 © 2013 ASHRAE, Inc.

WINNIPEG RICHARDSON INT'L A, MB, Canada

WMO#: **718520**

Lat: **49.92N** Long: **97.23W** Elev: **239** StdP: **98.49** Time Zone: **-6.00 (NAC)** Period: **86-10** WBAN: **99999**

Annual Heating and Humidification Design Conditions

	Coldest Month	Heating DB		Humidification DP/MCDB and HR						Coldest month WS/MCDB				MCWS/PCWD to 99.6% DB		
				99.6%			99%			0.4%		1%				
		99.6%	99%	DP	HR	MCDB	DP	HR	MCDB	WS	MCDB	WS	MCDB	MCWS	PCWD	
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	
(1)	1	-32.1	-29.7	-37.0	0.1	-32.0	-34.7	0.1	-29.6	14.3	-13.1	13.1	-11.3	3.3	300	(1)

Annual Cooling, Dehumidification, and Enthalpy Design Conditions

	Hottest Month	Hottest Month DB Range	Cooling DB/MCWB						Evaporation WB/MCDB						MCWS/PCWD to 0.4% DB		
			0.4%		1%		2%		0.4%		1%		2%				
			DB	MCWB	DB	MCWB	DB	MCWB	WB	MCDB	WB	MCDB	WB	MCDB	MCWS	PCWD	
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	
(2)	7	11.4	30.6	21.1	28.8	20.3	27.1	19.4	22.9	28.3	21.6	27.0	20.4	25.4	6.1	180	(2)

	Dehumidification DP/MCDB and HR									Enthalpy/MCDB						Hours 8 to 4 & 12.8/20.6	
	0.4%			1%			2%			0.4%		1%		2%			
	DP	HR	MCDB	DP	HR	MCDB	DP	HR	MCDB	Enth	MCDB	Enth	MCDB	Enth	MCDB		
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	
(3)	21.2	16.3	26.4	19.7	14.9	24.7	18.5	13.8	23.4	69.4	28.3	64.4	27.2	60.0	25.6	671	(3)

Extreme Annual Design Conditions

	Extreme Annual WS			Extreme Max WB	Extreme Annual DB				n-Year Return Period Values of Extreme DB								
					Mean		Standard deviation		n=5 years		n=10 years		n=20 years		n=50 years		
	1%	2.5%	5%		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	
(4)	12.5	11.0	9.8	27.4	-35.6	33.6	2.5	2.3	-37.4	35.3	-38.8	36.6	-40.2	37.8	-42.0	39.5	(4)

