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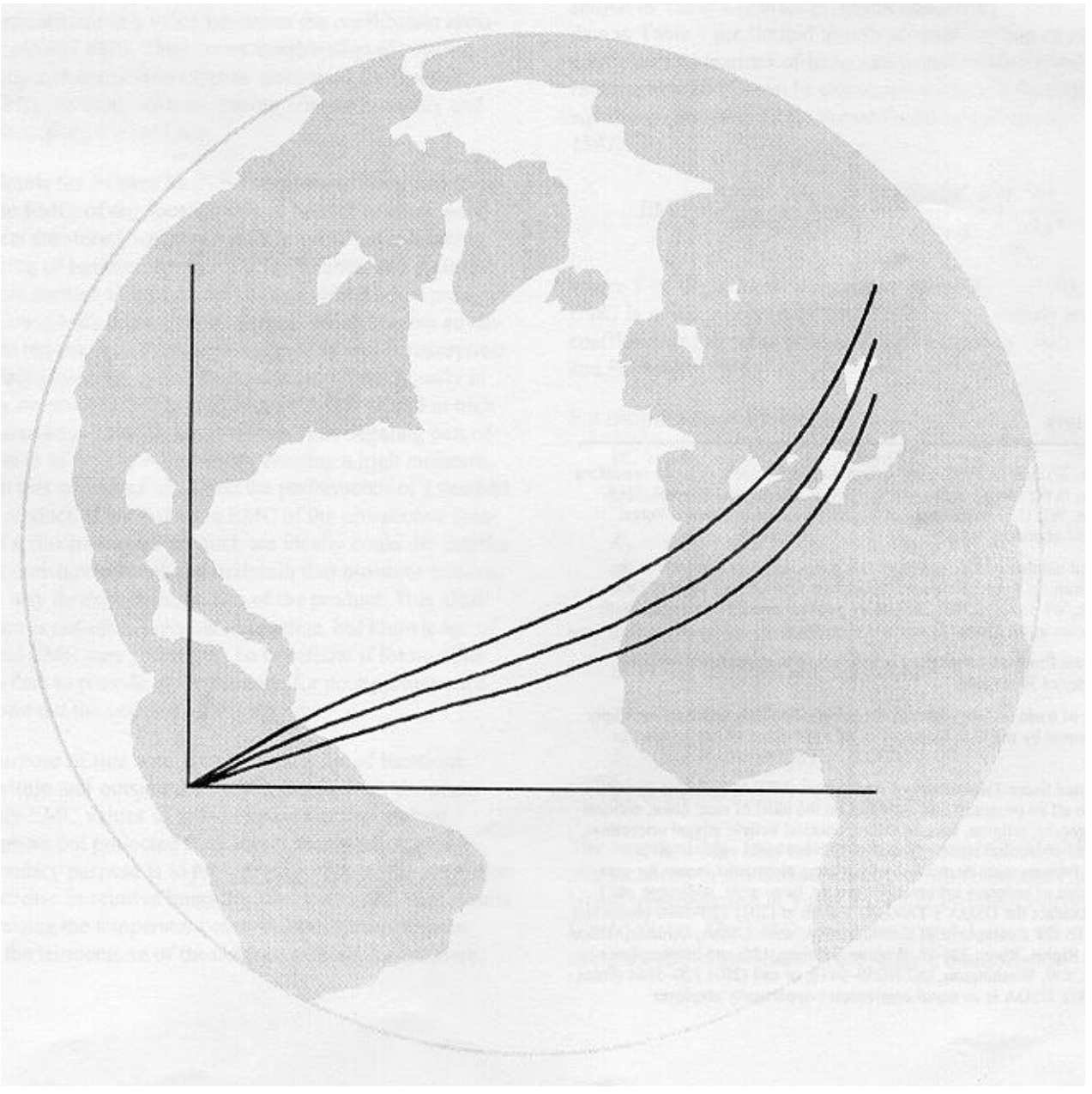
Equilibrium Moisture Content of Wood in Outdoor Locations in the United States and Worldwide

William T. Simpson



Abstract

With relative humidity and temperature data from the National Oceanic and Atmospheric Administration, the average equilibrium moisture content for each month of the year was calculated for 262 locations in the United States and 122 locations outside the United States. As an aid for storage of kiln-dried lumber, a graph is presented for determining the reduction in equilibrium moisture content that results from heating air in an enclosed storage space above the temperature of the outside air.

Keywords: Equilibrium moisture content, lumber storage, drying

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Errata

On Page 1, the equation in column 2 should read

$$\mathrm{EMC} = \frac{1{,}800}{W}\left(\frac{Kh}{1-Kh} + \frac{K_1Kh + 2K_1K_2K^2h^2}{1 + K_1Kh + K_1K_2K^2h^2}\right)$$

On Page 2, the last line in column 2 should read

". . . to 7%, a temperature rise of 20°F (11°C) is necessary."

Equilibrium Moisture Content of Wood in Outdoor Locations in the United States and Worldwide

William T. Simpson, Research Forest Products Technologist
Forest Products Laboratory, Madison, Wisconsin

Introduction

The moisture content of wood depends on the relative humidity and temperature of the air surrounding it. If wood remains long enough in air where the relative humidity and temperature remain constant, the moisture content will also become constant at a value known as the equilibrium moisture content (EMC). Thus, every combination of relative humidity and temperature has an associated EMC value. The EMC increases with increasing relative humidity and with decreasing temperature.

If we know the relative humidity and temperature, and therefore the EMC, of any location where lumber or other wood products are stored, we have useful information relevant to air drying of lumber, storage of dried lumber, and optimum moisture content of lumber for use in finished wood products. Low EMCs accelerate air drying, which is often advantageous but can be a detriment if a species that is susceptible to surface checking, such as oak, dries too quickly early in the drying process. Kiln-dried lumber that is stored in high EMC conditions can regain moisture, thus negating part of the results of drying and possibly creating a high moisture content that will adversely affect the performance of a finished wood product. If we knew the EMC of the prospective location of a finished wood product, we ideally could dry lumber to that moisture content and maintain that moisture content all the way through manufacture of the product. This ideal situation is not often possible in practice, but knowledge of the ideal EMC may sometimes be beneficial if for no other reason than to provide an explanation for poor performance and point out the necessity for a remedy.

The purpose of this note is to provide a list of locations, both within and outside the United States, with the mean monthly EMC values of wood exposed to the outdoor atmosphere but protected from direct precipitation or sun. A secondary purpose is to provide easy to use information on the decrease in relative humidity, and thus EMC, that results from raising the temperature of an enclosed storage space above the temperature of the outdoor ambient temperature.

Equilibrium Moisture Content at U.S. Locations

The dependence of EMC on relative humidity and temperatures between 30°F and 150°F (–1.1°C and 65.6°C) is shown in Table 1 (Forest Products Laboratory 1987). The data in Table 1 are limited to only a small fraction of all possible combinations of temperature and relative humidity. Intermediate EMCs can be calculated with the following equations (Simpson 1973, Forest Products Laboratory 1987):

$$\mathrm{EMC} = \frac{1{,}800}{W}\frac{Kh}{1-Kh} + \frac{K_1Kh + 2K_1K_2K^2h^2}{1+K_1Kh+K_1K_2K^2h^2}$$

where T is temperature, h is relative humidity (%/100), EMC is moisture content (%), and W, K, K_1, and K_2 are coefficients of an adsorption model developed by Hailwood and Horrobin (1946).

For temperature in Fahrenheit,

$$W = 330 + 0.452T + 0.00415T^2$$

$$K = 0.791 + 0.000463T - 0.000000844T^2$$

$$K_1 = 6.34 + 0.000775T - 0.0000935T^2$$

$$K_2 = 1.09 + 0.0284T - 0.0000904T^2$$

and for temperature in Celsius,

$$W = 349 + 1.29T + 0.0135T^2$$

$$K = 0.805 + 0.000736T - 0.00000273T^2$$

$$K_1 = 6.27 - 0.00938T - 0.000303T^2$$

$$K_2 = 1.91 + 0.0407T - 0.000293T^2$$

The average EMC for each month is shown in Table 2 for 262 locations in the United States, Puerto Rico, and Pacific Island territories and in Table 3 for 122 locations outside the United States. The EMCs in Tables 2 and 3 were calculated, using the above equations, from relative humidity and

temperature data available from the National Climatic Data Center (NCDC), National Oceanic and Atmospheric Administration (NOAA). Most of the data in Table 2 was from NCDC (1997), but 15 of the locations were from Wallis (1977). The tabulated relative humidities are the monthly averages of the daily morning and afternoon values. For the purpose of the EMC calculations, the morning and afternoon values were averaged. The temperature values are the monthly averages of the normal daily temperatures. Most of the NOAA relative humidity and temperature data is based on at least 30 years of observation. The EMCs in Table 3 were calculated from relative humidities that were derived from air and dew point temperatures (USA Today 1998; original data from NCDC). Relative humidity is the ratio of vapor pressure at the dew point temperature to vapor pressure at the air temperature. A least-squares relationship to calculate vapor pressure from temperature was developed from the data of Hawkins (1978):

$$\text{Vapor pressure} = \exp(-3.24 + 0.0519T - 0.000172T^2 + 0.000000424T^3)$$

for vapor pressure in inches of mercury and temperature in Fahrenheit, and

$$\text{Vapor pressure} = 3{,}390 \exp(-1.74 + 0.759T - 0.000424T^2 + 0.00000244T^3)$$

for vapor pressure in pascals and temperature in Celsius.

