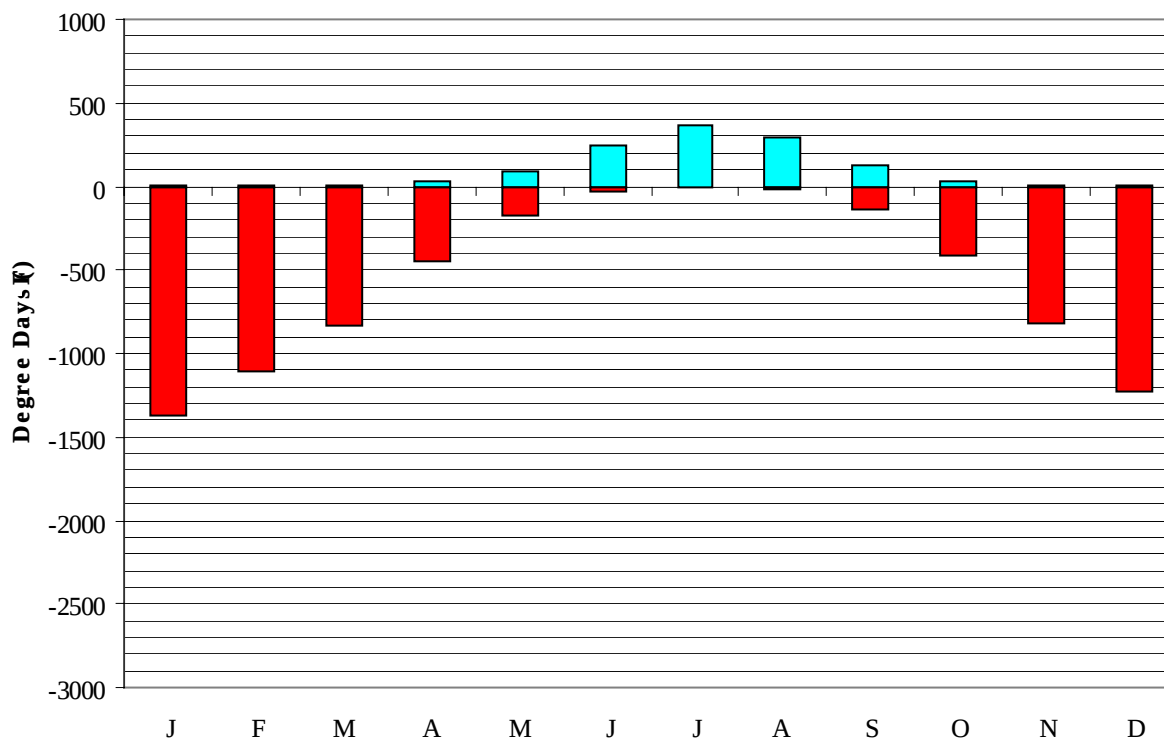
Week Ending	1.0% Temp (°F)	MCWB @ 1% Temp (°F)	Mean Max Temp (°F)	Mean Min Temp (°F)	99% Temp (°F)	1.0% HR (gr/lb)	MCDB @ 1% HR (°F)	Mean Max HR (gr/lb)	Mean Min HR (gr/lb)
7-Jan	43.0	40.3	25.7	11.0	-9.0	32.2	40.0	16.4	9.3
14-Jan	48.0	42.2	27.0	10.8	-12.0	35.0	47.3	16.7	8.8
21-Jan	51.0	45.6	30.3	13.2	-15.0	45.5	45.8	19.6	10.6
28-Jan	49.0	39.5	31.9	15.4	-5.0	31.5	38.6	19.1	10.2
4-Feb	54.0	46.7	29.2	12.1	-16.0	39.9	48.9	17.7	9.8
11-Feb	55.0	44.8	29.3	11.9	-12.0	33.6	47.1	17.1	9.7
18-Feb	60.0	48.6	34.9	19.0	-6.0	39.9	51.6	21.6	13.0
25-Feb	60.0	48.6	40.6	23.5	1.0	46.2	54.7	25.8	15.2
4-Mar	66.0	52.5	41.4	24.0	5.0	60.9	62.5	25.8	15.2
11-Mar	67.0	55.5	43.5	24.9	2.0	72.1	60.9	28.6	16.6
18-Mar	67.0	54.4	47.0	29.7	11.0	67.9	59.5	31.1	19.2
25-Mar	71.0	56.5	51.0	31.4	14.0	56.7	60.6	31.7	18.7
1-Apr	78.0	60.4	53.6	35.5	21.0	70.0	66.7	37.2	22.7
8-Apr	78.0	60.4	56.1	35.6	21.0	74.9	72.8	37.0	22.2
15-Apr	79.0	62.6	57.8	38.6	25.0	81.2	68.7	42.7	26.3
22-Apr	84.0	64.5	63.9	43.7	30.0	81.2	70.3	49.1	31.7
29-Apr	84.0	66.4	67.0	46.2	35.0	90.3	77.1	54.1	33.9
6-May	83.0	62.0	66.7	46.8	35.0	84.0	69.3	52.2	33.5
13-May	83.0	66.3	70.8	50.5	38.0	96.6	73.3	62.7	39.6
20-May	87.0	69.8	73.5	53.7	44.0	107.8	79.9	68.7	47.3
27-May	86.0	69.9	73.4	55.1	45.0	111.3	79.3	74.1	52.3
3-Jun	87.0	72.0	76.1	57.3	47.0	119.0	80.8	77.8	54.7
10-Jun	91.0	72.9	79.0	59.4	50.0	115.5	80.2	82.4	55.7
17-Jun	91.0	74.4	82.2	62.6	52.0	132.3	84.7	94.8	66.1
