

DULUTH MN

Latitude = 46.83 N

Longitude = 92.18 W

Period of Record = 1973 to 1996

WMO No. 727450

Elevation = 1417 feet

Average Pressure = 28.43 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	90	73	100	13.3	SW
0.4% Occurrence	85	70	91	11.6	S
1.0% Occurrence	81	67	82	11.7	SW
2.0% Occurrence	78	65	78	11.2	S
Mean Daily Range	17	-	-	-	-
97.5% Occurrence	-9	-10	2	10.2	NW
99.0% Occurrence	-16	-16	2	9.7	NW
99.6% Occurrence	-21	-21	1	9.6	NW
Median of Extreme Lows	-29	-29	1	10.2	NW
	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	77	87	128	12.5	SW
0.4% Occurrence	72	81	109	11.3	S
1.0% Occurrence	70	78	101	10.5	S
2.0% Occurrence	68	76	95	10.1	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	130	80	0.82	11.1	WSW
0.4% Occurrence	113	78	0.72	10.3	SW
1.0% Occurrence	104	76	0.67	9.9	SW
2.0% Occurrence	97	73	0.62	9.2	S
Air Conditioning/ Humid Area Criteria	# of Hours	T ≥ 93°F	T ≥ 80°F	T _{wb} ≥ 73°F	T _{wb} ≥ 67°F
		1	122	30	235

Other Site Data

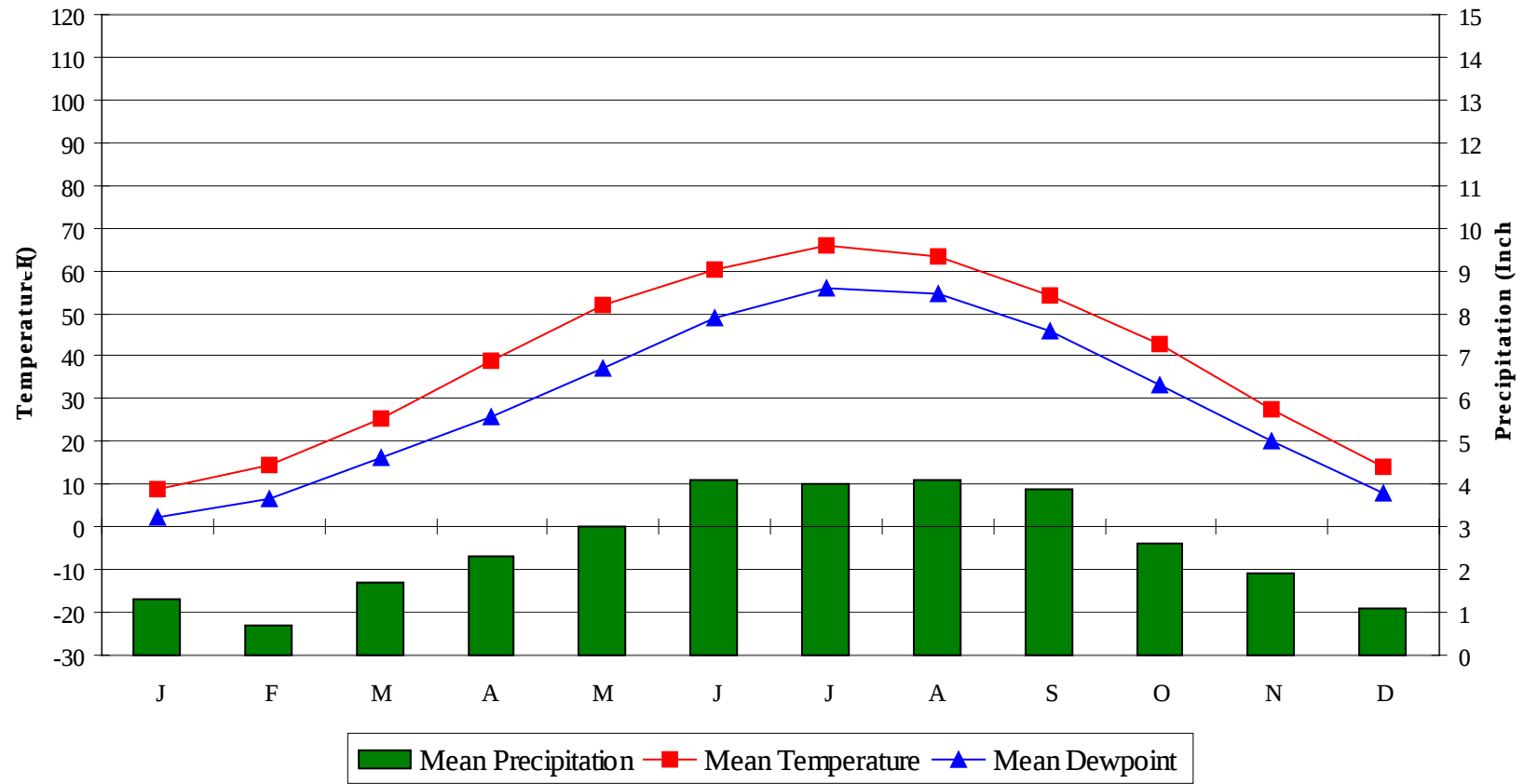
Weather Region	Rain Rate 100 Year Recurrence (in./hr)	Basic Wind Speed 3 sec gust @ 33 ft 50 Year Recurrence (mph)	Ventilation Cooling Load Index (Ton-hr/cfm/yr) Base 75°F-RH 60% Latent + Sensible
4	2.8	90	0.3 + 0.1
Ground Water Temperature (°F) 50 Foot Depth *	Frost Depth 50 Year Recurrence (in.)	Ground Snow Load 50 Year Recurrence (lb/ft ²)	Average Annual Freeze-Thaw Cycles (#)
41.5	140	63	57

