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NATIONAL BUREAU OF STANDARDS REPORT

9483

SIMULTANEOUS WEATHER CHARACTERISTICS IN SIX

SELECTED CITIES IN THE UNITED STATES

by

T. Kusuda
National Bureau of Standards
Washington, D. C.

Prepared for

Office of Civil Defense
Department of the Army-OSA

Under

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U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

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SUMMARY OF RESEARCH REPORT

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Many previous investigations related to this subject have shown that the thermal environment in fallout shelters may become very critical during extreme summer conditions in many U. S. cities unless adequate facilities of ventilation or air-conditioning are provided. The design and selection of equipment for shelter ventilation or air conditioning systems, depend strongly upon design conditions.

The purpose of this paper is to critically examine the existing weather data in the light of survival conditions required for fallout shelter design. It has been shown that simultaneous hourly data or dry- and wet-bulb temperatures for typical design day or design week are needed for the realistic evaluation of thermal environment in the shelter. Such data, however, are found non-existent among available sources such as ASHRAE Guide and Data Book, the Army, Navy, and Air Force Manual and the data of Fluor Products Co.

Four typical days were chosen from six selected cities in the United States to investigate their hourly characteristics with reference to published data in three sources mentioned above. The days selected are:

1) The day or each year with the highest hourly dry-bulb temperatures (hottest-day).
2) The day of each year with the highest hourly dew-point temperature (most-humid-day).
3) The average of seven consecutive days each year with the highest 7-day average of hourly dry-bulb temperature (hottest-week day).

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4) The average of seven consecutive days each year with the highest 7-day average of hourly dew-point temperature (most-humid-week day).

These data are prepared from ten years weather record covering from 1953 through 1962 from the following six cities:

Phonex, Ariz.	Minneapolis, Minn.
Washington, D.C.	Medford, Oreg.
Lake Charles, La.	Houston, Tex.

In order to facilitate easy computer application of these data for the evaluation of shelter thermal environment, least squares analysis were applied to each of four types of days for all of six cities. The least squares constants describing the dry-bulb temperature, dew-point temperature and solar radiation for up to 4th degree harmonics have been obtained. These least squares constants and best-fit data calculated by these constants are tabulated in this report.

Special attention was also given to the solar radiation data for these typical days. A comparison was made for the observed data and the calculated data using a currently available technique. The calculated data, which are for cloudless days of certain moisture and dust concentration, showed usually higher value than the observed even for the hottest-days of the year.

Finally the hourly data obtained during this study for Washington, D. C. has been applied to a family shelter and a 540-man shelter for the purpose of evaluating the internal thermal environment.

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The findings.

This pilot analysis of coincident weather data from six cities representing different types of climatic conditions resulted in the following points:

1) The diurnal levels of coincident dry-bulb and wet-bulb temperatures during the hottest-day and-week during the most-humid-day and-week cannot be derived directly from the presently published percentile levels of extreme temperatures, such as those of ASHRAE or the Army, Navy and Air Force Manual.

2) The dew-point temperature undergoes a small daily cycle with a range of 4 to 8 degrees during the hottest-days and approximately half of this range during the hottest-week, and most-humid-day and-week.

3) The daily range in dry-bulb temperature was about 50% greater during the hottest-week than for the most-humid-week.

4) The hottest-week and most-humid-week of the summer sometimes overlap. The hottest-day of the summer occurs during the hottest-week about 60% of the time and can occur anytime during the seven consecutive days of hot weather.

5) The diurnal cycles of dry-bulb temperature, dew-point temperatures, and solar radiation can be presented by harmonic equations with constants evaluated to the fourth degree with relatively small differences between the calculated values and the 10-year average observed values.

6) The total observed radiation on a horizontal surface during the hottest-day and -week was considerably less for some of the six cities than the value derived by adding the solar radiation calculated from Moon's proposed standards and the ASHRAE value for diffuse sky radiation. The solar and sky radiation should not be ignored during the most-humid-days and -weeks.

The use of the three different hourly conditions prepared in this report for the ventilation air for 540-man shelter and a 6-man shelter in Washington, D. C. indicated the following conclusions for this illustrative example.

1) The psychrometric conditions representing the 10-year-average hottest-week produced substantially the same shelter environment as the psychrometric conditions representing the 10-year-average most-humid-week.

2) The psychrometric conditions represented by the 5 percent ASHRAE dry- and wet-bulb temperatures in combination with a diurnal dry-bulb temperature variation specified in G&DB * produced only slightly higher effective temperatures inside the shelter than the 10-year-average hottest-week conditions.

3) The magnitude of the diurnal variation in shelter effective temperature increased with the size of shelter and also with an increase in per capita ventilation rate.

* ASHRAE Guide and Data Book (ref. 2).

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4) The average shelter effective temperature at the end of the average hottest-week was nearly equal for the 540-man shelter and for the 6-man shelter, with ventilation rates per person being 10 cfm and 7 cfm respectively. Doubling the ventilation rate in the larger shelter lowered the average effective temperature about 3 degrees.

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COINCIDENT SUMMER WEATHER CHARACTERISTICS OF SIX SELECTED CITIES IN THE UNITED STATES

by

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1. INTRODUCTION

Previous investigations have shown that the thermal environment in fallout shelters may become critical during the extreme summer conditions in many U. S. cities unless adequate means of ventilation or air-conditioning are provided [1]. The design or selection of the equipment for shelter ventilation or air-conditioning systems, or both, for a survival condition (not for a comfort condition) depends strongly upon summer outdoor weather conditions.

When air-conditioning equipment is not installed, the thermal stress on the occupants of a protective shelter is dependent on the rate of flow and psychrometric condition of ventilation air. It has been shown [1] that simultaneous design values of the dry- and wet-bulb temperatures are needed for a realistic appraisal of the summer ventilation requirements of shelters rather than independent data, such as those published in the ASHRAE Guide and Data Book [2,3] and the Army, Navy, and Air Force Manual [4]. Moreover, the coincident occurrence of extreme values of dry-bulb and wet-bulb temperatures would be less frequent than the independent occurrence of these same values in any given locality.

In the ASHRAE Guide and Data Book, the outdoor psychrometric conditions for cooling load calculation are listed for principal cities of the United States in two sets of temperatures, dry-bulb and wet-bulb temperatures, which are independently equalled or exceeded for 1, 2.5, and 5 percent of all the hours during the summer months, June through September. The Army, Navy, and Air Force Manual [4] presents dry-and wet-bulb temperatures that are independently equalled or exceed for 1, 2.5, 5, and 10 percent of the time during the warmest consecutive four months, as determined by the mean wet-bulb temperature (in the U. S. these four months correspond to June through September). The 1-, 2.5-, and 5-percent values of the Guide and Data Book differ slightly from corresponding equivalent values of the Army, Navy and Air Force Manual, but this difference is small and may be considered insignificant for practical purposes.

A publication of the Fluor Products Company [5], on the other hand, contains coincident dry- and wet-bulb temperatures based on their hourly occurrences at 49 weather stations in the U. S. The Fluor data are presented graphically on psychrometric charts by three iso-frequency curves representing high, moderate, and low coincident design conditions. The three zones defined by these three curves contain all the psychrometric conditions that occur approximately 99, 95, and 85 percent of the total summer hours, respectively [5].

In addition to the psychrometric data, the evaluation of the thermal behavior of protective shelters may require a knowledge of the simultaneous values of solar energy, particularly for shallow underground shelters and for above-ground shelters. Although a number of publications have described methods for the calculation or estimation of solar energy, most of them deal with solar data independent of other weather data factors.

Although analytical methods are available for calculating the cooling load of a structure under the influence of cylic weather conditions and solar radiation, a modified steady-state procedure is usually used for designing comfort air-conditioning systems. In this latter method equivalent temperature differences, which are evaluated hour by hour during the day and which are affected by latitude, heat capacity of the building element, orientation, and color and emissivity of the exterior surface, are used in the steady-state heat transmission equation to determine the approximate maximum rate of heat transfer into the air-conditioned space. The wet-bulb temperature of the outdoor air is important principally in determining the cooling load produced by ventialtion or leakage air.

For shelter applications the minimum of equipment and ventialtion air and a near-maximum interior effective temperature are usually chosen for design conditions to effect econmy in first cost and energy requirement for operation. Mechanical cooling is not used unless essential for survival. Under these design conditions there is a minimum of latitude for approximation in outdoor climatic variables, and a considerable physiological risk if all of the important parameters affecting shelter environment are not taken into account. For example, there would be about a 2 percent probability that a shelter would be occupied during temperature conditions equal to or worse than those of the average hottest week of the year, assuming the likelihood of attack was constant throughout the year and a typical occupancy period was of 2 weeks duration. Some of the climatic variables that have not been extensively considered in past design procedures are, (a) coincident values of dry-bulb temperature, wet-bulb temperature, and solar radiation, (b) the diurnal cycle of outdoor climatic conditions, and (c) the duration of periods of hot weather within the anticipated period of occupancy of a shelter.

When an analysis of the transient or dynamic thermal behavior of underground protective structures was undertaken, it became evident that coincident values of wet-bulb and dry-bulb temperatures, and of solar radiation, had not been developed on a diurnal basis for design purposes. Likewise, the frequency and duration of hot spells of weather of one or more consecutive days duration could only be obtained by resort to the original daily records of the National Weather Record Center in Asheville, N.C.

2. OBJECTIVE AND SCOPE

Coincident diurnal values of temperature, humidity, and solar radiation were obtained for a few localities for each of several years in order to study statistically the effects of weather parameters on shelter environment. Various investigators have found that an underground shelter attained a quasi-steady internal environmental condition in about one week at constant weather conditions and occupancy. Furthermore, it was expected that an above ground shelter of low heat capacity would be considerably affected by a single hot day. Thus, it was decided that the following four extreme weather conditions would be used for an initial study.

(1) The day of each year with the highest hourly dry-bulb temperatures (hottest-day)
(2) The day of each year with the highest hourly dewpoint temperature (most-humid-day)
(3) The 7 consecutive days each year with highest 7-day average of hourly dry-bulb temperatures (days of the hottest-week)

(4) The 7 consecutive days each year with highest 7-day average of hourly dewpoint temperatures (days of the most-humid-week)

The diurnal characteristics of dry-bulb and dewpoint temperatures and of solar radiation vary from year to year, as well as from locality to locality, throughout the U. S. A decision was made, therefore, to acquire data from these extreme cases over a span of 10 years. In December 1962, the National Weather Record Center of the U. S. Weather Bureau in Asheville, N. C., was requested to search their records and furnish these extreme weather data for the latest 10-year weather record of the following six cities:

Phoenix, Ariz.	Minneapolis, Minn.
Washington, D. C.	Medford, Ore.
Lake Charles, La.	Houston, Tex.

These cities were chosen to cover a suitable variety of climatic and geographic conditions.

Tables 1 through 6 list the calendar dates determined by the Weather Record Center as complying with the specification of the hottest day, most humid day, hottest week, and most humid week for the period 1953 to 1962 in the six cities. All the psychrometric data for these periods were those observed at the airport station of the cities. Unfortunately, some of the weather stations did not have the solar radiation measurement. Consequently, the San Antonio solar data were used for Houston, the Silver Hill, Md., data for Washington, D. C., and the St. Cloud data for Minneapolis, Minn. Although the solar radiation data for the three substitute cities were not geographically coincident with the accompanying psychrometric data, it was assumed in this analysis that the error due to the substitution was small. It should be noted that the solar radiation observed and reported by the Weather Bureau is the total irradiation on a horizontal surface, or the sum of the direct radiation and the scattered sky radiation.

Inspection of Tables 1 to 6 indicates that the hottest day and most humid day of the year occurred during the hottest week and most humid week, respectively, only about 6 times in 10 years on the average for the six cities. Furthermore, when these coincidences occurred the extreme day might occur at any time during the extreme week. For most cities the hottest week might occur in either June, July or August and there were a few isolated occurrences in September. The week of highest dewpoint temperature might occur in any of the four months from June to September, inclusive, with the most frequent occurrences being in July and August. Tables 1 - 6 further show that there was no overlap between the hottest week and the most humid week in three of the cities during the ten year period, whereas there was either 2 or 3 cases in ten years of overlapping of these extreme weeks in the other three cities.

3. AVERAGE SIMULTANEOUS DIURNAL CYCLES

All the hourly values of dry-bulb temperature, dewpoint temperature, and solar radiation at the specified locations for the periods shown in tables 1 through 6 were punched into IBM cards for further processing.

First, average daily cycles of the dry-bulb and dewpoint temperatures and the solar radiation were obtained for the hottest days and the most humid days using the 10 sets of data from the selected 10-year period.

Second, the corresponding hourly values for dry-bulb and dewpoint temperatures and for solar radiation for the hottest seven days and the most humid seven days (consecutive seven days) were averaged for the 10-year period to obtain an average daily cycle of each parameter.

Figures 1 through 12 show 10-year average diurnal cycles of dry-bulb and dewpoint temperatures for these four extreme conditions. Examination of these figures reveals the following trends for the particular days selected. In most of these figures the dewpoint temperature experienced a daily cycle of relatively small amplitude. The minimum daily dewpoint temperature occurred at about the same time as the maximum dry-bulb temperature in the afternoon, whereas the maximum dewpoint temperature occurred in the late evening about half of the time and about equally as often during the morning soon after the daily minimum dry-bulb temperature. Minneapolis was the principal exception to this pattern. The daily amplitude in dewpoint temperature ranged from 4 to 8 degrees for the six cities on the hottest days and averaged about about half this range for the hottest week, whereas it ranged from about 1.5 to 3.5 degrees for the most humid day and most humid week.

Figures 1 to 12 show that the daily minimum and maximum dry-bulb temperatures were about 10 hours apart with the minimum occurring at about 5 to 6 A. M. and the maximum occurring at about 3 to 4 P. M. The following table summarizes the daily amplitude of the dry-bulb temperature for the four extreme weather conditions chosen for this study and also the value published in the ASHRAE Guide and Data Book for the hottest summer month. Except for Minneapolis there is good agreement between this latter published value and the values obtained for the hottest week in the current study. In all cities the daily amplitude of dry-bulb temperature was considerably less for the humid periods than for the hot periods.

Daily Amplitude of Dry-Bulb Temperature During Hot and Humid Periods, °F

City	Hottest Day	Hottest Week	Most Humid Day	Most Humid Week	Hottest[a/] Month
Phoenix	37.4	25.8	12.4	17.0	27
Washington	19.5	18.1	12.5	12.1	18
Lake Charles	18.3	16.4	7.8	10.4	17
Minneapolis	20.3	18.8	15.1	14.0	24
Medford	37.7	36.6	27.3	28.5	35
Houston	18.2	18.0	9.9	9.8	18

a/ Values published in 1965-66 volume of ASHRAE Guide & Data Book

Figures 13 through 18 show the daily maximum and minimum dry-bulb temperature points and their associated dewpoint temperatures connected arbitrarily by straight lines on psychrometric charts for the four types of daily cycles represented by figure 1 through 12. Actually, all of the coincident sets of dry-bulb and wet-bulb temperatures in these daily cycles comprise a flattened ellipsoidal-shaped area on the psychrometric chart with more than half of the points lying above the straight lines shown in figures 13 to 18. The three curves on these charts designated by H, M, and L connect discrete psychrometric conditions with approximately equal hourly frequency of occurrence based on the data developed by Fluor Products Company [5]. The specific psychrometric points at the center of circles denoted by H, M, and L are the coincident design points suggested in the Fluor publication for high, moderate, and low frequency of occurrence. As mentioned in the previous section, the probability that the coincident conditions of dry- and wet-bulb temperature will fall outside the curves labelled H, M, and L are approximately 1, 5, and 15 percent of the total summer hours (2928 hours), respectively.

Also indicated on figures 13 through 18 are parallelograms enclosed by ASHRAE 1- and 5-percent non-coincident dry- and wet-bulb temperatures. Since high summer values of dry-bulb and wet-bulb temperatures do not always occur simultaneously it would be expected that the ASHRAE 1 percent and 5 percent values of wet-bulb and dry-bulb temperatures determined independently would occur less than 1 percent and 5 percent of the summer hours as coincident conditions, respectively.

This hypothesis is supported for five of the six cities by the relation between the parallelograms and the M and H curves on Figures 13 through 18. The psychrometric condition represented in the charts by the ASHRAE one percent wet-bulb and dry-bulb temperatures lie outside of the H curve in five of the six figures, and the psychrometric condition represented by the ASHRAE five percent wet-bulb and dry-bulb temperature lie outside of the M curve in an equal number of cases. Since the H, M, and L curves in these psychrometric charts represent a "best fit" or smoothing of the observed data, not all of the psychrometric conditions of 1-, 5-, and 15-percent frequency of occurrence for a selected period of years would lie on these curves.

Figures 13 to 18 show that the highest wet-bulb temperatures did not occur during the day or week with the highest dry-bulb or dewpoint temperatures. Only in Minneapolis did the maximum wet-bulb temperature on the most humid day equal the one percent ASHRAE value. These relations appear to confirm the conclusions reached in the Fluor [5] analysis that days with high wet-bulb temperature occur when there is a high moisture content, and the dry-bulb temperature is considerably below the maximum for that particular locality.

The hottest week and the most humid week of the summer each comprise about 6% of the total hours in the four summer months. However, figures 13 to 18 indicate that the maximum dry-bulb temperatures during the hottest week approximate the ASHRAE 1% dry-bulb temperatures. At the same time the magnitude of the daily range of dry-bulb temperature during both extremely hot and humid periods in relation to the L, M and

H frequency curves in these figures indicate the potential benefit to be obtained in a ventilated shelter from the diurnal psychrometric changes.

The simultaneous presentation of the average daily range of psychrometric conditions for extreme days and weeks, and the non-coincident ASHRAE and Fluor coincident dry-bulb and wet-bulb temperature data in figures 13 to 18 illustrates that the relation among these sets of information is not the same for all cities or all climates. It also indicates that there is no straightforward way to predict the daily cycle of psychrometric conditions for extreme weather periods from the presently published percentile values based on cumulative hourly data.

The hourly data provided by the U. S. Weather Record Center included rainfall record. The rainfall data for Washington, D. C. is summarized in tables 1 through 6.

Although most of the hottest-days were sunny days, the high-dewpoint-days did not necessarily have rain of long duration. The number of days that had rain during the 7-day periods of high dry-bulb temperatures or of high dewpoint temperatures were fairly constant throughout the 10-year period for all six cities. The most humid week averaged 4 to 5 days with rain for all six cities, except Medford, Ore., but very few of these days had protracted rainy weather. Most of the hottest-weeks and less than three days with rain. No appreciable rain was recorded during the hottest-day for the 10-year record for any of the six cities [except for July 19, 1957, and July 21, 1960, in Minneapolis, Minn.] However, 50 percent of the most-humid-days had occasional rain for all cities.

The wind data were separately compiled from the supplement to "Local Climatological Data," a Weather Bureau publication, for the calendar dates of the highest-dry-bulb and highest-dewpoint days of the six cities. Tables 1 through 6 also include the direction and average speed of the prevailing wind for the extreme days. The prevailing wind direction is that direction from which the winds blew more hours than from any other direction for the period under consideration. The direction and magnitude of the winds for the hottest-day and the most-humid day for these six cities agree very well with the general wind pattern indicated in the map (Fig. 73) of Fluor's publication [5]. The wind data for the hottest-week-days and the most-humid-week days have not been analyzed, but they are expected to be very similar to those presented herein. The wind data may be useful for the design of ventilation air inlet or outlet openings. The data are also helpful in arriving at a reasonable ground surface heat exchange calculation where the surface heat transfer coefficient is directly related to wind velocity.

4. HARMONIC ANALYSIS OF THE WEATHER DATA

The dynamic evaluation of shelter thermal environment based upon the cyclic change of climatic conditions is usually carried out by digital or/analog computer. For these computer analyses, mathematical expressions of the cyclic patterns are convenient for handling the input data. The mathematical simulation of cyclic input data may be achieved by a least-squares curve-fitting technique [7]. Cyclic-temperature and solar-radiation data can be fitted to the following general formula by the least-squares technique:

$$x = A_o + \sum_{i=1}^{N} A_i \cos(\omega_i \theta) + \sum_{i=1}^{N} B_i \sin(\omega_i \theta) \qquad (1)$$

$$\omega_i = \frac{i2\pi}{24} \text{ radians/hour}$$

θ = hour (local standard time +1)

x = temperatures or solar radiation

After the constants A_o, A_i, and B_i; $i = 1, 2, 3, \ldots N$ have been properly evaluated by the least-squares technique, the best fit values are computed and are shown in tables 7 through 30. The harmonic constants up to the fourth degree are indicated in these tables, together with their respective standard deviations. (It was found during this study that Fourier constants higher than the fourth degree harmonics were not needed.) The best fit values shown in tables 7 through 30 are naturally in very close agreement with the arithmetic averages plotted in figures 1 through 6. The standard deviations of these calculated temperatures and solar radiations are also shown in these tables.

When calculating solar radiations by use of the least-squares constants as in tables 7 through 30, it is recommended that x in equation (1) be set equal to zero for time periods when the sun is down. Calculated solar radiations by the least-squares formula have higher standard deviations than do the temperatures, because of the fluctuating nature of the radiations due to cloud cover. Figure 19 illustrates the scatter of the hottest day solar radiation of the Washington, D. C., area from the 10-year record. This figure also includes two least square fitted curves; one employing up to the second harmonic and the other employing up to the sixth harmonic, which indicates a small difference in phase angle for the maximum value.

The solar radiation was analyzed in this study, because the calculation of protective shelter themal environment requires it as a function of time in many cases. Solar heating influence becomes particularly significant for many above-ground shelters, as well as for shallow underground shelters with paved roof surfaces. Accurate design data for solar radiation and realistic simultaneous solar data with coincident temperature and humidity conditions of surface air have been lacking even though there have been many efforts in the past to theoretically calculate the available solar radiation using the sun's altitude angle, extra-terrestrial observation of solar constants, and absorption and scattering characteristics of solar energy by constituents of air, moisture, and dust. Most present-day calculations are made for special conditions such as a cloudless sky, and for assumed moisture and dust concentrations in the atmosphere. Moreover, the calculation technique for diffuse sky radiation is still incomplete. It is therefore interesting to compare the observed solar data with those computed by a known technique.

A typical procedure for calculating the solar incident radiation upon a horizontal surface is shown in the following paragraph.

Moon's proposed standard in the ASHRAE tables [2] may be used to estimate the direct normal solar radiation at sea level under cloudless conditions, where precipitable water vapor in the air is 20 mm, dust particle concentration is $300/cm^3$, and ozone partial pressure is 2.8 mm Hg. The diffuse sky radiation on the other hand may be estimated by the observed value of the ASHRAE Cleveland Laboratory on cloudless days [2] during which the observed direct normal incidence values closely approximated Moon's standard value. The sum of the direct radiation based upon Moon's standard and ASHRAE diffuse radiation over the horizontal surface is compared in tables 31 through 54 with the average observed solar radiation for the average hottest-day. These tables also include extraterrestrial radiation and the sun's altitude angles as functions of local standard time. As can be seen, the calculated solar radiations in tables 31 through 54 are generally higher than the observed values, for the hottest-day. Even in the most-humid-day and days of the most-humid-week, a large amount of solar radiation was observed. However, the total radiation for the humid days is less than that for the hot days, as expected.

At the time when the final draft of this report was being prepared, the author encountered a report of L. O. Degelman [8] describing the most recent solar heat calculation methodology.

The calculated results by the Degelman's method agreed well at least for the data of table 35 when the Moon's standard values were used for the direct normal radiation together with the Degelman's recommended formula for the diffuse sky radiation.

5. APPLICATION OF COINCIDENT CLIMATIC DATA TO UNDERGROUND SHELTERS

The diurnal cycles of coincident dry-bulb and dewpoint temperatures developed in this study for the Washington, D. C. area were applied to the heat transfer analysis of two underground shelters with simulated occupancy. This analysis was performed with a digital computer program of the National Bureau of Standards, which had provided satisfactory comparisons between observed and calculated values of the temperature and humidity in seven prototype shelters of various sizes and types. This computer program employs a finite difference calculation of three-dimensional heat conduction in conjunction with time-dependent ventilation air conditions, and is similar to the program described in reference [6]. Figures 20,21 and 22 illustrate results of such computer calculations for shelter thermal environment in terms of ASHRAE effective temperature for still air. In each of these calculations the initial temperature inside the shelter and in the surrounding earth was assumed to be 68.5°F, which is approximately the maximum mean earth temperature to a 10-ft depth at Washington, D. C.

Figure 20 depicts the calculated effective temperature in a 540-man shelter (5525 sq ft of floor area) during an 8-day occupancy period for three different outside weather conditions with a per capita ventilation rate of 10 cfm. In this figure the solid line shows the calculated effective temperature of the shelter for ventilation air conditions representing seven repetitive diurnal cycles of coincident dry-bulb and dewpoint temperatures equal to the 10-year average hottest-week followed by one diurnal cycle equal to the 10-year average hottest-day for

Washington, D. C The dotted line shows the calculated effective temperature for 7 days with climatic conditions equal to the 10-year average most-humid-week followed by one day equal to the 10-year average most-humid-day. The dashed curve in figure 20 shows the calculated effective temperature of the shelter during an 8-day period when the daily maximum dry-bulb temperature and wet-bulb temperature were made equal to the 5% design conditions in the ASHRAE Guide; the diurnal range of dry-bulb temperature was chosen to equal the published average daily range for the hottest month in Washington, D. C., viz 18°F, and the dewpoint temperature was assumed to be constant, since there is no published daily range for this parameter.

It can be seen in figure 20 that the shelter temperature attained an almost repetitive diurnal cycle after the first two or three days for each of the assumed climatic conditions. The ventilation air temperature cycle that involved the ASHRAE 5% design values of dry-bulb and wet-bulb temperatures produced a higher shelter effective temperature than did the average cycle for the hottest week, but not as high as the average cycle for the hottest single day. The greatest difference in diurnal maximum effective temperature among the three climatic conditions was less than 2 degrees; however, there was almost no variation in the diurnal minimum effective temperature in the shelter for the three climatic conditions. The small difference in the time of the daily maximum effective temperature between the diurnal cycle corresponding to the average hottest week and that corresponding to the ASHRAE 5% design dry-bulb and wet-bulb temperatures was caused by the nature of the variation in the diurnal dewpoint temperature for the former.

The effect of ventilation rate on the effective temperature inside the shelter over a 3-day period is shown in figure 21 for two climatic conditions. Doubling the ventilation rate, from 10 cfm to 20 cfm per person, in the 540-man shelter increased the diurnal variation in shelter effective temperature about 40 percent, reduced the minimum daily effective temperature about 3.5 degrees F, and reduced the maximum daily effective temperature about 2 degrees F for both types of climatic conditions illustrated.

A similar calculation of shelter effective temperature for a family-size shelter with 6 occupants and a ventilation rate of 7 cfm per person is illustrated in figure 22. The levels of effective temperature in the shelter fell in the same order in this small shelter with respect to the three outside weather conditions as for the larger shelter illustrated in figure 20. However, the daily range in effective temperature was 2 degrees or less in the smaller shelter because there was more surface area per occupant in the smaller shelter to provide heat exchange with the surroundings. Furthermore, there was only a little more than one degree difference in maximum diurnal effective temperature inside the shelter for the three outside weather conditions, which incorporated a 7 degree difference in maximum diurnal dry-bulb temperature.

6. SUMMARIES

This pilot analysis of coincident weather data from six cities representing different types of climatic conditions indicated the following points:

(1) The diurnal levels of coincident dry-bulb and wet-bulb temperatures during the hottest-day and week during the most-humid-day and week cannot be derived directly from the presently published percentile levels of extreme temperatures based on total summer hours for various climates.

(2) The dewpoint temperature undergoes a small daily cycle with a range of 4 to 8 degrees during the hottest days and approximately half of this range during the hottest-week, and most-humid-day and week. Thus an assumption of constant diurnal dewpoint temperature during extreme summer weather is not well-founded.

(3) The daily range in dry-bulb temperature was about 50% greater during the hottest-week than for the most-humid-week.

(4) The hottest-week and most-humid-week of the summer sometimes overlap. The hottest-day of the summer occurs during the hottest-week about 60 percent of the time and can occur anytime during the 7 consecutive days of hot weather.

(5) The diurnal cycles of dry-bulb temperature, dewpoint temperature, and solar radiation can be presented by harmonic equations with constants evaluated to the fourth degree with relatively small differences between the calculated values and the 10-year average observed values.

(6) The total observed radiation on a horizontal surface during the hottest-day and-week was considerably less for some of the six cities than the value derived by adding the solar radiation calculated from Moon's proposed standard and the ASHRAE value for diffuse sky radiation. The solar and sky radiation should not be ignored during the most-humid-days and-weeks.

The use of the three different design conditions for the ventilation air for a 540-man shelter and a 6-man family shelter in Washington, D. C. indicated the following conclusions for this illustrative example:

(1) The psychrometric conditions representing the 10-year-average hottest-week produced substantially the same shelter environment as the psychrometric conditions representing the 10-year-average most-humid-week.

(2) The psychrometric conditions represented by the 5 percent ASHRAE non-coincident dry-bulb and wet-bulb temperatures in combination with a diurnal dry-bulb variation equal to that for the hottest month produced only slightly higher effective temperatures inside the shelter than the 10-year-average hottest-week conditions.

(3) The magnitude of the diurnal variation in shelter effective temperature increased with the size of shelter and also with an increase in per capita ventilation rate.

(4) The average shelter effective temperature at the end of the average hottest-week was nearly equal for the 540-man shelter and for the 6-man shelter, with ventilation rates per person being 10 cfm and

7 cfm respectively. Doubling the ventilation rate in the larger shelter lowered the average effective temperature about 3 degrees.

Although not included in this analysis, days and weeks of high wet-bulb temperature should also be considered if the similar study is to be undertaken in the future.

6. REFERENCES

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[3] ASHRAE Guide and Data Book, Fundamental and Equipment, Chapter 27, Air Conditioning Cooling Load (table 3) p 497 (1965-1966).

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TABLE 1

Phoenix, Arizona
Municipal Airport

Year	Highest DB Week	Highest DP Week	Highest DB Day	Highest DP Day
1953	June 29 - July 5	July 13 - July 19	July 2	July 17
1954	July 27 - Aug. 2	July 20 - July 26	July 28	July 24
1955	July 10 - July 16	Aug. 18 - Aug. 24	June 9	Aug. 14
1956	July 6 - July 12	July 26 - Aug. 1	June 12	July 30
1957	June 23 - June 29	Aug 15 - Aug. 21	July 31	July 18
1958	July 8 - July 14	Aug. 11 - Aug. 17	July 11	Sept.12
1959	June 13 - June 19	Aug. 12 - Aug. 18	June 18	Aug. 12
1960	July 15 - July 20	Aug. 6 - Aug. 12	July 18	Aug. 22
1961	June 20 - June 26	Aug. 15 - Aug. 21	June 24	Aug. 29
1962	Aug. 11 - Aug. 17	Sept.21 - Sept.29	Aug. 15	Sept.25
Rain Data				
Average number of days that rained during the week				
	1.6	4		
Average weekly rainfall (in.)				
	T	.22		
Average daily rainfall (in.)				
	T	0.03	T	0.24
Prevailing Wind Data				
Direction			W	E
Speed (mph)			9.3	7.8

TABLE 2

Washington, D.C.
National Airport

Year	Highest DB Week	Highest DP Week	Highest DB Day	Highest DP Day
1953	Aug. 28 - Sept. 3	June 26 - July 2	July 18	Sept. 4
1954	July 26 - Aug. 1	Aug. 24 - Aug. 30	July 31	Aug. 28
1955	July 17 - July 23	Aug. 12 - Aug. 18	July 22	July 10
1956	June 11 - June 17	July 3 - July 9	July 2	July 27
1957	June 13 - June 19	Sept.10 - Sept.16	July 22	June 28
1958	June 30 - July 6	July 22 - July 28	July 5	July 28
1959	June 26 - July 2	July 18 - July 24	June 29	Sept. 2
1960	Aug. 27 - Sept. 2	Aug. 1 - Aug. 7	Aug. 30	Aug. 29
1961	July 20 - July 26	Sept. 1 - Sept. 7	July 23	Sept. 6
1962	July 7 - July 13	Aug. 3 - Aug. 9	Aug. 20	July 6
Rain Data				
Average number of days that rained during the week				
	2	5		
Average weekly rainfall (in.)				
	0.15	2.0		
Average daily rainfall (in.)				
	0.02	0.3	T	0.2
Prevailing Wind Data				
Direction			S	S
Speed (mph)			9.5	7.8

TABLE 3

Lake Charles, La.

