

BREMEN, GERMANY

Latitude = 53.05 N

Longitude = 8.80 E

Period of Record = 1973 to 1996

WMO No. 102240

Elevation = 16 feet

Average Pressure = 29.92 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	88	68	68	9.8	ESE
0.4% Occurrence	84	67	72	9.0	ESE
1.0% Occurrence	80	65	69	9.1	ESE
2.0% Occurrence	76	63	67	9.1	ESE
Mean Daily Range	13	-	-	-	-
97.5% Occurrence	23	22	15	8.1	E
99.0% Occurrence	18	17	12	8.3	E
99.6% Occurrence	13	13	9	8.0	E
Median of Extreme Lows	10	10	8	7.0	E
	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	72	83	96	8.6	SE
0.4% Occurrence	69	80	86	8.6	SE
1.0% Occurrence	67	77	82	8.6	ESE
2.0% Occurrence	65	73	77	8.6	ESE
	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	104	77	0.69	8.2	SE
0.4% Occurrence	91	72	0.61	7.9	W
1.0% Occurrence	85	70	0.57	8.2	W
2.0% Occurrence	81	68	0.54	8.1	WSW
Air Conditioning/ Humid Area Criteria	# of Hours	T ≥ 93°F	T ≥ 80°F	T _{wb} ≥ 73°F	T _{wb} ≥ 67°F
		1	89	1	93

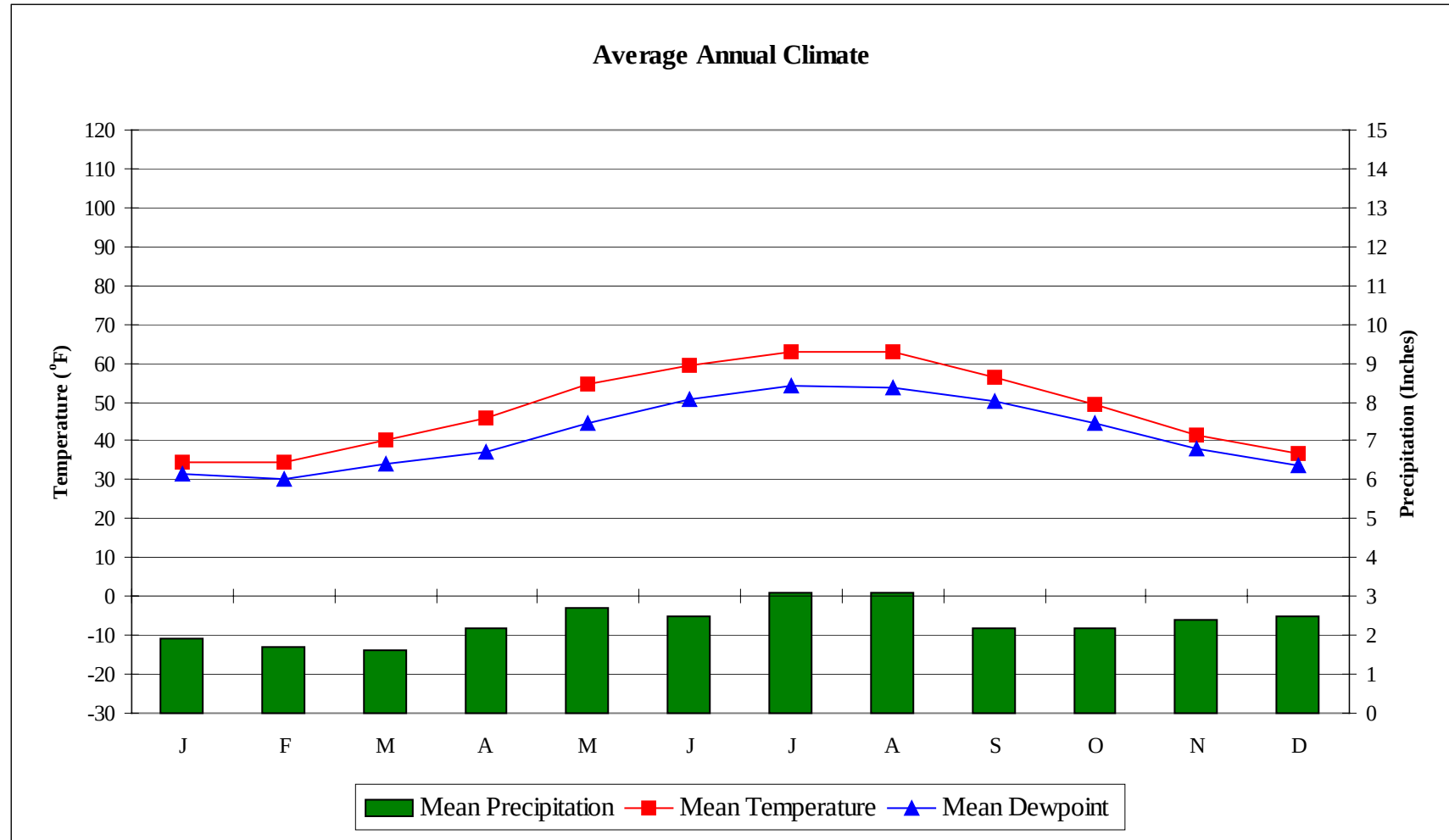
Other Site Data

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	N/A	N/A	0.1 + 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 (#)
50.8	N/A	N/A	38