Several factors should be noted about the EMC data in Tables 2 and 3. Wood exhibits hysteresis, which means that if wood comes to equilibrium at a given relative humidity and temperature, the EMC will be slightly higher if this equilibrium is reached by losing moisture than it would be if it reaches equilibrium by gaining moisture. In the extreme, this effect can be as much as 3% moisture content. However, the EMC database used in this analysis was obtained experimentally under relative humidity conditions that oscillated slightly. This tended to establish EMCs intermediate between the two hysteresis extremes (Stamm and Loughborough 1935) and means they can be considered reasonable estimates for practical applications. A second factor is that the EMC data in Table 1 does not extend below 30°F (-1.1°C), but some of the locations in Tables 2 and 3 have winter temperatures below this level. This raises the question of the validity of the extrapolation to below 30°F. Hedlin (1967) showed evidence that EMC data at 10°F (-12.2°C) are approximately what would be expected by extrapolating from values above 30°F. So, it seems valid to assume that the extrapolated EMCs are reasonable approximations. The third factor of concern is that the EMC values, especially at high relative humidities, of wood species with a high extractive content are lower than species with little or no extractives. Some tropical hardwoods exhibit this behavior (Spalt 1958, Wangaard and Granados 1967). Western redcedar and redwood are two native continental U.S. species that might be affected by this factor (Spalt 1958, Salamon and others 1975). However, high extractive content heartwood is likely to be more prevalent in old-growth timber, and with the current trend to harvest younger growth timber, extractive content in wood may no longer be as high.

Tables 2 and 3 show the wide variability in EMC as affected by location and month. For example, the EMC in Phoenix, Arizona, in June is only 4.6%, while the EMC in Eugene, Oregon, in December is 20.2%. In Fresno, California, the EMC varies from 7.8% in July to 16.6% in December—a wide range that will cause a large variation in moisture content of wood products from summer to winter. At the other extreme, the EMC in Little Rock, Arkansas, varies throughout the year by only about 1% EMC—from 12.8% in March to 13.9% in September and December.

Lowering Equilibrium Moisture Content for Storage

It is not uncommon for lumber to be kiln dried to 6% to 8% moisture content and then stored in a protected but unheated area where the relative humidity is such that the EMC is higher than 6% to 8%. If the EMC is high enough and storage is long enough, the lumber can increase in moisture content, which can create problems in product manufacture or performance of an end product. There are several ways to minimize this problem, including wrapping the lumber in a moisture barrier or storing it in an air-conditioned facility. One simple and not too costly method to lower EMC in an enclosed space is by simply raising the temperature above the outside ambient air temperature—easily controlled by a differential thermostat. Alternatively, a humidistat can be used to control a heating system.

When inside temperature is raised above outside temperature without adding any moisture to the inside air, the relative humidity of the inside air is reduced. This is because the specific humidity (the mass of water per unit mass of dry air) of the air remains the same when its temperature is raised, but the capacity of the air to hold moisture increases as temperature increases, therefore lowering relative humidity. Figure 1 shows the effect on EMC of raising inside temperature above outside ambient temperature. Calculations were made using the psychometric equations given in Hawkins (1978).

The graph applies to all outside ambient air temperatures from 30°F to 90°F (–1.1°C to 32.2°C). For example, if outside EMC is 14%, Fig. 1 indicates that to reduce EMC to 7%, a temperature rise of 20°F (–6.7°C) is necessary.

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Table 1—Dependence of equilibrium moisture content (EMC) of wood on relative humidity (RH) and temperature

	EMC (%)																		
Temperature (°F (°C))	5% RH	10% RH	15% RH	20% RH	25% RH	30% RH	35% RH	40% RH	45% RH	50% RH	55% RH	60% RH	65% RH	70% RH	75% RH	80% RH	85% RH	90% RH	95% RH
30 (–1.1)	1.4	2.6	3.7	4.6	5.5	6.3	7.1	7.9	8.7	9.5	10.4	11.3	12.4	13.5	14.9	16.5	18.5	21.0	24.3
50 (10.0)	1.4	2.6	3.6	4.6	5.5	6.3	7.1	7.9	8.7	9.5	10.3	11.2	12.3	13.4	14.8	16.4	18.4	20.9	24.3
70 (21.1)	1.3	2.5	3.5	4.5	5.4	6.2	6.9	7.7	8.5	9.2	10.1	11.0	12.0	13.1	14.4	16.0	17.9	20.5	23.9
90 (32.2)	1.2	2.3	3.4	4.3	5.1	5.9	6.7	7.4	8.1	8.9	9.7	10.5	11.5	12.6	13.9	15.4	17.3	19.8	23.3
110 (43.3)	1.1	2.2	3.2	4.0	4.9	5.6	6.3	7.0	7.7	8.4	9.2	10.0	11.0	12.0	13.2	14.7	16.6	19.1	22.4
130 (54.4)	1.0	2.0	2.9	3.7	4.5	5.2	5.9	6.6	7.2	7.9	8.7	9.4	10.3	11.3	12.5	14.0	15.8	18.2	21.5
150 (65.6)	0.9	1.8	2.6	3.4	4.1	4.8	5.5	6.1	6.7	7.4	8.1	8.8	9.7	10.6	11.8	13.1	14.9	17.2	20.4

Table 2—Equilibrium moisture content (EMC) of wood, exposed to outdoor atmosphere, in U.S. locations