Year	Highest DB Week	Highest DP Week	Highest DB Day	Highest DP Day
1953	June 15 - June 21	July 18 - July 24	June 21	July 20
1954	July 20 - July 26	July 16 - July 22	June 30	July 19
1955	Aug. 20 - Aug. 26	July 12 - July 18	Aug. 23	Sept. 22
1956	Aug. 7 - Aug. 13	Aug. 14 - Aug. 20	Aug. 9	Aug. 30
1957	July 10 - July 16	July 27 - Aug. 2	July 11	June 28
1958	July 27 - Aug. 2	June 14 - June 20	Aug. 2	June 15
1959	Aug. 2 - Aug. 8	Sept. 25 - Oct. 1	Aug. 7	Sept. 28
1960	July 23 - July 29	Aug. 19 - Aug. 25	July 27	Aug. 21
1961	Aug. 31 - Sept. 6	Aug. 30 - Sept. 5	Aug. 3	Sept. 2
1962	Aug. 7 - Aug. 13	Sept. 9 - Sept. 13	Aug. 9	Sept. 12
Rain Data				
Average number of days that rained during the week				
	1.4	4.6		
Average weekly rainfall (in.)				
	0.23	1.32		
Average daily rainfall (in.)				
	0.03	0.2	0	0.15
Prevailing Wind Data				
Direction			W	S
Speed (mph)			7.7	10.3

TABLE 4

Minneapolis, Minnesota
International Airport

Year	Highest DB Week	Highest DP Week	Highest DB Day	Highest DP Day
1953	Aug. 27 - Sept. 2	July 28 - Aug. 3	June 18	June 30
1954	July 11 - July 17	Aug. 21 - Aug. 27	June 24	June 25
1955	July 28 - Aug. 23	July 28 - Aug. 3	July 26	Aug. 2
1956	June 9 - June 15	June 15 - June 21	June 13	Aug. 4
1957	July 6 - July 12	July 14 - July 20	July 19	July 18
1958	June 27 - July 3	Aug. 5 - Aug. 11	Aug. 9	Aug. 9
1959	July 26 - Aug. 1	Aug. 19 - Aug. 25	Aug. 19	Aug. 20
1960	Aug. 31 - Sept. 6	Aug. 30 - Sept. 5	July 21	Aug. 31
1961	Aug. 27 - Sept. 2	July 27 - Aug. 2	June 28	Sept. 9
1962	June 24 - June 30	July 1 - July 7	June 28	July 7
Rain Data				
Average number of days that rained during the week				
	2.8	4.6		
Average weekly rainfall (in.)				
	0.52	1.75		
Average daily rainfall (in.)				
	0.08	0.25	0.17	0.13
Prevailing Wind Data				
Direction			S	S
Speed (mph)			14	12

TABLE 5

Medford, Oregon
Municipal Airport

Year	Highest DB Week	Highest DP Week	Highest DB Day	Highest DP Day
1953	Aug. 8 - Aug. 14	Sept. 9 - Sept. 15	Aug. 12	Sept. 6
1954	July 12 - July 18	July 12 - July 18	July 13	July 14
1955	Aug. 4 - Aug. 10	June 4 - June 10	July 14	July 13
1956	July 18 - July 24	July 7 - July 13	July 8	July 13
1957	July 4 - July 10	Sept.26 - Oct. 2	July 5	June 4
1958	July 23 - July 29	June 17 - June 23	July 28	June 22
1959	July 17 - July 23	July 16 - July 22	July 22	July 19
1960	Aug. 6 - Aug. 12	July 25 - July 31	July 6	July 29
1961	Aug. 2 - Aug. 8	Aug. 1 - Aug. 7	July 11	Aug. 5
1962	July 23 - July 29	Aug. 7 - Aug. 13	July 26	Aug. 9
Rain Data				
Average number of days that rained during the week				
	0.4	2.5		
Average weekly rainfall (in.)				
	T	0.4		
Average daily rainfall (in.)				
	0	0.06	0	0.09
Prevailing Wind Data				
Direction			W	W
Speed (mph)			10.1	8.2

TABLE 6

Houston, Texas
International Airport

Year	Highest DB Week	Highest DP Week	Highest DB Day	Highest DP Da
1953	June 19 - June 23	July 18 - July 24	July 22	Sept. 3
1954	July 21 - July 27	Sept. 29 - Oct. 5	Aug. 30	Oct. 1
1955	Aug. 21 - Aug. 27	Sept. 21 - Sept. 27	Aug. 25	Sept.22
1956	Aug. 9 - Aug. 15	Aug. 26 - Sept. 1	Aug. 31	Aug. 30
1957	July 28 - Aug. 3	June 27 - July 3	July 12	June 29
1958	June 15 - June 21	Aug. 18 - Aug. 24	June 20	Sept.22
1959	Aug. 1 - Aug. 7	Sept. 23 - Sept. 29	June 18	Sept.28
1960	July 25 - July 31	Aug. 17 - Aug. 23	July 29	Aug. 18
1961	Aug. 31 - Sept. 6	July 13 - July 19	Sept. 6	July 13
1962	Aug. 7 - Aug. 13	Sept. 7 - Sept. 13	Aug. 13	Aug. 30
Rain Data				
Average number of days that rained during the week				
	1.9	4.9		
Average weekly rainfall (in.)				
	0.56	1.05		
Average daily rainfall (in.)				
	0.08	0.15	0	0.04
Prevailing Wind Data				
Direction			S	S
Speed (mph)			11.7	12.0

TABLE 7.

BEST FITTED HOURLY VALUES OF DRY-BULB AND DEWPOINT TEMPERATURE AND TOTAL SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE USING LEAST SQUARES TECHNIQUE FOR THE AVERAGE HOTTEST DAY OF 1953-1962 INCLUSIVE IN PHOENIX, ARIZONA

LOCAL STANDARD TIME	DRY-BULB TEMP.(F)	(S.D.)	DEWPOINT TEMP.(F)	(S.D.)	SOLAR BTU/HR PER SQ.FT.	(S.D.)
0.	92.8	3.596	52.6	8.314	-0.0	-0.000
1.	91.8	3.273	53.0	7.959	-0.0	-0.000
2.	90.1	4.280	53.8	6.579	-0.0	-0.000
3.	87.7	4.274	54.6	6.111	-0.0	-0.000
4.	85.3	4.306	55.1	6.512	-0.0	-0.000
5.	83.9	4.780	55.1	5.873	-0.0	0.000
6.	84.6	4.408	55.0	6.272	19.1	5.276
7.	87.5	2.767	55.1	6.501	66.4	16.448
8.	91.6	2.366	55.4	5.142	133.8	17.650
9.	96.0	2.108	55.5	5.827	203.5	26.226
10.	99.7	1.663	54.8	7.125	257.9	40.742
11.	102.4	1.252	53.5	5.777	290.0	20.514
12.	104.7	1.398	51.9	8.396	303.0	22.405
13.	106.8	1.418	50.5	7.325	302.4	37.375
14.	108.9	2.573	49.6	6.782	287.6	30.325
15.	110.5	2.741	49.0	5.322	252.7	29.772
16.	111.3	2.685	48.3	5.322	195.6	35.151
17.	110.7	2.767	47.8	5.915	125.5	39.615
18.	108.6	3.725	47.8	5.493	60.5	21.712
19.	105.4	3.239	48.7	5.944	16.9	7.412
20.	101.7	3.559	50.1	6.413	-0.0	0.000
21.	98.1	3.773	51.5	6.420	-0.0	-0.000
22.	95.4	3.719	52.4	6.446	-0.0	-0.000
23.	93.7	3.712	52.6	7.177	-0.0	-0.000
(S.E.)		0.615		1.224		3.968

HARMONIC CONSTANTS AND THEIR STANDARD DEVIATIONS

		(S.E.)		(S.E.)		(S.E.)
A0	97.88	0.20	52.24	0.41	104.53	1.32
A1	-3.72	0.29	-0.43	0.58	-146.70	1.87
B1	-11.78	0.29	3.50	0.58	-58.54	1.87
A2	0.39	0.29	0.79	0.58	41.74	1.87
B2	1.42	0.29	-0.53	0.58	39.08	1.87
A3	-0.65	0.29	-0.01	0.58	2.08	1.87
B3	1.60	0.29	-0.14	0.58	5.07	1.87
A4	-0.20	0.29	0.01	0.58	-0.93	1.87
B4	-0.12	0.29	-0.48	0.58	-9.92	1.87

(S.E.) THE STANDARD ERROR OF THE BEST ESTIMATE VALUES.

(S.D.) THE STANDARD DEVIATION OF THE OBSERVED VALUES.

TABLE 8.

BEST FITTED HOURLY VALUES OF DRY-BULB AND DEWPOINT TEMPERATURE AND TOTAL SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE USING LEAST SQUARES TECHNIQUE FOR THE AVERAGE MOST HUMID DAY OF 1953-1962 INCLUSIVE IN PHOENIX, ARIZONA

LOCAL STANDARD TIME	DRY-BULB TEMP.(F)	(S.D.)	DEWPOINT TEMP.(F)	(S.D.)	SOLAR BTU/HR PER SQ.FT.	(S.D.)
0.	78.8	4.315	70.5	2.633	-0.0	-0.000
1.	78.0	4.228	70.3	2.541	-0.0	-0.000
2.	77.3	4.142	70.3	3.190	-0.0	-0.000
3.	76.5	3.893	70.3	2.359	-0.0	-0.000
4.	75.7	3.502	70.5	1.841	-0.0	-0.000
5.	75.1	3.190	70.6	2.875	-0.0	0.000
6.	75.1	2.846	70.6	2.869	8.3	4.097
7.	76.1	3.127	70.5	2.366	33.9	18.299
8.	77.9	3.584	70.4	2.961	68.7	32.652
9.	80.0	4.222	70.3	2.989	105.3	70.930
10.	81.8	5.420	70.1	2.214	138.4	82.519
11.	83.2	5.735	69.9	2.111	166.9	109.963
12.	84.2	6.346	69.5	2.591	190.0	108.577
13.	85.3	6.241	69.1	2.514	202.9	93.010
14.	86.4	5.363	68.9	2.601	197.8	97.214
15.	87.2	5.692	68.9	3.164	169.8	87.603
16.	87.5	5.613	69.1	3.240	123.2	69.680
17.	87.0	7.011	69.4	3.213	71.7	52.948
18.	85.8	7.055	69.8	2.221	30.7	29.726
19.	84.5	7.056	70.2	2.821	8.0	7.715
20.	83.1	6.179	70.5	2.710	-0.0	-0.000
21.	82.0	5.925	70.8	1.650	-0.0	-0.000
22.	80.9	5.425	70.8	2.283	-0.0	-0.000
23.	79.8	5.109	70.7	2.359	-0.0	-0.000
(S.E.)		0.976		0.497		10.293

HARMONIC CONSTANTS AND THEIR STANDARD DEVIATIONS

		(S.E.)		(S.E.)		(S.E.)
A0	81.22	0.33	70.07	0.17	63.00	3.43
A1	-1.52	0.46	0.47	0.23	-88.53	4.85
B1	-5.50	0.46	0.52	0.23	-41.31	4.85
A2	0.23	0.46	0.16	0.23	24.29	4.85
B2	0.66	0.46	-0.44	0.23	32.69	4.85
A3	-0.18	0.46	-0.05	0.23	4.42	4.85
B3	0.45	0.46	-0.08	0.23	-3.74	4.85
A4	0.05	0.46	0.05	0.23	-4.52	4.85
B4	-0.27	0.46	-0.03	0.23	-4.47	4.85

(S.E.) THE STANDARD ERROR OF THE BEST ESTIMATE VALUES.

(S.D.) THE STANDARD DEVIATION OF THE OBSERVED VALUES.

TABLE 9.

BEST FITTED HOURLY VALUES OF DRY-BULB AND DEWPOINT TEMPERATURE AND TOTAL SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE USING LEAST SQUARES TECHNIQUE FOR THE AVERAGE HOTTEST WEEK DAY OF 1953-1962 INCLUSIVE IN PHOENIX, ARIZONA

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UNDRFLOW AT 40776 IN MQ
UNDRFLOW AT 40776 IN MQ
UNDRFLOW AT 40776 IN MQ
UNDRFLOW AT 40776 IN MQ

LOCAL STANDARD TIME	DRY-BULB TEMP.(F)	(S.D.)	DEWPOINT TEMP.(F)	(S.D.)	SOLAR BTU/HR PER SQ.FT.	(S.D.)
0.	90.1	4.006	54.3	7.590	-0.0	-0.000
1.	88.7	4.224	54.2	7.562	-0.0	-0.000
2.	87.0	4.207	54.2	7.215	-0.0	-0.000
3.	85.0	4.140	54.4	7.097	-0.0	-0.000
4.	83.1	4.344	54.5	6.768	-0.0	-0.000
5.	82.2	4.393	54.6	6.862	-0.3	0.180
6.	82.9	4.191	54.6	6.927	19.2	6.023
7.	85.5	3.309	54.8	7.011	63.2	18.372
8.	89.4	2.814	55.1	7.265	126.6	27.147
9.	93.4	2.826	55.4	7.019	193.8	38.630
10.	97.0	2.820	55.3	6.923	248.2	44.507
11.	99.6	3.425	54.8	7.352	282.2	42.214
12.	101.7	3.471	54.1	7.403	298.3	35.220
13.	103.7	3.693	53.3	7.178	301.2	35.340
14.	105.6	4.051	52.6	7.388	290.1	33.459
15.	107.2	4.041	52.1	7.203	258.9	23.574
16.	108.0	3.901	51.7	9.219	204.4	23.410
17.	107.6	4.099	51.5	7.500	134.5	26.361
18.	106.0	4.177	51.7	7.526	67.4	19.156
19.	103.4	4.350	52.3	7.135	20.4	8.566
20.	100.2	4.175	53.2	7.278	-0.3	0.807
21.	96.9	3.823	54.0	7.140	-0.0	-0.000
22.	94.1	3.865	54.5	7.235	-0.0	-0.000
23.	91.8	4.049	54.5	7.392	-0.0	0.000
(S.E.)		0.283		0.533		1.753

HARMONIC CONSTANTS AND THEIR STANDARD DEVIATIONS

		(S.E.)		(S.E.)		(S.E.)
A0	95.42	0.09	53.83	0.18	104.54	0.58
A1	-3.33	0.13	-0.13	0.25	-143.45	0.83
B1	-11.55	0.13	1.40	0.25	-62.42	0.83
A2	0.41	0.13	0.82	0.25	37.69	0.83
B2	0.77	0.13	-0.36	0.25	41.13	0.83
A3	-0.58	0.13	-0.01	0.25	3.73	0.83
B3	1.15	0.13	-0.15	0.25	5.02	0.83
A4	-0.11	0.13	0.03	0.25	0.25	0.83
B4	-0.19	0.13	-0.18	0.25	-9.42	0.83

(S.E.) THE STANDARD ERROR OF THE BEST ESTIMATE VALUES.

(S.D.) THE STANDARD DEVIATION OF THE OBSERVED VALUES.

TABLE 10.

BEST FITTED HOURLY VALUES OF DRY-BULB AND DEWPOINT TEMPERATURE AND TOTAL SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE USING LEAST SQUARES TECHNIQUE FOR THE AVERAGE MOST HUMID WEEK DAY OF 1953-1962 INCLUSIVE IN PHOENIX, ARIZONA

LOCAL STANDARD TIME	DRY-BULB TEMP.(F)	(S.D.)	DEWPOINT TEMP.(F)	(S.D.)	SOLAR BTU/HR PER SQ.FT.	(S.D.)
0.	82.4	5.545	67.1	3.996	-0.0	-0.000
1.	81.6	5.288	67.2	3.725	-0.0	-0.000
2.	80.8	4.998	67.2	3.738	-0.0	-0.000
3.	79.9	4.889	67.3	3.610	-0.0	-0.000
4.	79.1	4.805	67.4	3.774	-0.0	-0.000
5.	78.5	4.566	67.5	3.598	-2.2	0.165
6.	78.6	4.293	67.6	3.518	10.9	8.905
7.	79.8	4.169	67.7	3.222	43.7	22.616
8.	81.8	4.531	67.7	3.320	93.2	40.763
9.	84.3	5.006	67.6	3.095	148.3	66.014
10.	86.7	5.926	67.4	3.089	197.1	80.159
11.	88.8	6.273	67.1	3.246	233.2	79.957
12.	90.5	6.406	66.6	3.389	255.6	74.732
13.	92.1	6.235	65.9	3.171	263.1	64.314
14.	93.7	6.531	65.3	3.422	251.6	69.806
15.	94.9	6.778	64.7	3.556	216.9	64.319
16.	95.5	7.038	64.3	3.731	161.4	59.968
17.	95.0	7.894	64.1	4.106	97.4	41.938
18.	93.6	7.821	64.2	4.092	42.4	23.932
19.	91.4	7.705	64.6	4.592	9.1	6.381
20.	89.0	7.175	65.3	4.488	-2.1	0.000
21.	86.8	6.637	65.9	4.222	-0.0	-0.000
22.	84.9	5.984	66.5	4.060	-0.0	-0.000
23.	83.5	5.725	66.9	4.138	-0.0	-0.000
(S.E.)		0.440		0.272		3.129

HARMONIC CONSTANTS AND THEIR STANDARD DEVIATIONS

		(S.E.)		(S.E.)		(S.E.)
A0	86.39	0.15	66.38	0.09	84.14	1.04
A1	-2.34	0.21	-0.14	0.13	-119.25	1.47
B1	-7.69	0.21	1.62	0.13	-52.27	1.47
A2	-0.31	0.21	0.58	0.13	34.66	1.47
B2	0.90	0.21	-0.11	0.13	40.48	1.47
A3	-0.33	0.21	0.04	0.13	2.95	1.47
B3	0.58	0.21	-0.09	0.13	-2.49	1.47
A4	0.06	0.21	0.01	0.13	-1.89	1.47
B4	-0.15	0.21	-0.03	0.13	-7.25	1.47

(S.E.) THE STANDARD ERROR OF THE BEST ESTIMATE VALUES.

(S.D.) THE STANDARD DEVIATION OF THE OBSERVED VALUES.

TABLE 11.

BEST FITTED HOURLY VALUES OF DRY-BULB AND DEWPOINT TEMPERATURE AND TOTAL SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE USING LEAST SQUARES TECHNIQUE FOR THE AVERAGE HOTTEST DAY OF 1953-1962 INCLUSIVE IN WASHINGTON, D.C.

LOCAL STANDARD TIME	DRY-BULB TEMP.(F)	(S.D.)	DEWPOINT TEMP.(F)	(S.D.)	SOLAR BTU/HR PER SQ.FT.	(S.D.)
0.	81.4	2.751	70.4	2.211	-0.0	-0.000
1.	79.9	3.084	70.0	2.234	-0.0	-0.000
2.	78.7	2.644	69.8	1.969	-0.0	-0.000
3.	77.7	2.424	69.8	1.700	-0.0	-0.000
4.	77.0	2.251	69.9	1.636	-0.0	-0.000
5.	76.7	2.319	69.9	1.713	3.4	0.658
6.	77.4	2.415	70.0	1.764	17.3	10.672
7.	79.4	2.718	70.3	1.767	50.6	19.117
8.	82.4	2.759	70.7	2.506	103.3	22.592
9.	85.8	3.748	70.9	2.908	164.0	39.535
10.	88.9	3.266	70.6	3.375	217.0	41.208
11.	91.3	2.998	69.7	3.645	250.9	16.079
12.	93.2	3.622	68.5	4.084	264.0	29.171
13.	94.7	3.393	67.4	5.482	260.6	61.731
14.	95.8	3.824	66.9	4.832	243.9	67.344
15.	96.2	3.348	67.1	5.238	213.0	36.747
16.	95.7	2.991	67.9	3.375	166.7	38.911
17.	94.2	3.281	68.9	3.938	109.9	38.888
18.	92.0	3.471	69.9	3.749	54.9	18.457
19.	89.8	3.129	70.6	2.440	15.5	7.930
20.	87.9	2.953	71.1	1.969	-2.2	0.352
21.	86.3	2.541	71.3	2.951	-0.0	-0.000
22.	84.7	2.558	71.2	2.404	-0.0	-0.000
23.	83.0	2.506	70.8	2.486	-0.0	-0.000
(S.E.)		0.563		0.591		5.571

HARMONIC CONSTANTS AND THEIR STANDARD DEVIATIONS

		(S.E.)		(S.E.)		(S.E.)
A0	86.25	0.19	69.72	0.20	88.82	1.86
A1	-4.11	0.27	0.88	0.28	-124.02	2.63
B1	-8.36	0.27	0.68	0.28	-51.35	2.63
A2	0.87	0.27	0.43	0.28	35.15	2.63
B2	1.04	0.27	-1.26	0.28	35.31	2.63
A3	-0.05	0.27	-0.33	0.28	0.02	2.63
B3	0.37	0.27	0.21	0.28	1.87	2.63
A4	0.05	0.27	0.11	0.28	2.97	2.63
B4	-0.32	0.27	-0.13	0.28	-7.06	2.63

(S.E.) THE STANDARD ERROR OF THE BEST ESTIMATE VALUES.

(S.D.) THE STANDARD DEVIATICN OF THE OBSERVED VALUES.

TABLE 12.

BEST FITTED HOURLY VALUES OF DRY-BULB AND DEWPOINT TEMPERATURE AND TOTAL SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE USING LEAST SQUARES TECHNIQUE FOR THE AVERAGE MOST HUMID DAY OF 1953-1962 INCLUSIVE IN WASHINGTON, D.C.

LOCAL STANDARD TIME	DRY-BULB TEMP.(F)	(S.D.)	DEWPOINT TEMP.(F)	(S.D.)	SOLAR BTU/HR PER SQ.FT.	(S.D.)
0.	77.3	2.132	72.6	2.331	-0.0	-0.000
1.	76.4	2.273	72.7	2.394	-0.0	-0.000
2.	75.9	1.969	72.7	2.066	-0.0	-0.000
3.	75.3	1.829	72.6	2.271	-0.0	-0.000
4.	74.8	1.751	72.4	2.066	-0.0	-0.000
5.	74.4	2.201	72.3	2.366	0.1	0.781
6.	74.6	1.932	72.6	2.098	8.5	9.335
7.	75.7	2.582	73.0	1.853	32.6	21.770
8.	77.8	2.961	73.2	1.700	75.5	36.415
9.	80.4	3.373	73.0	1.524	131.2	50.224
10.	82.9	4.089	72.6	2.058	186.0	74.678
11.	84.8	4.932	72.2	2.452	225.7	63.320
12.	85.9	5.109	72.1	1.932	242.0	73.220
13.	86.4	5.229	72.3	2.366	235.2	40.306
14.	86.7	4.306	72.7	3.134	210.2	59.242
15.	86.9	4.812	73.0	2.710	173.0	64.029
16.	86.9	3.695	73.3	2.424	128.7	42.251
17.	86.5	3.100	73.7	2.044	82.7	41.869
18.	85.6	4.900	74.3	2.119	41.9	24.051
19.	84.2	2.440	74.7	2.201	13.0	8.315
20.	82.7	2.263	74.7	1.636	-1.1	0.260
21.	81.1	2.150	74.2	1.751	-0.0	-0.000
22.	79.6	2.378	73.5	2.573	-0.0	-0.000
23.	78.3	2.751	72.9	2.791	-0.0	-0.000
(S.E.)		0.629		0.422		7.032

HARMONIC CONSTANTS AND THEIR STANDARD DEVIATIONS

		(S.E.)		(S.E.)		(S.E.)
A0	80.89	0.21	73.05	0.14	74.26	2.34
A1	-2.67	0.30	0.44	0.20	-106.83	3.31
B1	-5.80	0.30	-0.60	0.20	-44.33	3.31
A2	0.55	0.30	-0.26	0.20	36.09	3.31
B2	0.52	0.30	-0.63	0.20	33.82	3.31
A3	-0.57	0.30	-0.10	0.20	-5.24	3.31
B3	0.24	0.30	0.09	0.20	-3.06	3.31
A4	0.14	0.30	-0.27	0.20	3.23	3.31
B4	-0.14	0.30	-0.01	0.20	-2.93	3.31

(S.E.) THE STANDARD ERROR OF THE BEST ESTIMATE VALUES.

(S.D.) THE STANDARD DEVIATION OF THE OBSERVED VALUES.

TABLE 13.

BEST FITTED HOURLY VALUES OF DRY-BULB AND DEWPOINT TEMPERATURE AND TOTAL SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE USING LEAST SQUARES TECHNIQUE FOR THE AVERAGE HOTTEST WEEK DAY OF 1953-1962 INCLUSIVE IN WASHINGTON, D.C.

LOCAL STANDARD TIME	DRY-BULB TEMP.(F)	(S.D.)	DEWPOINT TEMP.(F)	(S.D.)	SOLAR BTU/HR PER SQ.FT.	(S.D.)
0.	77.9	3.807	68.3	4.445	-0.0	-0.000
1.	77.1	3.990	68.3	4.531	-0.0	-0.000
2.	76.1	3.979	68.1	4.585	-0.0	-0.000
3.	75.1	3.965	67.9	4.577	-0.0	-0.000
4.	74.2	3.934	67.6	4.512	-0.0	-0.000
5.	73.8	3.848	67.5	4.481	0.6	0.566
6.	74.6	3.650	67.6	4.435	17.9	9.005
7.	76.8	3.561	67.7	4.412	56.4	20.903
8.	79.9	3.549	67.7	4.645	112.2	28.913
9.	83.3	3.642	67.4	5.114	172.0	32.433
10.	86.1	3.779	66.9	5.666	221.3	33.303
11.	88.2	3.770	66.3	5.808	252.6	38.515
12.	89.6	4.007	65.7	5.942	266.3	44.657
13.	90.7	4.159	65.2	6.157	265.4	40.866
14.	91.5	4.063	64.8	6.573	249.9	43.311
15.	91.9	4.029	64.7	6.866	217.1	36.754
16.	91.5	4.415	64.9	6.739	166.8	47.888
17.	90.1	4.437	65.5	6.479	107.3	37.614
18.	88.1	4.255	66.5	6.547	52.9	25.817
19.	85.8	3.903	67.4	5.931	16.3	10.560
20.	83.6	3.853	68.0	5.544	0.5	0.925
21.	81.7	3.764	68.3	5.630	-0.0	-0.000
22.	80.2	3.803	68.3	5.652	-0.0	-0.000
23.	78.9	3.734	68.3	5.519	-0.0	-0.000
(S.E.)		0.286		0.402		1.906

HARMONIC CONSTANTS AND THEIR STANDARD DEVIATIONS

		(S.E.)		(S.E.)		(S.E.)
A0	82.79	0.10	67.04	0.13	90.57	0.64
A1	-4.38	0.13	1.14	0.19	-126.77	0.90
B1	-7.45	0.13	1.01	0.19	-50.96	0.90
A2	0.80	0.13	0.39	0.19	36.35	0.90
B2	1.04	0.13	-0.68	0.19	34.52	0.90
A3	-0.25	0.13	-0.15	0.19	0.81	0.90
B3	0.69	0.13	0.04	0.19	2.36	0.90
A4	-0.01	0.13	-0.14	0.19	-0.29	0.90
B4	-0.25	0.13	0.06	0.19	-7.27	0.90

(S.E.) THE STANDARD ERROR OF THE BEST ESTIMATE VALUES.

(S.D.) THE STANDARD DEVIATION OF THE OBSERVED VALUES.

TABLE 14.

BEST FITTED HOURLY VALUES OF DRY-BULB AND DEWPOINT TEMPERATURE AND TOTAL SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE USING LEAST SQUARES TECHNIQUE FOR THE AVERAGE MOST HUMID WEEK DAY OF 1953-1962 INCLUSIVE IN WASHINGTON, D.C.

LOCAL STANDARD TIME	DRY-BULB TEMP.(F)	(S.D.)	DEWPOINT TEMP.(F)	(S.D.)	SOLAR BTU/HR PER SQ.FT.	(S.D.)
0.	75.0	3.092	70.5	3.170	-0.0	-0.000
1.	74.5	2.918	70.3	3.053	-0.0	-0.000
2.	74.0	2.718	70.2	2.985	-0.0	-0.000
3.	73.5	2.471	70.1	3.116	-0.0	-0.000
4.	73.0	2.563	70.0	3.162	-0.0	-0.000
5.	72.9	2.624	69.9	3.154	-1.7	0.238
6.	73.3	2.695	70.0	3.014	8.7	5.895
7.	74.5	3.001	70.2	3.163	33.3	20.215
8.	76.4	3.634	70.4	3.308	70.0	38.028
9.	78.6	4.445	70.5	3.565	111.7	54.328
10.	80.7	4.850	70.6	3.847	150.3	67.483
11.	82.4	5.089	70.5	3.919	180.2	77.019
12.	83.6	5.258	70.2	3.892	197.7	84.521
13.	84.5	5.370	70.0	4.066	200.2	78.993
14.	85.0	5.327	69.8	3.994	185.1	68.376
15.	85.0	5.481	69.7	4.303	152.6	71.334
16.	84.4	5.635	69.7	4.159	108.4	57.571
17.	83.3	5.857	70.0	4.136	63.1	38.867
18.	81.7	5.500	70.3	3.863	27.6	22.083
19.	79.9	4.857	70.8	3.730	7.5	7.048
20.	78.3	4.280	71.0	3.758	0.7	0.528
21.	77.0	3.771	71.1	3.064	-0.0	-0.000
22.	76.1	3.447	71.0	3.079	-0.0	-0.000
23.	75.5	3.175	70.7	2.817	-0.0	-0.000
(S.E.)		0.310		0.258		3.292

HARMONIC CONSTANTS AND THEIR STANDARD DEVIATIONS

		(S.E.)		(S.E.)		(S.E.)
A0	78.46	0.10	70.32	0.09	62.29	1.10
A1	-3.32	0.15	0.26	0.12	-89.88	1.55
B1	-4.87	0.15	-0.05	0.12	-36.37	1.55
A2	0.43	0.15	0.32	0.12	29.54	1.55
B2	1.08	0.15	-0.34	0.12	28.99	1.55
A3	-0.14	0.15	-0.12	0.12	-0.53	1.55
B3	0.33	0.15	-0.04	0.12	-3.97	1.55
A4	0.03	0.15	-0.05	0.12	-2.09	1.55
B4	-0.09	0.15	-0.03	0.12	-3.51	1.55

(S.E.) THE STANDARD ERROR OF THE BEST ESTIMATE VALUES.

(S.D.) THE STANDARD DEVIATION OF THE OBSERVED VALUES.

TABLE 15.

BEST FITTED HOURLY VALUES OF DRY-BULB AND DEWPOINT TEMPERATURE AND TOTAL SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE USING LEAST SQUARES TECHNIQUE FOR THE AVERAGE HOTTEST DAY OF 1953-1962 INCLUSIVE IN LAKE CHARLES, LOUISIANA

LOCAL STANDARD TIME	DRY-BULB TEMP.(F)	(S.D.)	DEWPOINT TEMP.(F)	(S.D.)	SOLAR BTU/HR PER SQ.FT.	(S.D.)
0.	80.8	1.430	74.0	2.119	-0.0	-0.000
1.	80.2	0.876	74.4	2.616	-0.0	-0.000
2.	79.5	0.966	74.4	2.312	-0.0	-0.000
3.	78.8	0.943	73.8	2.627	-0.0	-0.000
4.	78.1	1.350	73.4	2.751	-0.0	-0.000
5.	77.8	1.287	73.4	2.635	-1.7	-0.000
6.	78.5	1.135	74.0	2.171	13.4	3.650
7.	80.3	1.252	74.6	2.055	54.4	9.690
8.	83.1	1.636	74.6	1.947	114.8	15.631
9.	86.3	1.897	74.0	2.014	178.8	21.211
10.	89.2	1.969	73.3	2.486	230.3	37.363
11.	91.3	2.424	72.7	3.440	262.7	43.897
12.	92.8	2.470	72.4	2.908	278.6	31.710
13.	94.0	2.366	72.1	2.627	281.7	21.672
14.	95.1	2.440	71.3	2.936	270.0	27.875
15.	96.0	2.658	70.3	3.266	237.3	33.090
16.	96.1	2.506	69.6	3.129	182.0	14.197
17.	94.9	2.601	69.8	2.633	114.3	14.661
18.	92.4	2.550	70.8	3.401	52.8	14.627
19.	89.3	1.636	71.9	3.368	13.1	5.718
20.	86.4	2.300	72.7	4.923	0.7	-0.000
21.	84.1	2.066	72.9	4.762	-0.0	-0.000
22.	82.5	1.494	73.0	3.432	-0.0	-0.000
23.	81.5	1.059	73.4	3.335	-0.0	-0.000
(S.E.)		0.365		0.567		3.504

HARMONIC CONSTANTS AND THEIR STANDARD DEVIATIONS

		(S.E.)		(S.E.)		(S.E.)
A0	86.21	0.12	72.79	0.19	94.93	1.17
A1	-4.62	0.17	0.36	0.27	-133.55	1.65
B1	-7.59	0.17	1.78	0.27	-56.14	1.65
A2	0.02	0.17	0.72	0.27	38.02	1.65
B2	1.30	0.17	-0.40	0.27	39.69	1.65
A3	-0.27	0.17	-0.05	0.27	2.51	1.65
B3	0.93	0.17	-0.02	0.27	2.56	1.65
A4	0.18	0.17	-0.46	0.27	-1.27	1.65
B4	-0.20	0.17	0.27	0.27	-9.74	1.65

(S.E.) THE STANDARD ERROR OF THE BEST ESTIMATE VALUES.

