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AVAILABILITY OF DIRECT, TOTAL, AND DIFFUSE SOLAR RADIATION TO FIXED AND TRACKING COLLECTORS IN THE USA

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I. INTRODUCTION

The recent efforts to use solar energy to meet some of the nation's energy needs have resulted in a strong interest in assessing the magnitude and distribution of this resource. For quite a long time it has been widely believed that only in the high desert regions of the Southwest is there sufficient direct beam solar radiation to allow the economic use of concentrating collectors. Generally, it was felt that in most parts of the country only flat plate solar collectors would be practical because they can capture the diffuse radiation as well as the direct.

In recent months results of several new studies of the availability of direct, diffuse and total solar radiation have been reported [1,2,3]. Some of these results, although preliminary, were quite startling:

(1) There is generally more direct-normal solar radiation than total-horizontal solar radiation throughout the entire continental United States [1].

(2) In the winter, direct-normal solar radiation generally exceeds total-horizontal solar radiation by 20 to 100% [1].

(3) The availability of diffuse radiation is not very much different for different locations [2,3].

(4) The geographic distributions of direct radiation availability are grossly different from the distributions of total-horizontal radiation, except during the summer [1,3].

This report describes the results of a rather thorough study of solar radiation availability for the U.S.A. The availabilities of both direct and total solar radiation to various types of sun tracking collectors are described. Availabilities of both direct and total solar radiation to a wide variety of tilted surfaces are also given, including surfaces with various azimuth angles. Finally, the distribution of diffuse radiation on a horizontal surface is given. All of these availabilities are described on a seasonal basis, and some availabilities are also presented by month.

It should be stressed that all availabilities reported here are average daily availabilities where the averages were computed from all of the data for a particular season or month over a period of several years. As such, these results contain no information on variations in these availabilities. It is well known that on any particular day the solar radiation could be as low as 20 percent, or as great as 130 percent, of the mean daily amount. Even the mean daily solar radiation available for a single month or season can vary from the long term mean daily solar radiation for that month or season by 30 percent. Thus, even though the results reported here

are probably not very accurate for reasons cited in the sections which follow, the natural variations in actual solar radiation amounts will frequently exceed whatever errors exist in the results.

Some of the initial results of this study were reported earlier in [1]. A major gap in that document is that it contains no information on solar radiation availabilities to fixed, tilted collectors. These availabilities are thoroughly described in Section V of the present report.

The organization of this report is as follows. Section II describes the data base and the computational techniques which were used. Section III discusses the results dealing with solar radiation availabilities to tracking collectors. The solar energy availabilities to various fixed surfaces are discussed in Section IV. A brief summary is given in Section V, and the bulky tabulations of availabilities form the final Section VI.

It should be pointed out that all of the solar energy availabilities presented in this report refer to incident radiation only. They totally ignore such collector performance considerations as cover plate transmittance for flat plate collectors, or end losses for single-axis tracking parabolic troughs. Thus, all of the values refer to energy availabile to the front aperture area of the collector. Of course, the direct radiation values recorded here are relevant for focussing collectors, while the total radiation values pertain to flat plate collectors. There may be some questions as to why availabilities of direct radiation to fixed surfaces were calculated or reported; they are only given so that the portions of the total radiation which are direct or diffuse can be easily seen.

A very important feature of this study is that all calculations were performed on an hourly basis. The value of this feature is that the separation of the measured total-horizontal radiation into its direct and diffuse components, and the subsequent conversion to direct and diffuse components on some other surface, can be performed quite accurately on an hourly basis. Although there are numerous techniques for conversion on a daily basis or a monthly mean basis from total-horizontal radiation to solar radiation on various other surfaces, these techniques are generally untested.

Just as in the earlier report on this study [1], this report contains numerous maps showing the geographic distributions of solar energy available to various surfaces. These are not to be interpreted as exact because with a data base which includes only 26 sites and which is known to contain errors, precise distributions are obviously impossible. Nonetheless, the maps do serve the valuable purpose of giving an indication of the true distributions as well as pointing out how potentially misleading the numerous maps of total-horizontal radiation can be.

II. DATA BASE AND COMPUTATIONAL PROCEDURES

The solar data base for this study consists of all hourly solar data which was available for the five years, 1958 through 1962, from the National Climatic Center, Asheville, North Carolina. Table 1.1 lists the locations and approximate periods of record; sufficiently complete data records were available from a total of 26 stations.

TABLE 1.1

Hourly Solar Data Base Locations and Periods of Record

Location	Period of Record
Albuquerque, New Mexico	All
Appalachicola, Florida	All
Bismark, North Dakota	All
Blue Hill, Massachusetts	All
Boston, Massachusetts	All
Brownsville, Texas	All but May-July 1958
Cape Hatteras, North Carolina	All
Caribou, Maine	All
Charleston, South Carolina	All
Columbia, Missouri	All
Dodge City, Kansas	All but Feb-July 1959
El Paso, Texas	All
Ely, Nevada	All
Fort Worth, Texas	All
Great Falls, Montana	All
Lake Charles, Louisiana	All
Madison, Wisconsin	All but Sept'58-Jan'59, Feb-Sept'60
Medford, Oregon	All
Miami, Florida	All
Nashville, Tennessee	All but Dec 1962
New York, New York	All but Oct'61-Dec'62
Omaha, Nebraska	All
Phoenix, Arizona	All
Santa Maria, California	All
Seattle, Washington	All
Washington, DC	All

The original data tapes contained numerous data gaps, erroneous values, and data out of chronological order. Consequently, the data were edited, sorted, and "filled" before analysis. Data gaps no longer than

one day were filled by interpolation; larger data gaps were omitted in subsequent analysis. It is known that these total-horizontal solar radiation measurements contain some errors due to faulty calibration, instrument response drift, etc. However, no attempt was made to correct the data because the necessary station-instrument records were not available.

Hourly values of direct-normal radiation, DN, were computed using the recorded measurements of total-horizontal radiation, TH, and the formula,

$$DN = \begin{cases} 0, & \text{if } \underline{PP} < .30 \\ -.52 + 1.80\ \underline{PP}, & \text{if } .30 \leq \underline{PP} \leq .85 \\ M, & \text{if } \underline{PP} > .85 \end{cases}$$

The symbol $\underline{PP}$ is the hourly percent of possible, that is, the total-horizontal reading divided by the computed value of radiation on a horizontal surface above the earth's atmosphere; the units for DN are kW hr/m^2 per hour. This relation was obtained empirically from 1962 National Weather Service data from Albuquerque, Blue Hill, and Omaha. Both direct-normal and total-horizontal radiation data are available for these three locations. Statistical regression techniques were used on these data to relate DN to TH and hence to PP. The above relationship was found to fit the data quite well. Further details of this work can be found in [4]. This relationship is similar to one suggested by Jordan and Liu [5]. Different values for M were used for different months, ranging from .95 in July to 1.05 in January. These are reasonable maximum values for direct-normal radiation; they avoid the difficulty of generating unreasonably high DN values from

high PP values caused by such phenomena as concentration of radiation by clouds. Similarly, DN is set equal to 0.4 in those cases of low sun angle when PP is enhanced by bright clouds; the criterion for this is ELEV $< 10^{o}$ and PP $> .50$.

At this stage in the study, the data base consisted of hourly values of direct-normal radiation in addition to the original hourly values of total-horizontal radiation. The next step was the computation of hourly values of direct radiation incident on various fixed and tracking surfaces. This is straightforward; the direct radiation intensity on a surface is the direct-normal intensity multipled by the cosine of the angle between the surface normal and the solar rays. The angle was computed at the mid-point of each hour, and the hourly integrals of direct radiation were treated as intensities at this mid-point. This conversion from integrated energy to energy intensity is particularly easy in the units chosen; the integrated hourly units were kW hr/m^2, and so the intensity becomes kW/m^2. Of course, for fixed surfaces, the surface normal is a constant vector while for tracking surfaces the surface normal must be computed each hour.

The process for obtaining hourly values of total solar radiation availabilities to various surfaces also requires hour-by-hour estimates of the diffuse component on these surfaces. Of course, this can be expected to vary considerably with different sky conditions and surface reflectance characteristics as well as surface orientations. No attempt is made to incorporate all possible variations in surface reflections in the calculations. Instead, the calculations were performed under some very simple assumptions. It was assumed that ground brightness is one-half of sky brightness, and that both are uniformly distributed.

At the conclusion of these hourly conversions, the data were systematically summed, and then averaged by month and by season over the entire five-year data base period. The final result was monthly and seasonal means of daily totals of direct solar radiation and of total solar radiation availabilities to various tracking and fixed surfaces. These availabilities are discussed in the next two sections. Tables of these availabilities for the 26 locations are presented in Section VI.

The discussions of availabilities in Sections III and IV include contour maps showing the geographic distribution of availabilities to some types of surfaces. Similar maps were presented in [1]; for the sake of completeness, the description of the procedure used for drawing these maps is repeated here.

In order that these maps be free from subjective judgment, the contour drawing process was done with computer codes. Two codes were used. The first of these accepted the monthly mean daily totals and the latitudes and longitudes for the 26 sites as inputs. It produced monthly mean daily totals on a rectangular grid of locations as output. This code was obtained from H. Akima of the Institute of Telecommunication Sciences, U.S. Department of Commerce, and the technique is described in [6].

The second code simply uses the regularly spaced values generated by the first code to provide a list of coordinates for points defining each isoline requested. Quite a few such codes are in existence; the particular one used was written by M. O. Dayhoff at the National Biomedical Research Foundation, Silver Springs, Maryland. The output from this second code was used to produce the maps manually.

One difficulty was encountered in the application of the first code to this task. The code is basically interpolative in nature. When asked to produce values for grid points geographically outside the area covered by the 26 input sites, the code would occasionally extrapolate to absurd values. This problem was solved by artifically creating 12 extra input data points surrounding the U.S. and about 1200 miles distant. After some comparisons indicated that this technique worked, and that the results were essentially independent of the values assigned to these created, remote sites, a value of 5 kW hr/m^2 was assigned to each of these sites in every case.

The remainder of this section is devoted to a description of the notation employed, Table 2.1, and a listing of the various formulas used in the conversion calculations, Table 2.2.

TABLE 2.1 - Notations

α	solar altitude angle
β	solar azimuth angle, measured from South, positive toward the West
δ	solar declination
γ	azimuth angle for fixed surfaces, measured from South, positive toward the West
θ	solar incidence angle (angle between solar rays and surface normal)
t	tilt angle for fixed surfaces, measured from horizontal and positive toward South
Z	solar zenith angle (complement of α)
H	hour angle, measured from solar noon (1 hour = 15 degrees)
L	latitude
N	day number, starting with January 1
DN (TN)	direct (total) radiation on a surface normal to the sun's rays
DH (TH)	direct (total) radiation on a horizontal surface
DP (TP)	direct (total) radiation on a surface tracking the sun about a polar axis (an axis parallel to the earth's axis)
DNSH(TNSH)	direct (total) radiation on a surface tracking the sun by rotating about a North-South horizontal axis
DEW (TEW)	direct (total) radiation on a surface tracking the sun by rotating about an East-West horizontal axis
DVL (TVL)	direct (total) radiation on a surface tilted up L degrees from horizontal and rotating about a vertical axis
DVLP (TVLP)	same as DVL (TVL), with a tilt angle of $L + 15^{o}$
DVLN (TVLN)	same as DVL (TVL), with a tilt angle of $L - 15^{o}$
D(t, γ) (T(t, γ))	direct (total) radiation on a surface with tilt angle t and azimuth angle γ
DFH	diffuse radiation on a horizontal surface

Table 2.2 Conversion Formulas

$$\delta = \sin^{-1}\left(.39795 \cos\left(.98563\,(N-172)\right)\right)$$

$$\alpha = \sin^{-1}\left(\cos L \cos\delta \cos H + \sin L \sin\delta\right)$$

$$\beta = \begin{cases} \sin^{-1}\dfrac{\cos\delta \sin H}{\cos\alpha}, & \text{if } \cos H > \dfrac{\tan\delta}{\tan L} \\ 90^{\circ}, & \text{if } \cos H = \dfrac{\tan\delta}{\tan L} \\ 180^{\circ} - \sin^{-1}\dfrac{\cos\delta \sin H}{\cos\alpha}, & \text{if } \cos H < \dfrac{\tan\delta}{\tan L} \end{cases}$$

$$D(t,\gamma) = \begin{cases} DN\,(\cos\alpha \cos(\beta-\gamma) \sin t + \sin\alpha \cos t) \\ 0, \text{ if the above expression is negative} \end{cases}$$

$$DFH = TH - DN \sin\alpha$$

$$T(t,\gamma) = D(t,\gamma) + (.75 + .25 \cos t)\, DFH$$

$$TN = DN + (.75 + .25 \sin\alpha)\, DFH$$

$$DEW = DN\,(1 - \cos^2\alpha \sin^2\beta)^{.5}$$

$$TEW = DEW + (.75 + .25 \sin\alpha\,(1 - \cos^2\alpha \sin^2\beta)^{-.5})\, DFH$$

$$DNSH = DN\,(1 - \cos^2\alpha \cos^2\beta)^{.5}$$

$$TNSH = DNSH + (.75 + .25 \sin\alpha\,(1 - \cos^2\alpha \cos^2\beta)^{-.5})\, DFH$$

$$DP = DN \cos\delta$$

$$TP = DP + (.75 + .25 \cos L \cos H)\, DFH$$

$$DVL = DN \sin(\alpha + L)$$

$$TVL = DVL + (.75 + .25 \cos L)\, DFH$$

$$DVLP = DN \sin(\alpha + L + 15^{\circ})$$

$$TVLP = DVLP + (.75 + .25 \cos(L + 15^{\circ}))\, DFH$$

$$DVLN = DN \sin(\alpha + L - 15^{\circ})$$

$$TVLN = DVLN + (.75 + .25 \cos(L - 15^{\circ}))\, DFH$$

III. SOLAR RADIATION AVAILABILITIES TO TRACKING SURFACES

In the preliminary report on this study [1], tables and maps of direct-normal radiation availability were presented in terms of mean daily total amounts by month. These were compared and contrasted with maps of mean daily totals of total-horizontal radiation which were produced from the same data base. These monthly availability maps are not reproduced here; instead, maps displaying direct-normal availabilities and total-horizontal availabilities on a seasonal basis are given in Figures 3.1 and 3.4. The definitions used for the seasons are essentially those of the "thermal" seasons of the Northern hemisphere:

Spring - March, April, May
Summer - June, July, August
Fall - September, October, November
Winter - December, January, February

The data used to produce these maps is given in the Tables of Section VI; the pertinent values are the "D" values in the table labeled "Tracking Surface-DN and TN" (the first table), and the "T" values in the table labelled "Fixed Surface" with both tilt and azimuth angles equal to 0.

These maps in Figures 3.1-3.4 show that the availabilities of direct-normal radiation and of total-horizontal radiation in the U.S. are quite different, especially in fall and winter. This difference is also evident in Table 3.1 below, which gives the ratios of mean daily totals of direct-normal to total-horizontal radiation by season. Both this table and the maps indicate that direct-normal radiation generally exceeds total-horizontal radiation

throughout the U.S. during the entire year; in the fall and winter DN is generally 50% higher than TH.

It is interesting to notice that the ratio of DN to TH is considerably greater in the fall than it is in the spring. This is undoubtedly due largely to the definition of seasons used here. The midpoint of our spring, April 15, is nearly a month later than the date when the solar declination is zero. As a consequence, during the spring as defined here the solar zenith angle is generally much less than it is during the fall months of September, October, and November. Thus, the "cosine effect" reduction in the direct component of total horizontal radiation is much greater in the fall.

These values of direct-normal radiation represent the average amount of energy which would be available to a focusing, full-tracking collector. A full-tracking flat plate collector would intercept the amount labelled TN, total-normal; these are given in the T columns of the first table in Section VI.

Availabilities of both direct and total solar radiation to various other tracking surfaces were also computed. In all, six other tracking schemes were considered. All of these are one-dimensional tracking schemes; that is, each one represents a surface rotating about a single, fixed axis and inclined at a fixed angle with respect to that axis. Table 3.2 lists these surface types, their axis orientations, and the angles between the respective surfaces and axis. The angles between the vertical axes and the surfaces for the last three types in this table may be difficult to visualize at first. Another way to think of VL, VLP, or VLN is as a surface tilted upward from horizontal L degrees

L+15 degrees, or L-15 degrees, respectively, and rotating about a vertical axis; here L represents local latitude.

Even though mean daily solar availabilities were computed for these one-dimensional tracking surfaces on a monthly basis and a seasonal basis, only seasonal data is reported here. Information on a monthly basis is available upon request from the authors. The seasonal data is tabulated in Section VI.

In order that the relative merits of these different one-dimensional tracking schemes may be compared, Table 3.3 gives the availability to these surfaces expressed as fractions of the amount of direct-normal radiation which would be available to a full-tracking collector. The ratios are given on a seasonal basis. They are not broken down by location because they do not vary much with location. Consequently, Table 3.3 only presents the average ratios and the range of ratios.

Of the six different one-dimensional tracking schemes considered, three seem to be superior with respect to incident direct radiation available. These are the polar axis-tracking scheme, and the two vertical axis tracking schemes with the surface tilted at L and L +15 degrees, respectively. All three of these intercept roughly 90 to 95% of DN, the direct radiation available to a full-tracking collector.

Horizontal axis tracking collectors are of interest because they generally require less structural support, especially when compared with polar axis trackers or full tracking collectors. Unfortunately, this table indicates that they generally intercept

15 to 25% less energy than a full tracking collector. It is interesting to note that a collector with a north-south horizontal axis design is very effective in the spring and summer, capturing about 95% of the direct-normal radiation in these seasons. Thus, this scheme might be quite effective for solar systems designed especially to meet high spring and summer energy loads such as air conditioning loads or crop irrigation loads.

Table 3.3 also suggests that a north-south horizontal axis collector intercepts more energy over a year than does a collector tracking about a horizontal east-west axis. This confirms a result indicated in [2], and is illustrated again in Table 3.4 which gives the averages of direct solar radiation availabilities to these different tracking schemes by season across the U.S. Of course, looking at national averages of solar energy availabilities as presented in Table 3.4 is not very informative because it completely obscures the geographic distribution of these availabilties which are of primary interest. Nonetheless, this table of national averges does provide another way of comparing these different tracking schemes.

A frequently posed question is whether or not the direct radiation intercepted by a focusing, tracking collector is as large as the amount of total radiation available to a fixed, flat-plate collector. The solar availabilities in this report will permit numerous comparisons of this type to be made for different locations, and for a variety of concentrating collector designs and a variety of different flat-plate collector orientation.

Results of one such comparison of tracking collectors with flat-plate collectors are given in Table 3.5. This table compares

the direct radiation available to seven different tracking surfaces to the total radiation available to a fixed surface tilted at 45 degrees upward toward the south. This orientation for the fixed surface was chosen because it is a fairly standard orientation for flat-plate collectors across the U.S. The comparisons made consisted of computing the ratio of the direct radiation available to the tracking collectors to the total radiation available to the 45 degree fixed, flat-plate collector. Table 3.5 gives the average values of these ratios for the 26 sites by season. The ranges of the values of these ratios for the 26 sites are also given. Finally, the last row in Table 3.5 lists the national average daily amount of total radiation available to the fixed surface.

This table indicates that generally the amounts of direct radiation available to tracking collectors are comparable to the amount of total radiation available to a fixed tilted flat plate collector; the better solar incidence angle provided by tracking roughly makes up for the lose of the diffuse component. Moreover, several of these direct availabilities, those denoted by DN, DP, DVLP, and DVL, significantly exceed the total solar energy available to a collector fixed at 45 degrees facing south.

These results leave the questions regarding the relative merits of flat-plate solar collectors versus concentrating solar collectors very much open. The two types are quite similar relative to the solar energy available to them. Since concentrating collectors tend to be at least as cheap as flat plate collectors, and they are generally more efficient than flat plate, it seems likely that concentrating collectors may be more widely adopted than has been generally believed.

TABLE 3.1

SEASONAL RATIOS, DN/TH, OF DIRECT-NORMAL
AND TOTAL-HORIZONTAL SOLAR RADIATION

	Spring (M,A,M,)	Summer (J,J,A)	Fall (S,O,N)	Winter (D,J,F)
Albuquerque	1.2	1.2	1.5	1.7
Appalachiocola	1.1	1.0	1.2	1.4
Bismark	1.3	1.3	1.7	2.1
Blue Hill	1.1	1.0	1.4	1.7
Boston	1.1	1.0	1.3	1.6
Brownsille	0.9	1.0	1.1	1.1
Cape Hatteras	1.1	1.1	1.3	1.5
Caribou	1.2	1.1	1.4	2.0
Charleston	1.0	0.9	1.2	1.4
Columbia	1.1	1.1	1.4	1.6
Dodge City	1.2	1.1	1.5	1.8
El Paso	1.3	1.1	1.4	1.6
Ely	1.2	1.2	1.6	1.8
Fort Worth	1.1	1.1	1.3	1.5
Great Falls	1.2	1.2	1.5	1.8
Lake Charles	1.0	1.0	1.1	1.2
Madison	1.2	1.1	1.5	1.8
Medford	1.1	1.2	1.3	1.2
Miami	1.0	1.0	1.2	1.3
Nashville	1.0	1.0	1.2	1.4
New York	1.1	0.9	1.3	1.5
Omaha	1.2	1.1	1.5	1.8
Phoenix	1.2	1.1	1.4	1n6
Santa Maria	1.2	1.1	1.4	1.6
Seattle	1.1	1.2	1.3	1.3
Washington, DC	1.1	1.0	1.3	1.6
Range	0.9-1.3	0.9-1.3	1.1-1.7	1.1-2.1
Average	1.1	1.1	1.4	1.6

TABLE 3.2

Description of Single-Axis Tracking Surfaces for Which Availabilities were Calculated

Surface Name	Axis Orientation	Angle Between Surface and Axis (Degrees)
P	Polar (parallel to earth's axis	0
NSH	North-South, Horizontal	0
EW	East-West, Horizontal	0
VL	Vertical	90-L (90-latitude)
VLP	Vertical	90- (L+15)
VLN	Vertical	90- (L-15)

TABLE 3.3

Seasonal Availabilities of Direct Radiation to Various One-dimensional Tracking Schemes Expressed as Fractions of Direct-Normal Radiation

Radiation Type \ Seasons	Spring Avg.	Spring Range	Summer Avg.	Summer Range	Fall Avg.	Fall Range	Winter Avg.	Winter Range
DP (polar axis)	.97	.96-.98	.94	.93-.95	.98	.96-1.0	.94	.93-1.0
DNSH (NS horizontal axis)	.93	.88-.97	.97	.94-.99	.80	.73-.87	.67	.56-.79
DEW (EW horizontal axis)	.73	.70-.75	.74	.71-.78	.77	.74-.80	.85	.80-.89
DVL (Latitude tilt, vertical axis)	.93	.90-.96	.94	.90-.97	.91	.85-.95	.88	.82-.93
DVLP (L + 15° tilt, vertical axis)	.95	.94-.96	.93	.91-.94	.97	.94-1.00	.97	.93-1.00
DVLN (L - 15° tilt, vertical axis)	.86	.80-.92	.88	.81-.92	.80	.72-.86	.73	.65-.81
National average daily values of DN, $kW \cdot hr \cdot m^{-2}$	6.4		7.1		5.2		4.2	

TABLE 3.4

National Average Daily Amounts of Direct Solar Radiation Available to Various Tracking Schemes kW hr m^{-2}

	Spring	Summer	Fall	Winter	Annual Average
DN	6.4	7.1	5.2	4.2	5.7
DP	6.2	6.7	5.1	4.0	5.5
DNSH	5.9	6.9	4.2	2.9	5.0
DEW	4.6	5.2	4.0	3.5	4.3
DVL	6.0	6.7	4.7	3.7	5.3
DVLP	6.0	6.6	5.0	4.1	5.4
DVLN	5.5	6.3	4.1	3.1	4.8