State	City	EMC (%)											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Ott	Nov	Dec
AK	Anchorage	14.2	13.5	12.0	11.2	10.5	11.5	12.7	13.5	14.0	14.1	14.9	15.3
AK	Barrow	12.5	11.5	11.9	14.6	18.5	19.4	18.9	20.4	20.5	18.2	15.3	13.0
AK	Bethel	15.1	14.4	15.2	15.7	13.8	13.5	15.1	17.1	16.6	17.3	17.0	15.3
AK	Fairbanks	12.5	11.7	11.2	10.0	8.7	9.6	11.0	12.3	12.6	14.3	14.1	13.3
AK	Homer	15.7	14.9	13.7	13.4	13.1	13.6	14.7	15.3	15.3	14.9	15.4	15.8
AK	Juneau	16.5	16.0	15.1	13.9	13.6	13.9	15.1	16.5	18.1	18.0	17.7	18.1
AK	King Salmom	15.4	14.5	14.2	13.4	12.3	12.9	14.3	15.2	15.1	15.5	16.5	15.6
AK	Kodiak	15.7	15.2	14.2	13.9	14.8	15.5	16.1	15.3	15.4	14.4	14.9	15.1
AK	Nome	14.4	13.6	13.7	14.8	14.8	14.7	16.4	16.7	15.3	15.1	15.1	14.4
AK	Valdez	15.0	13.7	13.5	12.8	13.2	13.8	15.5	15.8	16.4	15.2	13.8	15.3
AK	Yakutat	17.7	16.9	15.7	14.6	14.8	15.5	16.9	17.5	17.7	18.2	18.1	18.3
AL	Birmingham	13.6	12.9	12.3	12.6	13.2	13.2	14.0	14.0	13.8	13.4	13.5	13.6
AL	Huntsville	14.5	13.5	13.0	12.7	13.5	13.5	14.0	14.1	14.4	13.5	13.7	14.1
AL	Mobile	13.8	13.1	13.3	13.3	13.4	13.3	14.2	14.4	13.9	13.0	13.7	14.0
AL	Montgomery	13.7	12.9	12.8	12.8	13.3	13.3	14.3	14.3	13.7	13.3	13.6	13.7
AR	Fort Smith	13.9	13.1	12.5	12.5	13.9	13.8	13.2	13.1	13.6	13.0	13.4	14.2
AR	Little Rock	13.8	13.2	12.8	13.1	13.7	13.1	13.3	13.5	13.9	13.1	13.5	13.9
AZ	Flagstaff	11.8	11.4	10.8	9.3	8.8	7.5	9.7	11.1	10.3	10.1	10.8	11.8
AZ	Phoenix	9.4	8.4	7.9	6.1	5.1	4.6	6.2	6.9	6.9	7.0	8.2	9.5
AZ	Tucson	9.1	8.3	7.6	6.0	5.2	4.8	7.7	8.8	7.6	7.5	8.0	9.2
AZ	Winslow	12.3	9.9	8.5	7.2	6.2	5.5	8.0	8.7	8.6	8.5	9.8	12.0
AZ	Yuma	8.2	7.8	7.3	6.5	6.1	5.6	6.8	7.4	7.5	7.4	8.0	8.7
CA	Bakersfield	14.2	12.1	10.8	9.2	7.8	7.1	6.8	7.3	8.0	9.4	11.7	14.1
CA	Bishop	8.1	6.9	5.3	4.5	4.3	3.6	3.8	3.7	4.0	4.8	6.3	7.6
CA	Fresno	16.4	14.1	12.6	10.6	9.1	8.2	7.8	8.4	9.2	10.3	13.4	16.6
CA	Long Beach	11.9	12.2	12.4	12.0	12.6	12.8	12.4	12.3	12.6	12.5	12.2	12.1
CA	Los Angeles	12.2	13.0	13.8	13.8	14.4	14.8	15.0	15.1	14.5	13.8	12.4	12.1
CA	Oakland	14.5	14.0	13.1	12.3	12.8	13.2	13.7	13.9	13.1	12.7	13.7	14.1
CA	Red Bluff	12.4	11.0	9.5	7.9	6.8	6.0	4.9	5.4	5.7	7.4	10.4	12.6
CA	Redding	13.7	11.9	12.0	10.7	9.8	8.3	7.3	7.3	7.9	9.2	11.6	13.6
CA	Sacramento	16.4	14.5	13.4	11.6	10.9	10.0	9.6	9.7	10.0	10.9	13.8	16.4
CA	Sandberg	10.1	10.2	10.2	9.7	8.7	7.2	5.7	5.9	6.6	7.9	9.1	10.3
CA	San Diego	12.0	12.5	12.8	12.6	13.5	14.2	14.1	14.2	14.0	13.3	12.5	12.1
CA	San Francisco	15.2	14.7	14.0	13.6	13.8	13.6	13.9	14.3	13.6	13.4	14.3	15.1
CA	Santa Barbara	13.2	13.0	13.7	12.6	13.8	14.7	15.3	15.2	14.5	13.6	12.1	13.0
CA	Santa Maria	13.4	14.0	14.7	14.4	15.0	14.9	14.4	15.3	15.1	14.2	13.1	13.2
CA	Stockton	16.4	14.6	12.7	10.9	9.8	9.0	8.4	8.7	9.1	10.4	13.8	17.0
CA	Twentynine Palms	8.3	7.7	7.2	6.2	5.6	4.6	4.8	5.9	5.4	5.8	6.8	8.3
CO	Alamosa	13.0	12.1	10.5	9.6	9.7	9.4	11.0	11.6	10.6	10.4	11.9	13.0
CO	Colorado Springs	9.8	9.4	9.6	9.2	9.8	9.5	9.8	10.4	9.6	9.1	10.0	10.0
CO	Denver	10.7	10.5	10.2	9.6	10.2	9.6	9.4	9.6	9.5	9.5	11.0	11.0
CO	Grand Junction	13.7	11.4	9.5	8.2	7.8	6.5	6.8	7.2	7.5	8.7	11.0	13.2
CO	Pueblo	11.1	9.8	9.4	9.3	9.5	9.1	9.5	9.9	9.6	9.4	11.4	11.3
CT	Bridgeport	12.6	12.3	12.2	11.8	12.6	13.0	12.9	13.0	13.5	13.1	13.0	12.7
CT	Hartford	12.0	11.9	11.6	10.8	11.1	11.8	11.9	12.6	13.3	12.7	12.8	12.9
DC	Washington	11.8	11.5	11.3	11.1	11.6	11.7	11.7	12.3	12.6	12.5	12.2	12.2
DE	Wilmington	12.9	12.6	12.0	11.5	12.0	12.1	12.3	13.0	13.2	13.1	13.0	12.9
FL	Apalachicola	14.9	14.9	14.7	14.5	14.3	14.5	15.2	16.2	15.3	14.1	14.3	15.1
FL	Daytona Beach	14.1	13.7	13.4	13.0	13.2	14.2	14.7	15.4	15.2	14.3	14.3	14.3
FL	Fort Myers	14.0	13.6	13.2	12.5	12.7	13.7	13.8	14.1	14.2	13.7	13.8	13.8
FL	Gainesville	15.2	14.4	14.1	13.6	13.2	14.6	15.2	15.9	16.0	15.5	15.6	15.4
FL	Jacksonville	14.0	13.2	12.9	12.4	12.7	13.4	13.6	14.3	15.0	14.4	14.2	14.3
FL	Key West	14.5	14.1	13.6	12.9	13.0	13.5	13.0	13.4	14.1	14.3	14.6	14.7
FL	Miami	13.5	13.1	12.8	12.3	12.7	14.0	13.7	14.1	14.5	13.5	13.9	13.4

Table 2—Equilibrium moisture content (EMC) of wood, exposed to outdoor atmosphere, in U.S. locations-con.

State	City	EMC (%)											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
FL	Orlando	13.9	13.3	13.0	12.5	12.6	13.7	14.0	14.4	14.4	13.7	13.8	14.0
FL	Pensacola	13.9	13.4	13.6	13.5	13.7	13.6	14.5	14.9	14.1	13.2	13.6	14.4
FL	Tallahassee	14.1	13.5	13.3	12.9	13.0	13.6	14.9	15.0	14.3	13.6	13.9	14.0
FL	Tampa	14.2	13.5	13.4	12.8	12.7	13.7	14.2	14.7	14.6	13.9	13.8	14.0
FL	Vero Beach	14.3	13.9	13.4	12.9	13.2	14.3	14.6	15.2	14.9	14.3	14.4	14.3
FL	West Palm Beach	13.6	13.0	12.8	12.2	12.7	14.0	14.0	13.9	14.5	13.8	13.5	13.5
GA	Athens	13.3	12.6	12.6	12.2	13.1	13.3	13.9	14.5	14.5	13.6	13.3	13.4
GA	Atlanta	13.3	12.3	12.0	11.8	12.5	13.0	13.8	14.2	13.9	13.0	12.9	13.2
GA	Augusta	13.1	12.4	12.4	12.2	12.6	12.8	13.2	14.0	13.9	13.2	13.1	13.2
GA	Columbus	13.9	13.1	12.8	12.4	12.5	12.7	13.6	13.8	13.7	13.3	13.5	13.8
GA	Macon	13.7	13.2	13.1	12.5	12.8	13.0	13.7	14.3	14.4	13.4	13.5	13.6
GA	Rome	13.4	12.9	12.5	12.1	12.6	13.0	13.1	13.3	13.2	13.3	12.8	13.3
GA	Savannah	13.0	12.2	12.3	11.8	12.5	13.1	13.4	14.3	14.4	13.4	13.2	13.2
HI	Hilo	13.7	13.5	13.9	14.3	14.0	13.3	14.1	14.3	13.8	14.1	14.6	14.3
HI	Honolulu	13.3	12.8	11.9	11.3	10.8	10.6	10.6	10.7	10.8	11.3	12.1	12.9
HI	Kahului	13.5	13.2	12.6	12.1	11.5	11.1	11.5	11.5	11.4	11.8	12.5	13.1
HI	Lihue	14.1	13.8	13.5	13.5	13.1	12.9	13.0	13.1	13.1	13.5	14.1	14.1
IA	Des Moines	14.0	13.9	13.3	12.6	12.4	12.6	13.1	13.4	13.7	12.7	13.9	14.9
IA	Dubuque	14.3	14.0	13.8	12.6	12.8	13.3	13.9	14.4	14.3	13.4	14.6	15.3
IA	Sioux City	14.4	14.3	14.1	12.3	12.4	12.9	13.6	14.2	13.9	12.8	14.3	15.2
IA	Waterloo	14.5	14.6	14.5	13.1	12.7	13.0	13.8	14.3	14.3	13.4	14.8	15.5
ID	Boise	15.2	13.5	11.1	10.0	9.7	9.0	7.3	7.3	8.4	10.0	13.3	15.2
ID	Lewiston	15.1	13.6	11.9	10.9	10.7	10.0	8.1	8.0	9.2	12.1	15.0	15.7
ID	Pocatello	14.7	13.7	12.0	10.2	9.9	9.6	8.4	8.0	8.8	10.1	13.2	14.9
IL	Cairo	14.5	13.9	13.1	12.2	13.0	12.9	13.2	13.6	13.5	13.0	13.2	14.2
IL	Chicago	14.2	13.7	13.4	12.5	12.2	12.4	12.8	13.3	13.3	12.9	14.0	14.9
IL	Moline	13.6	13.5	13.3	12.5	12.4	12.4	13.2	14.2	13.8	12.8	13.9	14.6
IL	Peoria	14.6	14.6	14.0	12.8	12.9	12.8	13.7	14.3	13.9	13.6	14.9	15.7
IL	Rockford	15.0	14.5	14.1	12.8	12.5	12.5	13.4	14.4	14.3	13.8	15.0	15.8
IL	Springfield	14.6	14.6	14.0	12.8	12.5	12.6	13.3	14.2	13.6	13.0	14.6	15.7
IN	Evansville	14.2	13.9	13.2	12.4	12.8	12.5	13.1	13.4	13.6	13.0	13.7	14.6
IN	Fort Wayne	15.2	14.8	13.9	12.9	12.5	12.4	13.1	13.9	14.0	13.8	15.0	16.2
IN	Indianapolis	15.1	14.6	13.8	12.8	13.0	12.8	13.9	14.5	14.2	13.7	14.8	15.7
IN	South Bend	15.5	14.8	13.8	12.8	12.5	12.5	13.1	14.0	14.1	13.9	15.2	16.2
KS	Concordia	14.1	13.7	12.9	12.8	13.6	13.1	12.0	12.7	13.0	12.3	13.8	14.2
KS	Dodge City	13.1	12.6	11.9	11.5	12.5	11.7	10.8	11.4	11.8	11.1	12.3	12.9
KS	Goodland	13.2	12.4	12.0	11.4	12.6	11.6	11.0	11.3	11.0	11.0	13.0	13.2
KS	Topeka	13.8	13.5	12.9	12.9	13.6	13.9	13.5	13.7	13.8	13.0	13.7	14.2
KS	Wichita	13.8	13.4	12.4	12.4	13.2	12.5	11.5	11.8	12.6	12.4	13.2	13.9
KY	Covington	14.1	13.0	11.8	11.1	12.0	12.4	12.4	12.7	12.6	11.9	12.7	13.8
KY	Jackson	13.7	13.0	11.7	10.8	13.0	13.8	14.4	14.8	14.4	13.0	12.5	13.9
KY	Lexington	14.6	13.9	12.9	12.1	13.0	13.0	13.6	13.9	14.2	13.3	14.0	14.8
KY	Louisville	13.7	13.3	12.6	12.0	12.8	13.0	13.3	13.7	14.1	13.3	13.5	13.9
KY	Paducah	14.6	14.1	12.9	12.5	13.7	13.6	13.9	14.5	14.3	13.4	14.0	14.5
LA	Alexandria	15.6	14.2	14.2	14.5	14.5	14.8	15.0	14.6	15.0	14.1	14.4	15.5
LA	Baton Rouge	14.6	13.8	13.6	13.7	14.0	14.1	14.8	14.8	14.3	13.6	14.3	14.7
LA	Lake Charles	15.7	14.9	14.7	14.7	15.2	15.0	15.3	15.2	15.0	14.0	14.5	15.5
LA	New Orleans	14.9	14.3	14.0	14.2	14.1	14.6	15.2	15.3	14.8	14.0	14.2	15.0
LA	Shreveport	14.4	13.7	13.2	13.7	14.2	14.0	13.8	13.6	13.8	13.5	14.0	14.4
MA	Blue Hill	13.3	12.8	12.6	11.7	12.2	12.9	12.8	13.3	13.7	13.3	13.9	13.4
MA	Boston	11.8	11.6	11.9	11.7	12.2	12.1	11.9	12.5	13.1	12.8	12.6	12.2
MA	Worcester	12.5	12.2	11.9	11.1	11.2	12.1	12.3	12.9	13.6	12.7	13.3	13.2
MD	Baltimore	12.3	11.8	11.6	11.3	12.0	12.0	12.1	12.8	13.1	13.0	12.6	12.5