(S.D.) THE STANDARD DEVIATION OF THE OBSERVED VALUES.

TABLE 16.

BEST FITTED HOURLY VALUES OF DRY-BULB AND DEWPOINT TEMPERATURE AND TOTAL SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE USING LEAST SQUARES TECHNIQUE FOR THE AVERAGE MOST HUMID DAY OF 1953-1962 INCLUSIVE IN LAKE CHARLES, LOUISIANA

LOCAL STANDARD TIME	DRY-BULB TEMP.(F)	(S.D.)	DEWPOINT TEMP.(F)	(S.D.)	SOLAR BTU/HR PER SQ.FT.	(S.D.)
0.	79.2	1.619	76.7	1.247	-0.0	-0.000
1.	79.2	1.287	76.9	1.430	-0.0	-0.000
2.	79.0	1.054	76.9	1.033	-0.0	-0.000
3.	78.7	1.567	76.7	0.949	-0.0	-0.000
4.	78.4	1.506	76.5	1.059	-0.0	-0.000
5.	78.3	1.350	76.4	0.843	-1.7	-0.000
6.	79.0	1.581	76.7	1.059	10.7	5.679
7.	80.6	1.370	77.1	0.667	34.3	22.176
8.	82.5	1.494	77.3	1.494	72.6	31.077
9.	84.3	1.767	76.9	1.751	117.9	38.737
10.	85.4	3.565	76.1	1.398	157.6	79.200
11.	85.6	4.228	75.4	1.989	181.0	79.785
12.	85.6	6.494	75.2	1.663	184.6	119.729
13.	85.6	5.043	75.4	1.713	172.4	116.592
14.	85.9	4.546	75.8	0.876	151.0	113.938
15.	86.1	4.228	76.1	2.211	124.7	93.846
16.	85.8	3.028	76.1	2.132	94.7	61.151
17.	84.9	2.108	76.2	1.563	62.3	36.409
18.	83.5	2.108	76.4	1.350	31.8	16.455
19.	82.1	2.211	76.9	1.101	9.1	5.252
20.	81.0	2.003	77.2	1.333	0.7	-0.000
21.	80.2	2.098	77.2	1.476	-0.0	-0.000
22.	79.7	2.214	77.0	1.449	-0.0	-0.000
23.	79.4	2.214	76.8	1.663	-0.0	-0.000
(S.E.)		0.545		0.274		10.218

HARMONIC CONSTANTS AND THEIR STANDARD DEVIATIONS

		(S.E.)		(S.E.)		(S.E.)
A0	82.09	0.18	76.50	0.09	58.33	3.41
A1	-3.06	0.26	0.52	0.13	-84.85	4.82
B1	-2.59	0.26	0.26	0.13	-29.00	4.82
A2	0.45	0.26	-0.10	0.13	29.90	4.82
B2	0.35	0.26	-0.44	0.13	19.91	4.82
A3	-0.07	0.26	0.16	0.13	-4.69	4.82
B3	0.70	0.26	0.15	0.13	1.66	4.82
A4	-0.03	0.26	-0.31	0.13	3.21	4.82
B4	-0.27	0.26	-0.09	0.13	-3.26	4.82

(S.E.) THE STANDARD ERROR OF THE BEST ESTIMATE VALUES.

(S.D.) THE STANDARD DEVIATION OF THE OBSERVED VALUES.

TABLE 17.

BEST FITTED HOURLY VALUES OF DRY-BULB AND DEWPOINT TEMPERATURE AND TOTAL SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE USING LEAST SQUARES TECHNIQUE FOR THE AVERAGE HOTTEST WEEK DAY OF 1953-1962 INCLUSIVE IN LAKE CHARLES, LOUISIANA

LOCAL STANDARD TIME	DRY-BULB TEMP.(F)	(S.D.)	DEWPOINT TEMP.(F)	(S.D.)	SOLAR BTU/HR PER SQ.FT.	(S.D.)
0.	79.8	1.885	74.7	2.096	-0.0	-0.000
1.	79.4	1.823	74.7	2.052	-0.0	-0.000
2.	78.9	1.666	74.6	1.996	-0.0	-0.000
3.	78.2	1.744	74.3	2.004	-0.0	-0.000
4.	77.5	1.799	74.0	2.033	-0.0	-0.000
5.	77.3	1.934	74.1	2.174	-1.7	-0.000
6.	78.1	1.800	74.3	2.150	12.8	4.515
7.	80.2	2.132	74.5	2.290	53.1	14.934
8.	83.1	2.263	74.4	2.224	113.9	23.776
9.	86.2	2.340	73.8	2.055	178.4	35.031
10.	88.7	2.658	73.0	2.176	228.7	42.963
11.	90.4	2.923	72.3	2.651	257.0	46.443
12.	91.6	2.795	71.8	2.304	266.8	57.836
13.	92.5	3.270	71.5	2.581	264.9	57.638
14.	93.3	3.429	71.2	2.775	251.8	55.185
15.	93.7	3.813	71.0	2.808	221.8	46.479
16.	93.2	3.714	71.2	3.062	171.8	44.215
17.	91.5	3.602	71.8	2.997	109.0	32.460
18.	88.9	3.299	72.8	2.914	50.4	19.884
19.	86.1	2.584	73.8	2.871	11.9	6.497
20.	83.8	2.272	74.5	2.722	-2.4	0.184
21.	82.1	2.061	74.8	2.634	-0.0	-0.000
22.	81.0	1.855	74.7	2.402	-0.0	-0.000
23.	80.3	1.863	74.7	2.307	-0.0	-0.000
(S.E.)		0.189		0.179		2.200

HARMONIC CONSTANTS AND THEIR STANDARD DEVIATIONS

		(S.E.)		(S.E.)		(S.E.)
A0	84.83	0.06	73.44	0.06	91.15	0.73
A1	-4.98	0.09	1.23	0.08	-128.79	1.04
B1	-6.20	0.09	1.14	0.08	-51.60	1.04
A2	0.49	0.09	0.28	0.08	37.93	1.04
B2	1.32	0.09	-0.79	0.08	35.39	1.04
A3	-0.09	0.09	-0.02	0.08	0.90	1.04
B3	0.86	0.09	-0.00	0.08	4.20	1.04
A4	0.05	0.09	-0.22	0.08	0.01	1.04
B4	-0.29	0.09	0.11	0.08	-10.41	1.04

(S.E.) THE STANDARD ERROR OF THE BEST ESTIMATE VALUES.

(S.D.) THE STANDARD DEVIATION OF THE OBSERVED VALUES.

TABLE 18.

BEST FITTED HOURLY VALUES OF DRY-BULB AND DEWPOINT TEMPERATURE AND TOTAL SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE USING LEAST SQUARES TECHNIQUE FOR THE AVERAGE MOST HUMID WEEK DAY OF 1953-1962 INCLUSIVE IN LAKE CHARLES, LOUISIANA

LOCAL STANDARD TIME	DRY-BULB TEMP.(F)	(S.D.)	DEWPOINT TEMP.(F)	(S.D.)	SOLAR BTU/HR PER SQ.FT.	(S.D.)
0.	78.7	2.026	75.9	1.642	-0.0	-0.000
1.	78.6	2.016	76.0	1.616	-0.0	-0.000
2.	78.3	2.149	75.9	1.737	-0.0	-0.000
3.	77.8	2.193	75.5	1.917	-0.0	-0.000
4.	77.2	2.339	75.2	1.803	-0.0	-0.000
5.	77.1	2.344	75.0	1.933	-1.7	-0.000
6.	77.8	2.341	75.3	1.922	9.7	5.091
7.	79.5	2.674	75.7	1.901	41.6	21.804
8.	81.8	2.991	75.8	2.142	83.6	35.530
9.	84.1	3.355	75.6	2.192	138.0	55.373
10.	85.8	4.306	74.9	2.165	176.4	81.155
11.	86.8	4.483	74.3	1.931	197.2	83.095
12.	87.2	4.804	74.0	2.190	202.1	88.364
13.	87.5	4.922	74.0	1.954	195.2	90.465
14.	87.5	5.099	74.2	2.143	178.3	88.574
15.	87.2	5.071	74.3	2.581	150.1	71.761
16.	86.4	5.155	74.4	2.117	111.1	63.419
17.	85.0	4.668	74.6	2.155	67.6	41.973
18.	83.4	3.881	75.0	2.097	30.3	22.332
19.	81.9	3.173	75.5	1.932	7.4	6.115
20.	80.7	2.701	75.9	1.925	-2.4	-0.000
21.	79.9	2.450	76.1	1.896	-0.0	-0.000
22.	79.3	2.340	76.0	1.757	-0.0	-0.000
23.	78.9	2.286	75.9	1.672	-0.0	-0.000
(S.E.)		0.257		0.145		3.515

HARMONIC CONSTANTS AND THEIR STANDARD DEVIATIONS

		(S.E.)		(S.E.)		(S.E.)
A0	82.01	0.09	75.21	0.05	66.24	1.17
A1	-3.78	0.12	0.70	0.07	-96.31	1.66
B1	-3.43	0.12	0.38	0.07	-33.10	1.66
A2	0.89	0.12	0.14	0.07	33.10	1.66
B2	0.82	0.12	-0.43	0.07	23.03	1.66
A3	-0.15	0.12	0.10	0.07	-2.40	1.66
B3	0.54	0.12	0.17	0.07	2.23	1.66
A4	-0.08	0.12	-0.25	0.07	-0.84	1.66
B4	-0.22	0.12	-0.04	0.07	-6.52	1.66

(S.E.) THE STANDARD ERROR OF THE BEST ESTIMATE VALUES.

(S.D.) THE STANDARD DEVIATION OF THE OBSERVED VALUES.

TABLE 19.

BEST FITTED HOURLY VALUES OF DRY-BULB AND DEWPOINT TEMPERATURE AND TOTAL SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE USING LEAST SQUARES TECHNIQUE FOR THE AVERAGE HOTTEST DAY OF 1953-1962 INCLUSIVE IN MINNEAPOLIS, MINNESOTA

LOCAL STANDARD TIME	DRY-BULB TEMP.(F)	(S.D.)	DEWPOINT TEMP.(F)	(S.D.)	SOLAR BTU/HR PER SQ.FT.	(S.D.)
0.	77.7	2.710	67.1	5.350	-0.0	-0.000
1.	76.7	2.675	66.8	5.519	-0.0	-0.000
2.	75.9	2.867	66.4	5.534	-0.0	-0.000
3.	75.4	2.757	66.0	6.018	-0.0	-0.000
4.	75.0	2.946	65.7	5.666	-0.0	-0.000
5.	75.2	2.936	65.9	5.453	9.8	3.729
6.	76.2	2.821	66.5	5.358	38.4	13.840
7.	78.2	2.669	67.4	5.034	89.7	20.843
8.	81.1	2.627	68.2	4.762	153.8	16.892
9.	84.4	2.530	68.8	5.168	211.9	20.304
10.	87.4	2.530	69.1	4.809	247.7	14.502
11.	89.8	2.300	69.1	4.522	257.8	20.922
12.	91.7	2.898	68.8	4.771	251.0	73.725
13.	93.2	3.479	68.3	3.882	238.2	88.249
14.	94.4	2.710	67.8	4.274	222.5	58.722
15.	95.2	3.213	67.4	4.523	198.2	41.338
16.	95.3	3.071	67.6	4.962	159.3	26.896
17.	94.4	2.914	68.4	5.116	108.2	27.978
18.	92.5	2.944	69.3	5.425	57.3	23.119
19.	89.8	2.675	70.0	5.420	20.2	12.538
20.	86.7	2.751	70.0	5.337	2.5	1.852
21.	83.8	3.018	69.3	4.841	-0.0	-0.000
22.	81.2	3.972	68.4	5.131	-0.0	-0.000
23.	79.2	4.228	67.7	5.466	-0.0	-0.000
(S.E.)		0.557		0.960		6.079

HARMONIC CONSTANTS AND THEIR STANDARD DEVIATIONS

		(S.E.)		(S.E.)		(S.E.)
A0	84.59	0.19	67.92	0.32	94.44	2.03
A1	-4.92	0.26	-0.29	0.45	-130.34	2.87
B1	-9.05	0.26	-1.18	0.45	-37.14	2.87
A2	-0.14	0.26	0.61	0.45	35.10	2.87
B2	0.62	0.26	-1.01	0.45	16.61	2.87
A3	-0.38	0.26	-0.43	0.45	1.72	2.87
B3	0.55	0.26	0.06	0.45	12.06	2.87
A4	0.05	0.26	-0.16	0.45	-0.33	2.87
B4	-0.12	0.26	0.14	0.45	-8.93	2.87

(S.E.) THE STANDARD ERROR OF THE BEST ESTIMATE VALUES.

(S.D.) THE STANDARD DEVIATION OF THE OBSERVED VALUES.

TABLE 20.

BEST FITTED HOURLY VALUES OF DRY-BULB AND DEWPOINT TEMPERATURE AND TOTAL SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE USING LEAST SQUARES TECHNIQUE FOR THE AVERAGE MOST HUMID DAY OF 1953-1962 INCLUSIVE IN MINNEAPOLIS, MINN.

LOCAL STANDARD TIME	DRY-BULB TEMP.(F)	(S.D.)	DEWPOINT TEMP.(F)	(S.D.)	SOLAR BTU/HR PER SQ.FT.	(S.D.)
0.	76.7	4.000	71.7	3.032	-0.0	-0.000
1.	76.6	4.330	71.7	2.682	-0.0	-0.000
2.	76.3	4.147	71.4	2.739	-0.0	-0.000
3.	75.5	4.106	70.9	2.449	-0.0	-0.000
4.	74.5	3.598	70.4	2.449	-0.0	-0.000
5.	73.9	3.674	70.2	2.438	4.0	9.368
6.	74.4	3.606	70.3	2.108	24.7	21.744
7.	76.0	3.551	70.8	1.537	56.2	35.091
8.	78.2	3.621	71.4	1.414	90.5	48.588
9.	80.3	3.317	72.1	1.787	120.9	56.230
10.	81.9	3.428	72.7	1.323	145.5	76.718
11.	83.1	5.044	73.1	2.179	165.9	88.241
12.	84.6	5.223	73.3	2.455	182.4	50.205
13.	86.4	5.196	73.3	3.041	190.0	64.438
14.	88.1	5.431	73.1	2.539	181.5	65.629
15.	89.0	5.403	72.7	2.819	153.8	85.063
16.	88.6	4.969	72.4	3.127	112.3	60.348
17.	87.0	5.364	72.2	3.504	69.2	51.803
18.	84.7	8.002	72.1	4.558	35.6	29.770
19.	82.3	7.450	71.9	4.416	15.7	14.101
20.	80.4	6.685	71.8	3.905	6.0	2.082
21.	78.8	6.071	71.6	3.667	-0.0	-0.000
22.	77.7	5.840	71.6	4.035	-0.0	-0.000
23.	77.0	5.568	71.7	3.983	-0.0	-0.000
(S.E.)		0.996		0.588		9.829

HARMONIC CONSTANTS AND THEIR STANDARD DEVIATIONS

		(S.E.)		(S.E.)		(S.E.)
A0	80.50	0.33	71.86	0.20	64.62	3.28
A1	-3.25	0.47	-0.60	0.28	-88.73	4.63
B1	-5.73	0.47	-0.85	0.28	-33.08	4.63
A2	-0.17	0.47	0.60	0.28	22.56	4.63
B2	1.44	0.47	0.31	0.28	21.79	4.63
A3	0.19	0.47	-0.13	0.28	4.53	4.63
B3	0.80	0.47	0.15	0.28	-0.44	4.63
A4	-0.24	0.47	-0.07	0.28	-5.46	4.63
B4	-0.32	0.47	0.04	0.28	-1.50	4.63

(S.E.) THE STANDARD ERROR OF THE BEST ESTIMATE VALUES.

(S.D.) THE STANDARD DEVIATION OF THE OBSERVED VALUES.

TABLE 21.

BEST FITTED HOURLY VALUES OF DRY-BULB AND DEWPOINT TEMPERATURE AND TOTAL SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE USING LEAST SQUARES TECHNIQUE FOR THE AVERAGE HOTTEST WEEK DAY OF 1953-1962 INCLUSIVE IN MINNEAPOLIS, MINNESOTA

LOCAL STANDARD TIME	DRY-BULB TEMP.(F)	(S.D.)	DEWPOINT TEMP.(F)	(S.D.)	SOLAR BTU/HR PER SQ.FT.	(S.D.)
0.	74.9	5.677	64.0	6.420	-0.0	-0.000
1.	73.7	5.540	63.8	6.269	-0.0	-0.000
2.	72.5	5.702	63.6	6.348	-0.0	-0.000
3.	71.4	5.748	63.5	6.038	-0.0	-0.000
4.	70.5	5.745	63.3	6.112	-0.0	-0.000
5.	70.4	5.415	63.2	5.881	5.7	5.141
6.	71.1	4.782	63.3	5.683	29.7	19.175
7.	72.9	4.390	63.6	5.472	72.5	30.982
8.	75.6	4.538	64.0	5.739	126.8	44.483
9.	78.6	5.061	64.1	6.307	179.2	55.776
10.	81.6	5.084	64.2	6.691	218.1	64.223
11.	84.2	4.729	64.1	7.077	239.4	72.917
12.	86.2	4.853	64.1	7.367	245.4	71.815
13.	87.6	5.246	64.1	7.699	239.7	60.444
14.	88.7	5.524	64.1	7.738	222.3	57.628
15.	89.2	5.727	64.1	7.403	190.8	57.660
16.	89.0	5.609	64.1	7.438	145.9	52.928
17.	87.9	5.787	64.3	7.517	94.8	38.127
18.	86.1	5.581	64.7	7.794	49.2	28.397
19.	83.7	5.088	65.2	7.135	18.2	13.604
20.	81.2	4.854	65.5	6.622	3.4	3.946
21.	79.1	4.833	65.4	6.301	-0.0	-0.000
22.	77.3	5.112	64.9	6.314	-0.0	-0.000
23.	76.0	5.114	64.4	6.406	-0.0	-0.000
(S.E.)		0.383		0.488		3.005

HARMONIC CONSTANTS AND THEIR STANDARD DEVIATIONS

		(S.E.)		(S.E.)		(S.E.)
A0	79.56	0.13	64.16	0.16	86.62	1.00
A1	-3.89	0.18	0.25	0.23	-120.87	1.42
B1	-8.25	0.18	-0.64	0.23	-39.60	1.42
A2	0.47	0.18	0.24	0.23	34.60	1.42
B2	1.09	0.18	-0.42	0.23	23.25	1.42
A3	-0.20	0.18	-0.12	0.23	1.00	1.42
B3	0.54	0.18	-0.09	0.23	4.96	1.42
A4	0.06	0.18	-0.15	0.23	-1.73	1.42
B4	-0.03	0.18	-0.05	0.23	-5.47	1.42

(S.E.) THE STANDARD ERROR OF THE BEST ESTIMATE VALUES.

(S.D.) THE STANDARD DEVIATION OF THE OBSERVED VALUES.

TABLE 22.

BEST FITTED HOURLY VALUES OF DRY-BULB AND DEWPOINT TEMPERATURE AND TOTAL SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE USING LEAST SQUARES TECHNIQUE FOR THE AVERAGE MOST HUMID WEEK DAY OF 1953-1962 INCLUSIVE IN MINNEAPOLIS, MINNESOTA

LOCAL STANDARD TIME	DRY-BULB TEMP.(F)	(S.D.)	DEWPOINT TEMP.(F)	(S.D.)	SOLAR BTU/HR PER SQ.FT.	(S.D.)
0.	72.6	5.212	67.5	4.529	-0.0	-0.000
1.	71.9	5.023	67.2	4.562	-0.0	-0.000
2.	71.2	4.928	67.0	4.528	-0.0	-0.000
3.	70.6	4.879	66.8	4.450	-0.0	-0.000
4.	70.1	4.674	66.8	4.382	-0.0	-0.000
5.	69.9	4.474	66.9	4.108	3.7	6.766
6.	70.4	4.403	67.2	4.164	18.8	15.419
7.	71.7	4.412	67.5	3.941	48.2	32.956
8.	73.8	4.915	67.8	4.008	89.2	50.782
9.	76.2	5.689	68.0	4.519	133.2	70.122
10.	78.4	6.151	68.1	4.918	171.0	82.125
11.	80.2	6.806	68.3	5.133	196.5	92.814
12.	81.4	7.229	68.4	5.259	208.0	93.244
13.	82.4	7.454	68.5	5.368	206.1	93.995
14.	83.3	7.832	68.6	5.308	190.8	85.444
15.	83.9	7.877	68.6	5.255	161.8	75.602
16.	83.9	7.661	68.8	4.964	121.5	61.413
17.	83.2	7.297	69.0	4.852	77.1	42.202
18.	81.6	7.241	69.3	4.400	38.1	23.666
19.	79.6	6.294	69.4	4.470	12.3	9.222
20.	77.6	5.541	69.3	4.508	0.7	3.084
21.	75.9	5.143	69.0	4.269	-0.0	-0.000
22.	74.5	5.100	68.5	4.258	-0.0	-0.000
23.	73.5	5.005	67.9	4.164	-0.0	-0.000
(S.E.)		0.438		0.336		3.914

HARMONIC CONSTANTS AND THEIR STANDARD DEVIATIONS

		(S.E.)		(S.E.)		(S.E.)
A0	76.57	0.15	68.10	0.11	69.82	1.30
A1	-3.13	0.21	-0.09	0.16	-98.33	1.84
B1	-6.12	0.21	-1.09	0.16	-36.41	1.84
A2	0.14	0.21	0.08	0.16	29.03	1.84
B2	0.79	0.21	-0.39	0.16	25.27	1.84
A3	-0.20	0.21	-0.07	0.16	0.34	1.84
B3	0.50	0.21	-0.04	0.16	0.26	1.84
A4	0.11	0.21	-0.07	0.16	-0.39	1.84
B4	-0.12	0.21	0.04	0.16	-3.90	1.84

(S.E.) THE STANDARD ERROR OF THE BEST ESTIMATE VALUES.

(S.D.) THE STANDARD DEVIATION OF THE OBSERVED VALUES.

TABLE 23.

BEST FITTED HOURLY VALUES OF DRY-BULB AND DEWPOINT TEMPERATURE AND TOTAL SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE USING LEAST SQUARES TECHNIQUE FOR THE AVERAGE HOTTEST DAY OF 1953-1962 INCLUSIVE IN MEDFORD, OREGON

LOCAL STANDARD TIME	DRY-BULB TEMP.(F)	(S.D.)	DEWPOINT TEMP.(F)	(S.D.)	SOLAR BTU/HR PER SQ.FT.	(S.D.)
0.	71.9	3.055	54.2	2.348	-0.0	-0.000
1.	69.4	3.795	54.4	2.503	-0.0	-0.000
2.	66.8	3.742	54.4	2.685	-0.0	-0.000
3.	64.3	3.293	54.1	3.120	-0.0	-0.000
4.	62.7	3.091	53.8	2.150	-0.0	-0.000
5.	62.7	2.936	53.6	2.716	5.0	0.585
6.	64.8	2.413	53.7	2.211	30.5	7.077
7.	68.6	2.644	54.2	2.359	77.2	10.171
8.	73.5	2.616	55.1	2.547	139.3	9.249
9.	78.6	2.201	55.3	3.755	202.8	14.644
10.	83.5	2.875	55.3	2.906	253.5	17.169
11.	88.1	2.906	54.9	3.432	284.4	15.099
12.	92.4	2.415	53.1	4.067	297.0	13.620
13.	96.1	3.408	51.1	4.122	296.1	10.763
14.	98.9	3.348	49.4	4.909	282.9	13.085
15.	100.4	3.425	48.4	5.442	253.8	14.912
16.	100.3	4.104	47.9	7.421	206.4	12.130
17.	98.7	4.533	47.7	8.724	145.1	7.931
18.	95.7	4.886	47.9	8.592	82.7	8.650
19.	91.6	4.945	48.5	8.297	33.5	8.474
20.	86.8	3.978	49.6	7.777	5.4	0.897
21.	82.1	4.452	51.0	3.718	-0.0	-0.000
22.	77.9	4.742	52.4	4.581	-0.0	-0.000
23.	74.6	3.974	53.5	2.791	-0.0	-0.000
(S.E.)		0.677		0.907		1.846

HARMONIC CONSTANTS AND THEIR STANDARD DEVIATIONS

		(S.E.)		(S.E.)		(S.E.)
A0	81.28	0.23	52.27	0.30	107.80	0.62
A1	-6.69	0.32	-0.44	0.43	-144.66	0.87
B1	-17.05	0.32	3.30	0.43	-61.37	0.87
A2	0.34	0.32	1.77	0.43	33.68	0.87
B2	1.37	0.32	-0.20	0.43	34.53	0.87
A3	-0.07	0.32	-0.24	0.43	2.70	0.87
B3	0.97	0.32	0.38	0.43	8.70	0.87
A4	-0.24	0.32	0.17	0.43	0.93	0.87
B4	0.05	0.32	-0.13	0.43	-6.04	0.87

(S.E.) THE STANDARD ERROR OF THE BEST ESTIMATE VALUES.

(S.D.) THE STANDARD DEVIATION OF THE OBSERVED VALUES.

TABLE 24.

BEST FITTED HOURLY VALUES OF DRY-BULB AND DEWPOINT TEMPERATURE AND TOTAL SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE USING LEAST SQUARES TECHNIQUE FOR THE AVERAGE MOST HUMID DAY OF 1953-1962 INCLUSIVE IN MEDFORD, OREGON

LOCAL STANDARD TIME	DRY-BULB TEMP.(F)	(S.D.)	DEWPOINT TEMP.(F)	(S.D.)	SOLAR BTU/HR PER SQ.FT.	(S.D.)
0.	68.9	6.501	58.7	2.406	-0.0	-0.000
1.	67.9	6.350	58.7	2.201	-0.0	-0.000
2.	66.6	6.276	58.3	2.331	-0.0	-0.000
3.	64.9	4.849	57.7	2.767	-0.0	-0.000
4.	63.5	4.351	57.5	3.129	-0.0	-0.000
5.	63.0	3.755	57.9	3.164	2.9	1.073
6.	64.0	3.900	58.5	2.983	22.1	13.023
7.	66.4	4.541	59.1	2.981	56.4	34.459
8.	69.5	5.744	59.3	3.062	101.7	49.002
9.	72.7	7.168	59.5	2.541	150.7	70.062
10.	75.8	8.274	59.8	2.486	196.2	72.205
11.	78.9	8.979	60.2	2.658	232.8	62.205
12.	82.2	9.090	60.3	3.035	255.9	61.265
13.	85.7	8.994	59.9	3.084	260.5	39.871
14.	88.7	8.987	58.9	4.202	242.7	46.612
15.	90.3	9.187	58.0	3.771	202.8	39.706
16.	90.0	9.650	57.9	4.743	148.2	43.653
17.	87.9	10.027	58.6	4.638	91.7	56.898
18.	84.4	10.384	59.6	4.274	45.7	35.030
19.	80.4	9.407	60.1	3.502	16.8	10.493
20.	76.6	7.923	59.8	5.245	3.4	1.282
21.	73.6	6.339	59.1	6.736	-0.0	-0.000
22.	71.3	5.712	58.6	7.090	-0.0	-0.000
23.	69.9	4.715	58.6	4.526	-0.0	-0.000
(S.E.)		1.393		0.727		8.444

HARMONIC CONSTANTS AND THEIR STANDARD DEVIATIONS

		(S.E.)		(S.E.)		(S.E.)
A0	75.13	0.46	58.94	0.24	84.43	2.81
A1	-4.90	0.66	-0.44	0.34	-118.47	3.98
B1	-11.39	0.66	-0.39	0.34	-47.60	3.98
A2	-0.52	0.66	0.57	0.34	34.44	3.98
B2	2.28	0.66	-0.49	0.34	34.61	3.98
A3	0.39	0.66	-0.39	0.34	1.78	3.98
B3	1.03	0.66	0.00	0.34	-3.20	3.98
A4	-0.21	0.66	-0.13	0.34	-2.72	3.98
B4	-0.17	0.66	0.48	0.34	-2.36	3.98

(S.E.) THE STANDARD ERROR OF THE BEST ESTIMATE VALUES.

(S.D.) THE STANDARD DEVIATION OF THE OBSERVED VALUES.

TABLE 25.

BEST FITTED HOURLY VALUES OF DRY-BULB AND DEWPOINT TEMPERATURE AND TOTAL SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE USING LEAST SQUARES TECHNIQUE FOR THE AVERAGE HOTTEST WEEK DAY OF 1953-1962 INCLUSIVE IN MEDFORD, OREGON

LOCAL STANDARD TIME	DRY-BULB TEMP.(F)	(S.D.)	DEWPOINT TEMP.(F)	(S.D.)	SOLAR BTU/HR PER SQ.FT.	(S.D.)
0.	68.9	4.983	51.8	4.364	-0.0	-0.000
1.	66.6	4.714	51.9	3.901	-0.0	-0.000
2.	64.3	5.015	51.7	3.999	-0.0	-0.000
3.	62.0	4.595	51.3	4.040	-0.0	-0.000
4.	60.4	4.701	51.1	4.080	-0.0	-0.000
5.	60.2	4.745	51.2	4.206	2.2	0.361
6.	61.9	4.233	51.6	4.177	24.7	7.420
7.	65.5	3.949	52.2	4.087	69.3	15.851
8.	70.1	3.972	52.7	4.154	130.0	20.625
9.	75.0	4.050	53.2	3.818	192.4	32.703
10.	79.4	4.255	53.4	4.151	242.3	32.282
11.	83.5	4.426	53.3	4.091	273.4	41.713
12.	87.3	4.750	52.9	4.912	287.8	53.878
13.	90.9	4.926	52.2	5.217	289.1	32.472
14.	94.1	5.000	51.5	5.542	276.7	27.936
15.	96.3	5.106	51.0	5.423	245.8	28.735
16.	96.8	5.293	50.7	5.950	194.9	27.379
17.	95.4	5.566	50.7	6.833	131.2	25.225
18.	92.2	5.835	50.8	6.783	69.9	18.153
19.	87.9	5.381	50.8	6.552	25.5	9.061
20.	83.2	5.031	50.8	6.263	3.1	1.007
21.	78.5	4.761	50.9	5.743	-0.0	-0.000
22.	74.5	4.911	51.1	5.625	-0.0	-0.000
23.	71.4	4.615	51.5	5.043	-0.0	-0.000
(S.E.)		0.351		0.368		1.634

HARMONIC CONSTANTS AND THEIR STANDARD DEVIATIONS

		(S.E.)		(S.E.)		(S.E.)
A0	77.76	0.12	51.68	0.12	102.21	0.54
A1	-5.98	0.17	-0.76	0.17	-139.49	0.77
B1	-16.37	0.17	0.49	0.17	-58.60	0.77
A2	-0.18	0.17	0.72	0.17	35.08	0.77
B2	1.29	0.17	-0.10	0.17	36.08	0.77
A3	-0.05	0.17	-0.14	0.17	2.93	0.77
B3	1.22	0.17	0.24	0.17	5.92	0.77
A4	-0.17	0.17	-0.01	0.17	-0.45	0.77
B4	-0.12	0.17	0.10	0.17	-7.24	0.77

(S.E.) THE STANDARD ERROR OF THE BEST ESTIMATE VALUES.

(S.D.) THE STANDARD DEVIATION OF THE OBSERVED VALUES.

TABLE 25.