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

BREMEN, GERMANY

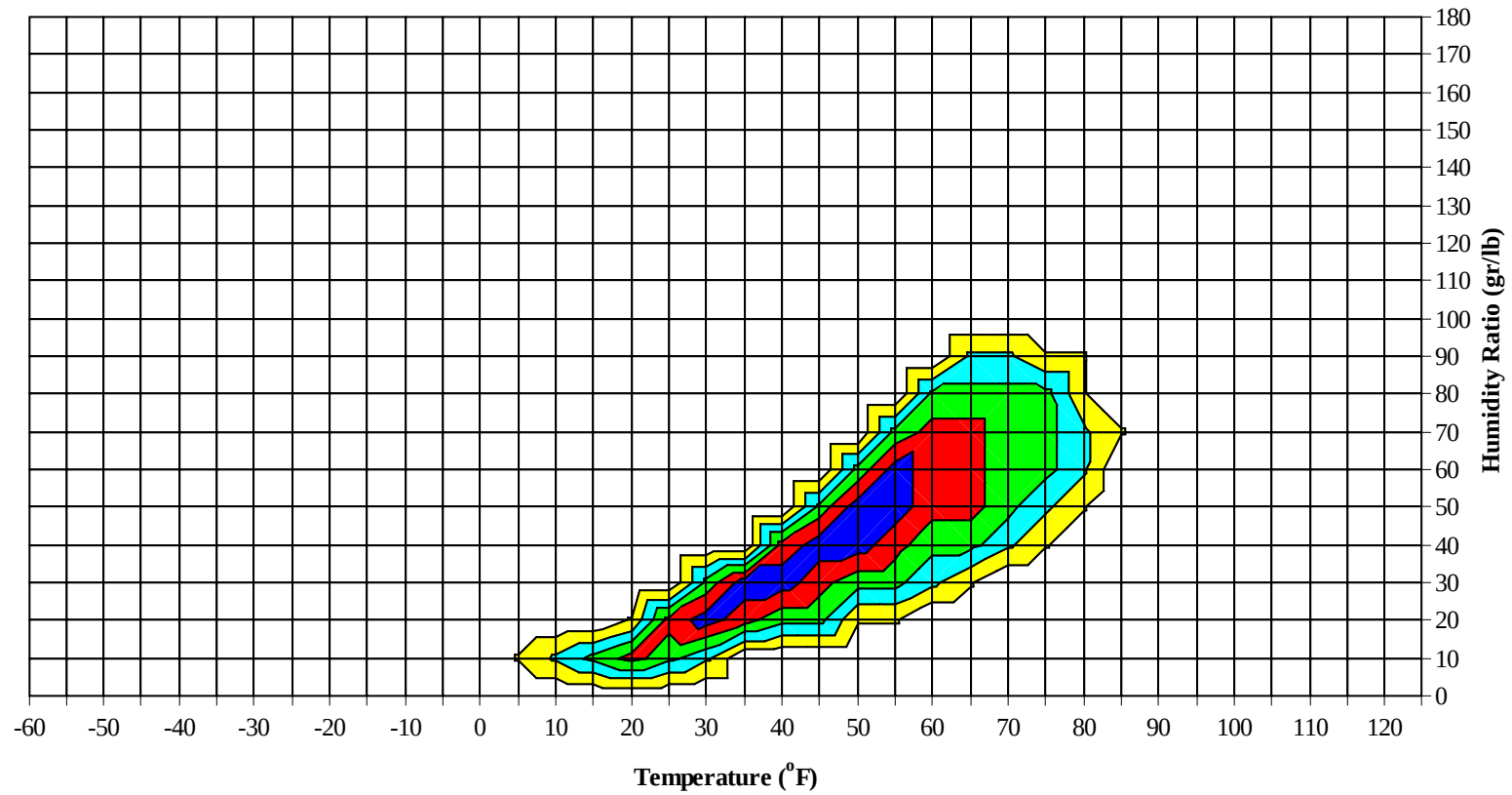
WMO No. 102240



BREMEN, GERMANY

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Long Term Psychrometric Summary

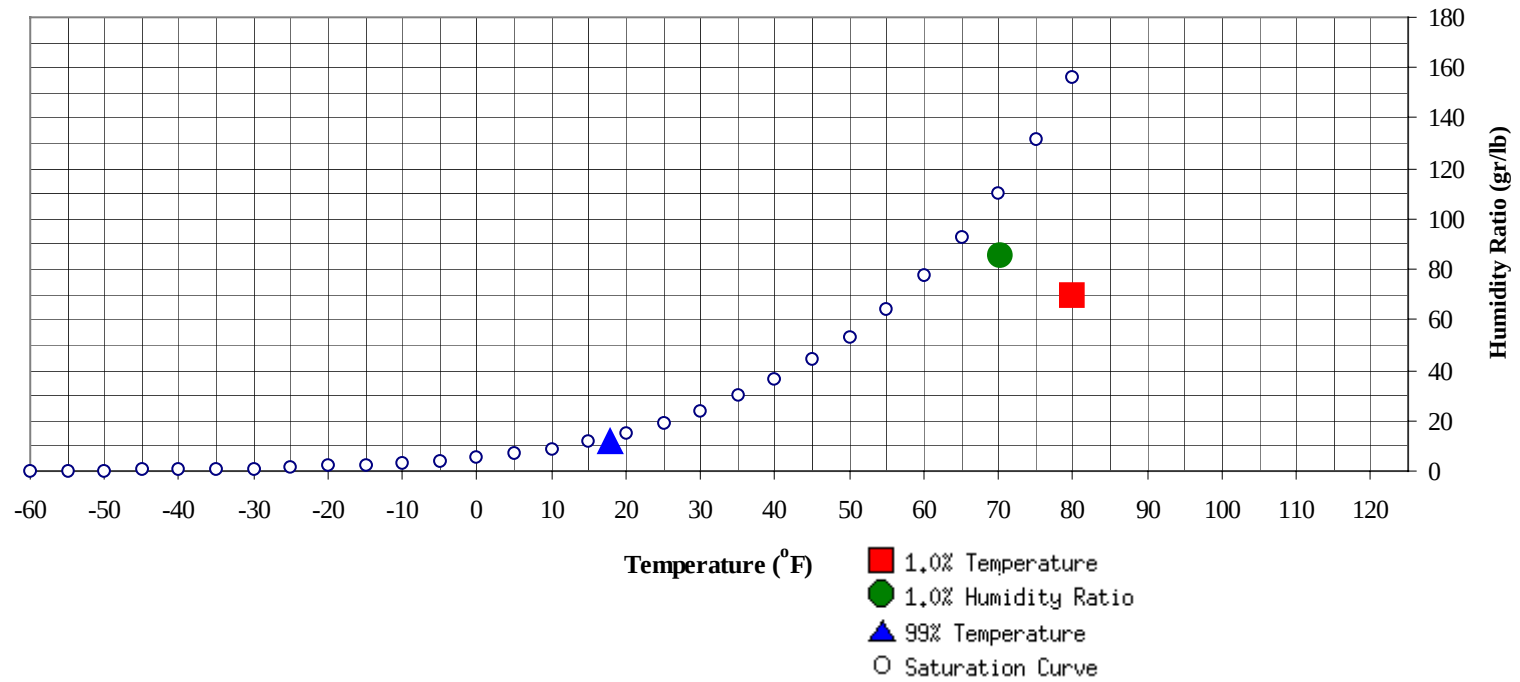


- 50% of all observations
- 80% of all observations
- 95% of all observations
- 97.5% of all observations
- 99% of all observations