Table 2—Equilibrium moisture content (EMC) of wood, exposed to outdoor atmosphere, in U.S. locations—con.

State	City	EMC (%)											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
ME	Caribou	13.5	13.0	13.0	12.7	11.7	12.6	13.2	13.7	14.3	14.6	15.7	14.8
ME	Portland	13.1	12.7	12.7	12.1	12.6	13.0	13.0	13.4	13.9	13.8	14.0	13.5
MI	Alpena	15.0	14.0	13.9	12.8	12.1	12.5	12.9	14.2	15.0	14.4	15.4	15.8
MI	Detroit	14.7	14.1	13.5	12.6	12.3	12.3	12.6	13.3	13.7	13.5	14.4	15.1
MI	Flint	15.0	14.3	13.5	12.6	12.2	12.7	13.1	13.9	14.4	13.9	14.9	15.5
MI	Grand Rapids	15.5	14.7	14.1	13.0	12.3	12.7	13.1	14.1	14.6	14.3	15.3	16.0
MI	Houghton Lake	15.8	14.9	14.5	12.9	12.0	12.6	13.1	14.7	15.3	15.1	16.5	16.7
MI	Lansing	16.3	15.2	14.5	13.2	12.7	12.8	13.4	14.4	14.9	14.8	15.8	16.7
MI	Marquette	12.6	14.9	13.9	12.8	12.2	12.9	13.3	14.1	14.5	14.2	14.9	16.0
MI	Muskegon	15.8	14.9	13.9	12.8	12.2	12.8	13.5	14.6	14.7	14.3	14.9	16.0
MI	Sault Ste. Marie	15.6	14.9	14.7	13.5	12.9	14.1	14.7	15.3	16.1	15.8	16.7	16.7
MN	Duluth	14.2	13.5	13.7	12.6	12.1	13.3	13.7	14.7	15.0	14.0	15.1	15.4
MN	International Falls	13.5	13.1	13.1	12.2	12.0	13.1	13.8	14.7	15.3	14.6	16.0	15.3
MN	Minneapolis–St. Paul	13.7	13.6	13.3	12.0	11.9	12.3	12.5	13.2	13.8	13.3	14.3	14.6
MN	Rochester	15.5	15.3	15.1	13.5	13.0	13.0	14.0	14.6	14.8	13.8	15.7	16.5
MN	Saint Cloud	14.1	14.1	14.1	12.7	12.3	13.2	13.5	14.3	14.5	13.9	14.9	15.1
MO	Columbia	14.5	14.1	13.1	12.6	14.1	13.7	13.4	13.7	13.9	13.5	14.1	14.8
MO	Kansas City	13.7	13.7	13.0	12.7	13.6	13.5	13.3	13.6	13.8	12.7	13.6	14.1
MO	St. Louis	14.5	14.1	13.2	12.4	12.8	12.6	12.9	13.3	13.7	13.1	14.0	14.9
MO	Springfield	13.5	13.2	12.7	12.6	13.7	13.8	13.3	13.1	13.7	12.8	13.3	13.8
MS	Jackson	15.1	14.4	13.7	13.8	14.1	13.9	14.6	14.6	14.6	14.1	14.3	14.9
MS	Meridian	14.1	13.4	13.2	13.3	13.8	13.4	14.1	14.0	13.9	13.5	13.6	14.1
MS	Tupelo	14.2	13.6	12.8	12.9	13.7	13.5	13.6	13.9	14.0	13.6	13.8	14.3
MT	Billings	11.3	11.0	10.8	10.3	10.4	10.1	8.9	8.5	9.5	9.9	11.1	11.3
MT	Glasgow	14.5	14.4	13.2	11.0	10.6	10.7	9.9	9.3	10.2	11.3	13.9	15.1
MT	Great Falls	12.1	11.5	10.9	10.3	10.4	10.3	9.1	9.0	9.7	10.1	11.3	11.8
MT	Havre	12.8	12.8	9.8	9.0	7.8	7.9	6.5	6.4	7.7	8.8	11.3	13.4
MT	Helena	12.9	12.0	11.2	10.4	10.3	10.2	9.1	9.2	10.2	10.8	12.6	13.4
MT	Kalispell	16.0	14.8	12.8	11.4	11.5	12.1	11.1	10.7	11.8	13.3	15.8	17.1
MT	Miles City	13.5	13.3	11.0	9.7	8.8	8.4	6.8	6.6	8.3	9.3	12.2	13.8
MT	Missoula	16.7	15.1	12.8	11.4	11.6	11.7	10.1	9.8	11.3	12.9	16.2	17.6
NC	Asheville	14.1	13.3	13.2	12.6	14.4	15.0	15.6	15.9	16.1	14.7	14.0	14.0
NC	Cape Hatteras	14.4	14.1	13.7	12.9	13.8	14.2	14.9	14.9	14.4	14.1	14.0	14.2
NC	Charlotte	12.8	11.9	12.0	11.4	12.4	12.8	13.1	13.8	13.8	13.0	12.9	12.8
NC	Greensboro	12.9	12.1	12.1	11.5	12.9	13.1	13.8	14.3	14.3	13.5	12.8	12.8
NC	Raleigh	12.8	12.1	12.2	11.7	13.1	13.4	13.8	14.5	14.5	13.7	12.9	12.8
NC	Wilmington	13.0	12.4	12.7	12.0	13.2	13.4	14.2	14.8	14.6	13.7	13.2	13.1
ND	Bismarck	13.9	14.3	14.1	12.4	11.9	12.8	12.2	12.1	12.5	12.4	14.3	14.8
ND	Fargo	14.2	14.6	15.2	12.9	11.9	12.9	13.2	13.2	13.7	13.5	15.2	15.2
ND	Williston	14.9	15.0	14.5	12.4	11.7	12.1	11.5	11.3	12.2	12.6	14.9	15.2
NE	Grand Island	13.5	13.4	13.0	12.1	12.7	12.2	12.6	12.9	12.8	12.1	13.3	13.9
NE	Lincoln	13.9	14.2	13.5	12.7	13.2	12.8	12.7	13.5	13.3	12.7	13.8	14.5
NE	Norfolk	13.5	13.9	13.7	12.2	12.3	12.4	12.6	13.2	12.7	12.1	13.4	14.0
NE	North Platte	13.9	13.4	12.6	12.0	12.6	12.7	12.4	12.6	12.2	11.9	13.0	13.7
NE	Omaha	14.0	13.8	13.0	12.1	12.6	12.9	13.3	13.8	14.0	13.0	13.9	14.8
NE	Scottsbluff	12.6	11.7	11.2	10.9	11.3	10.9	10.7	10.9	10.6	10.9	12.3	12.8
NE	Valentine	13.4	13.3	13.1	11.8	11.9	11.6	11.5	11.5	11.2	11.3	12.3	12.8
NH	Concord	12.9	12.4	12.4	11.4	11.6	12.5	12.5	13.3	13.9	13.6	13.9	13.7
NH	Mt. Washington	17.3	17.0	17.9	18.3	17.5	19.1	20.3	20.1	18.5	17.1	18.0	17.8
NJ	Atlantic City	13.1	12.9	12.6	12.2	12.7	12.7	13.2	13.6	13.9	13.9	13.7	13.2
NJ	Newark	12.6	11.9	11.4	10.6	11.2	11.1	11.1	11.6	12.3	12.3	12.5	12.6

Table 2—Equilibrium moisture content (EMC) of wood, exposed to outdoor atmosphere, in U.S. locations-con.