BEST FITTED HOURLY VALUES OF DRY-BULB AND DEWPOINT TEMPERATURE AND TOTAL SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE USING LEAST SQUARES TECHNIQUE FOR THE AVERAGE MOST HUMID WEEK DAY OF 1953-1962 INCLUSIVE IN MEDFORD, OREGON

LOCAL STANDARD TIME	DRY-BULB TEMP.(F)	(S.D.)	DEWPOINT TEMP.(F)	(S.D.)	SOLAR BTU/HR PER SQ.FT.	(S.D.)
0.	66.2	6.420	55.1	4.209	-0.0	-0.000
1.	64.5	6.016	54.8	4.008	-0.0	-0.000
2.	62.8	5.729	54.3	4.113	-0.0	-0.000
3.	61.1	5.305	53.8	4.358	-0.0	-0.000
4.	60.0	5.064	53.5	4.375	-0.0	-0.000
5.	60.0	4.838	53.6	4.249	2.4	1.052
6.	61.4	4.793	54.1	4.091	20.9	12.461
7.	64.0	5.583	54.8	4.049	57.2	32.660
8.	67.4	6.541	55.4	3.840	107.3	51.502
9.	70.9	7.506	55.8	3.573	160.9	67.761
10.	74.4	8.499	56.0	3.873	206.4	79.810
11.	77.8	9.346	56.1	3.638	237.2	84.605
12.	81.0	10.150	56.1	3.590	252.0	89.281
13.	84.2	11.107	55.8	4.230	251.8	83.239
14.	86.8	11.751	55.4	4.336	236.7	81.559
15.	88.4	12.437	55.2	3.864	205.3	76.805
16.	88.5	13.039	55.2	4.379	159.4	66.886
17.	87.0	12.975	55.5	5.296	105.1	51.322
18.	84.1	12.632	55.9	5.268	56.9	34.393
19.	80.4	11.582	56.1	4.657	21.7	12.929
20.	76.5	9.977	56.0	5.133	3.5	1.348
21.	72.9	8.816	55.7	4.716	-0.0	-0.000
22.	70.1	8.219	55.4	4.468	-0.0	-0.000
23.	67.9	7.374	55.2	4.319	-0.0	-0.000
(S.E.)		0.657		0.314		3.622

HARMONIC CONSTANTS AND THEIR STANDARD DEVIATIONS

		(S.E.)		(S.E.)		(S.E.)
A0	73.25	0.22	55.21	0.10	86.72	1.21
A1	-5.09	0.31	-0.31	0.15	-119.38	1.71
B1	-12.59	0.31	-0.78	0.15	-49.32	1.71
A2	-0.31	0.31	0.55	0.15	32.17	1.71
B2	1.44	0.31	-0.40	0.15	31.62	1.71
A3	0.18	0.31	-0.15	0.15	0.79	1.71
B3	0.90	0.31	0.16	0.15	2.56	1.71
A4	-0.09	0.31	-0.09	0.15	-0.30	1.71
B4	-0.04	0.31	0.17	0.15	-4.60	1.71

(S.E.) THE STANDARD ERROR OF THE BEST ESTIMATE VALUES.

(S.D.) THE STANDARD DEVIATION OF THE OBSERVED VALUES.

TABLE 27.

BEST FITTED HOURLY VALUES OF DRY-BULB AND DEWPOINT TEMPERATURE AND TOTAL SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE USING LEAST SQUARES TECHNIQUE FOR THE AVERAGE HOTTEST DAY OF 1953-1962 INCLUSIVE IN HOUSTON, TEXAS

LOCAL STANDARD TIME	DRY-BULB TEMP.(F)	(S.D.)	DEWPOINT TEMP.(F)	(S.D.)	SOLAR BTU/HR PER SQ.FT.	(S.D.)
0.	80.5	2.011	74.5	2.708	-0.0	-0.000
1.	79.9	1.567	75.1	2.601	-0.0	-0.000
2.	79.3	1.155	75.3	2.558	-0.0	-0.000
3.	78.7	1.101	75.0	2.251	-0.0	-0.000
4.	78.2	1.434	74.6	2.160	-0.0	-0.000
5.	78.0	1.398	74.6	2.366	3.8	3.296
6.	78.6	1.944	74.7	2.366	27.9	10.820
7.	80.6	2.119	74.6	2.201	76.2	29.211
8.	83.8	1.578	74.0	2.951	144.1	28.034
9.	87.5	1.780	73.0	3.340	216.0	21.508
10.	90.8	2.011	72.0	2.726	272.6	32.547
11.	93.0	2.283	71.4	3.199	299.8	10.557
12.	94.2	2.627	71.1	3.266	294.9	38.408
13.	94.9	3.373	70.9	3.479	264.0	34.155
14.	95.6	3.836	70.5	3.596	217.0	85.353
15.	96.2	3.308	70.2	4.447	162.9	79.006
16.	96.1	4.057	70.4	4.040	108.7	62.656
17.	94.6	3.622	71.3	4.638	60.7	38.474
18.	91.9	3.273	72.6	3.440	24.9	18.873
19.	88.7	2.503	73.6	2.726	4.4	3.183
20.	85.7	1.647	74.0	2.150	3.5	-0.000
21.	83.5	1.476	73.8	2.283	-0.0	-0.000
22.	82.1	1.350	73.6	3.340	-0.0	-0.000
23.	81.2	0.789	73.9	2.998	-0.0	-0.000
(S.E.)		0.448		0.578		7.192

HARMONIC CONSTANTS AND THEIR STANDARD DEVIATIONS

		(S.E.)		(S.E.)		(S.E.)
A0	86.40	0.15	73.12	0.19	90.52	2.40
A1	-5.49	0.21	1.46	0.27	-138.95	3.39
B1	-7.39	0.21	1.66	0.27	-26.65	3.39
A2	0.40	0.21	-0.15	0.27	59.05	3.39
B2	1.36	0.21	-0.56	0.27	18.89	3.39
A3	-0.40	0.21	-0.22	0.27	-10.52	3.39
B3	0.94	0.21	0.01	0.27	1.79	3.39
A4	0.30	0.21	-0.34	0.27	0.79	3.39
B4	-0.30	0.21	0.34	0.27	-4.53	3.39

(S.E.) THE STANDARD ERROR OF THE BEST ESTIMATE VALUES.

(S.D.) THE STANDARD DEVIATION OF THE OBSERVED VALUES.

TABLE 28.

BEST FITTED HOURLY VALUES OF DRY-BULB AND DEWPOINT TEMPERATURE AND TOTAL SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE USING LEAST SQUARES TECHNIQUE FOR THE AVERAGE MOST HUMID DAY OF 1953-1962 INCLUSIVE IN HOUSTON, TEXAS

LOCAL STANDARD TIME	DRY-BULB TEMP.(F)	(S.D.)	DEWPOINT TEMP.(F)	(S.D.)	SOLAR BTU/HR PER SQ.FT.	(S.D.)
0.	78.7	1.033	76.9	1.135	-0.0	-0.000
1.	78.8	1.287	77.1	0.876	-0.0	-0.000
2.	78.8	1.265	77.0	1.197	-0.0	-0.000
3.	78.5	1.430	76.5	1.080	-0.0	-0.000
4.	77.8	1.491	76.1	1.494	-0.0	-0.000
5.	77.5	1.449	76.0	1.549	-2.4	1.301
6.	78.1	1.252	76.5	1.449	7.3	9.034
7.	79.8	1.265	77.2	0.843	40.4	26.725
8.	82.3	1.989	77.7	1.333	95.5	31.691
9.	84.8	2.331	77.5	1.506	158.6	42.943
10.	86.5	2.914	76.9	1.080	210.9	55.880
11.	87.2	3.232	76.3	1.776	239.9	52.645
12.	87.4	3.806	76.1	1.476	243.6	59.644
13.	87.4	3.498	76.2	1.713	226.8	48.851
14.	87.3	3.048	76.4	1.650	194.8	47.963
15.	87.0	2.486	76.5	1.900	151.1	50.555
16.	86.2	3.107	76.5	2.201	100.1	43.227
17.	84.9	2.331	76.6	2.283	50.6	34.799
18.	83.3	1.751	76.9	2.079	13.7	12.991
19.	81.7	1.506	77.1	1.814	-3.7	1.561
20.	80.5	1.619	77.2	1.633	3.5	-0.000
21.	79.7	1.549	77.0	1.563	-0.0	-0.000
22.	79.1	1.595	76.8	1.524	-0.0	-0.000
23.	78.7	1.337	76.7	1.751	-0.0	-0.000
(S.E.)		0.412		0.300		6.384

HARMONIC CONSTANTS AND THEIR STANDARD DEVIATIONS

		(S.E.)		(S.E.)		(S.E.)
A0	82.17	0.14	76.75	0.10	72.07	2.13
A1	-3.94	0.19	0.12	0.14	-111.57	3.01
B1	-3.03	0.19	0.03	0.14	-29.81	3.01
A2	0.89	0.19	0.10	0.14	48.17	3.01
B2	0.82	0.19	-0.37	0.14	26.22	3.01
A3	-0.31	0.19	0.09	0.14	-7.93	3.01
B3	0.67	0.19	0.34	0.14	-3.32	3.01
A4	-0.07	0.19	-0.34	0.14	0.19	3.01
B4	-0.32	0.19	-0.00	0.14	-7.89	3.01

(S.E.) THE STANDARD ERROR OF THE BEST ESTIMATE VALUES.

(S.D.) THE STANDARD DEVIATION OF THE OBSERVED VALUES.

TABLE 29.

BEST FITTED HOURLY VALUES OF DRY-BULB AND DEWPOINT TEMPERATURE AND TOTAL SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE USING LEAST SQUARES TECHNIQUE FOR THE AVERAGE HOTTEST WEEK DAY OF 1953-1962 INCLUSIVE IN HOUSTON, TEXAS

LOCAL STANDARD TIME	DRY-BULB TEMP.(F)	(S.D.)	DEWPOINT TEMP.(F)	(S.D.)	SOLAR BTU/HR PER SQ.FT.	(S.D.)
0.	79.2	1.480	74.5	2.143	-0.0	-0.000
1.	78.7	1.530	74.6	2.039	-0.0	-0.000
2.	78.1	1.469	74.5	1.859	-0.0	-0.000
3.	77.4	1.529	74.2	1.866	-0.0	-0.000
4.	76.8	1.664	74.0	1.880	-0.0	-0.000
5.	76.7	1.685	74.2	1.835	1.0	2.764
6.	77.7	1.587	74.7	1.841	23.3	15.928
7.	79.9	2.069	75.1	1.748	72.1	29.063
8.	83.0	1.998	75.0	2.885	140.1	40.844
9.	86.3	2.323	74.2	2.886	209.3	42.131
10.	89.1	2.695	73.0	2.568	261.7	42.603
11.	90.9	2.555	71.9	2.967	289.4	48.402
12.	92.2	2.769	71.3	2.801	294.4	50.209
13.	93.3	3.186	71.0	3.018	281.7	48.633
14.	94.2	3.446	70.9	3.246	253.0	47.418
15.	94.7	3.611	71.1	3.220	207.1	44.547
16.	94.3	4.238	71.5	3.260	146.8	41.395
17.	92.6	3.971	72.2	3.200	83.2	29.895
18.	90.0	3.919	73.3	2.899	32.1	19.769
19.	87.0	3.091	74.2	2.090	3.9	7.506
20.	84.3	2.200	74.6	2.327	-3.0	0.260
21.	82.2	1.760	74.6	2.357	-0.0	-0.000
22.	80.8	1.522	74.4	2.424	-0.0	-0.000
23.	79.9	1.513	74.4	2.301	-0.0	-0.000
(S.E.)		0.188		0.186		2.273

HARMONIC CONSTANTS AND THEIR STANDARD DEVIATIONS

		(S.E.)		(S.E.)		(S.E.)
A0	84.97	0.06	73.48	0.06	95.72	0.76
A1	-5.40	0.09	1.18	0.09	-141.98	1.07
B1	-7.05	0.09	1.18	0.09	-39.70	1.07
A2	0.38	0.09	-0.04	0.09	51.41	1.07
B2	1.25	0.09	-1.04	0.09	29.42	1.07
A3	-0.14	0.09	0.03	0.09	-2.52	1.07
B3	0.90	0.09	0.20	0.09	1.44	1.07
A4	0.06	0.09	-0.29	0.09	-2.22	1.07
B4	-0.26	0.09	0.12	0.09	-8.82	1.07

(S.E.) THE STANDARD ERROR OF THE BEST ESTIMATE VALUES.

(S.D.) THE STANDARD DEVIATION OF THE OBSERVED VALUES.

TABLE 30.

BEST FITTED HOURLY VALUES OF DRY-BULB AND DEWPOINT TEMPERATURE AND TOTAL SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE USING LEAST SQUARES TECHNIQUE FOR THE AVERAGE MOST HUMID WEEK DAY OF 1953-1962 INCLUSIVE IN HOUSTON, TEXAS

LOCAL STANDARD TIME	DRY-BULB TEMP.(F)	(S.D.)	DEWPOINT TEMP.(F)	(S.D.)	SOLAR BTU/HR PER SQ.FT.	(S.D.)
0.	78.3	1.791	75.7	1.825	-0.0	-0.000
1.	78.0	1.706	75.7	1.781	-0.0	-0.000
2.	77.7	1.864	75.5	1.717	-0.0	-0.000
3.	77.3	1.824	75.3	1.648	-0.0	-0.000
4.	77.0	1.785	75.1	1.742	-0.0	-0.000
5.	76.9	1.841	75.1	1.738	1.2	8.006
6.	77.5	1.794	75.4	1.718	13.9	11.427
7.	79.1	2.579	75.8	1.758	44.5	27.455
8.	81.4	2.933	75.9	1.973	92.4	46.468
9.	83.7	3.324	75.8	2.267	149.0	64.135
10.	85.5	3.744	75.3	1.930	201.1	67.378
11.	86.3	4.145	74.8	2.407	237.6	62.851
12.	86.5	4.609	74.5	2.429	252.1	61.888
13.	86.4	4.936	74.4	2.749	243.3	56.317
14.	86.5	4.959	74.5	2.488	213.1	58.989
15.	86.7	4.605	74.6	2.826	166.5	61.863
16.	86.5	4.583	74.8	2.809	111.6	50.283
17.	85.5	4.041	75.1	2.411	59.7	34.553
18.	83.9	3.592	75.4	2.104	21.2	16.508
19.	82.1	2.897	75.8	1.952	1.3	4.647
20.	80.5	2.062	76.0	1.973	-3.0	0.000
21.	79.4	1.733	76.0	1.912	-0.0	-0.000
22.	78.8	1.764	75.8	1.808	-0.0	-0.000
23.	78.5	1.734	75.7	1.782	-0.0	-0.000
(S.E.)		0.233		0.154		2.774

HARMONIC CONSTANTS AND THEIR STANDARD DEVIATIONS

		(S.E.)		(S.E.)		(S.E.)
A0	81.66	0.08	75.34	0.05	75.28	0.92
A1	-3.68	0.11	0.41	0.07	-113.65	1.31
B1	-3.56	0.11	0.20	0.07	-35.35	1.31
A2	0.60	0.11	0.10	0.07	44.42	1.31
B2	0.61	0.11	-0.46	0.07	31.01	1.31
A3	-0.24	0.11	0.04	0.07	-4.65	1.31
B3	0.77	0.11	0.17	0.07	-6.13	1.31
A4	0.14	0.11	-0.15	0.07	-0.43	1.31
B4	-0.23	0.11	0.01	0.07	-4.07	1.31

(S.E.) THE STANDARD ERROR OF THE BEST ESTIMATE VALUES.

(S.D.) THE STANDARD DEVIATION OF THE OBSERVED VALUES.

TABLE 31. COMPARISON OF OBSERVED TOTAL SOLAR RADIATION WITH CALCULATED SOLAR RADIATION FOR THE AVERAGE HOTTEST DAYS (IN 1953-1962 INCLUSIVE) IN PHOENIX, ARIZONA

LATITUDE(DEG) = 33.4

LONGITUDE(DEG)= 112.0

EQU. OF TIME = -5.0 (MIN.)

TIME CORRECTION= -28.0 (MIN.)

DAY OF YEAR = 189.

SUNRISE = 5.5 MOUNTAIN STANDARD TIME

SUNSET = 19.6 MOUNTAIN STANDARD TIME

		SOLAR RADIATION, BTU/HR/(SQ.FT)					
TIME (HR)	SUN,S ALTITUDE (DEG.)	OUTER SPACE (1)	MOON,S STANDARD VALUE(2)	CALC. HORIZ. (3)	ASHRAE DIFFUSE (4)	CALC. TOTAL (4)	OBS. TOTAL (4)
6.	6.	43.	79.	8.	8.	16.	19.
7.	18.	129.	183.	55.	21.	76.	66.
8.	30.	212.	234.	116.	28.	144.	134.
9.	42.	287.	262.	176.	31.	207.	203.
10.	55.	349.	278.	227.	33.	260.	258.
11.	67.	393.	286.	263.	35.	298.	290.
12.	77.	417.	291.	283.	35.	318.	303.
13.	77.	418.	291.	284.	35.	319.	302.
14.	68.	397.	287.	266.	35.	301.	288.
15.	56.	354.	279.	231.	34.	265.	253.
16.	43.	294.	264.	181.	32.	213.	196.
17.	31.	220.	238.	122.	28.	151.	125.
18.	19.	137.	190.	61.	22.	83.	60.
19.	7.	51.	95.	11.	10.	22.	17.

1) The hourly solar radiation upon a horizontal surface at the outer limit of the atmosphere.

2) DIRECT NORMAL SOLAR RADIATION AT SEA LEVEL UNDER CLOUDLESS CONDITION WITH THE FOLLOWING ATMOSPHERIC CONDITIONS PRECIPITABLE WATER VAPOR 20 MM,DUST CONCENTRATION 300/(CU.CM) AND OZONE PARTIAL PRESSURE 2.8 MM HG

3) ASHRAE CLEAVELAND LABORATORY DATA OF DIFFUSE SKY RADIATION ON CLOUDLESS DAYS DURING WHICH THE OBSERVED NORMAL INCIDENT RADIATION CLOSELY APPRIXIMATED MOON,S STANDARD

4) SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE

TABLE 32. COMPARISON OF OBSERVED TOTAL SOLAR RADIATION WITH CALCULATED SOLAR RADIATION FOR THE AVERAGE MOST HUMID DAYS (IN 1953-1962 INCLUSIVE) IN PHOENIX, ARIZONA

LATITUDE(DEG) = 33.4

LONGITUDE(DEG) = 112.0

EQU. OF TIME = -6.0 (MIN.)

TIME CORRECTION = -28.0 (MIN.)

DAY OF YEAR = 226.

SUNRISE = 5.9 MOUNTAIN STANDARD TIME

SUNSET = 19.2 MOUNTAIN STANDARD TIME

TIME (HR)	SUN,S ALTITUDE (DEG.)	OUTER SPACE (1)	MOON,S STANDARD VALUE(2)	CALC. HORIZ. (3)	ASHRAE DIFFUSE (4)	CALC. TOTAL (4)	OBS. TOTAL (4)
		SOLAR RADIATION, BTU/HR/(SQ.FT)					
6.	1.	5.	0.	0.	0.	0.	8.
7.	13.	96.	150.	33.	17.	51.	34.
8.	25.	185.	219.	94.	26.	120.	69.
9.	38.	265.	254.	156.	31.	187.	105.
10.	50.	331.	273.	209.	33.	242.	138.
11.	61.	378.	284.	248.	34.	282.	167.
12.	69.	403.	288.	269.	35.	304.	190.
13.	70.	404.	289.	270.	35.	305.	203.
14.	62.	382.	284.	252.	34.	286.	198.
15.	52.	338.	275.	215.	33.	248.	170.
16.	39.	275.	257.	164.	31.	194.	123.
17.	27.	196.	225.	102.	27.	129.	72.
18.	15.	108.	163.	41.	19.	60.	31.
19.	2.	17.	9.	0.	1.	1.	8.

1) The hourly solar radiation upon a horizontal surface at the outer limit of the atmosphere.

2) DIRECT NORMAL SOLAR RADIATION AT SEA LEVEL UNDER CLOUDLESS CONDITION WITH THE FOLLOWING ATMOSPHERIC CONDITIONS PRECIPITABLE WATER VAPOR 20 MM,DUST CONCENTRATION 300/(CU.CM) AND OZONE PARTIAL PRESSURE 2.8 MM HG

3) ASHRAE CLEAVELAND LABORATORY DATA OF DIFFUSE SKY RADIATION ON CLOUDLESS DAYS DURING WHICH THE OBSERVED NORMAL INCIDENT RADIATION CLOSELY APPRIXIMATED MOON,S STANDARD

4) SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE

TABLE 33. COMPARISON OF OBSERVED TOTAL SOLAR RADIATION WITH CALCULATED SOLAR RADIATION FOR THE AVERAGE HOTTEST WEEK DAYS (IN 1953-1962 INCLUSIVE) IN PHOENIX, ARIZONA

LATITUDE(DEG) = 33.4

LONGITUDE(DEG)= 112.0

EQU. OF TIME = -6.0 (MIN.)

TIME CORRECTION= -28.0 (MIN.)

DAY OF YEAR = 192.

SUNRISE = 5.5 MOUNTAIN STANDARD TIME

SUNSET = 19.6 MOUNTAIN STANDARD TIME

SOLAR RADIATION, BTU/HR/(SQ.FT)

TIME (HR)	SUN,S ALTITUDE (DEG.)	OUTER SPACE (1)	MOON,S STANDARD VALUE(2)	CALC. HORIZ. (3)	ASHRAE DIFFUSE (4)	CALC. TOTAL (4)	OBS. TOTAL (4)
6.	5.	39.	72.	7.	8.	14.	19.
7.	17.	126.	180.	53.	21.	74.	63.
8.	29.	210.	233.	114.	28.	142.	127.
9.	42.	285.	261.	174.	31.	205.	194.
10.	54.	348.	277.	225.	33.	259.	248.
11.	66.	392.	286.	262.	35.	297.	282.
12.	76.	416.	290.	282.	35.	317.	298.
13.	77.	417.	291.	284.	35.	319.	301.
14.	68.	396.	287.	266.	35.	301.	290.
15.	56.	355.	279.	231.	34.	265.	259.
16.	43.	295.	264.	181.	32.	213.	204.
17.	31.	220.	238.	123.	28.	151.	135.
18.	19.	137.	190.	61.	22.	83.	67.
19.	7.	51.	95.	11.	10.	22.	20.

1) The hourly solar radiation upon a horizontal surface at the outer limit of the atmosphere.

2) DIRECT NORMAL SOLAR RADIATION AT SEA LEVEL UNDER CLOUDLESS CONDITION WITH THE FOLLOWING ATMOSPHERIC CONDITIONS PRECIPITABLE WATER VAPOR 20 MM, DUST CONCENTRATION 300/(CU.CM) AND OZONE PARTIAL PRESSURE 2.8 MM HG

3) ASHRAE CLEAVELAND LABORATORY DATA OF DIFFUSE SKY RADIATION ON CLOUDLESS DAYS DURING WHICH THE OBSERVED NORMAL INCIDENT RADIATION CLOSELY APPRIXIMATED MOON,S STANDARD

4) SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE

TABLE 34. COMPARISON OF OBSERVED TOTAL SOLAR RADIATION WITH CALCULATED SOLAR RADIATION FOR THE AVERAGE MOST HUMID WEEK DAYS (IN 1953-1962 INCLUSIVE) IN PHOENIX,ARIZONA

LATITUDE(DEG) = 33.4

LONGITUDE(DEG)= 112.0

EQU. OF TIME = -6.0 (MIN.)

TIME CORRECTION= -28.0 (MIN.)

DAY OF YEAR = 223.

SUNRISE = 5.9 MOUNTAIN STANDARD TIME

SUNSET = 19.2 MOUNTAIN STANDARD TIME

		SOLAR RADIATION, BTU/HR/(SQ.FT)					
TIME (HR)	SUN,S ALTITUDE (DEG.)	OUTER SPACE (1)	MOON,S STANDARD VALUE(2)	CALC. HORIZ. (3)	ASHRAE DIFFUSE (4)	CALC. TOTAL (4)	OBS. TOTAL (4)
6.	1.	9.	2.	0.	0.	0.	11.
7.	13.	100.	154.	36.	18.	53.	44.
8.	26.	188.	221.	96.	26.	123.	93.
9.	38.	268.	255.	158.	31.	189.	148.
10.	51.	333.	274.	211.	33.	244.	197.
11.	62.	380.	284.	250.	34.	284.	233.
12.	70.	405.	289.	271.	35.	306.	256.
13.	70.	406.	289.	273.	35.	308.	263.
14.	63.	384.	284.	254.	34.	288.	252.
15.	52.	340.	275.	217.	33.	251.	217.
16.	40.	277.	258.	166.	31.	197.	161.
17.	28.	199.	227.	105.	27.	132.	97.
18.	15.	112.	166.	43.	19.	62.	42.
19.	3.	21.	16.	1.	2.	2.	9.

1) The hourly solar radiation upon a horizontal surface at the outer limit of the atmosphere.

2) DIRECT NORMAL SOLAR RADIATION AT SEA LEVEL UNDER CLOUDLESS CONDITION WITH THE FOLLOWING ATMOSPHERIC CONDITIONS PRECIPITABLE WATER VAPOR 20 MM,DUST CONCENTRATION 300/(CU.CM) AND OZONE PARTIAL PRESSURE 2.8 MM HG

3) ASHRAE CLEAVELAND LABORATORY DATA OF DIFFUSE SKY RADIATION ON CLOUDLESS DAYS DURING WHICH THE OBSERVED NORMAL INCIDENT RADIATION CLOSELY APPRIXIMATED MOON,S STANDARD

4) SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE

TABLE 35. COMPARISON OF OBSERVED TOTAL SOLAR RADIATION WITH CALCULATED SOLAR RADIATION FOR THE AVERAGE HOTTEST DAYS (IN 1953-1962 INCLUSIVE) IN WASHINGTON,D.C.

LATITUDE(DEG) = 38.9

LONGITUDE(DEG)= 77.1

EQU. OF TIME = -6.0 (MIN.)

TIME CORRECTION= -8.0 (MIN.)

DAY OF YEAR = 206.

SUNRISE = 5.1 EASTERN STANDARD TIME

SUNSET = 19.3 EASTERN STANDARD TIME

SOLAR RADIATION, BTU/HR/(SQ.FT)

TIME (HR)	SUN,S ALTITUDE (DEG.)	OUTER SPACE (1)	MOON,S STANDARD VALUE(2)	CALC. HORIZ. (3)	ASHRAE DIFFUSE (4)	CALC. TOTAL (4)	OBS. TOTAL (4)
6.	9.	70.	120.	20.	13.	33.	17.
7.	21.	152.	201.	71.	24.	95.	51.
8.	32.	230.	242.	130.	29.	159.	103.
9.	44.	298.	265.	184.	32.	216.	164.
10.	55.	352.	278.	228.	34.	262.	217.
11.	65.	388.	285.	258.	34.	292.	251.
12.	70.	404.	289.	272.	35.	307.	264.
13.	68.	398.	287.	267.	35.	302.	261.
14.	60.	371.	283.	245.	34.	279.	244.
15.	49.	325.	272.	206.	33.	239.	213.
16.	38.	263.	254.	156.	31.	187.	167.
17.	26.	189.	222.	98.	27.	125.	110.
18.	15.	109.	164.	42.	19.	60.	55.
19.	4.	27.	30.	2.	3.	5.	16.

1) The hourly solar radiation upon a horizontal surface at the outer limit of the atmosphere.

2) DIRECT NORMAL SOLAR RADIATION AT SEA LEVEL UNDER CLOUDLESS CONDITION WITH THE FOLLOWING ATMOSPHERIC CONDITIONS PRECIPITABLE WATER VAPOR 20 MM,DUST CONCENTRATION 300/(CU.CM) AND OZONE PARTIAL PRESSURE 2.8 MM HG

3) ASHRAE CLEAVELAND LABORATORY DATA OF DIFFUSE SKY RADIATION ON CLOUDLESS DAYS DURING WHICH THE OBSERVED NORMAL INCIDENT RADIATION CLOSELY APPRIXIMATED MOON,S STANDARD

4) SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE

TABLE 36. COMPARISON OF OBSERVED TOTAL SOLAR RADIATION WITH CALCULATED SOLAR RADIATION FOR THE AVERAGE MOST HUMID DAYS (IN 1953-1962 INCLUSIVE) IN WASHINGTON,D.C.

LATITUDE(DEG) = 38.9

LONGITUDE(DEG)= 77.1

EQU. OF TIME = -6.0 (MIN.)

TIME CORRECTION= -8.0 (MIN.)

DAY OF YEAR = 220.

SUNRISE = 5.4 EASTERN STANDARD TIME

SUNSET = 19.1 EASTERN STANDARD TIME

			SOLAR RADIATION, BTU/HR/(SQ.FT)				
TIME (HR)	SUN,S ALTITUDE (DEG.)	OUTER SPACE (1)	MOON,S STANDARD VALUE(2)	CALC. HORIZ. (3)	ASHRAE DIFFUSE (4)	CALC. TOTAL (4)	OBS. TOTAL (4)
6.	7.	53.	99.	12.	11.	23.	8.
7.	19.	138.	190.	61.	22.	82.	33.
8.	30.	217.	236.	119.	28.	147.	76.
9.	42.	287.	261.	174.	31.	205.	131.
10.	53.	342.	276.	219.	33.	253.	186.
11.	62.	379.	284.	250.	34.	284.	226.
12.	67.	395.	286.	263.	35.	297.	242.
13.	65.	389.	285.	258.	34.	292.	235.
14.	57.	362.	280.	236.	34.	269.	210.
15.	47.	315.	269.	197.	32.	229.	173.
16.	36.	251.	250.	146.	30.	176.	129.
17.	24.	176.	215.	87.	26.	113.	83.
18.	12.	93.	146.	31.	17.	48.	42.
19.	1.	9.	1.	0.	0.	0.	13.

1) The hourly solar radiation upon a horizontal surface at the outer limit of the atmosphere.

2) DIRECT NORMAL SOLAR RADIATION AT SEA LEVEL UNDER CLOUDLESS CONDITION WITH THE FOLLOWING ATMOSPHERIC CONDITIONS PRECIPITABLE WATER VAPOR 20 MM,DUST CONCENTRATION 300/(CU.CM) AND OZONE PARTIAL PRESSURE 2.8 MM HG

3) ASHRAE CLEAVELAND LABORATORY DATA OF DIFFUSE SKY RADIATION ON CLOUDLESS DAYS DURING WHICH THE OBSERVED NORMAL INCIDENT RADIATION CLOSELY APPRIXIMATED MOON,S STANDARD

4) SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE

TABLE 37. COMPARISON OF OBSERVED TOTAL SOLAR RADIATION WITH CALCULATED SOLAR RADIATION FOR THE AVERAGE HOTTEST WEEK DAYS (IN 1953-1962 INCLUSIVE) IN WASHINGTON,D.C.

LATITUDE(DEG) = 38.9

LONGITUDE(DEG)= 77.1

EQU. OF TIME = -6.0 (MIN.)

TIME CORRECTION= -8.0 (MIN.)

DAY OF YEAR = 200.

SUNRISE = 5.1 EASTERN STANDARD TIME

SUNSET = 19.4 EASTERN STANDARD TIME

SOLAR RADIATION, BTU/HR/(SQ.FT)

TIME (HR)	SUN,S ALTITUDE (DEG.)	OUTER SPACE (1)	MOON,S STANDARD VALUE(2)	CALC. HORIZ. (3)	ASHRAE DIFFUSE (4)	CALC. TOTAL (4)	OBS. TOTAL (4)
6.	10.	76.	125.	22.	14.	36.	18.
7.	22.	157.	204.	75.	24.	99.	56.
8.	33.	234.	244.	133.	29.	162.	112.
9.	45.	302.	266.	187.	32.	219.	172.
10.	56.	355.	279.	231.	34.	265.	221.
11.	66.	391.	286.	260.	35.	295.	253.
12.	72.	406.	290.	275.	35.	310.	266.
13.	69.	401.	288.	270.	35.	305.	265.
14.	61.	374.	284.	248.	34.	282.	250.
15.	50.	329.	273.	209.	33.	243.	217.
16.	39.	267.	255.	159.	31.	190.	167.
17.	27.	194.	225.	102.	27.	129.	107.
18.	15.	114.	169.	45.	19.	64.	53.
19.	4.	33.	50.	4.	5.	9.	16.

1) The hourly solar radiation upon a horizontal surface at the outer limit of the atmosphere.

