

TABLE 2. SUMMER CLIMATIC CONDITIONS\* (CONTINUED)  
Suggested Design Wet-Bulb and Dry-Bulb Temperatures

| COL. 1 | COL. 2                | COL. 3                       | COL. 4                        | COL. 5                                         | COL. 6                                                       | COL. 7                                                 | COL. 8                                                 | COL. 9                                           |
|--------|-----------------------|------------------------------|-------------------------------|------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------|--------------------------------------------------------|--------------------------------------------------|
| STATE  | STATION <sup>b</sup>  | ELEVATION <sup>c</sup><br>FT | PERIOD OF RECORD <sup>d</sup> | HIGHEST TEMP. EVER RECORDED <sup>e</sup><br>°F | DESIGN DRY-BULB TEMP. ON T.A.C. 24% BASIS <sup>f</sup><br>°F | DESIGN DRY-BULB TEMP. IN COMMON USE <sup>g</sup><br>°F | DESIGN WET-BULB TEMP. IN COMMON USE <sup>h</sup><br>°F | AVERAGE SUMMER WIND VELOCITY <sup>i</sup><br>MPH |
| S. C.  | Columbia.....CO       | 401                          | 1887-1947                     | 106                                            | ...                                                          | 95                                                     | 75                                                     | ...                                              |
| S. D.  | Columbia.....AP       | 227                          | 1939-1947 <sup>d</sup>        | 104                                            | ...                                                          | 95                                                     | 75                                                     | 10.3                                             |
|        | Huron.....CO          | 1342                         | 1881-1938 <sup>d</sup>        | 111                                            | ...                                                          | 95                                                     | 70                                                     | 7.9                                              |
|        | Huron.....AP          | 1287                         | 1938-1947                     | 106                                            | ...                                                          | 95                                                     | 76                                                     | 5.6                                              |
|        | Rapid City.....CO     | 3309                         | 1888-1947                     | 108                                            | ...                                                          | 95                                                     | 75                                                     | 5.7                                              |
| Tenn.  | Rapid City.....AP     | 952                          | 1879-1947                     | 103                                            | ...                                                          | 95                                                     | 76                                                     | 7.3                                              |
|        | Chattanooga.....CO    | 675                          | 1940-1947                     | 105                                            | 94                                                           | 95                                                     | 75                                                     | ...                                              |
|        | Knoxville.....CO      | 1024                         | 1871-1942 <sup>d</sup>        | 104                                            | 94                                                           | 95                                                     | 78                                                     | ...                                              |
|        | Knoxville.....AP      | 1007                         | 1942-1947                     | 102                                            | 94                                                           | 95                                                     | 78                                                     | ...                                              |
|        | Memphis.....CO        | 348                          | 1872-1941 <sup>d</sup>        | 106                                            | 96                                                           | 95                                                     | 78                                                     | ...                                              |
|        | Memphis.....AP        | 287                          | 1941-1947                     | 106                                            | 96                                                           | 95                                                     | 78                                                     | ...                                              |
|        | Nashville.....CO      | 714                          | 1871-1947                     | 106                                            | ...                                                          | 95                                                     | 78                                                     | ...                                              |
|        | Nashville.....AP      | 610                          | 1939-1947                     | 104                                            | ...                                                          | 95                                                     | 78                                                     | ...                                              |
| Texas  | Nashville.....CO      | 1748                         | 1885-1944 <sup>d</sup>        | 111                                            | ...                                                          | 100                                                    | 74                                                     | ...                                              |
|        | Arlington.....AP      | 1756                         | 1940-1947                     | 109                                            | 97                                                           | 100                                                    | 72                                                     | 11.8                                             |
|        | Amarillo.....CO       | 3686                         | 1892-1941                     | 107                                            | ...                                                          | 100                                                    | 72                                                     | ...                                              |
|        | Amarillo.....AP       | 3595                         | 1941-1947                     | 108                                            | 96                                                           | 100                                                    | 78                                                     | ...                                              |
|        | Austin.....CO         | 625                          | 1897-1942                     | 109                                            | ...                                                          | 100                                                    | 78                                                     | ...                                              |
|        | Austin.....AP         | 625                          | 1942-1947                     | 104                                            | ...                                                          | 100                                                    | 80                                                     | 7.0                                              |
|        | Brownsville.....CO    | 140                          | 1922-1943 <sup>d</sup>        | 102                                            | ...                                                          | 100                                                    | 80                                                     | ...                                              |
|        | Brownsville.....AP    | 25                           | 1943-1947                     | 100                                            | ...                                                          | 95                                                     | 80                                                     | 9.3                                              |
|        | Corpus Christi.....CO | 21                           | 1887-1942                     | 105                                            | ...                                                          | 100                                                    | 78                                                     | 8.4                                              |
|        | Corpus Christi.....AP | 45                           | 1943-1946                     | 101                                            | ...                                                          | 100                                                    | 78                                                     | 9.3                                              |
|        | Dallas.....CO         | 732                          | 1913-1940                     | 110                                            | ...                                                          | 100                                                    | 78                                                     | ...                                              |