Monthly Climatic Design Conditions

				Annual (d)	Jan (e)	Feb (f)	Mar (g)	Apr (h)	May (i)	Jun (j)	Jul (k)	Aug (l)	Sep (m)	Oct (n)	Nov (o)	Dec (p)	
(5)	Temperatures, Degree-Days and Degree-Hours	Tavg		3.1	-16.1	-13.6	-5.9	4.4	11.4	17.1	19.4	18.6	13.1	5.1	-4.5	-12.9	(5)
(6)		Sd			8.09	8.04	7.62	6.19	5.58	4.27	3.26	3.71	4.54	5.04	6.56	7.95	(6)
(7)		HDD10.0		3535	809	661	493	187	52	2	0	0	20	167	434	711	(7)
(8)		HDD18.3		5727	1068	894	751	419	224	72	27	43	165	412	684	969	(8)
(9)		CDD10.0		1012	0	0	0	18	94	215	291	266	113	14	0	0	(9)
(10)		CDD18.3		162	0	0	0	1	9	35	59	51	8	0	0	0	(10)
(11)		CDH23.3		1667	0	0	0	10	136	356	547	514	99	5	0	0	(11)
(12)		CDH26.7		459	0	0	0	1	40	104	142	153	17	1	0	0	(12)
(13)	Precipitation	PrecAvg		523	19	16	25	37	61	83	77	79	50	36	23	20	(13)
(14)		PrecMax		712	47	42	50	90	178	182	155	173	148	72	55	38	(14)
(15)		PrecMin		339	3	5	10	5	8	3	17	4	10	3	1	6	(15)
(16)		PrecSD		105.3	13.3	10.6	12.7	23.1	49.0	39.3	40.8	42.8	35.0	16.5	14.8	7.9	(16)
(17)	Monthly Design Dry Bulb and Mean Coincident Wet Bulb Temperatures	0.4%	DB		3.4	4.5	12.2	24.6	30.9	33.3	32.2	32.9	29.0	23.1	12.5	3.9	(17)
(18)			MCWB		1.4	2.8	7.7	14.0	18.3	22.3	22.5	21.3	19.7	14.9	7.6	1.6	(18)
(19)		2%	DB		0.4	2.3	8.1	21.0	27.0	29.4	29.9	30.3	26.2	18.8	9.2	1.3	(19)
(20)			MCWB		-0.6	1.0	5.2	11.8	16.7	20.5	21.8	21.1	18.2	12.7	6.3	0.1	(20)
(21)		5%	DB		-2.0	0.6	5.2	17.9	24.0	27.1	28.2	28.2	23.7	15.7	6.5	-0.4	(21)
(22)			MCWB		-2.8	-0.3	3.0	10.2	14.7	19.3	20.9	20.0	17.0	10.7	3.9	-1.4	(22)
(23)		10%	DB		-4.3	-1.8	3.2	14.6	21.3	25.1	26.5	26.3	21.2	13.0	3.9	-2.1	(23)
(24)			MCWB		-5.0	-2.7	1.7	8.4	13.6	18.0	19.9	19.1	15.6	9.3	1.9	-3.1	(24)
(25)	Monthly Design Wet Bulb and Mean Coincident Dry Bulb Temperatures	0.4%	WB		1.5	2.9	8.8	15.3	20.3	24.1	24.9	24.1	21.5	16.5	8.8	1.9	(25)
(26)			MCDB		3.1	4.2	11.5	22.2	26.9	29.9	30.1	29.4	26.5	21.3	11.3	3.4	(26)
(27)		2%	WB		-0.6	1.3	5.4	12.4	17.9	21.7	23.3	22.2	19.3	13.4	6.5	0.2	(27)
(28)			MCDB		0.4	2.2	7.8	19.4	24.2	27.5	28.0	28.1	23.9	17.2	9.2	1.3	(28)
(29)		5%	WB		-2.8	-0.3	3.4	10.6	15.9	20.2	22.0	21.0	17.8	11.3	4.1	-1.4	(29)
(30)			MCDB		-2.0	0.7	5.0	16.7	21.9	25.7	27.1	26.4	22.1	15.4	6.2	-0.5	(30)
(31)		10%	WB		-5.0	-2.8	1.8	9.0	14.4	18.8	20.6	19.8	16.2	9.5	2.1	-3.0	(31)
(32)			MCDB		-4.3	-1.9	3.0	14.3	20.0	23.6	25.2	24.8	20.6	12.6	3.7	-2.2	(32)
(33)	Mean Daily Temperature Range		MDBR		9.1	9.5	9.2	11.7	12.9	11.4	11.4	12.1	11.7	10.3	8.2	8.4	(33)
(34)		5% DB	MCDBR		9.4	9.3	9.9	16.5	16.1	14.0	13.2	14.5	15.3	14.7	11.7	8.8	(34)
(35)			MCWBR		8.7	8.4	7.4	9.7	8.2	7.1	7.0	7.1	8.5	9.3	8.7	7.9	(35)
(36)		5% WB	MCDBR		9.4	8.9	9.3	15.0	13.6	12.2	11.7	12.5	13.0	13.6	11.0	8.8	(36)
(37)			MCWBR		8.7	8.1	7.2	9.3	7.9	6.9	6.9	6.8	8.1	9.1	8.5	8.0	(37)
(38)	Clear Sky Solar Irradiance	taub			0.238	0.255	0.266	0.295	0.319	0.331	0.338	0.342	0.318	0.295	0.276	0.243	(38)
(39)		taud			2.466	2.359	2.429	2.505	2.443	2.416	2.416	2.453	2.559	2.628	2.531	2.525	(39)
(40)		Ebn,noon			846	904	957	957	939	925	913	894	886	856	785	793	(40)
(41)		Edh,noon			57	81	92	96	107	111	109	101	81	64	54	47	(41)

Nomenclature: See separate page