

LANSING MI

Latitude = 42.77 N

Longitude = 84.60 W

Period of Record = 1973 to 1996

WMO No. 725390

Elevation = 873 feet

Average Pressure = 29.06 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	93	75	104	13.5	W
0.4% Occurrence	90	74	104	13.2	WSW
1.0% Occurrence	87	72	100	11.6	W
2.0% Occurrence	84	71	96	10.8	W
Mean Daily Range	18	-	-	-	-
97.5% Occurrence	8	7	6	9.0	W
99.0% Occurrence	2	1	5	8.1	W
99.6% Occurrence	-4	-4	3	7.0	W
Median of Extreme Lows	-12	-12	2	4.8	W
	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	89	141	12.9	W
0.4% Occurrence	77	86	127	11.9	W
1.0% Occurrence	75	83	120	10.8	W
2.0% Occurrence	73	80	113	9.9	W
	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	141	83	0.90	11.2	W
0.4% Occurrence	131	82	0.85	10.7	SW
1.0% Occurrence	123	80	0.79	9.9	SW
2.0% Occurrence	115	77	0.74	9.8	S
Air Conditioning/ Humid Area Criteria	# of Hours	T ≥ 93°F	T ≥ 80°F	T _{wb} ≥ 73°F	T _{wb} ≥ 67°F
		11	422	220	883

Other Site Data

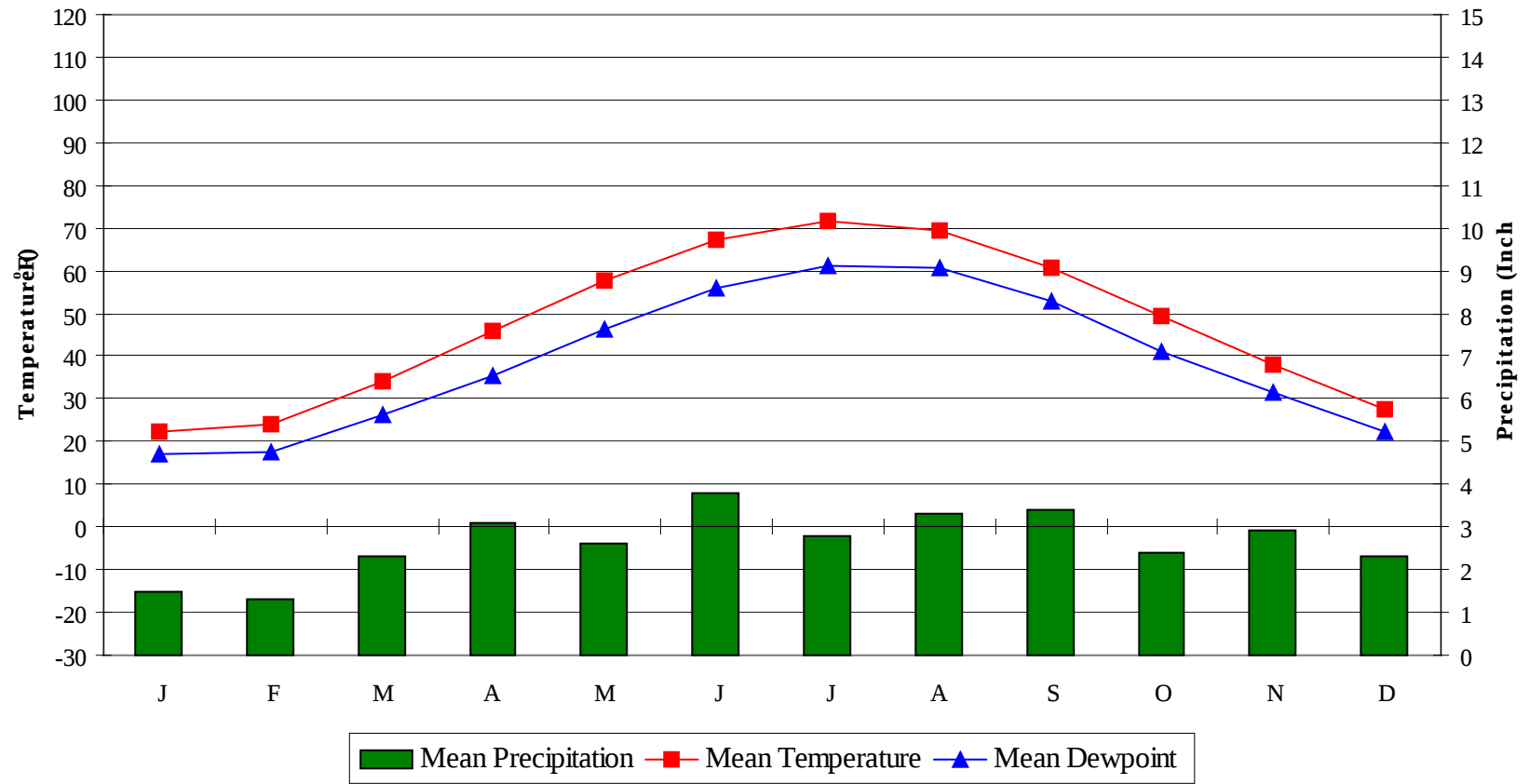
Weather Region	Rain Rate 100 Year Recurrence (in./hr)	Basic Wind Speed 3 sec gust @ 33 ft 50 Year Recurrence (mph)	Ventilation Cooling Load Index (Ton-hr/cfm/yr) Base 75°F-RH 60% Latent + Sensible
5	2.8	90	1.3 + 0.4
Ground Water Temperature (°F) 50 Foot Depth *	Frost Depth 50 Year Recurrence (in.)	Ground Snow Load 50 Year Recurrence (lb/ft ²)	Average Annual Freeze-Thaw Cycles (#)
49.8	N/A	36	66

