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Weather Data*

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RECOMMENDATIONS FOR MOISTURE CONTROL in buildings should be based on the specific climatic conditions that the building experiences or will experience. In Chapter 23, "Thermal and Moisture Control in Insulated Assemblies-Applications," in the 1997 ASHRAE handbook [1], three climate types are delineated for the purposes of moisture control: heating, cooling, and mixed climates. However, the definitions of these climate types are somewhat arbitrary, and they are used only to formulate a set of prescriptive and generic moisture control strategies. Neither the definition of climate type nor the moisture control strategies in the 1997 ASHRAE handbook are supported by analyses of the performance of buildings under design weather conditions and under standard indoor moisture design loads. At present, a standard for such moisture design loads is under development within ASHRAE (SPC 160P–Design Criteria for Moisture Control in Buildings). It will include criteria for moisture design weather data but will not provide the actual weather data. Until such design weather data are available, a moisture analysis has to be conducted with currently available weather data or design weather data generated by the user.

Building moisture analysis can provide specific information on the expected moisture levels in specific building constructions during a specific period of time. If the analysis is done for design purposes, the input data should reflect design conditions for the interior as well as the exterior of the building. The kind of weather data needed for moisture analysis depends on the analytical tool used and the purpose of the analysis. Generally, building moisture analysis requires more detailed weather data than building energy analysis or air-conditioning equipment sizing and design. In addition to temperature, wind, and solar radiation data, the analysis requires a measure of outdoor humidity (vapor pressure, wet-bulb temperature, dew point temperature, or humidity ratio) and often calls for precipitation data.

SOURCES OF WEATHER DATA

Detailed historical hourly weather data are available from the National Climatic Data Center (NCDC). The World Data Center for Meteorology at the NCDC in Ashville, NC, can provide archived weather data from around the world. The Surface Airways Meteorological and Solar Observing Network (SAMSON) data set contains historical hourly data for the United States, and the Canadian Weather Energy and Engineering Data Sets (CWEEDS) provide data for Canada. Some of this information is available on the Word Wide Web. Data sets have been derived from these historical data using statistical criteria that depend on the intended use of the data. A brief description of some of these data sets follows.

Chapter 26, "Climatic Design Information," in the 1997 *ASHRAE Handbook* [1] provides weather information that is useful for the design and sizing of heating, ventilating, air-conditioning, or dehumidification equipment. These data help determine peak operating conditions for the equipment. However, the weather conditions described occur only rarely. The summer conditions given are exceeded only 0.4, 1, or 2% of the time, and the winter design conditions are based on a 0.4 and 1% frequency (also referred to as 99.6 and 99% annual percentiles). The 1997 annual frequency data replaced data at 1, 2.5, and 5% frequency for summer and 1 and 2.5% frequency for winter [1], which were included in the ASTM *Manual on Moisture Control in Buildings* [2]. Data of such extremity would rarely be called for in moisture analysis.

ASHRAE has produced one year of hourly weather data known as Weather Year for Energy Calculations (WYEC) data [3]. The data were recently revised, improved, and reissued as WYEC Version 2, or WYEC2 data, for 52 locations in the United States and 6 locations in Canada [4]. The MOIST building moisture analysis computer program uses WYEC data [5]. The WYEC data represent typical conditions from the viewpoint of building energy consumption and do not include precipitation.

Typical Meteorological Year (TMY) data were produced for building energy analysis as well. An updated set, TMY2, for 239 cities in the United States is available from the National Renewable Energy Laboratory [6]. The Canadian Weather Year for Energy Calculations (CWEC) data were developed for 47 locations, using the TMY algorithm and software and is available from Environment Canada. The TMY data do not include precipitation.

CLIMATE DEFINITIONS FOR MOISTURE CONTROL

Recommendations for moisture control strategies are usually given by climate type. For instance, the 1997 ASHRAE handbook provides recommendations for heating climates,

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TABLE 1a-Mean monthly dry-bulb and dew-point temperatures (°C) over 30 years (1961-1990) for United States locations.

			January		April		July		October	
State	WBAN	Location	Mean DB	Mean DP	Mean DB	Mean DP	Mean DB	Mean DP	Mean DB	Mean DP
AK	26451	Anchorage	-9.2	-13.3	2.2	-4.4	14.7	9.2	1.6	-2.8
AK	25308	Annette	1.3	-2.2	6.1	1.6	14.3	10.3	8.3	5.3
AK	27502	Barrow	-25.2	-28.6	-18.7	-21.7	3.9	2	-10.1	-12
AK	26615	Bethel	-14	-17.2	-4.5	-7.6	12.7	9	-1.4	-3.8
AK	26533	Bettles	-24.5	-28.3	-5.9	-11.2	15.5	8.9	-7.3	-10.5
AK	26415	Big Delta	-20.1	-24.6	-0.1	-8.6	15.9	8.4	-3.7	-7.6
AK	25624	Cold Bay	-1.6	-3.9	0.7	-2	10	7.8	4.3	1.4
AK	26411	Fairbanks	-23.4	-27.3	-0.3	-8.7	17	9.3	-3.8	-8
AK	26425	Gulkana	-21.3	-24.8	0.2	-7.2	14.7	6.9	-2.2	-6.2
AK	25503	King Salmon	-9.3	-12.7	-0.3	-5.1	12.4	8.3	0.4	-2.9
AK	25501	Kodiak	-0.6	-4.3	2.9	-2	12.3	9.2	4.7	0.3
AK	26616	Kotzebue	-18.2	-21.9	-11.1	-14.4	12.1	8.7	-4.9	-7.9
AK	26510	McGrath	-22.3	-25.7	-2.4	-9.1	14.9	8.7	-3.9	-7.3
AK	26617	Nome	-13.6	-17.4	-7.3	-11.3	11.1	7.2	-1.9	-6.1
AK	25713	St. Paul Is.	-2.6	-4.9	-1.7	-3.9	7.7	6.7	3.5	0.7
AK	26528	Talkeetna	-11.3	-15.4	1.3	-4.7	15.1	10	-0.1	-3.4
AK	25339	Yakutat	-3.7	-6.3	2.6	-0.6	12.1	9.9	4.9	2.8
AL	13876	Birmingham	5.4	-0.2	16.9	9.3	26.1	20.7	16.7	10.7
AL	3856	Huntsville	3.8	-1.2	16.3	8.4	25.8	20.3	16	9.8
AL	13894	Mobile	9.7	4.3	19.6	13.2	27	22.1	19.7	13.6
AL	13895	Montgomery	7.4	1.6	18.2	11.1	26.7	21.6	18.2	12
AR	13964	Fort Smith	2.3	-3.2	16.3	8.5	27.3	20.3	16.3	9.8
AR	13963	Little Rock	3.8	-1.7	16.8	9.8	27.3	21.2	16.8	10.7
AZ	3103	Flagstaff	-1.9	-9	6.1	-6.4	18.9	6.6	8.2	-2.6
AZ	23183	Phoenix	11.7	0.2	21.6	-0.1	34.3	13.4	23.5	6.1
AZ	23184	Prescott	2.5	-5.8	11.4	-4.6	24.1	9.1	13.5	0.2
AZ	23160	Tucson	10.3	-2	19.1	-2.9	29.8	13.3	20.9	4.1
CA	24283	Arcata	7.7	4.5	9.4	6.1	13.4	10.9	11.5	9.2
CA	23155	Bakersfield	8.4	4.1	17.1	5.6	29.2	10.8	19.9	8.2
CA	23161	Daggett	8.9	-3.3	18.3	-0.9	31.9	6.9	20.4	1.3
CA	93193	Fresno	7.1	4.1	16	6.3	27.9	11.3	18	8.6
CA	23129	Long Beach	12.9	5.1	16.1	8.9	21.6	15.2	19.3	12.2
CA	23174	Los Angeles	13.3	5.2	15.3	9.5	20	15.6	18.8	12.4
CA	23232	Sacramento	7	4.1	14.2	6.6	23.2	11.8	16.9	8.7
CA	23188	San Diego	13.9	6.1	16.4	9.8	21	16.2	19.6	13.1
CA	23234	San Francisco	9.1	5.2	12.5	6.9	16	10.8	15.3	9.7
CA	23273	Santa Maria	10.7	4.6	13	7.6	16.9	11.8	16	9.7
co	23061	Alamosa	-10.1	-14.2	5.7	-7.1	18.2	7.2	6.5	-3.7
co	94018	Boulder	-1.6	-10.6	9.1	-3.2	22.7	9.2	10.4	-1.8
co	93037	Colorado Springs	-2.1	-12.1	8	-5.2	21.3	8.8	9.8	-3.2
co	23063	Eagle	-8	-12.1	5.7	-4.3	19.2	6.7	6.4	-2.7
co	23066	Grand Junction	-4.2	-9.3	11.1	-4.1	25.9	6.5	12.1	-1.1
co	93058	Pueblo	-1.2	-9.4	11.7	-2.8	25.2	11.3	12.4	-0.7
CT	94702	Bridgeport	-1.6	-7.4	9	1.6	23.1	17.4	13.4	7.6
CT	14740	Hartford	-3.9	-10	9.2	0.2	23	16.1	11.1	5
DE	13781	Wilmington	-0.7	-6.3	11.2	3.2	24.5	18.1	13.4	7.6
FL	12834	Daytona Beach	13.9	9.1	20.7	14.2	26.6	22.1	22.8	17.8
FL	13889	Jacksonville	11.2	6.3	19.8	13.2	2.7	22.4	20.7	16.4
FL	12836	Key West	20.8	16.3	24.8	18.8	29.1	23.5	26.4	21.6
FL	12839	Miami	19.6	14.2	23.9	17	27.9	22.8	25.5	20.4
FL	93805	Tallahassee	10.1	5.1	19.2	12.4	26.4	22.3	19.8	14.3
FL	12842	Tampa	14.9	10.1	21.7	15.1	27.3	22.6	23.2	17.9
FL	12844	West Palm Beach	18.5	13.2	23	16.2	27.5	22.8	25.1	19.8
GA	13873	Athens	5.2	-0.9	16.4	8.3	25.7	20.4	16.4	10.5
GA	13874	Atlanta	4.8	-1.5	16.3	7.7	25.3	19.9	16.4	9.8
GA	3820	Augusta	6.3	0.4	17	9.1	26.4	20.7	16.9	11.2
GA	93842	Columbus	7.4	1.7	18.2	10.3	26.9	21.4	18.4	12.2
GA	3813	Macon	7.3	1.4	18	10.2	26.7	21.1	17.9	11.8
GA	3822	Savannah	8.9	2.9	18.6	11	26.9	21.8	19.2	13.6
HI	21504	Hilo	21.6	17.1	22.1	18.4	24	20.1	23.8	20
HI	22521	Honolulu	22.4	17.2	23.8	17.2	26.3	18.9	25.9	19.3
HI	22516	Kahului	22.2	17.2	23.5	17.6	25.9	19.2	25.4	19.3
HI	22536	Lihue	21.8	17.3	23.1	18.3	25.7	20.6	25.1	20.5
IA	14933	Des Moines	-6.9	-11.5	10.4	2.8	24.6	17.7	11.7	5.1
IA	14940	Mason City	-10.3	-14.1	7.8	1.6	22.6	16.9	9.4	3.9
IA	14943	Sioux City	-7.9	-12.3	10.1	1.9	24.2	17.7	10.8	3.9
IA	94910	Waterloo	-9.4	-13.4	8.7	1.9	22.9	17.1	9.9	4.1
ID	24131	Boise	-1.7	-5.8	9.6	-1	23.7	6.2	10.7	0.4