TABLE 3.5

Seasonal Availabilities of Direct Radiation to Various Tracking Schemes Expressed as Fractions of the Total Solar Radiation Incident on a Fixed Surface Tilted Upward 45° Toward the South

Seasons / Radiation Type	Spring Avg.	Spring Range	Summer Avg.	Summer Range	Fall Avg.	Fall Range	Winter Ave.	Winter Range
DN (full tracking)	1.14	1.02-1.34	1.25	1.02-1.43	1.04	.97-1.14	.99	.78-1.10
DP (Polar axis)	1.11	1.00-1.30	1.18	.96-1.35	1.02	.94-1.11	.93	.74-1.03
DNSH (NS horizontal axis)	1.06	.91-1.27	1.22	.98-1.41	.84	.73-0.94	.66	.48-0.78
DEW (EW horizontal axis)	.83	.74-0.96	.92	.77-1.06	.81	.73-0.88	.83	.70-0.93
DVL (latitude tilt, vertical axis)	1.07	.96-1.23	1.18	.98-1.33	.95	.83-1.06	.86	.70-0.98
DVLP (L + 15° tilt, vertical axis)	1.08	.98-1.25	1.16	.96-1.33	1.01	.92-1.11	.95	.78-1.08
DVLP (L - 15° tilt, vertical axis)	.98	.85-1.12	1.11	.94-1.25	.83	.71-0.94	.72	.59-0.83
National Average Daily Values, TT(-45°, 0), of Total Radiation on a Surface Tilted Upward 45° Toward the South $kW \cdot hr \cdot m^{-2}$	5.5		5.6		5.0		4.2	

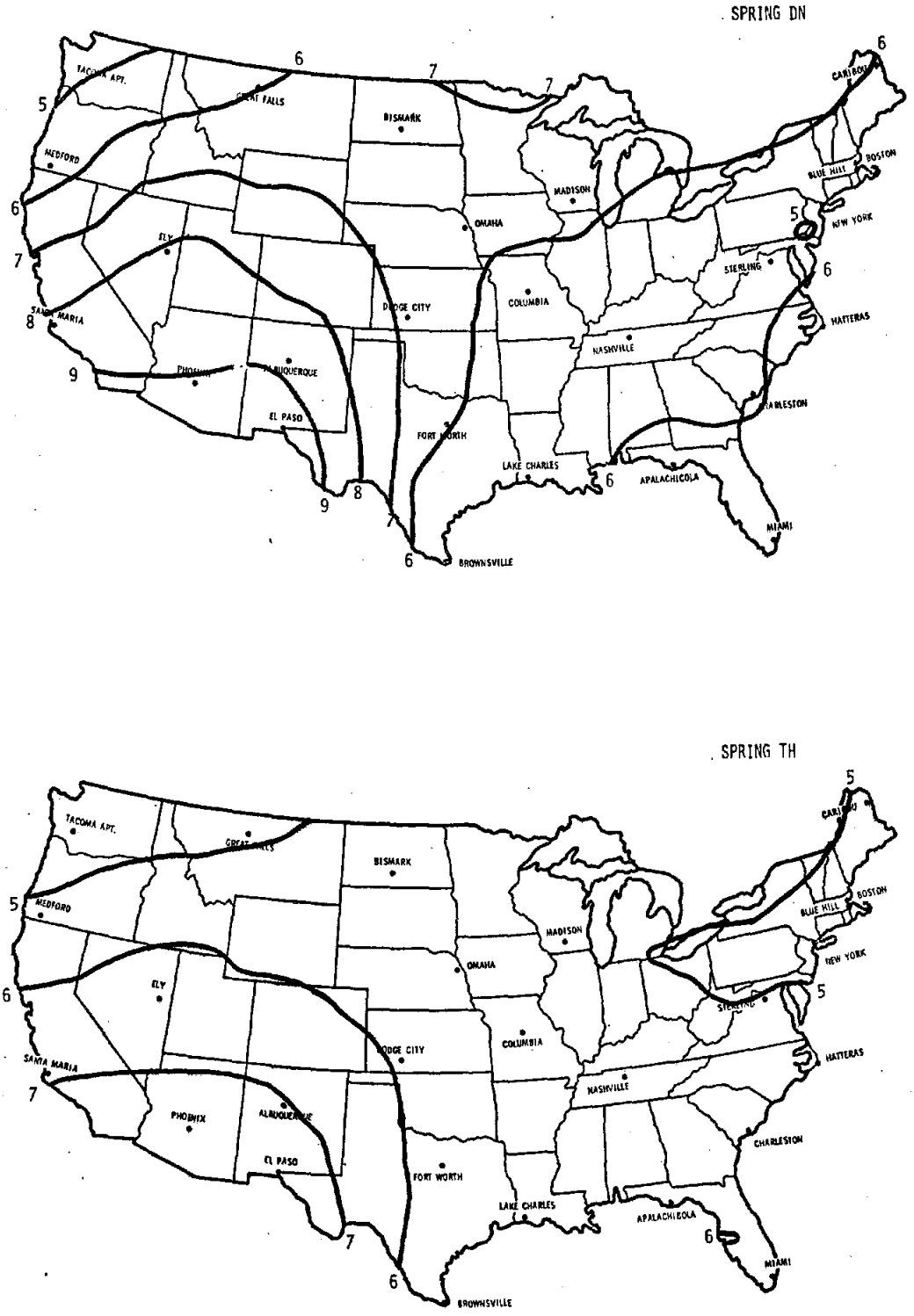


FIGURE 3.1 MEAN DAILY DIRECT-NORMAL SOLAR RADIATION (TOP) AND TOTAL-HORIZONTAL SOLAR RADIATION (BOTTOM) IN THE SPRING; $kW \cdot HR \cdot M^{-2}$

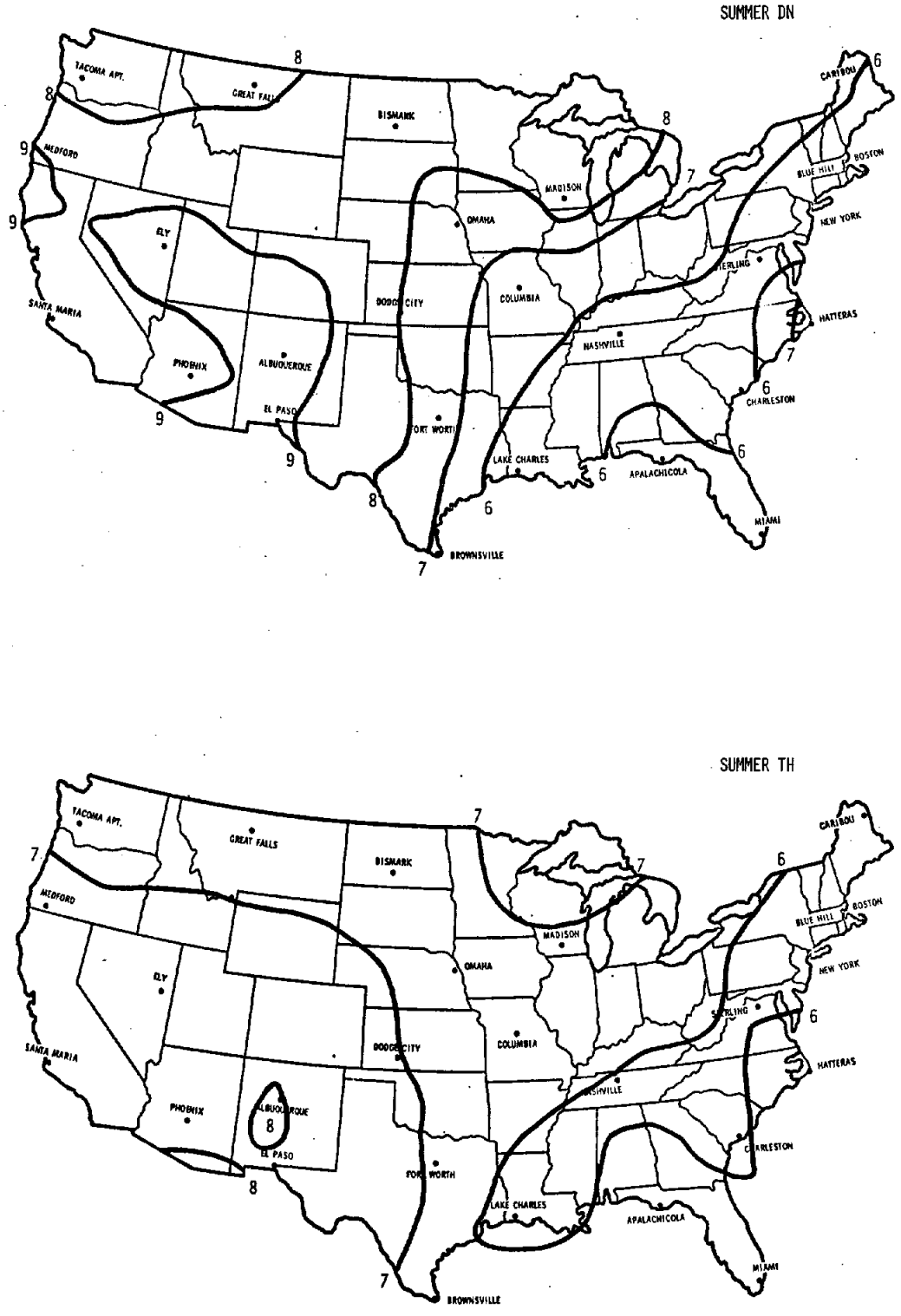


FIGURE 3.2 MEAN DAILY DIRECT-NORMAL SOLAR RADIATION (TOP) AND TOTAL-HORIZONTAL SOLAR RADIATION (BOTTOM) IN THE SUMMER; $kW \cdot HR \cdot M^{-2}$

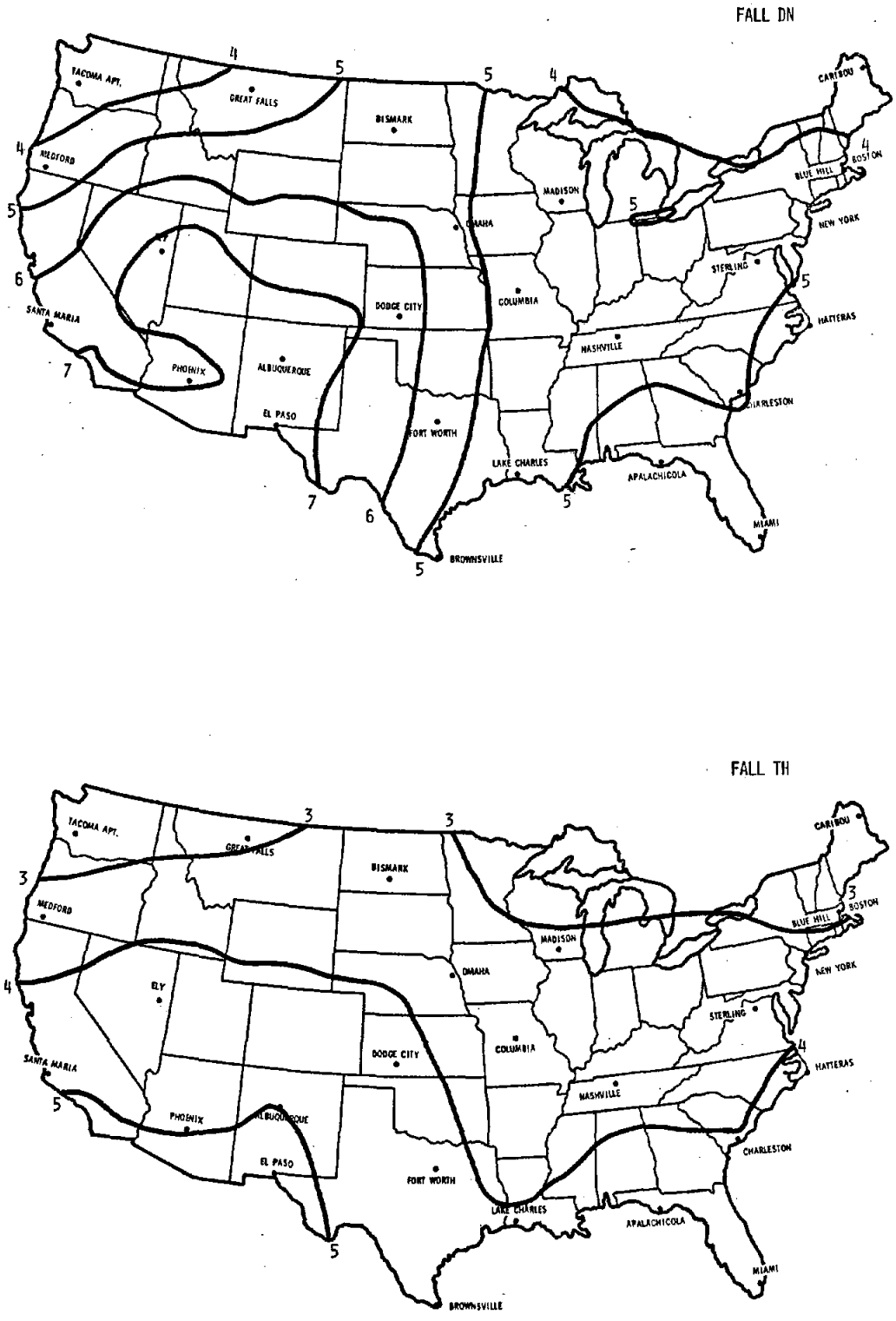


FIGURE 3.3 MEAN DAILY DIRECT-NORMAL SOLAR RADIATION (TOP) AND TOTAL-HORIZONTAL SOLAR RADIATION (BOTTOM) IN THE FALL; $kW \cdot HR \cdot M^{-2}$

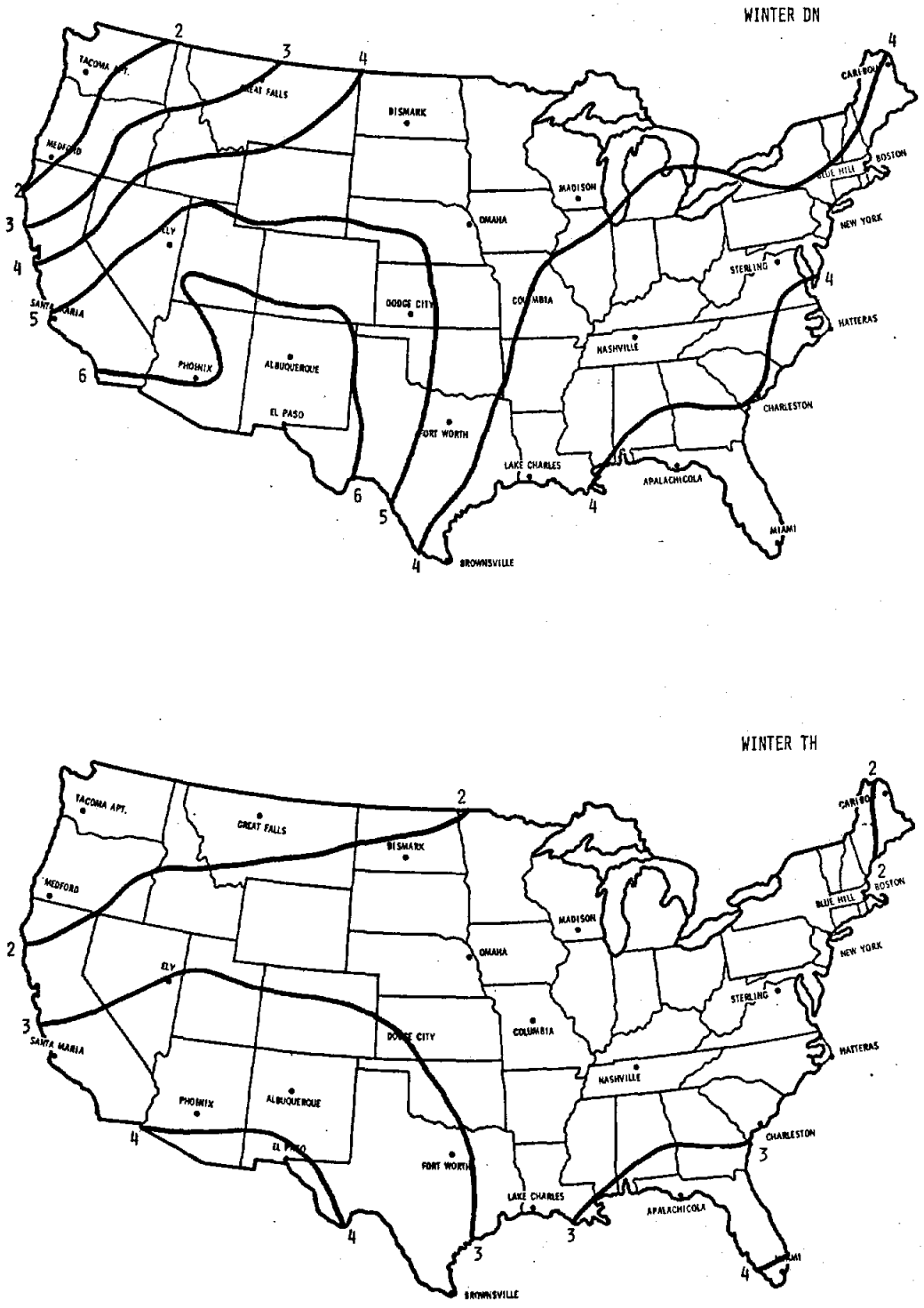


FIGURE 3.4 MEAN DAILY DIRECT-NORMAL SOLAR RADIATION (TOP) AND TOTAL-HORIZONTAL SOLAR RADIATION (BOTTOM) IN THE WINTER; $kW \cdot HR \cdot M^{-2}$

IV. SOLAR RADIATION AVAILABLE TO VARIOUS FIXED SURFACES

A major task in this study was the compilation of mean daily totals of solar energy available to a wide variety of orientations of fixed surfaces. These mean daily availabilities were compiled for all 26 sites represented in the data base on a monthly basis and on a seasonal basis. This section discusses some of the more important results of this project relative to fixed surfaces. Some special tabulations and maps of energy availability for standard orientations of flat-plate collectors are presented. Seasonal values for solar energy incident on vertical walls of different orientations are given. Finally, the seasonal and geographic distribution of diffuse radiation on a horizontal surface is presented.

As described in Section II, the availabilities were computed hour by hour for the entire data base period of 1958 thru 1962. The monthly and seasonal mean daily values were obtained by summing and averaging these hourly values in the obvious manner. It is believed that performing the calculations on an hourly basis is reasonably reliable. Of course, the end results cannot be any more reliable than the total-horizontal readings which comprise the input data.

The fixed surface orientations for which solar energy availabilities were calculated are as follows. Tilt angles were varied in 15 degree increments from minus 90 degrees (North facing wall) thru zero degrees (horizontal surface) to plus 90 degrees (South facing wall). For each of these tilt angles, the surface azimuth was varied in 15 degree increments from minus 90 degrees (East)

thru zero degrees (south) to plus 90 degrees (West). In all, a total of 169 surface orientations were used. For some extreme values of the tilt angle t and the wall azimuth angle γ, the surfaces are the same. For instance, an east wall is represented by both $(t,\gamma) = (+90, -90)$ and $(t,\gamma) = (-90, +90)$. Also, a horizontal surface is represented by all 13 pairs (t, γ) for which t = zero degrees.

Tabulations of solar energy availabilities to all of these fixed surfaces on a seasonal basis are included in Section VI. The tables have the heading "Fixed Surface," followed by the relevant tilt angle and azimuth angle. Availabilities of both direct radiation and of total radiation are listed, in the columns labeled "D" and "T," respectively. Although these same kind of tables were compiled on a monthly basis, only a few particular monthly means are included in this section of this report. The complete tabulations are quite voluminous. Interested readers may contact the authors for more information regarding availabilities by month. Information of special interest available in Section VI is presented below.

1. Monthly Availabilities of Total Radiation to Fixed Surfaces at Tilt of L + 20°, 45°, and 90° During Winter Season

Because of their importance, solar availabilities, on a monthly basis, to fixed surfaces during the winter heating season are studied. It is generally believed that the optimum orientation for a non-tracking, flat-plate collector which is to be used for winter heating is tilted upward toward the south at approximately L+20 degrees. The tables in Section VI generally support this rule of thumb. Of more importance is the fact that the amount of solar energy available to the collector is not extremely sensitive to changes in the tilt angle up to 20 degrees or so. This fact is displayed in Table 4.1; here, availabilities for all 26 sites are listed

for three different collector orientations for the principal winter heating months of November thru March. The three orientations used in Table 4.1 are tilts of L+20 degrees, 45 degrees, and 90 degrees, respectively, all facing due South. (The actual tilt angles used in the columns labeled "L+20" are rounded to the nearest 15-degree tilt; for example, the figures given for Albuquerque correspond to a 60-degree tilt rather than L+20 degrees = 55 degrees.) This table indicates that for south-facing surfaces, radiation available to a 45 degree tilted surface during the winter is generally only 5 percent less than that incident on a surface tilted at L+20 degrees. Table 4.1 also indicates that a south wall intercepts about 5 to 20 percent less radiation than a surface tilted to the south at L+20 degrees in the winter, depending on the location.

Because the radiation availabilities at 45 degree tilt and at L+20 degree tilt are so similar, only maps for a 45 degree tilt are presented here. Monthly maps for the winter months, November thru March, are given in Figures 4.1-4.3.

2. Seasonal Availabilities of Total Radiation to Fixed Surface at Tilt of 15°, 30°, and 45°.

For collecting the most energy on an annual basis, the best orientation for a flat-plate collector is generally thought to be facing south and tilted at L degrees, or slightly less. Table 4.2 lists seasonal and annual mean daily totals for the 26 sites for tilt angles of 15 degrees, 30 degrees, and 45 degrees. For convenience, station latitude are also listed. The annual figures in this table generally confirm the conventional knowledge just mentioned; tilt angles between L-20 and L degrees provide optimal year-around solar energy availability for flat-plate collectors.

The seasonal availabilities to south facing, 45 degree tilted surfaces are shown in maps of Figures 4.4-4.7. These figures also display the corresponding seasonal availabilities of total-horizontal radiation, for comparison purposes. Although the maps are somewhat similar in the spring and summer, significantly more radiation is available to the tilted surface in fall and winter. This points out how misleading maps of total-horizontal radiation can be.

This difference between total radiation availabilities at 45 degrees facing south and total radiation availabilities on a horizontal surface are presented in another form in Table 4.3. Here, a total radiation at a 45 degree tilt toward the south is expressed both as a fraction of total-horizontal and as a fraction of direct-normal solar radiation.

3. Seasonal Availability of Total Radiation on South, East, and West Walls

Table 4.4 gives mean daily availabilities of total radiation by season on east, south, and west vertical walls. Several interesting points are evident in this table. First of all, we see that for this data base, the availabilities to east and west walls are remarkably similar. This indicates that in every season on the average the reduction of solar energy by clouds is quite symmetric from morning to evening. Of course, on a daily basis asymmetry would be common.

Another interesting point in Table 4.4 is that the differences in incident solar radiation between south walls and east (or west) walls are strongly seasonally dependent. For example, south facing walls receive more than twice as much radiation as the east walls in the winter but only about 3/4 as much in the summer. This has an obvious interpretation for rectangular buildings. They should be oriented along east/west lines so as to decrease summer solar radiation gain through east and west walls while increasing solar gain through the south wall in the winter.

The only availabilities of solar radiation to vertical walls which were used to draw contour maps are those for south-facing vertical walls. The geographic distributions of total radiation available to south-facing vertical walls for the four seasons are presented in Figures 4.8 and 4.9.