BREMEN, GERMANY

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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)
	18	11.8	6.1		85.4	70.2	65.3	62.6	30.2

1.0% Dry Bulb	(°F)	MCHR (gr/lb)	MCWB (°F)	Enthalpy (btu/lb)
	80	70.1	65.4	30.2

BREMEN, GERMANY

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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	0	59.5
65 / 69												1	0	1	53.4
60 / 64							0	0	0	54.1		3	1	4	51.7
55 / 59	0	0	0	0	51.2	1	2	1	4	50.6	1	11	7	19	49.5
50 / 54	7	8	7	22	48.0	2	9	5	16	47.2	6	31	23	60	46.9
45 / 49	22	29	27	78	44.1	13	26	19	58	43.6	31	58	52	140	43.3
40 / 44	38	53	43	134	40.0	27	41	40	108	39.8	49	60	58	167	39.3
35 / 39	60	60	63	183	36.0	50	50	54	154	35.5	66	53	65	184	35.1
30 / 34	55	42	51	148	31.5	56	50	53	159	30.8	66	25	34	125	30.9
25 / 29	25	25	22	72	26.0	35	26	31	92	25.7	21	4	7	32	25.8
20 / 24	13	14	14	41	21.1	18	12	13	43	20.8	6	2	1	9	20.8
15 / 19	15	10	13	38	16.6	14	6	6	26	16.8	1	0	0	1	16.6
10 / 14	9	5	5	19	12.0	5	2	2	9	11.7	1	0	0	1	11.8
5 / 9	3	1	2	6	6.8	2	1	0	3	7.3	0	0	0	0	7.0
0 / 4	1	0	0	1	1.7	0	0	0	0	2.2	1			1	1.3
-5 / -1	1	0	0	1	-2.7	0	0	0	0	-1.7	0			0	-1.0

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.

BREMEN, GERMANY

WMO No. 102240

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	69.2
85 / 89							0	0	0	60.0		3	1	4	68.4
80 / 84		0	0	0	59.0		2	1	3	63.7		8	5	13	66.5
75 / 79		2	1	3	59.3		12	6	18	61.3	0	19	12	31	63.5
70 / 74		3	2	5	58.1	0	20	13	33	58.8	2	28	21	51	61.1
65 / 69	0	9	5	14	54.4	1	28	18	47	56.7	8	34	26	68	59.2
60 / 64	1	19	12	32	52.2	9	47	38	94	54.3	29	60	49	138	56.5
55 / 59	5	29	23	57	49.3	34	58	54	146	51.6	65	60	66	191	53.3
50 / 54	16	51	42	109	46.5	66	52	60	177	48.4	81	25	49	155	49.9
45 / 49	47	67	61	175	42.9	72	23	40	135	44.4	41	2	11	54	45.9
40 / 44	66	44	55	165	39.6	41	5	15	61	40.5	11	0	1	12	41.6
35 / 39	63	15	32	110	35.7	20	1	4	25	36.4	2			2	37.8
30 / 34	34	1	7	42	31.2	5		0	5	32.0					
25 / 29	7		1	8	26.7	1			1	28.2					
20 / 24	1		0	1	22.2										
15 / 19	0			0	19.0										
10 / 14															
5 / 9															
0 / 4															
-5 / -1															

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BREMEN, GERMANY

WMO No. 102240

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	0	70.8					
90 / 94		2	1	3	67.1		2	1	3	68.0					
85 / 89		6	3	9	67.3		5	2	7	67.0					
80 / 84		15	10	25	66.7		15	7	22	65.4		1	0	1	66.4
75 / 79	0	26	18	44	64.5	1	26	15	42	63.9		5	1	6	65.4
70 / 74	5	41	29	75	62.5	3	44	30	77	62.0	0	15	6	21	62.2
65 / 69	19	52	42	113	60.4	14	56	46	116	60.3	1	31	17	49	59.6
60 / 64	62	67	66	194	57.8	60	70	71	201	58.1	21	77	51	149	57.2
55 / 59	87	37	58	182	54.5	86	28	52	166	54.7	59	78	81	218	53.9
50 / 54	57	3	20	80	50.9	61	3	21	85	50.9	85	29	58	172	50.2
45 / 49	16	0	2	18	46.6	20	0	3	23	46.6	49	4	21	74	45.8
40 / 44	2		0	2	42.7	3	0	0	3	42.8	18	0	4	22	41.9
35 / 39	0			0	38.3	0			0	38.7	6		1	7	37.5
30 / 34											1			1	33.2
25 / 29															
20 / 24															
15 / 19															
10 / 14															
5 / 9															
0 / 4															
-5 / -1															

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.

BREMEN, GERMANY

WMO No. 102240

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															
75 / 79		1		1	65.6										
70 / 74		3	0	3	62.8										
65 / 69	0	8	3	11	59.7										
60 / 64	3	22	13	38	57.1		1		1	54.5	0	0		0	54.3
55 / 59	24	58	41	123	53.4	4	10	6	20	52.9	1	2	1	4	51.9
50 / 54	54	78	66	197	49.4	21	37	26	84	49.2	11	12	12	35	48.9
45 / 49	69	50	70	189	44.9	40	66	53	159	44.6	29	39	33	101	44.7
40 / 44	45	19	37	101	40.8	59	52	59	170	40.4	41	50	47	138	40.3
35 / 39	36	8	16	60	36.6	59	42	54	155	36.2	60	60	61	181	35.9
30 / 34	14	2	2	18	31.8	35	24	29	88	31.2	54	48	49	151	31.2
25 / 29	2	0	0	2	27.7	15	6	10	31	26.3	30	24	28	82	26.1
20 / 24	0			0	24.0	5	2	2	9	21.8	12	7	9	28	21.4
15 / 19						1	0	1	2	17.8	6	4	5	15	17.3
10 / 14								0	0	12.5	2	1	1	4	11.7
5 / 9											1	1	1	3	6.8
0 / 4											0	0	0	0	3.0
-5 / -1															