2) DIRECT NORMAL SOLAR RADIATION AT SEA LEVEL UNDER CLOUDLESS CONDITION WITH THE FOLLOWING ATMOSPHERIC CONDITIONS PRECIPITABLE WATER VAPOR 20 MM,DUST CONCENTRATION 300/(CU.CM) AND OZONE PARTIAL PRESSURE 2.8 MM HG

3) ASHRAE CLEAVELAND LABORATORY DATA OF DIFFUSE SKY RADIATION ON CLOUDLESS DAYS DURING WHICH THE OBSERVED NORMAL INCIDENT RADIATION CLOSELY APPRIXIMATED MOON,S STANDARD

4) SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE

TABLE 38. COMPARISCN OF OBSERVED TOTAL SOLAR RADIATION WITH CALCULATED SOLAR RADIATION FOR THE AVERAGE MOST HUMID WEEK DAYS (IN 1953-1962 INCLUSIVE) IN WASHINGTON,D.C.

LATITUDE(DEG) = 38.9

LONGITUDE(DEG)= 77.1

EQU. OF TIME = -6.0 (MIN.)

TIME CORRECTION= -8.0 (MIN.)

DAY OF YEAR = 219.

SUNRISE = 5.3 EASTERN STANDARD TIME

SUNSET = 19.1 EASTERN STANDARD TIME

			SOLAR RADIATION, BTU/HR/(SQ.FT)				
TIME (HR)	SUN,S ALTITUDE (DEG.)	OUTER SPACE (1)	MOON,S STANDARD VALUE(2)	CALC. HORIZ. (3)	ASHRAE DIFFUSE (4)	CALC. TOTAL (4)	OBS. TOTAL (4)
6.	7.	55.	101.	13.	11.	24.	9.
7.	19.	139.	191.	61.	22.	84.	33.
8.	30.	218.	236.	120.	28.	148.	70.
9.	42.	288.	261.	175.	31.	206.	112.
10.	53.	343.	276.	220.	33.	253.	150.
11.	62.	380.	284.	251.	34.	285.	180.
12.	67.	396.	286.	263.	35.	298.	198.
13.	65.	390.	285.	258.	34.	293.	200.
14.	57.	363.	280.	236.	34.	270.	185.
15.	47.	316.	269.	197.	32.	230.	153.
16.	36.	252.	250.	146.	30.	177.	108.
17.	24.	177.	215.	88.	26.	114.	63.
18.	13.	94.	147.	32.	17.	49.	28.
19.	1.	10.	2.	0.	0.	0.	8.

1) The hourly solar radiation upon a horizontal surface at the outer limit of the atmosphere.

2) DIRECT NORMAL SOLAR RADIATION AT SEA LEVEL UNDER CLOUDLESS CONDITION WITH THE FOLLOWING ATMOSPHERIC CONDITIONS PRECIPITABLE WATER VAPOR 20 MM,DUST CCNCENTRATION 300/(CU.CM) AND OZONE PARTIAL PRESSURE 2.8 MM HG

3) ASHRAE CLEAVELAND LABURATORY DATA OF CIFFUSE SKY RADIATION ON CLOUDLESS DAYS CURING WHICH THE OBSERVED NORMAL INCIDENT RADIATION CLOSELY APPRIXIMATED MOON,S STANDARD

4) SOLAR RADIATION INCIDENT UPON A HORIZCNTAL SURFACE

TABLE 39. COMPARISON OF OBSERVED TOTAL SOLAR RADIATION WITH CALCULATED SOLAR RADIATION FOR THE AVERAGE HOTTEST DAYS (IN 1953-1962 INCLUSIVE) IN LAKE CHRLES,LA.

LATITUDE(DEG) = 30.1

LONGITUDE(DEG)= 93.2

EQU. OF TIME = -6.0 (MIN.)

TIME CORRECTION= -12.0 (MIN.)

DAY OF YEAR = 206.

SUNRISE = 5.5 CENTRAL STANDARD TIME

SUNSET = 19.1 CENTRAL STANDARD TIME

SOLAR RADIATION, BTU/HR/(SQ.FT)

TIME (HR)	SUN,S ALTITUDE (DEG.)	OUTER SPACE (1)	MOON,S STANDARD VALUE(2)	CALC. HORIZ. (3)	ASHRAE DIFFUSE (4)	CALC. TOTAL (4)	OBS. TOTAL (4)
6.	6.	42.	78.	8.	8.	16.	13.
7.	18.	134.	187.	58.	22.	80.	54.
8.	31.	221.	238.	123.	28.	151.	115.
9.	44.	298.	264.	184.	32.	215.	179.
10.	57.	359.	280.	234.	34.	268.	230.
11.	69.	401.	288.	269.	35.	304.	263.
12.	78.	420.	291.	285.	35.	320.	279.
13.	75.	415.	290.	281.	35.	316.	282.
14.	64.	387.	285.	257.	34.	291.	270.
15.	52.	337.	275.	216.	33.	249.	237.
16.	39.	269.	256.	160.	31.	191.	182.
17.	26.	187.	221.	96.	26.	123.	114.
18.	13.	97.	151.	34.	17.	52.	53.
19.	1.	6.	0.	0.	0.	0.	13.

1) The hourly solar radiation upon a horizontal surface at the outer limit of the atmosphere.

2) DIRECT NORMAL SOLAR RADIATION AT SEA LEVEL UNDER CLOUDLESS CONDITION WITH THE FOLLOWING ATMOSPHERIC CONDITIONS PRECIPITABLE WATER VAPOR 20 MM,DUST CONCENTRATION 300/(CU.CM) AND OZONE PARTIAL PRESSURE 2.8 MM HG

3) ASHRAE CLEAVELAND LABORATORY DATA OF DIFFUSE SKY RADIATION ON CLOUDLESS DAYS DURING WHICH THE OBSERVED NORMAL INCIDENT RADIATION CLOSELY APPRIXIMATED MOON,S STANDARD

4) SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE

TABLE 40. COMPARISON OF OBSERVED TOTAL SOLAR RADIATION WITH CALCULATED SOLAR RADIATION FOR THE AVERAGE MOST HUMID DAYS (IN 1953-1962 INCLUSIVE) IN LAKE CHRLES, LA.

LATITUDE(DEG) = 30.1

LONGITUDE(DEG)= 93.7

EQU. OF TIME = -3.0 (MIN.)

TIME CORRECTION= -12.0 (MIN.)

DAY OF YEAR = 232.

SUNRISE = 5.8 CENTRAL STANDARD TIME

SUNSET = 18.7 CENTRAL STANDARD TIME

SOLAR RADIATION, BTU/HR/(SQ.FT)

TIME (HR)	SUN,S ALTITUDE (DEG.)	OUTER SPACE (1)	MOON,S STANDARD VALUE(2)	CALC. HORIZ. (3)	ASHRAE DIFFUSE (4)	CALC. TOTAL (4)	OBS. TOTAL (4)
6.	3.	20.	14.	1.	1.	2.	11.
7.	16.	116.	170.	45.	19.	65.	34.
8.	28.	206.	230.	110.	27.	137.	73.
9.	41.	286.	260.	172.	31.	203.	118.
10.	54.	349.	277.	223.	33.	257.	158.
11.	65.	391.	285.	258.	34.	292.	181.
12.	71.	410.	290.	274.	35.	309.	185.
13.	69.	404.	288.	269.	35.	304.	172.
14.	60.	373.	283.	244.	34.	277.	151.
15.	48.	320.	270.	199.	33.	232.	125.
16.	35.	248.	248.	142.	30.	172.	95.
17.	22.	162.	206.	77.	24.	102.	62.
18.	9.	68.	117.	19.	13.	32.	32.

1) The hourly solar radiation upon a horizontal surface at the outer limit of the atmosphere.

2) DIRECT NORMAL SOLAR RADIATION AT SEA LEVEL UNDER CLOUDLESS CONDITION WITH THE FOLLOWING ATMOSPHERIC CONDITIONS PRECIPITABLE WATER VAPOR 20 MM, DUST CONCENTRATION 300/(CU.CM) AND OZONE PARTIAL PRESSURE 2.8 MM HG

3) ASHRAE CLEAVELAND LABORATORY DATA OF DIFFUSE SKY RADIATION ON CLOUDLESS DAYS DURING WHICH THE OBSERVED NORMAL INCIDENT RADIATION CLOSELY APPRIXIMATED MOON,S STANDARD

4) SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE

TABLE 41. COMPARISON OF OBSERVED TOTAL SOLAR RADIATION WITH CALCULATED SOLAR RADIATION FOR THE AVERAGE HOTTEST WEEK DAYS (IN 1953-1962 INCLUSIVE) IN LAKE CHRLES, LA.

LATITUDE(DEG) = 30.1

LONGITUDE(DEG)= 93.2

EQU. OF TIME = -6.0 (MIN.)

TIME CORRECTION= -12.0 (MIN.)

DAY OF YEAR = 214.

SUNRISE = 5.6 CENTRAL STANDARD TIME

SUNSET = 19.0 CENTRAL STANDARD TIME

SOLAR RADIATION, BTU/HR/(SQ.FT)

TIME (HR)	SUN,S ALTITUDE (DEG.)	OUTER SPACE (1)	MOON,S STANDARD VALUE(2)	CALC. HORIZ. (3)	ASHRAE DIFFUSE (4)	CALC. TOTAL (4)	OBS. TOTAL (4)
6.	5.	37.	64.	5.	7.	12.	13.
7.	17.	129.	183.	55.	21.	76.	53.
8.	30.	217.	236.	119.	28.	147.	114.
9.	43.	295.	263.	181.	32.	212.	178.
10.	56.	357.	279.	232.	34.	265.	229.
11.	68.	399.	287.	267.	35.	302.	257.
12.	77.	418.	291.	283.	35.	318.	267.
13.	74.	413.	290.	279.	35.	314.	265.
14.	64.	385.	285.	255.	34.	289.	252.
15.	51.	334.	274.	213.	33.	246.	222.
16.	38.	266.	255.	157.	31.	188.	172.
17.	25.	183.	219.	93.	26.	119.	109.
18.	12.	92.	145.	31.	17.	48.	50.

1) The hourly solar radiation upon a horizontal surface at the outer limit of the atmosphere.

2) DIRECT NORMAL SOLAR RADIATION AT SEA LEVEL UNDER CLOUDLESS CONDITION WITH THE FOLLOWING ATMOSPHERIC CONDITIONS PRECIPITABLE WATER VAPOR 20 MM, DUST CONCENTRATION 300/(CU.CM) AND OZONE PARTIAL PRESSURE 2.8 MM HG

3) ASHRAE CLEAVELAND LABORATORY DATA OF DIFFUSE SKY RADIATION ON CLOUDLESS DAYS DURING WHICH THE OBSERVED NORMAL INCIDENT RADIATION CLOSELY APPRIXIMATED MOON,S STANDARD

4) SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE

TABLE 42. COMPARISON OF OBSERVED TOTAL SOLAR RADIATION WITH CALCULATED SOLAR RADIATION FOR THE AVERAGE MOST HUMID WEEK DAYS (IN 1953-1962 INCLUSIVE) IN LAKE CHRLES,LA.

LATITUDE(DEG) = 30.1

LONGITUDE(DEG)= 93.2

EQU. OF TIME = -6.0 (MIN.)

TIME CORRECTION= -12.0 (MIN.)

DAY OF YEAR = 222.

SUNRISE = 5.7 CENTRAL STANDARD TIME

SUNSET = 18.9 CENTRAL STANDARD TIME

SOLAR RADIATION, BTU/HR/(SQ.FT)

TIME (HR)	SUN,S ALTITUDE (DEG.)	OUTER SPACE (1)	MOON,S STANDARD VALUE(2)	CALC. HORIZ. (3)	ASHRAE DIFFUSE (4)	CALC. TOTAL (4)	OBS. TOTAL (4)
6.	4.	28.	33.	2.	3.	6.	10.
7.	16.	122.	176.	50.	20.	70.	42.
8.	29.	211.	233.	114.	28.	142.	89.
9.	42.	290.	262.	176.	31.	208.	138.
10.	55.	353.	278.	228.	33.	261.	176.
11.	67.	396.	286.	263.	35.	297.	197.
12.	74.	415.	290.	279.	35.	314.	202.
13.	72.	410.	290.	276.	35.	311.	195.
14.	62.	381.	284.	251.	34.	286.	178.
15.	50.	330.	273.	209.	33.	242.	150.
16.	37.	260.	253.	152.	31.	183.	111.
17.	24.	176.	215.	88.	26.	114.	68.
18.	11.	85.	136.	27.	16.	42.	30.

1) The hourly solar radiation upon a horizontal surface at the outer limit of the atmosphere.

2) DIRECT NORMAL SOLAR RADIATION AT SEA LEVEL UNDER CLOUDLESS CONDITION WITH THE FOLLOWING ATMOSPHERIC CONDITIONS PRECIPITABLE WATER VAPOR 20 MM,DUST CONCENTRATICN 300/(CU.CM) AND OZONE PARTIAL PRESSURE 2.8 MM HG

3) ASHRAE CLEAVELAND LABORATORY DATA OF DIFFUSE SKY RADIATION ON CLOUDLESS DAYS DURING WHICH THE OBSERVED NORMAL INCIDENT RADIATION CLOSELY APPRIXIMATED MOON,S STANDARD

4) SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE

TABLE 43. COMPARISON OF OBSERVED TOTAL SOLAR RADIATION WITH CALCULATED SOLAR RADIATION FOR THE AVERAGE HOTTEST DAYS (IN 1953-1962 INCLUSIVE) IN MINNEAPOLIS, MINN.

LATITUDE(DEG) = 44.9

LONGITUDE(DEG) = 93.2

EQU. OF TIME = -6.0 (MIN.)

TIME CORRECTION = -12.0 (MIN.)

DAY OF YEAR = 193.

SUNRISE = 4.7 CENTRAL STANDARD TIME

SUNSET = 19.9 CENTRAL STANDARD TIME

SOLAR RADIATION, BTU/HR/(SQ.FT)

TIME (HR)	SUN,S ALTITUDE (DEG.)	OUTER SPACE (1)	MOON,S STANDARD VALUE(2)	CALC. HORIZ. (3)	ASHRAE DIFFUSE (4)	CALC. TOTAL (4)	OBS. TOTAL (4)
5.	2.	19.	11.	0.	1.	2.	10.
6.	12.	90.	144.	30.	16.	47.	38.
7.	23.	164.	208.	80.	25.	104.	90.
8.	33.	234.	243.	133.	29.	162.	154.
9.	44.	295.	264.	182.	32.	214.	212.
10.	54.	344.	277.	223.	33.	256.	248.
11.	62.	378.	284.	251.	34.	285.	258.
12.	67.	393.	286.	263.	35.	298.	251.
13.	65.	389.	285.	259.	35.	294.	238.
14.	59.	367.	282.	241.	34.	275.	222.
15.	50.	327.	273.	208.	33.	241.	198.
16.	39.	272.	257.	163.	31.	194.	159.
17.	29.	206.	231.	112.	28.	139.	108.
18.	18.	135.	188.	59.	22.	81.	57.
19.	8.	61.	111.	16.	12.	28.	20.

1) The hourly solar radiation upon a horizontal surface at the outer limit of the atmosphere.

2) DIRECT NORMAL SOLAR RADIATION AT SEA LEVEL UNDER CLOUDLESS CONDITION WITH THE FOLLOWING ATMOSPHERIC CONDITIONS PRECIPITABLE WATER VAPOR 20 MM, DUST CONCENTRATION 300/(CU.CM) AND OZONE PARTIAL PRESSURE 2.8 MM HG

3) ASHRAE CLEAVELAND LABORATORY DATA OF DIFFUSE SKY RADIATION ON CLOUDLESS DAYS DURING WHICH THE OBSERVED NORMAL INCIDENT RADIATION CLOSELY APPRIXIMATED MOON,S STANDARD

4) SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE

TABLE 44. COMPARISON OF OBSERVED TOTAL SOLAR RADIATION WITH CALCULATED SOLAR RADIATION FOR THE AVERAGE MOST HUMID DAYS (IN 1953-1962 INCLUSIVE) IN MINNEAPOLIS,MINN.

LATITUDE(DEG) = 44.9

LONGITUDE(DEG)= 93.2

EQU. OF TIME = -6.0 (MIN.)

TIME CORRECTION= -12.0 (MIN.)

DAY OF YEAR = 192.

SUNRISE = 4.7 CENTRAL STANDARD TIME

SUNSET = 19.9 CENTRAL STANDARD TIME

SOLAR RADIATION, BTU/HR/(SQ.FT)

TIME (HR)	SUN,S ALTITUDE (DEG.)	OUTER SPACE (1)	MOON,S STANDARD VALUE(2)	CALC. HORIZ. (3)	ASHRAE DIFFUSE (4)	CALC. TOTAL (4)	OBS. TOTAL (4)
5.	3.	19.	13.	1.	1.	2.	4.
6.	12.	91.	144.	31.	17.	47.	25.
7.	23.	164.	209.	80.	25.	105.	56.
8.	33.	234.	244.	133.	29.	163.	91.
9.	44.	296.	264.	183.	32.	214.	121.
10.	54.	345.	277.	223.	33.	257.	145.
11.	62.	378.	284.	251.	34.	285.	166.
12.	67.	394.	286.	263.	35.	298.	182.
13.	66.	390.	285.	260.	35.	294.	190.
14.	59.	367.	282.	242.	34.	276.	182.
15.	50.	327.	273.	208.	33.	241.	154.
16.	40.	272.	257.	164.	31.	195.	112.
17.	29.	207.	232.	112.	28.	140.	69.
18.	18.	135.	188.	60.	22.	81.	36.
19.	8.	62.	112.	16.	12.	28.	16.

1) The hourly solar radiation upon a horizontal surface at the outer limit of the atmosphere.

2) DIRECT NORMAL SOLAR RADIATION AT SEA LEVEL UNDER CLOUDLESS CONDITION WITH THE FOLLOWING ATMOSPHERIC CONDITIONS PRECIPITABLE WATER VAPOR 20 MM,DUST CONCENTRATION 300/(CU.CM) AND OZONE PARTIAL PRESSURE 2.8 MM HG

3) ASHRAE CLEAVELAND LABORATORY DATA OF DIFFUSE SKY RADIATION ON CLOUDLESS DAYS DURING WHICH THE OBSERVED NORMAL INCIDENT RADIATION CLOSELY APPRIXIMATED MOON,S STANDARD

4) SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE

TABLE 45. COMPARISON OF OBSERVED TOTAL SOLAR RADIATION WITH CALCULATED SOLAR RADIATION FOR THE AVERAGE HOTTEST WEEK DAYS (IN 1953-1962 INCLUSIVE) IN MINNEAPOLIS,MINN.

LATITUDE(DEG) = 44.9

LONGITUDE(DEG)= 93.2

EQU. OF TIME = -6.0 (MIN.)

TIME CORRECTION= -12.0 (MIN.)

DAY OF YEAR = 207.

SUNRISE = 4.9 CENTRAL STANDARD TIME

SUNSET = 19.7 CENTRAL STANDARD TIME

SOLAR RADIATION, BTU/HR/(SQ.FT)

TIME (HR)	SUN,S ALTITUDE (DEG.)	OUTER SPACE (1)	MOON,S STANDARD VALUE(2)	CALC. HORIZ. (3)	ASHRAE DIFFUSE (4)	CALC. TOTAL (4)	OBS. TOTAL (4)
5.	0.	4.	0.	0.	0.	0.	6.
6.	10.	77.	126.	23.	14.	37.	30.
7.	21.	152.	201.	71.	23.	94.	72.
8.	31.	223.	239.	124.	29.	153.	127.
9.	42.	286.	261.	174.	31.	205.	179.
10.	52.	336.	275.	215.	33.	248.	218.
11.	60.	370.	283.	244.	34.	278.	239.
12.	64.	386.	285.	256.	34.	290.	245.
13.	63.	382.	284.	253.	34.	287.	240.
14.	57.	359.	280.	234.	34.	268.	222.
15.	48.	318.	270.	200.	33.	233.	191.
16.	38.	262.	254.	155.	31.	186.	146.
17.	27.	195.	225.	103.	27.	130.	95.
18.	17.	122.	177.	50.	20.	71.	49.
19.	6.	47.	88.	10.	9.	19.	18.

1) The hourly solar radiation upon a horizontal surface at the outer limit of the atmosphere.

2) DIRECT NORMAL SOLAR RADIATION AT SEA LEVEL UNDER CLOUDLESS CONDITION WITH THE FOLLOWING ATMOSPHERIC CONDITIONS PRECIPITABLE WATER VAPOR 20 MM,DUST CONCENTRATION 300/(CU.CM) AND OZONE PARTIAL PRESSURE 2.8 MM HG

3) ASHRAE CLEAVELAND LABORATORY DATA OF DIFFUSE SKY RADIATION ON CLOUDLESS DAYS DURING WHICH THE OBSERVED NORMAL INCIDENT RADIATION CLOSELY APPRIXIMATED MOON,S STANDARD

4) SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE

TABLE 46. COMPARISON OF OBSERVED TOTAL SOLAR RADIATION WITH CALCULATED SOLAR RADIATION FOR THE AVERAGE MOST HUMID WEEK DAYS (IN 1953-1962 INCLUSIVE) IN MINNEAPOLIS,MINN.

LATITUDE(DEG) = 44.9

LONGITUDE(DEG)= 93.2

EQU. OF TIME = -6.0 (MIN.)

TIME CORRECTION= -12.0 (MIN.)

DAY OF YEAR = 213.

SUNRISE = 5.1 CENTRAL STANDARD TIME

SUNSET = 19.5 CENTRAL STANDARD TIME

SOLAR RADIATION, BTU/HR/(SQ.FT)

TIME (HR)	SUN,S ALTITUDE (DEG.)	OUTER SPACE (1)	MOON,S STANDARD VALUE(2)	CALC. HORIZ. (3)	ASHRAE DIFFUSE (4)	CALC. TOTAL (4)	OBS. TOTAL (4)
6.	9.	69.	119.	19.	13.	33.	19.
7.	20.	145.	196.	66.	23.	89.	48.
8.	30.	217.	236.	119.	28.	147.	89.
9.	41.	281.	259.	169.	31.	200.	133.
10.	50.	331.	273.	211.	33.	244.	171.
11.	58.	366.	281.	239.	34.	273.	196.
12.	63.	381.	284.	252.	34.	287.	208.
13.	61.	377.	284.	249.	34.	283.	206.
14.	55.	354.	278.	229.	34.	263.	191.
15.	47.	313.	268.	195.	32.	228.	162.
16.	37.	256.	252.	150.	30.	181.	122.
17.	26.	189.	222.	98.	27.	124.	77.
18.	16.	115.	170.	45.	19.	65.	38.
19.	5.	39.	71.	6.	7.	14.	12.

1) The hourly solar radiation upon a horizontal surface at the outer limit of the atmosphere.

2) DIRECT NORMAL SOLAR RADIATION AT SEA LEVEL UNDER CLOUDLESS CONDITION WITH THE FOLLOWING ATMOSPHERIC CONDITIONS PRECIPITABLE WATER VAPOR 20 MM,DUST CONCENTRATION 300/(CU.CM) AND OZONE PARTIAL PRESSURE 2.8 MM HG

3) ASHRAE CLEAVELAND LABORATORY DATA OF DIFFUSE SKY RADIATION ON CLOUDLESS DAYS DURING WHICH THE OBSERVED NORMAL INCIDENT RADIATION CLOSELY APPRIXIMATED MOON,S STANDARD

4) SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE

TABLE 47. COMPARISON OF OBSERVED TOTAL SOLAR RADIATION WITH CALCULATED SOLAR RADIATION FOR THE AVERAGE HOTTEST DAYS (IN 1953-1962 INCLUSIVE) IN MEDFORD, OREGON

LATITUDE(DEG) = 42.4

LONGITUDE(DEG) = 122.9

EQU. OF TIME = -6.0 (MIN.)

TIME CORRECTION = -12.0 (MIN.)

DAY OF YEAR = 199.

SUNRISE = 4.9 PACIFIC STANDARD TIME

SUNSET = 19.7 PACIFIC STANDARD TIME

			SOLAR RADIATION, BTU/HR/(SQ.FT)				
TIME (HR)	SUN,S ALTITUDE (DEG.)	OUTER SPACE (1)	MOON,S STANDARD VALUE(2)	CALC. HORIZ. (3)	ASHRAE DIFFUSE (4)	CALC. TOTAL (4)	OBS. TOTAL (4)
5.	1.	4.	0.	0.	0.	0.	5.
6.	11.	80.	130.	24.	15.	39.	31.
7.	21.	157.	204.	75.	24.	99.	77.
8.	32.	230.	242.	130.	29.	159.	139.
9.	44.	295.	264.	182.	32.	213.	203.
10.	54.	347.	277.	224.	33.	258.	253.
11.	63.	382.	284.	253.	34.	288.	284.
12.	68.	398.	287.	267.	35.	302.	297.
13.	67.	394.	286.	263.	35.	298.	296.
14.	60.	370.	283.	244.	34.	278.	283.
15.	50.	328.	273.	209.	33.	242.	254.
16.	39.	270.	256.	162.	31.	193.	206.
17.	28.	202.	229.	108.	27.	135.	145.
18.	17.	126.	180.	53.	21.	74.	83.
19.	7.	49.	91.	10.	10.	20.	33.

1) The hourly solar radiation upon a horizontal surface at the outer limit of the atmosphere.

2) DIRECT NORMAL SOLAR RADIATION AT SEA LEVEL UNDER CLOUDLESS CONDITION WITH THE FOLLOWING ATMOSPHERIC CONDITIONS PRECIPITABLE WATER VAPOR 20 MM, DUST CONCENTRATION 300/(CU.CM) AND OZONE PARTIAL PRESSURE 2.8 MM HG

3) ASHRAE CLEAVELAND LABORATORY DATA OF DIFFUSE SKY RADIATION ON CLOUDLESS DAYS DURING WHICH THE OBSERVED NORMAL INCIDENT RADIATION CLOSELY APPRIXIMATED MOON,S STANDARD

4) SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE

TABLE 48. COMPARISON OF OBSERVED TOTAL SOLAR RADIATION WITH CALCULATED SOLAR RADIATION FOR THE AVERAGE MOST HUMID DAYS (IN 1953-1962 INCLUSIVE) IN MEDFORD, OREGON

LATITUDE(DEG) = 42.4

LONGITUDE(DEG)= 122.9

EQU. OF TIME = -6.0 (MIN.)

TIME CORRECTION= -12.0 (MIN.)

DAY OF YEAR = 201.

SUNRISE = 5.0 PACIFIC STANDARD TIME

SUNSET = 19.6 PACIFIC STANDARD TIME

TIME (HR)	SUN,S ALTITUDE (DEG.)	OUTER SPACE (1)	MOON,S STANDARD VALUE(2)	CALC. HORIZ. (3)	ASHRAE DIFFUSE (4)	CALC. TOTAL (4)	OBS. TOTAL (4)
		SOLAR RADIATION, BTU/HR/(SQ.FT)					
5.	0.	2.	0.	0.	0.	0.	3.
6.	10.	78.	128.	23.	15.	38.	22.
7.	21.	155.	203.	73.	24.	97.	56.
8.	32.	229.	241.	129.	29.	158.	102.
9.	43.	294.	263.	181.	32.	212.	151.
10.	54.	345.	277.	223.	33.	257.	196.
11.	63.	381.	284.	253.	34.	287.	233.
12.	68.	397.	287.	266.	35.	301.	256.
13.	66.	393.	286.	262.	35.	297.	261.
14.	59.	369.	282.	243.	34.	277.	243.
15.	50.	327.	273.	208.	33.	241.	203.
16.	39.	269.	256.	161.	31.	192.	148.
17.	28.	200.	228.	106.	27.	134.	92.
18.	17.	124.	179.	52.	21.	72.	46.
19.	6.	47.	88.	10.	9.	19.	17.

1) The hourly solar radiation upon a horizontal surface at the outer limit of the atmosphere.

2) DIRECT NORMAL SOLAR RADIATION AT SEA LEVEL UNDER CLOUDLESS CONDITION WITH THE FOLLOWING ATMOSPHERIC CONDITIONS PRECIPITABLE WATER VAPOR 20 MM,DUST CONCENTRATION 300/(CU.CM) AND OZONE PARTIAL PRESSURE 2.8 MM HG

3) ASHRAE CLEAVELAND LABORATORY DATA OF DIFFUSE SKY RADIATION ON CLOUDLESS DAYS DURING WHICH THE OBSERVED NORMAL INCIDENT RADIATION CLOSELY APPRIXIMATED MOON,S STANDARD

4) SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE

TABLE 49. COMPARISON OF OBSERVED TOTAL SOLAR RADIATION WITH CALCULATED SOLAR RADIATION FOR THE AVERAGE HOTTEST WEEK DAYS (IN 1953-1962 INCLUSIVE) IN MEDFORD, OREGON

LATITUDE(DEG) = 42.4

LONGITUDE(DEG) = 122.9

EQU. OF TIME = -6.0 (MIN.)

TIME CORRECTION = -12.0 (MIN.)

DAY OF YEAR = 209.

SUNRISE = 5.1 PACIFIC STANDARD TIME

SUNSET = 19.5 PACIFIC STANDARD TIME

SOLAR RADIATION, BTU/HR/(SQ.FT)

TIME (HR)	SUN,S ALTITUDE (DEG.)	OUTER SPACE (1)	MOON,S STANDARD VALUE(2)	CALC. HORIZ. (3)	ASHRAE DIFFUSE (4)	CALC. TOTAL (4)	OBS. TOTAL (4)
6.	9.	69.	119.	19.	13.	33.	25.
7.	20.	148.	198.	68.	23.	91.	69.
8.	31.	222.	238.	123.	28.	152.	130.
9.	42.	288.	262.	175.	31.	207.	192.
10.	52.	340.	276.	219.	33.	252.	242.
11.	61.	376.	284.	248.	34.	283.	273.
12.	66.	392.	286.	261.	35.	296.	288.
13.	65.	388.	285.	258.	34.	292.	289.
14.	58.	364.	281.	238.	34.	272.	277.
15.	48.	321.	271.	203.	33.	235.	246.
16.	38.	263.	254.	155.	31.	186.	195.
17.	27.	193.	224.	101.	27.	128.	131.
18.	16.	116.	171.	46.	20.	66.	70.
19.	5.	38.	68.	6.	7.	13.	25.

1) The hourly solar radiation upon a horizontal surface at the outer limit of the atmosphere.

2) DIRECT NORMAL SOLAR RADIATION AT SEA LEVEL UNDER CLOUDLESS CONDITION WITH THE FOLLOWING ATMOSPHERIC CONDITIONS PRECIPITABLE WATER VAPOR 20 MM, DUST CONCENTRATION 300/(CU.CM) AND OZONE PARTIAL PRESSURE 2.8 MM HG

3) ASHRAE CLEAVELAND LABORATORY DATA OF DIFFUSE SKY RADIATION ON CLOUDLESS DAYS DURING WHICH THE OBSERVED NORMAL INCIDENT RADIATION CLOSELY APPRIXIMATED MOON,S STANDARD

4) SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE

TABLE 50. COMPARISON OF OBSERVED TOTAL SOLAR RADIATION WITH CALCULATED SOLAR RADIATION FOR THE AVERAGE MOST HUMID WEEK DAYS (IN 1953-1962 INCLUSIVE) IN MEDFORD, OREGON

LATITUDE(DEG) = 42.4

LONGITUDE(DEG)= 122.9

EQU. OF TIME = -6.0 (MIN.)

TIME CORRECTION= -12.0 (MIN.)

DAY OF YEAR = 210.

SUNRISE = 5.1 PACIFIC STANDARD TIME

SUNSET = 19.5 PACIFIC STANDARD TIME

SOLAR RADIATION, BTU/HR/(SQ.FT)

TIME (HR)	SUN,S ALTITUDE (DEG.)	OUTER SPACE (1)	MOON,S STANDARD VALUE(2)	CALC. HORIZ. (3)	ASHRAE DIFFUSE (4)	CALC. TOTAL (4)	OBS. TOTAL (4)
6.	9.	68.	118.	19.	13.	32.	21.
7.	20.	146.	197.	67.	23.	90.	57.
8.	31.	221.	238.	123.	28.	151.	107.
9.	42.	287.	261.	175.	31.	206.	161.
10.	52.	340.	275.	218.	33.	251.	206.
11.	61.	375.	284.	248.	34.	282.	237.
12.	66.	392.	286.	260.	35.	295.	252.
13.	64.	388.	285.	257.	34.	292.	252.
14.	58.	363.	281.	238.	34.	271.	237.
15.	48.	320.	271.	202.	33.	235.	205.
16.	38.	262.	254.	155.	31.	185.	159.
17.	27.	192.	224.	100.	27.	127.	106.
18.	16.	115.	170.	46.	19.	65.	57.
19.	5.	37.	65.	6.	7.	12.	22.