*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

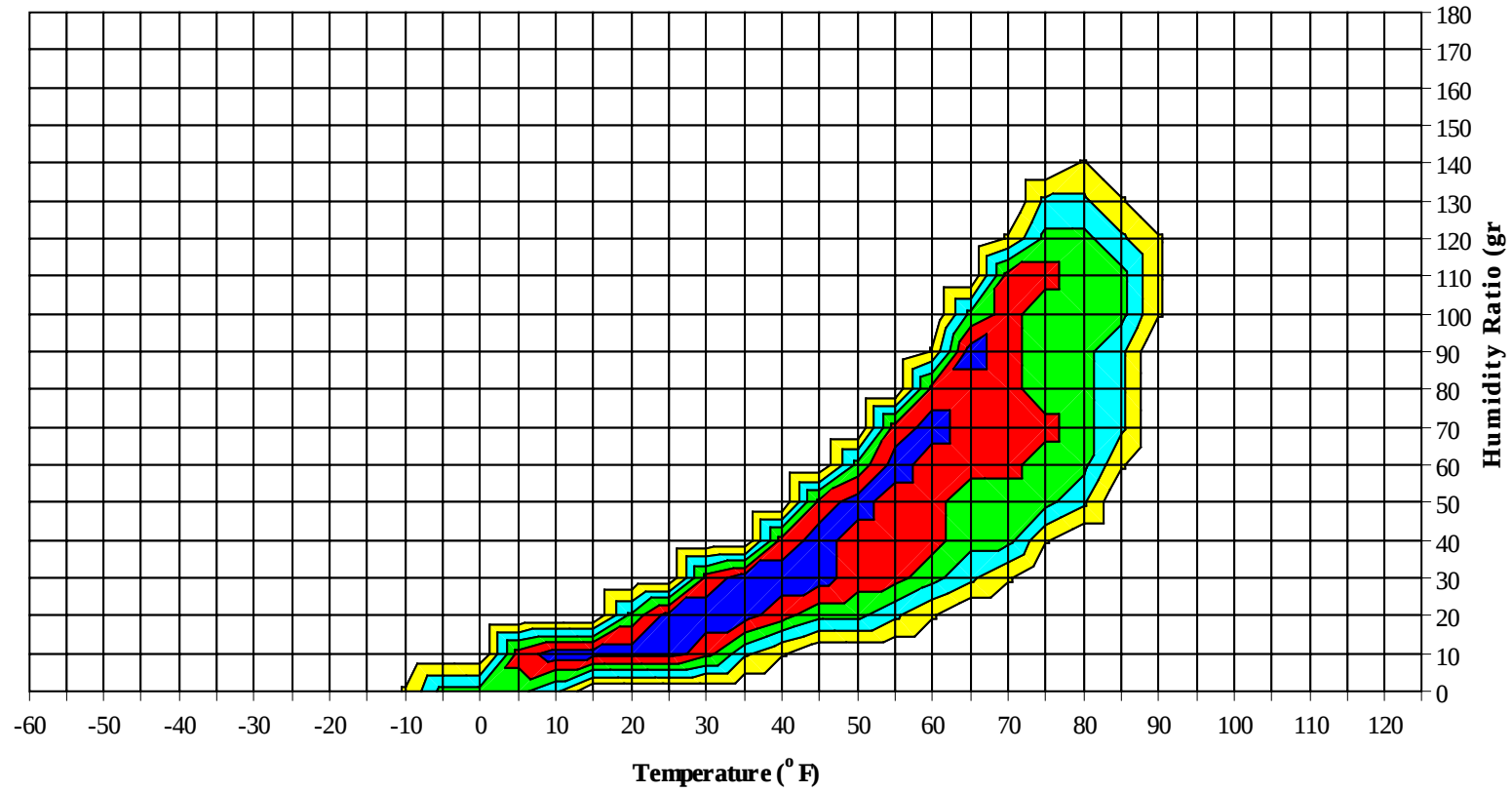


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Long Term Psychrometric Summary

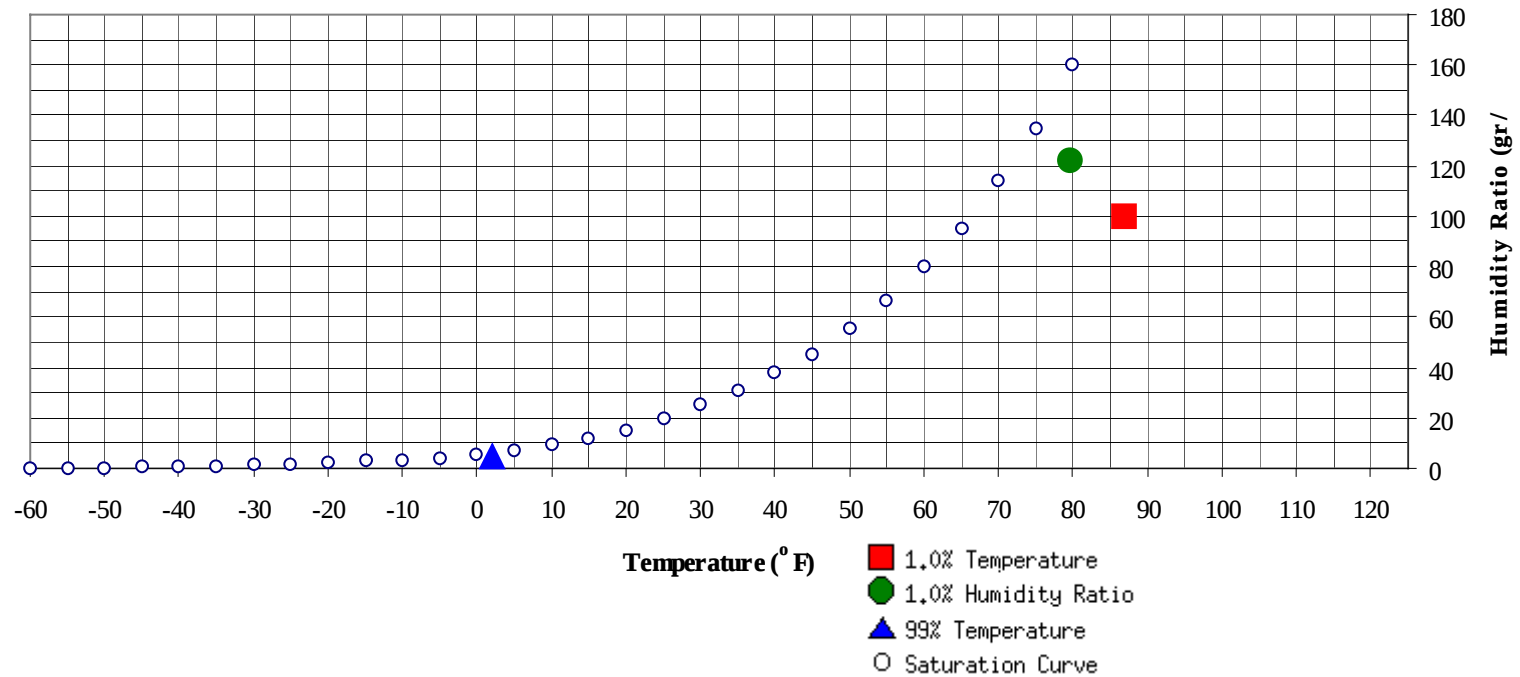


- 50% of all observations
- 80% of all observations
- 95% of all observations
- 97.5% of all observations
- 99% of all observations