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BREMEN, GERMANY

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

Period of Record = 1973 to 1996

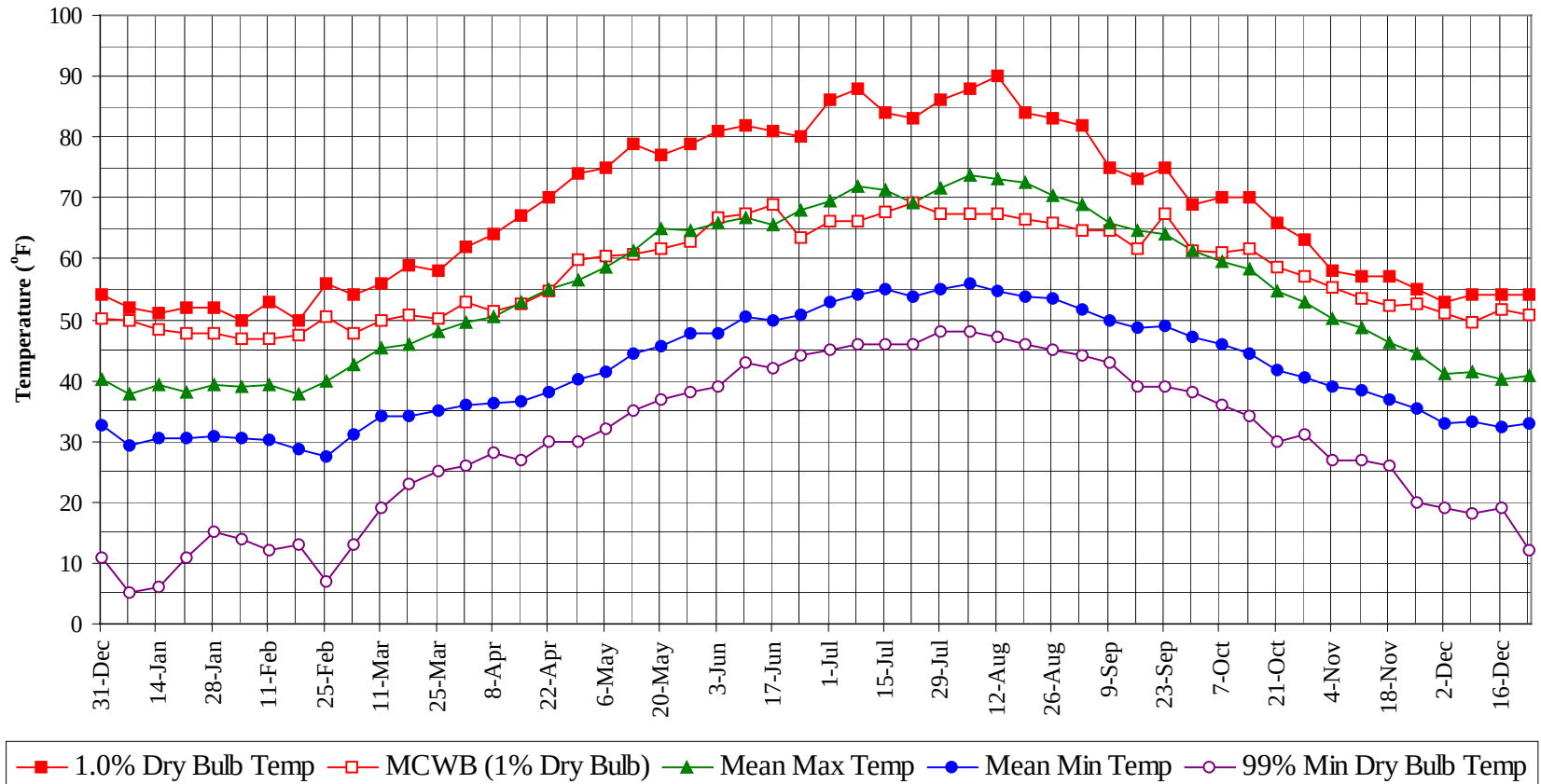
Annual Totals					
Temperature Range (°F)	Hour Group (LST)			Total Obs	M C W B (°F)
	01 To 08	09 To 16	17 To 00		
95 / 99		0	0	0	70.8
90 / 94		4	2	6	67.8
85 / 89		13	6	19	67.3
80 / 84		41	23	64	66.0
75 / 79	1	90	52	143	63.7
70 / 74	10	154	100	264	61.5
65 / 69	43	218	157	418	59.4
60 / 64	183	366	299	848	56.9
55 / 59	366	373	390	1129	53.3
50 / 54	467	337	387	1191	49.1
45 / 49	448	364	391	1203	44.4
40 / 44	401	324	360	1085	40.1
35 / 39	424	289	350	1063	35.8
30 / 34	319	193	226	738	31.2
25 / 29	136	85	100	321	26.0
20 / 24	56	36	39	131	21.1
15 / 19	38	20	25	83	16.8
10 / 14	17	9	9	35	11.9
5 / 9	6	3	3	12	7.0
0 / 4	2	1	1	4	1.9
-5 / -1	1	0	0	1	-2.3