1) The hourly solar radiation upon a horizontal surface at the outer limit of the atmosphere.

2) DIRECT NORMAL SOLAR RADIATION AT SEA LEVEL UNDER CLOUDLESS CONDITION WITH THE FOLLOWING ATMOSPHERIC CONDITIONS PRECIPITABLE WATER VAPOR 20 MM,DUST CONCENTRATION 300/(CU.CM) AND OZONE PARTIAL PRESSURE 2.8 MM HG

3) ASHRAE CLEAVELAND LABORATORY DATA OF DIFFUSE SKY RADIATION ON CLOUDLESS DAYS DURING WHICH THE OBSERVED NORMAL INCIDENT RADIATION CLOSELY APPRIXIMATED MOON,S STANDARD

4) SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE

TABLE 51. COMPARISCN OF OBSERVED TOTAL SOLAR RADIATION WITH CALCULATED SOLAR RADIATION FOR THE AVERAGE HOTTEST DAYS (IN 1953-1962 INCLUSIVE) IN HOUSTON, TEXAS

LATITUDE(DEG) = 29.7

LONGITUDE(DEG)= 95.3

EQU. OF TIME = -6.0 (MIN.)

TIME CORRECTION= -20.0 (MIN.)

DAY OF YEAR = 214.

SUNRISE = 5.7 CENTRAL STANDARD TIME

SUNSET = 19.1 CENTRAL STANDARD TIME

SOLAR RADIATION, BTU/HR/(SQ.FT)

TIME (HR)	SUN,S ALTITUDE (DEG.)	OUTER SPACE (1)	MOON,S STANDARD VALUE(2)	CALC. HORIZ. (3)	ASHRAE DIFFUSE (4)	CALC. TOTAL (4)	OBS. TOTAL (4)
6.	3.	23.	21.	1.	2.	3.	28.
7.	16.	116.	171.	46.	20.	66.	76.
8.	29.	206.	231.	110.	28.	138.	144.
9.	42.	286.	261.	173.	31.	205.	216.
10.	55.	350.	278.	226.	33.	260.	273.
11.	67.	395.	286.	263.	35.	298.	300.
12.	76.	418.	290.	282.	35.	317.	295.
13.	76.	416.	290.	281.	35.	316.	264.
14.	65.	391.	285.	259.	35.	294.	217.
15.	53.	343.	276.	220.	33.	253.	163.
16.	40.	276.	258.	165.	31.	196.	109.
17.	27.	194.	225.	102.	27.	128.	61.
18.	14.	104.	158.	38.	18.	56.	25.
19.	1.	11.	3.	0.	0.	0.	4.

1) The hourly solar radiation upon a horizontal surface at the outer limit of the atmosphere.

2) DIRECT NORMAL SOLAR RADIATION AT SEA LEVEL UNDER CLOUDLESS CONDITION WITH THE FOLLOWING ATMOSPHERIC CONDITIONS PRECIPITABLE WATER VAPOR 20 MM,DUST CONCENTRATION 300/(CU.CM) AND OZONE PARTIAL PRESSURE 2.8 MM HG

3) ASHRAE CLEAVELAND LABORATORY DATA OF DIFFUSE SKY RADIATION ON CLOUDLESS DAYS DURING WHICH THE OBSERVED NORMAL INCIDENT RADIATION CLOSELY APPRIXIMATED MOON,S STANDARD

4) SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE

TABLE 52. COMPARISON OF OBSERVED TOTAL SOLAR RADIATION WITH CALCULATED SOLAR RADIATION FOR THE AVERAGE MOST HUMID DAYS (IN 1953-1962 INCLUSIVE) IN HOUSTON, TEXAS

LATITUDE(DEG) = 29.7

LONGITUDE(DEG)= 95.3

EQU. OF TIME = -0.0 (MIN.)

TIME CORRECTION= 20.0 (MIN.)

DAY OF YEAR = 241.

SUNRISE = 5.3 CENTRAL STANDARD TIME

SUNSET = 18.0 CENTRAL STANDARD TIME

		SOLAR RADIATION, BTU/HR/(SQ.FT)					
TIME (HR)	SUN,S ALTITUDE (DEG.)	OUTER SPACE (1)	MOON,S STANDARD VALUE(2)	CALC. HORIZ. (3)	ASHRAE DIFFUSE (4)	CALC. TOTAL (4)	OBS. TOTAL (4)
6.	9.	64.	113.	17.	13.	29.	7.
7.	22.	160.	204.	75.	24.	99.	40.
8.	34.	246.	247.	140.	30.	170.	96.
9.	47.	318.	269.	197.	32.	229.	159.
10.	58.	370.	282.	240.	34.	274.	211.
11.	67.	400.	286.	263.	35.	298.	240.
12.	68.	404.	288.	267.	35.	302.	244.
13.	62.	383.	284.	250.	34.	284.	227.
14.	51.	338.	274.	213.	33.	246.	195.
15.	39.	272.	256.	160.	31.	191.	151.
16.	26.	190.	221.	97.	26.	123.	100.
17.	13.	97.	149.	33.	17.	50.	51.

1) The hourly solar radiation upon a horizontal surface at the outer limit of the atmosphere.

2) DIRECT NORMAL SOLAR RADIATION AT SEA LEVEL UNDER CLOUDLESS CONDITION WITH THE FOLLOWING ATMOSPHERIC CONDITIONS PRECIPITABLE WATER VAPOR 20 MM,DUST CONCENTRATION 300/(CU.CM) AND OZONE PARTIAL PRESSURE 2.8 MM HG

3) ASHRAE CLEAVELAND LABORATORY DATA OF DIFFUSE SKY RADIATION ON CLOUDLESS DAYS DURING WHICH THE OBSERVED NORMAL INCIDENT RADIATION CLOSELY APPRIXIMATED MOON,S STANDARD

4) SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE

TABLE 53. COMPARISON OF OBSERVED TOTAL SOLAR RADIATION WITH CALCULATED SOLAR RADIATION FOR THE AVERAGE HOTTEST WEEK DAYS (IN 1953-1962 INCLUSIVE) IN HOUSTON, TEXAS

LATITUDE(DEG) = 29.7

LONGITUDE(DEG)= 95.3

EQU. OF TIME = -6.0 (MIN.)

TIME CORRECTION= -20.0 (MIN.)

DAY OF YEAR = 212.

SUNRISE = 5.7 CENTRAL STANDARD TIME

SUNSET = 19.1 CENTRAL STANDARD TIME

			SOLAR RADIATION, BTU/HR/(SQ.FT)				
TIME (HR)	SUN,S ALTITUDE (DEG.)	OUTER SPACE (1)	MOON,S STANDARD VALUE(2)	CALC. HORIZ. (3)	ASHRAE DIFFUSE (4)	CALC. TOTAL (4)	OBS. TOTAL (4)
6.	3.	25.	26.	2.	3.	4.	23.
7.	16.	118.	173.	47.	20.	67.	72.
8.	29.	207.	231.	112.	28.	139.	140.
9.	42.	287.	261.	174.	31.	206.	209.
10.	55.	351.	278.	227.	33.	260.	262.
11.	67.	396.	287.	264.	35.	299.	289.
12.	77.	418.	291.	283.	35.	318.	294.
13.	76.	417.	290.	282.	35.	317.	282.
14.	66.	391.	285.	260.	35.	294.	253.
15.	53.	343.	276.	221.	33.	254.	207.
16.	40.	277.	258.	166.	31.	197.	147.
17.	27.	196.	225.	103.	27.	130.	83.
18.	14.	106.	160.	39.	18.	58.	32.
19.	2.	13.	4.	0.	0.	1.	4.

1) The hourly solar radiation upon a horizontal surface at the outer limit of the atmosphere.

2) DIRECT NORMAL SOLAR RADIATION AT SEA LEVEL UNDER CLOUDLESS CONDITION WITH THE FOLLOWING ATMOSPHERIC CONDITIONS PRECIPITABLE WATER VAPOR 20 MM,DUST CONCENTRATION 300/(CU.CM) AND OZONE PARTIAL PRESSURE 2.8 MM HG

3) ASHRAE CLEAVELAND LABORATORY DATA OF DIFFUSE SKY RADIATION ON CLOUDLESS DAYS DURING WHICH THE OBSERVED NORMAL INCIDENT RADIATION CLOSELY APPRIXIMATED MOON,S STANDARD

4) SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE

TABLE 54. COMPARISON OF OBSERVED TOTAL SOLAR RADIATION WITH CALCULATED SOLAR RADIATION FOR THE AVERAGE MOST HUMID WEEK DAYS (IN 1953-1962 INCLUSIVE) IN HOUSTON, TEXAS

LATITUDE(DEG) = 29.7

LONGITUDE(DEG)= 95.3

EQU. OF TIME = -3.0 (MIN.)

TIME CORRECTION= -20.0 (MIN.)

DAY OF YEAR = 239.

SUNRISE = 6.0 CENTRAL STANDARD TIME

SUNSET = 18.7 CENTRAL STANDARD TIME

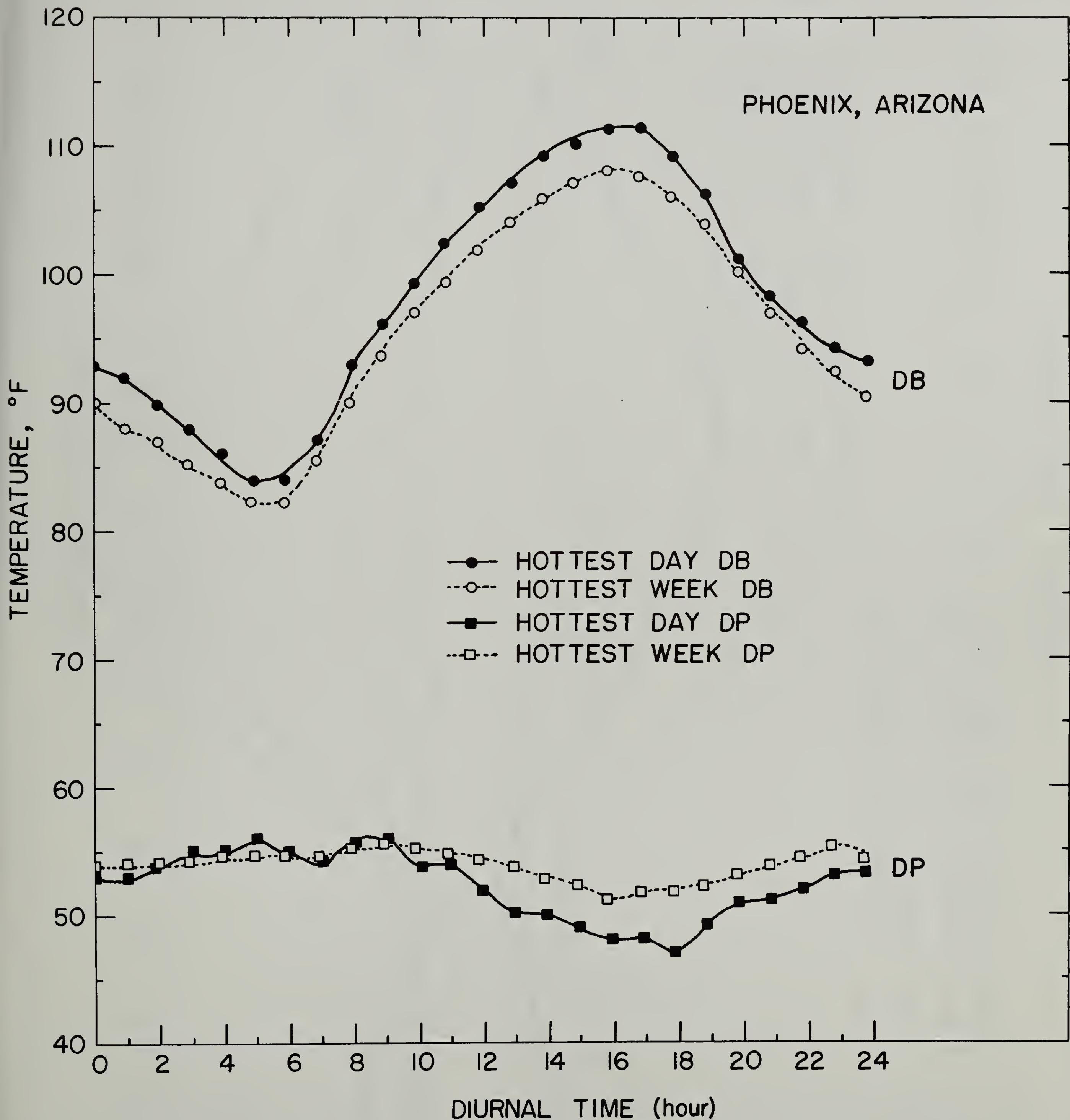
			SOLAR RADIATION, BTU/HR/(SQ.FT)				
TIME (HR)	SUN,S ALTITUDE (DEG.)	OUTER SPACE (1)	MOON,S STANDARD VALUE(2)	CALC. HORIZ. (3)	ASHRAE DIFFUSE (4)	CALC. TOTAL (4)	OBS. TOTAL (4)
7.	13.	94.	147.	32.	17.	49.	44.
8.	26.	187.	220.	95.	26.	121.	92.
9.	38.	270.	255.	159.	31.	190.	149.
10.	51.	337.	274.	213.	33.	246.	201.
11.	62.	383.	284.	250.	34.	285.	238.
12.	69.	405.	288.	269.	35.	304.	252.
13.	68.	402.	287.	266.	35.	301.	243.
14.	59.	374.	283.	243.	34.	277.	213.
15.	48.	323.	270.	201.	33.	234.	166.
16.	35.	252.	249.	145.	30.	175.	112.
17.	23.	166.	209.	80.	25.	105.	60.
18.	10.	72.	120.	20.	14.	33.	21.

1) The hourly solar radiation upon a horizontal surface at the outer limit of the atmosphere.

2) DIRECT NORMAL SOLAR RADIATION AT SEA LEVEL UNDER CLOUDLESS CONDITION WITH THE FOLLOWING ATMOSPHERIC CONDITIONS PRECIPITABLE WATER VAPOR 20 MM,DUST CONCENTRATION 300/(CU.CM) AND OZONE PARTIAL PRESSURE 2.8 MM HG

3) ASHRAE CLEAVELAND LABORATORY DATA OF DIFFUSE SKY RADIATION ON CLOUDLESS DAYS DURING WHICH THE OBSERVED NORMAL INCIDENT RADIATION CLOSELY APPRIXIMATED MOON,S STANDARD

4) SOLAR RADIATION INCIDENT UPON A HORIZONTAL SURFACE



PHOENIX, ARIZONA
TEMPERATURE, °F
DIURNAL TIME (hour)
HOTTEST DAY DB
HOTTEST WEEK DB
HOTTEST DAY DP
HOTTEST WEEK DP
DB
DP
120
110
100
90
80
70
60
50
40
0
2
4
6
8
10
12
14
16
18
20
22
24

Figure 1

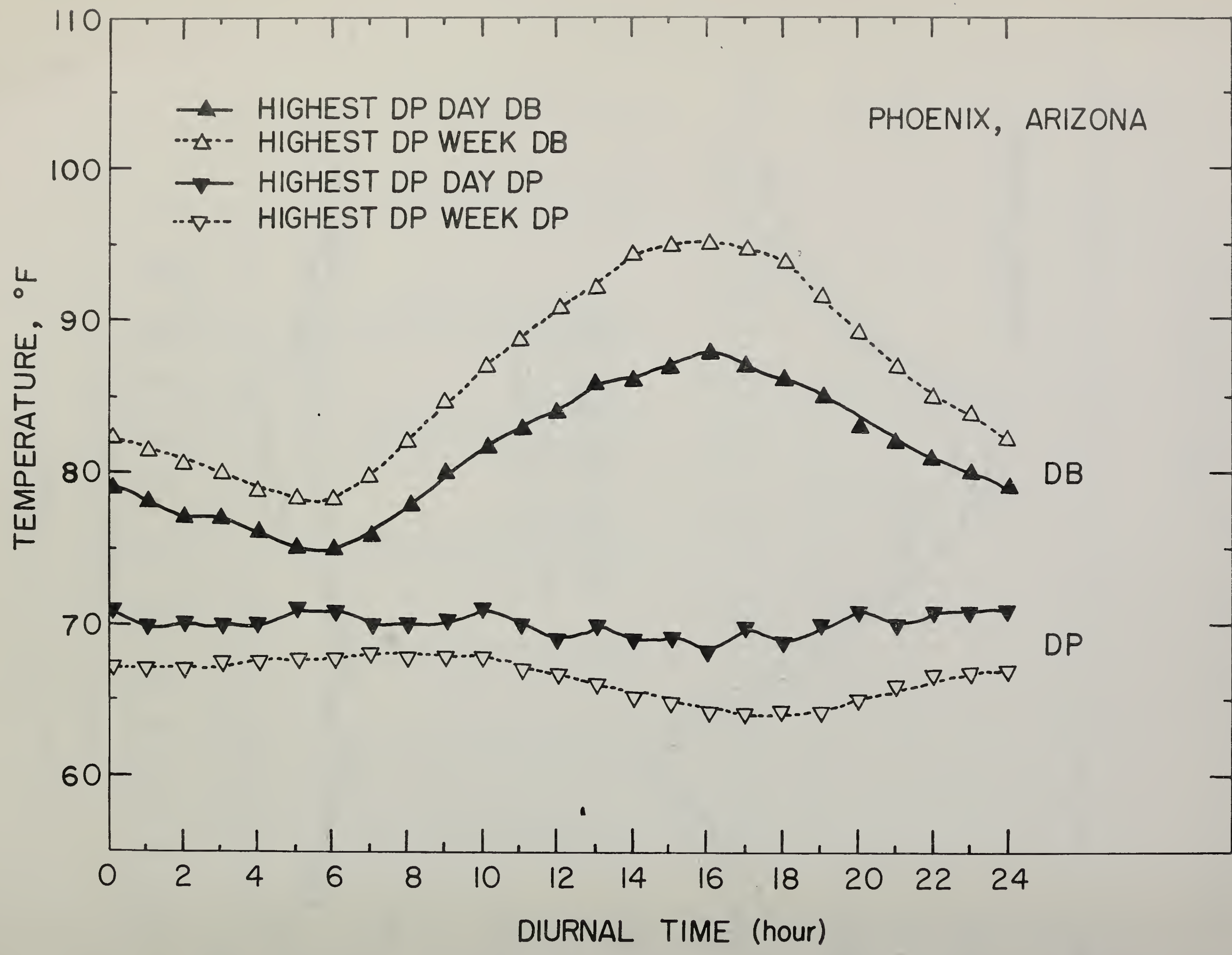

HIGHEST DP DAY DB
HIGHEST DP WEEK DB
HIGHEST DP DAY DP
HIGHEST DP WEEK DP
PHOENIX, ARIZONA
DB
DP
TEMPERATURE, °F
110
100
90
80
70
60
0
2
4
6
8
10
12
14
16
18
20
22
24
DIURNAL TIME (hour)

Figure 2

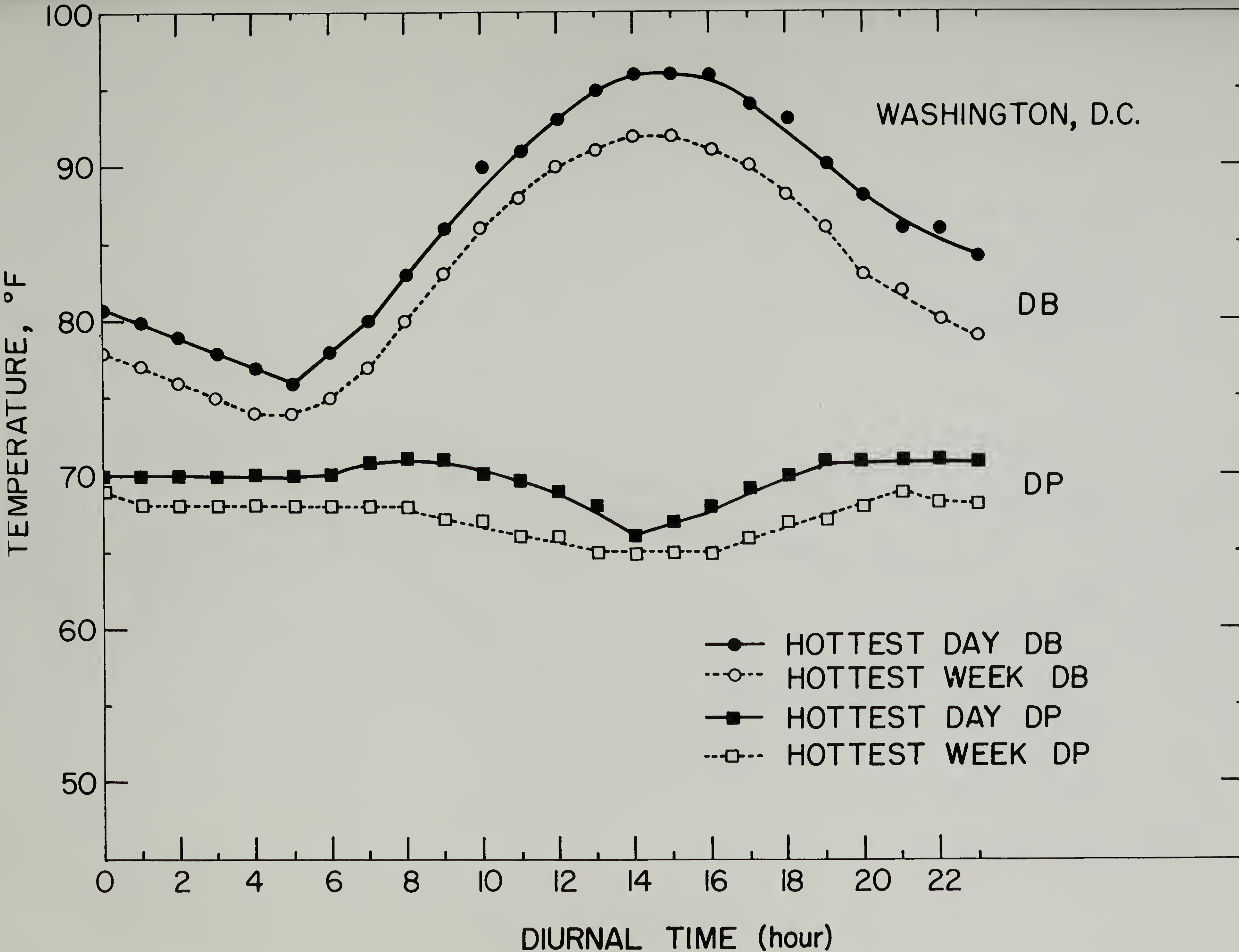

WASHINGTON, D.C.
DB
DP
HOTTEST DAY DB
HOTTEST WEEK DB
HOTTEST DAY DP
HOTTEST WEEK DP
TEMPERATURE, °F
100
90
80
70
60
50
0
2
4
6
8
10
12
14
16
18
20
22
DIURNAL TIME (hour)

Figure 3

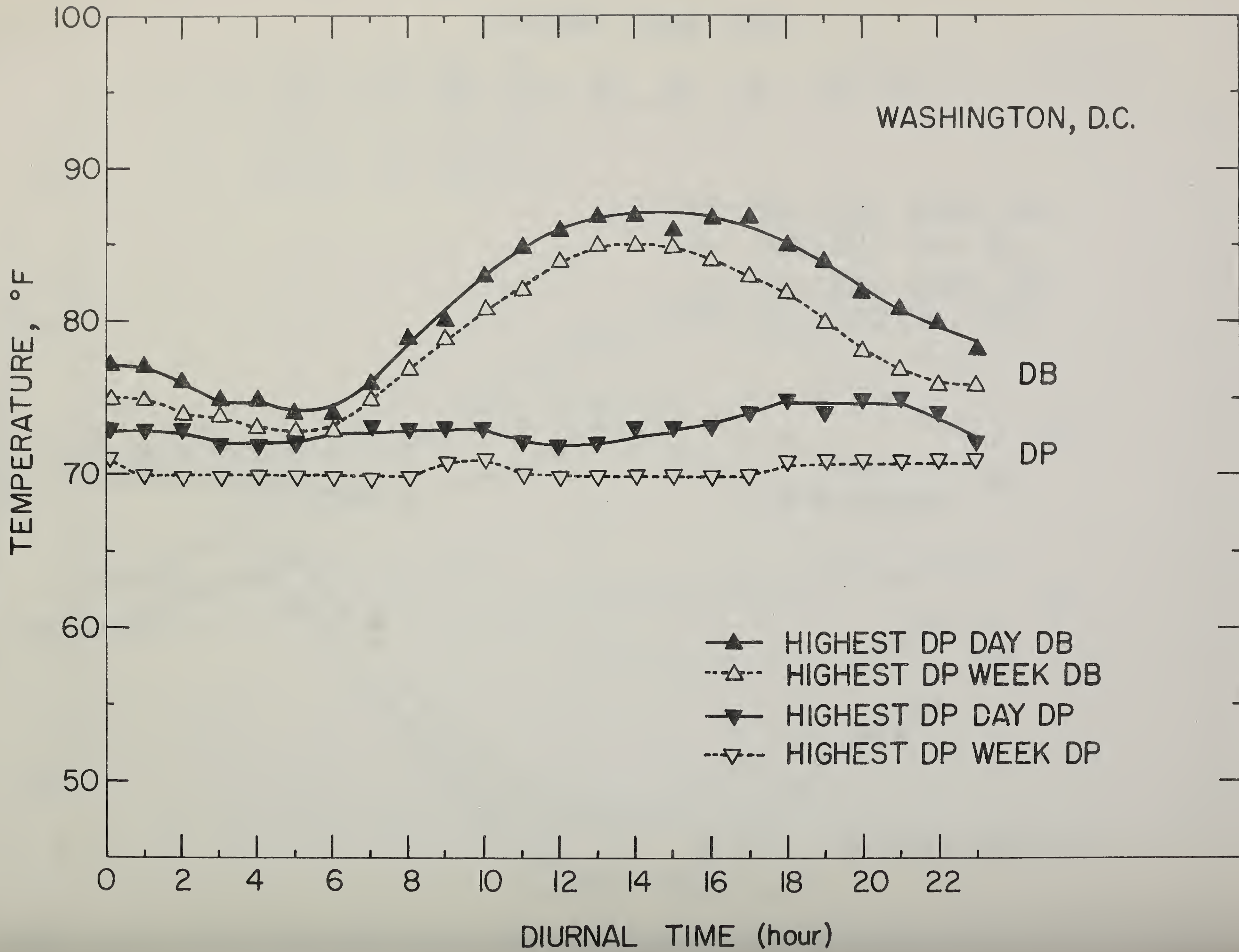
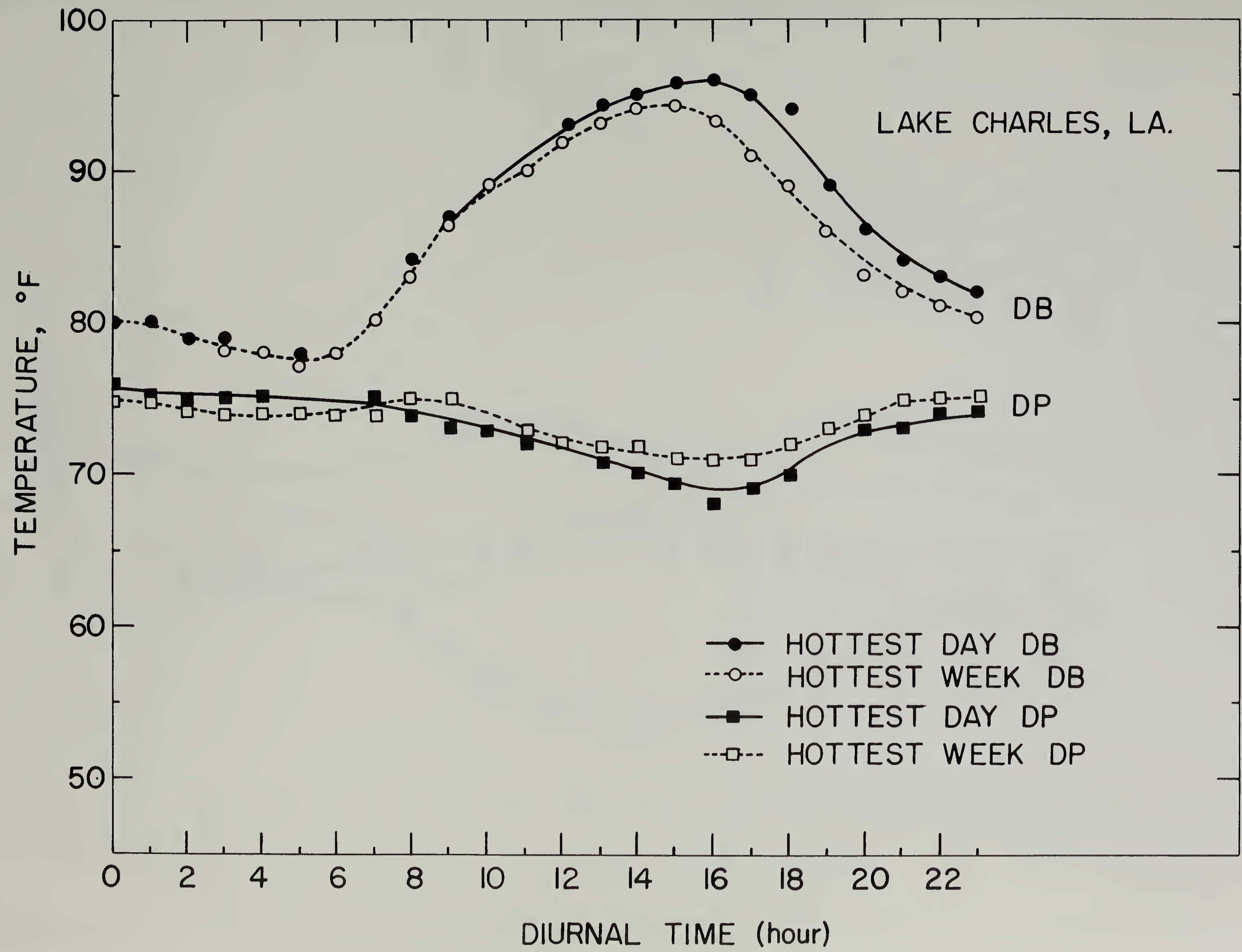

WASHINGTON, D.C.
DB
DP
HIGHEST DP DAY DB
HIGHEST DP WEEK DB
HIGHEST DP DAY DP
HIGHEST DP WEEK DP
TEMPERATURE, °F
100
90
80
70
60
50
0
2
4
6
8
10
12
14
16
18
20
22
DIURNAL TIME (hour)

Figure 4



LAKE CHARLES, LA.
DB
DP
HOTTEST DAY DB
HOTTEST WEEK DB
HOTTEST DAY DP
HOTTEST WEEK DP
TEMPERATURE, °F
100
90
80
70
60
50
0
2
4
6
8
10
12
14
16
18
20
22
DIURNAL TIME (hour)