|        | Dallas.....AP         | 520                          | 1940-1947                     | 109                                            | 99                                                           | 100                                                    | 78                                                     | ...                                              |
|        | Del Rio.....CO        | 1020                         | 1905-1947                     | 111                                            | ...                                                          | 100                                                    | 69                                                     | 8.4                                              |
|        | El Paso.....CO        | 3792                         | 1887-1942                     | 104                                            | 97                                                           | 100                                                    | 69                                                     | 9.5                                              |
|        | El Paso.....AP        | 3956                         | 1939-1947                     | 106                                            | ...                                                          | 100                                                    | 78                                                     | 9.7                                              |
|        | Fort Worth.....CO     | 708                          | 1898-1939                     | 112                                            | ...                                                          | 100                                                    | 80                                                     | 8.8                                              |
|        | Fort Worth.....AP     | 728                          | 1940-1947                     | 110                                            | ...                                                          | 95                                                     | 80                                                     | ...                                              |
|        | Galveston.....CO      | 128                          | 1871-1947                     | 101                                            | ...                                                          | 95                                                     | 80                                                     | ...                                              |
|        | Galveston.....AP      | 9                            | 1939-1947                     | 101                                            | ...                                                          | 95                                                     | 80                                                     | ...                                              |
|        | Houston.....CO        | 198                          | 1888-1947                     | 108                                            | 93                                                           | 100                                                    | 78                                                     | ...                                              |
|        | Houston.....AP        | 73                           | 1932-1947                     | 105                                            | ...                                                          | 100                                                    | 78                                                     | ...                                              |
|        | Palestine.....CO      | 555                          | 1881-1947                     | 108                                            | ...                                                          | 95                                                     | 79                                                     | ...                                              |
|        | Port Arthur.....CO    | 84                           | 1917-1947                     | 102                                            | ...                                                          | 95                                                     | 79                                                     | ...                                              |
|        | Port Arthur.....AP    | 21                           | 1944-1947                     | 98                                             | ...                                                          | 100                                                    | 78                                                     | 7.8                                              |
|        | San Antonio.....CO    | 770                          | 1885-1941 <sup>d</sup>        | 107                                            | ...                                                          | 100                                                    | 78                                                     | ...                                              |
|        | San Antonio.....AP    | 800                          | 1942-1947                     | 104                                            | 98                                                           | ...                                                    | ...                                                    | ...                                              |
|        | Waco.....CO           | 513                          | 1931-1947                     | 111                                            | 98                                                           | ...                                                    | ...                                                    | ...                                              |
|        | Wink.....AP           | 2811                         | 1935-1939                     | 110                                            | 99                                                           | ...                                                    | ...                                                    | ...                                              |
| Utah   | Milford.....AP        | 5095                         | 1935-1939                     | 103                                            | 94                                                           | ...                                                    | ...                                                    | ...                                              |
|        | Modena.....CO         | 5472                         | 1901-1947                     | 101                                            | 95                                                           | 65                                                     | 9.8                                                    | ...                                              |
|        | Salt Lake City.....CO | 4346                         | 1874-1947                     | 105                                            | 95                                                           | 65                                                     | 9.8                                                    | ...                                              |
|        | Salt Lake City.....AP | 4254                         | 1925-1947                     | 106                                            | 95                                                           | 90                                                     | 73                                                     | 8.5                                              |
| Vt.    | Burlington.....CO     | 409                          | 1884-1943 <sup>d</sup>        | 100                                            | ...                                                          | 90                                                     | 73                                                     | ...                                              |
|        | Burlington.....AP     | 335                          | 1943-1947                     | 101                                            | ...                                                          | 95                                                     | 78                                                     | ...                                              |
| Va.    | Cape Henry.....CO     | 24                           | 1874-1947                     | 104                                            | ...                                                          | 95                                                     | 75                                                     | ...                                              |
|        | Lynchburg.....CO      | 644                          | 1874-1944                     | 106                                            | ...                                                          | 95                                                     | 75                                                     | ...                                              |
|        | Lynchburg.....AP      | 951                          | 1944-1947                     | 100                                            | ...                                                          | 95                                                     | 78                                                     | 10.1                                             |