4. Seasonal Availabilities of Diffuse Radiation on Horizontal Surface

Since the diffuse component is obtained by subtracting the direct-horizontal radiation from the total-horizontal, both relatively large and similar numbers, it is felt that individual differences in availability of diffuse radiation may not be too significant.

Table 4.5 gives the mean daily amounts of diffuse radiation on a horizontal surface by season. A very interesting point is that there is remarkably little difference in the amount of diffuse radiation available at the different locations in any given season; the range of values does not span a factor of 2 in any season. Perhaps even more interesting is the fact that the

values are so uniformly low, all below 2 kW hr/m^{-2}/day. Such low intensities of diffuse radiation as these daily totals imply are very difficult to capture and utilize. The intensities would not be great enough to overcome collector losses at any reasonable operating temperatures. In fact, these data suggests that systems utilizing active collectors would seldom operate on diffuse radiation alone. The diffuse component would only be of value when it is available along with direct radiation.

Of course, solar systems which do not need to operate at temperatures above 80 degrees Farenheit or so can utilize the diffuse component when there is no direct radiation. Examples are bioconversion systems, photovoltaic systems, and direct gain systems such as passive systems or solar greenhouses.

Although the amounts of diffuse radiation listed in Table 4.5 are so uniform and low, they were nevertheless used in the contour process in order to see if there are any trends of interest in the resulting geographic distribution contour maps. These maps are shown in Figures 4.10 and 4.11. The contour lines were drawn for multiples of 0.3 kW hr m^{-2}. The map for winter, Figure 4.11, indicates a "latitude effect" which suggests that there would probably be a little more diffuse energy available to a tilted collector. The maps for summer suggest a little more diffuse radiation in the eastern half of the U.S. than in the west. But, in general, these maps are quite inconclusive.

TABLE 4.1

MEAN DAILY AVAILABILITIES OF TOTAL RADIATION TO SURFACE TILTED UPWARD TOWARD THE SOUTH AT L +20°, 45°, and 90° FOR THE WINTER HEATING MONTHS: $kW \cdot hr \cdot m^{-2}$

	NOVEMBER			DECEMBER			JANUARY			FEBRUARY			MARCH		
	L + 20°	45°	90°	L + 20°	45°	90°	L + 20°	45°	90°	L + 20°	45°	90°	L + 20°	45°	90°
ALBUQUERQUE	6.2	6.2	5.3	5.8	5.7	5.2	6.3	6.1	5.4	6.3	6.4	5.1	6.4	6.9	4.4
APPALACHICOLA	5.4	5.4	4.3	4.7	4.7	4.0	4.8	4.8	4.0	5.4	5.4	4.0	5.3	5.3	3.3
BISMARCK	3.8	3.6	3.5	3.5	3.2	3.4	4.2	3.9	4.0	5.1	5.0	4.5	5.3	5.5	4.2
BLUE HILL	3.3	3.2	2.9	3.4	3.2	3.2	3.7	3.5	3.3	4.0	4.0	3.4	4.5	4.7	3.4
BOSTON	3.0	3.0	2.7	3.1	2.9	2.8	3.3	3.2	3.0	3.8	3.7	3.2	4.5	4.7	3.4
BROWNSVILLE	4.3	4.3	3.3	3.5	3.5	2.9	3.8	3.8	3.0	4.4	4.4	3.2	4.3	4.3	2.7
CAPE HATTERAS	4.9	4.9	4.2	4.6	4.5	4.1	5.1	5.0	4.3	4.9	5.0	3.9	5.3	5.7	3.7
CARIBOU	2.5	2.4	2.3	3.1	2.9	3.0	3.9	3.6	3.7	4.7	4.6	4.2	5.5	5.6	4.3
CHARLESTON	4.5	4.5	3.7	4.3	4.2	3.7	4.1	4.1	3.5	4.4	4.5	3.4	4.5	4.9	3.1
COLUMBIA	4.1	4.0	3.6	3.6	3.5	3.3	4.0	3.9	3.6	4.3	4.3	3.5	4.2	4.4	3.1
DODGE CITY	5.5	5.4	4.8	4.9	4.7	4.5	5.7	5.5	5.1	4.7	4.7	3.9	5.2	5.5	3.7
EL PASO	6.1	6.1	5.0	5.8	5.8	5.1	6.1	6.1	5.2	6.9	6.9	5.2	7.3	7.3	4.4
ELY	5.7	5.6	5.0	5.5	5.2	5.0	5.4	5.2	4.8	5.2	5.3	4.3	6.2	6.5	4.5
FORT WORTH	4.7	4.7	3.9	4.2	4.1	3.6	4.8	4.8	4.1	4.7	4.9	3.8	4.9	5.3	3.4
GREAT FALLS	3.2	3.0	2.9	2.6	2.4	2.5	3.0	2.8	2.8	4.2	4.1	3.7	5.2	5.3	4.1
LAKE CHARLES	4.3	4.3	3.5	3.6	3.6	3.1	4.0	4.0	3.3	4.0	4.0	3.0	4.7	4.7	3.0
MADISON	3.4	3.3	3.1	3.8	3.5	3.5	4.0	3.8	3.6	4.9	4.8	4.2	5.3	5.5	4.1
MEDFORD	2.8	2.7	2.5	1.8	1.7	1.6	2.1	2.0	1.8	3.1	3.1	2.6	4.2	4.4	3.2
MIAMI	5.3	5.3	4.1	5.3	5.3	4.4	5.2	5.2	4.1	6.0	6.0	4.3	5.5	5.5	3.2
NASHVILLE	3.8	3.7	3.2	3.2	3.1	2.8	3.3	3.2	2.9	3.8	3.9	3.1	3.9	4.1	2.8
NEW YORK	2.9	2.9	2.6	3.0	2.8	2.7	3.1	3.0	2.8	3.6	3.6	3.1	4.4	4.6	3.3
OMAHA	4.1	4.0	3.6	3.8	3.7	3.6	4.6	4.4	4.1	4.9	4.9	4.1	5.0	5.2	3.7
PHOENIX	5.7	5.7	4.7	5.2	5.1	4.5	5.7	5.7	4.9	6.1	6.2	4.7	6.4	6.9	4.3
SANTA MARIA	5.6	5.6	4.7	5.2	5.0	4.5	5.3	5.2	4.6	4.9	5.0	3.9	6.1	6.5	4.3
SEATTLE	2.2	2.2	2.1	1.5	1.4	1.4	1.8	1.7	1.7	2.4	2.4	2.1	3.8	3.9	3.0
WASHINGTON,DC	3.8	3.7	3.3	3.7	3.6	3.4	3.9	3.7	3.4	4.2	4.2	3.5	4.7	5.0	3.5

TABLE 4.2

MEAN DAILY AVAILABILITIES OF TOTAL RADIATION TO SOUTH FACING SURFACE TILTED UPWARD FROM HORIZONTAL AT 15, 30, and 45°; $kW \cdot hr \cdot m^{-2}$

	Latitude	SPRING (M,A,M)			SUMMER (J,J,A)			FALL (S,O,N)			WINTER (D,J,F)			ANNUAL		
		15	30	45	15	30	45	15	30	45	15	30	45	15	30	45
ALBUQUERQUE	35.1	7.5	7.4	6.9	8.1	7.6	6.7	5.9	6.5	6.6	4.8	5.6	6.1	6.6	6.8	6.6
APPALACHICOLA	29.7	6.2	6.0	5.5	6.3	5.8	5.1	5.3	5.6	5.6	4.2	4.7	5.0	5.5	5.5	5.3
BISMARCK	46.8	5.7	5.9	5.8	7.0	6.9	6.4	4.0	4.5	4.8	2.9	3.6	4.0	4.9	5.2	5.3
BLUE HILL	42.2	5.0	5.0	4.8	5.5	5.3	4.9	3.5	3.9	4.0	2.7	3.3	3.6	4.2	4.4	4.3
BOSTON	42.4	4.9	5.0	4.8	5.7	5.5	5.0	3.4	3.8	3.9	2.5	3.0	3.3	4.1	4.3	4.3
BROWNSVILLE	25.9	5.3	5.1	4.6	6.5	5.9	5.1	4.7	4.8	4.8	3.5	3.8	3.9	5.0	4.9	4.6
CAPE HATTERAS	35.3	6.7	6.6	6.1	7.0	6.6	5.9	5.0	5.4	5.5	3.9	4.5	4.8	5.7	5.8	5.6
CAPIBOU	46.9	5.2	5.4	5.3	5.7	5.6	5.2	2.9	3.3	3.4	2.7	3.3	3.7	4.1	4.4	4.4
CHARLESTON	32.9	5.8	5.7	5.3	5.8	5.5	4.8	4.6	4.9	5.0	3.6	4.0	4.3	5.0	5.0	4.9
COLUMBIA	39.0	5.3	5.3	5.0	6.5	6.3	5.7	4.2	4.6	4.8	3.1	3.6	3.9	4.8	5.0	4.9
DODGE CITY	37.8	6.1	6.1	5.7	7.0	6.7	6.0	5.1	5.6	5.8	3.8	4.6	5.0	5.5	5.8	5.6
EL PASO	31.8	7.9	7.7	7.1	7.8	7.2	6.3	5.9	6.4	6.5	5.1	5.9	6.3	6.7	6.8	6.6
ELY	39.3	7.0	7.0	6.6	7.7	7.3	6.5	5.6	6.1	6.4	4.0	4.8	5.2	6.1	6.3	6.2
FORT WORTH	32.8	5.8	5.7	5.3	6.7	6.3	5.6	4.9	5.2	5.2	3.8	4.3	4.6	5.3	5.4	5.2
GREAT FALLS	47.5	5.4	5.5	5.4	6.8	6.7	6.2	3.6	4.0	4.3	2.3	2.8	3.1	4.5	4.8	4.8
LAKE CHARLES	30.1	5.5	5.4	4.9	5.6	5.2	4.6	4.5	4.7	4.7	3.4	3.7	3.9	4.8	4.8	4.5
MADISON	43.1	5.7	5.8	5.6	7.0	6.8	6.2	3.7	4.2	4.3	3.0	3.6	4.0	4.9	5.1	5.0
MEDFORD	42.4	5.5	5.5	5.3	7.7	7.4	6.7	3.9	4.3	4.4	1.9	2.1	2.3	4.8	4.8	4.7
MIAMI	25.8	6.1	5.9	5.3	5.9	5.4	4.7	5.1	5.4	5.3	4.8	5.3	5.5	5.5	5.5	5.2
NASHVILLE	36.1	5.2	5.1	4.8	6.0	5.7	5.1	4.2	4.5	4.5	2.8	3.2	3.4	4.6	4.6	4.5
NEW YORK	40.8	4.8	4.8	4.6	5.3	5.1	4.7	3.7	4.0	4.1	2.5	2.9	3.2	4.1	4.2	4.2
OMAHA	41.4	5.5	5.6	5.3	6.5	6.2	5.7	4.2	4.6	4.8	3.3	3.9	4.3	4.9	5.1	5.0
PHOENIX	33.4	7.7	7.5	6.9	7.5	7.0	6.1	5.7	6.1	6.1	4.6	5.3	5.6	6.4	6.5	6.2
SANTA MARIA	34.9	7.2	7.2	6.7	7.8	7.3	6.5	5.6	6.1	6.2	4.1	4.7	5.1	6.2	6.3	6.1
SEATTLE	47.5	4.7	4.8	4.7	6.5	6.4	5.9	2.9	3.2	3.3	1.4	1.7	1.8	3.9	4.0	3.9
WASHINGTON, DC	39.0	5.3	5.3	5.1	6.0	5.7	5.2	4.0	4.4	4.5	3.0	3.5	3.8	4.6	4.7	4.7

TABLE 4.3

TOTAL RADIATION ON A SOUTH-FACING, 45 DEGREE TILTED SURFACE EXPRESSED AS A FRACTION OF TOTAL-HORIZONTAL AND AS A FRACTION OF DIRECT-NORMAL

LOCATION	SPRING		SUMMER		FALL		WINTER		ANNUAL	
	Fraction of TH	Fraction of DN	Fraction of TH	Fraction of DN	Fraction of TH	Fraction of DN	Fraction of TH	Fraction of DN	Fraction of TH	Fraction of DN
ALBUQUERQUE	.97	.78	.82	.71	1.29	.89	1.61	.94	1.08	.81
APPALACHIOCOLA	.92	.86	.85	.80	1.19	.95	1.43	1.04	1.02	.90
BISMARK	1.12	.85	.94	.75	1.50	.89	2.00	.91	1.23	.84
BLUE HILL	1.04	.92	.91	.92	1.33	.98	1.71	1.00	1.13	.93
BOSTON	1.04	.92	.89	.89	1.34	1.00	1.74	1.03	1.13	.96
BROWNSVILLE	.88	.94	.77	.75	1.12	1.02	1.30	1.15	.96	.92
CAPE HATTERAS	.95	.85	.84	.78	1.28	.93	1.55	1.00	1.08	.88
CARIBOU	1.10	.90	.95	.87	1.36	1.00	1.95	.95	1.19	.92
CHARLESTON	.95	.90	.83	.87	1.22	1.02	1.48	1.05	1.07	.96
COLUMBIA	1.00	.91	.88	.81	1.33	.96	1.63	1.03	1.11	.92
DODGE CITY	.98	.84	.86	.76	1.35	.89	1.72	.94	1.12	.85
EL PASO	.93	.75	.80	.70	1.27	.89	1.54	.94	1.06	.81
ELY	1.02	.80	.86	.71	1.39	.88	1.68	.95	1.13	.83
FORT WORTH	.95	.88	.82	.77	1.24	.95	1.48	1.02	1.06	.90
GREAT FALLS	1.10	.90	.94	.78	1.48	.98	1.82	1.00	1.20	.89
LAKE CHARLES	.91	.91	.81	.84	1.18	1.02	1.39	1.11	1.00	.94
MADISON	1.06	.89	.91	.81	1.39	.93	1.82	.95	1.14	.88
MEDFORD	1.02	.95	.89	.75	1.29	.98	1.44	1.28	1.07	.90
MIAMI	.88	.85	.77	.80	1.15	.98	1.34	1.00	1.00	.90
NASHVILLE	.96	.92	.85	.88	1.25	1.00	1.48	1.06	1.07	.96
NEW YORK	1.02	.98	.90	.98	1.32	1.03	1.60	1.07	1.14	1.02
OMAHA	1.02	.87	.89	.79	1.37	.94	1.72	.96	1.14	.88
PHOENIX	.95	.76	.80	.72	1.24	.91	1.51	.97	1.05	.83
SANTA MARIA	.97	.82	.83	.76	1.29	.94	1.55	1.00	1.07	.86
SEATTLE	1.07	.98	.94	.80	1.38	1.03	1.64	1.20	1.08	.93
WASHINGTON, DC	1.02	.94	.88	.90	1.29	1.00	1.58	1.00	1.12	.96

TABLE 4.4

MEAN DAILY AVAILABILITIES OF TOTAL RADIATION ON SOUTH, EAST, AND WEST WALLS BY SEASON; $kW \cdot hr \cdot m^{-2}$

	SPRING (M,A,M)			SUMMER (J,J,A)			FALL (S,O,N)			WINTER (D,J,F)		
	South	East	West	South	East	West	South	East	West	South	East	West
ALBUQUERQUE	3.4	3.5	3.9	2.3	3.5	4.1	4.8	2.7	2.9	5.2	2.2	2.2
APPALACHIOCOLA	2.6	2.9	2.9	1.8	2.9	3.1	3.8	2.4	2.5	4.0	2.0	1.9
BISMARK	3.6	3.0	3.2	3.1	3.7	3.8	4.0	2.0	2.2	3.9	1.4	1.4
BLUE HILL	2.8	2.5	2.7	2.4	2.8	2.8	3.1	1.8	1.9	3.3	1.4	1.4
BOSTON	2.8	2.5	2.7	2.4	2.9	3.0	3.0	1.7	1.8	3.0	1.3	1.2
BROWNSVILLE	2.2	2.7	2.7	1.7	3.1	3.3	3.1	2.2	2.6	3.0	1.7	1.8
CAPE HATTERAS	3.1	3.3	3.1	2.2	3.4	3.4	4.0	2.4	2.4	4.1	1.8	1.8
CARIBOU	3.4	2.7	3.0	2.7	3.0	3.0	2.8	1.6	1.6	3.6	1.3	1.4
CHARLESTON	2.7	2.7	2.9	2.0	2.7	3.0	3.5	2.1	2.3	3.5	1.6	1.7
COLUMBIA	2.8	2.7	2.7	2.5	3.4	3.2	3.6	2.1	2.0	3.5	1.5	1.4
DODGE CITY	3.1	3.1	3.0	2.5	3.5	3.3	4.4	2.5	2.4	4.5	1.9	1.8
EL PASO	3.2	3.6	3.9	1.9	3.4	3.8	4.5	2.7	2.9	5.2	2.3	2.4
ELY	3.6	3.3	3.8	2.6	3.5	4.3	4.8	2.6	2.8	4.7	1.8	1.9
FORT WORTH	2.7	3.0	2.8	2.0	3.3	3.3	3.7	2.4	2.3	3.8	1.8	1.8
GREAT FALLS	3.5	2.7	3.0	3.1	3.3	3.7	3.5	1.7	1.9	3.0	1.1	1.1
LAKE CHARLES	2.5	2.8	2.9	1.8	2.8	3.2	3.2	2.2	2.4	3.1	1.7	1.6
MADISON	3.3	3.0	3.1	2.9	3.5	3.6	3.4	1.9	2.0	3.7	1.5	1.5
MEDFORD	3.1	2.8	2.7	2.8	3.7	3.6	3.3	2.0	1.8	2.0	1.1	0.9
MIAMI	2.4	2.9	3.1	1.6	2.7	3.2	3.5	2.4	2.6	4.3	2.3	2.4
NASHVILLE	2.6	2.6	2.7	2.2	3.0	3.1	3.3	2.0	2.1	2.9	1.4	1.4
NEW YORK	2.7	2.4	2.5	2.3	2.7	2.6	3.1	1.7	1.8	2.9	1.3	1.1
OMAHA	3.0	2.9	3.0	2.6	3.5	3.3	3.7	2.1	2.1	3.9	1.6	1.6
PHOENIX	3.2	3.5	3.7	2.0	3.5	3.5	4.3	2.5	2.6	4.7	2.1	2.0
SANTA MARIA	3.3	3.6	3.1	2.3	4.0	2.7	4.4	2.7	2.2	4.4	1.8	1.8
SEATTLE	3.0	2.7	2.4	3.0	3.8	3.1	2.7	1.8	1.5	1.7	0.8	0.8
WASHINGTON, DC	2.9	2.6	2.7	2.4	3.0	2.9	3.4	2.0	1.9	3.4	1.5	1.4

TABLE 4.5

MEAN DAILY AVAILABILITIES OF DIFFUSE RADIATION ON A HORIZONTAL SURFACE BY SEASON; $kW \cdot hr \cdot m^{-2}$

	SPRING (M,A,M)	SUMMER (J,J,A)	FALL (S,O,N)	WINTER (D,J.F)
ALBUQUERQUE	1.5	1.5	1.1	0.9
APPALACHIOCOLA	1.6	1.7	1.2	1.1
BISMARK	1.5	1.6	0.9	0.7
BLUE HILL	1.5	1.8	1.0	0.7
BOSTON	1.5	1.8	1.0	0.7
BROWNSVILLE	1.8	1.7	1.5	1.2
CAPE HATTERAS	1.6	1.6	1.2	0.9
CARIBOU	1.5	1.7	0.9	0.7
CHARLESTON	1.6	1.8	1.2	1.0
COLUMBIA	1.5	1.7	1.1	0.8
DODGE CITY	1.5	1.5	1.0	0.8
EL PASO	1.4	1.4	1.1	1.0
ELY	1.5	1.6	1.0	0.9
FORT WORTH	1.6	1.6	1.2	1.0
GREAT FALLS	1.5	1.6	0.9	0.7
LAKE CHARLES	1.7	1.9	1.4	1.1
MADISON	1.6	1.7	1.0	0.8
MEDFORD	1.6	1.4	1.1	0.8
MIAMI	1.7	1.8	1.4	1.3
NASHVILLE	1.5	1.8	1.2	0.9
NEW YORK	1.5	1.8	1.0	0.8
OMAHA	1.5	1.7	1.0	0.8
PHOENIX	1.s	1.5	1.1	1.0
SANTA MARIA	1.5	1.5	1.1	0.9
SEATTLE	1.6	1.7	1.0	0.6
WASHINGTON, DC	1.5	1.8	1.1	0.8
RANGE	1.3-1.8	1.4-1.9	0.9-1.5	0.7-1.3

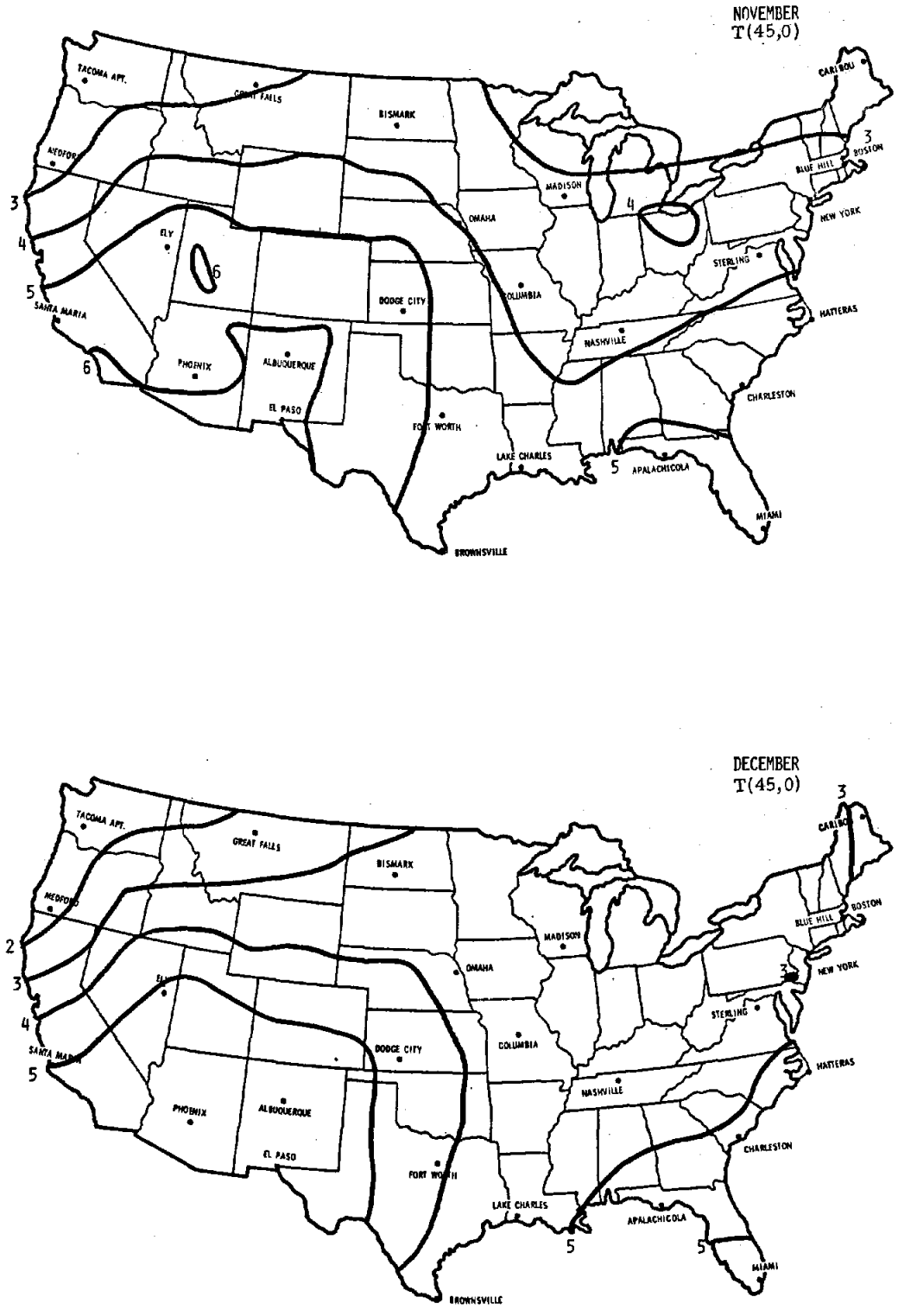


FIGURE 4.1 MEAN DAILY TOTAL SOLAR RADIATION ON A SURFACE TILTED UPWARD TOWARD THE SOUTH AT 45° IN NOVEMBER (TOP) AND DECEMBER (BOTTOM); $kW \cdot HR \cdot M^{-2}$