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Psychrometric Summary of Peak Design Values



	(°F)	MCHR (gr/lb)	Enthalpy (btu/lb)	1.0% Humidity Ratio	(gr/lb)	MCDB (°F)	MCWB (°F)	MC Dewpt (°F)	Enthalpy (btu/lb)
99% Dry Bulb	2	4.7	1.2		122.5	79.6	74.1	72	38.3

	(°F)	MCHR (gr/lb)	MCWB (°F)	Enthalpy (btu/lb)
1.0% Dry Bulb	87	99.8	72.4	36.6

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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		
95 / 99															
90 / 94															
85 / 89															
80 / 84															
75 / 79												0	0	0	62.5
70 / 74												3	1	4	58.6
65 / 69											0	5	3	8	56.4
60 / 64			0	0	54.0		0	0	1	50.9	2	7	4	13	54.2
55 / 59		1	0	1	50.4	0	1	1	2	49.2	4	10	9	23	50.6
50 / 54	1	3	2	6	48.6	1	4	2	6	46.6	8	16	12	36	46.1
45 / 49	2	4	3	9	43.5	2	6	4	12	42.7	9	21	19	50	42.3
40 / 44	5	8	7	19	38.8	6	16	12	34	38.3	18	34	26	78	38.0
35 / 39	17	26	20	63	34.4	18	29	27	74	34.4	34	50	48	132	34.0
30 / 34	41	45	42	129	30.1	38	39	39	116	30.2	57	46	55	158	29.9
25 / 29	35	39	42	116	25.5	29	32	31	93	25.0	42	25	30	97	25.0
20 / 24	34	43	36	113	20.5	29	36	35	100	20.3	29	17	21	68	20.4
15 / 19	38	36	37	111	15.9	30	29	31	90	15.7	21	7	12	40	15.9
10 / 14	28	21	25	74	11.1	25	16	19	60	11.0	11	3	5	19	10.9
5 / 9	21	12	17	50	6.4	17	9	12	38	6.3	7	1	2	11	6.4
0 / 4	12	5	9	26	1.4	14	5	5	24	1.4	4	0	1	5	1.7
-5 / -1	6	2	4	13	-2.9	6	1	2	10	-2.8	2	0	0	2	-2.5
-10 / -6	5	2	2	9	-6.8	4	1	2	7	-7.2	1			1	-6.7
-15 / -11	2	0	1	3	-11.4	2	0	0	3	-12.0	0			0	-11.4
-20 / -16	1	0	0	1	-16.7	2		0	2	-16.8					
-25 / -21	1	0		1	-22.3	0		0	1	-20.4					
-30 / -26	0			0	-25.0	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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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		
95 / 99												1	0	1	72.2
90 / 94							1	0	1	67.3		5	2	7	71.6
85 / 89		0	0	0	64.8		7	3	10	69.5		19	9	27	70.5
80 / 84		4	1	5	65.2	0	16	7	22	67.3	1	34	17	51	68.0
75 / 79		5	3	9	63.2	1	23	13	37	64.5	7	52	37	95	65.7
70 / 74	0	10	6	17	59.8	7	32	22	61	61.3	24	52	46	121	63.8
65 / 69	4	17	13	34	56.8	17	38	33	88	58.5	45	40	46	131	61.4
60 / 64	11	21	15	47	53.9	28	43	41	111	55.1	53	22	39	113	57.8
55 / 59	13	28	23	64	49.4	35	37	39	112	51.5	45	12	25	81	54.1
50 / 54	18	35	32	85	45.7	42	27	36	105	47.7	35	4	15	54	49.5
45 / 49	27	38	39	104	42.3	44	15	29	88	43.7	21	1	5	27	45.5
40 / 44	41	35	42	118	38.5	37	7	18	62	39.8	8		1	9	41.1
35 / 39	45	25	33	103	34.2	26	1	7	34	35.4	2		0	2	36.6
30 / 34	42	16	22	79	29.9	10		1	11	30.9	0			0	33.5
25 / 29	24	4	8	36	25.4	2		0	2	26.2					
20 / 24	11	1	3	15	20.9	0			0	22.0					
15 / 19	2	0	1	3	16.5										
10 / 14	0		0	0	12.2										
5 / 9	0			0	7.3										
0 / 4	0			0	1.5										
-5 / -1															
-10 / -6															
-15 / -11															
-20 / -16															
-25 / -21															
-30 / -26															

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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		
95 / 99		2	1	2	73.3		1	0	2	76.6		0		0	72.7
90 / 94		11	5	16	74.8		6	2	8	75.9		2	0	2	73.3
85 / 89	0	30	15	45	73.3		19	8	26	73.2		5	2	6	72.3
80 / 84	2	59	35	96	69.8	1	48	25	74	70.6		17	5	23	69.4
75 / 79	17	65	51	133	67.8	10	64	43	117	68.3	2	33	16	52	67.2
70 / 74	43	48	53	144	66.2	36	57	55	148	66.4	10	40	29	79	64.8
65 / 69	64	22	44	130	63.4	60	36	49	145	63.3	29	44	37	110	61.6
60 / 64	55	9	30	93	59.4	54	13	36	103	59.6	35	42	41	118	57.5
55 / 59	39	1	13	54	55.4	42	3	21	66	55.4	41	33	42	116	53.7
50 / 54	20	0	3	23	51.0	27	0	8	35	51.1	45	17	32	94	49.7
45 / 49	8		0	8	46.3	12		2	14	46.7	35	6	22	64	45.2
40 / 44	1			1	42.3	4		0	4	42.2	23	1	10	33	41.2
35 / 39						1			1	36.5	14	0	3	17	36.6
30 / 34											4		1	5	32.0
25 / 29											1			1	27.4
20 / 24											0			0	24.0
15 / 19															
10 / 14															
5 / 9															
0 / 4															
-5 / -1															
-10 / -6															
-15 / -11															
-20 / -16															
-25 / -21															
-30 / -26															