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

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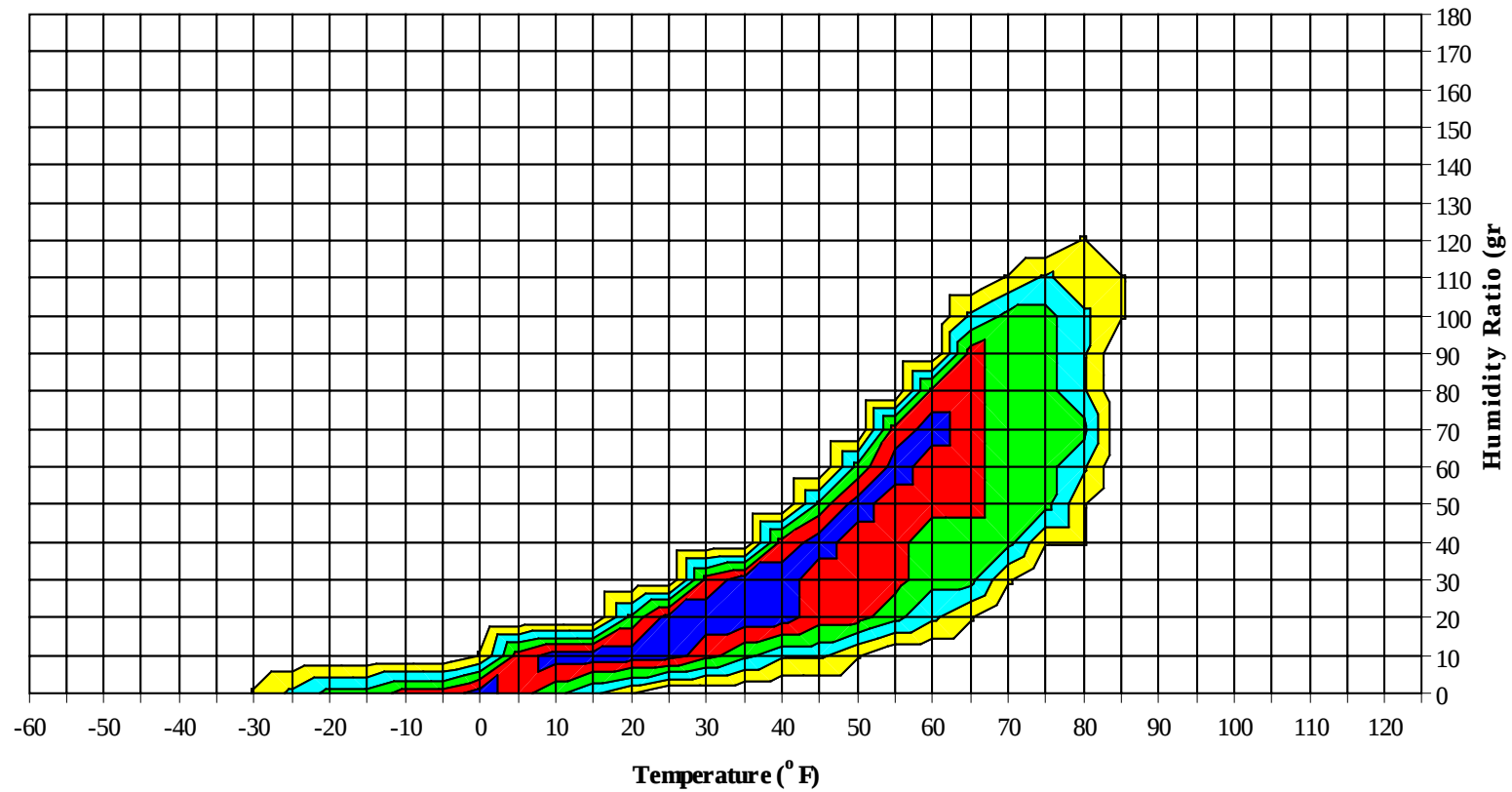
Average Annual Climate



DULUTH MN

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Long Term Psychrometric Summary

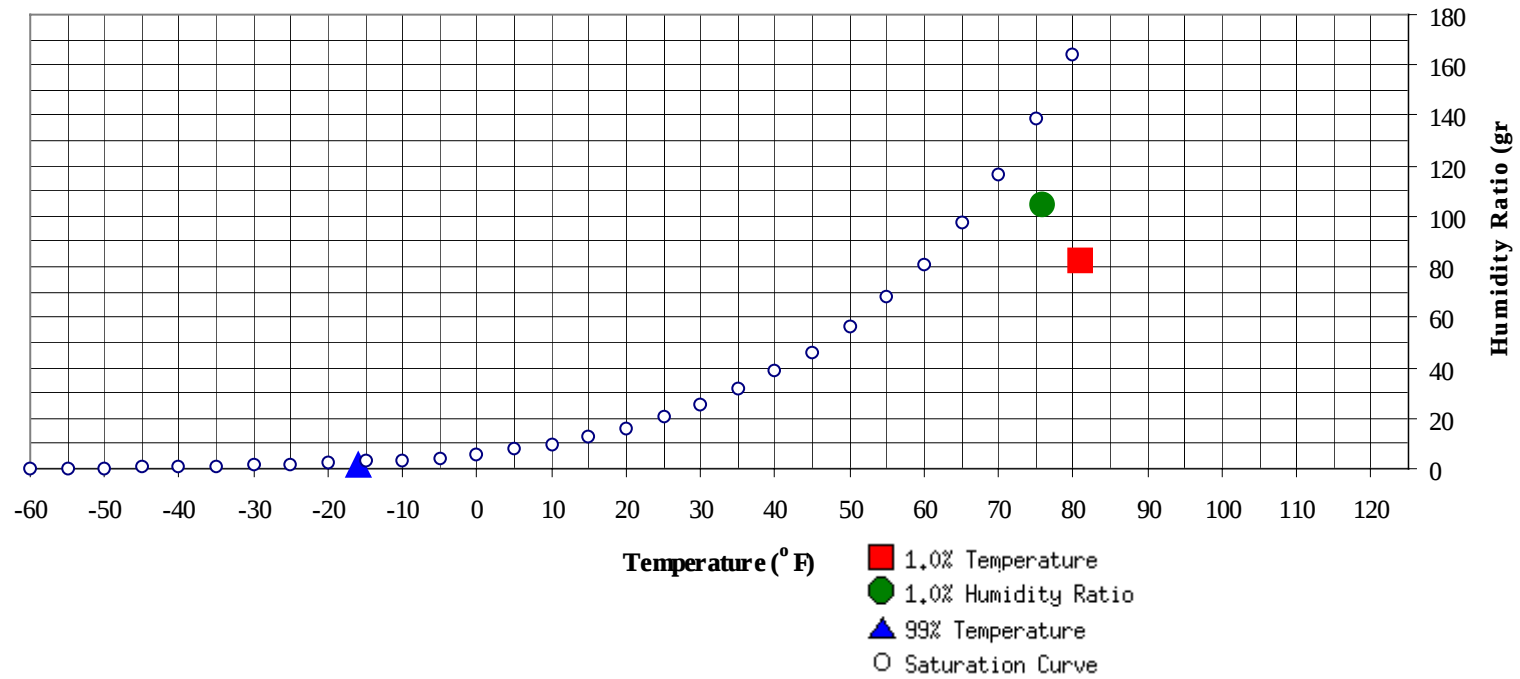


- 50% of all observations
- 80% of all observations
- 95% of all observations
- 97.5% of all observations
- 99% of all observations

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Psychrometric Summary of Peak Design Values