|        | Norfolk.....CO        | 91                           | 1871-1947                     | 105                                            | ...                                                          | 95                                                     | 78                                                     | 6.4                                              |
|        | Richmond.....CO       | 180                          | 1897-1947                     | 107                                            | 92                                                           | 95                                                     | 76                                                     | ...                                              |
|        | Richmond.....AP       | 172                          | 1929-1947                     | 104                                            | 90                                                           | 95                                                     | 76                                                     | ...                                              |
|        | Roanoke.....CO        | 1194                         | 1835-1939                     | 103                                            | 90                                                           | 95                                                     | 76                                                     | ...                                              |
| Wash.  | Roanoke.....AP        | 1731                         | 1935-1939                     | 105                                            | 90                                                           | 85                                                     | 65                                                     | 7.7                                              |
|        | North Head.....CO     | 199                          | 1884-1947                     | 97                                             | ...                                                          | 85                                                     | 65                                                     | ...                                              |
|        | Seattle.....CO        | 104                          | 1890-1947                     | 100                                            | ...                                                          | 85                                                     | 65                                                     | ...                                              |
|        | Seattle.....AP        | 47                           | 1928-1947                     | 99                                             | 81                                                           | 93                                                     | 65                                                     | 6.5                                              |
|        | Spokane.....CO        | 2030                         | 1881-1941 <sup>d</sup>        | 108                                            | 92                                                           | 95                                                     | 64                                                     | ...                                              |
|        | Spokane.....AP        | 1974                         | 1941-1947                     | 104                                            | ...                                                          | 95                                                     | 64                                                     | ...                                              |
|        | Tacoma.....CO         | 279                          | 1897-1947                     | 98                                             | ...                                                          | 95                                                     | 64                                                     | ...                                              |
|        | Tacoma.....AP         | 110                          | 1883-1947                     | 88                                             | ...                                                          | 95                                                     | 65                                                     | ...                                              |
|        | Tacoma Island.....CO  | 1160                         | 1928-1946                     | 110                                            | ...                                                          | 95                                                     | 65                                                     | ...                                              |
|        | Yakima.....CO         | 1066                         | 1944-1947                     | 103                                            | ...                                                          | 95                                                     | 75                                                     | 5.2                                              |
| W. Va. | Yakima.....AP         | 685                          | 1888-1947                     | 106                                            | ...                                                          | 95                                                     | 75                                                     | 9.3                                              |
|        | Parkersburg.....CO    | 598                          | 1886-1947                     | 104                                            | ...                                                          | 95                                                     | 75                                                     | 6.4                                              |
| Wisc.  | La Crosse.....CO      | 725                          | 1872-1947                     | 108                                            | ...                                                          | 91                                                     | 75                                                     | 7.9                                              |
|        | La Crosse.....AP      | 677                          | 1943-1947                     | 96                                             | ...                                                          | 95                                                     | 75                                                     | ...                                              |
|        | Madison.....CO        | 1008                         | 1858-1947                     | 107                                            | 89                                                           | 95                                                     | 75                                                     | 9.8                                              |
|        | Madison.....AP        | 884                          | 1935-1939                     | 106                                            | ...                                                          | 95                                                     | 75                                                     | ...                                              |
|        | Madison.....CO        | 744                          | 1870-1947                     | 105                                            | ...                                                          | 95                                                     | 65                                                     | 9.3                                              |
|        | Milwaukee.....CO      | 707                          | 1927-1947                     | 106                                            | 87                                                           | 95                                                     | 65                                                     | ...                                              |
|        | Milwaukee.....AP      | 6144                         | 1873-1935                     | 100                                            | 89                                                           | 95                                                     | 65                                                     | ...                                              |
| Wyo.   | Cheyenne.....CO       | 6161                         | 1935-1947                     | 100                                            | ...                                                          | 95                                                     | 65                                                     | ...                                              |
|        | Cheyenne.....AP       | 5448                         | 1891-1946                     | 102                                            | ...                                                          | ...                                                    | ...                                                    | ...                                              |
|        | Lander.....CO         | 5568                         | 1936-1947                     | 97                                             | ...                                                          | ...                                                    | ...                                                    | ...                                              |
|        | Rock Springs.....AP   | 6746                         | 1932-1942                     | 98                                             | 87                                                           | ...                                                    | ...                                                    | ...                                              |