TABLE 1a–Mean monthly dry-bulb and dew-point temperatures (°C) over 30 years (1961-1990) for United States locations. *(continued)*

			January		April		July		October	
State	WBAN	Location	Mean DB	Mean DP	Mean DB	Mean DP	Mean DB	Mean DP	Mean DB	Mean DP
ID	24156	Pocatello	-4.8	-8.7	7.3	-2.9	21.8	6.2	8.7	-1.6
IL	94846	Chicago	-5.8	-10.2	9.2	2.2	23.1	16.5	11.6	5.4
IL	14923	Moline	-6.5	-11.2	10.3	3	24.1	17.8	11.6	5.3
IL	14842	Peoria	-5.7	-9.7	10.7	3.6	23.9	18	11.8	5.9
IL	94822	Rockford	-7.4	-11.1	8.9	2.1	23.1	16.9	10.7	5.2
IL	93822	Springlield	-4.2	-8.3	11.9	4.8	24.8	18.5	13	6.6
IN	93817	Evansville	-0.9	-5.7	13.7	6.4	25.5	19.3	13.7	7.5
IN	14827	Fort Wayne	-4.9	-8.7	9.6	2.9	23.1	16.6	11.3	5.8
IN	93819	Indianapolis	-3.6	-7.6	11.3	4.4	24	18.3	12.3	6.7
IN	14848	South Bend	-4.7	-8.3	9.3	2.6	22.8	16.5	11.4	6.1
KS	13985	Dodge City	-1.8	-8.2	12.3	2.6	26.6	15.6	13.6	4.1
KS	23065	Goodland	-2.8	-9.1	9.6	0.2	24.1	13.8	10.9	1.1
KS	13996	Topeka	- 3	-8.2	12.9	5.4	25.9	19.3	13.6	6.9
KS	3928	Wichita	-1.6	-6.8	13.6	5.8	27.4	17.6	14.6	7.2
KY	93814	Covington	-2.1	-6.7	11.9	4.2	23.9	17.9	12.7	6.6
KY	93820	Lexington	-0.7	-5.2	12.7	5	24.1	18.2	13.5	7.3
KY	93821	Louisville	-0.1	-5.5	13.7	5.5	25.2	19	14.1	7.9
LA	13970	Baton Rouge	9.6	4.7	19.9	13.8	27.1	22.3	19.7	13.9
LA	3937	Lake Charles	9.9	5.9	19.9	15	27.2	23.1	20.1	14.9
LA	12916	New Orleans	10.8	6.2	20.5	15.1	27.2	23.1	20.5	15.4
LA	13957	Shreveport	7.1	1.8	18.6	12.2	27.6	21.6	18.7	12.7
MA	14739	Boston	-1.8	-8.6	8.6	0.9	22.8	16.1	12.2	6
MA	94746	Worchester	- 5	-10.8	6.9	-1.3	20.9	14.8	9.9	4
MD	93721	Baltimore	-0.1	-6.7	12	3.2	24.8	18.1	13.6	7.6
ME	14607	Caribou	-11.9	-15.9	3.3	-2.8	18.7	13.5	6.2	2
ME	14764	Portland	-5.8	-11.2	6.1	-0.5	20.2	15.1	9.3	4.3
MI	94849	Alpena	-7.2	-10.9	5.2	-1.5	19.9	13.6	8.3	3.7
MI	94847	Detroit	-4.8	-8.8	8.4	1.7	22.4	15.8	10.6	5.2
MI	14826	Flint	-5.5	-9.3	7.8	1.1	21.7	15.2	10.1	5.1
MI	94860	Grand Rapids	-5.3	-8.7	7.9	1.3	22.1	15.6	10.1	5.3
MI	94814	Houghton	-8.1	-11.2	5.4	-1.1	20.3	13.9	8.3	4.1
MI	14836	Lansing	-5.7	-8.9	7.8	1.4	21.9	15.8	9.9	5.3
MI	14840	Muskegon	-4.9	-8.2	7.4	0.6	21.4	15.4	10.4	5.6
MI	14847	Sault Ste.	-10.2	-13.4	3.6	-2.1	17.9	13.2	6.9	3.5
MI	14850	Traverse City	-6.4	-9.8	5.9	-0.7	20.9	14.1	9.4	4.6
MN	14913	Duluth	-13.4	-17.4	3.6	-3.5	18.8	12.8	6.4	1.1
MN	14918	International Falls	-16.6	-20.7	4	-3.7	19.4	13.4	5.7	1
MN	14920	La Crosse	-9.4	-13.5	8.6	1.2	22.8	16.9	10	4.4
MN	14922	Minneapolis	-10.9	-15.4	8	-0.2	23.2	15.6	9.4	3.3
MN	14925	Rochester	-11.1	-14.4	7.1	0.9	21.5	15.8	8.7	3.3
MN	14926	Saint Cloud	-12.9	-16.5	6.4	-0.8	21.7	15.3	7.8	2.5
MO	3945	Columbia	-2.5	-7.4	12.8	5.1	25.3	18.7	13.5	6.8
MO	3947	Kansas City	-2.7	-8.2	13.1	4.8	26.2	18.8	14.2	6.7
MO	13995	Springfield	-0.6	-6.2	13.4	6.1	25.2	18.9	14	7.4
MO	13994	St. Louis	-1.8	-6.5	13.5	5.7	26.2	19.2	14.3	7.8
MS	3940	Jackson	6.8	2.3	18.2	12.1	26.9	21.9	17.8	12.3
MS	13865	Meridian	6.7	1.8	17.8	11.3	26.3	21.4	17.2	11.7
MT	24033	Billings	-5.2	-12.2	7.3	-2.9	22.3	8.5	9.2	-1.2
MT	24137	Cut Bank	-8.3	-13.8	4.8	-4.4	18.6	6.3	7	-2.4
MT	94008	Glasgow	-11.7	-15.4	6.6	-2.6	21.7	9.4	7.4	- I
MT	24143	Great Falls	-5.8	-12.2	6.5	-3.6	20.8	6.7	8.6	-1.8
MT	24144	Helena	-6.6	-11.9	6.2	-3.5	20.2	6.5	6.9	-1.7
MT	24146	Kalispell	-5.9	-9.2	6.2	-1.8	18.6	8.4	5.3	0.1
MT	24036	Lewistown	-6.4	-11.6	5.1	-2.9	19.1	8.3	7.2	-1.7
MT	24037	Miles City	-9.1	-13.3	7.7	-1.4	23.9	10.1	8.6	0.1
MT	24153	Missoula	-5.3	-8.1	6.7	-1.2	19.6	7.6	6.1	0.4
NC	3812	Asheville	1.6	-3.6	12.7	5.2	22.2	18.3	12.6	8.1
NC	93729	Cape Hatteras	7.1	2.7	15.1	9.7	25.8	22.1	18.6	13.9
NC	13881	Charlotte	4.1	-2.6	15.6	6.5	25.4	19.5	15.8	9.5
NC	13723	Greensboro	2.5	-3.7	14.4	5.8	24.7	19.5	14.4	8.7
NC	13722	Raleigh	3.6	-2.8	14.9	6.3	24.9	19.8	15.2	9.7
NC	13748	Wilmington	7	1.4	16.8	9.8	26.4	22	17.8	12.9
ND	24011	Bismarck	-12.2	-16.4	6.2	-1.9	21.7	12.8	7.4	0
ND	14914	Fargo	-14.3	-18.1	6.2	-0.8	22	14.8	7.6	1.6
ND	24013	Minot	-13.1	-17.8	5.6	-2.3	21.1	12.2	7.1	-0.2
NE	14935	Grand Island	-5.7	-10.8	10.3	1.9	24.6	16.7	11.1	3.3
NE	14941	Norfolk	-6.7	-11.9	10.6	1.3	25.1	16.6	11.2	2.9
NE	24023	North Platte	- 6	-11.2	9	0.1	23.4	14.9	9.6	1.2

TABLE 1a–Mean monthly dry-bulb and dew-point temperatures (°C) over 30 years (1961-1990) for United States locations. *(continued)*