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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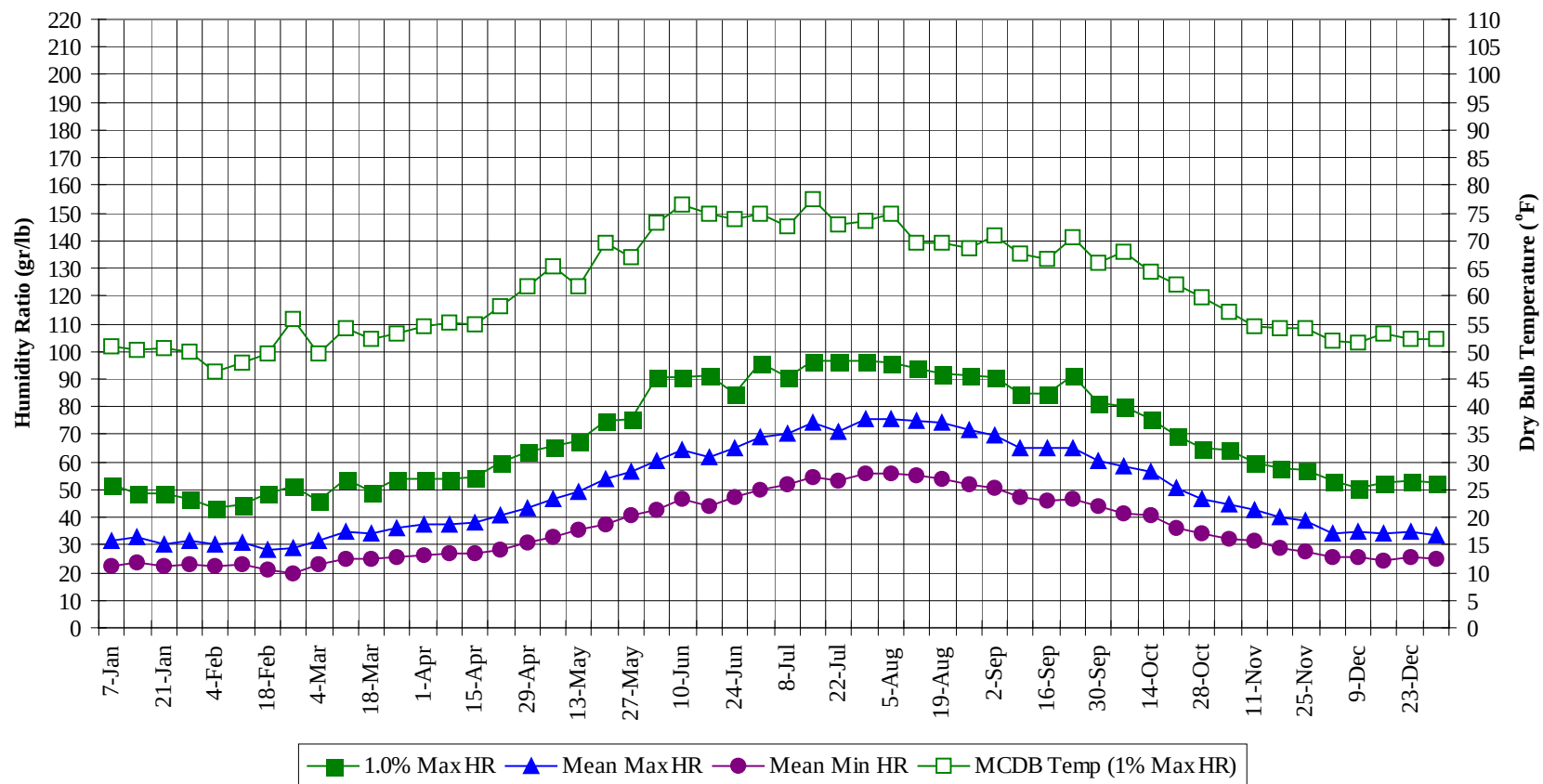
Annual Summary of Temperatures