TABLE 2. SUMMER CLIMATIC CONDITIONS\* (CONCLUDED)  
Suggested Design Wet-Bulb and Dry-Bulb Temperatures

| COL. 1                         | COL. 2                  | COL. 3                 | COL. 4                        | COL. 5                                 | COL. 6              | COL. 7 | COL. 8 | COL. 9 | COL. 10                           | COL. 11                           | COL. 12                                      |
|--------------------------------|-------------------------|------------------------|-------------------------------|----------------------------------------|---------------------|--------|--------|--------|-----------------------------------|-----------------------------------|----------------------------------------------|
| PROV. OF CAN. ADA <sup>j</sup> | STATION <sup>b</sup>    | ELEVATION <sup>c</sup> | PERIOD OF RECORD <sup>d</sup> | HIGH-EST TEMP. ON RE-CORD <sup>e</sup> | Summer Design Temp. |        |        |        | TEMP. IN COM-MON USE <sup>f</sup> | TEMP. IN COM-MON USE <sup>f</sup> | AVG. SUM-MER WIND VELO-CITY <sup>g</sup> MPH |
|                                |                         |                        |                               |                                        | 1% F                | 2% F   | 5% F   | 10% F  |                                   |                                   |                                              |
| Alta.                          | Calgary.....AP          | 3540°                  | 1921-1950                     | 97                                     | 86                  | 83     | 80     | 77     | 90                                | 66                                | 9.7                                          |
|                                | Edmonton.....AP         | 2219°                  | 1921-1950                     | 99                                     | 87                  | 83     | 80     | 77     | 90                                | 68                                | 8.9                                          |
|                                | Medicine hat.....AP     | 2365°                  | 1921-1950                     | 106                                    | 92                  | 89     | 86     | 82     | 90                                | 65                                | 9.1                                          |
| B.C.                           | Vancouver.....AP        | 22°                    | 1938-1950                     | 87                                     | 80                  | 77     | 75     | 72     | 80                                | 67                                | 7.8                                          |
| B.C.                           | Winnipeg.....AP         | 786°                   | 1921-1950                     | 108                                    | 89                  | 86     | 84     | 81     | 90                                | 71                                | 11.5                                         |
| Man.                           | Fredericton.....CO      | 184°                   | 1921-1950                     | 102                                    | 89                  | 87     | 84     | 81     | 90                                | 75                                | ...                                          |
| N.B.                           | Saint John.....CO       | 119°                   | 1921-1950                     | 93                                     | 80                  | 77     | 75     | 72     | 90                                | 75                                | 7.9                                          |
| N.S.                           | Halifax.....CO          | 83°                    | 1921-1950                     | 94                                     | 80                  | 78     | 76     | 73     | 90                                | 75                                | 6.6                                          |
|                                | Sydney.....AP           | 197°                   | 1921-1950                     | 95                                     | 85                  | 83     | 80     | 75     | 90                                | 75                                | 9.9                                          |
| Ont.                           | Fort William.....AP     | 644°                   | 1921-1950                     | 104                                    | 86                  | 82     | 79     | 76     | 90                                | 75                                | 8.4                                          |
|                                | North Bay.....AP        | 1210°                  | 1925-1950                     | 99                                     | 83                  | 80     | 77     | 74     | 90                                | 75                                | 9.6                                          |
|                                | Ottawa.....AP           | 339°                   | 1921-1950                     | 102                                    | 89                  | 86     | 84     | 81     | 90                                | 75                                | 8.9                                          |
|                                | Sault Ste. Marie.....CO | 635°                   | 1921-1950                     | 99                                     | 83                  | 80     | 77     | 74     | 93                                | 75                                | ...                                          |
|                                | Toronto.....CO          | 375°                   | 1921-1950                     | 105                                    | 88                  | 86     | 83     | 81     | 93                                | 75                                | 8.1                                          |
|                                | Toronto.....AP          | 578°                   | 1935-1950                     | 101                                    | 90                  | 87     | 84     | 81     | 90                                | 75                                | 8.7                                          |
| P.E.I.                         | Charlottetown.....CO    | 74°                    | 1921-1950                     | 98                                     | 82                  | 79     | 77     | 74     | 90                                | 75                                | 9.9                                          |
| Que.                           | Montreal.....CO         | 187°                   | 1921-1950                     | 97                                     | 87                  | 84     | 82     | 79     | 90                                | 75                                | 9.5                                          |
|                                | Montreal.....AP         | 98°                    | 1942-1950                     | 96                                     | 88                  | 85     | 83     | 80     | 90                                | 75                                | 9.0                                          |
|                                | Quebec.....CO           | 296°                   | 1921-1950                     | 96                                     | 85                  | 82     | 80     | 77     | 90                                | 71                                | 12.4                                         |
| Sask.                          | Regina.....AP           | 1884°                  | 1921-1950                     | 111                                    | 91                  | 88     | 85     | 81     | 90                                | 70                                | 10.7                                         |
|                                | Saskatoon.....AP        | 1645°                  | 1921-1950                     | 104                                    | 92                  | 89     | 85     | 81     | 90                                | 70                                | 10.7                                         |