			January		April		July		October	
State	WBAN	Location	Mean DB	Mean DP	Mean DB	Mean DP	Mean DB	Mean DP	Mean DB	Mean DP
NE	94918	Omaha	**-5.9**	-10.6	11.2	2.9	25.1	18.2	11.9	5.2
NE	24028	Scottsbluff	-4.2	-10.6	8.3	-1.5	23.1	12.3	9.2	-0.7
NH	14745	Concord	-6.7	-11.9	6.9	-1.1	21.1	15.1	8.9	3.6
NJ	93730	Atlantic City	-0.4	-5.6	10.3	3.4	23.7	18.2	13	8.1
NJ	14734	Newark	-0.7	-6.8	11.1	1.9	24.9	16.9	13.9	7.1
NM	23050	Albuquerque	0.9	-7.8	13.1	-5.9	25.2	9.5	13.7	0.3
NM	23048	Tucumcari	2.3	-6.5	14.4	-0.7	26.3	13.8	14.8	3.2
NV	24121	Elko	-4.1	-8.7	7.1	-3.7	22.4	2.9	8.3	-3.6
NV	23154	Ely	-4.7	-10.8	5.4	-5.6	20.5	1.9	7.3	-4.2
NV	23169	Las Vegas	7	-5.5	18.2	-4.4	32.8	4.8	19.7	-0.9
NV	23185	Reno	-0.1	-5.9	9.1	-3.6	22.3	4.3	10.3	-1.2
NV	23153	Tonopah	-0.8	- 8	9.4	-6.6	24.4	0.4	11.5	-4.7
NV	24128	Winnemucca	-1.6	-6.8	8.3	-4.4	23.6	1.5	9.3	-3.6
NY	14735	Albany		-10.5		0.1		15.7		4.7
NY	4725	Binghamton	-5.9	-10	6.8	-0.2	20.5	14.7	9.3	4.4
NY	14733	Buffalo	-4.7	-8.4	7.2	0.8	21.7	15	10.5	5.4
NY	94725	Massena	-9.4	-12.9	6.1	-0.2	20.9	15.1	8.4	4.2
NY	94728	New York City	-0.3	-7.3	10.6	2	24.4	16.8	14.1	7.1
NY	14768	Rochester	-4.5	-8.6	7.7	1.2	21.9	15.5	10.5	5.7
NY	14771	Syracuse	-5.1	-9.2	7.7	0.7	21.7	15.5	10.3	5.4
OH	14895	Akron	-3.9	-8.1	9.2	1.8	22.1	15.9	11.2	5.4
OH	14820	Cleveland	-3.8	-8.1	8.8	2.1	22.3	16.1	11.5	5.9
OH	14821	Columbus	- 3	-7.6	10.7	3.1	23.2	17.1	11.9	5.9
OH	93815	Dayton	-3.3	-7.7	10.7	3.4	23.5	16.9	12	5.9
OH	14891	Mansfield	-4.1	-7.8	9.3	2.4	22.5	16.3	11.4	5.6
OH	94830	Toledo	- 5	-8.9	8.8	2	22.3	16.3	10.6	5.3
OH	14852	Youngstown	-4.5	-8.4	8.5	1.6	21.3	15.6	10.6	5.3
OK	13967	Oklahoma City	1.8	-4.5	15.9	7.4	27.6	18.6	16.4	8.8
OK	13968	Tulsa	1.6	-4.7	16.3	7.8	28.3	19.9	16.5	9.3
OR	94224	Astoria	5.6	2.7	8.8	5.2	15.4	11.8	11.5	8.5
OR	94185	Burns	-3.6	-6.8	6.5	-3.1	20.7	4.3	8.1	-1.2
OR	24221	Eugene	4.3	2.3	9.7	5.3	19.3	11	11.4	7.8
OR	24225	Medford	2.8	0.2	10.2	3	22.3	9.1	11.6	5.3
OR	24284	North Bend	7.2	4.2	9.6	5.8	1.5	11.4	12.2	9.1
OR	24155	Pendleton	0.8	-3.1	10.1	1.3	23.1	5.8	11	2.3
OR	24229	Portland	4.2	0.9	10.4	4.9	19.6	11.6	12.3	8
OR	24230	Redmond	-0.4	-5.2	6.8	-2.3	19.2	5.2	8.7	-0.3
OR	24232	Salem	4.2	1.4	9.6	4.6	19.1	10.9	11.2	7.2
PA	14737	Allentown	-2.9	-8.1	9.9	1.6	23.3	16.6	11.8	6.3
PA	4751	Bradford	-6.9	-10.2	5.9	-0.4	18.7	14.1	8.1	3.8
PA	14860	Erie	-3.8	-7.9	7.3	1.2	21.3	15.7	11.1	5.7
PA	14751	Harrisburg	-1.8	- 8	10.9	2.3	24.1	17.3	12.4	6.7
PA	13739	Philadelphia	-0.8	-6.8	11.3	2.8	24.6	18.1	13.4	7.7
PA	94823	Pittsburgh	-3.2	-8.2	9.8	1.4	22.2	15.6	11.2	4.9
PA	14777	Wilkes-Barre	-3.9	-8.8	8.8	0.6	21.9	15.8	10.7	5.3
PA	14778	Williamsport	-3.6	-8.6	9.6	1.4	22.2	16.8	10.8	6
	41415	Guam	25.4	22	26.2	22.4	26.5	23.8	26.4	23.8
PR	11641	San Juan	24.7	19.6	25.9	20.1	27.8	23	27.2	22.6
RI	14765	Providence	-2.2	-8.6	8.7	0.7	22.6	16.4	11.7	5.9
SC	13880	Charleston	8.2	2.2	17.8	10.8	26.7	21.9	18.6	13.3
SC	13883	Columbia	6.2	0.1	17.3	8.6	26.4	20.7	16.9	11.1
SC	3870	Greenville	4.3	-2.3	15.5	6.7	25.1	19.7	15.5	9.3
SD	14936	Huron	-10.3	-14.5	7.9	1	23.5	15.8	8.9	2.2
SD	24025	Pierre	-8.4	-13	8.2	-0.1	24.4	14.2	9.7	1.2
SD	24090	Rapid City	-5.5	-11.7	7.4	-1.6	22.5	12.1	9.2	-0.9
SD	14944	Sioux Falls	-9.8	-14.1	8.3	1	23.6	16	9.2	2.7
TN	13877	Bristol	1	-4.1	13	5	23.1	18.2	13.3	7.6
TN	13882	Chattanooga	2.9	-2.3	15.3	7.4	25.4	20.1	15.1	9.8
TN	13891	Knoxville	2.6	-2.4	14.9	7	24.7	19.6	14.7	9.3
TN	13893	Memphis	3.9	-1.9	17.2	9.2	27.8	21.1	17.2	10.1
TN	13897	Nashville	2.3	- 3	15.2	7.3	25.8	20	15.5	9.1
TX	13962	Abilene	5.6	-2.6	18.3	7.7	28.3	16.9	18.6	9.8
TX	23047	Amarillo	1	-7.6	13.7	0.6	25.7	14.3	14.3	4.1
TX	13958	Austin	9	2.4	20.3	12.8	28.6	20.5	20.7	13.7
TX	12919	Brownsville	14.8	10.8	23.4	18.4	28.6	22.8	23.7	18.7
TX	12924	Corpus Christi	12.6	8.2	22.2	17.3	28.5	23.1	22.9	17.8
TX	23044	El Paso	6.3	-4.8	18.2	-3.7	27.9	12.7	17.6	4.3
TX	3927	Fort Worth	6.1	-0.3	18.6	11.1	29.3	19.8	19.3	11.8

TABLE 1a–Mean monthly dry-bulb and dew-point temperatures (°C) over 30 years (1961-1990) for United States locations. *(continued)*

			January		April		July		October	
State	WBAN	Location	Mean DB	Mean DP	Mean DB	Mean DP	Mean DB	Mean DP	Mean DB	Mean DP
TX	12960	Houston	10.4	5.4	20.4	15	27.8	22.4	20.7	15.3
TX	23042	Lubbock	3.1	-5.8	16.1	2.4	26.3	15.4	15.9	6.6
TX	93987	Lufkin	8.4	3.4	19.7	13.6	27.7	22.1	19.4	13.6
TX	23023	Midland	5.4	-4.2	17.9	2.9	27.2	14.9	17.5	8.2
TX	12917	Port Arthur	10.3	6.3	20.3	15.7	27.5	23.6	20.6	15.8
TX	23034	San Angelo	6.7	-1.5	19.2	7.9	28.2	16.9	18.7	11.1
TX	12921	San Antonio	9.6	2.8	20.7	13.2	28.6	20.6	21.1	13.9
TX	12912	Victoria	11.4	6.7	21.4	15.8	28.3	22.6	21.8	16.3
TX	13959	Waco	7.1	1.5	19.4	12.4	29.4	20.1	20.1	13.1
TX	13966	Wichita Falls	3.8	-2.8	17.4	8.9	29.2	18.3	17.8	10.3
UT	93129	Cedar City	-1.7	-7.8	8.8	-4.2	23.7	4.9	10.8	-1.8
UT	24127	Salt Lake City	-2.3	-6.7	9.9	-0.6	25.6	7.5	11.2	1.4
VA	13733	Lynchburg	1.7	-5.7	13.9	3.9	24.5	18.4	14.2	7.5
VA	13737	Norfolk	4	-2.3	14.1	6.2	25.6	20.1	16.3	10.8
VA	13740	Richmond	2.1	-3.9	14.1	5.4	25.2	19.8	14.6	9.2
VA	13741	Roanoke	1.3	-6.1	13.3	3.6	24	17.8	13.6	7.1
VA	93738	Sterling	-0.6	-6.3	11.8	3.7	24.2	18.3	12.8	7.3
VT	14742	Burlington	-8.1	-13.2	6.2	-0.9	21.1	14.6	8.9	3.8
WA	24227	Olympia	3.4	1.4	8.7	3.9	17.2	11.2	9.8	7.1
WA	94240	Quillayute	4.8	2.7	7.9	4.6	14.4	11.1	10.2	7.8
WA	24233	Seattle	4.5	0.6	9.3	3.8	18	10.8	11.2	7.3
WA	24157	Spokane	-2.8	-5.5	7.8	-0.1	20.8	6.5	8.2	1.6
WA	24243	Yakima	-1.4	-4.9	10.1	-0.6	21.9	7.9	9.3	1.8
WI	14991	Eau Claire	-11.4	-15.2	7.5	0	22.2	15.7	8.8	3.4
WI	14898	Green Bay	-9.4	-13.2	6.6	0.3	21.3	15.4	8.9	4.2
WI	14837	Madison	-8.5	-12.3	7.8	1.1	22.1	16	9.6	4.4
WI	14839	Milwaukee	- 7	-11.2	7	1	21.8	15.9	10.4	5.2
WV	13866	Charleston	0.1	-5.3	12.9	3.7	23.3	18.3	12.9	7.3
WV	13729	Elkins	-2.4	-6.8	9.3	2.7	20.1	16.5	9.8	5.2
WV	3860	Huntington	0.2	-5.2	13.1	4.2	23.7	18.7	13.3	7.4
WY	24089	Casper	- 5	-11.1	5.8	-3.4	21.6	6.6	7.7	-2.9
WY	24018	Cheyenne	-2.8	-12.1	5.8	-4.3	20.1	8	8	-3.6
WY	24021	Lander	-7.2	-13.2	6.2	-4.4	21.7	5.7	7.8	-2.8
WY	24027	Rock Springs	-6.5	-10.9	4.7	-5.1	20.2	3.1	6.6	- 4
WY	24029	Sheridan	-6.1	-11.7	6.8	-2.1	21.4	9	8	-1.2