Figure 5

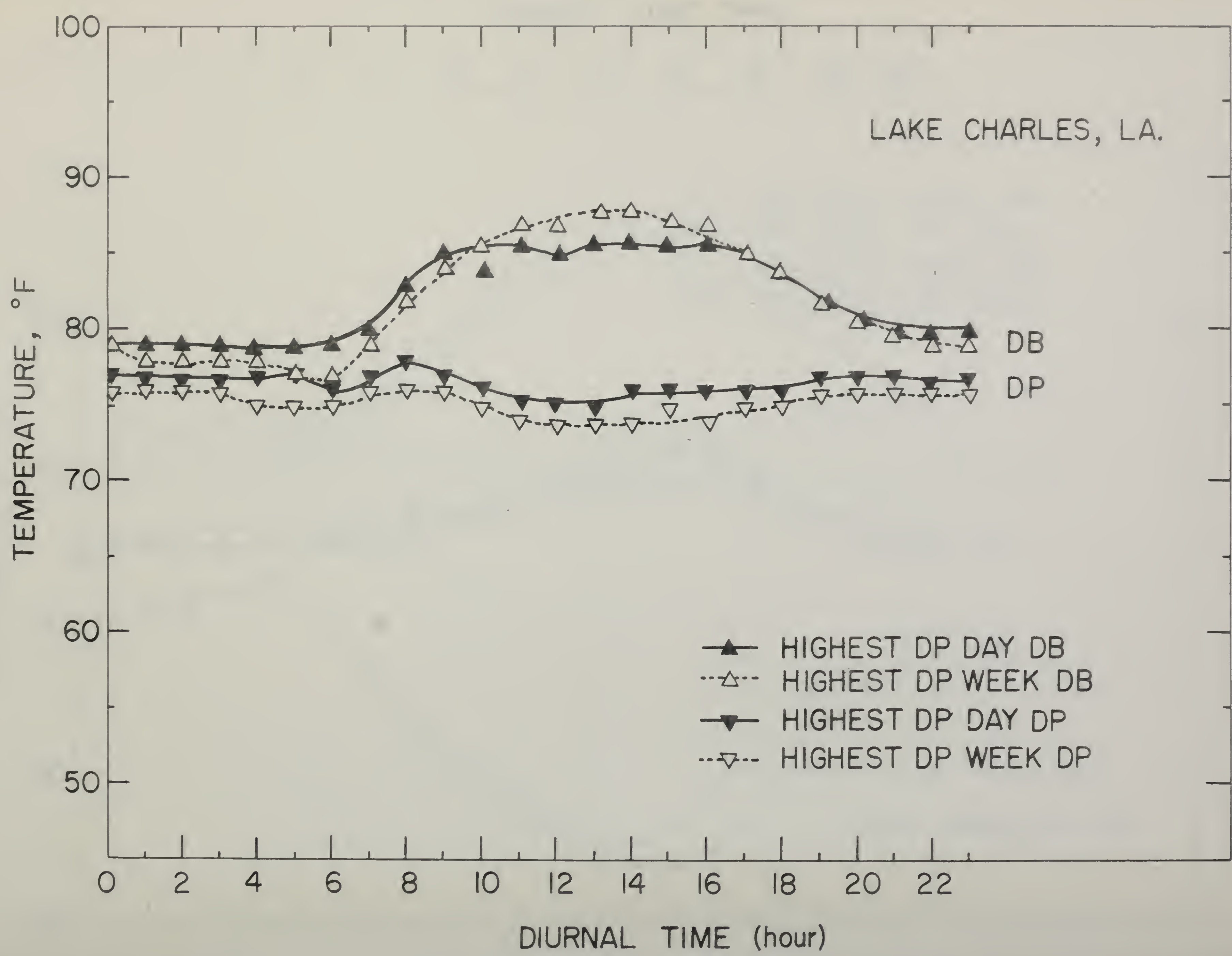

LAKE CHARLES, LA.
TEMPERATURE, °F
100
90
80
70
60
50
DB
DP
HIGHEST DP DAY DB
HIGHEST DP WEEK DB
HIGHEST DP DAY DP
HIGHEST DP WEEK DP
0
2
4
6
8
10
12
14
16
18
20
22
DIURNAL TIME (hour)

Figure 6

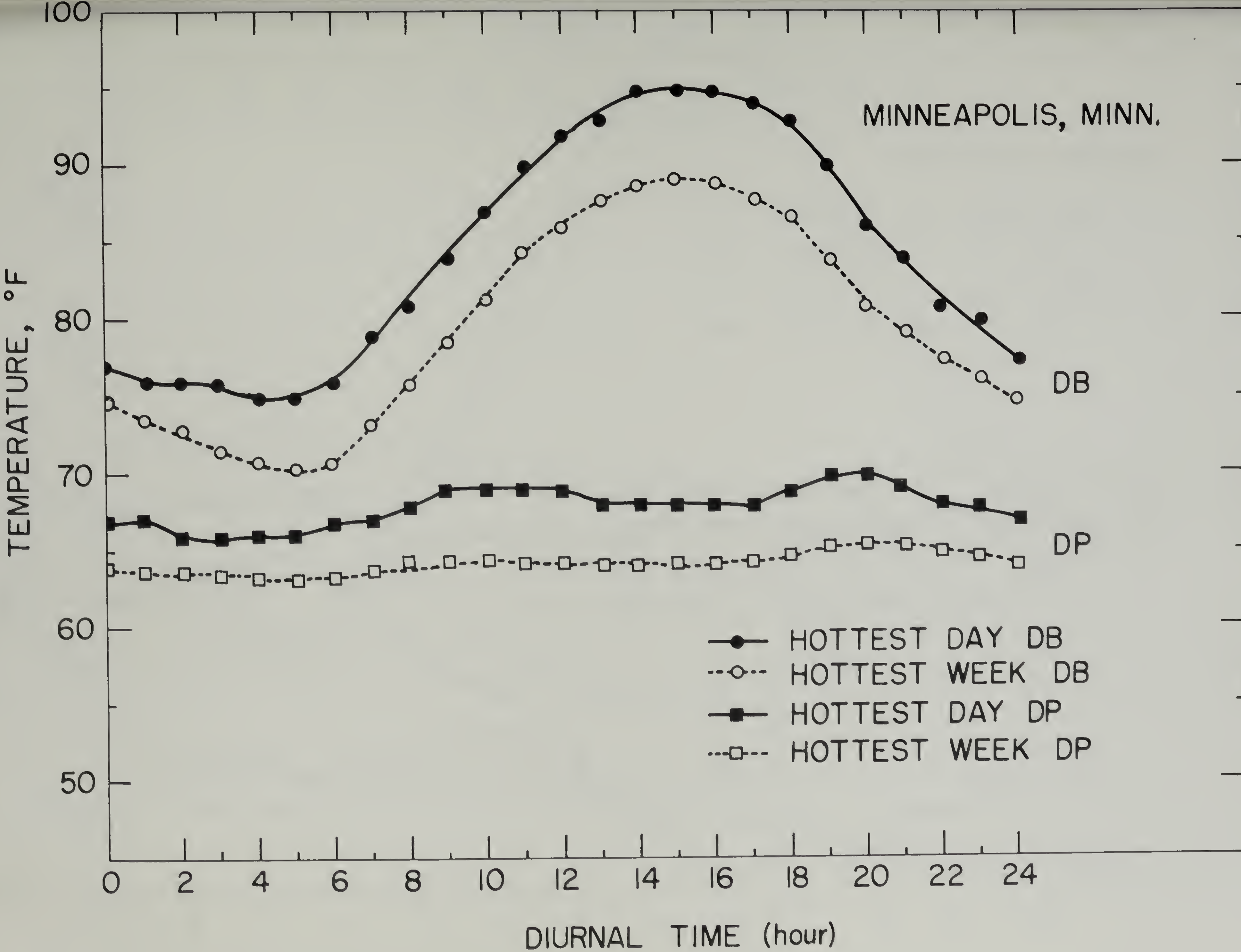

MINNEAPOLIS, MINN.
TEMPERATURE, °F
100
90
80
70
60
50
DB
DP
HOTTEST DAY DB
HOTTEST WEEK DB
HOTTEST DAY DP
HOTTEST WEEK DP
0
2
4
6
8
10
12
14
16
18
20
22
24
DIURNAL TIME (hour)

Figure 7

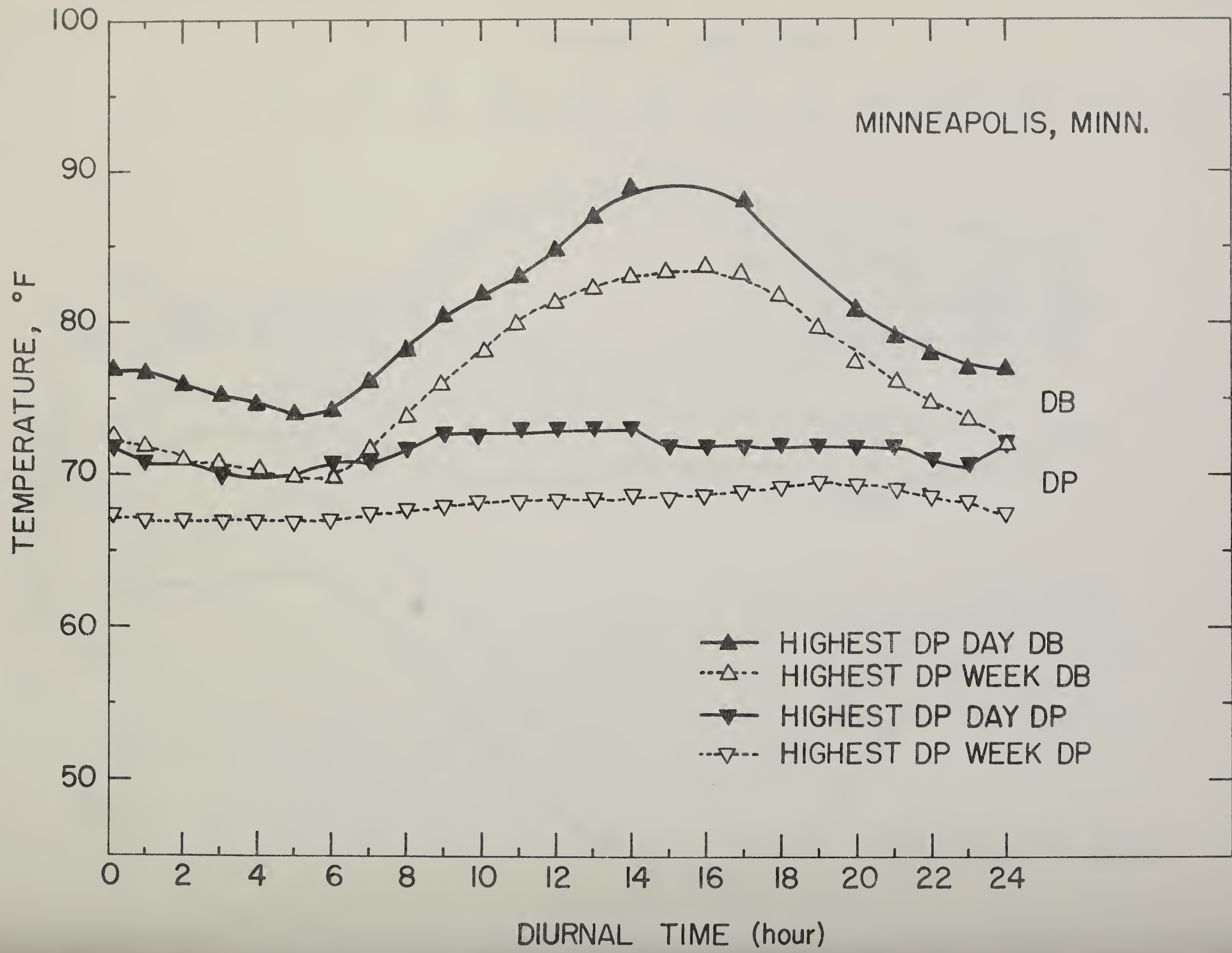

MINNEAPOLIS, MINN.
TEMPERATURE, °F
100
90
80
70
60
50
DB
DP
HIGHEST DP DAY DB
HIGHEST DP WEEK DB
HIGHEST DP DAY DP
HIGHEST DP WEEK DP
0
2
4
6
8
10
12
14
16
18
20
22
24
DIURNAL TIME (hour)

Figure 8

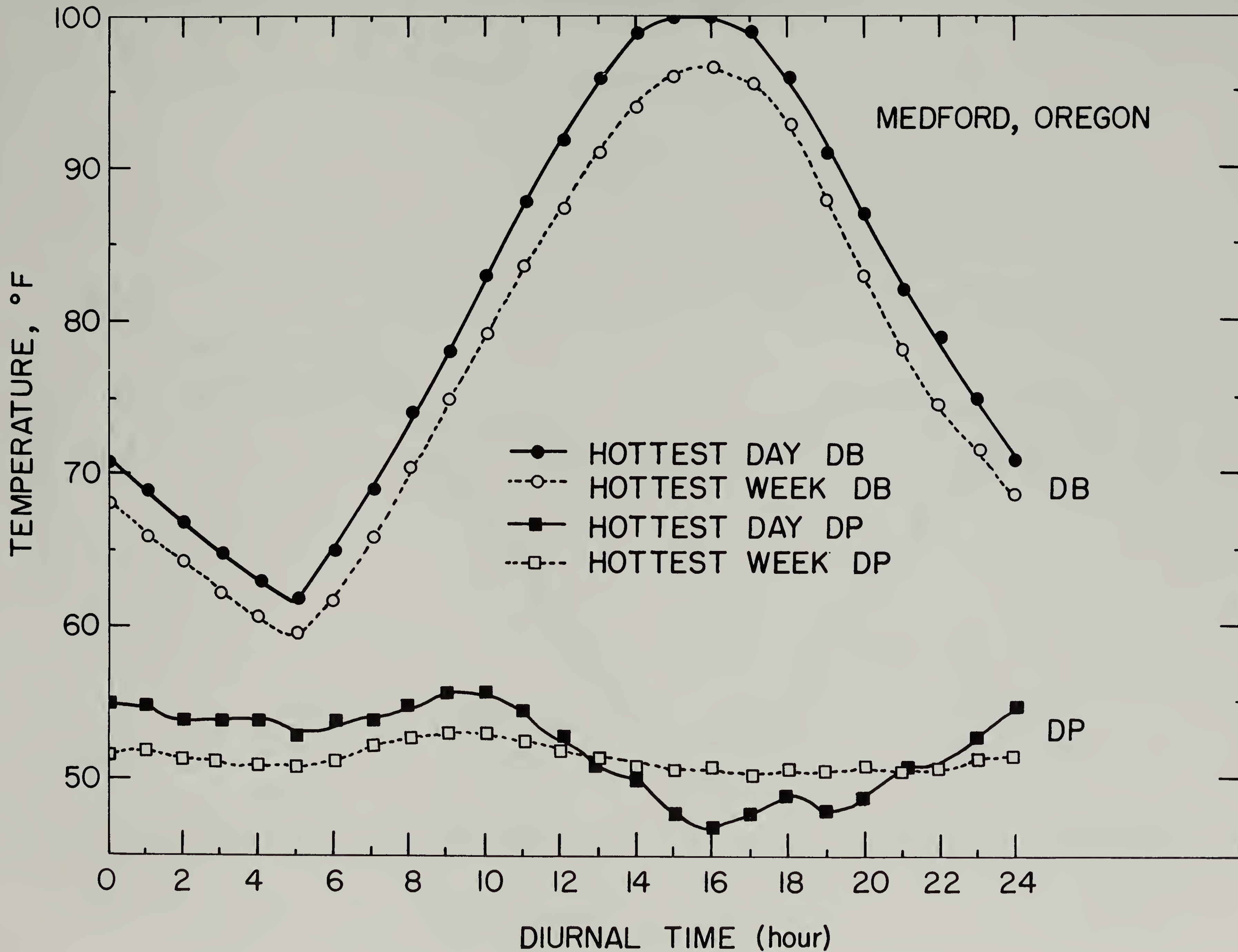

MEDFORD, OREGON
HOTTEST DAY DB
HOTTEST WEEK DB
HOTTEST DAY DP
HOTTEST WEEK DP
DB
DP
TEMPERATURE, °F
100
90
80
70
60
50
0
2
4
6
8
10
12
14
16
18
20
22
24
DIURNAL TIME (hour)

Figure 9

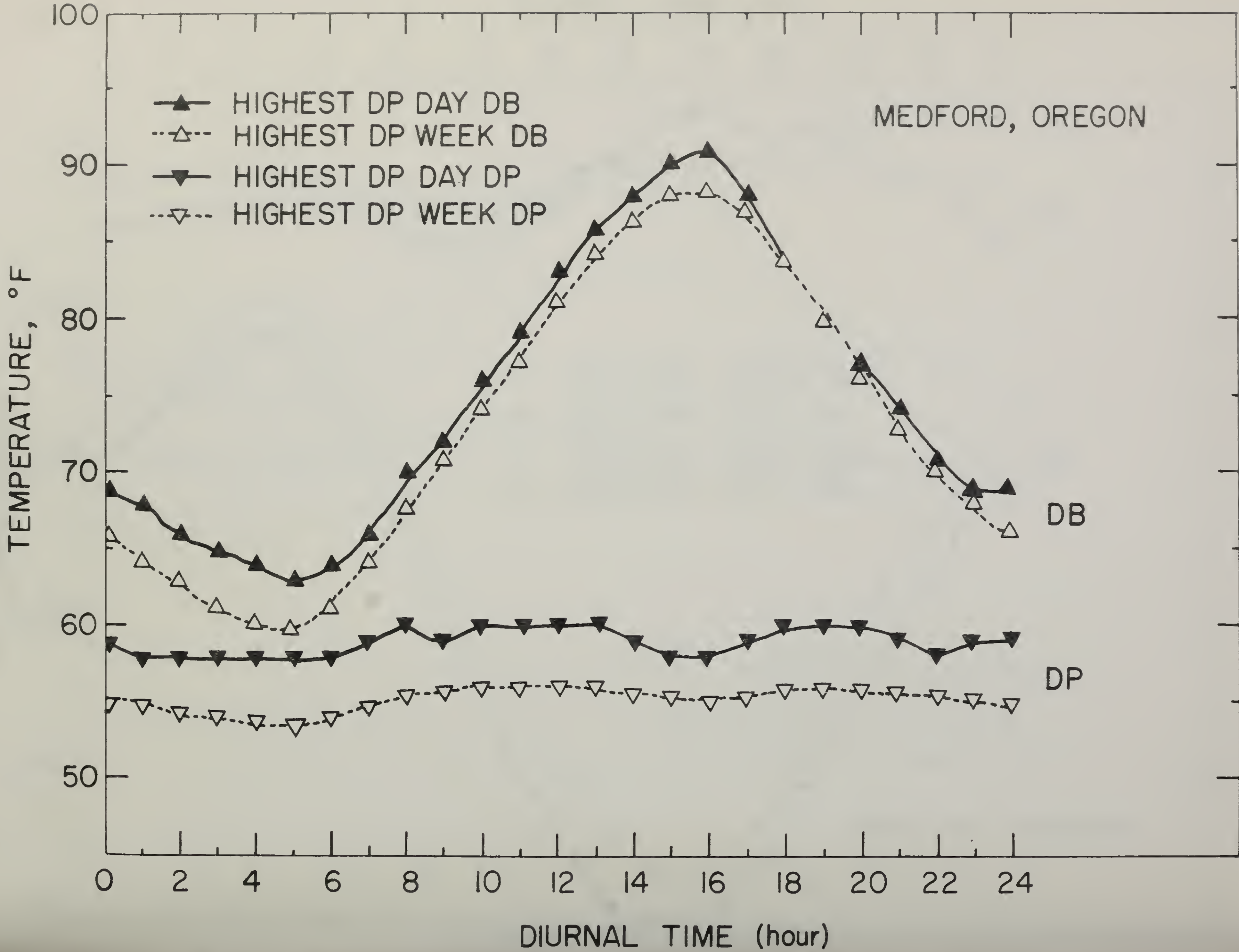

HIGHEST DP DAY DB
HIGHEST DP WEEK DB
HIGHEST DP DAY DP
HIGHEST DP WEEK DP
MEDFORD, OREGON
DB
DP
TEMPERATURE, °F
100
90
80
70
60
50
0
2
4
6
8
10
12
14
16
18
20
22
24
DIURNAL TIME (hour)

Figure 10

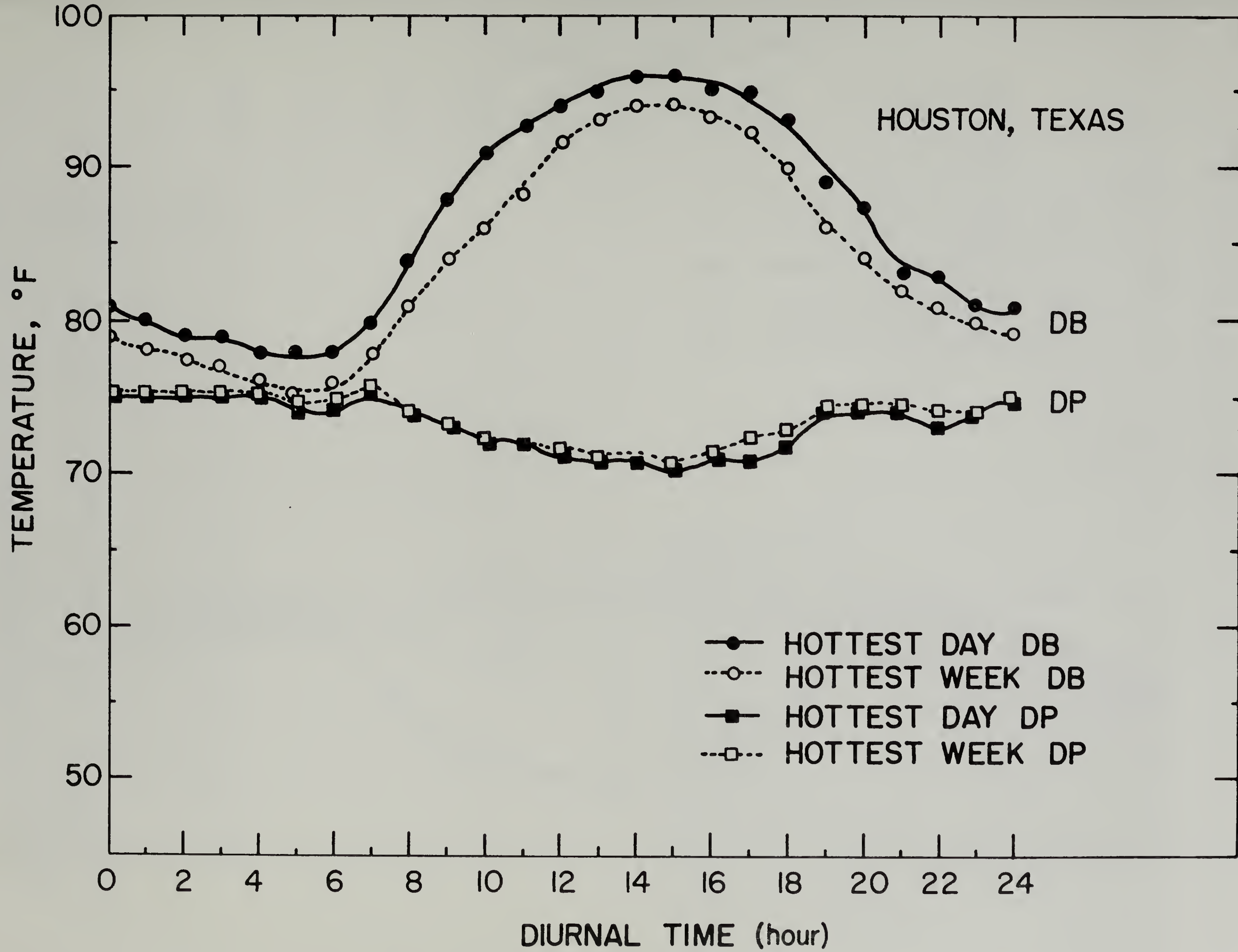
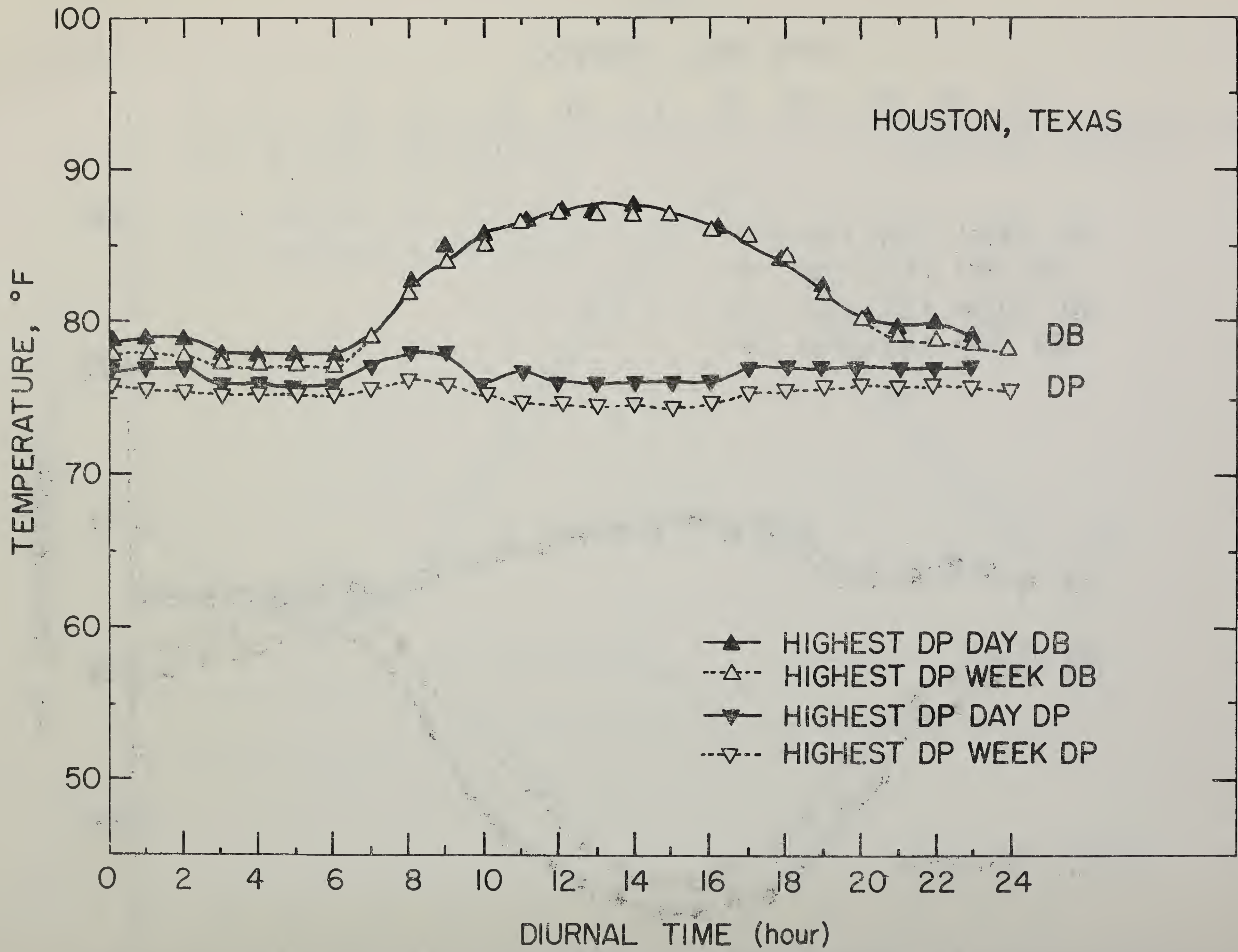

HOUSTON, TEXAS
DB
DP
HOTTEST DAY DB
HOTTEST WEEK DB
HOTTEST DAY DP
HOTTEST WEEK DP
TEMPERATURE, °F
100
90
80
70
60
50
0
2
4
6
8
10
12
14
16
18
20
22
24
DIURNAL TIME (hour)

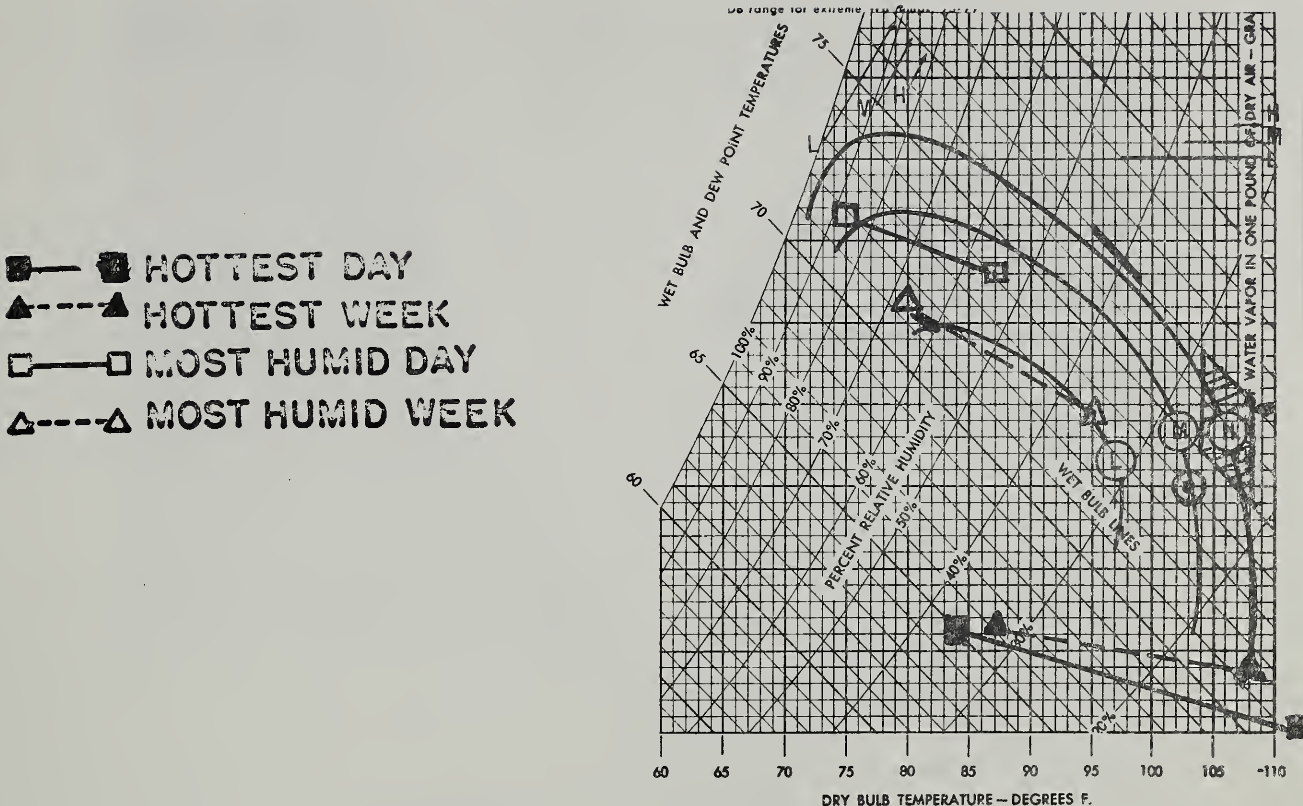
Figure 11



HOUSTON, TEXAS
DB
DP
HIGHEST DP DAY DB
HIGHEST DP WEEK DB
HIGHEST DP DAY DP
HIGHEST DP WEEK DP
TEMPERATURE, °F
100
90
80
70
60
50
0
2
4
6
8
10
12
14
16
18
20
22
24
DIURNAL TIME (hour)

Figure 12

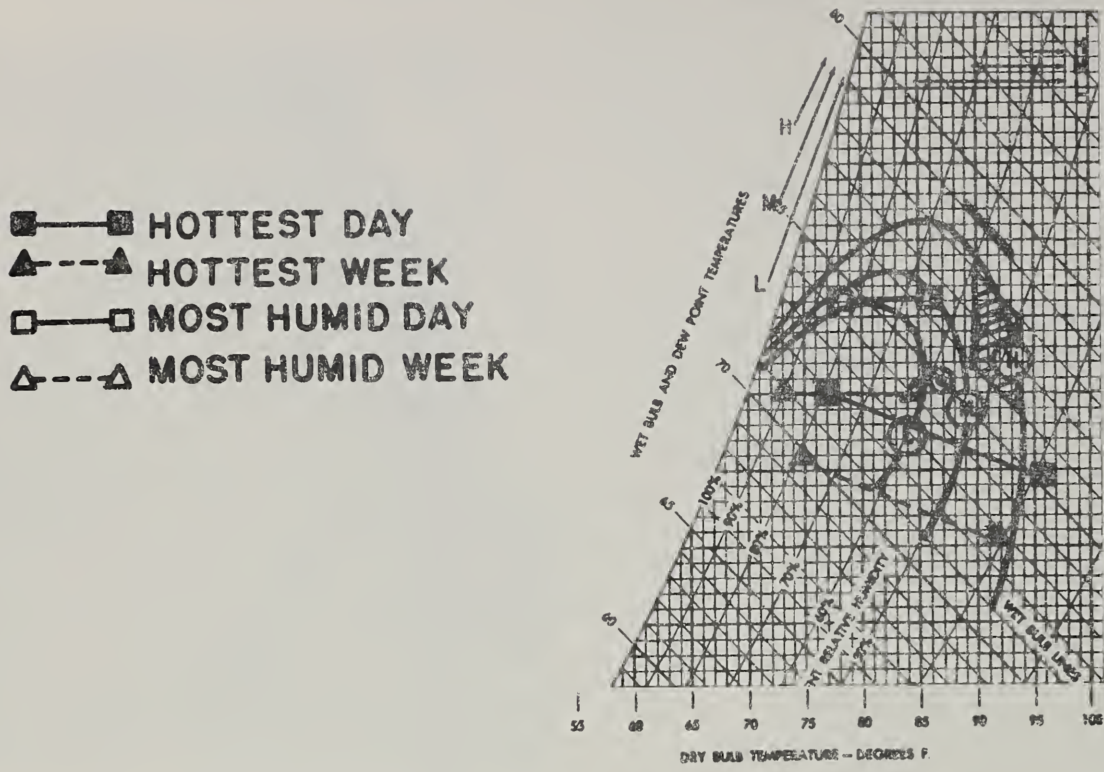
Phoenix, Arizona



	ASHRAE			ANAFM
	1%	2.5%	5%	10%
DB	108	106	104	103
WB	77	76	75	74

Fig.13 Graphical representation on a psychrometric chart of (a) one and five percent non-coincident ASHRAE dry-bulb and wet-bulb temperature, (b) Fluor coincident dry-bulb and wet-bulb temperatures at three frequency levels: the specific points at the center of circles denoted by H, M, and L are the coincident design points suggested in the Fluor publication for high, moderate, and low frequencies of occurrence. The three curves passing through these three points are loci of the iso-frequency points as those of H, M, and L points, and (c) maximum and minimum average daily dry-bulb temperatures and associated dewpoint temperatures for hottest and most humid days and weeks for Phoenix, Arizona.