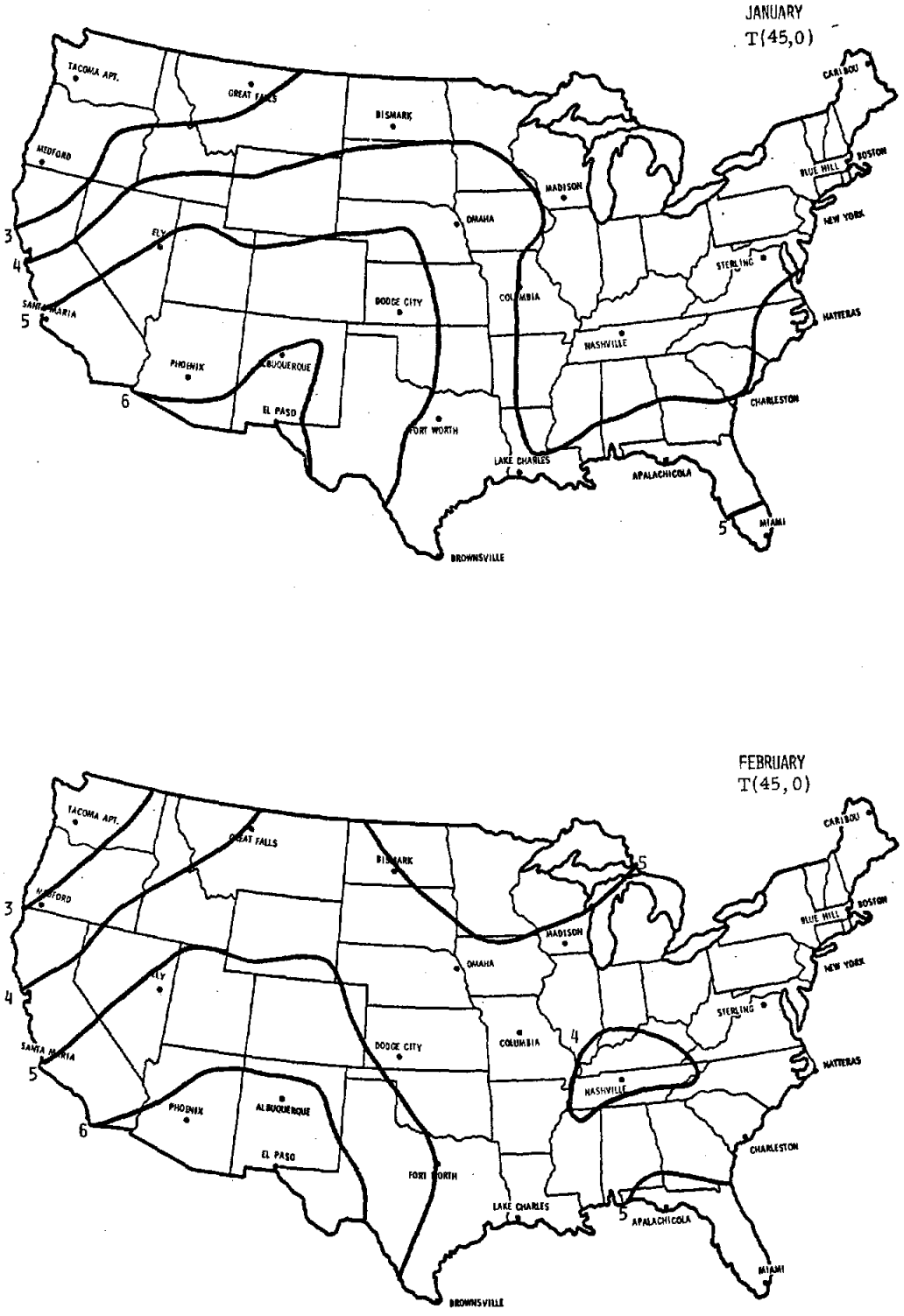


FIGURE 4.2 MEAN DAILY TOTAL SOLAR RADIATION ON A SURFACE TILTED UPWARD TOWARD THE SOUTH AT 45° IN JANUARY (TOP) AND FEBRUARY (BOTTOM); $kW \cdot HR \cdot M^{-2}$

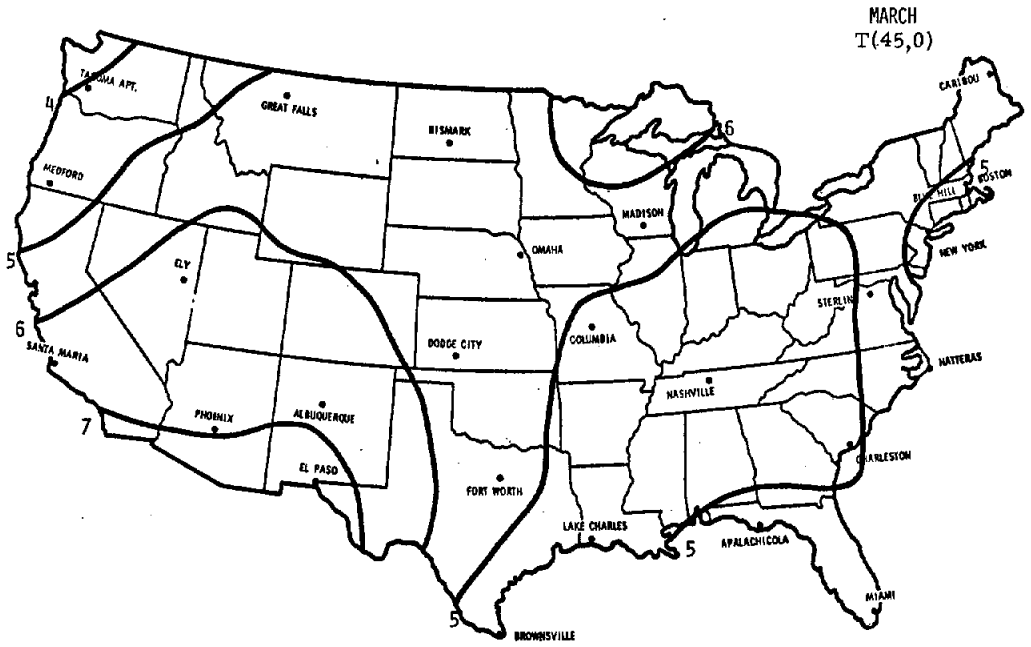


FIGURE 4.3 MEAN DAILY TOTAL SOLAR RADIATION ON A SURFACE TILTED UPWARD TOWARD THE SOUTH AT 45° IN MARCH; $kW \cdot hr \cdot m^{-2}$

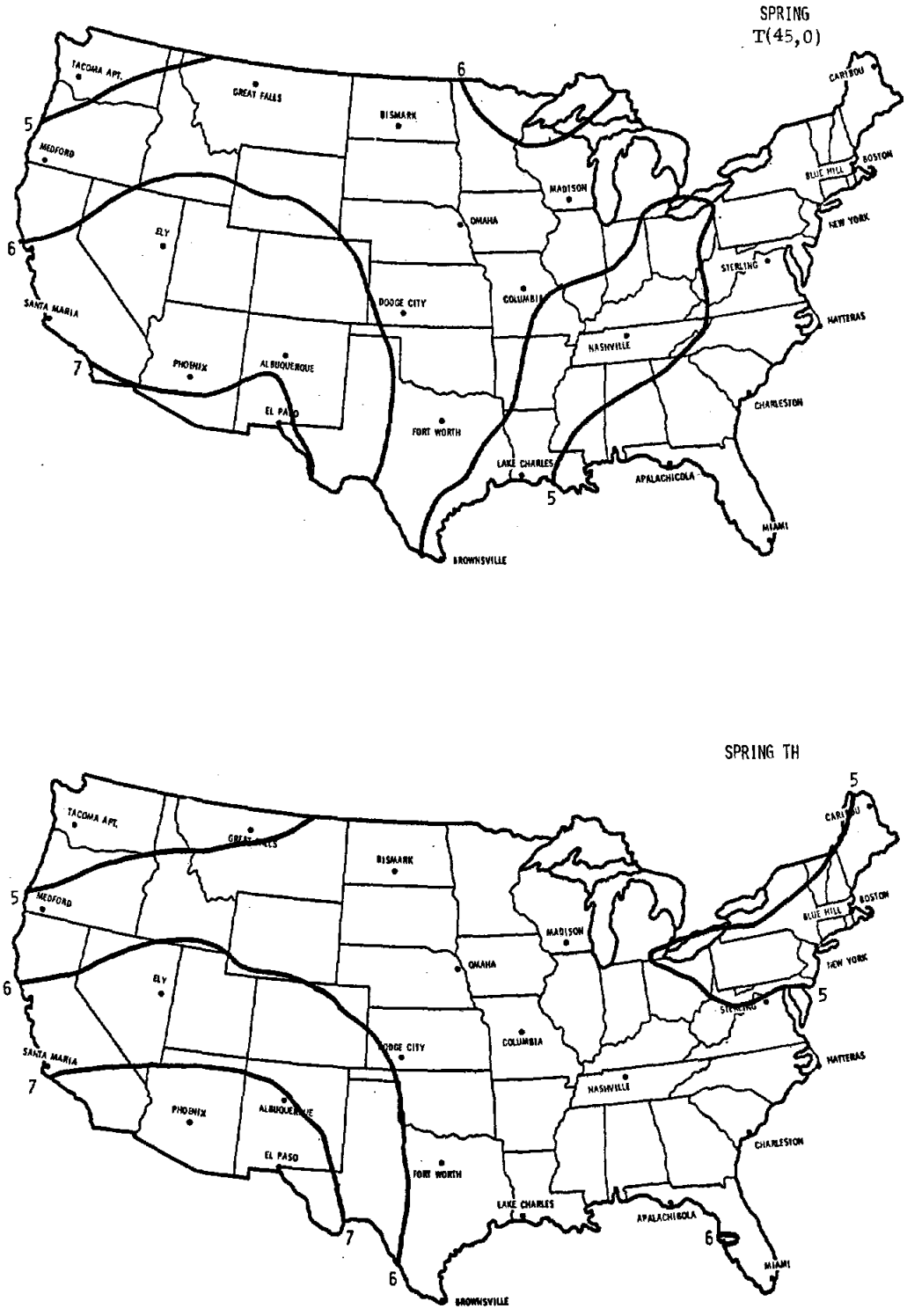


FIGURE 4.4 MEAN DAILY TOTAL SOLAR RADIATION ON A SURFACE TILTED UPWARD TOWARD THE SOUTH AT 45^{o} (TOP) AND MEAN DAILY TOTAL-HORIZONTAL RADIATION (BOTTOM) IN THE SPRING; $KW \cdot HR \cdot M^{-2}$

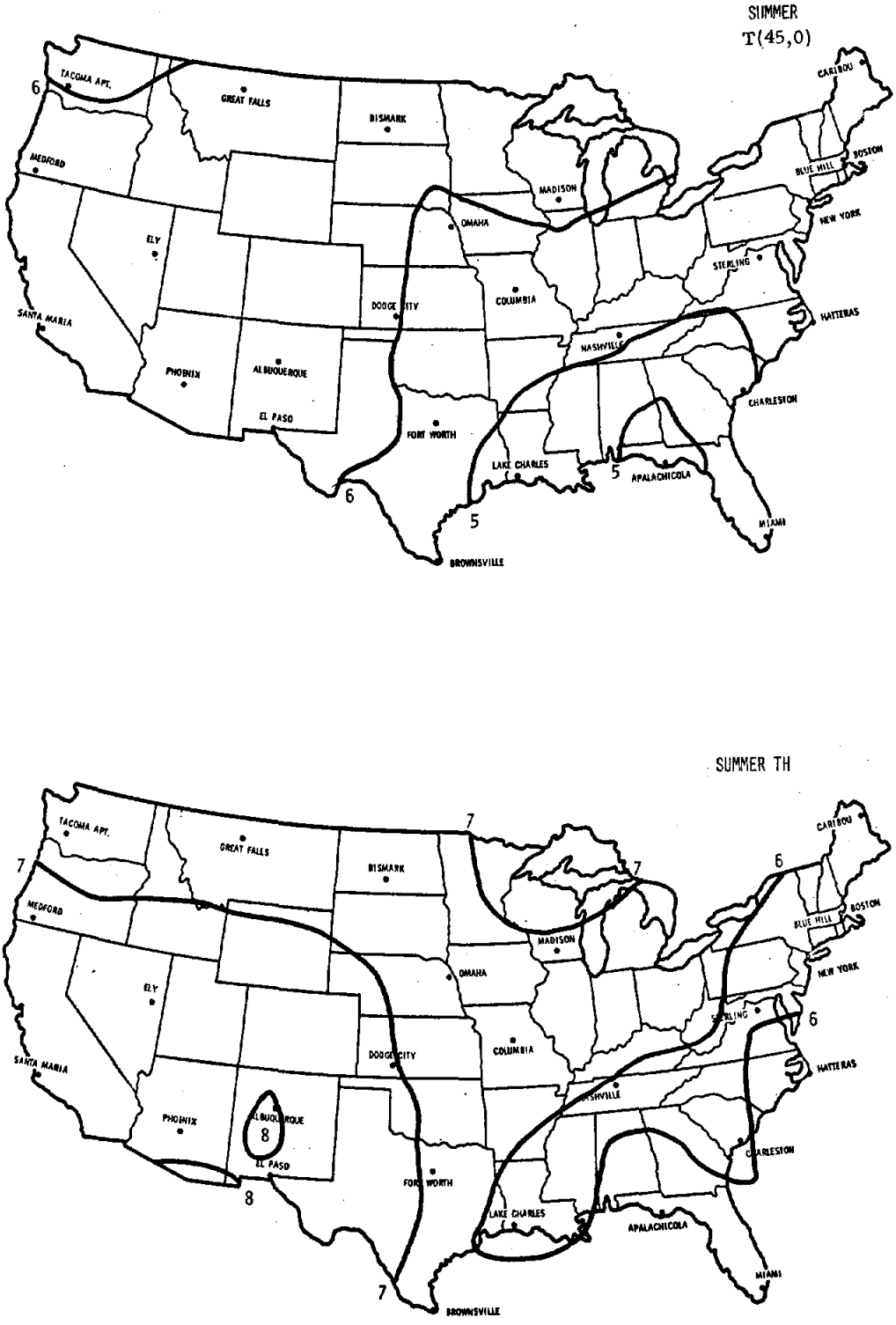


FIGURE 4.5 MEAN DAILY TOTAL SOLAR RADIATION ON A SURFACE TILTED UPWARD TOWARD THE SOUTH AT 45^{0} (TOP) AND MEAN DAILY TOTAL-HORIZONTAL RADIATION (BOTTOM) IN THE SUMMER; $KW \cdot HR \cdot M^{-2}$

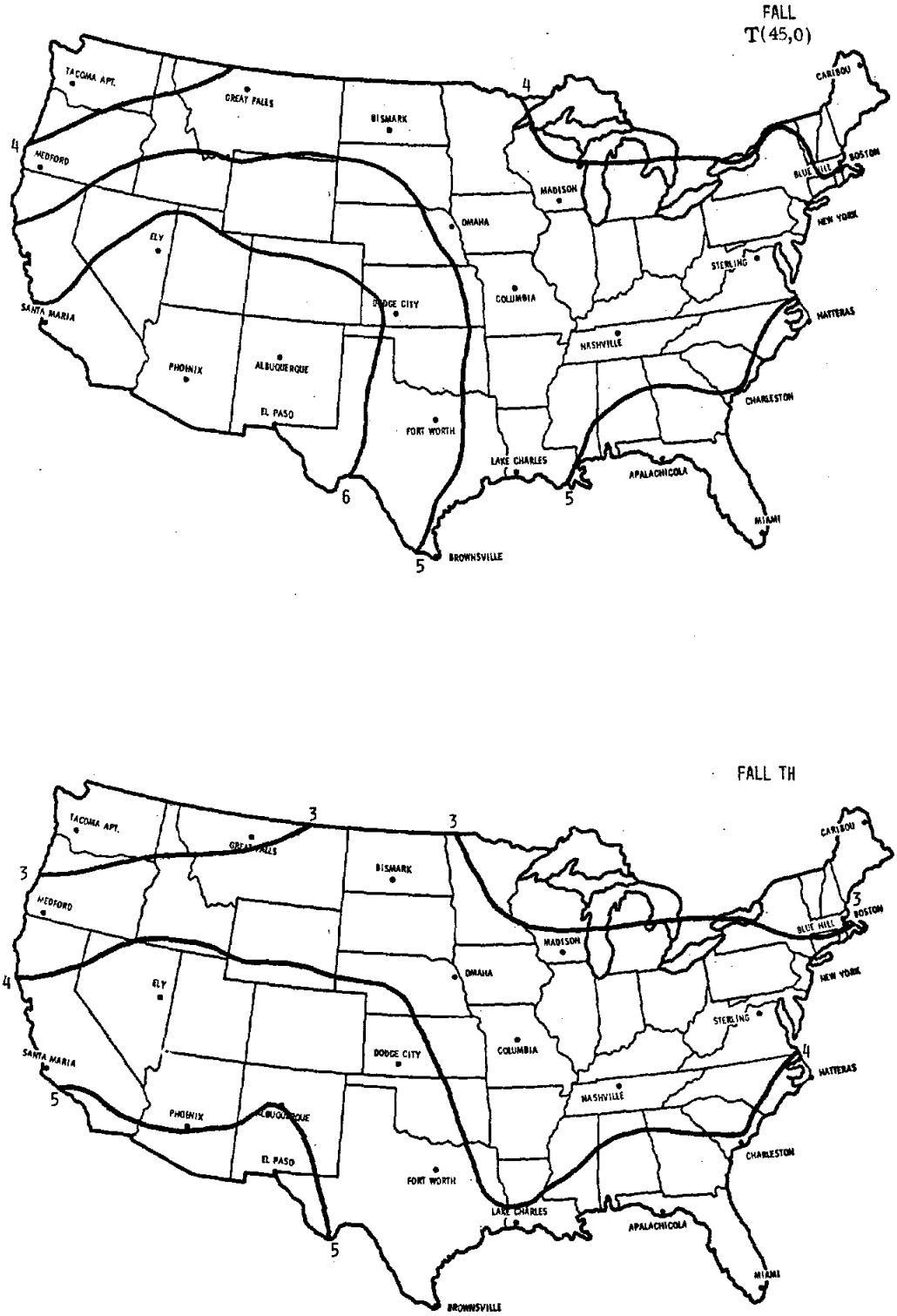


FIGURE 4.6 MEAN DAILY TOTAL SOLAR RADIATION ON A SURFACE TILTED UPWARD TOWARD THE SOUTH AT 45° (TOP) AND MEAN DAILY TOTAL-HORIZONTAL RADIATION (BOTTOM) IN THE FALL; $KW \cdot HR \cdot M^{-2}$

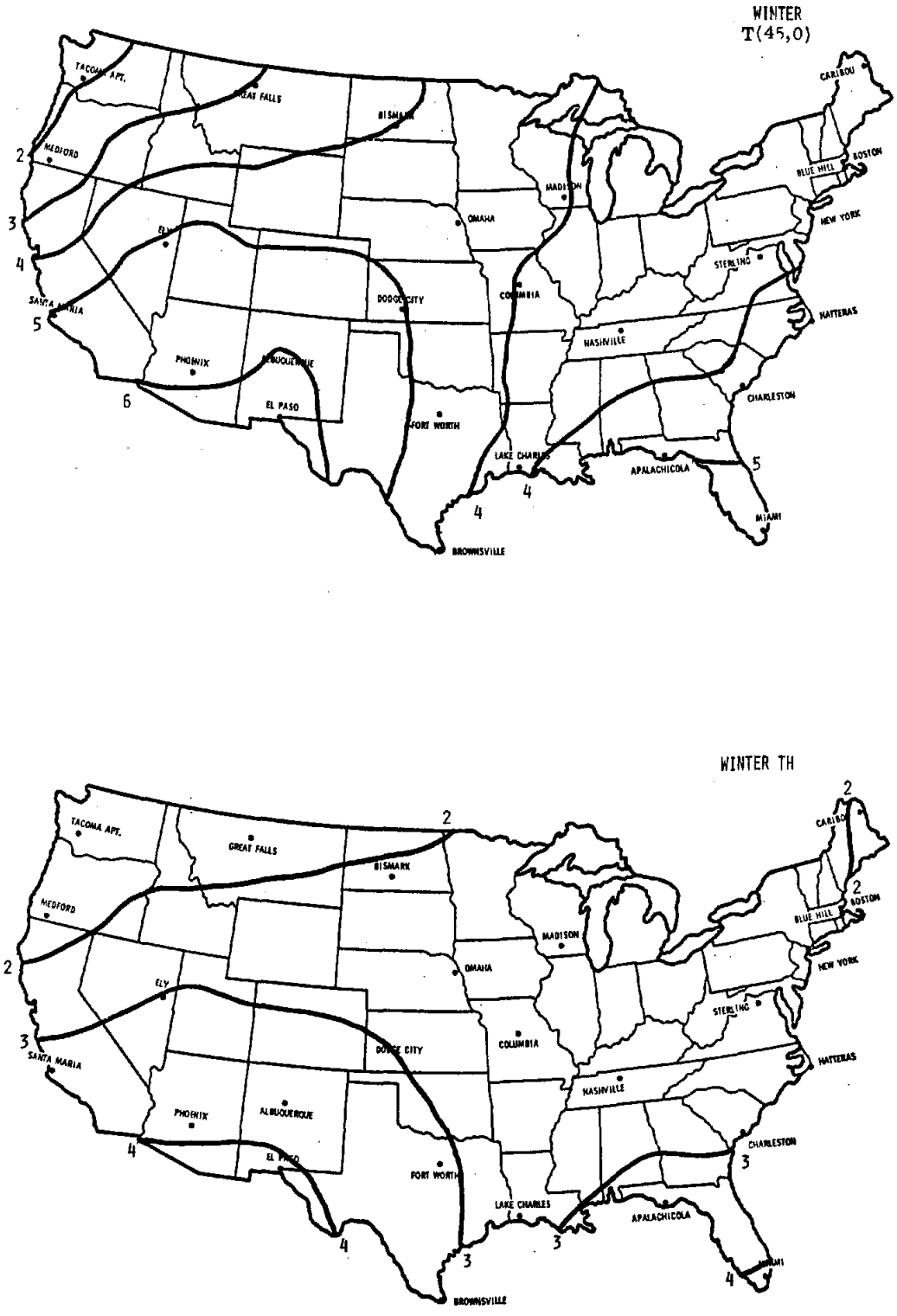


FIGURE 4.7 MEAN DAILY TOTAL SOLAR RADIATION ON A SURFACE TILTED UPWARD TOWARD THE SOUTH AT 45° (TOP) AND MEAN DAILY TOTAL-HORIZONTAL RADIATION (BOTTOM) IN THE WINTER: $kW \cdot HR \cdot M^{-2}$