24-Jun	94.0	75.7	82.9	63.7	55.0	130.9	86.4	97.2	69.6
1-Jul	93.0	76.2	84.3	65.2	56.0	137.2	85.7	102.8	74.5
8-Jul	96.0	75.4	86.3	67.0	60.0	140.7	86.5	109.2	78.7
15-Jul	98.0	77.0	86.5	67.8	57.0	146.3	90.6	111.3	81.9
22-Jul	98.0	76.3	86.3	68.3	60.0	140.0	88.5	111.6	84.4
29-Jul	95.0	77.1	84.9	66.0	59.0	132.3	83.0	107.3	80.0
5-Aug	97.0	76.2	84.2	65.6	57.0	137.2	79.6	105.3	78.7
12-Aug	95.0	76.3	84.1	65.2	55.0	140.0	83.1	104.8	77.7
19-Aug	100.0	76.0	83.4	65.4	55.0	140.7	85.5	107.1	80.2
26-Aug	95.0	76.9	83.6	64.4	55.0	135.8	87.1	104.4	77.6
2-Sep	94.0	76.3	81.7	62.7	51.0	132.3	86.2	100.6	73.1
9-Sep	93.0	75.3	80.0	60.3	47.0	123.2	80.6	92.5	65.6
16-Sep	88.0	73.6	75.2	56.3	43.0	120.4	79.7	81.6	58.7
23-Sep	86.0	71.8	71.9	51.6	37.0	115.5	77.9	71.5	48.0
30-Sep	84.0	66.4	70.9	50.1	37.0	112.0	75.5	65.6	44.3
7-Oct	82.0	65.5	67.0	46.2	33.0	93.1	68.7	57.3	37.3
14-Oct	81.0	64.8	64.6	44.4	32.0	96.6	71.0	53.3	34.8
21-Oct	76.0	62.4	61.7	42.0	30.0	90.3	68.9	48.9	31.4
28-Oct	77.0	63.2	60.3	40.7	28.0	83.3	70.9	47.0	30.2
4-Nov	71.0	58.5	54.5	38.0	14.0	79.8	63.0	44.5	28.0
11-Nov	65.0	54.0	49.3	32.2	13.0	71.4	60.9	35.1	21.5
18-Nov	66.0	54.8	48.4	30.9	13.0	65.1	56.6	35.3	21.0
25-Nov	63.0	56.1	43.8	27.5	10.0	67.9	59.9	29.9	17.5
2-Dec	60.0	49.6	37.8	22.1	2.0	63.0	57.8	25.5	14.5
9-Dec	56.0	48.4	35.6	19.6	-1.0	51.8	50.6	23.7	13.1
16-Dec	53.0	48.5	34.8	18.9	-6.0	48.3	51.6	23.9	13.4
23-Dec	50.0	40.9	30.4	15.4	-16.0	36.4	42.9	19.9	11.5
31-Dec	53.0	46.9	30.7	15.9	-8.0	49.7	47.0	20.5	11.7