State	City	EMC (%)											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug.	Sep	Oct	Nov	Dec
NM	Albuquerque	10.4	9.3	8.0	6.9	6.8	6.4	8.0	8.9	8.7	8.6	9.6	10.7
NM	Clayton	10.5	10.1	9.7	9.1	9.9	9.7	10.6	10.8	10.4	9.8	10.5	10.8
NM	Roswell	10.7	9.6	8.0	7.4	8.1	8.3	9.1	9.9	10.5	9.7	10.0	10.2
NV	Elko	13.3	12.5	11.1	10.0	9.5	8.7	7.3	7.4	8.0	9.1	11.8	13.2
NV	Ely	12.2	11.8	10.9	9.7	9.3	8.0	7.2	7.7	8.0	9.2	10.9	11.9
NV	Las Vegas	8.5	7.7	7.0	5.5	5.0	4.0	4.5	5.2	5.3	5.9	7.2	8.4
NV	Reno	12.3	10.7	9.7	8.8	8.8	8.2	7.7	7.9	8.4	9.4	10.9	12.3
NV	Winnemucca	12.9	11.7	10.4	9.1	8.7	7.7	6.1	6.3	7.2	8.7	11.3	13.2
NY	Albany	13.5	12.8	12.4	11.4	12.0	12.4	12.6	13.6	14.3	13.8	13.9	14.2
NY	Binghamton	15.0	14.3	13.7	12.5	12.6	13.2	13.2	14.3	15.1	14.4	15.0	15.7
NY	Buffalo	15.0	14.9	14.2	12.6	12.2	12.4	12.3	13.2	13.7	13.7	14.6	15.2
NY	Islip	13.2	12.7	12.8	12.5	12.4	12.4	13.3	13.6	13.9	13.7	13.4	12.8
NY	New York	12.2	11.9	11.5	11.0	11.5	11.8	11.8	12.4	12.6	12.3	12.5	12.3
NY	Rochester	14.3	14.3	13.7	12.5	12.3	12.6	12.6	13.6	14.4	14.2	14.6	15.4
NY	Syracuse	14.2	13.9	13.4	12.2	12.3	12.6	12.7	13.8	14.6	14.1	14.6	15.1
OH	Akron	14.6	13.9	13.2	12.2	12.4	12.8	13.0	14.0	14.1	13.5	14.0	14.8
OH	Cincinnati	14.5	13.8	13.1	12.2	12.6	12.9	13.2	13.9	13.9	13.2	13.9	14.8
	Cleveland	14.6	14.2	13.7	12.6	12.7	12.7	12.8	13.7	13.8	13.3	13.8	14.6
OH	Columbus	14.2	13.7	12.6	12.0	12.6	12.6	13.0	13.7	13.8	13.1	13.9	14.6
OH	Dayton	14.5	14.1	13.4	12.4	12.3	12.3	12.6	13.4	13.7	13.2	14.4	15.2
OH	Mansfield	15.4	14.9	13.8	12.6	12.8	13.0	13.2	14.1	14.1	13.4	14.6	16.0
OH	Toledo	14.9	14.3	13.8	12.8	12.4	12.7	13.3	14.3	14.4	13.8	14.7	15.8
OH	Youngstown	15.3	14.8	13.9	12.6	12.5	12.8	13.2	13.7	14.3	13.8	14.6	15.7
OK	Oklahoma City	13.2	12.9	12.2	12.1	13.4	13.1	11.7	11.8	12.9	12.3	12.8	13.2
OK	Tulsa	13.3	12.7	12.1	12.1	13.7	13.5	12.2	12.5	13.8	12.8	13.1	13.5
OR	Astoria	17.2	16.6	16.3	16.2	16.3	16.4	16.0	16.4	16.4	16.9	17.6	17.8
	Burns	12.8	12.6	10.1	8.1	7.7	7.3	5.9	6.1	6.7	8.6	11.9	14.5
OR	Eugene	18.9	17.4	15.7	14.6	14.0	13.1	11.6	11.7	12.3	15.6	18.9	20.2
OR	Medford	16.7	14.1	13.0	12.1	11.3	10.3	9.4	9.4	10.0	12.1	16.5	17.8
	Pendleton	15.8	14.0	11.6	10.6	9.9	9.1	7.4	7.7	8.8	11.0	14.6	16.5
OR	Portland	16.5	15.3	14.2	13.5	13.1	12.4	11.7	11.9	12.6	15.0	16.8	17.4
OR	Salem	16.9	15.8	14.4	13.9	13.4	12.8	11.6	11.6	12.3	14.6	17.8	18.0
PA	Allentown	13.3	12.8	12.1	11.7	12.0	12.2	12.4	13.3	13.8	13.6	13.5	13.7
PA	Avoca	13.7	13.2	12.5	11.7	11.9	12.9	13.0	13.6	14.4	13.7	13.9	14.1
PA	Erie	14.8	14.6	13.8	13.0	13.1	13.4	13.6	13.8	14.0	13.4	13.7	14.5
PA	Harrisburg	12.4	11.9	11.7	11.2	11.7	11.9	12.1	12.8	13.3	13.1	12.8	12.5
PA	Philadelphia	12.6	11.9	11.7	11.2	11.8	11.9	12.1	12.4	13.0	13.0	12.7	12.7
PA	Pittsburg	13.8	13.2	12.7	11.5	11.9	12.1	12.6	13.2	13.6	12.9	13.5	14.1
PA	Williamsport	13.3	12.8	12.5	11.6	12.2	12.9	13.3	14.0	14.7	14.0	13.9	13.7
PC	Guam	16.3	16.2	15.8	15.6	16.3	16.4	17.9	18.6	18.9	18.4	17.5	16.5
PC	Koror	15.2	14.9	14.6	14.4	15.1	15.5	15.5	15.5	15.0	15.2	15.0	15.2
PC	Marshall Islands	15.0	14.6	15.0	15.9	16.0	16.0	15.9	15.7	15.5	15.5	15.7	15.5
PC	Pago Pago	16.4	16.4	16.6	16.8	16.6	15.9	15.6	15.4	15.2	15.7	15.7	15.7
PC	East Caroline Is.	15.3	15.0	15.2	15.8	16.4	16.6	17.0	16.8	16.6	16.8	16.6	16.0
PC	Wake Island	13.3	13.3	13.8	14.0	14.1	14.1	14.2	14.7	14.7	14.5	14.1	13.5
PC	West Caroline Is.	14.7	14.3	13.9	13.8	14.4	15.0	15.2	15.5	15.4	15.4	15.2	15.0
PR	San Juan	13.7	13.2	12.6	12.5	13.2	13.3	13.5	13.4	13.5	13.6	13.9	13.8
RI	Providence	12.0	11.7	11.7	11.1	11.8	12.1	12.2	12.6	13.0	12.7	12.8	12.5
SC	Charleston	13.3	12.6	12.5	12.4	12.8	13.5	14.1	14.6	14.5	13.7	13.2	13.2
SC	Columbia	13.0	12.3	12.3	11.8	12.4	12.7	13.2	14.0	14.0	13.5	13.4	13.1
SC	Greenville	12.6	11.9	11.9	11.6	12.7	13.0	13.4	14.1	14.2	13.6	12.7	12.7

Table 2—Equilibrium moisture content (EMC) of wood, exposed to outdoor atmosphere, in U.S. locations-con.