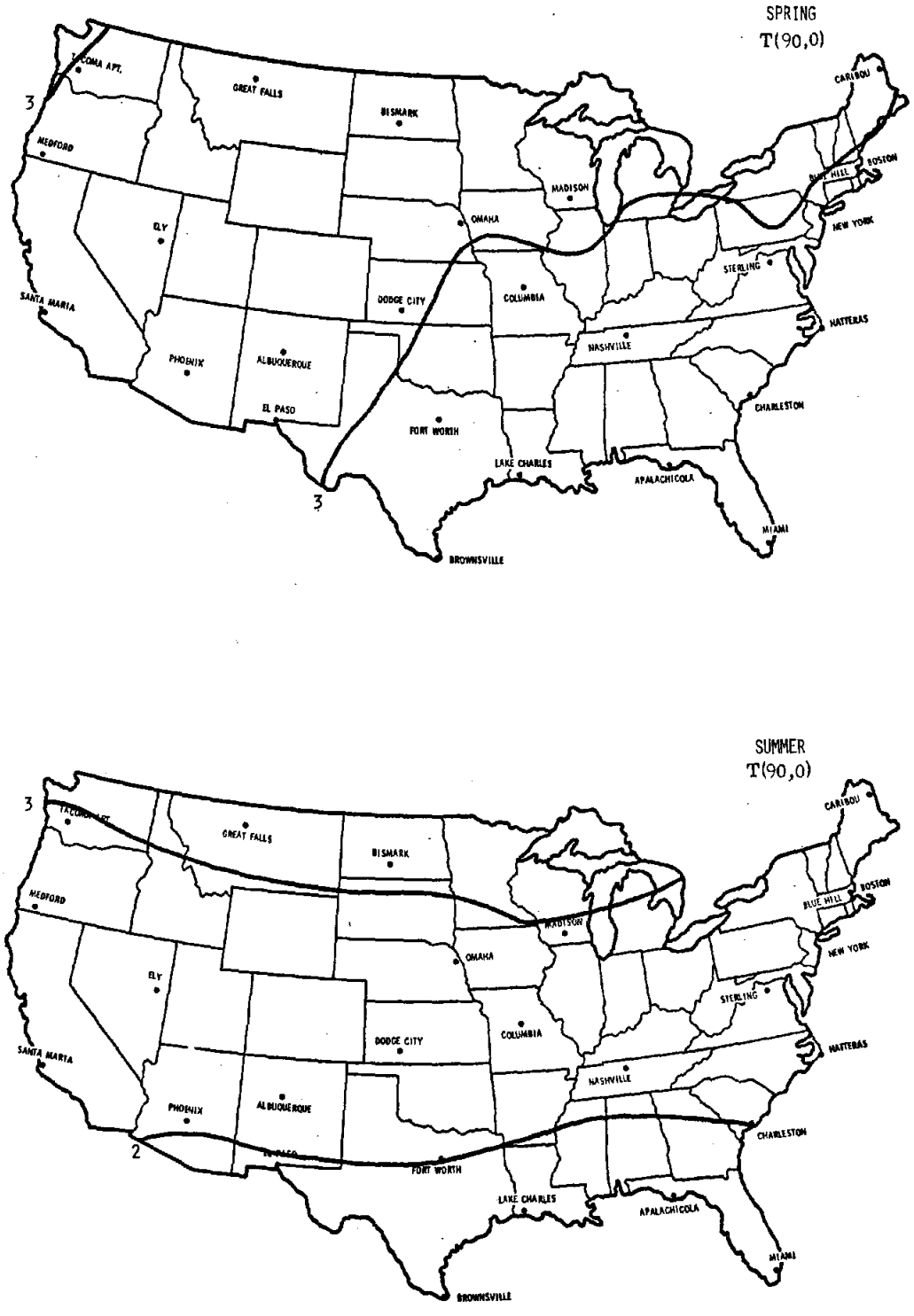


FIGURE 4.8 MEAN DAILY TOTAL SOLAR RADIATION ON A SOUTH-FACING VERTICAL SURFACE IN THE SPRING (TOP) AND SUMMER (BOTTOM); $kW \cdot HR \cdot M^{-2}$

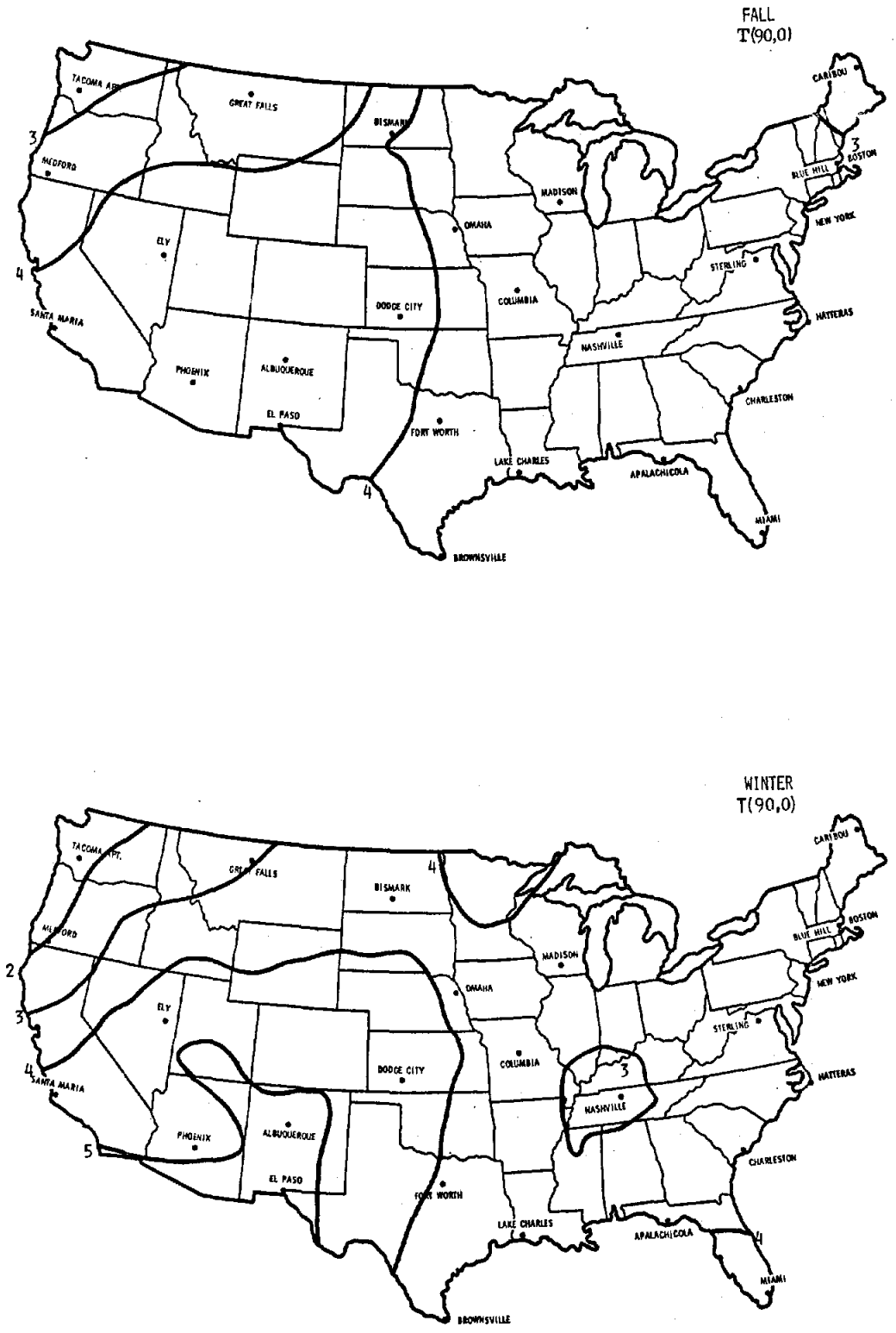
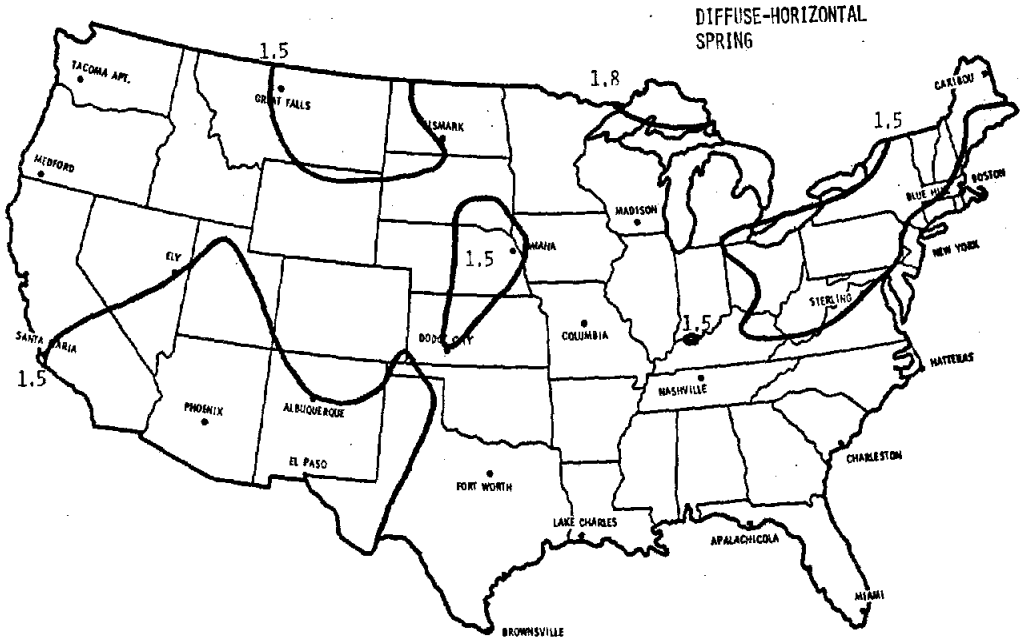


FIGURE 4.9 MEAN DAILY TOTAL SOLAR RADIATION ON A SOUTH-FACING VERTICAL SURFACE IN THE FALL (TOP) AND WINTER (BOTTOM); $kW \cdot HR \cdot M^{-2}$



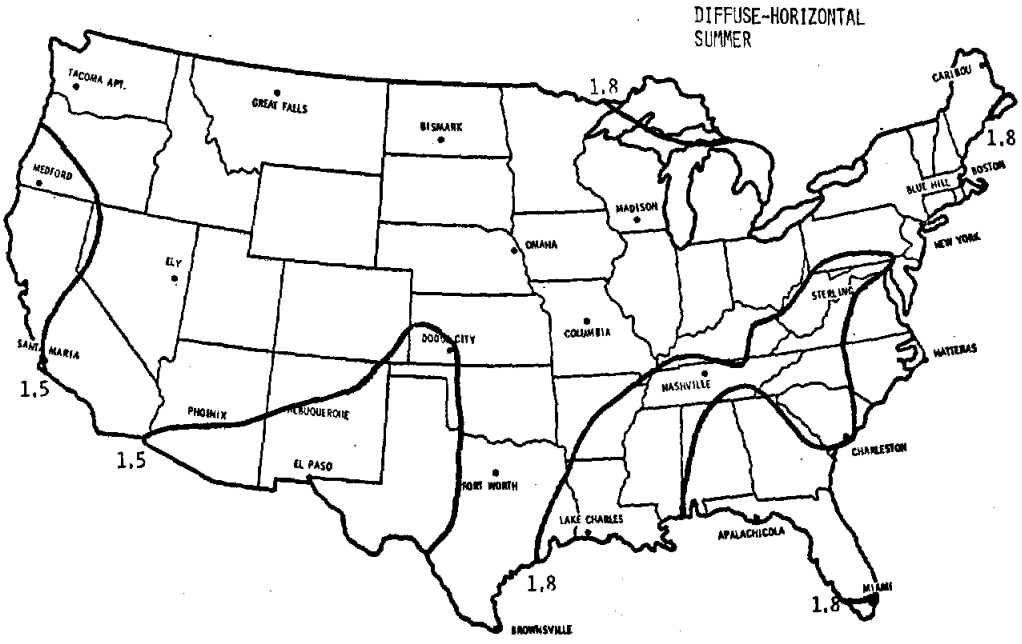
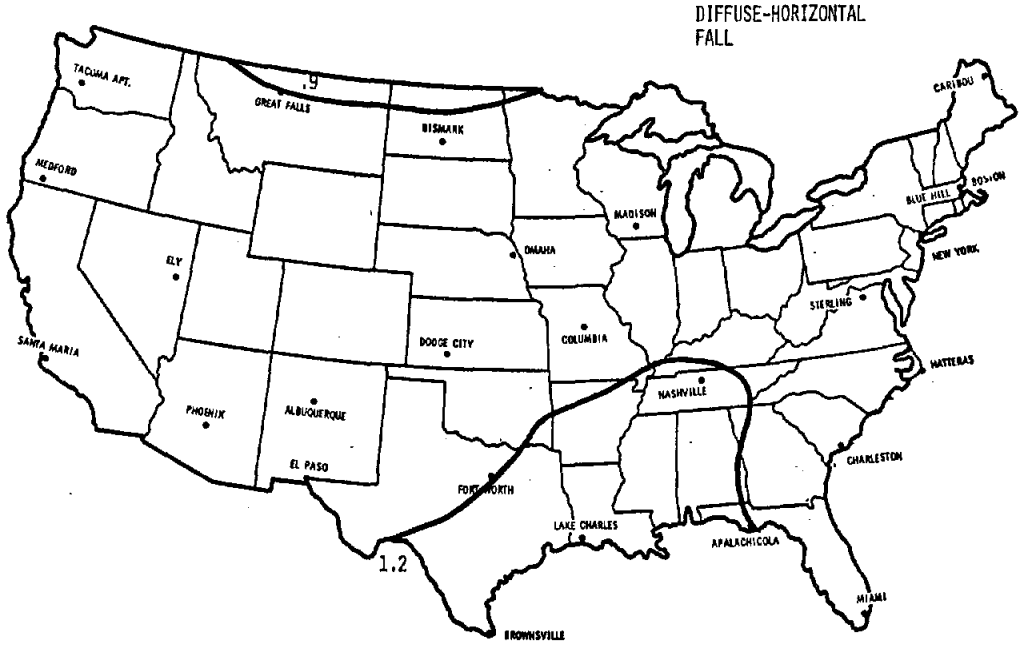


FIGURE 4.10 MEAN DAILY DIFFUSE SOLAR RADIATION ON A HORIZONTAL SURFACE IN THE SPRING (TOP) AND SUMMER (BOTTOM); $kW \cdot HR \cdot M^{-2}$



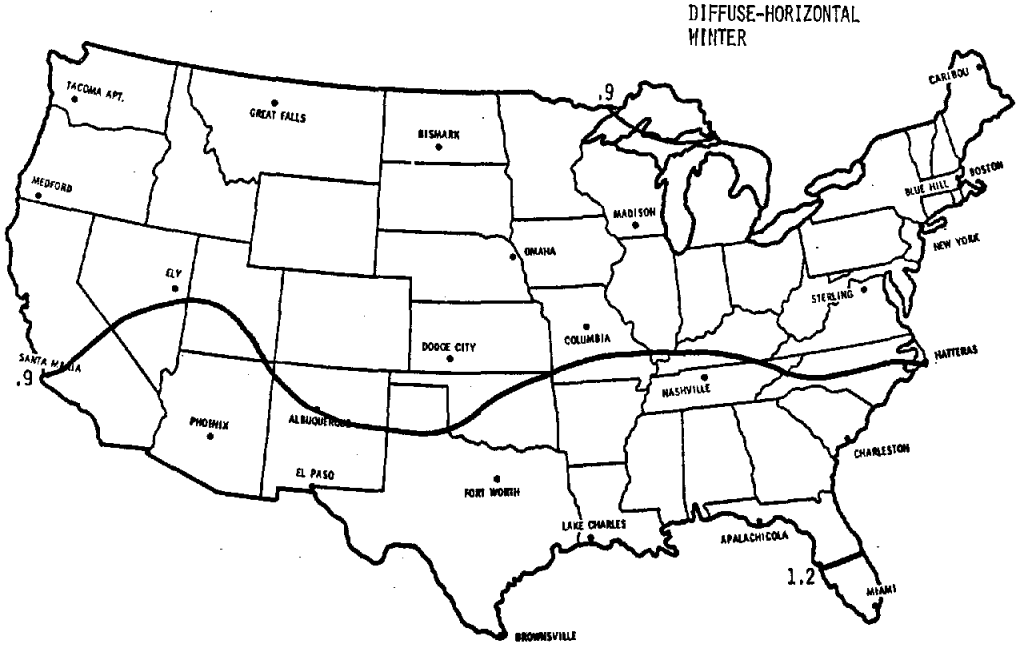


FIGURE 4.11 MEAN DAILY DIFFUSE SOLAR RADIATION ON A HORIZONTAL SURFACE IN THE FALL (TOP) AND WINTER (BOTTOM); $KW \cdot HR \cdot M^{-2}$

V. SUMMARY AND CONCLUSIONS

The primary importance of this report is that it gives a rather comprehensive description of the availabilities of solar energy to flat-plate and concentrating collectors in a wide variety of orientations and tracking schemes. Although these solar availabilities are not based on actual measurements recorded by instruments in these various orientations, they are all based on hourly conversions of hourly total-horizontal measurements, and such hour-by-hour calculations are probably fairly accurate.

Only a few of the principal conclusions regarding solar energy availability will be repeated in this final section. The principal conclusions are as follows:

1. There seems to be at least as much direct radiation available in every season across the U.S. as there is total radiation.

2. Selection of a tilt angle for a fixed flat-plate collector is not critically important; use of an angle which varies by 10 to 15 degrees from the optimal angle has only a slight affect on the amount of solar energy available to the surface.

3. The best tracking schemes for year-around solar energy collection for focusing collectors are the full-tracking scheme, the polar-mount tracking scheme, and the vertical axis tracking scheme with the collector tilted at L+15 degrees from horizontal.

4. There is generally very little diffuse solar energy available to a horizontal surface and hence little difference in the diffuse across the U.S.A.

5. South vertical walls intercept nearly as much solar energy during the winter as do optimally tilted surfaces.

6. For year-around energy collection, the optimal tilt angle for a flat-plate collector is approximately latitude minus 10 degrees upward from horizontal facing south.

Most of the shortcomings of this study are related to the data base used. The decision to perform all conversion computations on an hourly basis severely limited the number of sites for which input data was available. All available records of hourly measurements of total-horizontal radiation for the years 1958 to 1962 were obtained from the National Climatic Center. This provided data for only 29 sites, and reservations regarding data quality led to the decision to reduce the total number of locations included in the study to 26. The selection of the data base period was based upon the suggestions by NOAA that the National Weather Service data recorded during that period is perhaps the most reliable. Even for this period, data accuracy is probably no better than 20 percent, and station instrument histories which might have allowed an improvement in this accuracy level were not available.

Two serious difficulties resulting from these data base deficiencies deserve special mention. The first is rather obvious; the results of this study do not contain any information regarding solar energy availability variations on a microclimate scale. For example, the availability maps totally ignore local geographic features which might produce local differences in solar radiation patterns. Consequently, interpolation between isolines on these maps should only be done with caution.

The second drawback resulting from the input data accuracy deficiency has to do with comparison of solar energy availabilities at different sites in the data base. Obviously, these differences in availabilities can be no more accurate than the original data for the sites being compared. For this reason, small differences cannot be considered very significant.

In spite of these deficiencies in this study, the results are still worthwhile for several reasons. The most important reason, of course, is that this is the first study which employs a fairly large data base and produces estimates of solar energy availability to a rather comprehensive list of collector-types, collector-orientations, and tracking schemes.

Another advantage of this report is that, in one important aspect, the results do not strongly depend on input data quality. This is the aspect of relative amounts of radiation to different types of tracking schemes or relative amounts of solar energy available to different fixed flat-surfaces. For example, even though the availabilities to surfaces tilted at various angles

upward toward the south at a given location may all be in error (either too high or too low), the amounts given should be correct relative to each other. Of course, the same relative accuracy would hold for the different amounts of direct radiation available to different types of tracking collectors.

Although this study has been fairly comprehensive in scope, there is obviously a powerful need for a similar study in the future. This same work should be repeated when more accurate hourly total-horizontal measurements are available for a long period. Even more important, this study should be repeated when hourly measurements of both total-horizontal radiation and of direct-normal radiation become available. Unfortunately, hourly measurements of direct-normal radiation for any sort of extended time period will not be available for some time, because there will not be an extensive network of pyrheliometers installed for probably at least a year.

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2. E. Boes, "Solar Radiation Availability to Various Collector Geometrics: A Preliminary Study," Sandia Laboratories Report SAND76-0411.

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5. R. Jordan and B. Liu, "The Interrelationship and Characteristic Distribution of Direct, Diffuse, and Total Solar Radiation," Solar Energy, IV, p. 1, 1960.