## Notes for Table 2

- \* Data compiled from U. S. Weather Bureau Data and various other sources.
- <sup>b</sup> Column 2. The station designation AP or CO indicates airport or city office station, respectively.
- <sup>c</sup> Column 3. The elevations marked c are ground elevations of the station. All other elevations given are the actual elevations of the thermometer bulb above mean sea level, corrected to 1948.
- <sup>d</sup> The periods of record indicated apply only to the highest temperature ever recorded shown in Column 5, and do not necessarily include all of the summer months of the first year indicated. The last year indicated includes July or August, except those marked d which terminate prior to July of that year.
- <sup>e</sup> It should be noted that Column 6 in the United States section of the table applies only to airports, as these data for city stations are not available at this time. The temperature shown is the maximum hourly outdoor temperature which has been equalled or exceeded 24 percent of the total hours of June, July, August and September for the 5-year period 1935-1939 inclusive. It is pointed out that in most cases the airport stations are outside of the city, and that these data would apply primarily to rural areas.
- <sup>f</sup> Columns 7 and 8 in the United States section and Columns 9 and 10 in the Canadian section of the table record wet and dry-bulb temperatures in use by A.S.H.A.E. members as reported by Chapter secretaries for various stations. Where such values were not available, the design temperatures published by API or obtained from various other sources have been inserted.
- <sup>g</sup> The average wind velocities in Column 9 in the United States section were furnished by the U. S. Weather Bureau, corrected to 1948. In general these velocities are averages for the months of June through September.
- <sup>h</sup> The bulletin published by the A.S.H.A.E. for the annual weather data of Detroit indicates 73 F as the design wet-bulb temperature which has been equalled or exceeded 5 percent of the hours for period 1935-39.
- <sup>i</sup> Blank spaces indicate data not available.
- <sup>j</sup> The data for Canada were compiled by D. W. Boyd and Morley Thomas from the records of the Meteorological Division, National Research Council of Canada.
- <sup>k</sup> The highest temperature ever recorded in the Canadian section of the table is for the 30 year period, 1921-1950, where available. In some cases the stations have been relocated and in a few instances some year, are missing.
- <sup>l</sup> In the Canadian section of the table, the summer design dry-bulb temperatures for the basis of 1, 2, 5 and 10 percent are the Fahrenheit temperature values at or above which these percentages of all the July hourly outdoor temperatures occur, for the years 1941-1950 inclusive.
- <sup>m</sup> Most of the wind speeds are based on the periods ending in 1947 which are somewhat shorter than the periods for the highest temperatures. The three months June, July and August were used.

## INSTANTANEOUS HEAT LOAD

The total cooling load is frequently divided for convenience into two components, *sensible heat* and *latent heat*. While this subdivision is not imperative, past practice has found it convenient.

A gain of *sensible heat* is considered to occur when there is a direct addi-