	(°F)	MCHR	Enthalpy	1.0% Humidity	(gr/lb)	MCDB	MCWB	MC Dewpt	Enthalpy
		(gr/lb)	(btu/lb)			(°F)	(°F)	(°F)	(btu/lb)
99% Dry Bulb	-16	1.5	-3.6	Ratio	104.3	75.9	69.7	66.9	34.5

1.0% Dry Bulb	(°F)	MCHR	MCWB	Enthalpy
		(gr/lb)	(°F)	(btu/lb)
81	82.7	67	32.4	

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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															
70 / 74												0		0	50.0
65 / 69												0	0	0	51.3
60 / 64												0	0	1	48.0
55 / 59												2	0	2	46.0
50 / 54							1	0	1	41.5	0	4	2	6	42.8
45 / 49		0	0	0	37.7	0	2	1	3	38.4	1	10	6	16	39.5
40 / 44	0	2	1	3	35.7	0	5	3	8	35.5	4	17	11	31	36.1
35 / 39	1	5	4	9	32.8	3	10	9	23	32.6	22	41	31	94	33.1
30 / 34	9	15	13	37	29.8	20	27	24	71	29.7	46	55	58	159	29.5
25 / 29	22	23	23	68	25.6	25	31	30	86	25.0	44	39	50	134	24.8
20 / 24	27	33	30	90	20.7	27	34	32	93	20.3	40	34	35	109	20.0
15 / 19	26	32	34	92	15.9	25	27	29	81	15.5	24	20	20	65	15.1
10 / 14	28	33	29	90	10.8	23	27	28	77	10.5	21	13	16	49	10.2
5 / 9	25	29	28	82	5.9	22	23	21	65	5.7	17	7	10	34	5.7
0 / 4	22	24	22	67	0.9	20	15	17	53	0.8	13	3	6	21	1.0
-5 / -1	18	15	18	51	-3.3	13	8	11	31	-3.4	6	1	2	9	-3.4
-10 / -6	22	17	22	61	-7.8	16	8	10	35	-7.7	6	1	1	8	-7.5
-15 / -11	17	9	14	39	-12.4	13	3	6	22	-12.2	3	0	0	4	-12.2
-20 / -16	16	7	7	30	-17.0	9	2	3	14	-17.0	1		0	1	-16.5
-25 / -21	10	4	3	17	-21.6	5	1	1	6	-21.7	0			0	-20.6
-30 / -26	4	1	1	7	-26.7	2	0	0	2	-26.6	0			0	-26.0
-35 / -31	2	0	0	2	-30.8	0	0	0	1	-30.6					
-40 / -36	0			0	-36.0	0	0		0						

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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															
90 / 94												1	0	1	72.0
85 / 89							1	0	1	63.6		4	1	5	69.2
80 / 84		0	0	1	60.3		6	2	7	61.8	0	12	4	17	66.6
75 / 79		2	0	2	57.8	0	13	6	19	59.2	1	30	12	44	63.6
70 / 74		4	1	5	55.0	1	17	8	25	57.7	4	38	21	63	60.7
65 / 69	0	8	3	11	51.4	4	29	14	47	54.3	16	45	33	93	58.3
60 / 64	1	12	7	20	49.2	14	45	29	88	51.6	40	52	48	140	55.9
55 / 59	3	15	9	27	46.0	25	37	36	98	49.1	49	31	48	128	52.6
50 / 54	7	29	17	53	42.8	39	41	46	126	45.7	62	20	45	127	48.8
45 / 49	16	38	27	80	39.8	53	32	48	133	42.2	42	5	21	68	44.6
40 / 44	24	39	38	101	36.4	49	16	32	97	38.2	17	2	5	24	40.4
35 / 39	51	43	52	147	32.8	36	9	20	65	33.9	6	0	2	8	36.1
30 / 34	68	30	53	151	29.3	23	2	7	32	30.0	1		0	1	31.9
25 / 29	35	13	21	69	24.5	5	0	1	6	26.1					
20 / 24	20	5	8	34	20.2	1	0	0	1	20.9					
15 / 19	7	1	2	11	15.4			0	0	18.0					
10 / 14	3	1	1	5	10.5										
5 / 9	2	0	0	2	6.1										
0 / 4	1	0	0	1	1.0										
-5 / -1	0			0	-3.3										
-10 / -6															
-15 / -11															
-20 / -16															
-25 / -21															
-30 / -26															
-35 / -31															
-40 / -36															

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DULUTH MN

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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		0		0	75.8										
90 / 94		3	1	4	73.0		1	0	2	73.4		0	0	1	69.8
85 / 89		9	4	14	71.8		6	2	8	71.5		1	0	1	70.2
80 / 84	0	26	11	37	68.1		16	5	21	68.6		3	1	3	67.1
75 / 79	4	61	29	94	65.3	2	43	18	63	65.9	0	11	4	15	65.0
70 / 74	15	51	37	103	63.1	9	51	30	91	63.4	2	19	7	27	62.5
65 / 69	40	50	51	140	60.8	32	55	49	136	61.3	8	32	17	57	59.4
60 / 64	68	32	58	158	58.1	68	50	64	181	58.1	21	46	34	101	56.1
55 / 59	65	12	38	116	54.6	59	19	45	123	54.1	32	46	41	119	52.4
50 / 54	40	2	16	58	50.5	49	6	26	81	50.2	58	48	57	163	48.7
45 / 49	13	1	4	17	46.1	18	0	8	26	45.5	50	22	42	114	44.4
40 / 44	3		0	3	41.9	8		2	10	41.3	35	9	23	67	40.0
35 / 39	0			0	38.1	2		0	2	36.3	22	2	11	35	35.5
30 / 34						0			0	32.4	11	0	4	15	31.0
25 / 29											2		0	2	26.4
20 / 24											0			0	23.3
15 / 19															
10 / 14															
5 / 9															
0 / 4															
-5 / -1															
-10 / -6															
-15 / -11															
-20 / -16															
-25 / -21															
-30 / -26															
-35 / -31															
-40 / -36															