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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		
95 / 99															
90 / 94															
85 / 89															
80 / 84		1	0	1	64.6										
75 / 79		6	1	7	64.3		0		0	63.0					
70 / 74	1	13	6	20	61.2		1	0	2	59.9					
65 / 69	4	23	12	39	58.4	0	4	2	6	58.5	0	0	0	0	62.7
60 / 64	14	32	24	70	55.5	4	9	7	21	56.7	1	1	1	2	59.0
55 / 59	23	39	30	92	51.7	10	15	12	37	53.2	1	2	2	6	53.8
50 / 54	34	48	41	122	47.8	14	20	15	49	48.3	2	3	4	9	49.2
45 / 49	41	43	47	131	43.7	17	27	23	67	43.3	5	7	5	17	44.2
40 / 44	45	27	41	113	39.7	26	41	31	98	38.9	7	16	8	31	39.0
35 / 39	43	13	31	87	35.3	41	48	52	141	34.5	27	41	32	100	34.5
30 / 34	30	2	13	45	31.2	58	46	53	158	30.0	57	62	67	186	30.4
25 / 29	11	0	2	14	26.6	39	19	30	89	25.5	47	43	43	134	25.4
20 / 24	3		1	3	21.9	21	5	12	37	21.2	36	31	35	102	20.8
15 / 19	1			1	17.9	6	2	3	11	16.5	24	21	21	67	16.0
10 / 14						4	0	1	5	11.8	16	11	14	41	11.2
5 / 9						0	0	0	1	8.1	11	6	9	25	6.6
0 / 4											8	2	4	15	1.6
-5 / -1											3	1	1	5	-2.7
-10 / -6											2	0	1	3	-6.8
-15 / -11											1		0	1	-11.3
-20 / -16													0	0	-15.5
-25 / -21															
-30 / -26															

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Dry-Bulb Temperature Hours For An Average Year (Sheet 5 of 5)

Period of Record = 1973 to 1996

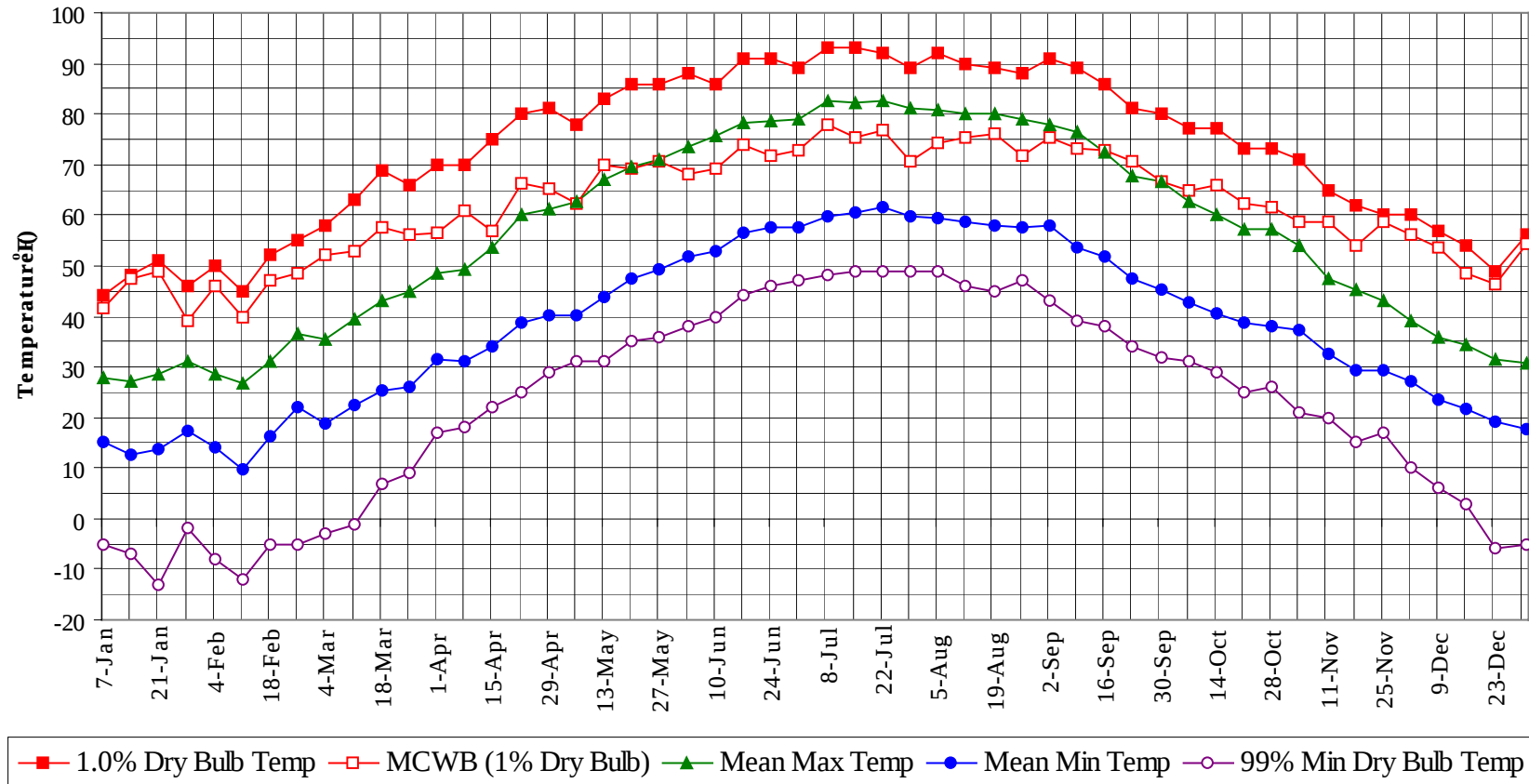
Annual Totals					
Temperature Range (°F)	Hour Group (LST)			Total Obs	M C W B (°F)
	01 To 08	09 To 16	17 To 00		
95 / 99		4	1	5	74.2
90 / 94		24	9	33	74.1
85 / 89	0	79	35	114	72.2
80 / 84	4	178	90	272	69.3
75 / 79	37	247	163	448	67.0
70 / 74	119	254	218	590	64.7
65 / 69	222	227	237	685	61.4
60 / 64	256	196	236	688	57.2
55 / 59	252	183	217	651	52.8
50 / 54	245	177	201	623	48.2
45 / 49	223	169	197	589	43.6
40 / 44	220	184	198	602	39.1
35 / 39	269	235	254	758	34.6
30 / 34	340	256	295	890	30.2
25 / 29	232	164	188	584	25.4
20 / 24	164	134	143	442	20.6
15 / 19	123	97	106	325	15.9
10 / 14	84	53	64	202	11.1
5 / 9	57	28	40	125	6.4
0 / 4	39	13	19	71	1.5
-5 / -1	17	4	8	30	-2.8
-10 / -6	13	2	5	20	-7.0
-15 / -11	5	1	2	7	-11.6
-20 / -16	2	0	1	3	-16.7
-25 / -21	1	0	0	1	-21.5
-30 / -26	0			0	-25.0