BREMEN, GERMANY

WMO No. 102240

Long Term Humidity and Dry Bulb Temperature Summary

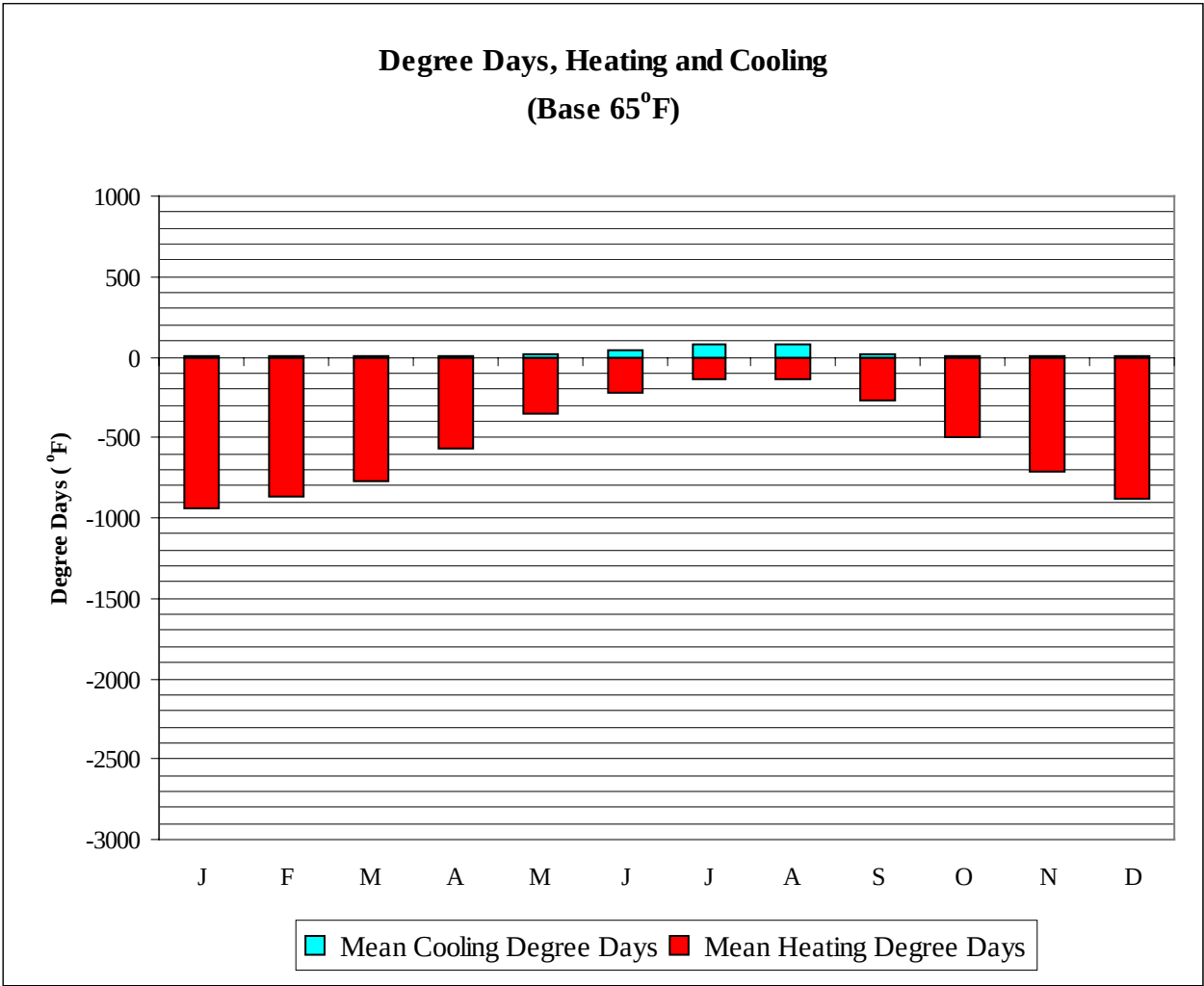


BREMEN, GERMANY

WMO No. 102240

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	50.0	37.8	29.4	5.0	51.8	50.8	31.4	22.4
14-Jan	51.0	48.3	39.2	30.5	6.0	48.3	50.2	32.7	23.4
21-Jan	52.0	47.7	38.0	30.4	11.0	48.3	50.5	30.2	22.5
28-Jan	52.0	47.7	39.4	30.9	15.0	46.9	49.9	31.8	23.0
4-Feb	50.0	46.7	39.1	30.5	14.0	43.4	46.3	30.2	22.5
11-Feb	53.0	46.8	39.3	30.3	12.0	44.8	48.0	31.0	22.7
18-Feb	50.0	47.4	37.8	28.7	13.0	48.3	49.7	28.2	21.0
25-Feb	56.0	50.3	39.9	27.6	7.0	51.1	55.9	28.7	20.0
4-Mar	54.0	47.7	42.5	31.2	13.0	46.2	49.5	31.7	22.8
11-Mar	56.0	49.8	45.4	34.2	19.0	53.9	54.2	34.7	25.3
18-Mar	59.0	50.7	46.0	34.2	23.0	49.0	52.3	34.4	25.2
25-Mar	58.0	50.2	48.2	34.9	25.0	53.9	53.2	36.1	25.5
1-Apr	62.0	53.0	49.6	35.9	26.0	53.9	54.4	37.6	26.2
8-Apr	64.0	51.2	50.5	36.2	28.0	53.9	55.2	37.5	26.9
15-Apr	67.0	52.6	52.9	36.6	27.0	54.6	54.7	37.8	26.6
22-Apr	70.0	54.6	55.1	38.0	30.0	59.5	58.0	40.5	28.1
29-Apr	74.0	59.8	56.6	40.2	30.0	63.7	61.6	43.5	30.7
6-May	75.0	60.5	58.7	41.5	32.0	65.8	65.5	46.8	32.7
13-May	79.0	60.8	61.2	44.4	35.0	67.9	61.9	49.5	35.4
20-May	77.0	61.6	65.0	45.6	37.0	74.9	69.5	54.1	37.6
27-May	79.0	62.7	64.6	47.9	38.0	75.6	67.1	56.3	40.9
3-Jun	81.0	66.9	66.0	47.9	39.0	90.3	73.4	60.7	42.4
10-Jun	82.0	67.3	66.8	50.5	43.0	90.3	76.5	64.2	46.5
17-Jun	81.0	68.8	65.7	49.7	42.0	91.0	74.8	61.4	44.0
24-Jun	80.0	63.6	67.8	50.9	44.0	84.7	73.8	64.7	47.5
1-Jul	86.0	66.1	69.6	52.8	45.0	95.9	74.8	69.3	49.9
8-Jul	88.0	66.2	72.0	54.0	46.0	90.3	72.6	70.6	51.6
15-Jul	84.0	67.7	71.4	54.8	46.0	96.6	77.4	74.3	54.2
22-Jul	83.0	69.1	69.3	53.7	46.0	96.6	73.0	70.8	53.0
29-Jul	86.0	67.3	71.8	54.9	48.0	96.6	73.5	75.3	55.6
5-Aug	88.0	67.4	73.6	56.0	48.0	95.9	75.0	75.8	55.6
12-Aug	90.0	67.4	73.1	54.8	47.0	93.8	69.5	74.7	55.2
19-Aug	84.0	66.6	72.4	53.9	46.0	91.7	69.5	73.9	53.7
26-Aug	83.0	65.9	70.5	53.4	45.0	91.0	68.8	71.3	51.7
2-Sep	82.0	64.6	68.8	51.8	44.0	90.3	71.0	69.6	50.4
9-Sep	75.0	64.6	65.8	50.0	43.0	84.7	67.5	65.3	47.2
16-Sep	73.0	61.7	64.6	48.8	39.0	84.7	66.5	65.0	46.1
23-Sep	75.0	67.3	64.0	48.9	39.0	91.0	70.7	64.8	46.6
30-Sep	69.0	61.3	61.4	47.0	38.0	81.2	66.0	60.7	43.9
7-Oct	70.0	61.2	59.6	45.8	36.0	79.8	67.8	58.2	41.4
14-Oct	70.0	61.6	58.4	44.6	34.0	75.6	64.3	56.3	40.6
21-Oct	66.0	58.7	54.7	41.8	30.0	69.3	62.1	50.6	36.2
28-Oct	63.0	57.1	52.7	40.5	31.0	65.1	59.6	46.9	33.9
4-Nov	58.0	55.3	50.0	39.1	27.0	64.4	57.1	44.8	32.3
11-Nov	57.0	53.5	48.5	38.5	27.0	59.5	54.7	42.6	31.3
18-Nov	57.0	52.1	46.1	36.7	26.0	58.1	54.3	40.0	29.0
25-Nov	55.0	52.5	44.3	35.4	20.0	57.4	54.3	38.5	27.9
2-Dec	53.0	51.1	41.0	32.9	19.0	53.2	51.8	34.4	25.3
9-Dec	54.0	49.6	41.4	33.1	18.0	50.4	51.4	35.0	25.4
16-Dec	54.0	51.7	40.3	32.2	19.0	52.5	53.3	34.0	24.6
23-Dec	54.0	50.7	40.7	33.0	12.0	53.2	52.2	34.5	25.4
31-Dec	54.0	50.2	40.1	32.7	11.0	52.5	52.1	33.8	25.2