State	City	EMC (%)											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
SD	Aberdeen	14.6	14.8	15.1	13.0	12.5	13.4	12.9	13.0	13.0	13.0	15.1	15.4
SD	Huron	13.9	14.6	14.6	13.2	13.1	13.4	13.0	13.3	13.4	13.0	14.3	14.6
SD	Rapid City	12.6	12.7	12.1	11.2	11.5	11.5	10.5	9.9	9.9	10.4	12.1	12.8
SD	Sioux Falls	14.2	14.6	14.2	12.9	12.6	12.8	12.6	13.3	13.6	13.0	14.6	15.3
TN	Bristol-Johnson City	13.9	13.2	12.4	12.2	13.6	14.0	14.6	14.8	14.6	13.6	13.5	14.0
TN	Chattanooga	14.0	13.3	12.7	12.3	13.0	13.2	13.6	13.9	13.9	13.6	13.5	14.2
TN	Knoxville	14.2	13.4	12.8	12.4	13.7	14.0	14.4	14.7	14.7	14.1	14.0	14.4
TN	Memphis	13.8	13.1	12.4	12.2	12.7	12.8	13.0	13.1	13.2	12.5	12.9	13.6
TN	Nashville	13.9	13.4	12.4	12.4	13.4	13.2	13.6	13.8	14.1	13.4	13.5	13.9
TX	Abilene	12.0	12.0	11.1	10.9	12.1	11.5	10.5	10.8	11.9	11.6	11.9	11.9
TX	Amarillo	11.6	11.6	10.4	10.0	11.0	11.2	10.4	11.3	11.9	10.8	11.3	11.3
TX	Austin	13.3	13.1	12.8	13.1	14.1	13.6	12.6	12.4	13.0	12.9	13.3	13.4
TX	Brownsville	15.7	14.9	14.0	14.0	14.3	14.1	13.5	13.6	14.3	14.0	14.1	15.2
TX	Corpus Christi	15.5	15.1	14.2	14.8	15.4	15.0	14.0	14.0	14.3	14.0	14.2	14.8
TX	Dallas–Ft. Worth	13.6	13.1	12.9	13.2	13.9	13.0	11.6	11.7	12.9	12.8	13.1	13.5
TX	Del Rio	12.4	11.8	11.1	11.8	12.9	12.4	11.7	12.1	13.0	12.9	12.9	12.2
TX	El Paso	9.6	8.2	7.0	5.8	6.1	6.3	8.3	9.1	9.3	8.8	9.0	9.8
TX	Houston	14.8	14.4	14.2	14.0	14.6	14.4	14.1	14.2	14.5	14.0	14.4	14.7
TX	Lubbock	11.6	11.5	10.2	10.0	11.0	11.0	11.0	11.5	12.3	11.6	11.5	11.3
TX	Midland–Odessa	11.4	11.1	9.6	9.5	10.5	10.8	10.3	10.8	12.1	11.4	11.1	11.0
TX	Port Arthur	15.7	14.9	14.6	14.9	15.2	15.2	15.6	15.5	15.1	14.3	14.7	15.6
TX	San Angelo	12.3	11.9	10.8	10.8	12.0	12.0	10.9	11.1	12.7	12.6	12.3	12.4
TX	San Antonio	13.3	13.0	12.5	13.0	13.9	13.3	12.5	12.4	12.9	12.7	12.8	13.0
TX	Victoria	15.0	14.4	13.9	14.1	14.5	14.4	13.8	13.8	14.3	13.8	14.1	14.8
TX	Waco	14.4	13.9	13.4	13.5	14.2	12.9	11.6	11.7	12.9	13.1	13.7	14.1
TX	Wichita Falls	13.1	12.9	12.1	12.0	12.9	12.4	10.8	11.2	12.8	12.5	12.9	13.1
UT	Milford	11.9	10.9	8.1	6.5	5.5	4.5	4.8	5.2	5.2	6.4	9.3	11.8
UT	Salt Lake City	14.6	13.2	11.1	10.0	9.4	8.2	7.1	7.4	8.5	10.3	12.8	14.9
UT	Wendover	11.4	9.9	7.6	6.5	5.6	5.4	4.1	4.7	5.2	7.2	10.2	11.9
VT	Burlington	13.0	12.9	12.7	11.9	11.7	12.2	12.2	13.1	14.2	13.7	14.1	13.9
VA	Lynchburg	11.8	11.5	11.4	10.9	12.5	12.8	13.3	13.9	13.8	13.0	12.2	12.2
VA	Norfolk	12.7	12.3	12.1	11.5	12.2	12.4	12.9	13.6	13.4	13.4	12.8	12.7
VA	Richmond	13.2	12.5	12.0	11.3	12.1	12.4	13.0	13.7	13.8	13.5	12.8	13.0
VA	Roanoke	11.6	11.2	11.1	11.0	12.4	12.6	12.8	13.4	13.9	12.9	12.1	11.9
VA	Wallops Island	13.4	13.0	13.2	12.7	13.6	13.7	14.1	14.6	14.1	13.8	13.6	13.4
WA	Olympia	18.9	17.0	15.3	14.5	14.0	13.9	13.3	13.3	14.2	16.6	19.1	19.9
WA	Quillayute	19.6	18.0	17.2	16.6	16.2	16.5	16.1	16.6	16.4	18.1	20.1	20.4
WA	Seattle–Tacoma	15.6	14.6	15.4	13.7	13.0	12.7	12.2	12.5	13.5	15.3	16.3	16.5
WA	Spokane	17.5	15.5	12.9	11.4	10.9	10.3	8.7	8.6	9.8	12.1	17.1	18.7
WA	Yakima	15.5	13.7	11.1	9.9	9.5	9.4	8.8	9.2	10.1	11.6	14.5	16.5
WI	Green Bay	14.5	14.4	14.3	13.1	12.5	13.0	13.6	14.6	14.8	14.4	15.2	15.5
WI	La Crosse	14.1	14.0	13.8	12.4	12.2	13.0	13.5	14.5	14.7	13.7	14.6	15.2
WI	Madison	14.5	14.3	14.1	12.8	12.5	12.8	13.4	14.4	14.9	14.1	15.2	15.7
WI	Milwaukee	14.0	13.9	13.9	13.4	12.9	13.1	13.4	14.3	14.4	13.8	14.5	15.0
WV	Beckley	14.5	13.9	12.9	11.7	12.8	13.8	14.6	14.9	15.2	13.8	13.4	14.2
WV	Charleston	13.7	13.0	12.1	11.4	12.5	13.3	14.1	14.3	14.0	13.6	13.0	13.5
WV	Elkins	14.2	13.7	13.3	12.8	13.4	14.4	15.2	15.7	15.5	13.9	13.9	14.6
WV	Huntington	13.9	13.3	12.3	11.7	13.1	13.7	14.1	14.5	14.7	13.5	13.3	13.9
WV	Parkersburg	14.6	14.1	12.9	11.5	11.6	12.3	12.1	13.0	12.6	12.8	13.2	14.2
WY	Casper	12.3	12.0	11.3	11.0	11.0	10.1	9.0	8.6	9.2	10.3	11.9	12.3
WY	Cheyenne	10.2	10.4	10.7	10.4	10.8	10.5	9.9	9.9	9.7	9.7	10.6	10.6
WY	Lander	12.1	11.5	10.7	10.0	9.9	8.9	7.8	7.7	8.7	9.8	11.9	12.3
WY	Sheridan	12.8	12.4	11.7	11.1	11.5	11.4	9.9	9.2	10.1	10.9	12.9	13.0

Table 3—Equilibrium moisture content (EMC) of wood, exposed to outdoor atmosphere, in locations outside U.S.