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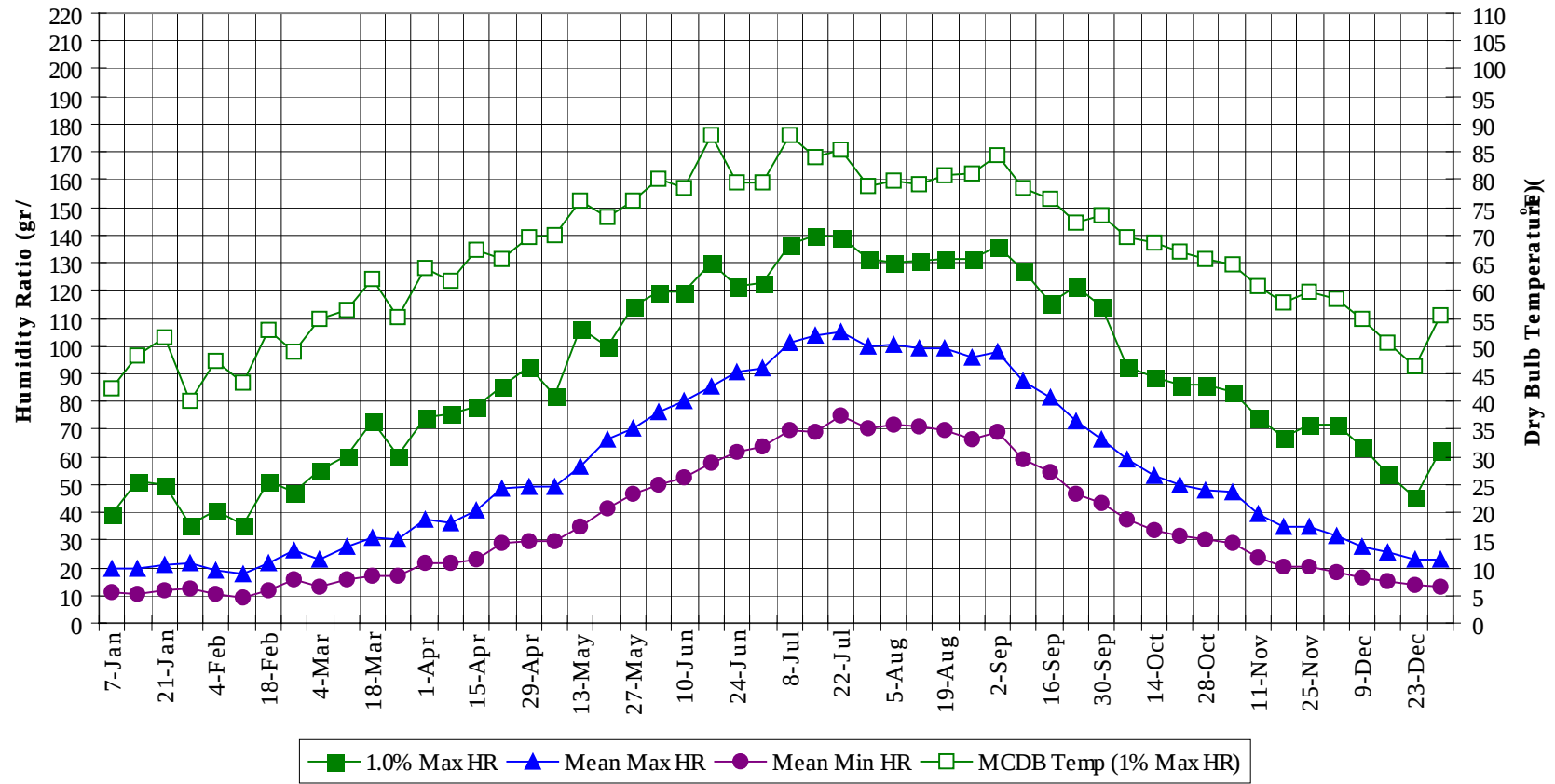
LANSING MI

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Annual Summary of Temperatures