Source: Colliver, D. G. 1999. Mean monthly dry-bulb and dew-point temperatures determined from the Samson data set. Biosystems and Agricultural Engineering, University of Kentucky, Lexington.

warm and humid cooling climates, and mixed climates [1]. The definitions of these climates are somewhat arbitrary. In the ASHRAE handbook, heating climates are defined as climates with 4000 heating degree days (base 65°F (18°C)) or more. Cooling climates are defined as warm, humid climates where one or both of the following conditions occur: (i) a 67°F (19°C) or higher wet-bulb temperature for 3000 or more hours during the warmest six consecutive months of the year; (ii) a 73°F (23°C) or higher wet-bulb temperature for 1500 or more hours during the warmest six consecutive months of the year. Mixed climates are all other climates that are neither heating nor cooling. In addition to temperature and humidity criteria, these climates can be further subdivided by the amount of rainfall, creating six different climate definitions.

Although these definitions are useful for broad, prescriptive recommendations, it is often difficult to determine in which climate zone a particular location fits. Climate zone definitions also make an assumption about which part of the season is most critical for moisture control, the heating or cooling season. While this approach is often adequate for broad prescriptive measures in extreme climates, it is far more problematic in more moderate climates. In such climates, we recommend an individual analysis.

WEATHER DATA FOR MOISTURE ANALYSIS

Building moisture analysis is most often done to analyze the design of new buildings, changes in design or use of an existing building, or for forensic purposes to investigate building failures. Weather data for forensic purposes ideally should be hourly site data, or as close to that as possible. Weather data for design analysis, however, require more careful consideration. If average weather data are used for design, such as TMY or WYEC data, a load factor should be used to account for the fact that average data do not reflect more severe weather conditions that undoubtedly will occur during the life of the building [7]. However, no guidance is given in the literature to arrive at a value for this load factor. A better approach is to select the level of severity desired for the design climate data and to create a set of design weather data based on that criterion. Such a set has been called a moisture design reference year or MDRY [7]. A consensus is

TABLE 1b–Mean monthly dry-bulb and dew-point temperatures (°F) over 30 Years (1961-1990) for United States locations.

			January		April		July		October	
State	WBAN	Location	Mean DB	Mean DP	Mean DB	Mean DP	Mean DB	Mean DP	Mean DB	Mean DP
AK	26451	Anchorage	15.4	8.1	36.0	24.1	58.5	48.6	34.9	27.0
AK	25308	Annette	34.3	28.0	43.0	34.9	57.7	50.5	46.9	41.5
AK	27502	Barrow	-13.4	-19.5	-1.7	-7.1	39.0	35.6	13.8	10.4
AK	26615	Bethel	6.8	1.0	23.9	18.3	54.9	48.2	29.5	25.2
AK	26533	Bettles	-12.1	-18.9	21.4	11.8	59.9	48.0	18.9	13.1
AK	26415	Big Delta	-4.2	-12.3	31.8	16.5	60.6	47.1	25.3	18.3
AK	25624	Cold Bay	29.1	25.0	33.3	28.4	50.0	46.0	39.7	34.5
AK	26411	Fairbanks	-10.1	-17.1	31.5	16.3	62.6	48.7	25.2	17.6
AK	2642.5	Gulkana	-6.3	-12.6	32.4	19.0	58.5	44.4	28.0	20.8
AK	25503	King Salmon	15.3	9.1	31.5	22.8	54.3	46.9	32.7	26.8
AK	25501	Kodiak	30.9	24.3	37.2	28.4	54.1	48.6	40.5	32.5
AK	26616	Kotzebue	-0.8	-7.4	12.0	6.1	53.8	47.7	23.2	17.8
AK	26510	McGrath	-8.1	-14.3	27.7	15.6	58.8	47.7	25.0	18.9
AK	26617	Nome	7.5	0.7	18.9	11.7	52.0	45.0	28.6	21.0
AK	25713	St. Paul Is.	27.3	23.2	28.9	25.0	45.9	44.1	38.3	33.3
AK	26528	Talkeetna	11.7	4.3	34.3	23.5	59.2	50.0	31.8	25.9
AK	25339	Yakutat	25.3	20.7	36.7	30.9	53.8	49.8	40.8	37.0
AL	13876	Birmingham	41.7	31.6	62.4	48.7	79.0	69.3	62.1	51.3
AL	3856	Huntsville	38.8	29.8	61.3	47.1	78.4	68.5	60.8	49.6
AL	13894	Mobile	49.5	39.7	67.3	55.8	80.6	71.8	67.5	56.5
AL	13895	Montgomery	45.3	34.9	64.8	52.0	80.1	70.9	64.8	53.6
AR	13964	Fort Smith	36.1	26.2	61.3	47.3	81.1	68.5	61.3	49.6
AR	13963	Little Rock	38.8	28.9	62.2	49.6	81.1	70.2	62.2	51.3
AZ	3103	Flagstaff	28.6	15.8	43.0	20.5	66.0	43.9	46.8	27.3
AZ	23183	Phoenix	53.1	32.4	70.9	31.8	93.7	56.1	74.3	43.0
AZ	23184	Prescott	36.5	21.6	52.5	23.7	75.4	48.4	56.3	32.4
AZ	23160	Tucson	50.5	28.4	66.4	26.8	85.6	55.9	69.6	39.4
CA	24283	Arcata	45.9	40.1	48.9	43.0	56.1	51.6	52.7	48.6
CA	23155	Bakersfield	47.1	39.4	62.8	42.1	84.6	51.4	67.8	46.8
CA	23161	Daggett	48.0	26.1	64.9	30.4	89.4	44.4	68.7	34.3
CA	93193	Fresno	44.8	39.4	60.8	43.3	82.2	52.3	64.4	47.5
CA	23129	Long Beach	55.2	41.2	61.0	48.0	70.9	59.4	66.7	54.0
CA	23174	Los Angeles	55.9	41.4	59.5	49.1	68.0	60.1	65.8	54.3
CA	23232	Sacramento	44.6	39.4	57.6	43.9	73.8	53.2	62.4	47.7
CA	23188	San Diego	57.0	43.0	61.5	49.6	69.8	61.2	67.3	55.6
CA	23234	San Francisco	48.4	41.4	54.5	44.4	60.8	51.4	59.5	49.5
CA	23273	Santa Maria	51.3	40.3	55.4	45.7	62.4	53.2	60.8	49.5
c o	23061	Alamosa	13.8	6.4	42.3	19.2	64.8	45.0	43.7	25.3
c o	94018	Boulder	29.1	12.9	48.4	26.2	72.9	48.6	50.7	28.8
c o	93037	Colorado Springs	28.2	10.2	46.4	22.6	70.3	47.8	49.6	26.2
c o	23063	Eagle	17.6	10.2	42.3	24.3	66.6	44.1	43.5	27.1
c o	23066	Grand Junction	24.4	15.3	52.0	24.6	78.6	43.7	53.8	30.0
c o	93058	Pueblo	29.8	15.1	53.1	27.0	77.4	52.3	54.3	30.7
CT	94702	Bridgeport	29.1	18.7	48.2	34.9	73.6	63.3	56.1	45.7
CT	14740	Hartford	25.0	14.0	48.6	32.4	73.4	61.0	52.0	41.0
DE	13781	Wilmington	30.7	20.7	52.2	37.8	76.1	64.6	56.1	45.7
FL	12834	Daytona Beach.	57.0	48.4	69.3	57.6	79.9	71.8	73.0	64.0
FL	13889	Jacksonville	52.2	43.3	67.6	55.8	80.6	72.3	69.3	61.5
FL	12836	Key West	69.4	61.3	76.6	65.8	84.4	74.3	79.5	70.9
FL	12839	Miami	67.3	57.6	75.0	62.6	82.2	73.0	77.9	68.7
FL	93805	Tallahassee	50.2	41.2	66.6	54.3	79.5	72.1	67.6	57.7
FL	12842	Tampa	58.8	50.2	71.1	59.2	81.1	72.7	73.8	64.2
FL	12844	West Palm Beach	65.3	55.8	73.4	61.2	81.5	73.0	77.2	67.6
GA	13873	Athens	41.4	30.4	61.5	46.9	78.3	68.7	61.5	50.9
GA	13874	Atlanta	40.6	29.3	61.3	45.9	77.5	67.8	61.5	49.6
GA	3820	Augusta	43.3	32.7	62.6	48.4	79.5	69.3	62.4	52.2
GA	93842	Columbus	45.3	35.1	64.8	50.5	80.4	70.5	65.1	54.0
GA	3813	Macon	45.1	34.5	64.4	50.4	80.1	70.0	64.2	53.2
GA	3822	Savannah	48.0	37.2	65.5	51.8	80.4	71.2	66.6	56.5
HI	21504	Hilo	70.9	62.8	71.8	65.1	75.2	68.2	74.8	68.0
HI	22521	Honolulu	72.3	63.0	74.8	63.0	79.3	66.0	78.6	66.7
HI	22516	Kahului	72.0	63.0	74.3	63.7	78.6	66.6	77.7	66.7
HI	22536	Lihue	71.2	63.1	73.6	64.9	78.3	69.1	77.2	68.9
IA	14933	Des Moines	19.6	11.3	50.7	37.0	76.3	63.9	53.1	41.2
IA	14940	Mason City	13.5	6.6	46.0	34.9	72.7	62.4	48.9	39.0
IA	14943	Sioux City	17.8	9.9	50.2	35.4	75.6	63.9	51.4	39.0
IA	94910	Waterloo	15.1	7.9	47.7	35.4	73.2	62.8	49.8	39.4
ID	24131	Boise	28.9	21.6	49.3	30.2	74.7	43.2	51.3	32.7