DES MOINES

IA

WMO No. 725460

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



■ Mean Cooling Degree Days ■ Mean Heating Degree Days

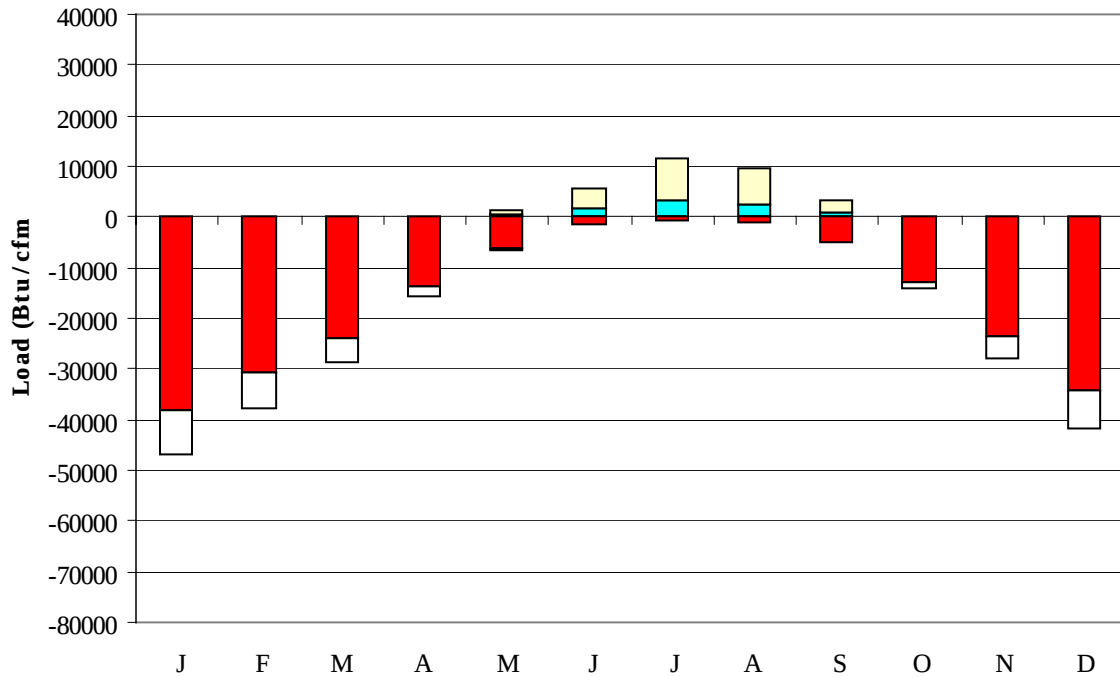
	Mean Cooling Degree Days (°F)	Mean Heating Degree Days (°F)
JAN	0	1372
FEB	0	1103
MAR	5	828
APR	29	449
MAY	93	175
JUN	241	34
JUL	361	8
AUG	295	22
SEP	127	138
OCT	24	411
NOV	1	819
DEC	0	1231
ANN	1177	6590