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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		0		0	60.9										
75 / 79		1	0	2	59.5										
70 / 74		3	1	3	57.2										
65 / 69	0	8	1	10	54.5		1	0	1	56.0					
60 / 64	3	17	7	27	52.0		2	0	2	51.3					
55 / 59	7	23	14	45	49.3	0	3	1	4	49.2					
50 / 54	16	42	27	85	46.1	2	7	3	12	46.5		0	0	0	48.6
45 / 49	36	47	51	134	42.4	6	11	7	24	41.7		0	0	0	42.6
40 / 44	51	44	49	144	38.5	10	19	15	45	37.8	1	2	0	3	36.9
35 / 39	56	41	50	147	34.1	25	31	30	87	33.9	2	7	5	14	33.0
30 / 34	45	16	33	95	29.7	49	52	53	154	29.7	17	27	24	68	30.1
25 / 29	19	4	10	33	25.2	45	43	44	133	25.0	34	35	34	104	25.6
20 / 24	10	1	3	14	20.9	36	32	36	105	20.3	35	42	42	119	20.9
15 / 19	3	0	1	4	16.4	24	17	19	60	15.5	32	33	33	97	16.0
10 / 14	1		0	1	12.2	18	12	16	45	10.8	28	29	25	82	10.8
5 / 9	0			0	7.5	11	5	7	23	6.1	24	22	24	70	6.0
0 / 4						7	3	4	14	1.1	20	18	21	58	1.0
-5 / -1						4	1	2	7	-2.9	15	12	15	41	-3.2
-10 / -6						2	0	1	3	-7.1	16	11	13	39	-7.5
-15 / -11						1	0	0	2	-11.8	11	6	7	24	-12.2
-20 / -16						0			0	-16.0	8	4	3	15	-16.7
-25 / -21											4	1	2	7	-21.6
-30 / -26											1	0	0	2	-26.1
-35 / -31											0		0	0	-31.3
-40 / -36															

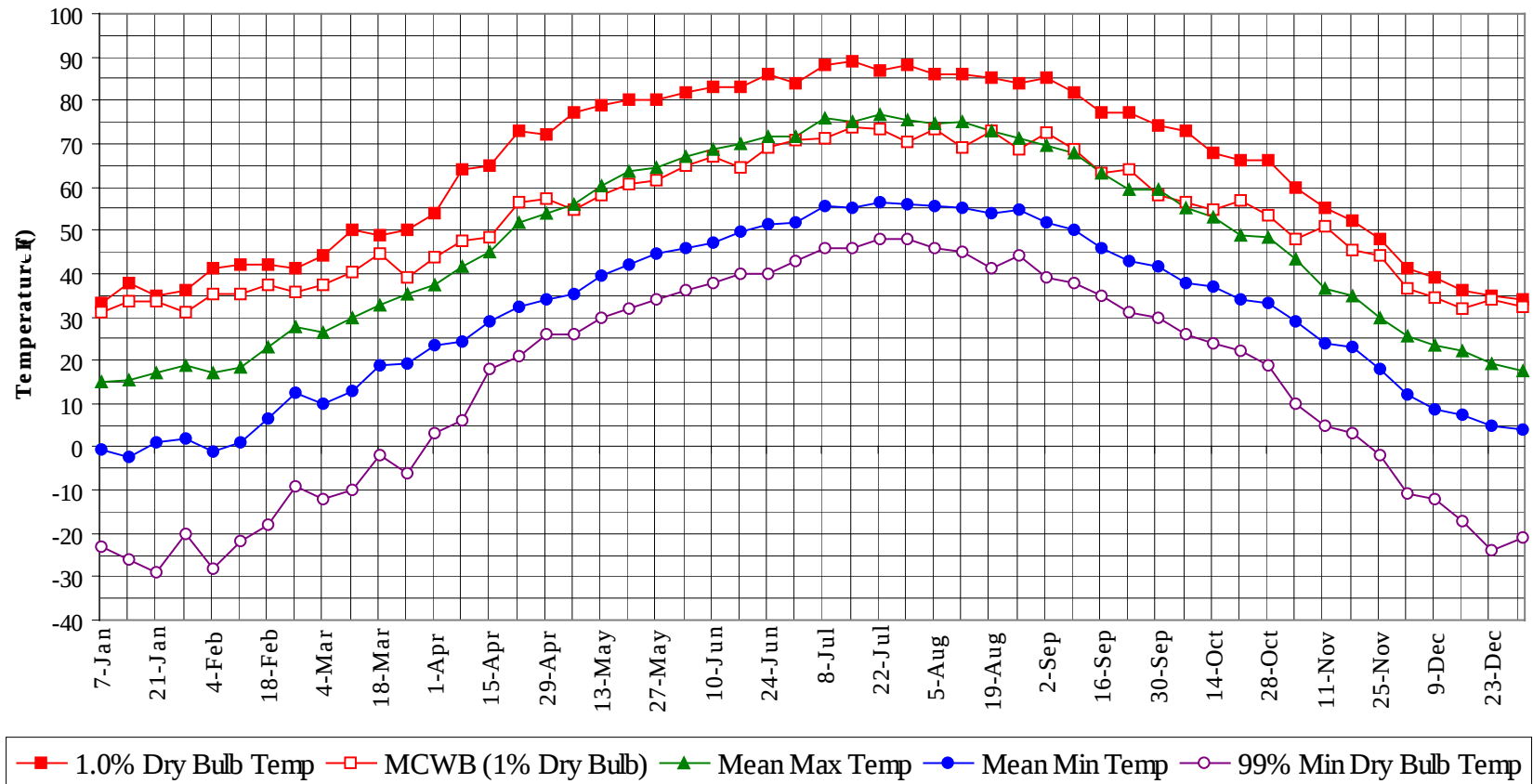
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DULUTH MN**WMO No. 727450****Dry-Bulb Temperature Hours For An Average Year (Sheet 5 of 5)****Period of Record = 1973 to 1996**