Country	City	EMC (%)											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Argentina	Buenos Aires	11.4	12.4	13.2	14.1	14.4	14.7	15.6	14.0	12.7	13.1	12.3	11.9
Australia	Hobart, TS	10.8	11.5	11.9	12.7	14.3	14.6	14.6	13.5	13.2	11.8	11.4	11.0
Australia	Melbourne	11.8	11.4	10.7	12.2	14.0	15.6	15.1	13.9	13.3	12.1	11.7	10.9
Australia	Perth	9.0	8.8	9.5	11.1	13.1	14.4	15.3	14.0	13.0	12.0	10.7	9.8
Australia	Sydney	12.6	12.9	13.2	13.2	12.8	13.0	12.3	11.8	11.4	11.8	11.6	11.8
Austria	Vienna	16.1	14.2	12.6	11.2	11.9	11.8	10.7	11.1	12.5	14.3	15.3	15.2
Bahamas	Nassau	15.0	13.9	13.6	12.7	13.9	14.3	13.9	14.7	14.7	15.1	14.3	14.6
Belgium	Antwerp	19.2	15.8	16.0	13.8	14.4	14.1	15.0	14.2	15.8	18.0	18.6	18.5
Belgium	Brussels	18.4	16.4	15.5	13.8	13.7	14.9	13.8	14.2	15.3	16.2	17.8	18.5
Bermuda	Hamilton	12.6	13.1	12.8	12.6	14.2	14.7	13.9	13.3	13.3	13.3	12.6	12.9
Boliva	La Paz	14.2	13.8	13.5	11.4	9.3	8.5	8.3	8.9	10.0	10.3	10.5	12.2
Bosnia	Tuzla	15.6	15.2	11.9	12.0	12.5	12.9	12.3	12.9	13.8	15.2	15.9	16.9
Brazil	Brasilia	13.6	13.2	13.9	13.2	12.6	11.6	10.5	9.5	9.7	11.6	13.6	14.6
Brazil	Rio De Janeiro	12.4	11.9	12.7	13.3	13.9	13.2	12.9	12.4	12.9	12.7	12.2	13.0
Brazil	Sao Paulo	15.5	14.3	13.9	15.0	15.9	14.5	12.5	13.8	14.6	14.6	15.5	14.2
Canada	Calgary, AB	10.8	11.0	10.8	9.5	9.6	10.0	10.4	10.6	10.4	9.9	10.7	11.2
Canada	Churchill, MN	11.3	11.1	12.6	14.8	16.1	15.0	14.0	14.8	15.9	16.7	15.6	11.8
Canada	Edmonton, AB	13.1	13.3	12.7	10.7	10.2	11.9	13.4	13.7	12.9	12.0	14.2	14.6
Canada	Halifax, NS	14.6	15.7	13.6	13.6	14.3	14.1	13.8	14.6	14.9	16.1	17.0	16.6
Canada	Montreal, ON	13.8	13.1	12.1	11.5	11.4	12.3	12.6	13.5	14.5	13.8	14.7	15.1
Canada	Mould Bay, NT	15.6	19.0	14.7	14.1	18.0	17.5	17.0	19.1	20.5	18.3	12.5	14.4
Canada	Quebec, QB	12.7	12.8	12.6	11.7	11.1	12.0	13.2	13.8	14.0	13.4	14.6	13.9
Canada	St. John, NB	13.5	13.2	12.8	12.9	13.2	14.1	14.9	14.9	15.3	15.5	15.7	14.7
Canada	St. John's, NF	17.1	15.8	16.6	15.7	15.4	16.2	15.8	16.3	16.8	16.6	16.3	17.3
Canada	Toronto, ON	15.7	15.2	14.1	12.4	12.4	12.3	12.3	13.5	14.5	14.6	16.4	17.2
Canada	Vancouver, BC	17.6	16.5	16.0	14.7	14.0	14.1	13.8	14.5	15.8	18.0	17.8	19.2
Canada	Winnipeg, MN	16.6	14.4	15.1	11.2	10.1	12.0	12.9	12.8	12.4	13.0	15.2	14.9
Canada	Yellowknife, NT	11.7	11.3	11.0	11.0	9.9	9.7	10.4	12.1	13.8	16.0	14.3	12.5
Chile	Santiago	9.8	10.2	11.3	12.2	14.8	16.1	16.1	15.2	14.0	12.4	11.3	10.5
China	Beijing	7.0	6.9	7.4	7.7	9.2	10.2	13.3	13.9	11.4	9.9	9.1	7.7
China	Hong Kong	12.2	13.8	15.4	15.5	15.5	15.1	13.9	13.9	13.3	11.7	11.4	11.1
China	Shanghai	13.6	13.7	14.6	14.1	14.2	15.5	16.0	15.5	15.1	14.2	13.3	12.7
Colombia	Barranquilla	14.3	13.9	13.3	13.9	15.1	15.1	14.7	15.5	16.0	16.5	15.5	14.3
Colombia	Bogota	15.7	15.8	15.3	16.3	16.8	16.3	14.8	15.3	15.8	16.3	17.4	15.8
Czech Republic	Prague	19.8	17.4	14.0	12.1	12.7	13.1	12.5	13.1	14.0	16.6	19.2	19.9
Denmark	Copenhagen	19.1	18.2	16.3	13.7	12.6	13.1	13.1	13.4	14.8	16.7	19.3	19.1
Egypt	Alexandria	12.4	12.2	12.2	11.3	11.6	12.1	13.0	12.7	12.2	12.4	11.8	12.8
England	Birmingham	19.2	18.4	15.4	14.6	13.9	14.4	13.8	14.1	15.8	16.7	17.8	19.3
England	Leeds	16.5	15.9	14.1	13.1	12.4	13.0	12.5	13.1	13.7	16.7	16.0	16.5
England	Liverpool	18.5	17.1	15.5	14.6	14.0	14.1	14.1	14.9	16.3	17.3	17.9	18.5
England	London	19.3	16.5	15.5	13.5	13.3	13.1	13.1	13.1	14.5	17.4	17.9	19.4
England	Newcastle	17.6	17.0	15.4	14.1	13.9	14.8	14.9	14.1	15.2	16.1	17.1	19.3
England	Plymouth	17.8	17.1	16.6	15.6	15.2	15.3	15.8	15.8	17.5	16.8	18.7	18.6
Equador	Quito	13.0	13.0	13.7	13.4	13.4	11.4	10.5	10.2	11.2	12.4	13.0	13.0
Ethiopia	Addis Ababa	9.5	10.1	9.9	10.7	9.9	12.2	15.4	15.4	14.1	10.4	9.5	9.5
Finland	Helsinki	19.5	19.5	16.0	13.2	11.7	12.2	13.4	15.8	16.7	18.5	19.9	19.7
France	Bordeaux	17.8	16.0	14.7	13.6	14.1	13.8	13.2	13.2	14.6	17.4	18.0	18.6
France	Brest	19.4	16.5	17.2	16.1	16.2	16.9	16.9	16.9	18.1	18.1	18.0	17.2
France	Marseille	14.1	13.1	12.3	11.4	11.5	10.9	10.1	10.8	11.8	13.1	13.6	14.6
France	Nice	11.0	11.7	12.3	13.7	14.1	13.9	13.9	13.2	13.9	13.1	12.1	11.5
France	Paris	17.7	15.3	14.6	12.6	13.3	13.1	12.3	12.0	14.1	16.8	18.6	17.7
Germany	Berlin	19.0	16.8	14.9	12.4	11.8	12.8	12.3	12.5	14.5	16.1	18.5	20.0
Ghana	Accra	12.7	13.6	14.3	14.7	15.5	17.0	16.5	16.5	16.0	15.5	14.7	14.3
Grand Cayman	George Town	15.5	15.1	14.3	13.6	14.7	14.3	14.7	14.7	15.5	15.5	15.5	15.5
Greece	Athens	12.6	12.6	12.1	11.9	11.1	10.1	8.4	8.6	9.4	11.3	12.7	13.3
India	Bombay	10.1	9.6	10.6	12.4	12.7	15.1	17.6	17.6	16.0	12.7	10.5	9.9
India	Calcutta	12.1	11.2	10.8	12.2	13.6	16.0	17.0	17.6	17.0	14.7	13.0	12.6
India	Madras	13.9	13.3	12.7	12.7	10.7	10.0	11.5	11.9	12.7	14.3	14.7	14.7
India	New Delhi	11.0	9.9	8.4	6.6	6.3	8.0	12.2	13.6	11.3	9.2	9.7	10.6
Indonesia	Jakarta	17.6	16.5	16.0	14.7	14.7	14.3	13.9	13.9	13.3	13.0	13.9	15.1
Iraq	Baghdad	12.8	11.1	9.0	7.2	5.4	4.3	4.1	4.7	5.1	6.6	9.0	12.9

Table 3—Equilibrium moisture content (EMC) of wood, exposed to outdoor atmosphere, in locations outside U.S.—con.

