2021 ASHRAE Handbook - Foundamentals (SI)

SAN RAFAEL, ARGENTINA (WMO: 875090)

Lat:34.5908S	Long:68.4017W	Elev:748	StdP: 92.66	Time zone:-3.00 (W03)	Period:94-19	WBAN:99999

Annual Heating, Humidification, and Ventilation Design Conditions

Coldest Month	Heating DB		Humidification DP/MCDB and HR						Coldest month WS/MCDB				MCWS/PCWD to 99.6% DB		WSF
			99.6%			99%			0.4%		1%				
	99.6%	99%	DP	HR	MCDB	DP	HR	MCDB	WS	MCDB	WS	MCDB	MCWS	PCWD	
7	-2.0	-0.5	-12.4	1.4	10.9	-9.9	1.8	9.0	10.3	14.0	8.7	13.6	1.6	270	0.436

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
1	14.2	34.9	19.5	33.4	19.1	31.9	18.5	22.0	31.2	21.0	30.0	20.1	28.7	5.2	0

Dehumidification DP/MCDB and HR									Enthalpy/MCDB						Extreme Max WB
0.4%			1%			2%			0.4%		1%		2%		
DP	HR	MCDB	DP	HR	MCDB	DP	HR	MCDB	Enth	MCDB	Enth	MCDB	Enth	MCDB	
19.1	15.3	26.0	18.1	14.2	25.1	17.0	13.3	24.3	68.2	31.2	64.3	30.2	61.0	28.8	27.2

Extreme Annual Design Conditions

Extreme Annual WS				Extreme Annual Temperature				n-Year Return Period Values of Extreme Temperature							
				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
9.2	7.5	6.3	DB	-4.5	38.1	1.3	1.6	-5.5	39.3	-6.3	40.2	-7.0	41.2	-8.0	42.4
			WB	-5.7	24.0	1.2	1.3	-6.5	25.0	-7.2	25.8	-7.8	26.5	-8.7	27.5

Monthly Climatic Design Conditions

		Annual	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperatures, Degree-Days and Degree-Hours	DBAvg	15.9	23.8	22.4	19.8	15.5	11.8	9.0	8.2	10.1	12.7	16.0	19.5	22.2
	DBStd	6.34	2.90	3.45	3.55	3.55	3.40	3.06	3.42	3.94	3.80	3.62	3.35	3.23
	HDD10.0	219	0	0	1	3	19	54	74	46	17	3	1	0
	HDD18.3	1482	2	8	27	97	202	282	313	256	172	90	27	7
	CDD10.0	2364	428	346	303	168	77	23	20	50	98	188	284	379
	CDD18.3	584	171	121	71	12	1	0	0	1	3	17	61	128
	CDH23.3	6912	1924	1282	751	179	22	1	3	43	94	303	790	1521
	CDH26.7	2804	901	557	266	33	3	0	0	9	17	79	283	657
Wind	WSAvg	2.5	2.7	2.5	2.4	2.1	2.0	2.2	2.4	2.6	2.6	2.8	2.9	3.0
Precipitation	PrecAvg	336	54	47	42	24	11	10	10	15	24	31	40	45
	PrecMax	598	204	281	178	92	53	78	51	79	113	106	160	168
	PrecMin	107	2	0	0	0	0	0	0	0	0	0	0	0
	PrecStd	119	45	45	37	26	13	14	13	19	25	27	32	35
Monthly Design Dry Bulb and Mean Coincident Wet Bulb Temperatures	0.4% DB	37.4	36.2	33.6	29.7	25.9	22.6	22.9	27.7	28.9	31.6	34.1	36.4	
	0.4% MCWB	20.6	20.4	19.6	17.2	14.6	11.7	10.5	13.5	14.0	16.6	18.0	19.2	
	2% DB	35.1	34.0	31.5	27.5	23.1	19.8	20.1	23.8	26.0	28.9	31.9	34.2	
	2% MCWB	19.9	19.6	18.9	16.4	13.9	10.3	9.8	11.9	13.1	15.6	17.5	18.7	
	5% DB	33.2	32.1	29.7	25.3	21.0	17.8	17.9	21.0	23.7	26.7	30.0	32.2	
	5% MCWB	19.3	19.0	18.4	15.3	12.9	9.6	9.0	10.6	12.3	14.5	16.7	18.5	
	10% DB	31.5	30.2	27.8	23.3	18.8	15.9	15.6	18.3	21.2	24.6	28.0	30.4	
	10% MCWB	18.8	18.6	17.5	14.6	11.8	8.6	7.9	9.1	11.2	13.8	15.8	17.5	
Monthly Design Wet Bulb and Mean Coincident Dry Bulb Temperatures	0.4% WB	23.3	23.2	22.2	19.3	16.2	12.8	12.1	14.5	16.1	19.1	20.8	23.0	
	0.4% MCDB	32.8	31.9	30.5	25.7	23.5	19.9	20.2	25.2	26.0	28.0	30.3	32.0	
	2% WB	21.7	21.8	20.5	17.7	14.8	11.3	10.6	12.4	14.3	17.2	19.1	21.0	
	2% MCDB	31.4	30.7	28.3	24.8	21.1	18.1	18.7	22.7	23.6	25.9	28.9	30.5	
	5% WB	20.8	20.7	19.2	16.5	13.6	10.1	9.4	11.0	13.0	15.8	17.7	19.6	
	5% MCDB	30.5	28.7	27.4	23.3	19.1	16.4	16.8	19.6	21.9	24.2	27.3	28.9	
	10% WB	19.9	19.7	18.2	15.4	12.4	9.1	8.2	9.6	11.7	14.6	16.6	18.6	
	10% MCDB	29.0	27.4	26.2	21.7	17.4	15.2	14.6	17.3	20.0	22.5	25.9	28.0	