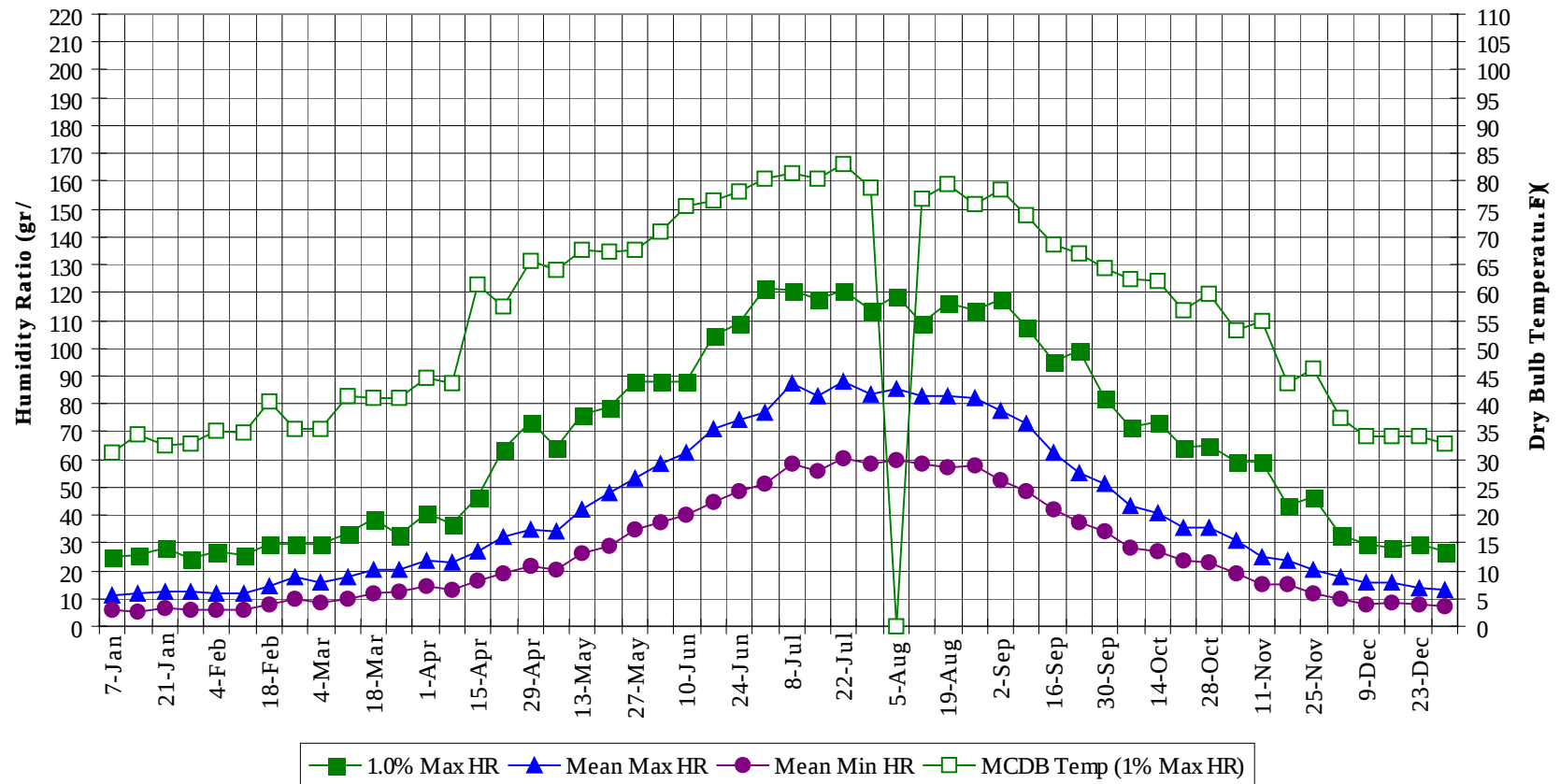
Annual Totals						
Temperature Range (°F)	Hour Group (LST)			Total Obs	M C W B (°F)	
	01 To 08	09 To 16	17 To 00			
95 / 99	0			0	75.8	
90 / 94	5			1	6	72.7
85 / 89	21			8	29	70.9
80 / 84	0	64	22	87	67.3	
75 / 79	7	161	69	237	64.5	
70 / 74	31	183	104	318	62.0	
65 / 69	100	226	168	494	59.4	
60 / 64	214	255	248	717	56.1	
55 / 59	241	187	232	660	52.1	
50 / 54	273	198	238	709	47.7	
45 / 49	232	167	213	612	42.7	
40 / 44	200	153	178	531	38.1	
35 / 39	226	190	212	628	33.6	
30 / 34	289	225	269	783	29.6	
25 / 29	231	190	214	635	25.1	
20 / 24	198	182	188	568	20.4	
15 / 19	143	130	139	411	15.6	
10 / 14	122	114	115	351	10.7	
5 / 9	101	87	92	279	5.9	
0 / 4	82	63	71	216	0.9	
-5 / -1	55	37	48	140	-3.3	
-10 / -6	62	38	47	147	-7.7	
-15 / -11	46	18	27	92	-12.3	
-20 / -16	35	13	13	61	-16.9	
-25 / -21	20	6	6	31	-21.6	
-30 / -26	8	2	2	11	-26.6	
-35 / -31	3	0	0	3	-30.8	
-40 / -36	0	0		0	-36.0	

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Annual Summary of Temperatures



Long Term Humidity and Dry Bulb Temperature Summary



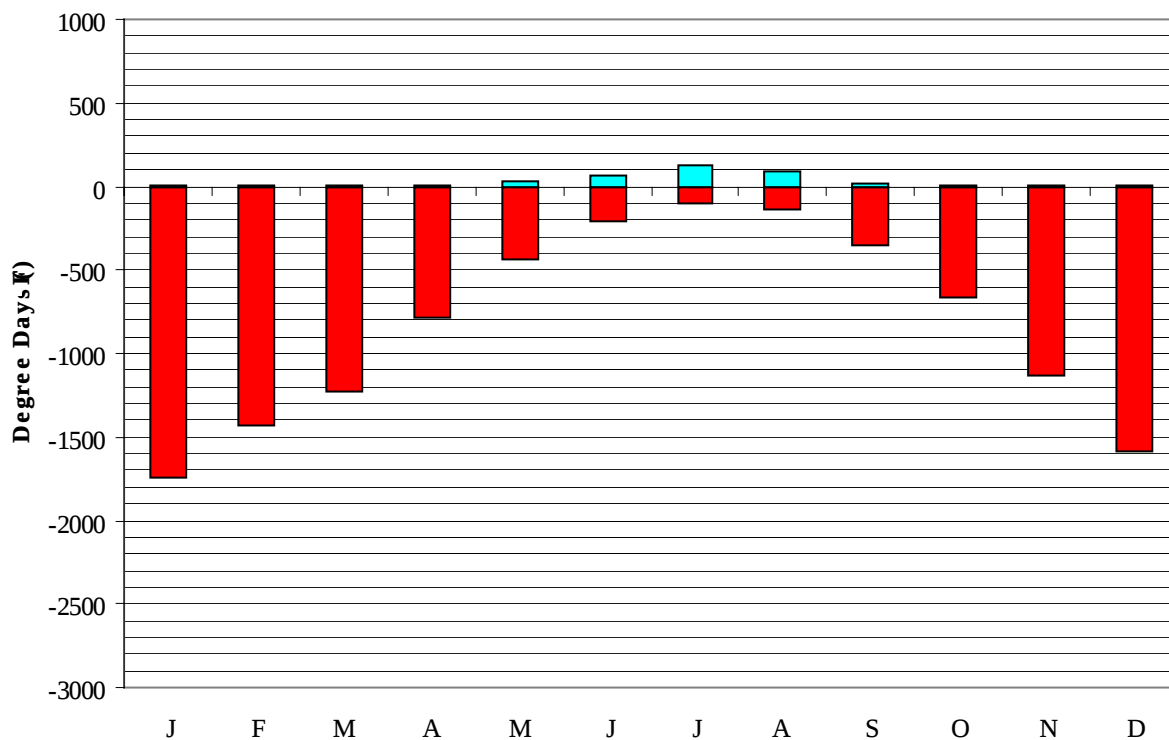
DULUTH MN**WMO No. 727450****Long Term Dry Bulb Temperature and Humidity Summary**