TABLE 1b–Mean monthly dry-bulb and dew-point temperatures (°F) over 30 Years (1961-1990) for United States locations. *(continued)*

			January		April		July		October	
State	WBAN	Location	Mean DB	Mean DP	Mean DB	Mean DP	Mean DB	Mean DP	Mean DB	Mean DP
ID	24156	Pocatello	23.4	16.3	45.1	26.8	71.2	43.2	47.7	29.1
IL	94846	Chicago	21.6	13.6	48.6	36.0	73.6	61.7	52.9	41.7
IL	14923	Moline	20.3	11.8	50.5	37.4	75.4	64.0	52.9	41.5
IL	14842	Peoria	21.7	14.5	51.3	38.5	75.0	64.4	53.2	42.6
IL	94822	Rockford	18.7	12.0	48.0	35.8	73.6	62.4	51.3	41.4
IL	93822	Springfield	24.4	17.1	53.4	40.6	76.6	65.3	55.4	43.9
IN	93817	Evansville	30.4	21.7	56.7	43.5	77.9	66.7	56.7	45.5
IN	14827	Fort Wayne	23.2	16.3	49.3	37.2	73.6	61.9	52.3	42.4
IN	93819	Indianapolis	25.5	18.3	52.3	39.9	75.2	64.9	54.1	44.1
IN	14848	South Bend	23.5	17.1	48.7	36.7	73.0	61.7	52.5	43.0
KS	13985	Dodge City	28.8	17.2	54.1	36.7	79.9	60.1	56.5	39.4
KS	23065	Goodland	27.0	15.6	49.3	32.4	75.4	56.8	51.6	34.0
KS	13996	Topeka	26.6	17.2	55.2	41.7	78.6	66.7	56.5	44.4
KS	3928	Wichita	29.1	19.8	56.5	42.4	81.3	63.7	58.3	45.0
KY	93814	Covington	28.2	19.9	53.4	39.6	75.0	64.2	54.9	43.9
KY	93820	Lexington	30.7	22.6	54.9	41.0	75.4	64.8	56.3	45.1
KY	93821	Louisville	31.8	22.1	56.7	41.9	77.4	66.2	57.4	46.2
LA	13970	Baton Rouge	49.3	40.5	67.8	56.8	80.8	72.1	67.5	57.0
LA	3937	Lake Charles	49.8	42.6	67.8	59.0	81.0	73.6	68.2	58.8
LA	12916	New Orleans	51.4	43.2	68.9	59.2	81.0	73.6	68.9	59.7
LA	13957	Shreveport	44.8	35.2	65.5	54.0	81.7	70.9	65.7	54.9
MA	14739	Boston	28.8	16.5	47.5	33.6	73.0	61.0	54.0	42.8
MA	94746	Worchester	23.0	12.6	44.4	29.7	69.6	58.6	49.8	39.2
MD	93721	Baltimore	31.8	19.9	53.6	37.8	76.6	64.6	56.5	45.7
ME	14607	Caribou	10.6	3.4	37.9	27.0	65.7	56.3	43.2	35.6
ME	14764	Portland	21.6	11.8	43.0	31.1	68.4	59.2	48.7	39.7
MI	94849	Alpena	19.0	12.4	41.4	29.3	67.8	56.5	46.9	38.7
MI	94847	Detroit	23.4	16.2	47.1	35.1	72.3	60.4	51.1	41.4
MI	14826	Flint	22.1	15.3	46.0	34.0	71.1	59.4	50.2	41.2
MI	94860	Grand Rapids	22.5	16.3	46.2	34.3	71.8	60.1	50.2	41.5
MI	94814	Houghton	17.4	11.8	41.7	30.0	68.5	57.0	46.9	39.4
MI	14836	Lansing	21.7	16.0	46.0	34.5	71.4	60.4	49.8	41.5
MI	14840	Muskegon	23.2	17.2	45.3	33.1	70.5	59.7	50.7	42.1
MI	14847	Sault Ste. Marie	13.6	7.9	38.5	28.2	64.2	55.8	44.4	38.3
MI	14850	Traverse City	20.5	14.4	42.6	30.7	69.6	57.4	48.9	40.3
MN	14913	Duluth	7.9	0.7	38.5	25.7	65.8	55.0	43.5	34.0
MN	14918	International Falls	2.1	-5.3	39.2	25.3	66.9	56.1	42.3	33.8
MN	14920	La Crosse	15.1	7.7	47.5	34.2	73.0	62.4	50.0	39.9
MN	14922	Minneapolis	12.4	4.3	46.4	31.6	73.8	60.1	48.9	37.9
MN	14925	Rochester	12.0	6.1	44.8	33.6	70.7	60.4	47.7	37.9
MN	14926	Saint Cloud	8.8	2.3	43.5	30.6	71.1	59.5	46.0	36.5
MO	3945	Columbia	27.5	18.7	55.0	41.2	77.5	65.7	56.3	44.2
MO	3947	Kansas City	27.1	17.2	55.6	40.6	79.2	65.8	57.6	44.1
MO	13995	Springlield	30.9	20.8	56.1	43.0	77.4	66.0	57.2	45.3
MO	13994	St. Louis	28.8	20.3	56.3	42.3	79.2	66.6	57.7	46.0
MS	3940	Jackson	44.2	36.1	64.8	53.8	80.4	71.4	64.0	54.1
MS	13865	Meridian	44.1	35.2	64.0	52.3	79.3	70.5	63.0	53.1
MT	24033	Billings	22.6	10.0	45.1	26.8	72.1	47.3	48.6	29.8
MT	24137	Cut Bank	17.1	7.2	40.6	24.1	65.5	43.3	44.6	27.7
MT	94008	Glasgow	10.9	4.3	43.9	27.3	71.1	48.9	45.3	30.2
MT	24143	Great Falls	21.6	10.0	43.7	25.5	69.4	44.1	47.5	28.8
MT	24144	Helena	20.1	10.6	43.2	25.7	68.4	43.7	44.4	28.9
MT	24146	Kalispell	21.4	15.4	43.2	28.8	65.5	47.1	41.5	32.2
MT	24036	Lewistown	20.5	11.1	41.2	26.8	66.4	46.9	45.0	28.9
MT	24037	Miles City	15.6	8.1	45.9	29.5	75.0	50.2	47.5	32.2
MT	24153	Missoula	22.5	17.4	44.1	29.8	67.3	45.7	43.0	32.7
NC	3812	Asheville	34.9	25.5	54.9	41.4	72.0	64.9	54.7	46.6
NC	93729	Cape Hatteras	44.8	36.9	59.2	49.5	78.4	71.8	65.5	57.0
NC	13881	Charlotte	39.4	27.3	60.1	43.7	77.7	67.1	60.4	49.1
NC	13723	Greensboro	36.5	25.3	57.9	42.4	76.5	67.1	57.9	47.7
NC	13722	Raleigh	38.5	27.0	58.8	43.3	76.8	67.6	59.4	49.5
NC	13748	Wilmington	44.6	34.5	62.2	49.6	79.5	71.6	64.0	55.2
ND	24011	Bismarck	10.0	2.5	43.2	28.6	71.1	55.0	45.3	32.0
ND	14914	Fargo	6.3	-0.6	43.2	30.6	71.6	58.6	45.7	34.9
ND	24013	Minot	8.4	0.0	42.1	27.9	70.0	54.0	44.8	31.6
NE	14935	Grand Island	21.7	12.6	50.5	35.4	76.3	62.1	52.0	37.9
NE	14941	Norfolk	19.9	10.6	51.1	34.3	77.2	61.9	52.2	37.2
NE	24023	North Platte	21.2	11.8	48.2	32.2	74.1	58.8	49.3	34.2

TABLE 1b–Mean monthly dry-bulb and dew-point temperatures (°F) over 30 Years (1961-1990) for United States locations. *(continued)*