Mean Daily Temperature Range		MDBR	14.2	13.5	12.8	12.3	11.6	12.6	12.9	13.5	13.6	13.6	14.6	14.5
	5% DB	MCDBR	16.8	16.5	16.1	16.0	15.2	15.7	16.5	17.7	17.9	17.6	18.1	17.4
		MCWBR	6.4	6.2	6.6	7.6	7.9	8.8	8.9	8.8	8.5	7.9	7.9	7.1
	5% WB	MCDBR	14.7	13.8	14.0	13.8	13.2	14.5	15.1	16.1	16.1	15.3	15.8	15.0
		MCWBR	6.3	6.2	6.5	7.3	7.5	8.5	8.7	8.5	8.5	7.9	7.9	7.1
Clear Sky Solar Irradiance	taub		0.386	0.374	0.363	0.349	0.324	0.297	0.296	0.320	0.356	0.354	0.361	0.372
	taud		2.361	2.400	2.426	2.434	2.467	2.546	2.517	2.438	2.338	2.374	2.370	2.373
	Ebn at noon		951	940	912	866	835	841	861	885	904	949	969	968
	Edn at noon		131	121	110	97	82	71	76	94	118	123	129	130
All-Sky Solar Radiation	RadAvg		8.02	6.99	5.71	4.23	2.96	2.64	2.88	3.78	5.12	6.41	7.76	8.31
	RadStd		0.44	0.38	0.41	0.41	0.34	0.22	0.20	0.28	0.34	0.63	0.45	0.42

Historical Trends

	DBAvg	Heating		Cooling			Degree-Days				
		99% DB	99% DP	1% DB	1% WB	1% DP	HDD10.0	HDD18.3	CDD10.0	CDD18.3	
Station Only	N/A	N/A	N/A	+0.85	N/A	N/A	N/A	N/A	N/A	N/A	
Regional (0 neighbors)	N/A	N/A	N/A	+0.64	N/A	N/A	N/A	N/A	N/A	+63	

CDDn	Cooling degree-days base n°C, °C-day	Lat	Latitude, °	Period	Years used to calculate the design conditions
CDHn	Cooling degree-hours base n°C, °C-hour	Long	Longitude, °	Sd	Standard deviation of daily average temperature, °C
DB	Dry bulb temperature, °C	MCDB	Mean coincident dry bulb temperature, °C	StdP	Standard pressure at station elevation, kPa
DP	Dew point temperature, °C	MCDBR	Mean coincident dry bulb temp. range, °C	taub	Clear sky optical depth for beam irradiance
Ebn,noon Edh,noon	Clear sky beam normal and diffuse horizontal irradiances at solar noon, W/m2	MCDP	Mean coincident dew point temperature, °C	taud	Clear sky optical depth for diffuse irradiance
		MCWB	Mean coincident wet bulb temperature, °C	Tavg	Average temperature, °C
Elev	Elevation, m	MCWBR	Mean coincident wet bulb temp. range, °C	Time Zone	Hours ahead or behind UTC
Enth	Enthalpy, kJ/kg	MCWS	Mean coincident wind speed, m/s	WB	Wet bulb temperature, °C
HDDn	Heating degree-days base n°C, °C-day	MDBR	Mean dry bulb temp. range, °C	Hours 8/4 & 12.8/20.6	Number of hours between 8 a.m. and 4 p.m with DB between 12.8 and 20.6 °C
PCWD	Prevailing coincident wind direction, °,0 = North, 90 = East	WS	Wind speed, m/s	HR	Humidity ratio, g of moisture per kg of dry air