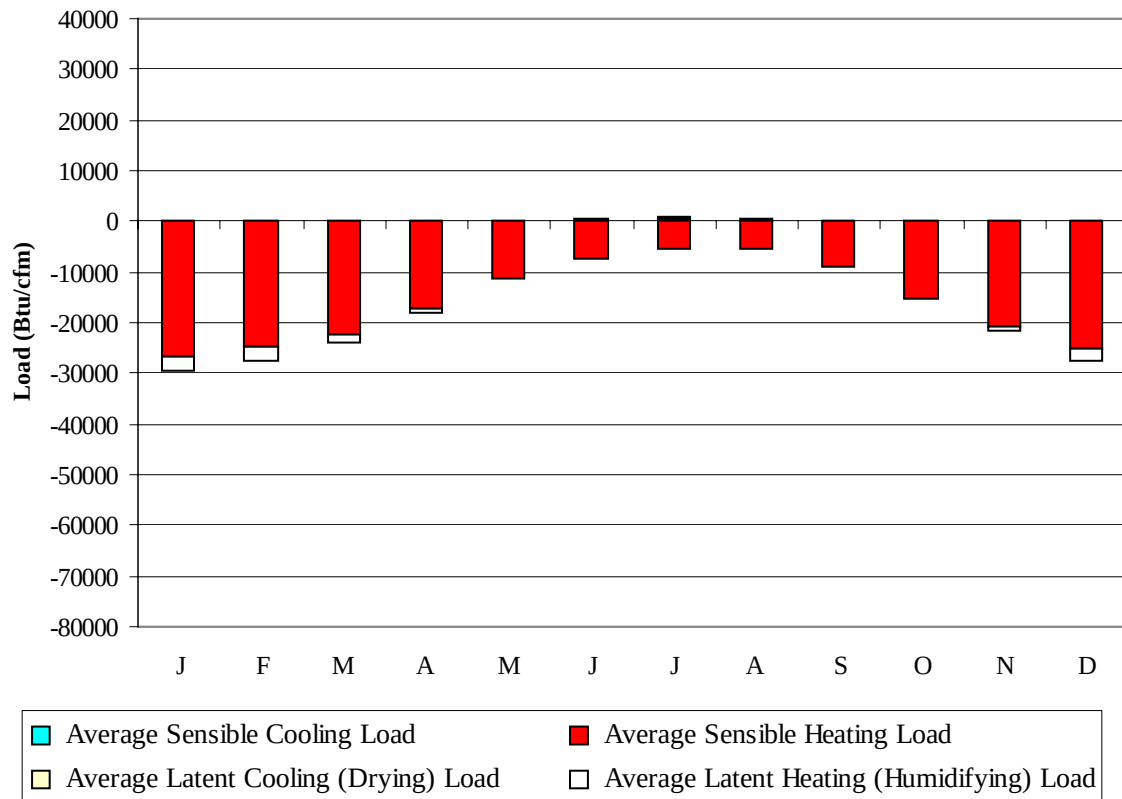


	Mean Cooling Degree Days (°F)	Mean Heating Degree Days (°F)
JAN	0	941
FEB	0	866
MAR	0	767
APR	3	573
MAY	23	352
JUN	47	216
JUL	78	136
AUG	75	141
SEP	13	268
OCT	2	492
NOV	0	707
DEC	0	876
ANN	242	6335

BREMEN, GERMANY

WMO No. 102240

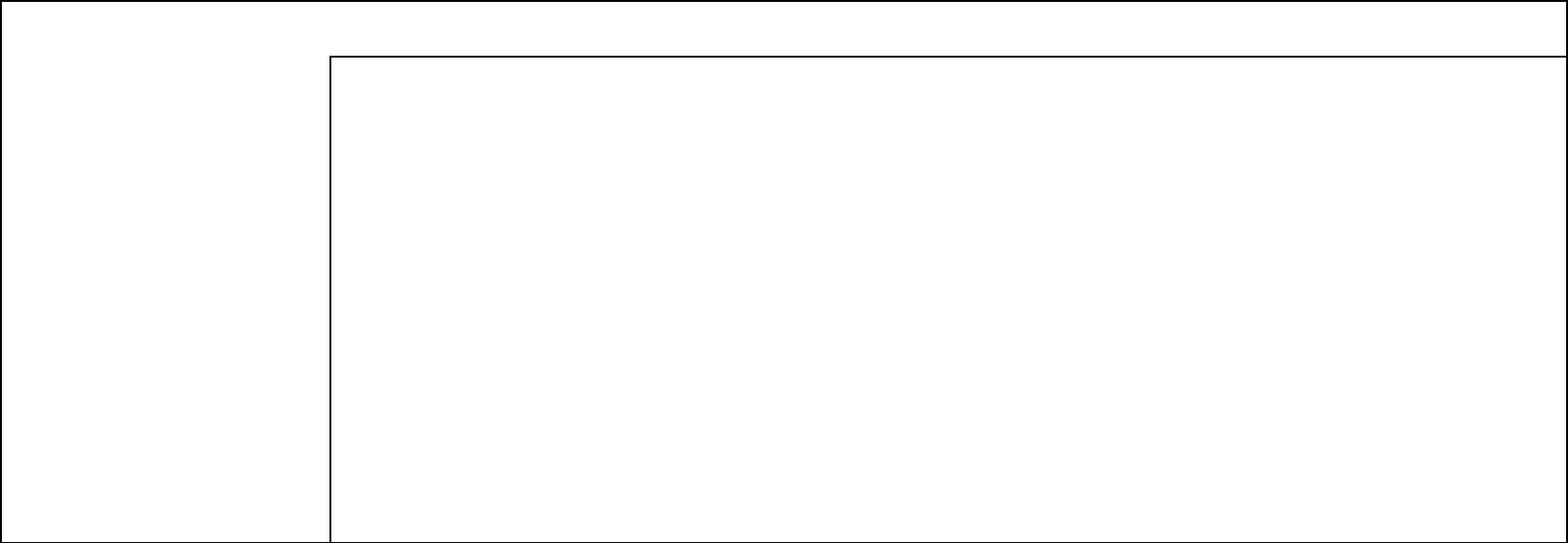
Average Ventilation and Infiltration Loads
(Outside Air vs. 75°F, 60% RH summer; 68°F, 30% RH winter)