DES MOINES

IA

WMO No. 725460

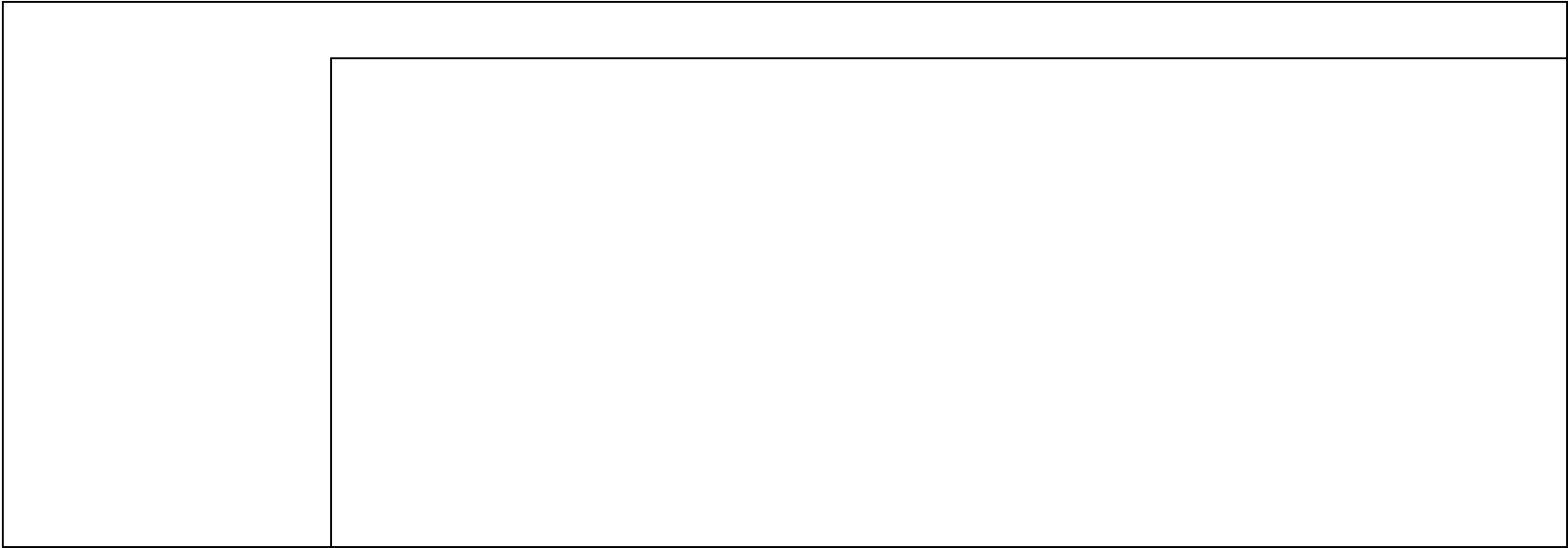
Average Ventilation and Infiltration Loads
(Outside Air vs. 75°F, 60% RH summer; 68°F, 30% RH winter)



■ 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	-37967	0	-9010
FEB	0	-30779	0	-7051
MAR	18	-23823	1	-4816
APR	138	-13686	31	-1971
MAY	464	-6132	719	-354
JUN	1840	-1570	3652	-1
JUL	3344	-512	8056	0
AUG	2439	-1069	7038	0
SEP	802	-4896	2301	-111
OCT	78	-12807	115	-1272
NOV	0	-23551	2	-4321
DEC	0	-34325	0	-7553
ANN	9123	-191117	21915	-36460

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

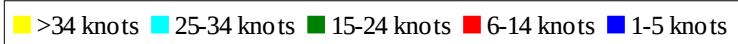
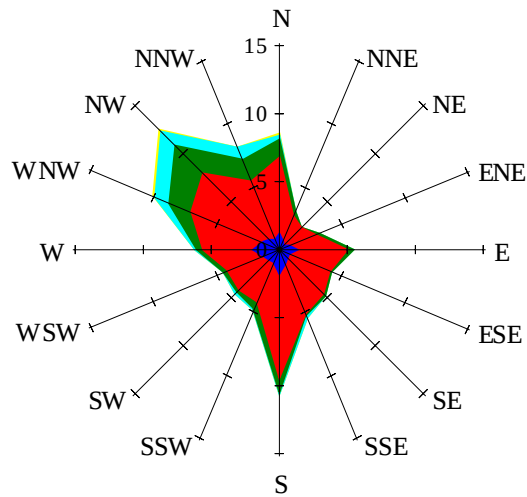