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	33.0	30.9	14.9	-0.8	-23.0	25.2	31.1	11.4	5.8
14-Jan	38.0	33.7	15.6	-2.3	-26.0	25.9	34.4	11.8	5.4
21-Jan	35.0	33.4	17.3	1.1	-29.0	28.0	32.6	12.6	6.4
28-Jan	36.0	31.3	18.7	1.9	-20.0	24.5	32.8	12.5	5.9
4-Feb	41.0	35.4	17.0	-0.9	-28.0	26.6	35.2	11.5	5.8
11-Feb	42.0	35.3	18.6	1.0	-22.0	25.9	34.9	11.6	5.9
18-Feb	42.0	37.6	23.1	6.3	-18.0	29.4	40.3	14.3	7.8
25-Feb	41.0	35.7	27.7	12.3	-9.0	29.4	35.4	17.6	9.7
4-Mar	44.0	37.3	26.6	9.8	-12.0	29.4	35.3	15.6	8.4
11-Mar	50.0	40.2	29.9	13.1	-10.0	33.6	41.3	17.9	9.9
18-Mar	49.0	44.4	33.0	18.7	-2.0	38.5	41.0	20.6	12.1
25-Mar	50.0	39.0	35.1	19.4	-6.0	32.9	41.0	20.6	12.2
1-Apr	54.0	43.6	37.6	23.5	3.0	40.6	44.6	24.0	14.5
8-Apr	64.0	47.4	41.5	24.4	6.0	37.1	43.8	22.8	13.4
15-Apr	65.0	48.3	44.9	29.1	18.0	46.9	61.4	27.0	16.3
22-Apr	73.0	56.5	51.7	32.4	21.0	63.7	57.6	32.3	19.3
29-Apr	72.0	57.5	53.9	34.1	26.0	73.5	65.8	34.9	21.5
6-May	77.0	54.8	55.9	35.2	26.0	64.4	63.9	34.3	20.5
13-May	79.0	58.3	60.1	39.5	30.0	76.3	67.8	41.7	26.3
20-May	80.0	60.7	63.5	42.1	32.0	79.1	67.3	48.2	28.9
27-May	80.0	61.6	64.7	44.5	34.0	88.2	67.7	53.2	34.5
3-Jun	82.0	64.9	66.8	46.0	36.0	88.2	70.9	58.6	37.2
10-Jun	83.0	66.9	68.8	47.1	38.0	88.2	75.5	62.2	40.2
17-Jun	83.0	64.3	69.9	49.7	40.0	104.3	76.7	70.8	44.9
24-Jun	86.0	69.0	71.6	51.4	40.0	109.2	78.2	74.3	48.7
1-Jul	84.0	70.8	71.8	52.0	43.0	121.8	80.6	77.0	51.0
8-Jul	88.0	71.1	75.8	55.7	46.0	121.1	81.5	87.3	58.7
15-Jul	89.0	73.8	75.1	55.1	46.0	117.6	80.6	82.7	55.7
22-Jul	87.0	73.5	76.8	56.4	48.0	121.1	83.2	88.1	60.1
29-Jul	88.0	70.6	75.5	55.8	48.0	113.4	78.9	83.6	58.5
5-Aug	86.0	73.5	74.8	55.6	46.0	119.0	.	85.1	59.9
12-Aug	86.0	69.2	75.0	55.2	45.0	109.2	76.8	83.0	58.7
19-Aug	85.0	73.0	72.9	54.0	41.0	116.2	79.6	82.5	56.8
26-Aug	84.0	68.9	71.4	54.9	44.0	113.4	75.7	81.8	57.9
2-Sep	85.0	72.7	69.7	51.8	39.0	117.6	78.6	77.7	52.5
9-Sep	82.0	68.6	68.0	49.9	38.0	107.8	73.8	73.1	48.8
16-Sep	77.0	63.3	63.1	45.8	35.0	95.2	68.6	62.3	42.1
23-Sep	77.0	64.0	59.4	42.8	31.0	99.4	67.0	55.0	37.3
30-Sep	74.0	58.3	59.3	41.4	30.0	81.9	64.4	51.0	34.2
7-Oct	73.0	56.6	55.1	37.9	26.0	71.4	62.4	43.6	28.0
14-Oct	68.0	54.6	52.9	37.2	24.0	73.5	61.9	40.5	27.0
21-Oct	66.0	56.8	48.8	33.9	22.0	64.4	56.8	35.6	23.4
28-Oct	66.0	53.7	48.4	33.3	19.0	65.1	59.8	35.2	22.8
4-Nov	60.0	47.9	43.4	29.1	10.0	58.8	53.1	30.8	19.1
11-Nov	55.0	50.9	36.6	24.0	5.0	58.8	54.7	25.0	15.1
18-Nov	52.0	45.2	35.0	22.8	3.0	43.4	43.8	23.6	15.0
25-Nov	48.0	44.1	30.0	17.9	-2.0	46.9	46.4	20.6	12.0
2-Dec	41.0	36.4	25.6	12.0	-11.0	32.9	37.4	17.7	10.0
9-Dec	39.0	34.4	23.4	8.5	-12.0	29.4	34.3	15.7	8.1
16-Dec	36.0	31.9	22.0	7.2	-17.0	28.0	34.1	15.6	8.3
23-Dec	35.0	33.9	19.1	5.0	-24.0	29.4	34.1	14.0	7.6
31-Dec	34.0	32.2	17.7	3.8	-21.0	26.6	32.9	13.0	7.3

DULUTH MN

WMO No. 727450

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



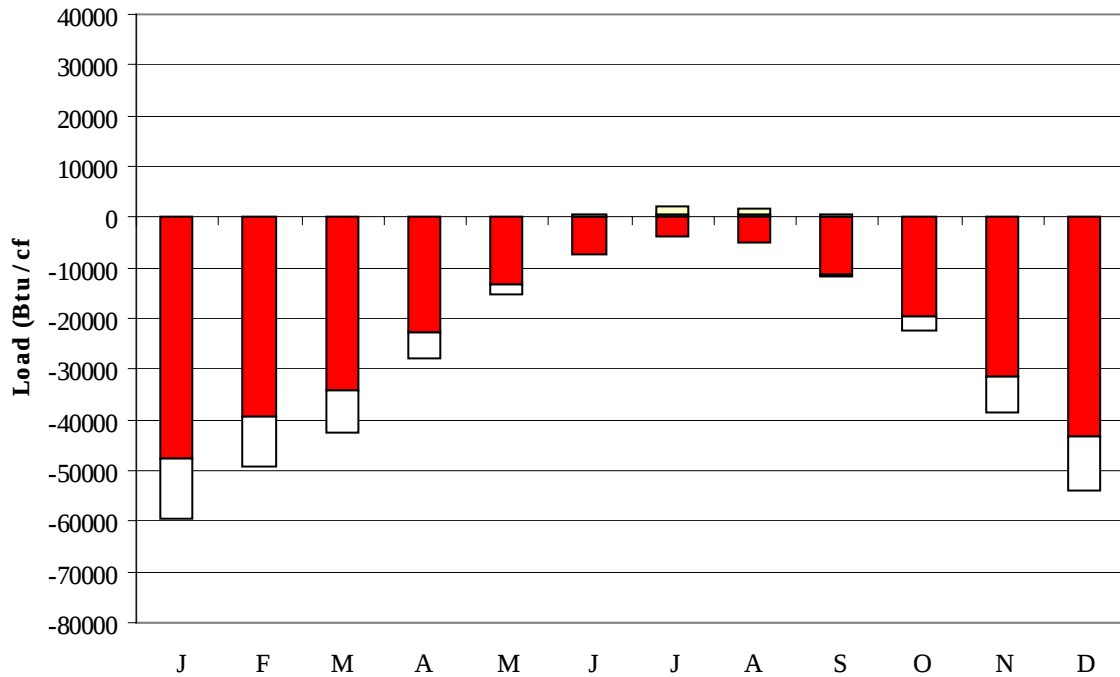
■ Mean Cooling Degree Days ■ Mean Heating Degree Days