Long Term Humidity and Dry Bulb Temperature Summary



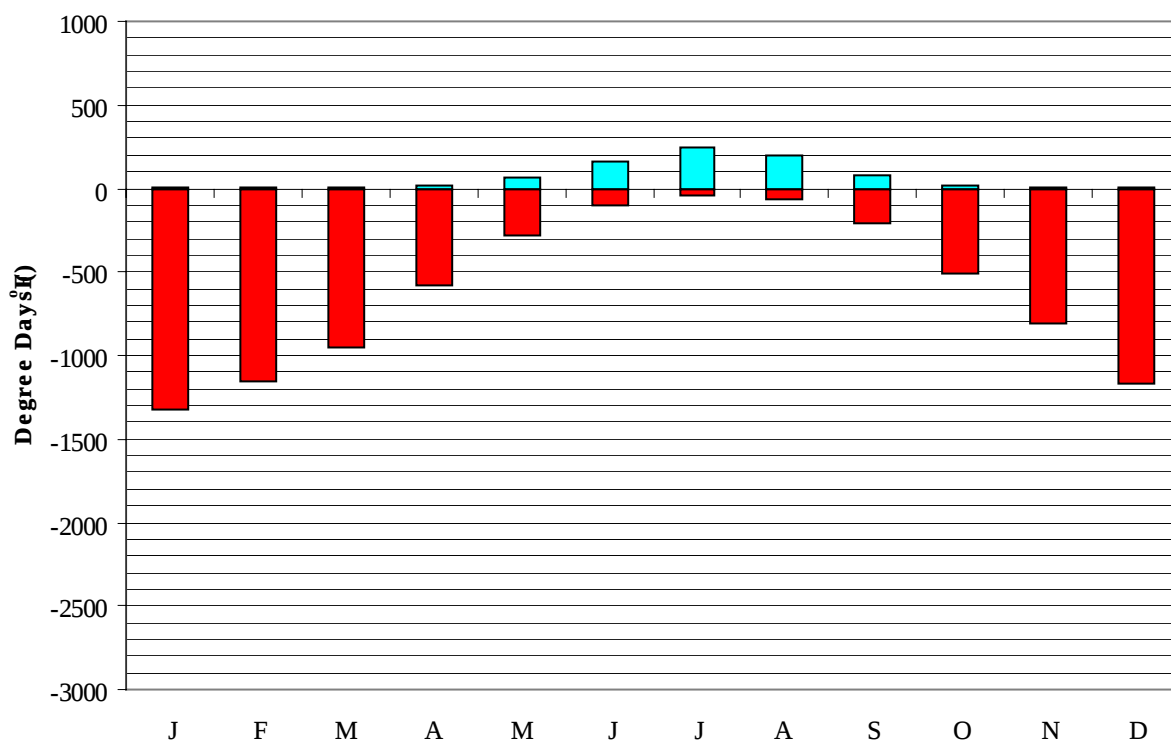
LANSING**MI****WMO No. 725390****Long Term Dry Bulb Temperature and Humidity Summary**

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	44.0	41.5	27.9	15.2	-5.0	39.2	42.3	19.7	11.2
14-Jan	48.0	47.6	27.1	12.7	-7.0	51.1	48.1	19.5	10.3
21-Jan	51.0	49.0	28.6	13.8	-13.0	49.7	51.5	20.8	11.7
28-Jan	46.0	39.1	31.0	17.3	-2.0	35.7	40.0	21.6	12.2
4-Feb	50.0	46.1	28.6	14.0	-8.0	40.6	47.4	19.4	10.8
11-Feb	45.0	40.0	26.9	9.8	-12.0	35.7	43.5	17.5	9.0
18-Feb	52.0	47.2	31.2	16.3	-5.0	51.1	52.7	21.4	12.1
25-Feb	55.0	48.5	36.7	22.2	-5.0	47.6	48.8	26.6	16.1
4-Mar	58.0	52.0	35.5	18.8	-3.0	55.3	55.0	23.2	13.1
11-Mar	63.0	53.0	39.5	22.4	-1.0	60.2	56.5	27.9	15.8
18-Mar	69.0	57.4	43.0	25.4	7.0	72.8	62.1	30.9	17.3
25-Mar	66.0	56.3	44.8	26.2	9.0	60.2	55.2	30.3	17.2
1-Apr	70.0	56.6	48.5	31.3	17.0	74.2	63.9	37.4	21.4
8-Apr	70.0	60.8	49.4	31.3	18.0	75.6	61.8	36.4	21.4
15-Apr	75.0	57.0	53.6	34.0	22.0	78.4	67.2	40.6	23.0
22-Apr	80.0	66.2	59.9	38.6	25.0	85.4	65.6	48.6	28.6
29-Apr	81.0	65.2	61.3	40.2	29.0	92.4	69.7	49.4	29.9
6-May	78.0	62.3	62.5	40.1	31.0	81.9	69.9	49.2	29.5
13-May	83.0	70.0	66.9	43.7	31.0	106.4	76.2	56.7	35.1
20-May	86.0	69.4	69.4	47.3	35.0	100.1	73.2	66.4	41.6
27-May	86.0	70.7	71.2	49.3	36.0	114.1	76.1	70.3	46.9
3-Jun	88.0	67.9	73.7	51.8	38.0	119.7	80.2	76.3	50.0
10-Jun	86.0	69.3	75.9	53.0	40.0	119.7	78.5	79.9	52.8
17-Jun	91.0	73.9	78.2	56.3	44.0	130.2	88.0	85.2	57.7
24-Jun	91.0	71.7	78.6	57.5	46.0	121.8	79.5	90.8	61.8
1-Jul	89.0	72.9	79.1	57.7	47.0	122.5	79.6	91.8	63.6
8-Jul	93.0	77.8	82.7	59.7	48.0	136.5	87.9	101.2	69.3
15-Jul	93.0	75.4	82.2	60.5	49.0	140.0	83.9	103.6	68.6
22-Jul	92.0	76.9	82.7	61.5	49.0	139.3	85.5	104.8	75.1
29-Jul	89.0	70.7	81.2	59.9	49.0	131.6	78.9	100.1	70.0
5-Aug	92.0	74.1	80.7	59.5	49.0	130.2	79.7	100.6	71.5
12-Aug	90.0	75.5	80.1	58.9	46.0	130.9	79.2	99.2	70.6
19-Aug	89.0	75.9	79.9	58.0	45.0	131.6	80.9	99.2	69.3
26-Aug	88.0	71.8	79.2	57.5	47.0	131.6	81.1	95.8	66.6
2-Sep	91.0	75.3	78.0	58.0	43.0	135.8	84.5	97.6	68.7
9-Sep	89.0	73.3	76.6	53.6	39.0	127.4	78.5	87.6	58.8
16-Sep	86.0	72.7	72.3	51.8	38.0	115.5	76.6	81.3	54.2
23-Sep	81.0	70.5	67.6	47.6	34.0	121.8	72.3	73.1	46.9
30-Sep	80.0	66.7	66.8	45.4	32.0	114.1	73.7	66.4	43.4
7-Oct	77.0	64.8	62.8	42.6	31.0	92.4	69.7	58.9	37.4
14-Oct	77.0	66.0	60.2	40.5	29.0	88.9	68.5	53.2	33.6
21-Oct	73.0	62.1	57.1	38.7	25.0	86.1	67.1	50.1	31.2
28-Oct	73.0	61.6	57.1	37.8	26.0	86.1	65.7	48.3	30.2
4-Nov	71.0	58.8	53.9	37.2	21.0	83.3	64.6	47.1	29.1
11-Nov	65.0	58.8	47.5	32.5	20.0	74.2	60.7	39.2	23.8
18-Nov	62.0	53.9	45.1	29.3	15.0	67.2	57.9	35.1	20.5
25-Nov	60.0	58.6	43.2	29.4	17.0	71.4	59.7	34.7	20.5
2-Dec	60.0	56.0	39.2	27.1	10.0	71.4	58.5	31.6	18.6
9-Dec	57.0	53.5	35.7	23.4	6.0	63.7	54.9	27.4	16.3
16-Dec	54.0	48.6	34.3	21.8	3.0	53.9	50.6	25.5	15.1
23-Dec	49.0	46.2	31.5	19.2	-6.0	45.5	46.3	23.2	13.8
31-Dec	56.0	54.5	30.6	17.7	-5.0	62.3	55.5	22.9	13.1