			January		April		July		October	
State	WBAN	Location	Mean DB	Mean DP	Mean DB	Mean DP	Mean DB	Mean DP	Mean DB	Mean DP
NE	94918	Omaha	21.4	12.9	52.2	37.2	77.2	64.8	53.4	41.4
NE	24028	Scottsbluff	24.4	12.9	46.9	29.3	73.6	54.1	48.6	30.7
NH	14745	Concord	19.9	10.6	44.4	30.0	70.0	59.2	48.0	38.5
NJ	93730	Atlantic City	31.3	21.9	50.5	38.1	74.7	64.8	55.4	46.6
NJ	14734	Newark	30.7	19.8	52.0	35.4	76.8	62.4	57.0	44.8
NM	23050	Albuquerque	33.6	18.0	55.6	21.4	77.4	49.1	56.7	32.5
NM	23048	Tucumcari	36.1	20.3	57.9	30.7	79.3	56.8	58.6	37.8
NV	24121	Elko	24.6	16.3	44.8	25.3	72.3	37.2	46.9	25.5
NV	23154	Ely	23.5	12.6	41.7	21.9	68.9	35.4	45.1	24.4
NV	23169	Las Vegas	44.6	22.1	64.8	24.1	91.0	40.6	67.5	30.4
NV	23185	Reno	31.8	21.4	48.4	25.5	72.1	39.7	50.5	29.8
NV	23153	Tonopah	30.6	17.6	48.9	20.1	75.9	32.7	52.7	23.5
NV	24128	Winnemucca	29.1	19.8	46.9	24.1	74.5	34.7	48.7	25.5
NY	14735	Albany	32.0	13.2	32.0	32.1	32.0	60.2	32.0	40.4
NY	4725	Binghamton	21.4	14.0	44.2	31.6	68.9	58.5	48.7	39.9
NY	14733	Buffalo	23.5	16.9	45.0	33.4	71.1	59.0	50.9	41.7
NY	94725	Massena	15.1	8.8	43.0	31.6	69.6	59.2	47.1	39.6
NY	94728	New York City	31.5	18.9	51.1	35.6	75.9	62.2	57.4	44.8
NY	14768	Rochester	23.9	16.5	45.9	34.2	71.4	59.9	50.9	42.3
NY	14771	Syracuse	22.8	15.4	45.9	33.3	71.1	59.9	50.5	41.7
OH	14895	Akron	25.0	17.4	48.6	35.2	71.8	60.6	52.2	41.7
OH	14820	Cleveland	25.2	17.4	47.8	35.8	72.1	61.0	52.7	42.6
OH	14821	Columbus	26.6	18.3	51.3	37.6	73.8	62.8	53.4	42.6
OH	93815	Dayton	26.1	18.1	51.3	38.1	74.3	62.4	53.6	42.6
OH	14891	Mansfield	24.6	18.0	48.7	36.3	72.5	61.3	52.5	42.1
OH	94830	Toledo	23.0	16.0	47.8	35.6	72.1	61.3	51.1	41.5
OH	14852	Youngstown	23.9	16.9	47.3	34.9	70.3	60.1	51.1	41.5
OK	13967	Oklahoma City	35.2	23.9	60.6	45.3	81.7	65.5	61.5	47.8
OK	13968	Tulsa	34.9	23.5	61.3	46.0	82.9	67.8	61.7	48.7
OR	94224	Astoria	42.1	36.9	47.8	41.4	59.7	53.2	52.7	47.3
OR	94185	Burns	25.5	19.8	43.7	26.4	69.3	39.7	46.6	29.8
OR	24221	Eugene	39.7	36.1	49.5	41.5	66.7	51.8	52.5	46.0
OR	24225	Medford	37.0	32.4	50.4	37.4	72.1	48.4	52.9	41.5
OR	24284	North Bend	45.0	39.6	49.3	42.4	59.0	52.5	54.0	48.4
OR	24155	Pendleton	33.4	26.4	50.2	34.3	73.6	42.4	51.8	36.1
OR	24229	Portland	39.6	33.6	50.7	40.8	67.3	52.9	54.1	46.4
OR	24230	Redmond	31.3	22.6	44.2	27.9	66.6	41.4	47.7	31.5
OR	24232	Salem	39.6	34.5	49.3	40.3	66.4	51.6	52.2	45.0
PA	14737	Allentown	26.8	17.4	49.8	34.9	73.9	61.9	53.2	43.3
PA	4751	Bradford	19.6	13.6	42.6	31.3	65.7	57.4	46.6	38.8
PA	14860	Erie	25.2	17.8	45.1	34.2	70.3	60.3	52.0	42.3
PA	14751	Harrisburg	28.8	17.6	51.6	36.1	75.4	63.1	54.3	44.1
PA	13739	Philadelphia	30.6	19.8	52.3	37.0	76.3	64.6	56.1	45.9
PA	94823	Pittsburgh	26.2	17.2	49.6	34.5	72.0	60.1	52.2	40.8
PA	14777	Wilkes-Barre	25.0	16.2	47.8	33.1	71.4	60.4	51.3	41.5
PA	14778	Williamsport	25.5	16.5	49.3	34.5	72.0	62.2	51.4	42.8
	41415	Guam	77.7	71.6	79.2	72.3	79.7	74.8	79.5	74.8
PR	11641	San Juan	76.5	67.3	78.6	68.2	82.0	73.4	81.0	72.7
RI	14765	Providence	28.0	16.5	47.7	33.3	72.7	61.5	53.1	42.6
SC	13880	Charleston	46.8	36.0	64.0	51.4	80.1	71.4	65.5	55.9
SC	13883	Columbia	43.2	32.2	63.1	47.5	79.5	69.3	62.4	52.0
SC	3870	Greenville	39.7	27.9	59.9	44.1	77.2	67.5	59.9	48.7
SD	14936	Huron	13.5	5.9	46.2	33.8	74.3	60.4	48.0	36.0
SD	24025	Pierre	16.9	8.6	46.8	31.8	75.9	57.6	49.5	34.2
SD	24090	Rapid City	22.1	10.9	45.3	29.1	72.5	53.8	48.6	30.4
SD	14944	Sioux Falls	14.4	6.6	46.9	33.8	74.5	60.8	48.6	36.9
TN	13877	Bristol	33.8	24.6	55.4	41.0	73.6	64.8	55.9	45.7
TN	13882	Chattanooga	37.2	27.9	59.5	45.3	77.7	68.2	59.2	49.6
TN	13891	Knoxville	36.7	27.7	58.8	44.6	76.5	67.3	58.5	48.7
TN	13893	Memphis	39.0	28.6	63.0	48.6	82.0	70.0	63.0	50.2
TN	13897	Nashville	36.1	26.6	59.4	45.1	78.4	68.0	59.9	48.4
TX	13962	Abilene	42.1	27.3	64.9	45.9	82.9	62.4	65.5	49.6
TX	23047	Amarillo	33.8	18.3	56.7	33.1	78.3	57.7	57.7	39.4
TX	13958	Austin	48.2	36.3	68.5	55.0	83.5	68.9	69.3	56.7
TX	12919	Brownsville	58.6	51.4	74.1	65.1	83.5	73.0	74.7	65.7
TX	12924	Corpus Christi	54.7	46.8	72.0	63.1	83.3	73.6	73.2	64.0
TX	23044	El Paso	43.3	23.4	64.8	25.3	82.2	54.9	63.7	39.7
TX	3927	Fort Worth	43.0	31.5	65.5	52.0	84.7	67.6	66.7	53.2

TABLE 1b–Mean monthly dry-bulb and dew-point temperatures (°F) over 30 Years (1961-1990) for United States locations. *(continued)*

			January		April		July		October	
State	WBAN	Location	Mean DB	Mean DP	Mean DB	Mean DP	Mean DB	Mean DP	Mean DB	Mean DP
TX	12960	Houston	50.7	41.7	68.7	59.0	82.0	72.3	69.3	59.5
TX	23042	Lubbock	37.6	21.6	61.0	36.3	79.3	59.7	60.6	43.9
TX	93987	Lufkin	47.1	38.1	67.5	56.5	81.9	71.8	66.9	56.5
TX	23023	Midland	41.7	24.4	64.2	37.2	81.0	58.8	63.5	46.8
TX	12917	Port Arthur	50.5	43.3	68.5	60.3	81.5	74.5	69.1	60.4
TX	23034	San Angelo	44.1	29.3	66.6	46.2	82.8	62.4	65.7	52.0
TX	12921	San Antonio	49.3	37.0	69.3	55.8	83.5	69.1	70.0	57.0
TX	12912	Victoria	52.5	44.1	70.5	60.4	82.9	72.7	71.2	61.3
TX	13959	Waco	44.8	34.7	66.9	54.3	84.9	68.2	68.2	55.6
TX	13966	Wichita Falls	38.8	27.0	63.3	48.0	84.6	64.9	64.0	50.5
UT	93129	Cedar City	28.9	18.0	47.8	24.4	74.7	40.8	51.4	28.8
UT	24127	Salt Lake City	27.9	19.9	49.8	30.9	78.1	45.5	52.2	34.5
VA	13733	Lynchburg	35.1	21.7	57.0	39.0	76.1	65.1	57.6	45.5
VA	13737	Norfolk	39.2	27.9	57.4	43.2	78.1	68.2	61.3	51.4
VA	13740	Richmond	35.8	25.0	57.4	41.7	77.4	67.6	58.3	48.6
VA	13741	Roanoke	34.3	21.0	55.9	38.5	75.2	64.0	56.5	44.8
VA	93738	Sterling	30.9	20.7	53.2	38.7	75.6	64.9	55.0	45.1
VT	14742	Burlington	17.4	8.2	43.2	30.4	70.0	58.3	48.0	38.8
WA	24227	Olympia	38.1	34.5	47.7	39.0	63.0	52.2	49.6	44.8
WA	94240	Quillayute	40.6	36.9	46.2	40.3	57.9	52.0	50.4	46.0
WA	24233	Seattle	40.1	33.1	48.7	38.8	64.4	51.4	52.2	45.1
WA	24157	Spokane	27.0	22.1	46.0	31.8	69.4	43.7	46.8	34.9
WA	24243	Yakima	29.5	23.2	50.2	30.9	71.4	46.2	48.7	35.2
WI	14991	Eau Claire	11.5	4.6	45.5	32.0	72.0	60.3	47.8	38.1
WI	14898	Green Bay	15.1	8.2	43.9	32.5	70.3	59.7	48.0	39.6
WI	14837	Madison	16.7	9.9	46.0	34.0	71.8	60.8	49.3	39.9
WI	14839	Milwaukee	19.4	11.8	44.6	33.8	71.2	60.6	50.7	41.4
WV	13866	Charleston	32.2	22.5	55.2	38.7	73.9	64.9	55.2	45.1
WV	13729	Elkins	27.7	19.8	48.7	36.9	68.2	61.7	49.6	41.4
WV	3860	Huntington	32.4	22.6	55.6	39.6	74.7	65.7	55.9	45.3
WY	24089	Casper	23.0	12.0	42.4	25.9	70.9	43.9	45.9	26.8
WY	24018	Cheyenne	27.0	10.2	42.4	24.3	68.2	46.4	46.4	25.5
WY	24021	Lander	19.0	8.2	43.2	24.1	71.1	42.3	46.0	27.0
WY	24027	Rock Springs	20.3	12.4	40.5	22.8	68.4	37.6	43.9	24.8
WY	24029	Sheridan	21.0	10.9	44.2	28.2	70.5	48.2	46.4	29.8

Source: Colliver, D. G. 1999. Mean monthly dry-bulb and dew-point temperatures determined from the Samson data set. Biosystems and Agricultural Engineering, University of Kentucky, Lexington.

emerging that 10% is the appropriate level of severity, meaning that one out of ten years will be as severe or more severe than the MDRY weather conditions [8]. Creation of a MDRY involves analyzing moisture accumulation in a number of selected building components, using a computer model and historical weather data, and selecting the design weather year based on the results. This means that the choice of MDRY may depend on the construction selected. Moreover, to this date, methodologies for creating MDRY data have focused on cold climates, and no methodology as yet exists to create a MDRY for warm or mixed climates. The procedure to select the MDRY needs to be simplified and generalized so it applies to all building types and climates. Better yet, specific MDRY data sets for locations in the U.S., Canada, and elsewhere should be developed and made available. In the interim, because such MDRY data are not yet available, using a sequence of 10 years of actual weather data is a reasonable alternative.