	Mean Cooling Degree Days (°F)	Mean Heating Degree Days (°F)
JAN	0	1739
FEB	0	1427
MAR	0	1224
APR	4	788
MAY	26	433
JUN	63	212
JUL	128	102
AUG	90	135
SEP	22	354
OCT	2	667
NOV	0	1126
DEC	0	1583
ANN	335	9790

DULUTH MN

WMO No. 727450

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	-47483	0	-11802
FEB	0	-39192	0	-9911
MAR	0	-34142	0	-8358
APR	7	-22722	1	-5252
MAY	105	-13396	25	-1945
JUN	276	-7223	447	-110
JUL	691	-4005	1509	0
AUG	381	-5075	1414	-9
SEP	72	-11259	361	-373
OCT	5	-19561	0	-2683
NOV	0	-31507	0	-7114
DEC	0	-43444	0	-10659
ANN	1537	-279009	3757	-58216

Average Annual Solar Radiation – Nearest Available Site

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

City: DULUTH
 State: MN
 WBAN No: 14913
 Lat(N): 46.83
 Long(W): 92.18
 Elev(ft): 1417

Stn Type: Secondary
 SHADING GEOMETRY IN DIMENSIONLESS UNITS

Window: 1
 Overhang: 0.731
 Vert Gap: 0.328

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	500	820	1210	1530	1770	1890	1920	1610	1170	780	470	390	1170
	Std Dev	27	55	86	110	152	140	144	128	100	66	36	32	41
	Minimum	460	670	1050	1330	1450	1610	1610	1330	960	660	400	300	1100
	Maximum	560	900	1390	1750	2070	2160	2170	1870	1390	900	550	460	1270
	Diffuse	290	440	650	710	770	840	790	690	550	390	290	240	550
Clear Day	Global	650	1020	1580	2120	2510	2670	2560	2200	1670	1110	690	540	1610
NORTH	Global	170	260	370	440	540	630	600	470	340	240	170	140	360
	Diffuse	170	260	370	430	490	530	510	440	340	240	170	140	340
Clear Day	Global	140	210	300	410	590	710	650	460	310	220	150	120	360
EAST	Global	370	560	770	950	1050	1090	1120	970	740	520	320	280	730
	Diffuse	210	330	470	530	580	630	610	530	420	300	200	170	420
Clear Day	Global	570	820	1140	1410	1540	1600	1550	1410	1160	860	590	490	1100
SOUTH	Global	970	1200	1230	1110	970	900	970	1030	1040	980	760	780	990
	Diffuse	350	470	580	570	570	600	590	550	480	380	300	290	480
Clear Day	Global	1810	2020	2000	1660	1330	1170	1220	1460	1770	1900	1780	1690	1650
WEST	Global	370	570	790	940	1050	1100	1140	1000	760	530	340	290	740
	Diffuse	220	330	470	540	590	640	630	550	420	300	210	180	420
Clear Day	Global	570	820	1140	1410	1540	1600	1550	1410	1160	860	590	490	1100

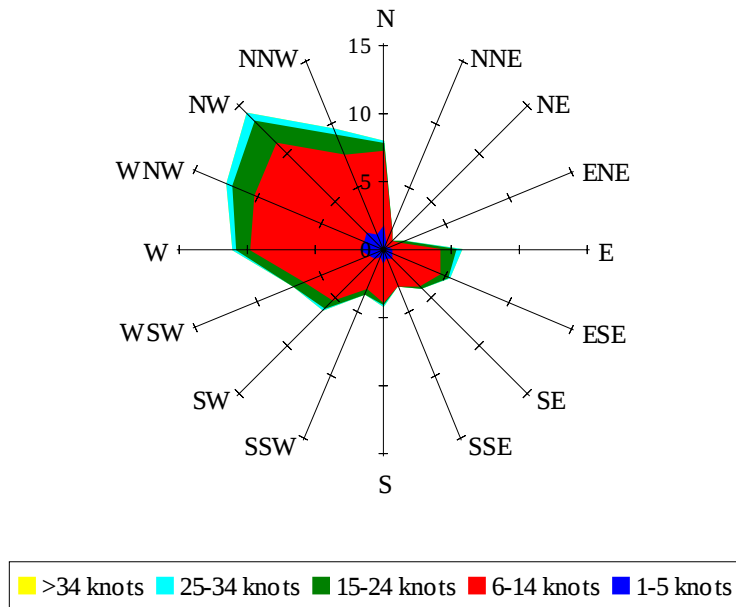
Average Annual Solar Heat and Illumination – Nearest Available Site

(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	310	540	840	1090	1280	1370	1390	1150	820	520	300	240	820
NORTH	Unshaded	120	180	260	300	360	410	390	310	240	170	120	96	250
	Shaded	95	150	210	250	300	340	330	260	200	140	93	77	200
EAST	Unshaded	250	390	550	670	750	780	800	690	530	370	220	190	520
	Shaded	210	320	450	540	580	610	630	550	420	300	180	160	410
SOUTH	Unshaded	730	890	880	750	620	570	610	680	720	720	570	600	690
	Shaded	700	800	650	420	330	340	340	350	470	600	540	570	510
WEST	Unshaded	250	400	560	670	750	780	810	720	540	370	230	200	520
	Shaded	220	330	450	540	590	610	640	570	430	310	200	170	420