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TRACKING SURFACE - DN AND TN

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	8.9	10.2	9.5	10.8	7.4	8.4	6.5	7.3
APPALACHICOLA	6.4	7.8	6.4	8.0	5.9	7.0	4.8	5.8
BISMARCK	6.8	8.1	8.5	10.0	5.4	6.2	4.4	4.9
BLUE HILL	5.2	6.5	5.3	7.0	4.1	5.0	3.6	4.2
BOSTON	5.2	6.5	5.6	7.3	3.9	4.8	3.2	3.8
BROWNSVILLE	4.9	6.6	6.8	8.4	4.7	6.1	3.4	4.5
CAPE HATTERAS	7.2	8.7	7.6	9.1	5.9	6.9	4.8	5.6
CARIBOU	5.9	7.2	6.0	7.6	3.4	4.3	3.9	4.5
CHARLESTON	5.9	7.3	5.5	7.2	4.9	6.0	4.1	4.9
COLUMBIA	5.5	6.9	7.0	8.5	5.0	5.9	3.8	4.5
DODGE CITY	6.8	8.1	7.9	9.4	6.5	7.4	5.3	6.0
EL PASO	9.5	10.7	9.0	10.3	7.3	8.3	6.7	7.5
ELY	8.2	9.6	9.1	10.6	7.3	8.1	5.5	6.2
FORT WORTH	6.0	7.5	7.3	8.8	5.5	6.6	4.5	5.4
GREAT FALLS	6.8	7.3	7.9	9.3	4.4	5.3	3.1	3.6
LAKE CHARLES	5.4	7.8	5.5	7.2	4.6	5.8	3.5	4.5
MADISON	6.3	7.8	7.7	9.3	4.6	5.4	4.2	4.8
MEDFORD	5.6	7.1	8.9	10.3	4.5	5.4	1.8	2.5
MIAMI	6.2	7.8	5.9	7.5	5.4	6.7	5.5	6.6
NASHVILLE	5.2	6.6	5.8	7.6	4.5	5.5	3.2	3.9
NEW YORK	4.7	6.1	4.8	6.5	4.0	4.9	3.0	3.6
OMAHA	6.1	7.5	7.2	8.7	5.1	6.0	4.5	5.1
PHOENIX	9.1	10.3	8.5	9.9	6.7	7.7	5.8	6.6
SANTA MARIA	8.2	9.6	8.5	9.9	6.6	7.6	5.1	5.9
SEATTLE	4.8	6.3	7.4	9.0	3.2	4.0	1.5	2.1
WASHINGTON,DC	5.4	6.8	5.8	7.5	4.5	5.5	3.8	4.5

TRACKING SURFACE - DEW AND TEW

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	6.3	7.8	7.0	8.5	5.7	6.7	5.4	6.2
APPALACHICOLA	4.8	6.3	4.8	6.5	4.6	5.7	4.8	5.0
BISMARCK	4.8	6.2	6.0	7.5	4.1	4.9	3.7	4.3
BLUE HILL	3.8	5.2	3.9	5.7	3.2	4.1	3.1	3.7
BOSTON	3.8	5.2	4.1	5.8	3.0	3.9	2.8	3.4
BROWNSVILLE	3.6	5.4	5.0	6.8	3.5	4.9	2.8	3.9
CAPE HATTERAS	5.3	6.9	5.6	7.2	4.6	5.6	4.1	4.9
CARIBOU	4.2	5.6	4.3	6.0	2.6	3.5	3.4	3.9
CHARLESTON	4.4	5.9	4.2	6.0	3.9	5.1	3.4	4.3
COLUMBIA	4.1	5.5	5.1	6.7	3.9	4.9	3.3	4.0
DODGE CITY	4.9	6.3	5.8	7.3	5.0	5.9	4.5	5.2
EL PASO	6.8	8.1	6.7	8.1	5.5	6.6	5.5	6.4
ELY	5.8	7.3	6.5	8.0	5.6	6.5	4.6	5.4
FORT WORTH	4.4	6.0	5.4	7.0	4.2	5.3	3.8	4.6
GREAT FALLS	4.3	5.8	5.7	7.2	3.5	4.4	2.7	3.3
LAKE CHARLES	4.0	5.7	4.0	5.9	3.5	4.8	2.9	3.9
MADISON	4.5	6.0	5.6	7.2	3.5	4.4	3.5	4.2
MEDFORD	4.2	5.7	6.5	7.9	3.5	4.5	1.6	2.3
MIAMI	4.6	6.2	4.4	6.2	4.1	5.5	4.4	5.6
NASHVILLE	3.8	5.3	4.4	6.2	3.5	4.6	2.7	3.5
NEW YORK	3.5	5.0	3.6	5.4	3.2	4.1	2.6	3.3
OMAHA	4.3	5.8	5.1	6.7	3.9	4.9	3.7	4.4
PHOENIX	6.6	7.9	6.3	7.8	5.2	6.3	4.9	5.7
SANTA MARIA	6.1	7.5	6.6	8.0	5.3	6.3	4.3	5.2
SEATTLE	3.5	5.0	5.3	7.0	2.5	3.4	1.3	1.9
WASHINGTON,DC	4.0	5.5	4.3	6.1	3.6	4.6	3.2	3.9

TRACKING SURFACE - DNSH AND TNSH

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	8.3	9.7	9.3	10.7	6.1	7.1	4.5	5.4
APPALACHICOLA	6.1	7.6	6.3	7.9	5.0	6.1	3.6	4.6
BISMARCK	6.0	7.4	8.0	9.5	4.0	4.9	2.5	3.1
BLUE HILL	4.7	6.1	5.1	6.8	3.2	4.1	2.3	2.9
BOSTON	4.7	6.1	5.4	7.1	3.0	4.0	2.0	2.7
BROWNSVILLE	4.7	6.4	6.7	8.4	4.1	5.6	2.7	3.8
CAPE HATTERAS	6.8	8.3	7.4	9.0	4.8	5.9	3.3	4.2
CARIBOU	5.2	6.6	5.7	7.2	2.6	3.4	2.2	2.9
CHARLESTON	5.6	7.0	5.4	7.1	4.1	5.2	2.9	3.8
COLUMBIA	5.1	6.5	6.8	8.3	3.9	4.9	2.5	3.3
DODGE CITY	6.3	7.7	7.7	9.1	5.2	6.1	3.5	4.2
EL PASO	9.0	10.3	8.9	10.2	6.1	7.2	4.9	5.8
ELY	7.6	9.0	8.9	10.4	5.8	6.7	3.6	4.4
FORT WORTH	5.7	7.2	7.2	8.7	4.6	5.7	3.2	4.1
GREAT FALLS	5.3	6.7	7.4	8.9	3.2	4.1	1.8	2.4
LAKE CHARLES	5.2	6.8	5.4	7.2	3.9	5.2	2.6	3.6
MADISON	5.7	7.2	7.4	9.0	3.5	4.4	2.6	3.2
MEDFORD	5.1	6.6	8.6	9.9	3.5	4.5	1.1	1.9
MIAMI	6.0	7.6	5.8	7.5	4.7	6.0	4.3	5.5
NASHVILLE	4.9	6.3	5.7	7.4	3.6	4.7	2.2	3.0
NEW YORK	4.3	5.7	4.6	6.3	3.1	4.1	1.9	2.6
OMAHA	5.6	7.1	6.9	8.5	4.0	5.0	2.9	3.6
PHOENIX	8.6	9.9	8.4	9.7	5.5	6.6	4.1	5.0
SANTA MARIA	7.7	9.1	8.4	9.7	5.4	6.4	3.5	4.4
SEATTLE	4.3	5.8	7.0	8.6	2.4	3.2	.9	1.5
WASHINGTON,DC	5.0	6.4	5.6	7.3	3.5	4.6	2.5	3.2

TRACKING SURFACE - DP AND TP

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	8.6	10.0	8.9	10.3	7.3	8.3	6.1	6.9
APPALACHICOLA	6.2	7.7	6.0	7.6	5.7	6.8	4.5	5.5
BISMARCK	6.6	7.9	8.0	9.4	5.3	6.1	4.1	4.7
BLUE HILL	5.0	6.4	5.0	6.6	4.0	4.9	3.4	4.0
BOSTON	5.0	6.4	5.3	6.9	3.8	4.7	3.0	3.6
BROWNSVILLE	4.7	6.4	6.4	8.0	4.6	6.0	3.2	4.3
CAPE HATTERAS	7.0	8.5	7.1	8.6	5.7	6.8	4.5	5.3
CARIBOU	5.7	7.0	5.7	7.2	3.4	4.2	3.7	4.3
CHARLESTON	5.7	7.2	5.2	6.9	4.8	5.9	3.8	4.7
COLUMBIA	5.3	6.7	6.6	8.2	4.9	5.9	3.6	4.3
DODGE CITY	6.6	8.0	7.5	8.9	6.3	7.2	5.0	5.7
EL PASO	9.2	10.5	8.5	9.8	7.1	8.1	6.3	7.2
ELY	7.9	9.3	8.6	10.1	7.1	8.0	5.2	6.0
FORT WORTH	5.9	7.4	6.9	8.4	5.4	6.5	4.3	5.2
GREAT FALLS	5.8	7.1	7.4	8.8	4.4	5.2	2.9	3.5
LAKE CHARLES	5.2	6.8	5.2	7.0	4.5	5.8	3.3	4.3
MADISON	6.1	7.6	7.2	8.7	4.5	5.4	3.9	4.6
MEDFORD	5.4	6.9	8.4	9.7	4.4	5.4	1.7	2.4
MIAMI	6.1	7.7	5.5	7.2	5.2	6.5	5.2	6.4
NASHVILLE	5.1	6.5	5.5	7.2	4.4	5.5	3.0	3.8
NEW YORK	4.6	6.0	4.5	6.1	3.9	4.8	2.8	3.5
OMAHA	5.9	7.3	6.8	8.4	5.0	5.9	4.2	4.9
PHOENIX	8.8	10.0	8.0	9.4	6.5	7.5	5.5	6.4
SANTA MARIA	8.0	9.4	8.0	9.4	6.5	7.5	4.8	5.6
SEATTLE	4.7	6.1	7.0	8.5	3.1	4.3	1.5	2.0
WASHINGTON,DC	5.3	6.7	5.4	7.1	4.4	5.4	3.6	4.3

TRACKING SURFACE - DVL AND TVL

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	8.2	9.6	8.9	10.3	6.7	7.8	5.6	6.5
APPALACHICOLA	5.9	7.4	5.9	7.5	5.2	6.4	4.1	5.2
BISMARCK	6.5	7.9	8.1	9.6	5.1	5.9	3.9	4.5
BLUE HILL	4.9	6.3	5.1	6.8	3.9	4.8	3.3	4.0
BOSTON	4.9	6.3	5.4	7.1	3.6	4.5	2.9	3.6
BROWNSVILLE	4.4	6.2	6.1	7.8	4.0	5.5	2.8	4.0
CAPE HATTERAS	6.8	8.3	7.1	8.6	5.3	6.4	4.2	5.1
CARIBOU	5.6	7.0	5.8	7.4	3.2	4.0	3.5	4.1
CHARLESTON	5.5	7.0	5.2	6.9	4.5	5.7	3.5	4.5
COLUMBIA	5.2	6.6	6.6	8.2	4.6	5.6	3.4	4.2
DODGE CITY	6.3	7.7	7.5	8.9	5.9	6.8	4.6	5.4
EL PASO	8.7	10.0	8.4	9.7	6.5	7.6	5.7	6.7
ELY	7.7	9.1	8.6	10.1	6.7	7.6	4.8	5.6
FORT WORTH	5.6	7.1	6.8	8.3	4.9	6.1	3.9	4.9
GREAT FALLS	5.7	7.1	7.5	9.0	4.2	5.0	2.8	3.4
LAKE CHARLES	4.9	6.5	5.0	6.8	4.0	5.4	3.0	4.1
MADISON	5.9	7.4	7.3	8.9	4.3	5.2	3.7	4.4
MEDFORD	5.4	6.9	8.5	9.8	4.2	5.2	1.6	2.3
MIAMI	5.6	7.3	5.3	7.1	4.6	6.0	4.5	5.8
NASHVILLE	4.9	6.3	5.5	7.2	4.1	5.2	2.8	3.7
NEW YORK	4.5	5.9	4.6	6.3	3.7	4.6	2.7	3.5
OMAHA	5.8	7.2	6.8	8.4	4.7	5.6	4.0	4.8
PHOENIX	8.4	9.6	7.9	9.3	6.0	7.1	5.1	6.1
SANTA MARIA	7.7	9.1	8.1	9.5	6.1	7.2	4.5	5.4
SEATTLE	4.6	6.1	7.1	8.7	3.0	3.9	1.4	2.0
WASHINGTON,DC	5.1	6.5	5.5	7.2	4.1	5.1	3.3	4.1

TRACKING SURFACE - DVLP AND TVLP

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	8.4	9.8	8.8	10.2	7.2	8.2	6.2	7.0
APPALACHICOLA	6.1	7.6	6.0	7.6	5.6	6.7	4.6	5.6
BISMARCK	6.5	7.8	7.9	9.3	5.3	6.1	4.3	4.9
BLUE HILL	4.9	6.2	4.8	6.4	4.0	4.9	3.6	4.2
BOSTON	4.9	6.2	5.2	6.8	3.8	4.7	3.1	3.7
BROWNSVILLE	4.6	6.3	6.3	7.9	4.4	5.8	3.2	4.3
CAPE HATTERAS	6.9	8.4	7.1	8.6	5.7	6.8	4.6	5.4
CARIBOU	5.6	6.9	5.6	7.1	3.4	4.2	3.8	4.4
CHARLESTON	5.6	7.1	5.1	6.8	4.8	5.9	3.9	4.8
COLUMBIA	5.2	6.5	6.5	8.0	4.9	5.9	3.7	4.4
DODGE CITY	6.4	7.8	7.4	8.8	6.3	7.2	5.1	5.8
EL PASO	8.9	10.2	8.4	9.7	7.0	8.0	6.4	7.3
ELY	7.8	9.1	8.5	9.9	7.1	8.0	5.3	6.1
FORT WORTH	5.7	7.2	6.8	8.3	5.3	6.4	4.3	5.2
GREAT FALLS	5.7	7.0	7.3	8.7	4.4	5.2	3.0	3.6
LAKE CHARLES	5.1	6.7	5.1	6.9	4.4	5.7	3.3	4.3
MADISON	6.0	7.4	7.1	8.6	4.5	5.4	4.0	4.7
MEDFORD	5.3	6.7	8.3	9.5	4.4	5.4	1.8	2.5
MIAMI	5.8	7.4	5.4	7.1	5.1	6.4	5.1	6.3
NASHVILLE	5.0	6.4	5.4	7.0	4.3	5.4	3.1	3.9
NEW YORK	4.5	5.8	4.5	6.1	3.9	4.8	2.9	3.6
OMAHA	5.8	7.1	6.7	8.2	5.0	5.9	4.3	5.0
PHOENIX	8.6	9.8	7.9	9.3	6.4	7.4	5.6	6.5
SANTA MARIA	7.8	9.2	7.9	9.3	6.4	7.4	4.9	5.7
SEATTLE	4.6	6.0	6.9	8.4	3.1	4.0	1.5	2.0
WASHINGTON,DC	5.2	6.5	5.4	7.0	4.4	5.4	3.7	4.4

TRACKING SURFACE - DVLN AND TVLN

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	7.4	8.9	8.3	9.8	5.8	6.9	4.6	5.5
APPALACHICOLA	5.4	7.0	5.5	7.2	4.5	5.7	3.4	4.5
BISMARCK	6.0	7.4	7.7	9.2	4.5	5.4	3.3	4.0
BLUE HILL	4.7	6.2	4.9	6.7	3.5	4.5	2.9	3.6
BOSTON	4.6	6.1	5.1	6.8	3.2	4.2	2.4	3.1
BROWNSVILLE	3.9	5.7	5.6	7.3	3.4	4.9	2.3	3.5
CAPE HATTERAS	6.2	7.8	6.7	8.3	4.6	5.8	3.5	4.4
CARIBOU	5.2	6.6	5.5	7.1	2.9	3.8	3.0	3.7
CHARLESTON	5.0	6.6	4.8	6.6	3.9	5.1	2.9	3.9
COLUMBIA	4.8	6.3	6.2	7.9	4.0	5.1	2.8	3.6
DODGE CITY	5.8	7.3	7.0	8.5	5.1	6.1	3.8	4.6
EL PASO	7.8	9.2	7.8	9.2	5.5	6.6	4.7	5.7
ELY	7.0	8.5	8.1	9.7	5.8	6.8	4.0	4.9
FORT WORTH	5.1	6.7	6.3	7.9	4.2	5.4	3.2	4.2
GREAT FALLS	5.4	6.8	7.2	8.7	3.8	4.7	2.4	3.1
LAKE CHARLES	4.4	6.1	4.6	6.5	3.5	4.9	2.4	3.5
MADISON	5.5	7.1	7.0	8.6	3.8	4.8	3.1	3.9
MEDFORD	5.0	6.6	8.1	9.5	3.8	4.9	1.4	2.2
MIAMI	5.0	6.7	4.8	6.6	3.9	5.3	3.6	4.9
NASHVILLE	4.5	6.0	5.2	7.0	3.6	4.8	2.3	3.2
NEW YORK	4.2	5.7	4.4	6.2	3.3	4.3	2.2	3.0
OMAHA	5.3	6.8	6.4	8.1	4.1	5.1	3.3	4.1
PHOENIX	7.7	9.0	7.4	8.9	5.2	6.3	4.2	5.2
SANTA MARIA	7.0	8.5	7.7	9.2	5.3	6.4	3.7	4.6
SEATTLE	4.4	5.9	6.8	8.4	2.7	3.7	1.2	1.8
WASHINGTON,DC	4.8	6.3	5.2	7.0	3.6	4.7	2.8	3.6

FIXED SURFACE

TILT ANGLE 90 D AZIMUTH ANGLE -90 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	2.4	3.5	2.4	3.5	1.9	2.7	1.5	2.2
APPALACHICOLA	1.8	2.9	1.6	2.9	1.5	2.4	1.2	2.0
BISMARCK	1.9	3.0	2.5	3.7	1.3	2.0	.9	1.4
BLUE HILL	1.4	2.5	1.5	2.8	1.0	1.8	.8	1.4
BOSTON	1.4	2.5	1.6	2.9	1.0	1.7	.7	1.3
BROWNSVILLE	1.3	2.7	1.8	3.1	1.1	2.2	.8	1.7
CAPE HATTERAS	2.1	3.3	2.1	3.4	1.5	2.4	1.1	1.8
CARIBOU	1.6	2.7	1.8	3.0	.9	1.6	.8	1.3
CHARLESTON	1.5	2.7	1.4	2.7	1.2	2.1	.9	1.6
COLUMBIA	1.5	2.7	2.1	3.4	1.3	2.1	.9	1.5
DODGE CITY	2.0	3.1	2.4	3.5	1.8	2.5	1.3	1.9
EL PASO	2.6	3.6	2.4	3.4	1.9	2.7	1.6	2.3
ELY	2.2	3.3	2.4	3.5	1.8	2.6	1.2	1.8
FORT WORTH	1.8	3.0	2.1	3.3	1.5	2.4	1.1	1.8
GREAT FALLS	1.5	2.7	2.1	3.3	1.0	1.7	.6	1.1
LAKE CHARLES	1.5	2.8	1.4	2.8	1.1	2.2	.9	1.7
MADISON	1.8	3.0	2.2	3.5	1.1	1.9	.9	1.5
MEDFORD	1.6	2.8	2.6	3.7	1.2	2.0	.5	1.1
MIAMI	1.7	2.9	1.4	2.7	1.3	2.4	1.3	2.3
NASHVILLE	1.4	2.6	1.6	3.0	1.1	2.0	.7	1.4
NEW YORK	1.3	2.4	1.4	2.7	1.0	1.7	.7	1.3
OMAHA	1.8	2.9	2.2	3.5	1.4	2.1	1.0	1.6
PHOENIX	2.5	3.5	2.4	3.5	1.7	2.5	1.3	2.1
SANTA MARIA	2.6	3.6	3.0	4.0	1.9	2.7	1.1	1.8
SEATTLE	1.5	2.7	2.5	3.8	.8	1.6	.3	.8
WASHINGTON,DC	1.5	2.6	1.6	3.0	1.1	2.0	.9	1.5

FIXED SURFACE

TILT ANGLE 90 D AZIMUTH ANGLE -75 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	2.6	3.7	2.4	3.5	2.4	3.2	2.1	2.8
APPALACHICOLA	1.9	3.1	1.6	2.9	1.8	2.8	1.6	2.5
BISMARCK	2.2	3.3	2.6	3.8	1.7	2.4	1.4	1.9
BLUE HILL	1.6	2.7	1.6	2.9	1.3	2.1	1.2	1.7
BOSTON	1.5	2.6	1.6	3.0	1.2	2.0	1.0	1.6
BROWNSVILLE	1.4	2.8	1.8	3.1	1.3	2.5	1.0	2.0
CAPE HATTERAS	2.3	3.5	2.2	3.4	1.9	2.8	1.6	2.3
CARIBOU	1.8	3.0	1.9	3.1	1.1	1.8	1.2	1.7
CHARLESTON	1.7	2.8	1.4	2.7	1.5	2.4	1.3	2.0
COLUMBIA	1.7	2.8	2.2	3.4	1.7	2.5	1.3	1.9
DODGE CITY	2.2	3.3	2.4	3.6	2.2	3.0	1.8	2.4
EL PASO	2.8	3.8	2.3	3.4	2.3	3.2	2.1	2.9
ELY	2.4	3.6	2.4	3.6	2.3	3.0	1.7	2.4
FORT WORTH	1.9	3.1	2.1	3.3	1.8	2.7	1.5	2.2
GREAT FALLS	1.8	2.9	2.2	3.4	1.4	2.1	1.0	1.5
LAKE CHARLES	1.5	2.8	1.4	2.8	1.4	2.4	1.2	2.0
MADISON	2.0	3.2	2.3	3.6	1.5	2.2	1.4	1.9
MEDFORD	1.8	3.0	2.7	3.8	1.6	2.4	.7	1.3
MIAMI	1.7	3.0	1.3	2.7	1.6	2.7	1.7	2.7
NASHVILLE	1.6	2.7	1.6	3.0	1.4	2.2	1.0	1.7
NEW YORK	1.4	2.5	1.4	2.8	1.3	2.0	1.0	1.6
OMAHA	1.9	3.1	2.3	3.6	1.7	2.5	1.5	2.1
PHOENIX	2.7	3.7	2.4	3.5	2.1	2.9	1.9	2.6
SANTA MARIA	2.7	3.8	3.0	4.1	2.4	3.2	1.6	2.3
SEATTLE	1.7	2.9	2.6	3.9	1.1	1.8	.5	1.0
WASHINGTON,DC	1.6	2.8	1.7	3.1	1.5	2.3	1.3	1.9

FIXED SURFACE

TILT ANGLE 90 D AZIMUTH ANGLE -60 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	2.6	3.8	2.3	3.4	2.8	3.6	2.7	3.4
APPALACHICOLA	1.9	3.1	1.5	2.7	2.2	3.1	2.0	2.9
BISMARCK	2.4	3.5	2.6	3.8	2.1	2.8	2.0	2.4
BLUE HILL	1.7	2.8	1.6	2.9	1.6	2.3	1.6	2.1
BOSTON	1.7	2.8	1.6	3.0	1.5	2.3	1.4	2.0
BROWNSVILLE	1.4	2.8	1.6	2.9	1.5	2.6	1.3	2.2
CAPE HATTERAS	2.4	3.5	2.1	3.3	2.3	3.1	2.0	2.7
CARIBOU	2.0	3.2	1.9	3.1	1.4	2.1	1.7	2.2
CHARLESTON	1.7	2.9	1.3	2.6	1.8	2.7	1.6	2.4
COLUMBIA	1.8	2.9	2.1	3.4	2.1	2.8	1.7	2.3
DODGE CITY	2.3	3.4	2.4	3.5	2.6	3.4	2.4	3.0
EL PASO	2.8	3.8	2.2	3.2	2.7	3.6	2.7	3.4
ELY	2.5	3.7	2.3	3.5	2.8	3.5	2.3	2.9
FORT WORTH	2.0	3.1	1.9	3.2	2.1	3.1	1.9	2.6
GREAT FALLS	2.0	3.1	2.3	3.4	1.8	2.5	1.4	1.9
LAKE CHARLES	1.6	2.9	1.3	2.6	1.6	2.7	1.5	2.3
MADISON	2.2	3.4	2.3	3.6	1.8	2.5	1.9	2.4
MEDFORD	2.0	3.2	2.7	3.8	1.9	2.7	.9	1.5
MIAMI	1.7	3.0	1.2	2.5	1.8	2.9	2.1	3.1
NASHVILLE	1.6	2.8	1.5	2.9	1.6	2.5	1.3	2.0
NEW YORK	1.5	2.7	1.4	2.8	1.5	2.3	1.4	2.0
OMAHA	2.1	3.2	2.3	3.5	2.1	2.9	1.9	2.5
PHOENIX	2.7	3.7	2.2	3.3	2.5	3.3	2.4	3.1
SANTA MARIA	2.8	3.9	2.8	3.9	2.8	3.6	2.2	2.9
SEATTLE	1.9	3.0	2.6	3.9	1.4	2.1	.7	1.2
WASHINGTON,DC	1.8	2.9	1.7	3.0	1.8	2.6	1.7	2.3

FIXED SURFACE

TILT ANGLE 90 D AZIMUTH ANGLE -45 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	2.6	3.7	2.1	3.2	3.2	4.0	3.3	4.0
APPALACHICOLA	1.8	3.0	1.3	2.5	2.4	3.4	2.5	3.3
BISMARCK	2.5	3.6	2.5	3.7	2.5	3.2	2.5	3.0
BLUE HILL	1.7	2.8	1.5	2.8	1.9	2.6	2.0	2.6
BOSTON	1.7	2.8	1.5	2.8	1.8	2.5	1.8	2.4
BROWNSVILLE	1.3	2.7	1.3	2.6	1.7	2.8	1.5	2.5
CAPE HATTERAS	2.3	3.5	1.9	3.1	2.6	3.4	2.5	3.2
CARIBOU	2.1	3.3	1.8	3.1	1.6	2.3	2.2	2.7
CHARLESTON	1.7	2.9	1.1	2.5	2.0	3.0	2.0	2.8
COLUMBIA	1.8	2.9	1.9	3.2	2.4	3.1	2.1	2.7
DODGE CITY	2.3	3.4	2.1	3.3	3.0	3.8	2.9	3.6
EL PASO	2.7	3.7	1.9	3.0	3.0	3.9	3.3	4.0
ELY	2.6	3.7	2.1	3.3	3.2	3.9	2.9	3.5
FORT WORTH	1.9	3.1	1.7	2.9	2.4	3.3	2.3	3.1
GREAT FALLS	2.1	3.2	2.2	3.4	2.1	2.8	1.8	2.3
LAKE CHARLES	1.5	2.8	1.1	2.5	1.8	2.8	1.8	2.6
MADISON	2.2	3.4	2.1	3.4	2.1	2.8	2.3	2.9
MEDFORD	2.0	3.2	2.5	3.6	2.2	3.0	1.1	1.7
MIAMI	1.6	2.9	1.0	2.3	2.0	3.1	2.5	3.4
NASHVILLE	1.6	2.8	1.4	2.8	1.9	2.8	1.6	2.3
NEW YORK	1.6	2.7	1.3	2.7	1.8	2.6	1.8	2.3
OMAHA	2.1	3.2	2.1	3.3	2.4	3.2	2.4	3.0
PHOENIX	2.6	3.6	2.0	3.1	2.8	3.7	3.0	3.7
SANTA MARIA	2.8	3.9	2.5	3.6	3.2	4.0	2.7	3.4
SEATTLE	1.9	3.1	2.5	3.7	1.6	2.3	.9	1.4
WASHINGTON,DC	1.8	2.9	1.6	2.9	2.1	2.9	2.1	2.7