	Average Sensible Cooling Load	Average Sensible Heating Load	Average Latent Cooling Load	Average Latent Heating Load
	(Btu/cfm)	(Btu/cfm)	(Btu/cfm)	(Btu/cfm)
JAN	0	-26789	0	-2812
FEB	0	-24656	0	-2957
MAR	0	-22284	0	-1857
APR	5	-17149	0	-958
MAY	54	-11290	12	-170
JUN	208	-7470	160	-2
JUL	407	-5216	397	0
AUG	374	-5351	295	0
SEP	22	-9102	91	-4
OCT	0	-15138	4	-210
NOV	0	-20670	0	-1000
DEC	0	-25126	0	-2197
ANN	1070	-190241	959	-12167

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

No Solar Radiation
Data Available

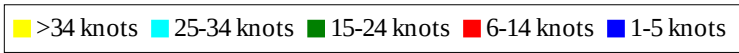
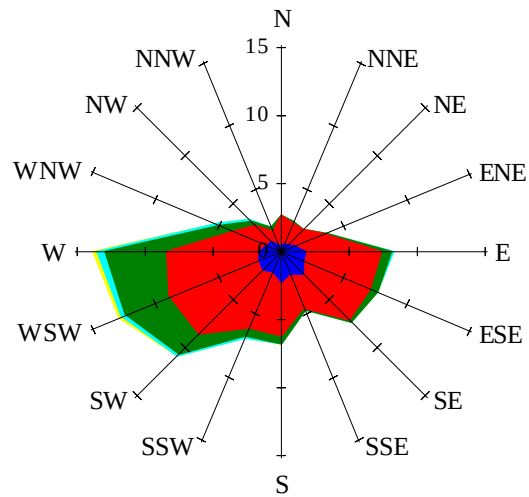


Average Annual Solar Heat and Illumination – Nearest Available Site

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

Wind Summary - December, January, and February

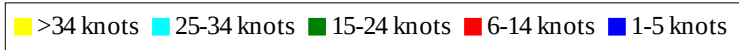
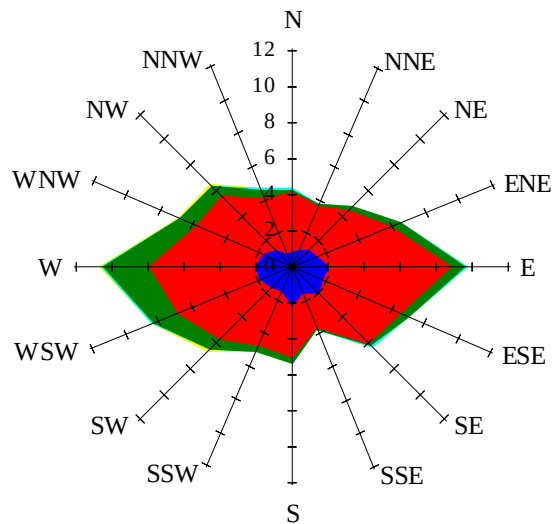
Labels of Percent Frequency on North Axis



Percent Calm = 0.81

Wind Summary - March, April, and May

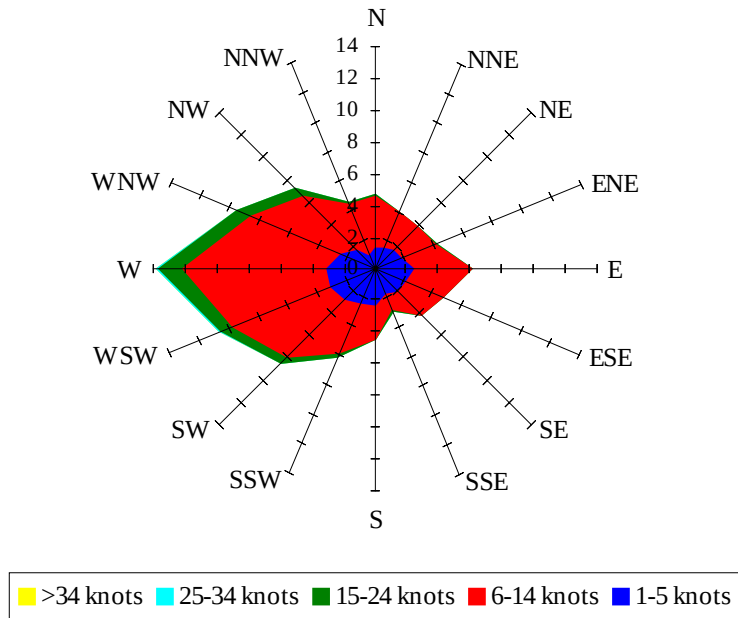
Labels of Percent Frequency on North Axis



Percent Calm = 1.33

Wind Summary - June, July, and August

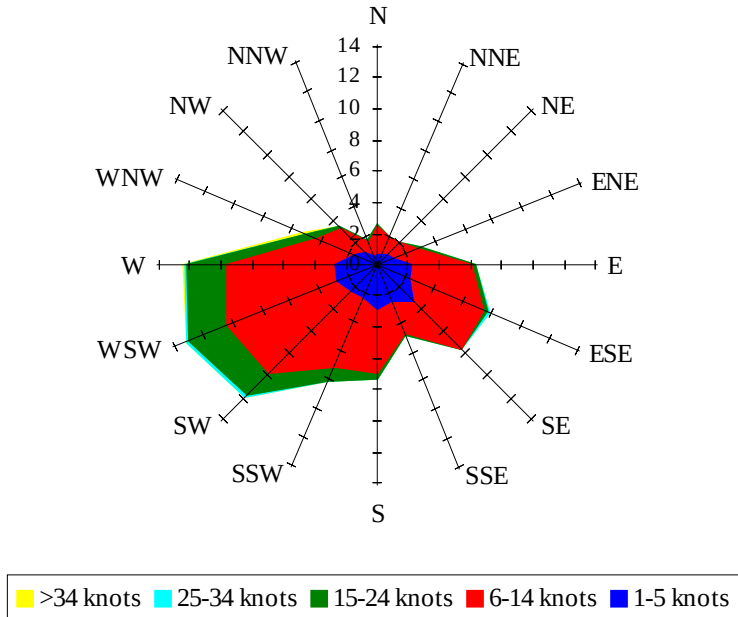
Labels of Percent Frequency on North Axis



Percent Calm = 1.59

Wind Summary - September, October, and November

Labels of Percent Frequency on North Axis



Percent Calm = 1.48