		EMC (%)											
Country	City	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ireland	Dublin	17.8	15.9	16.0	15.5	15.2	15.3	15.4	16.3	15.8	16.7	16.6	18.5
Is. of St. Martin	St. Martin	13.3	13.3	13.9	14.3	13.9	13.3	13.3	13.9	13.9	14.3	14.3	14.3
Israel	Jerusalem	13.8	13.1	11.8	9.8	9.1	9.5	10.2	11.2	10.6	10.7	11.2	13.5
Israel	Tel Aviv	13.0	13.0	11.9	10.5	11.2	11.7	12.7	12.4	12.1	11.6	11.1	13.0
Italy	Genoa	11.2	11.2	11.8	12.4	13.1	13.2	12.7	12.4	12.4	12.5	11.6	11.2
Italy	Milan	15.2	14.8	13.4	12.9	14.1	13.8	13.5	13.9	15.0	16.2	15.4	15.2
Italy	Naples	15.1	14.2	13.6	13.7	13.5	13.5	13.0	13.0	14.2	15.4	15.7	15.1
Italy	Palermo	14.4	13.7	14.0	14.1	14.2	13.6	13.6	13.6	13.3	13.2	13.8	14.1
Italy	Piss	14.1	13.1	13.2	13.6	14.1	13.2	12.9	12.9	13.5	14.1	14.3	14.6
Italy	Rome	15.1	15.1	15.2	15.3	14.9	15.5	15.1	14.7	15.0	15.0	16.2	14.7
Italy	Venice	17.0	14.9	15.1	14.0	13.4	14.2	13.2	13.6	15.0	15.3	16.6	15.8
Jamaica	Kingston	12.7	12.4	12.4	12.4	12.7	12.4	12.4	12.4	13.3	13.6	13.3	12.7
Japan	Kobe	10.8	11.0	10.9	11.0	11.8	13.6	14.3	12.7	13.3	12.0	12.4	11.4
Japan	Nagasaki	12.1	12.1	12.3	12.8	13.2	15.0	15.5	13.9	13.9	12.1	12.4	12.5
Japan	Tokyo	9.5	9.6	10.9	12.4	12.6	15.5	16.0	14.3	14.6	13.5	11.8	10.5
Kenya	Nairobi	11.3	10.3	10.7	13.5	14.2	13.5	13.4	12.5	11.3	11.1	12.9	13.2
Korea	Seoul	10.9	10.9	10.5	10.1	10.9	12.4	15.1	13.9	12.6	11.7	11.3	11.4
Luxembourg	Luxembourg	21.0	15.7	14.9	11.9	11.8	13.1	12.0	12.5	14.4	16.7	17.7	20.0
Madagascar	Antananarivo	13.9	14.2	13.9	13.9	13.5	13.4	13.7	13.1	11.3	11.3	12.3	13.9
Mexico	Acapulco	14.3	13.6	14.3	14.7	14.3	14.7	14.7	14.7	15.1	14.7	14.7	14.3
Mexico	Cancun	16.5	15.5	14.3	14.7	13.6	15.1	14.7	15.1	15.1	15.1	15.5	16.0
Mexico	Mazatlan	12.9	12.6	12.6	12.4	12.7	13.0	14.3	14.7	15.5	14.7	13.3	13.2
Mexico	Puerto Vallarta	14.6	14.6	14.6	15.1	14.3	14.7	15.1	14.7	15.5	15.1	15.1	15.5
Morocco	Casablanca	16.8	16.8	16.9	16.9	15.9	15.9	16.0	16.5	17.0	16.4	16.4	17.5
Netherland Antilles	Aruba	13.6	13.6	13.6	13.6	13.6	13.6	14.3	13.6	14.3	14.3	14.7	14.7
Netherland Antilles	Curacao	14.7	14.3	13.6	14.3	14.3	13.9	13.9	13.6	14.3	15.1	14.7	14.7
Netherlands	Amsterdam	21.1	18.4	17.8	15.5	14.8	15.3	16.4	15.9	18.1	18.0	21.3	20.2
Niger	Niamey	4.3	3.6	3.6	4.6	7.2	9.2	11.7	13.0	11.7	7.6	5.3	4.9
Nigeria	Lagos	14.3	13.3	13.9	15.1	16.0	17.6	18.2	17.0	19.7	18.2	15.5	13.9
Norway	Bergen	16.9	15.1	13.9	13.3	12.8	13.6	14.8	15.3	15.2	15.1	15.8	16.9
Norway	Oslo	17.2	17.2	14.6	11.2	10.6	11.0	11.5	12.0	13.3	15.5	16.9	18.0
Peru	Lima	15.1	15.1	15.1	15.5	17.0	16.4	15.9	16.4	16.4	15.4	15.0	14.6
Philippines	Manila	14.3	13.3	12.4	11.9	12.7	14.3	15.5	16.5	16.0	15.5	15.1	14.7
Portugal	Lisbon	15.2	14.4	13.3	13.0	12.5	12.1	11.0	10.6	11.6	13.5	15.3	16.2
Russia	Moscow	17.5	16.2	14.4	12.3	12.1	13.1	13.8	15.4	16.2	17.0	18.0	18.5
Scotland	Aberdeen	18.4	17.0	16.5	15.5	15.6	15.7	15.8	16.3	16.8	17.9	17.1	17.7
Scotland	Edinburgh	18.4	15.8	15.4	14.6	14.3	14.4	14.9	15.3	16.8	17.3	17.8	19.3
Scotland	Glascow	19.2	17.0	16.5	14.2	13.6	14.8	14.5	15.3	16.8	18.7	17.8	19.3
Scotland	Kirkwall	18.4	19.2	17.7	17.8	17.3	18.7	19.6	19.6	18.7	19.5	19.4	19.3
Singapore	Singapore	16.5	16.0	15.1	16.5	16.0	16.5	16.5	16.5	17.0	17.0	18.2	17.0
Somalia	Mogadishu	13.3	13.9	12.7	13.0	13.6	14.7	14.7	15.1	14.3	14.3	13.9	13.9
South Africa	Cape Town	12.1	12.4	13.2	13.8	14.9	14.4	15.7	14.8	13.7	12.8	12.6	12.6
South Africa	Pretoria	10.2	10.6	10.6	10.1	9.3	9.2	8.7	8.1	7.8	9.0	9.8	10.4
Spain	Barcelona	13.8	13.5	13.6	14.0	14.9	15.0	14.3	14.3	14.6	14.5	14.4	13.2
Spain	Bilbao	13.2	12.3	12.3	13.0	13.1	13.5	13.5	14.2	12.6	12.5	13.0	12.9
Spain	Madrid	14.5	13.0	11.7	11.5	10.8	9.7	8.2	8.2	9.8	12.2	13.9	14.5
Spain	Seville	13.9	13.3	11.6	11.7	10.3	9.6	8.8	8.6	9.4	11.1	13.1	14.4
St. Lucia Island	St. Lucia	13.9	13.3	12.7	13.3	13.3	13.9	14.3	14.7	14.7	14.3	15.1	13.9
Sudan	Khartoum	5.0	4.0	3.2	3.2	3.7	4.8	6.8	7.7	6.9	5.1	5.2	5.6
Sweden	Stockholm	18.8	18.8	16.1	13.2	11.5	11.9	12.5	13.4	15.7	18.5	20.0	23.3
Switzerland	Bern	17.4	15.2	13.7	13.1	13.3	12.5	12.6	12.6	14.1	15.6	15.9	18.3
Switzerland	Geneva	16.9	15.7	13.0	11.9	12.7	12.0	11.8	11.8	13.7	16.2	15.4	16.3
Switzerland	Zurich	16.2	15.1	13.0	12.2	12.4	13.1	12.3	12.8	14.9	16.2	16.4	18.3
Taiwan	Taipei	15.8	16.4	16.9	15.5	16.0	14.7	13.3	13.9	14.7	15.5	15.5	15.4
Tanzania	Dar es Salaam	14.7	13.9	15.5	17.0	16.5	15.1	15.1	14.3	14.3	14.7	14.7	15.1
Thailand	Bangkok	12.2	13.0	12.7	12.7	13.3	13.0	13.9	13.9	14.7	14.7	13.3	11.9
Tunisia	Tunis	15.2	14.8	14.4	13.4	12.3	11.2	10.6	11.0	12.7	13.5	14.1	15.3
Venezuela	Caracas	13.9	13.2	12.4	13.3	13.9	14.3	15.1	14.6	14.3	14.6	15.1	14.2
Vietnam	Hanoi	15.4	16.9	18.2	17.0	15.5	14.7	15.5	16.0	14.7	14.3	13.9	14.2
Vietnam	Ho Chi Minh City	12.2	11.5	11.7	12.2	13.0	14.7	14.7	15.1	15.5	15.1	14.3	13.0
Wales	Cardiff	19.3	17.1	17.1	14.6	15.2	15.3	15.4	15.4	16.3	18.7	19.4	18.5

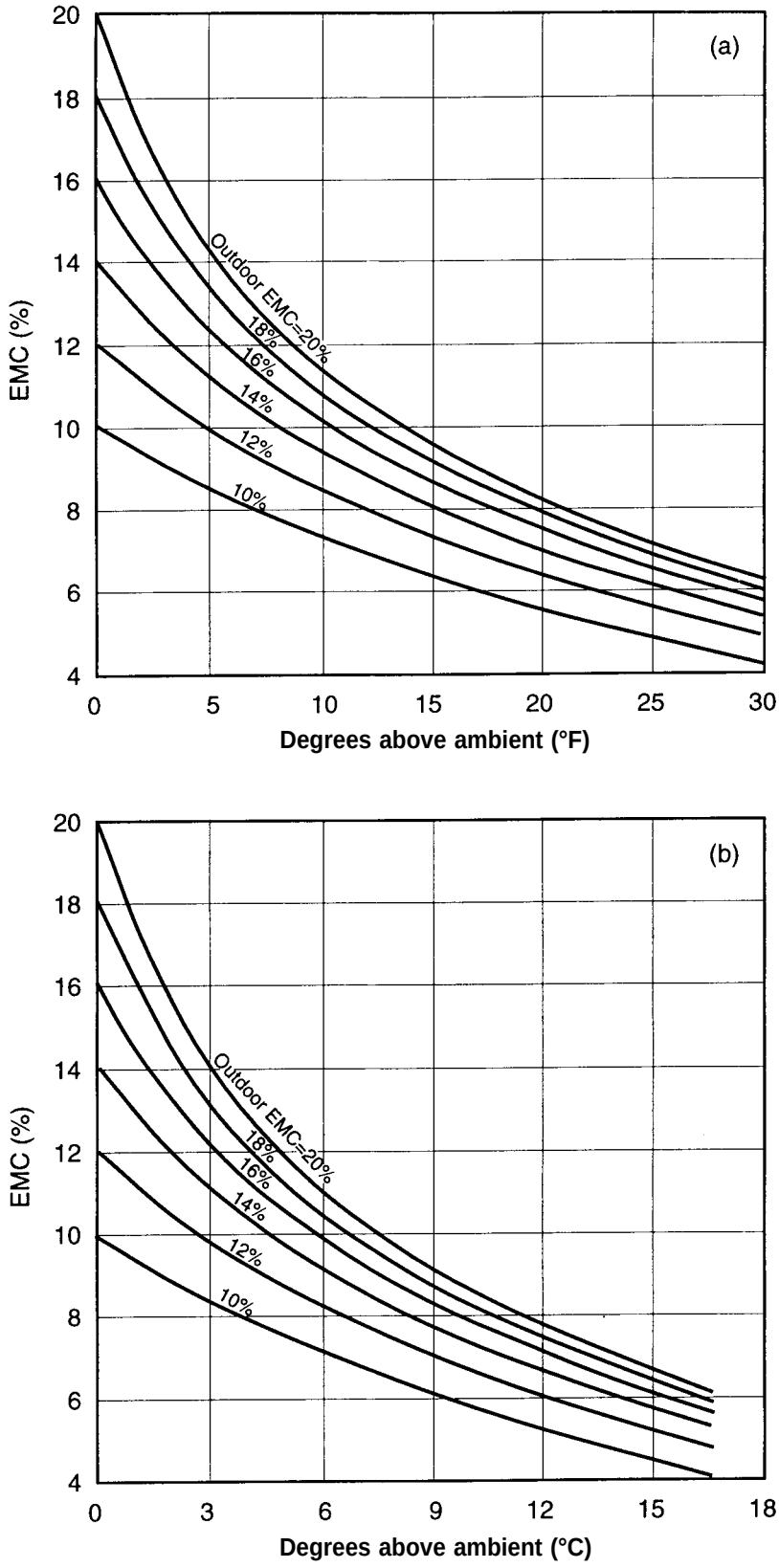

Figure l—Equilibrium moisture content (EMC) of wood when air in an enclosed space is heated above the temperature of the outside ambient air: (a) in Fahrenheit, (b) in Celsius.