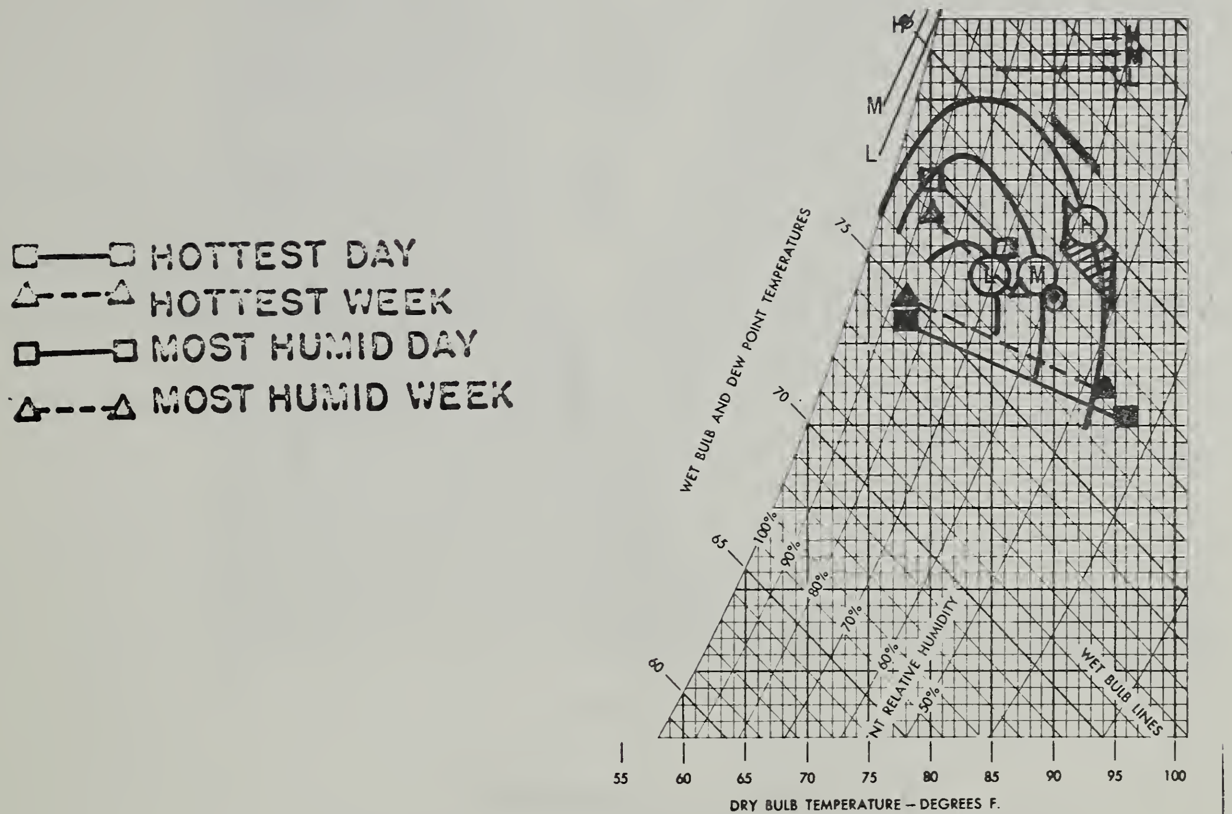
WASHINGTON, D.C.



	ASHRAE			ANAFM
	1%	2.5%	5%	10%
DB	94	92	90	87
WB	78	77	76	75

Figure 14 Graphical representation on a psychrometric chart of (a) one- and five percent non-coincident ASHRAE dry-bulb and wet-bulb temperatures, (b) Fluor coincident dry-bulb and wet-bulb temperatures at three frequency levels: the specific points at the center of circles denoted by H, M, and L are the coincident design points suggested in the Fluor publication for high, moderate, and low frequencies of occurrence. The three curves passing through these three points are loci of the iso-frequency points as those of H, M and L points, and (c) maximum and minimum average daily dry-bulb temperatures and associated dewpoint temperatures for hottest and most humid days and weeks for Washington, D. C.

New Orleans, Louisianas

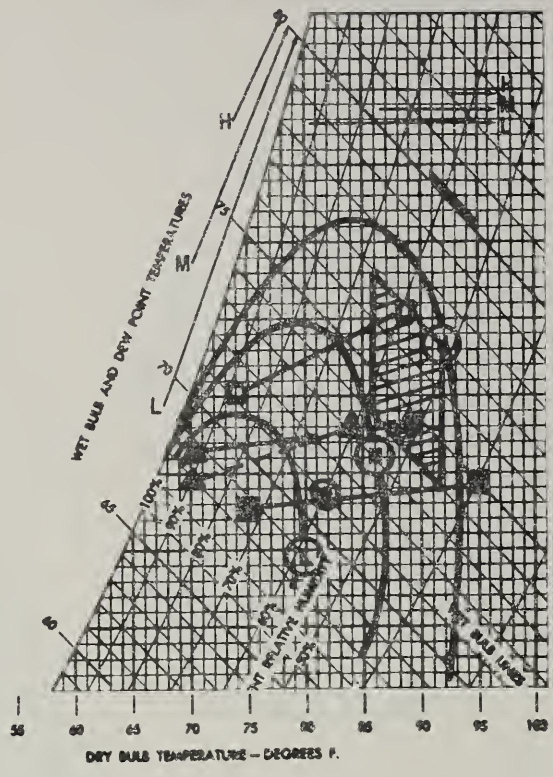


	ASHRAE			ANAFM
	1%	2.5%	5%	10%
DB	95	93	91	90
WB	80	79	79	78

Fig .15 Graphical representation on a psychrometric chart of (a) one- and five percent non-coincident ASHRAE dry-bulb and wet-bulb temperatures, (b) Fluor coincident dry-bulb and wet-bulb temperatures at three frequency levels: the specific points at the center of circles denoted by H, M, and L are the coincident design points suggested in the Fluor publication for high, moderate, and low frequencies of occurrence. The three curves passing through these three points are loci of the iso-frequency points as those of H, M and L points, and (c) maximum and minimum average daily dry-bulb temperatures and associated dewpoint temperatures for hottest and most humid days and weeks for New Orleans, La.

MINNEAPOLIS, MINNESOTA

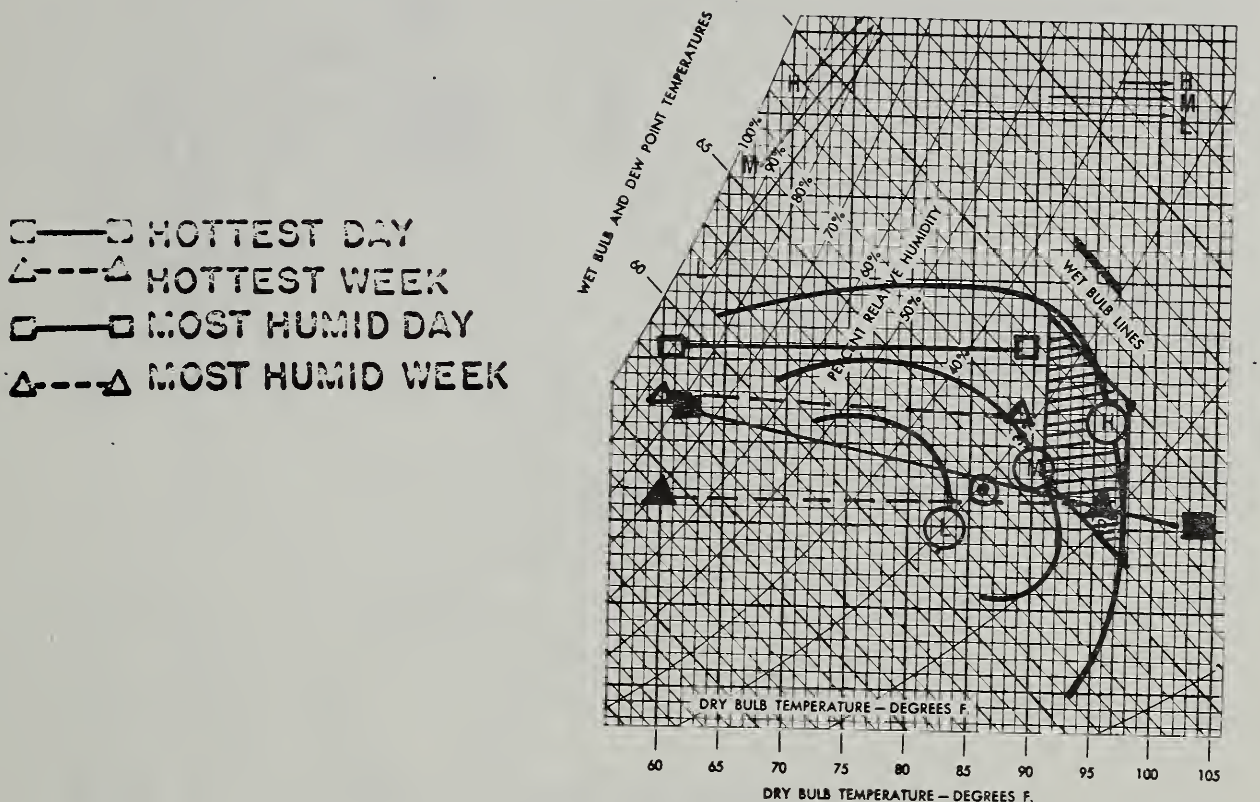
■——■ HOTTEST DAY
▲---▲ HOTTEST WEEK
□——□ MOST HUMID DAY
△---△ MOST HUMID WEEK



	ASHRAE			ANAFM
	1%	2.5%	5%	10%
DB	92	89	86	82
WB	77	75	74	71

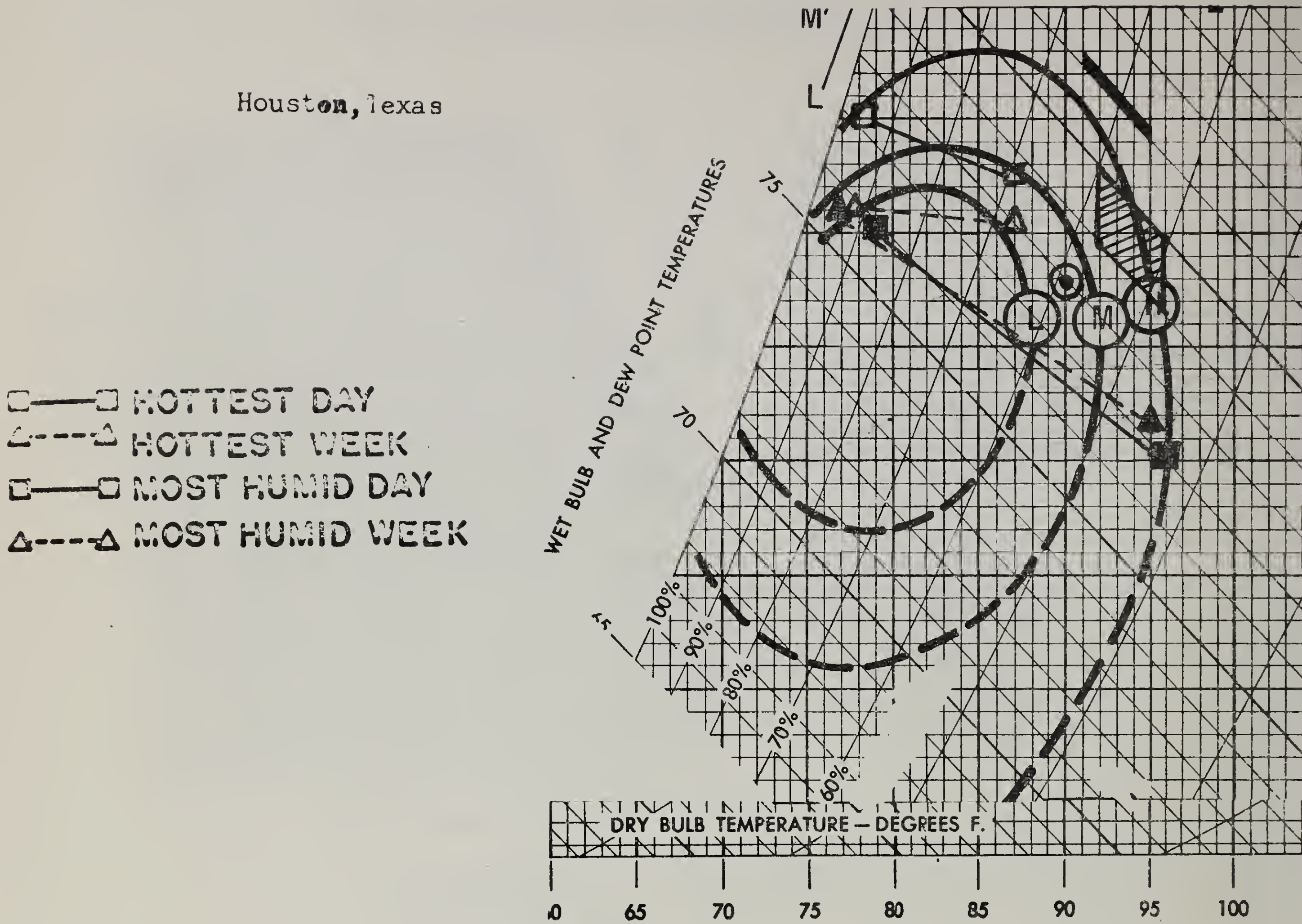
Figure 16 Graphical representation on a psychrometric chart of (a) one and five percent non-coincident ASHRAE dry-bulb and wet-bulb temperature, (b) Fluor coincident dry-bulb and wet-bulb temperatures at three frequency levels: the specific points at the center of circles denoted by H, M, and L are the coincident design points suggested in the Fluor publication for high, moderate, and low frequencies of occurrence. The three curves passing through these three points are loci of the iso-frequency points as those of H, M, and L points, and (c) maximum and minimum average daily dry-bulb temperatures and associated dewpoint temperatures for hottest and most humid days and weeks for Minneapolis, Minnesota.

Medford, Oregon



	ASHRAE			ANAFM
	1%	2.5%	5%	10%
DB	98	94	91	86
WB	70	68	66	64

Fig .17 : Graphical representation on a psychrometric chart of (a) one- and five percent non-coincident ASHRAE dry-bulb and wet-bulb temperatures, (b) Fluor coincident dry-bulb and wet-bulb temperatures at three frequency levels: the specific points at the center of circles denoted by H, M, and L are the coincident design points suggested in the Fluor publication for high, moderate, and low frequencies of occurrence. The three curves passing through these three points are loci of the iso-frequency points as those of H, M and L points, and (c) maximum and minimum average daily dry-bulb temperatures and associated dewpoint temperatures for hottest and most humid days and weeks for Medford,Oregon.



	ASHRAE			ANAFM
	1%	2.5%	5%	10%
DB	96	94	92	90
WB	80	80	79	78

Fig .18 Graphical representation on a psychrometric chart of (a) one and five percent non-coincident ASHRAE dry-bulb and wet-bulb temperature, (b) Fluor coincident dry-bulb and wet-bulb temperatures at three frequency levels: the specific points at the center of circles denoted by H, M, and L are the coincident design points suggested in the Fluor publication for high, moderate, and low frequencies of occurrence. The three curves passing through these three points are loci of the iso-frequency points as those of H, M, and L points, and (c) maximum and minimum average daily dry-bulb temperatures and associated dewpoint temperatures for hottest and most humid days and weeks for Houston, Texas.

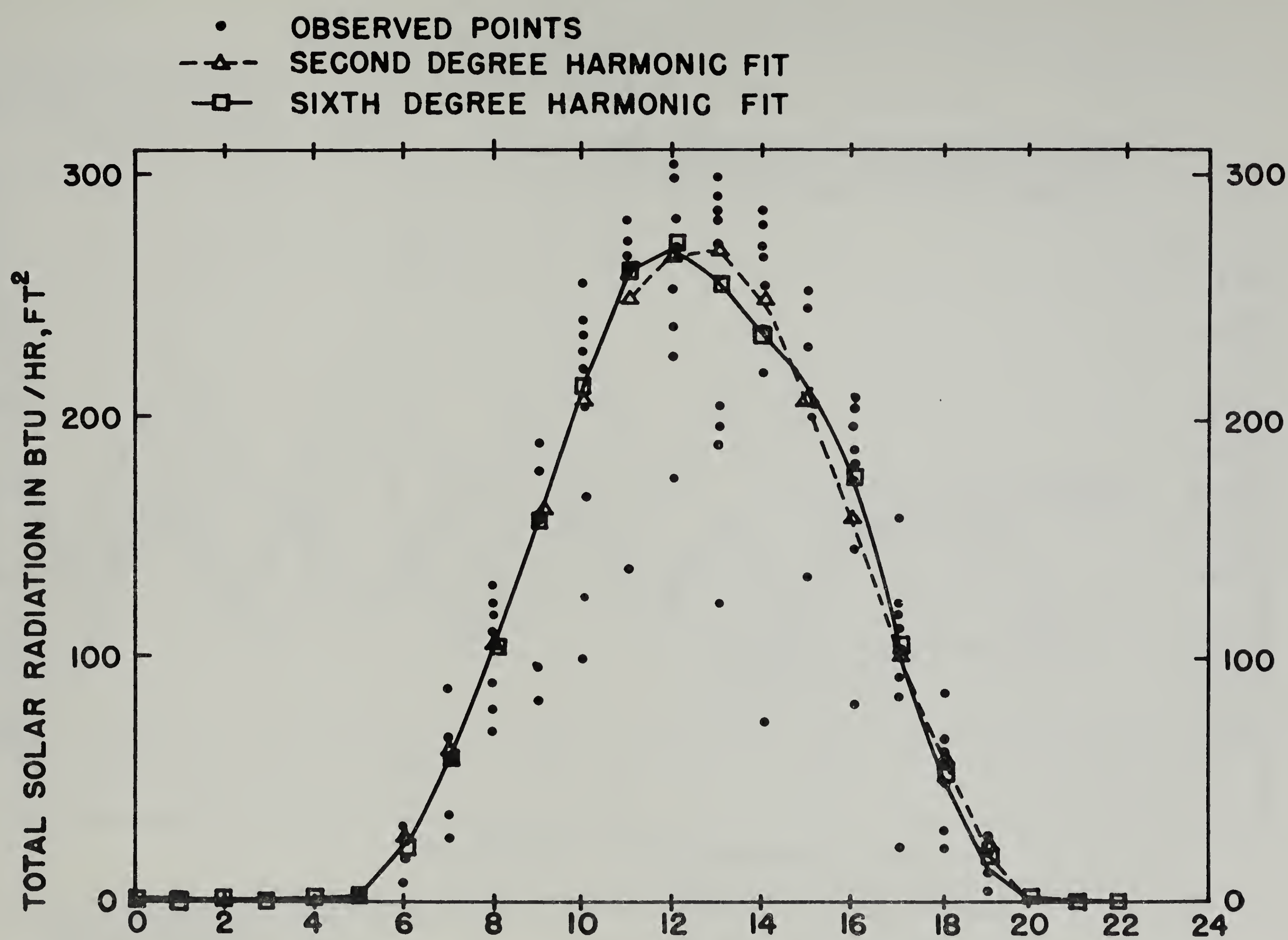


Fig.19 Total solar radiation incident upon a horizontal surface in the hottest days of each year for 1953-1962 inclusive.

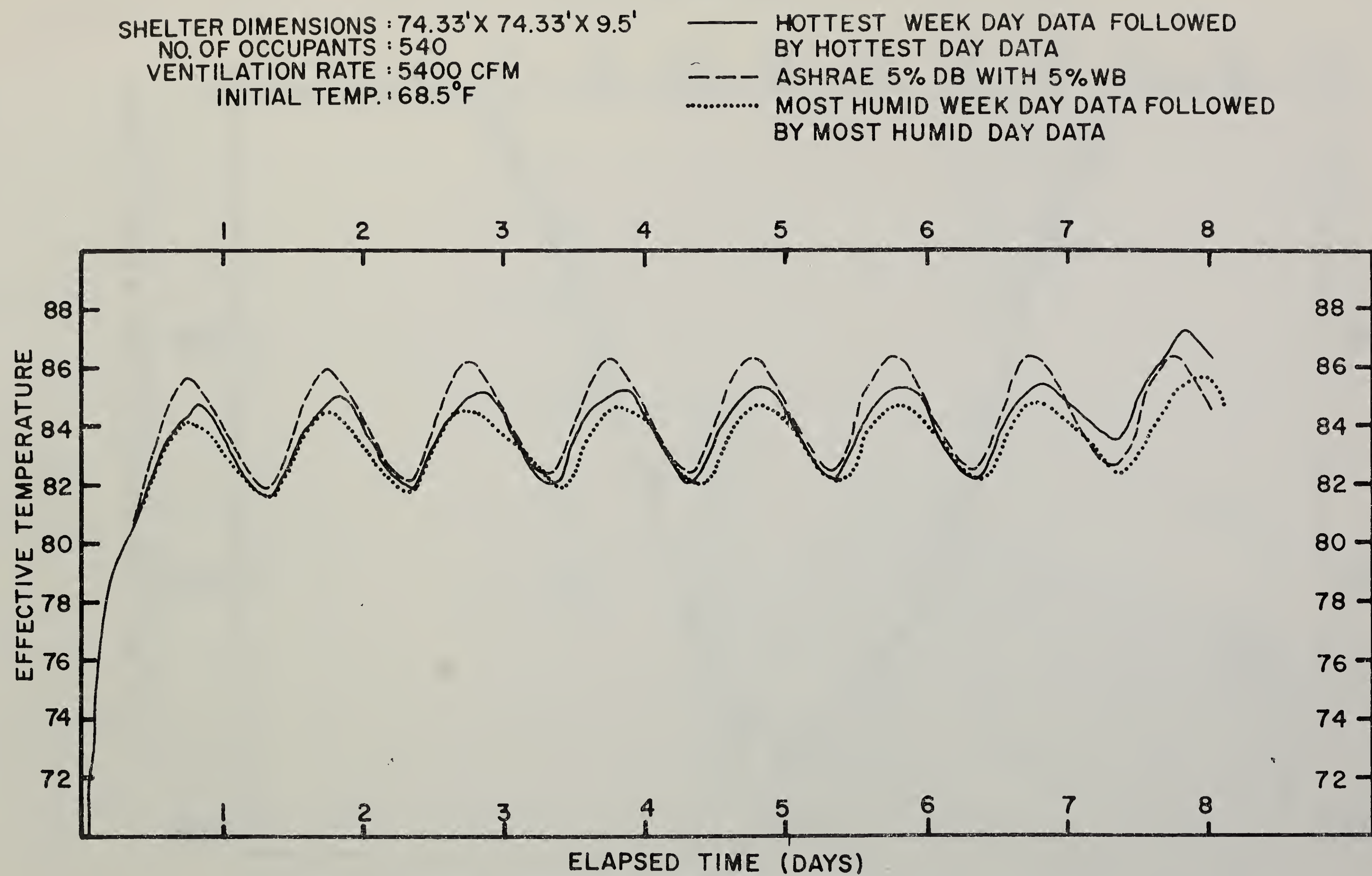


Figure 20 Computed effective temperature inside a 540-man fallout shelter for three different diurnal cycles of coincident dry-bulb and wet-bulb temperatures for the ventilating air.

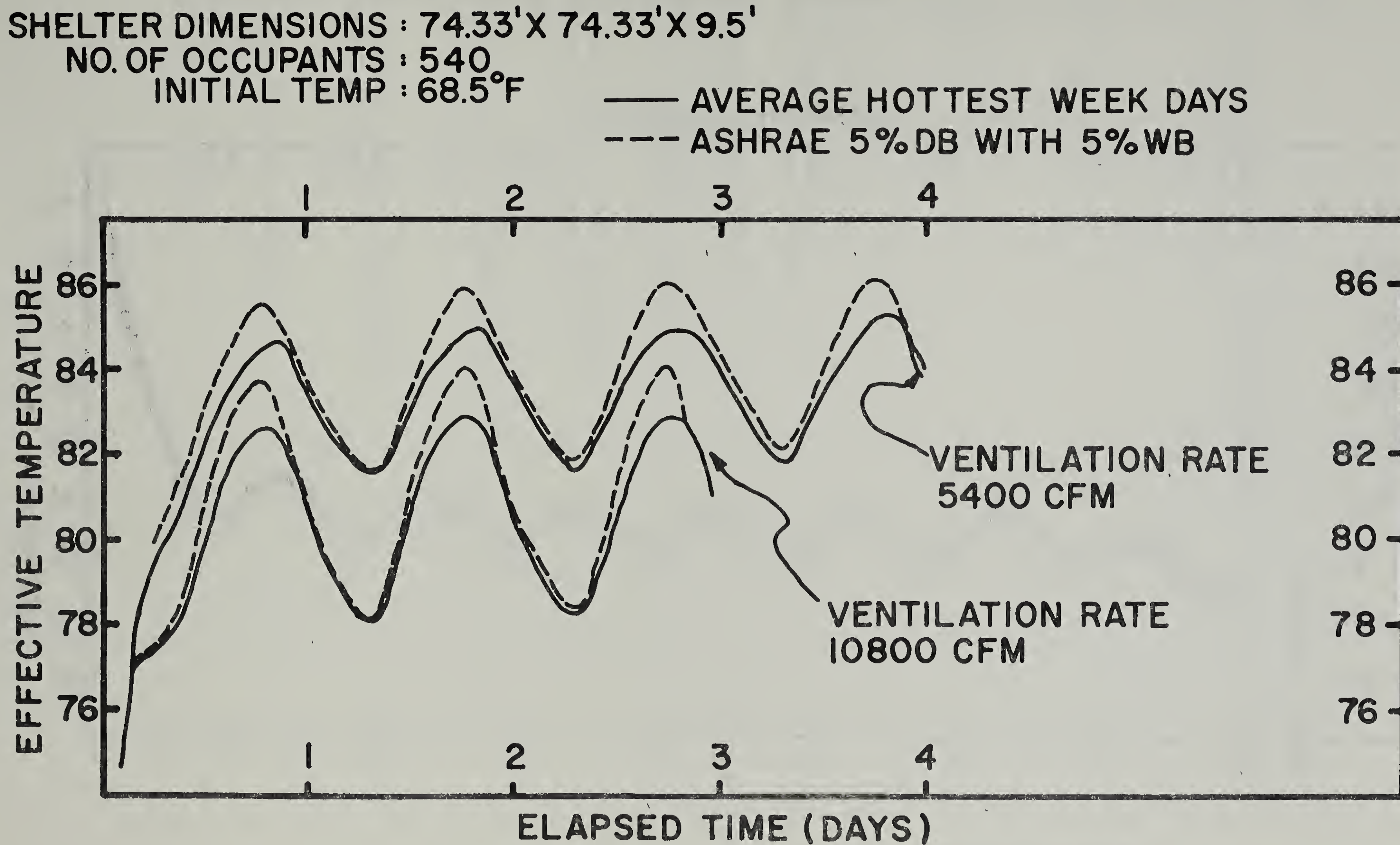


Figure 21 Relation of ventilation rate to the effective temperature inside a 540-man fallout shelter for two different diurnal cycles of coincident dry-bulb and wet-bulb temperature for the ventilating air.

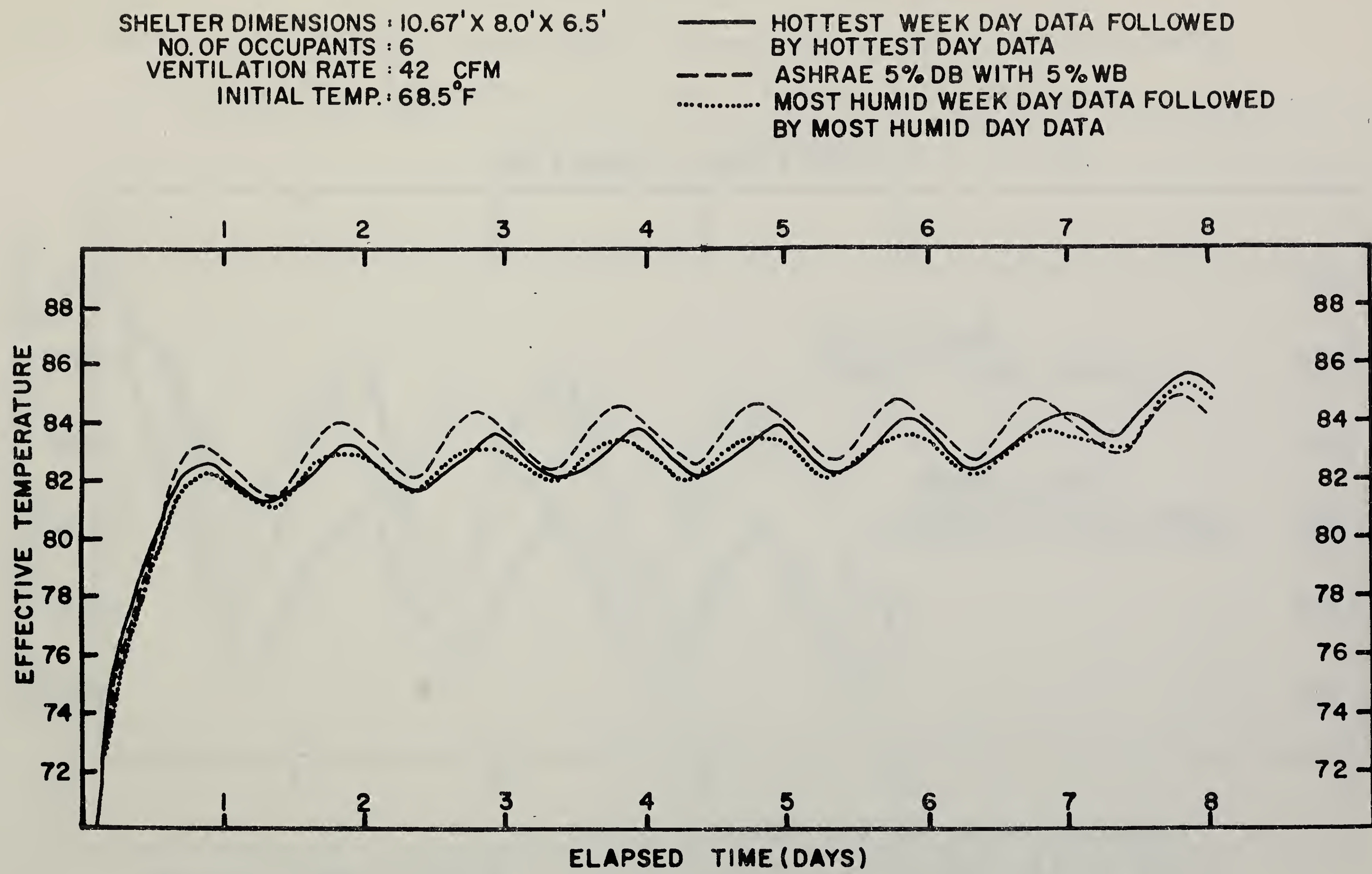


Figure 22 Computed effective temperature inside a 6-man fallout shelter for three different diurnal cycles of coincident dry-bulb and wet-bulb temperatures for the ventilating air.

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Coincident diurnal values of dry-bulb temperature, dew-point temperature and solar radiation of six selected cities in the United States were collected from the Weather Bureau records for the hottest-day, hottest-week, most-humid-day and most-humid-week. The data thus collected were analyzed by a least squares technique to yield best fitted harmonic representation. Data thus obtained for Washington, D. C. area were applied to the evaluation of shelter thermal environment.

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