LANSING MI

WMO No. 725390

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



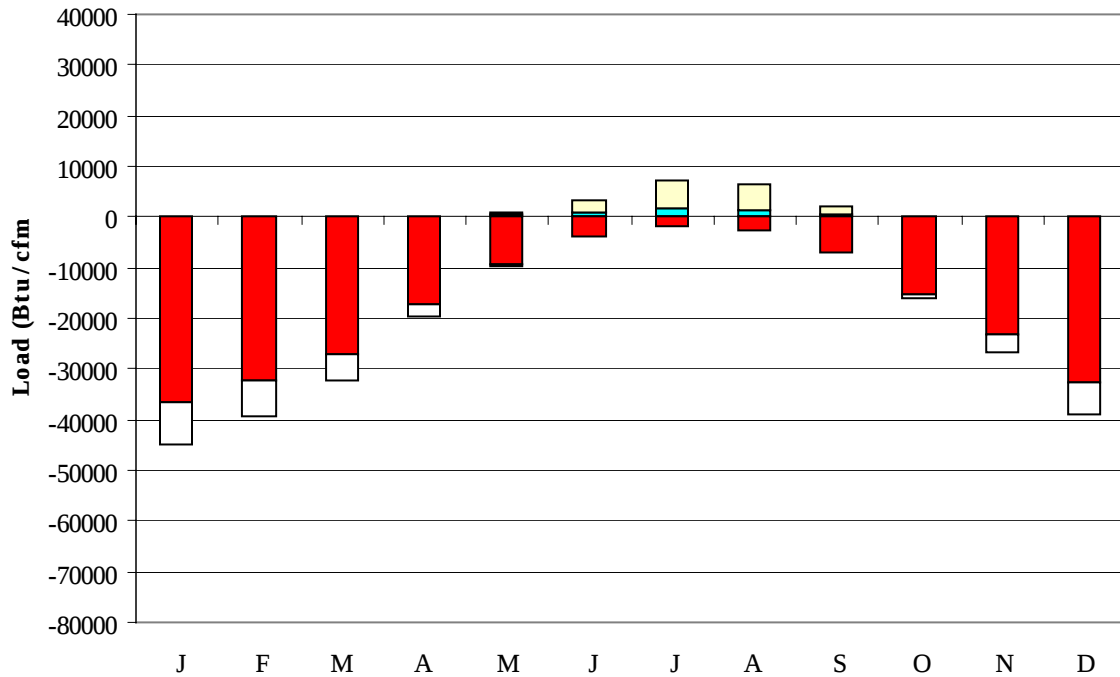
■ Mean Cooling Degree Days ■ Mean Heating Degree Days

	Mean Cooling Degree Days (°F)	Mean Heating Degree Days (°F)
JAN	0	1322
FEB	0	1161
MAR	2	955
APR	15	584
MAY	67	287
JUN	158	98
JUL	245	46
AUG	197	66
SEP	79	210
OCT	12	504
NOV	1	808
DEC	0	1166
ANN	776	7207

LANSING MI

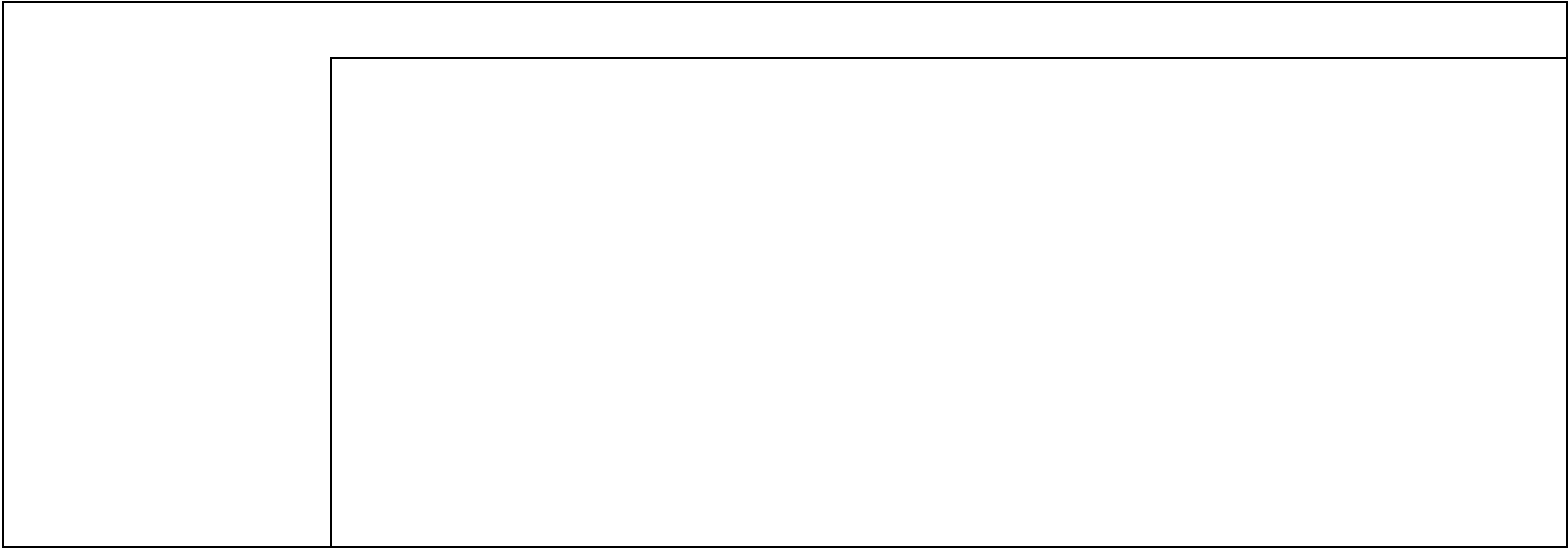
WMO No. 725390

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



	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	-36665	0	-8064
FEB	0	-32295	0	-7067
MAR	0	-27147	1	-5125
APR	53	-17318	39	-2401
MAY	365	-9276	651	-448
JUN	998	-3645	2335	-17
JUL	1839	-1930	5517	-3
AUG	1242	-2607	5179	-1
SEP	365	-7036	1797	-84
OCT	21	-15315	80	-915
NOV	0	-23266	5	-3370
DEC	0	-32632	1	-6427
ANN	4883	-209132	15605	-33922