Some moisture analysis methods allow the use of time-averaged weather data. Kuenzel determined that, when analyzing the drying of a cellular concrete roof, using time-averaged data led to errors [9]. Hourly weather data produced more accurate results than time-averaged weather data, and the error was not affected very much by the choice of averaging period, for example, daily, monthly, or six-month means. This indicates that accurate results can most likely only be obtained with hourly data. If average data are used, the averaging period is probably not very important. If use of hourly data is not feasible, or hourly data are not available, approximate moisture accumulation calculations may be done using daily or monthly average weather data, but large errors may occur with such calculations.

The following tables provide monthly average dry-bulb and dew-point temperatures for the months of January, April, July, and October for use in simplified approximate moisture calculations, such as dew point calculations (see Chapter 7). The data represent weather conditions during the four seasons and can be used to estimate whether drying or wetting of the assembly is likely to occur. Table 1 contains locations in the United States. The data in Table 1 are based on hourly or 3-h measured data for the period 1961 to 1990 and were determined from the SAMSON data set [10]. Table 2 contains locations in Canada, based on 1973 to 1993 data. Table 3 contains data for a few selected international locations. More information on climate for U.S. and international locations can be found on the Word Wide Web at the NCDC web site (www.ncdc.noaa.gov). Canadian weather data can be found at the Environment Canada's Canadian Meteorological Centre web site (www.cmc.ec.gc.ca/climate).

TABLE 2a–Mean monthly dry-bulb and dew-point temperatures (°C) for Canadian locations.

		January		April		July		October	
Province	Location	DB	DP	DB	DP	DB	DP	DB	DP
Alberta	Calgary	-7.2	-13.9	5.0	-4.4	16.7	7.8	6.1	-2.8
	Edmonton	-11.7	-16.1	4.4	-3.3	16.1	10.6	4.4	-1.7
	Grande Prairie	-15.8	-16.7	2.5	-2.2	15.8	9.4	4.2	0.0
	Lethbridge	-8.9	-11.7	5.6	-1.1	17.8	10.0	6.4	1.1
	Medicine Hat	-11.1	-13.3	7.2	0.0	20.8	11.1	7.5	1.7
	Peace River	-15.3	-16.7	3.3	-4.4	16.7	8.9	4.2	0.0
	Red Deer	-12.2	-13.3	3.3	-1.7	15.8	11.7	4.7	0.0
BC	Fort Nelson	-21.7	-22.2	2.2	-5.0	16.9	10.6	1.1	-1.7
	Penticton	-3.1	-6.7	8.9	1.1	20.3	11.1	9.2	4.4
	Prince George	-10.6	-11.7	4.7	-1.7	15.3	9.4	5.0	1.1
	Prince Rupert	1.4	-0.6	6.4	2.8	13.1	11.1	8.6	6.7
	Quesnel	-9.7	-15.0	5.8	-0.6	16.7	10.6	5.8	1.1
	Smithers	-9.4	-9.4	5.0	-0.6	15.0	9.4	4.7	1.7
	Vancouver	3.3	0.6	9.4	5.0	17.2	12.2	10.6	7.8
	Victoria	3.9	1.7	8.9	4.4	16.1	11.1	10.0	6.7
Manitoba	Brandon	-19.2	-18.3	3.3	-2.2	18.6	13.3	4.4	0.6
	Churchill	-25.0	-30.0	-9.4	-12.8	12.2	7.2	-1.7	-4.4
	Dauphin	-17.8	-17.8	3.3	-3.3	19.4	14.4	5.3	2.8
	The Pas	-22.5	-23.3	0.6	-5.6	18.1	12.8	1.9	0.6
	Winnipeg	-16.7	-18.9	4.4	-2.8	20.0	13.9	5.6	0.0
New Brunswick	Fredericton	-10.3	-12.8	3.9	-0.6	18.9	15.6	7.5	4.4
	Moncton	-8.9	-10.6	3.3	-1.1	18.6	14.4	7.8	4.4
	Saint John	-7.8	-12.2	3.9	-1.7	17.2	12.8	7.8	3.9
Newfoundland	Cartwright	-14.4	-16.1	-2.8	-4.4	13.1	10.0	3.3	1.7
	St. John's	-4.4	-7.2	1.7	-1.7	15.6	11.7	7.2	3.9
Northwest Territories	Fort Smith	-25.3	-22.8	-3.3	-5.0	16.1	10.6	-0.3	0.6
	Iqualuit (Frobisher)	-25.6	-30.6	-15.0	-18.3	7.8	3.3	-5.0	-7.8
	Inuvik	-26.1	-29.4	-12.8	-17.8	13.9	6.7	-8.3	-11.1
	Resolute	-30.6	-35.6	-22.2	-26.7	4.4	1.7	-15.0	-17.2
	Yellowknife	-25.0	-29.4	-5.0	-11.7	16.7	7.8	-1.7	-5.0
Nova Scotia	Halifax	-5.6	-9.4	4.4	-0.6	18.3	13.3	8.3	5.0
	Sydney	-5.6	-8.9	2.2	-1.7	17.2	13.3	8.3	4.4
	Yarmouth	-2.8	-5.6	5.0	1.1	16.1	13.9	9.4	6.1
Ontario	Kapuskasing	-18.9	-19.4	-0.6	-3.9	16.9	11.7	3.9	1.7
	Kenora	-17.8	-16.7	2.2	-2.8	19.4	13.9	4.7	2.0
	London	-5.6	-6.7	6.4	1.7	20.8	16.1	9.2	6.7
	North Bay	-12.2	-16.1	3.9	-3.3	18.9	12.8	6.1	1.7
	Ottawa	-10.0	-14.4	6.1	-1.7	21.1	13.9	7.8	2.8
	Toronto	-6.1	-8.9	6.7	0.6	21.1	14.4	8.9	4.4
	Wiarton	-5.8	-7.2	5.0	0.6	18.6	14.4	9.7	6.1
Prince Edward Island	Charlottetown	-7.8	-10.0	2.5	-0.6	18.6	15.6	8.6	5.6
	Summerside	-8.1	-7.2	2.5	0.0	18.6	13.9	8.3	5.0
Quebec	Baie Comeau	-14.4	-12.8	0.8	-2.2	16.4	13.3	5.0	2.8
	Mont Joli	-11.1	-12.8	1.7	-2.2	18.1	13.3	6.4	2.8
	Quebec	-12.2	-16.7	3.9	-2.8	19.4	13.9	6.7	1.1
	Riviere Du Loup	-11.1	-12.8	1.7	-2.2	18.1	13.3	6.4	2.8
	Sherbrooke	-10.0	-12.2	4.4	-0.6	19.7	15.6	7.5	4.4
	Val d'Or	-16.7	-17.8	1.4	-3.9	17.2	11.1	5.6	0.6
Saskatchewan	Estevan	-16.1	-15.0	3.9	-1.1	19.4	13.9	5.8	1.7
	Moose Jaw	-15.6	-15.6	4.2	-0.6	18.9	12.2	4.4	1.7
	North Battleford	-18.3	-21.1	3.9	-2.2	18.3	12.2	4.7	-1.1
	Prince Albert	-20.3	-18.9	2.5	-2.8	17.5	12.8	3.6	0.6
	Regina	-18.1	-16.1	3.3	-1.7	18.3	12.2	4.2	0.0
	Saskatoon	-18.3	-18.3	3.1	-2.2	18.1	11.1	3.9	0.0
	Swift Current	-13.6	-14.4	5.3	-0.6	19.2	11.7	5.8	1.1
	Yorkton	-20.0	-18.3	1.9	-2.2	18.3	12.8	3.9	0.6
Yukon Territory	Whitehorse	-15.0	-13.9	-0.3	-6.1	13.3	6.7	1.4	-1.7

Source: NCDC. 1995. International Station Meteorological Climate Summary Ver 3.0. Fleet Numerical Meteorology and Oceanography Detachment, USAFETAC 0L-A, National Climatic Data Center. Ashville, NC.

TABLE 2b–Mean monthly dry-bulb and dew-point temperatures (°F) for Canadian locations.