Average Annual Solar Heat and Illumination – Nearest Available Site

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

Wind Summary - December, January, and February

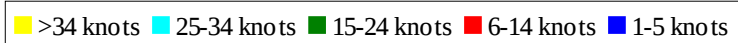
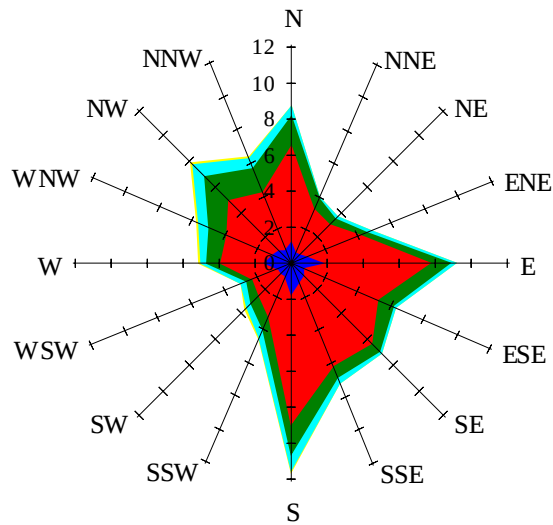
Labels of Percent Frequency on North Axis



Percent Calm = 2.69

Wind Summary - March, April, and May

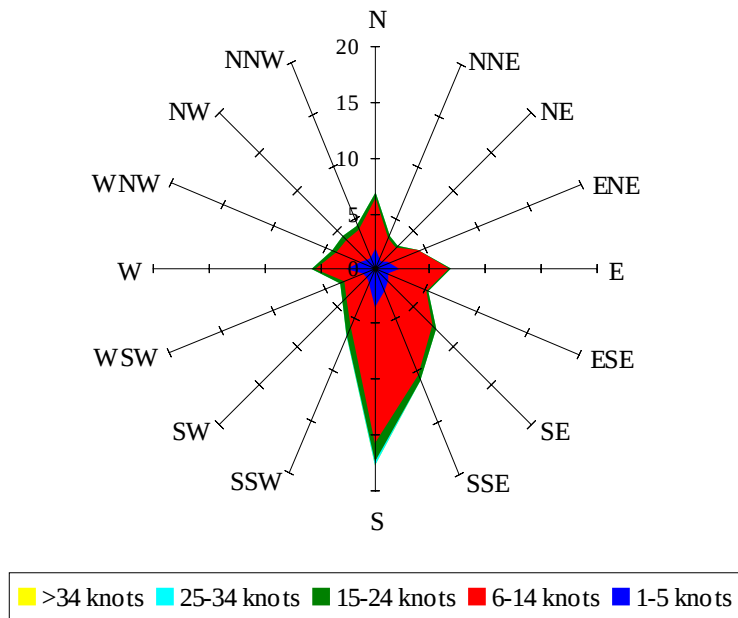
Labels of Percent Frequency on North Axis



Percent Calm = 2.73

Wind Summary - June, July, and August

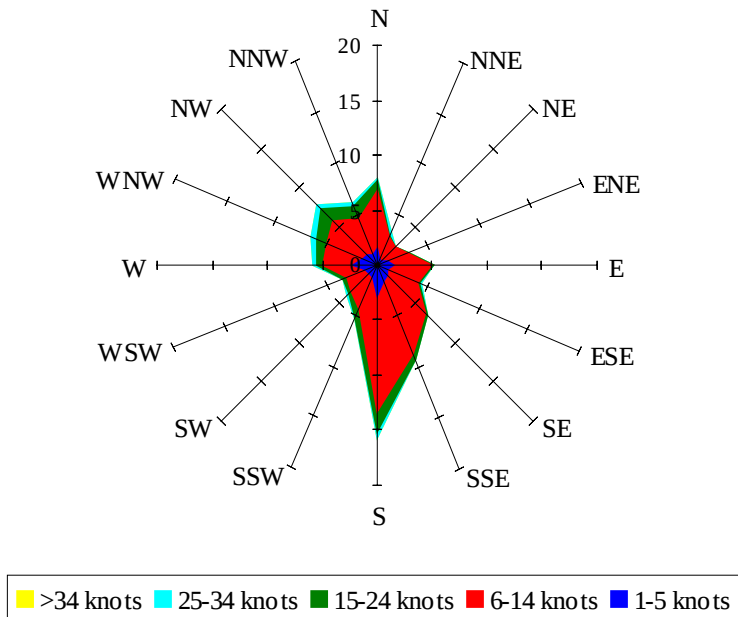
Labels of Percent Frequency on North Axis



Percent Calm = 4.04

Wind Summary - September, October, and November

Labels of Percent Frequency on North Axis



Percent Calm = 4.04