FIXED SURFACE

TILT ANGLE 90 D AZIMUTH ANGLE -30 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	2.5	3.6	1.7	2.8	3.5	4.4	3.9	4.6
APPALACHICOLA	1.7	2.8	1.0	2.3	2.6	3.6	2.8	3.7
BISMARCK	2.5	3.6	2.3	3.4	2.9	3.6	3.0	3.5
BLUE HILL	1.7	2.9	1.3	2.7	2.1	2.9	2.4	2.9
BOSTON	1.7	2.8	1.4	2.7	2.0	2.8	2.2	2.7
BROWNSVILLE	1.1	2.5	.9	2.2	1.8	2.9	1.8	2.7
CAPE HATTERAS	2.2	3.4	1.5	2.8	2.8	3.7	3.0	3.7
CARIBOU	2.2	3.4	1.7	2.9	1.9	2.6	2.6	3.1
CHARLESTON	1.6	2.8	.9	2.3	2.3	3.2	2.4	3.2
COLUMBIA	1.8	2.9	1.6	2.9	2.6	3.4	2.5	3.1
DODGE CITY	2.2	3.3	1.8	3.0	3.3	4.1	3.5	4.1
EL PASO	2.5	3.5	1.5	2.6	3.3	4.1	3.8	4.6
ELY	2.5	3.7	1.8	3.0	3.6	4.3	3.5	4.1
FORT WORTH	1.8	3.0	1.3	2.6	2.6	3.5	2.7	3.4
GREAT FALLS	2.2	3.3	2.1	3.2	2.4	3.1	2.1	2.6
LAKE CHARLES	1.4	2.7	.8	2.2	1.9	3.0	2.1	2.9
MADISON	2.2	3.4	1.9	3.2	2.4	3.1	2.8	3.3
MEDFORD	2.0	3.2	2.3	3.3	2.4	3.2	1.3	1.9
MIAMI	1.4	2.7	.7	2.1	2.2	3.2	2.9	3.8
NASHVILLE	1.6	2.7	1.2	2.6	2.1	3.0	1.9	2.6
NEW YORK	1.6	2.7	1.2	2.6	2.0	2.8	2.1	2.6
OMAHA	2.0	3.2	1.8	3.1	2.7	3.4	2.9	3.5
PHOENIX	2.5	3.5	1.6	2.7	3.1	4.0	3.5	4.2
SANTA MARIA	2.6	3.7	2.0	3.1	3.5	4.3	3.2	3.9
SEATTLE	1.9	3.1	2.2	3.5	1.8	2.5	1.1	1.5
WASHINGTON,DC	1.8	2.9	1.4	2.7	2.3	3.2	2.5	3.1

FIXED SURFACE

TILT ANGLE 90 D AZIMUTH ANGLE -15 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	2.3	3.5	1.3	2.4	3.8	4.6	4.4	5.1
APPALACHICOLA	1.5	2.7	.7	2.0	2.8	3.7	3.1	3.9
BISMARCK	2.5	3.6	2.1	3.2	3.2	3.8	3.3	3.8
BLUE HILL	1.7	2.8	1.2	2.5	2.3	3.0	2.7	3.2
BOSTON	1.7	2.8	1.2	2.5	2.2	2.9	2.4	2.9
BROWNSVILLE	1.0	2.3	.6	1.9	1.9	3.0	2.0	2.9
CAPE HATTERAS	2.0	3.2	1.2	2.4	3.0	3.9	3.3	4.0
CARIBOU	2.2	3.4	1.5	2.8	2.0	2.7	3.0	3.5
CHARLESTON	1.5	2.7	.7	2.1	2.5	3.4	2.7	3.4
COLUMBIA	1.7	2.8	1.4	2.6	2.8	3.6	2.8	3.4
DODGE CITY	2.0	3.1	1.5	2.6	3.5	4.3	3.8	4.4
EL PASO	2.3	3.3	1.1	2.2	3.5	4.4	4.3	5.0
ELY	2.4	3.6	1.5	2.7	3.9	4.6	3.9	4.5
FORT WORTH	1.6	2.8	1.0	2.2	2.7	3.6	3.0	3.7
GREAT FALLS	2.3	3.4	1.9	3.1	2.7	3.4	2.4	2.9
LAKE CHARLES	1.2	2.5	.6	1.9	2.1	3.1	2.3	3.1
MADISON	2.2	3.4	1.7	3.0	2.6	3.3	3.1	3.6
MEDFORD	1.9	3.1	1.9	3.0	2.5	3.3	1.4	2.0
MIAMI	1.2	2.5	.4	1.8	2.3	3.4	3.2	4.1
NASHVILLE	1.5	2.6	.9	2.3	2.3	3.2	2.2	2.8
NEW YORK	1.6	2.7	1.1	2.4	2.2	3.0	2.2	2.8
OMAHA	1.9	3.1	1.5	2.8	2.9	3.6	3.2	3.8
PHOENIX	2.3	3.3	1.1	2.3	3.3	4.2	3.9	4.6
SANTA MARIA	2.4	3.5	1.5	2.6	3.6	4.5	3.5	4.2
SEATTLE	1.9	3.1	1.9	3.2	1.9	2.7	1.2	1.7
WASHINGTON,DC	1.8	2.9	1.2	2.5	2.5	3.4	2.7	3.3

FIXED SURFACE

TILT ANGLE 90 D AZIMUTH ANGLE 0 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	2.3	3.4	1.2	2.3	3.9	4.8	4.5	5.2
APPALACHICOLA	1.4	2.6	.5	1.8	2.9	3.8	3.2	4.0
BISMARCK	2.5	3.6	1.9	3.1	3.3	4.0	3.5	3.9
BLUE HILL	1.7	2.8	1.1	2.4	2.4	3.1	2.7	3.3
BOSTON	1.7	2.8	1.1	2.4	2.3	3.0	2.5	3.0
BROWNSVILLE	.9	2.2	.4	1.7	2.0	3.1	2.1	3.0
CAPE HATTERAS	1.9	3.1	1.0	2.2	3.1	4.0	3.4	4.1
CARIBOU	2.3	3.4	1.5	2.7	2.1	2.8	3.1	3.6
CHARLESTON	1.5	2.7	.6	2.0	2.6	3.5	2.8	3.5
COLUMBIA	1.7	2.8	1.2	2.5	2.8	3.6	2.8	3.5
DODGE CITY	2.0	3.1	1.3	2.5	3.6	4.4	3.9	4.5
EL PASO	2.2	3.2	.9	1.9	3.6	4.5	4.5	5.2
ELY	2.5	3.6	1.4	2.6	4.1	4.8	4.0	4.7
FORT WORTH	1.5	2.7	.8	2.0	2.8	3.7	3.1	3.8
GREAT FALLS	2.3	3.5	1.9	3.1	2.8	3.5	2.5	3.0
LAKE CHARLES	1.2	2.5	.4	1.8	2.2	3.2	2.3	3.1
MADISON	2.1	3.3	1.6	2.9	2.7	3.4	3.2	3.7
MEDFORD	1.9	3.1	1.8	2.8	2.5	3.3	1.4	2.0
MIAMI	1.1	2.4	.3	1.6	2.4	3.5	3.3	4.3
NASHVILLE	1.4	2.6	.9	2.2	2.4	3.3	2.3	2.9
NEW YORK	1.6	2.7	1.0	2.3	2.3	3.1	2.3	2.9
OMAHA	1.9	3.0	1.4	2.6	2.9	3.7	3.3	3.9
PHOENIX	2.2	3.2	.9	2.0	3.4	4.3	4.0	4.7
SANTA MARIA	2.2	3.3	1.2	2.3	3.6	4.4	3.6	4.4
SEATTLE	1.8	3.0	1.7	3.0	2.0	2.7	1.2	1.7
WASHINGTON,DC	1.8	2.9	1.0	2.4	2.6	3.4	2.8	3.4

FIXED SURFACE

TILT ANGLE 90 D AZIMUTH ANGLE 15 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	2.5	3.6	1.5	2.6	3.9	4.7	4.4	5.1
APPALACHICOLA	1.5	2.7	.8	2.0	2.8	3.7	3.0	3.8
BISMARCK	2.6	3.7	2.1	3.2	3.3	4.0	3.3	3.8
BLUE HILL	1.8	2.9	1.2	2.5	2.3	3.1	2.7	3.2
BOSTON	1.8	2.9	1.2	2.5	2.2	3.0	2.4	2.9
BROWNSVILLE	.9	2.3	.6	1.9	2.0	3.2	2.0	3.0
CAPE HATTERAS	2.0	3.1	1.2	2.4	3.0	3.9	3.3	4.0
CARIBOU	2.3	3.5	1.6	2.8	2.1	2.8	3.0	3.5
CHARLESTON	1.6	2.8	.8	2.2	2.6	3.5	2.7	3.5
COLUMBIA	1.7	2.8	1.3	2.6	2.7	3.5	2.7	3.4
DODGE CITY	2.0	3.1	1.5	2.6	3.5	4.3	3.8	4.4
EL PASO	2.4	3.4	1.2	2.2	3.6	4.4	4.3	5.1
ELY	2.6	3.8	1.7	2.9	4.0	4.8	3.9	4.6
FORT WORTH	1.6	2.7	1.0	2.2	2.7	3.6	3.0	3.7
GREAT FALLS	2.4	3.5	2.1	3.2	2.8	3.5	2.4	2.9
LAKE CHARLES	1.3	2.6	.6	2.0	2.2	3.2	2.2	3.0
MADISON	2.2	3.4	1.7	3.0	2.7	3.4	3.1	3.6
MEDFORD	1.9	3.1	1.9	3.0	2.4	3.2	1.3	1.9
MIAMI	1.3	2.6	.5	1.9	2.4	3.5	3.2	4.2
NASHVILLE	1.5	2.7	1.0	2.4	2.4	3.3	2.2	2.8
NEW YORK	1.6	2.7	1.1	2.4	2.2	3.0	2.2	2.7
OMAHA	1.9	3.1	1.5	2.7	2.8	3.6	3.2	3.8
PHOENIX	2.3	3.3	1.1	2.2	3.4	4.2	3.8	4.6
SANTA MARIA	2.2	3.3	1.2	2.3	3.4	4.2	3.5	4.2
SEATTLE	1.8	3.0	1.7	3.0	1.9	2.6	1.2	1.7
WASHINGTON,DC	1.8	2.9	1.1	2.5	2.5	3.3	2.7	3.3

FIXED SURFACE

TILT ANGLE 90 D AZIMUTH ANGLE 30 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	2.7	3.8	2.0	3.1	3.7	4.5	4.0	4.7
APPALACHICOLA	1.7	2.8	1.1	2.4	2.6	3.6	2.7	3.5
BISMARCK	2.6	3.7	2.3	3.5	3.1	3.8	3.0	3.5
BLUE HILL	1.9	3.0	1.3	2.7	2.2	3.0	2.4	2.9
BOSTON	1.9	3.0	1.4	2.8	2.1	2.8	2.1	2.7
BROWNSVILLE	1.1	2.5	1.0	2.3	2.0	3.2	1.9	2.8
CAPE HATTERAS	2.1	3.3	1.5	2.8	2.8	3.7	3.0	3.7
CARIBOU	2.4	3.5	1.7	3.0	1.9	2.6	2.7	3.2
CHARLESTON	1.7	2.9	1.1	2.5	2.4	3.3	2.5	3.2
COLUMBIA	1.8	2.9	1.6	2.9	2.5	3.3	2.4	3.1
DODGE CITY	2.1	3.2	1.8	2.9	3.2	4.0	3.4	4.0
EL PASO	2.7	3.7	1.7	2.7	3.4	4.2	3.9	4.7
ELY	2.8	4.0	2.2	3.4	3.8	4.5	3.6	4.2
FORT WORTH	1.7	2.8	1.4	2.6	2.5	3.4	2.7	3.4
GREAT FALLS	2.5	3.6	2.3	3.5	2.6	3.3	2.1	2.7
LAKE CHARLES	1.4	2.7	1.0	2.4	2.1	3.2	2.0	2.8
MADISON	2.3	3.5	2.0	3.3	2.5	3.2	2.8	3.3
MEDFORD	1.9	3.1	2.2	3.3	2.2	3.0	1.1	1.7
MIAMI	1.5	2.8	.9	2.3	2.4	3.4	3.0	3.9
NASHVILLE	1.6	2.8	1.3	2.6	2.3	3.1	2.0	2.6
NEW YORK	1.7	2.8	1.2	2.5	2.1	2.9	1.9	2.5
OMAHA	2.0	3.2	1.7	2.9	2.6	3.4	2.9	3.5
PHOENIX	2.6	3.6	1.6	2.7	3.2	4.0	3.4	4.2
SANTA MARIA	2.3	3.4	1.4	2.5	3.1	3.9	3.2	3.9
SEATTLE	1.7	2.9	1.8	3.1	1.7	2.4	1.1	1.5
WASHINGTON,DC	1.9	3.0	1.3	2.7	2.3	3.1	2.4	3.0

FIXED SURFACE

TILT ANGLE 90 D AZIMUTH ANGLE 45 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	2.9	4.1	2.4	3.5	3.4	4.2	3.4	4.1
APPALACHICOLA	1.8	3.0	1.5	2.7	2.4	3.4	2.3	3.1
BISMARCK	2.6	3.7	2.6	3.7	2.8	3.5	2.5	3.0
BLUE HILL	1.9	3.0	1.5	2.8	2.0	2.7	2.0	2.6
BOSTON	1.9	3.0	1.6	2.9	1.9	2.6	1.8	2.3
BROWNSVILLE	1.3	2.6	1.4	2.7	2.0	3.1	1.7	2.6
CAPE HATTERAS	2.2	3.4	1.8	3.1	2.6	3.4	2.5	3.2
CARIBOU	2.4	3.5	1.9	3.1	1.7	2.4	2.3	2.8
CHARLESTON	1.9	3.0	1.4	2.8	2.2	3.1	2.1	2.8
COLUMBIA	1.8	3.0	1.8	3.1	2.2	3.0	2.0	2.7
DODGE CITY	2.2	3.3	2.0	3.2	2.9	3.7	2.8	3.4
EL PASO	2.9	4.0	2.1	3.2	3.2	4.0	3.4	4.1
ELY	2.9	4.1	2.7	3.9	3.5	4.2	3.0	3.7
FORT WORTH	1.7	2.9	1.7	2.9	2.3	3.2	2.3	3.0
GREAT FALLS	2.5	3.6	2.5	3.7	2.3	3.0	1.8	2.3
LAKE CHARLES	1.6	2.9	1.3	2.7	2.0	3.0	1.7	2.5
MADISON	2.3	3.5	2.2	3.5	2.3	3.0	2.3	2.9
MEDFORD	1.9	3.1	2.5	3.5	1.9	2.7	.9	1.5
MIAMI	1.8	3.0	1.3	2.6	2.2	3.3	2.6	3.6
NASHVILLE	1.7	2.9	1.5	2.9	2.1	2.9	1.7	2.3
NEW YORK	1.7	2.8	1.3	2.7	1.9	2.6	1.5	2.1
OMAHA	2.1	3.3	1.9	3.2	2.4	3.1	2.5	3.1
PHOENIX	2.8	3.8	1.9	3.0	2.9	3.7	2.9	3.6
SANTA MARIA	2.4	3.5	1.6	2.7	2.7	3.5	2.7	3.4
SEATTLE	1.7	2.9	1.9	3.2	1.5	2.2	.9	1.4
WASHINGTON,DC	1.9	3.0	1.5	2.8	2.0	2.9	2.0	2.6

FIXED SURFACE

TILT ANGLE 90 D AZIMUTH ANGLE 60 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	3.0	4.2	2.8	3.9	3.0	3.8	2.8	3.5
APPALACHICOLA	1.9	3.1	1.7	3.0	2.2	3.1	1.9	2.7
BISMARCK	2.6	3.6	2.7	3.9	2.4	3.1	2.0	2.5
BLUE HILL	1.9	3.0	1.6	2.9	1.7	2.5	1.6	2.1
BOSTON	1.9	3.0	1.7	3.0	1.6	2.4	1.4	1.9
BROWNSVILLE	1.4	2.7	1.7	3.0	1.9	3.0	1.4	2.4
CAPE HATTERAS	2.2	3.4	2.0	3.3	2.2	3.1	2.0	2.7
CARIBOU	2.3	3.4	1.9	3.2	1.5	2.2	1.8	2.3
CHARLESTON	1.9	3.1	1.6	2.9	2.0	2.9	1.7	2.4
COLUMBIA	1.8	2.9	1.9	3.2	1.9	2.7	1.6	2.2
DODGE CITY	2.2	3.3	2.2	3.3	2.5	3.3	2.2	2.9
EL PASO	3.1	4.1	2.5	3.5	2.9	3.7	2.8	3.6
ELY	3.0	4.1	3.0	4.2	3.1	3.8	2.4	3.1
FORT WORTH	1.8	2.9	1.9	3.2	2.0	2.9	1.9	2.6
GREAT FALLS	2.4	3.5	2.7	3.8	1.9	2.6	1.4	1.9
LAKE CHARLES	1.7	3.0	1.6	3.0	1.8	2.9	1.4	2.2
MADISON	2.3	3.5	2.4	3.7	2.0	2.7	1.8	2.4
MEDFORD	1.8	3.0	2.6	3.7	1.7	2.5	.7	1.3
MIAMI	1.9	3.2	1.6	2.9	2.1	3.2	2.3	3.2
NASHVILLE	1.7	2.9	1.6	3.0	1.8	2.7	1.4	2.0
NEW YORK	1.6	2.8	1.4	2.7	1.6	2.4	1.2	1.8
OMAHA	2.1	3.2	2.1	3.3	2.1	2.8	2.0	2.6
PHOENIX	2.9	3.9	2.2	3.3	2.6	3.4	2.4	3.1
SANTA MARIA	2.4	3.5	1.7	2.8	2.3	3.1	2.1	2.8
SEATTLE	1.6	2.8	2.0	3.3	1.2	2.0	.7	1.2
WASHINGTON,DC	1.9	3.0	1.6	2.9	1.7	2.6	1.6	2.2

FIXED SURFACE

TILT ANGLE 90 D AZIMUTH ANGLE 75 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	3.0	4.1	3.0	4.1	2.5	3.4	2.1	2.8
APPALACHICOLA	1.9	3.0	1.9	3.1	1.9	2.8	1.5	2.3
BISMARCK	2.4	3.5	2.7	3.9	2.0	2.7	1.4	1.9
BLUE HILL	1.8	2.9	1.6	2.9	1.4	2.2	1.2	1.7
BOSTON	1.8	2.9	1.7	3.1	1.3	2.1	1.0	1.6
BROWNSVILLE	1.4	2.8	1.9	3.2	1.7	2.8	1.2	2.1
CAPE HATTERAS	2.1	3.3	2.2	3.4	1.9	2.8	1.5	2.2
CARIBOU	2.1	3.2	1.9	3.1	1.2	1.9	1.3	1.8
CHARLESTON	1.8	3.0	1.7	3.0	1.7	2.6	1.3	2.0
COLUMBIA	1.7	2.8	2.0	3.2	1.6	2.4	1.2	1.8
DODGE CITY	2.0	3.1	2.3	3.4	2.1	2.9	1.7	2.3
EL PASO	3.1	4.1	2.7	3.7	2.5	3.3	2.3	3.0
ELY	2.9	4.0	3.2	4.4	2.6	3.3	1.9	2.5
FORT WORTH	1.7	2.9	2.1	3.3	1.7	2.6	1.4	2.2
GREAT FALLS	2.2	3.3	2.6	3.8	1.6	2.3	1.0	1.5
LAKE CHARLES	1.7	3.0	1.7	3.1	1.6	2.6	1.1	1.9
MADISON	2.1	3.3	2.4	3.7	1.6	2.3	1.4	1.9
MEDFORD	1.7	2.9	2.6	3.7	1.3	2.1	.5	1.1
MIAMI	1.9	3.2	1.8	3.1	1.8	2.9	1.9	2.8
NASHVILLE	1.7	2.8	1.7	3.1	1.5	2.4	1.0	1.7
NEW YORK	1.5	2.6	1.3	2.7	1.3	2.1	.8	1.4
OMAHA	2.0	3.1	2.1	3.3	1.7	2.5	1.5	2.1
PHOENIX	2.9	3.9	2.4	3.5	2.2	3.0	1.8	2.5
SANTA MARIA	2.2	3.3	1.7	2.8	1.8	2.6	1.6	2.3
SEATTLE	1.4	2.6	2.0	3.2	1.0	1.7	.5	1.0
WASHINGTON,DC	1.7	2.9	1.6	3.0	1.4	2.3	1.2	1.8

FIXED SURFACE

TILT ANGLE 90 D AZIMUTH ANGLE 90 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	2.8	3.9	3.0	4.1	2.1	2.9	1.5	2.2
APPALACHICOLA	1.8	2.9	1.9	3.1	1.5	2.5	1.1	1.9
BISMARCK	2.1	3.2	2.6	3.8	1.6	2.2	1.0	1.4
BLUE HILL	1.6	2.7	1.5	2.8	1.1	1.9	.8	1.4
BOSTON	1.6	2.7	1.7	3.0	1.0	1.8	.7	1.2
BROWNSVILLE	1.3	2.7	2.0	3.3	1.5	2.6	.9	1.8
CAPE HATTERAS	2.0	3.1	2.1	3.4	1.5	2.4	1.1	1.8
CARIBOU	1.8	3.0	1.8	3.0	.9	1.6	.9	1.4
CHARLESTON	1.7	2.9	1.7	3.0	1.3	2.3	.9	1.7
COLUMBIA	1.6	2.7	1.9	3.2	1.2	2.0	.8	1.4
DODGE CITY	1.9	3.0	2.2	3.3	1.7	2.4	1.2	1.8
EL PASO	2.9	3.9	2.7	3.8	2.0	2.9	1.7	2.4
ELY	2.6	3.8	3.1	4.3	2.0	2.8	1.3	1.9
FORT WORTH	1.6	2.8	2.1	3.3	1.4	2.3	1.0	1.8
GREAT FALLS	1.9	3.0	2.5	3.7	1.2	1.9	.6	1.1
LAKE CHARLES	1.6	2.9	1.8	3.2	1.3	2.4	.8	1.6
MADISON	1.9	3.1	2.3	3.6	1.3	2.0	.9	1.5
MEDFORD	1.5	2.7	2.5	3.6	1.0	1.8	.3	.9
MIAMI	1.9	3.1	1.9	3.2	1.5	2.6	1.4	2.4
NASHVILLE	1.5	2.7	1.7	3.1	1.2	2.1	.7	1.4
NEW YORK	1.4	2.5	1.3	2.6	1.0	1.8	.5	1.1
OMAHA	1.8	3.0	2.0	3.3	1.3	2.1	1.0	1.6
PHOENIX	2.7	3.7	2.4	3.5	1.8	2.6	1.3	2.0
SANTA MARIA	2.0	3.1	1.6	2.7	1.4	2.2	1.1	1.8
SEATTLE	1.2	2.4	1.9	3.1	.7	1.5	.3	.8
WASHINGTON,DC	1.5	2.7	1.6	2.9	1.1	1.9	.8	1.4