		January		April		July		October	
Province	Location	Mean DB	Mean DP	Mean DB	Mean DP	Mean DB	Mean DP	Mean DB	Mean DP
Alberta	Calgary	19.0	7.0	41.0	24.0	62.0	46.0	43.0	21.0
	Edmonton	11.0	3.0	40.0	26.0	61.0	51.0	40.0	29.0
	Grande Prairie	3.5	2.0	36.5	28.0	60.5	49.0	39.5	32.0
	Lethbridge	16.0	11.0	42.0	30.0	64.0	50.0	43.5	34.0
	Medicine Hat	12.0	8.0	45.0	32.0	69.5	52.0	45.5	35.0
	Peace River	4.5	2.0	38.0	24.0	62.0	48.0	39.5	32.0
	Red Deer	10.0	8.0	38.0	29.0	60.5	53.0	40.5	32.0
BC	Fort Nelson	-7.0	-8.0	36.0	23.0	62.5	51.0	34.0	29.0
	Penticton	26.5	20.0	48.0	34.0	68.5	52.0	48.5	40.0
	Prince George	13.0	11.0	40.5	29.0	59.5	49.0	41.0	34.0
	Prince Rupert	34.5	31.0	43.5	37.0	55.5	52.0	47.5	44.0
	Quesnel	14.5	5.0	42.5	31.0	62.0	51.0	42.5	34.0
	Smithers	15.0	15.0	41.0	31.0	59.0	49.0	40.5	35.0
	Vancouver	38.0	33.0	49.0	41.0	63.0	54.0	51.0	46.0
	Victoria	39.0	35.0	48.0	40.0	61.0	52.0	50.0	44.0
Manitoba	Brandon	-2.5	-1.0	38.0	28.0	65.5	56.0	40.0	33.0
	Churchill	-13.0	-22.0	15.0	9.0	54.0	45.0	29.0	24.0
	Dauphin	0.0	0.0	38.0	26.0	67.0	58.0	41.5	37.0
	The Pas	-8.5	-10.0	33.0	22.0	64.5	55.0	35.5	33.0
	Winnipeg	2.0	-2.0	40.0	27.0	68.0	57.0	42.0	32.0
New Brunswick	Fredericton	13.5	9.0	39.0	31.0	66.0	60.0	45.5	40.0
	Moncton	16.0	13.0	38.0	30.0	65.5	58.0	46.0	40.0
	Saint John	18.0	10.0	39.0	29.0	63.0	55.0	46.0	39.0
Newfoundland	Cartwright	6.0	3.0	27.0	24.0	55.5	50.0	38.0	35.0
	St. John's	24.0	19.0	35.0	29.0	60.0	53.0	45.0	39.0
Northwest Territories	Fort Smith	-13.5	-9.0	26.0	23.0	61.0	51.0	31.5	33.0
	Iqualuit (Frobisher)	-14.0	-23.0	5.0	-1.0	46.0	38.0	23.0	18.0
	Inuvik	-15.0	-21.0	9.0	0.0	57.0	44.0	17.0	12.0
	Resolute	-23.0	-32.0	-8.0	-16.0	40.0	35.0	5.0	1.0
	Yellowknife	-13.0	-21.0	23.0	11.0	62.0	46.0	29.0	23.0
Nova Scotia	Halifax	22.0	15.0	40.0	31.0	65.0	56.0	47.0	41.0
	Sydney	22.0	16.0	36.0	29.0	63.0	56.0	47.0	40.0
	Yarmouth	27.0	22.0	41.0	34.0	61.0	57.0	49.0	43.0
Ontario	Kapuskasing	-2.0	-3.0	31.0	25.0	62.5	53.0	39.0	35.0
	Kenora	0.0	2.0	36.0	27.0	67.0	57.0	40.5	36.0
	London	22.0	20.0	43.5	35.0	69.5	61.0	48.5	44.0
	North Bay	10.0	3.0	39.0	26.0	66.0	55.0	43.0	35.0
	Ottawa	14.0	6.0	43.0	29.0	70.0	57.0	46.0	37.0
	Toronto	21.0	16.0	44.0	33.0	70.0	58.0	48.0	40.0
	Wiarton	21.5	19.0	41.0	33.0	65.5	58.0	49.5	43.0
Prince Edward Island	Charlottetown	18.0	14.0	36.5	31.0	65.5	60.0	47.5	42.0
	Summerside	17.5	19.0	36.5	32.0	65.5	57.0	47.0	41.0
Quebec	Baie Comeau	6.0	9.0	33.5	28.0	61.5	56.0	41.0	37.0
	Mont Joli	12.0	9.0	35.0	28.0	64.5	56.0	43.5	37.0
	Quebec	10.0	2.0	39.0	27.0	67.0	57.0	44.0	34.0
	Riviere Du Loup	12.0	9.0	35.0	28.0	64.5	56.0	43.5	37.0
	Sherbrooke	14.0	10.0	40.0	31.0	67.5	60.0	45.5	40.0
	Val d'Or	2.0	0.0	34.5	25.0	63.0	52.0	42.0	33.0
Saskatchewan	Estevan	3.0	5.0	39.0	30.0	67.0	57.0	42.5	35.0
	Moose Jaw	4.0	4.0	39.5	31.0	66.0	54.0	40.0	35.0
	North Battleford	-1.0	-6.0	39.0	28.0	65.0	54.0	40.5	30.0
	Prince Albert	-4.5	-2.0	36.5	27.0	63.5	55.0	38.5	33.0
	Regina	-0.5	3.0	38.0	29.0	65.0	54.0	39.5	32.0
	Saskatoon	-1.0	-1.0	37.5	28.0	64.5	52.0	39.0	32.0
	Swift Current	7.5	6.0	41.5	31.0	66.5	53.0	42.5	34.0
	Yorkton	-4.0	-1.0	35.5	28.0	65.0	55.0	39.0	33.0
Yukon Territory	Whitehorse	5.0	7.0	31.5	21.0	56.0	44.0	34.5	29.0

Source: NCDC. 1995. International Station Meteorological Climate Summary Ver 3.0. Fleet Numerical Meteorology and Oceanography Detachment, USAFETAC OL-A, National Climatic Data Center. Ashville, NC.

TABLE 3a–Mean monthly dry-bulb and dew-point temperatures (°C) for international locations.

		January		April		July		October	
country	Location	Mean DB	Mean DP	Mean DB	Mean DP	Mean DB	Mean DP	Mean DB	Mean DP
Argentina	Buenos Aires	23.9	16.1	16.7	12.2	10.0	6.1	16.1	10.6
Australia	Sydney AP	22.8	16.7	18.9	13.3	12.2	5.6	17.8	10.6
Austria	Vienna	0.0	-3.3	9.4	2.2	20.0	11.7	10.6	5.6
Belgium	Brussels	3.3	1.1	8.9	3.9	17.8	12.8	11.1	7.8
Brazil	Rio de Janeiro/Galeao	28.3	21.7	26.1	20.6	22.2	16.7	24.4	18.3
Bulgaria	Sofia	-1.1	-5.0	10.0	2.8	20.0	11.7	11.7	5.0
Chili	Santiago	21.1	11.1	15.0	8.3	8.3	5.0	14.4	8.3
China	Beijing	-3.3	-16.1	13.9	0.6	26.1	20.6	13.9	4.4
Finland	Helsinki/Vantaa	-5.6	-7.8	3.3	-1.7	16.7	11.1	5.0	2.8
France	Paris/Orly	3.9	1.1	10.0	3.9	19.4	12.8	11.7	8.3
Germany	Berlin/Schonefeld	-0.6	-2.8	7.8	1.7	18.3	11.7	9.4	6.1
Greece	Athens	10.0	3.9	15.0	8.3	27.2	14.4	19.4	11.7
Hungary	Budapest/Ferihegy	-0.6	-3.9	10.6	3.3	20.6	12.8	10.6	5.6
Ireland	Dublin AP	5.6	2.8	8.3	4.4	15.6	11.7	10.6	7.2
Italy	Rome/Fiumicino	8.3	4.4	12.8	8.9	23.9	19.4	17.8	13.3
Japan	Tokyo Intl	5.6	-3.9	13.9	7.8	25.0	21.1	17.8	12.2
Malaysia	Kuala Lumpur	27.2	22.8	28.3	23.9	27.8	23.3	27.8	23.3
Mexico	Mexico City	13.9	3.9	18.9	6.1	18.3	11.1	17.2	8.9
New Zealand	Auckland Intl AP	20.0	14.4	16.1	12.8	11.1	8.3	14.4	10.6
Poland	Warsaw	-1.7	-3.9	7.8	2.2	17.8	12.8	8.3	5.6
Russia	Moscow/Sheremetievo	-8.9	-11.1	5.6	-0.6	17.2	12.2	3.9	1.1
South Africa	Pretoria	23.3	14.4	18.9	10.0	12.8	1.7	21.1	9.4
South Korea	Seoul/Kimpo	-3.3	-9.4	11.7	4.4	25.0	20.6	13.3	7.8
Spain	Madrid	5.6	1.1	11.7	4.4	24.4	11.1	14.4	7.8
Sweden	Stockholm/Essa	-2.8	-5.0	3.9	-1.1	17.2	10.6	6.1	3.9
United Kingdom	London/Heathrow	5.0	2.8	8.9	3.9	18.3	12.2	11.1	8.3
Ukraine	Kiev	-6.1	-8.3	7.8	2.2	18.3	12.8	7.2	3.3
Venezuela	Caracas/La Carlotas	21.1	16.1	23.9	18.3	23.3	18.9	23.3	18.9

Source: NCDC. 1995. International Station Meteorological Climate Summary Ver 3.0. Fleet Numerical Meteorology and Oceanography Detachment, USAFETAC 0L-A, National Climatic Data Center. Ashville, NC.

TABLE 3b–Mean monthly dry-bulb and dew-point temperatures (°F) for international locations.

		January		April		July		October	
Country	Location	Mean DB	Mean DP	Mean DB	Mean DP	Mean DB	Mean DP	Mean DB	Mean DP
Argentina	Buenos Aires	75	61	62	54	50	43	61	51
Australia	Sydney AP	73	62	66	56	54	42	64	51
Austria	Vienna	32	26	49	36	68	53	51	42
Belgium	Brussels	38	34	48	39	64	55	52	46
Brazil	Rio de Janeiro/Galeao	83	71	79	69	72	62	76	65
Bulgaria	Sofia	30	23	50	37	68	53	53	41
Chili	Santiago	70	52	59	47	47	41	58	47
China	Beijing	26	3	57	33	79	69	57	40
Finland	Helsinki/Vantaa	22	18	38	29	62	52	41	37
France	Paris/Orly	39	34	50	39	67	55	53	47
Germany	Berlin/Schonefeld	31	27	46	35	65	53	49	43
Greece	Athens	50	39	59	47	81	58	67	53
Hungary	Budapest/Ferihegy	31	25	51	38	69	55	51	42
Ireland	Dublin AP	42	37	47	40	60	53	51	45
Italy	Rome/Fiumicino	47	40	55	48	75	67	64	56
Japan	Tokyo Intl	42	25	57	46	77	70	64	54
Malaysia	Kuala Lumpur	81	73	83	75	82	74	82	74
Mexico	Mexico City	57	39	66	43	65	52	63	48
New Zealand	Auckland Intl AP	68	58	61	55	52	47	58	51
Poland	Warsaw	29	25	46	36	64	55	47	42
Russia	Moscow/Sheremetievo	16	12	42	31	63	54	39	34
South Africa	Pretoria	74	58	66	50	55	35	70	49
South Korea	Seoul/Kimpo	26	15	53	40	77	69	56	46
Spain	Madrid	42	34	53	40	76	52	58	46
Sweden	Stockholm/Essa	27	23	39	30	63	51	43	39
United Kingdom	London/Heathrow	41	37	48	39	65	54	52	47
Ukraine	Kiev	21	17	46	36	65	55	45	38
Venezuela	Caracas/LaCarlotas	70	61	75	65	74	66	74	66

Source: NCDC. 1995. International Station Meteorological Climate Summary Ver 3.0. Fleet Numerical Meteorology and Oceanography Detachment, USAFETAC 0L-A, National Climatic Data Center. Ashville, NC.

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