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

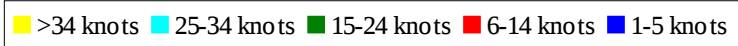
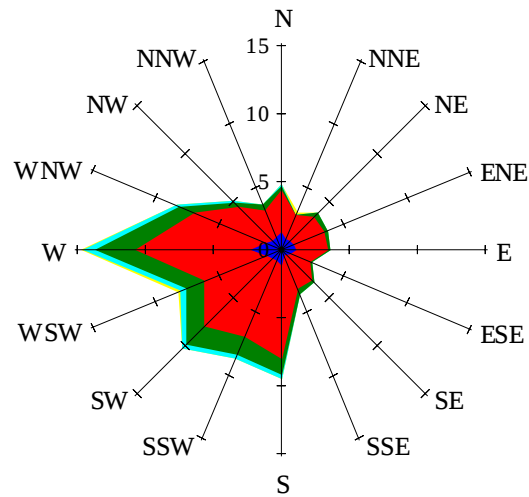


Average Annual Solar Heat and Illumination – Nearest Available Site

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

Wind Summary - December, January, and February

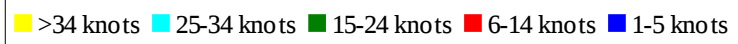
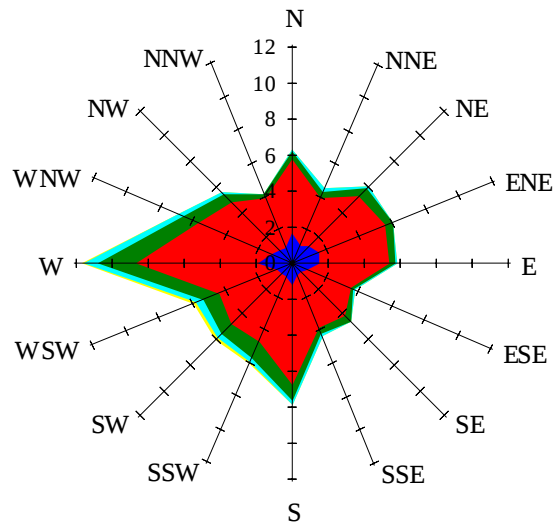
Labels of Percent Frequency on North Axis



Percent Calm = 5.18

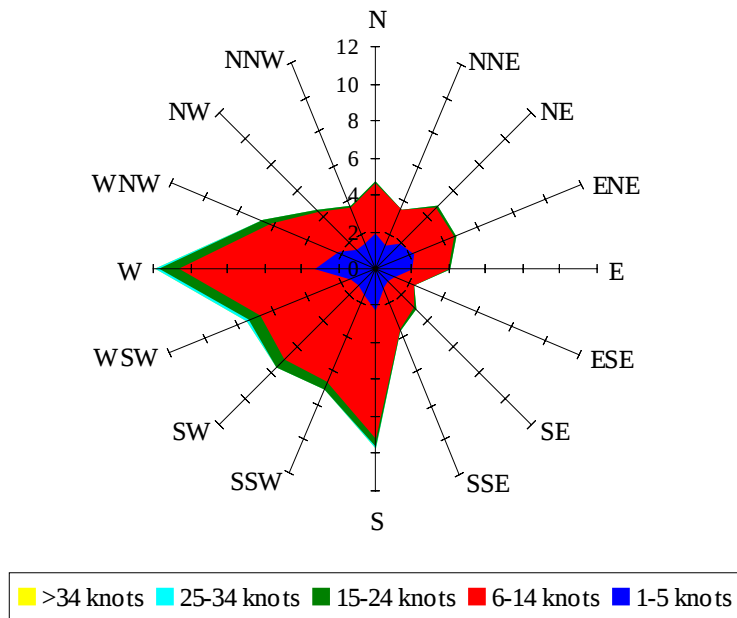
Wind Summary - March, April, and May

Labels of Percent Frequency on North Axis



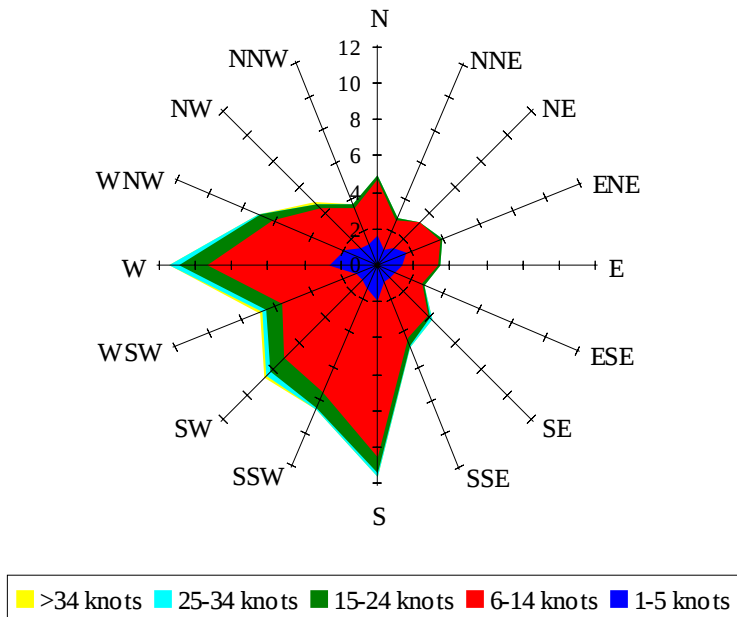
Percent Calm = 6.11

Wind Summary - June, July, and August **Labels of Percent Frequency on North Axis**



Percent Calm = 11.54

Wind Summary - September, October, and November **Labels of Percent Frequency on North Axis**



Percent Calm = 8.61