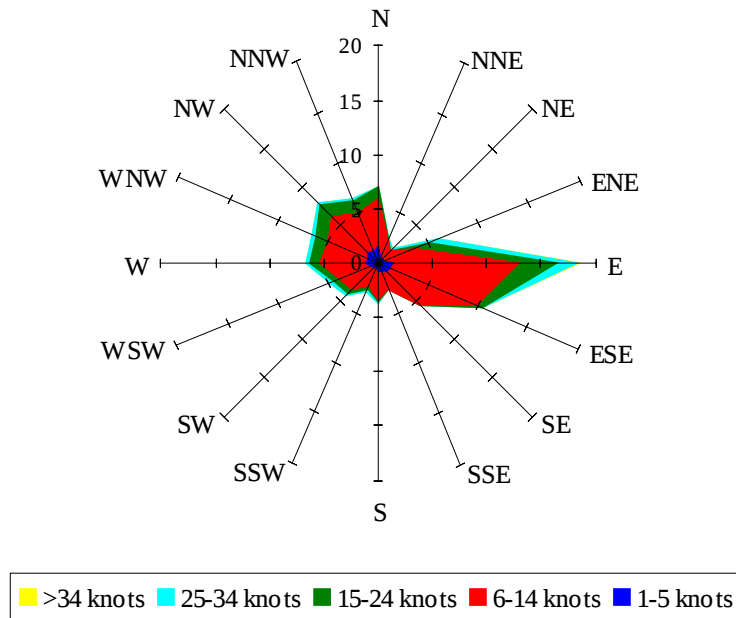
AVERAGE INCIDENT ILLUMINANCE (klux-hr) FOR MOSTLY CLEAR AND MOSTLY CLOUDY CONDITIONS, Percentage Uncertainty = 9											
		March					June				
		9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
HORIZ.	M.Clear	33	63	73	59	25	48	80	95	91	68
	M.Cloudy	22	45	53	42	18	29	52	64	65	47
NORTH	M.Clear	9	13	14	13	8	14	15	16	16	14
	M.Cloudy	9	16	18	15	8	12	17	18	18	15
EAST	M.Clear	72	57	14	13	8	81	72	32	16	14
	M.Cloudy	26	33	18	15	8	34	41	26	18	15
SOUTH	M.Clear	41	79	92	74	30	11	39	57	53	29
	M.Cloudy	18	41	50	38	15	11	27	39	38	22
WEST	M.Clear	9	13	20	64	65	11	15	16	48	77
	M.Cloudy	9	16	21	35	26	11	17	18	36	45
M.Clear	(% hrs)	30	28	28	29	29	32	29	27	24	26
		Sept					Dec				
		9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
HORIZ.	M.Clear	24	57	75	70	44	6	28	34	20	0
	M.Cloudy	14	34	44	44	27	4	18	22	13	0
NORTH	M.Clear	7	12	14	14	11	3	8	9	6	0
	M.Cloudy	6	13	15	15	10	2	8	9	6	0
EAST	M.Clear	63	67	29	14	11	23	35	9	6	0
	M.Cloudy	18	30	20	15	10	6	14	9	6	0
SOUTH	M.Clear	21	59	81	74	43	21	73	84	56	0
	M.Cloudy	9	27	38	38	21	5	23	29	17	0
WEST	M.Clear	7	12	14	49	72	3	8	17	40	0
	M.Cloudy	6	13	15	28	31	2	8	11	13	0
M.Clear	(% hrs)	33	31	30	29	30	26	26	27	28	30

Wind Summary - December, January, and February **Labels of Percent Frequency on North Axis**



Percent Calm = 3.07

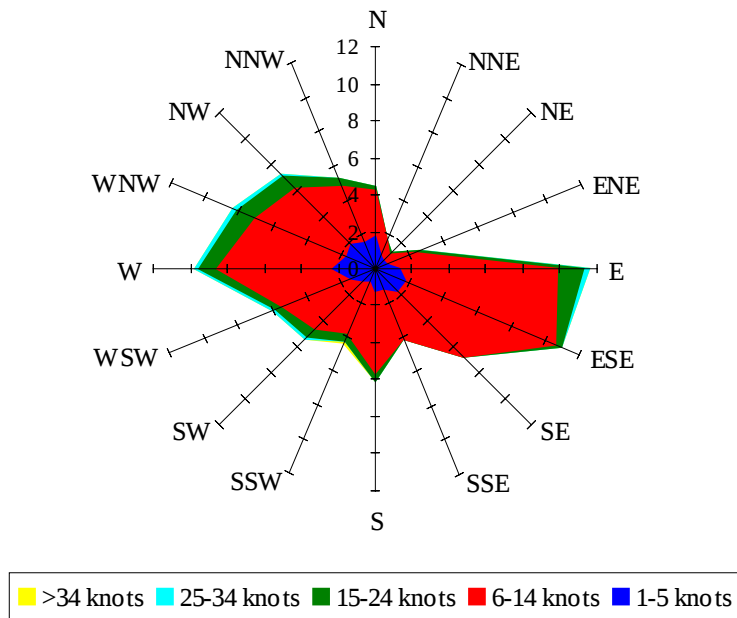
Wind Summary - March, April, and May **Labels of Percent Frequency on North Axis**



Percent Calm = 3.46

Wind Summary - June, July, and August

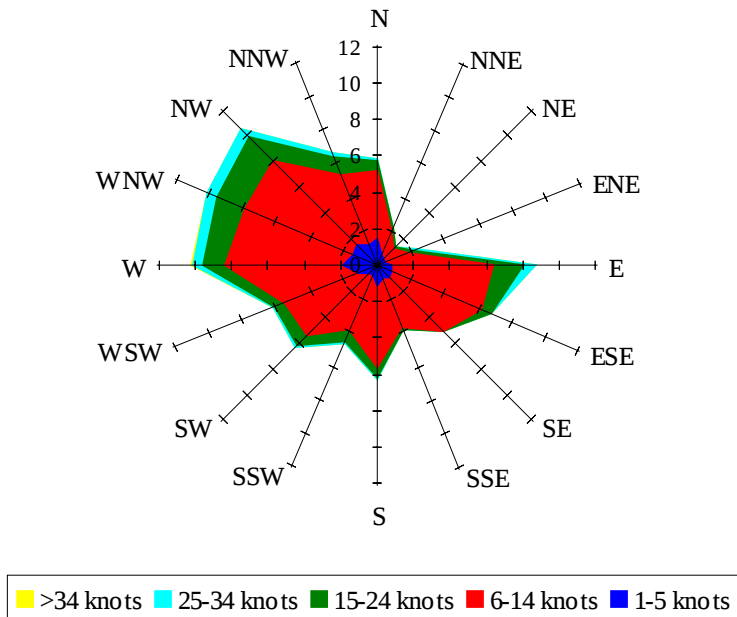
Labels of Percent Frequency on North Axis



Percent Calm = 4.75

Wind Summary - September, October, and November

Labels of Percent Frequency on North Axis



Percent Calm = 3.32