FIXED SURFACE

TILT ANGLE 75 D AZIMUTH ANGLE -90 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	3.1	4.3	3.3	4.4	2.4	3.3	1.8	2.6
APPALACHICOLA	2.4	3.6	2.3	3.6	1.9	3.0	1.5	2.4
BISMARCK	2.4	3.5	3.2	4.5	1.6	2.3	1.1	1.6
BLUE HILL	1.8	3.0	2.0	3.4	1.2	2.1	.9	1.6
BOSTON	1.8	2.9	2.1	3.5	1.2	2.0	.8	1.4
BROWNSVILLE	1.8	3.3	2.5	3.9	1.5	2.7	1.0	2.0
CAPE HATTERAS	2.8	4.0	2.9	4.2	1.9	2.9	1.4	2.1
CARIBOU	2.0	3.2	2.3	3.6	1.0	1.8	.9	1.4
CHARLESTON	2.1	3.3	1.9	3.3	1.5	2.5	1.1	1.9
COLUMBIA	2.0	3.2	2.7	4.1	1.7	2.5	1.0	1.7
DODGE CITY	2.6	3.8	3.1	4.3	2.2	3.0	1.5	2.2
EL PASO	3.4	4.5	3.2	4.3	2.4	3.3	1.9	2.7
ELY	2.8	4.0	3.1	4.4	2.2	3.0	1.4	2.1
FORT WORTH	2.3	3.6	2.8	4.1	1.9	2.9	1.3	2.1
GREAT FALLS	1.9	3.2	2.7	4.0	1.3	2.0	.7	1.3
LAKE CHARLES	1.9	3.3	1.9	3.4	1.4	2.6	1.1	2.0
MADISON	2.3	3.6	2.8	4.2	1.4	2.2	1.1	1.7
MEDFORD	2.1	3.4	3.4	4.6	1.5	2.4	.6	1.2
MIAMI	2.2	3.6	1.9	3.4	1.7	2.9	1.7	2.7
NASHVILLE	1.9	3.1	2.1	3.6	1.4	2.3	.9	1.6
NEW YORK	1.6	2.9	1.8	3.3	1.2	2.1	.8	1.5
OMAHA	2.2	3.5	2.9	4.2	1.7	2.5	1.2	1.8
PHOENIX	3.3	4.3	3.2	4.4	2.1	3.1	1.7	2.5
SANTA MARIA	3.3	4.5	3.9	5.1	2.4	3.3	1.4	2.2
SEATTLE	1.9	3.2	3.2	4.6	1.0	1.8	.4	.9
WASHINGTON,DC	1.9	3.2	2.2	3.7	1.4	2.3	1.0	1.7

FIXED SURFACE

TILT ANGLE 75 D AZIMUTH ANGLE -75 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	3.3	4.6	3.3	4.5	2.9	3.8	2.5	3.2
APPALACHICOLA	2.5	3.8	2.3	3.6	2.4	3.4	2.0	2.9
BISMARCK	2.7	3.9	3.4	4.7	2.0	2.8	1.6	2.1
BLUE HILL	2.0	3.2	2.1	3.6	1.6	2.4	1.4	2.0
BOSTON	2.0	3.2	2.2	3.6	1.5	2.3	1.2	1.8
BROWNSVILLE	1.9	3.4	2.4	3.9	1.7	3.0	1.3	2.3
CAPE HATTERAS	3.0	4.3	2.9	4.3	2.4	3.3	1.9	2.7
CARIBOU	2.3	3.5	2.4	3.8	1.3	2.1	1.4	1.9
CHARLESTON	2.2	3.5	1.9	3.4	1.9	2.9	1.5	2.3
COLUMBIA	2.2	3.4	2.8	4.2	2.1	2.9	1.5	2.2
DODGE CITY	2.8	4.0	3.2	4.5	2.7	3.5	2.1	2.8
EL PASO	3.6	4.8	3.3	4.4	2.9	3.8	2.6	3.4
ELY	3.1	4.3	3.2	4.5	2.8	3.6	2.0	2.7
FORT WORTH	2.5	3.8	2.8	4.1	2.3	3.3	1.8	2.6
GREAT FALLS	2.2	3.5	2.9	4.2	1.7	2.4	1.1	1.7
LAKE CHARLES	2.1	3.5	1.9	3.4	1.7	2.9	1.4	2.3
MADISON	2.5	3.9	3.0	4.4	1.8	2.6	1.6	2.2
MEDFORD	2.3	3.7	3.6	4.8	1.9	2.8	.8	1.5
MIAMI	2.3	3.7	1.9	3.3	2.0	3.2	2.1	3.2
NASHVILLE	2.1	3.3	2.2	3.7	1.7	2.7	1.2	1.9
NEW YORK	1.9	3.1	1.9	3.4	1.6	2.4	1.2	1.9
OMAHA	2.5	3.7	3.0	4.3	2.1	2.9	1.7	2.4
PHOENIX	3.5	4.6	3.3	4.5	2.6	3.6	2.3	3.1
SANTA MARIA	3.6	4.8	4.0	5.2	3.0	3.8	2.0	2.8
SEATTLE	2.1	3.4	3.4	4.7	1.3	2.1	.6	1.1
WASHINGTON,DC	2.1	3.4	2.3	3.8	1.8	2.7	1.5	2.2

FIXED SURFACE

TILT ANGLE 75 D AZIMUTH ANGLE -60 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	3.5	4.7	3.3	4.5	3.5	4.4	3.2	4.0
APPALACHICOLA	2.6	3.9	2.2	3.5	2.8	3.8	2.5	3.4
BISMARCK	3.0	4.2	3.5	4.7	2.5	3.2	2.2	2.7
BLUE HILL	2.2	3.4	2.2	3.6	1.9	2.7	1.8	2.4
BOSTON	2.2	3.4	2.2	3.7	1.9	2.7	1.6	2.2
BROWNSVILLE	1.9	3.4	2.3	3.7	2.0	3.2	1.6	2.6
CAPE HATTERAS	3.1	4.4	2.9	4.2	2.8	3.8	2.4	3.2
CARIBOU	2.6	3.8	2.5	3.9	1.7	2.4	1.9	2.4
CHARLESTON	2.4	3.6	1.9	3.3	2.2	3.3	2.0	2.8
COLUMBIA	2.4	3.6	2.8	4.2	2.5	3.4	2.0	2.6
DODGE CITY	3.0	4.2	3.2	4.5	3.2	4.1	2.7	3.4
EL PASO	3.8	4.9	3.2	4.3	3.4	4.3	3.3	4.0
ELY	3.3	4.6	3.2	4.5	3.4	4.2	2.7	3.4
FORT WORTH	2.6	3.9	2.7	4.0	2.7	3.7	2.3	3.1
GREAT FALLS	2.5	3.7	3.1	4.3	2.1	2.9	1.5	2.1
LAKE CHARLES	2.1	3.5	1.8	3.3	2.0	3.2	1.8	2.7
MADISON	2.8	4.1	3.1	4.5	2.2	3.0	2.1	2.7
MEDFORD	2.5	3.9	3.7	4.9	2.3	3.2	1.0	1.7
MIAMI	2.3	3.7	1.8	3.2	2.3	3.5	2.6	3.6
NASHVILLE	2.2	3.4	2.2	3.7	2.1	3.0	1.6	2.3
NEW YORK	2.0	3.2	2.0	3.4	1.9	2.7	1.6	2.2
OMAHA	2.7	3.9	3.0	4.4	2.5	3.3	2.2	2.9
PHOENIX	3.7	4.7	3.2	4.4	3.1	4.1	2.9	3.7
SANTA MARIA	3.7	4.9	3.9	5.1	3.5	4.4	2.6	3.4
SEATTLE	2.3	3.6	3.4	4.8	1.6	2.4	.8	1.3
WASHINGTON,DC	2.3	3.6	2.3	3.8	2.2	3.1	1.9	2.6

FIXED SURFACE

TILT ANGLE 75 D AZIMUTH ANGLE -45 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	3.6	4.8	3.2	4.4	3.9	4.8	3.9	4.6
APPALACHICOLA	2.6	3.9	2.0	3.4	3.1	4.1	2.9	3.8
BISMARCK	3.2	4.3	3.4	4.7	3.0	3.7	2.7	3.3
BLUE HILL	2.3	3.5	2.1	3.6	2.2	3.1	2.3	2.9
BOSTON	2.3	3.5	2.2	3.6	2.2	3.0	2.0	2.6
BROWNSVILLE	1.9	3.4	2.1	3.5	2.2	3.4	1.9	2.9
CAPE HATTERAS	3.2	4.5	2.8	4.1	3.2	4.1	3.0	3.7
CARIBOU	2.7	4.0	2.5	3.8	1.9	2.7	2.4	3.0
CHARLESTON	2.4	3.7	1.8	3.3	2.6	3.6	2.4	3.2
COLUMBIA	2.4	3.7	2.7	4.1	2.9	3.7	2.4	3.1
DODGE CITY	3.0	4.2	3.1	4.3	3.6	4.5	3.4	4.0
EL PASO	3.8	4.9	3.0	4.1	3.8	4.7	3.9	4.7
ELY	3.4	4.7	3.1	4.4	3.9	4.7	3.3	4.0
FORT WORTH	2.7	3.9	2.6	3.9	3.0	4.0	2.8	3.5
GREAT FALLS	2.7	4.0	3.1	4.3	2.5	3.3	2.0	2.5
LAKE CHARLES	2.1	3.5	1.7	3.2	2.3	3.4	2.1	3.0
MADISON	2.9	4.2	3.0	4.4	2.5	3.3	2.6	3.2
MEDFORD	2.7	4.0	3.6	4.8	2.6	3.5	1.2	1.9
MIAMI	2.3	3.7	1.6	3.1	2.6	3.8	3.1	4.1
NASHVILLE	2.2	3.5	2.1	3.6	2.4	3.4	1.9	2.6
NEW YORK	2.1	3.4	1.9	3.4	2.2	3.1	2.0	2.6
OMAHA	2.7	4.0	2.9	4.3	2.9	3.7	2.8	3.4
PHOENIX	3.7	4.8	3.0	4.2	3.5	4.5	3.5	4.3
SANTA MARIA	3.8	5.0	3.7	4.8	3.9	4.8	3.2	3.9
SEATTLE	2.5	3.7	3.3	4.7	1.9	2.7	1.0	1.5
WASHINGTON,DC	2.4	3.7	2.3	3.7	2.5	3.5	2.4	3.1

FIXED SURFACE

TILT ANGLE 75 D AZIMUTH ANGLE -30 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	3.6	4.8	2.9	4.1	4.4	5.3	4.5	5.3
APPALACHICOLA	2.6	3.8	1.8	3.2	3.4	4.4	3.3	4.2
BISMARCK	3.3	4.5	3.3	4.6	3.3	4.1	3.2	3.8
BLUE HILL	2.4	3.6	2.1	3.5	2.5	3.3	2.6	3.3
BOSTON	2.4	3.6	2.1	3.5	2.4	3.2	2.4	3.0
BROWNSVILLE	1.8	3.3	1.8	3.2	2.4	3.6	2.1	3.2
CAPE HATTERAS	3.1	4.4	2.6	3.9	3.5	4.5	3.4	4.2
CARIBOU	2.9	4.1	2.4	3.8	2.2	2.9	2.9	3.4
CHARLESTON	2.4	3.7	1.7	3.1	2.9	3.9	2.8	3.6
COLUMBIA	2.5	3.7	2.6	4.0	3.1	4.0	2.8	3.5
DODGE CITY	3.0	4.2	2.9	4.1	4.0	4.9	3.9	4.6
EL PASO	3.7	4.8	2.7	3.8	4.1	5.1	4.5	5.3
ELY	3.5	4.8	2.9	4.2	4.3	5.2	3.9	4.6
FORT WORTH	2.6	3.9	2.3	3.6	3.2	4.2	3.2	4.0
GREAT FALLS	2.9	4.1	3.0	4.3	2.9	3.6	2.3	2.9
LAKE CHARLES	2.1	3.5	1.5	3.0	2.5	3.6	2.4	3.3
MADISON	3.0	4.3	2.9	4.3	2.8	3.6	3.1	3.7
MEDFORD	2.7	4.0	3.4	4.6	2.9	3.7	1.4	2.1
MIAMI	2.2	3.6	1.5	2.9	2.8	4.0	3.5	4.5
NASHVILLE	2.3	3.5	2.0	3.5	2.7	3.6	2.2	3.0
NEW YORK	2.2	3.4	1.9	3.4	2.5	3.3	2.3	2.9
OMAHA	2.8	4.0	2.7	4.1	3.2	4.0	3.2	3.9
PHOENIX	3.6	4.7	2.7	3.9	3.9	4.8	4.1	4.9
SANTA MARIA	3.7	4.9	3.3	4.5	4.3	5.2	3.7	4.4
SEATTLE	2.5	3.8	3.1	4.5	2.1	2.9	1.2	1.7
WASHINGTON,DC	2.5	3.7	2.2	3.6	2.8	3.7	2.8	3.5

FIXED SURFACE

TILT ANGLE 75 D AZIMUTH ANGLE -15 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	3.6	4.8	2.7	3.9	4.7	5.6	5.0	5.7
APPALACHICOLA	2.5	3.7	1.6	3.0	3.6	4.6	3.6	4.5
BISMARCK	3.3	4.5	3.2	4.4	3.6	4.4	3.6	4.1
BLUE HILL	2.4	3.6	2.0	3.4	2.7	3.5	2.9	3.5
BOSTON	2.4	3.6	2.0	3.4	2.6	3.4	2.6	3.2
BROWNSVILLE	1.7	3.2	1.5	2.9	2.5	3.7	2.4	3.4
CAPE HATTERAS	3.1	4.4	2.3	3.7	3.8	4.7	3.8	4.5
CARIBOU	3.0	4.2	2.4	3.7	2.3	3.1	3.2	3.7
CHARLESTON	2.4	3.7	1.5	3.0	3.1	4.1	3.1	3.9
COLUMBIA	2.5	3.7	2.4	3.8	3.3	4.2	3.1	3.7
DODGE CITY	3.0	4.2	2.7	3.9	4.3	5.1	4.2	4.9
EL PASO	3.7	4.8	2.5	3.6	4.4	5.3	4.9	5.7
ELY	3.5	4.8	2.8	4.1	4.7	5.5	4.3	5.0
FORT WORTH	2.5	3.8	2.1	3.4	3.4	4.4	3.5	4.2
GREAT FALLS	3.0	4.2	3.0	4.3	3.1	3.9	2.6	3.1
LAKE CHARLES	2.0	3.4	1.3	2.8	2.7	3.8	2.6	3.5
MADISON	3.0	4.3	2.8	4.2	3.1	3.9	3.4	4.0
MEDFORD	2.7	4.0	3.2	4.4	3.0	3.9	1.5	2.2
MIAMI	2.1	3.5	1.3	2.7	3.0	4.2	3.8	4.8
NASHVILLE	2.2	3.5	1.8	3.4	2.9	3.8	2.5	3.2
NEW YORK	2.2	3.5	1.8	3.3	2.7	3.5	2.5	3.1
OMAHA	2.7	4.0	2.5	3.9	3.4	4.2	3.5	4.2
PHOENIX	3.6	4.7	2.4	3.6	4.2	5.1	4.4	5.2
SANTA MARIA	3.6	4.8	2.9	4.1	4.5	5.4	4.0	4.8
SEATTLE	2.5	3.8	3.0	4.3	2.2	3.0	1.3	1.8
WASHINGTON,DC	2.5	3.8	2.1	3.5	3.0	3.9	3.0	3.7

FIXED SURFACE

TILT ANGLE 75 D AZIMUTH ANGLE 0 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	3.6	4.8	2.7	3.9	4.8	5.7	5.1	5.9
APPALACHICOLA	2.4	3.7	1.6	2.9	3.7	4.7	3.7	4.6
BISMARCK	3.4	4.6	3.1	4.4	3.8	4.5	3.7	4.2
BLUE HILL	2.5	3.7	1.9	3.4	2.8	3.6	3.0	3.6
BOSTON	2.5	3.7	2.0	3.4	2.7	3.5	2.7	3.3
BROWNSVILLE	1.7	3.1	1.4	2.8	2.6	3.9	2.5	3.5
CAPE HATTERAS	3.0	4.3	2.2	3.6	3.8	4.8	3.9	4.6
CARIBOU	3.0	4.3	2.3	3.7	2.4	3.2	3.3	3.9
CHARLESTON	2.5	3.7	1.5	3.0	3.2	4.2	3.2	4.0
COLUMBIA	2.5	3.7	2.3	3.7	3.4	4.3	3.2	3.8
DODGE CITY	3.0	4.2	2.6	3.8	4.3	5.2	4.3	5.0
EL PASO	3.7	4.8	2.3	3.5	4.5	5.5	5.1	5.9
ELY	3.6	4.9	2.8	4.1	4.9	5.7	4.5	5.2
FORT WORTH	2.5	3.7	2.0	3.3	3.5	4.5	3.5	4.3
GREAT FALLS	3.1	4.3	3.0	4.3	3.2	4.0	2.7	3.2
LAKE CHARLES	2.0	3.4	1.3	2.8	2.8	3.9	2.7	3.6
MADISON	3.0	4.3	2.7	4.1	3.2	4.0	3.5	4.1
MEDFORD	2.7	4.0	3.2	4.3	3.0	3.9	1.5	2.2
MIAMI	2.1	3.5	1.2	2.7	3.2	4.3	3.9	5.0
NASHVILLE	2.2	3.5	1.8	3.3	3.0	3.9	2.5	3.3
NEW YORK	2.3	3.5	1.8	3.3	2.7	3.6	2.5	3.1
OMAHA	2.7	4.0	2.4	3.8	3.5	4.3	3.6	4.3
PHOENIX	3.6	4.7	2.3	3.5	4.3	5.2	4.5	5.3
SANTA MARIA	3.5	4.7	2.6	3.8	4.5	5.4	4.1	4.9
SEATTLE	2.5	3.7	2.8	4.2	2.3	3.1	1.3	1.8
WASHINGTON,DC	2.6	3.8	2.0	3.5	3.1	4.0	3.1	3.8

FIXED SURFACE

TILT ANGLE 75 D AZIMUTH ANGLE 15 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	3.7	5.0	2.9	4.1	4.8	5.7	5.0	5.7
APPALACHICOLA	2.5	3.7	1.7	3.1	3.6	4.6	3.5	4.4
BISMARCK	3.4	4.6	3.2	4.5	3.8	4.5	3.6	4.1
BLUE HILL	2.5	3.7	2.0	3.4	2.8	3.6	2.9	3.5
BOSTON	2.5	3.7	2.1	3.5	2.6	3.5	2.6	3.2
BROWNSVILLE	1.7	3.2	1.6	3.0	2.7	3.9	2.4	3.5
CAPE HATTERAS	3.0	4.3	2.3	3.7	3.7	4.7	3.7	4.5
CARIBOU	3.1	4.3	2.4	3.8	2.4	3.1	3.2	3.8
CHARLESTON	2.5	3.8	1.7	3.2	3.2	4.2	3.1	3.9
COLUMBIA	2.5	3.7	2.4	3.7	3.3	4.1	3.1	3.7
DODGE CITY	3.0	4.2	2.7	3.9	4.2	5.1	4.2	4.8
EL PASO	3.8	4.9	2.5	3.7	4.5	5.4	5.0	5.8
ELY	3.7	5.0	3.1	4.3	4.8	5.6	4.4	5.1
FORT WORTH	2.4	3.7	2.1	3.4	3.4	4.4	3.4	4.2
GREAT FALLS	3.2	4.4	3.2	4.4	3.2	4.0	2.6	3.1
LAKE CHARLES	2.1	3.5	1.4	2.9	2.8	3.9	2.6	3.5
MADISON	3.0	4.3	2.8	4.2	3.1	3.9	3.3	4.0
MEDFORD	2.7	4.0	3.2	4.4	2.9	3.8	1.4	2.1
MIAMI	2.2	3.6	1.4	2.9	3.2	4.3	3.9	4.9
NASHVILLE	2.3	3.5	1.9	3.4	2.9	3.9	2.5	3.2
NEW YORK	2.3	3.5	1.8	3.3	2.7	3.5	2.4	3.0
OMAHA	2.8	4.0	2.5	3.8	3.4	4.2	3.5	4.2
PHOENIX	3.7	4.8	2.4	3.6	4.2	5.1	4.4	5.2
SANTA MARIA	3.4	4.6	2.5	3.7	4.2	5.1	4.0	4.8
SEATTLE	2.4	3.7	2.7	4.1	2.2	3.0	1.3	1.8
WASHINGTON,DC	2.6	3.8	2.0	3.5	3.0	3.9	3.0	3.7

FIXED SURFACE

TILT ANGLE 75 D AZIMUTH ANGLE 30 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	3.9	5.1	3.3	4.5	4.5	5.4	4.6	5.3
APPALACHICOLA	2.6	3.8	2.0	3.4	3.4	4.4	3.2	4.1
BISMARCK	3.4	4.6	3.4	4.6	3.6	4.3	3.3	3.8
BLUE HILL	2.5	3.7	2.1	3.5	2.6	3.4	2.7	3.3
BOSTON	2.5	3.7	2.2	3.6	2.5	3.3	2.4	3.0
BROWNSVILLE	1.8	3.3	1.9	3.3	2.6	3.8	2.3	3.3
CAPE HATTERAS	3.1	4.3	2.6	3.9	3.5	4.4	3.4	4.2
CARIBOU	3.0	4.3	2.5	3.9	2.2	3.0	3.0	3.6
CHARLESTON	2.6	3.8	1.9	3.4	3.0	4.0	2.9	3.7
COLUMBIA	2.5	3.7	2.5	3.9	3.0	3.9	2.8	3.4
DODGE CITY	3.0	4.2	2.8	4.1	3.9	4.8	3.8	4.4
EL PASO	3.9	5.0	2.9	4.0	4.3	5.2	4.6	5.4
ELY	3.8	5.1	3.4	4.7	4.6	5.4	4.0	4.7
FORT WORTH	2.5	3.7	2.3	3.7	3.2	4.1	3.1	3.9
GREAT FALLS	3.2	4.4	3.3	4.6	3.0	3.8	2.3	2.9
LAKE CHARLES	2.2	3.6	1.7	3.2	2.7	3.8	2.3	3.2
MADISON	3.0	4.3	3.0	4.4	2.9	3.7	3.0	3.6
MEDFORD	2.6	3.9	3.4	4.6	2.7	3.6	1.3	1.9
MIAMI	2.4	3.8	1.7	3.2	3.0	4.2	3.6	4.6
NASHVILLE	2.3	3.6	2.1	3.6	2.8	3.7	2.3	3.0
NEW YORK	2.3	3.5	1.9	3.3	2.5	3.4	2.1	2.8
OMAHA	2.8	4.0	2.6	4.0	3.2	4.0	3.2	3.9
PHOENIX	3.8	4.9	2.7	3.9	4.0	4.9	4.0	4.8
SANTA MARIA	3.4	4.6	2.6	3.7	3.9	4.7	3.6	4.4
SEATTLE	2.3	3.6	2.7	4.1	2.0	2.8	1.1	1.7
WASHINGTON,DC	2.6	3.8	2.1	3.6	2.8	3.7	2.7	3.4

FIXED SURFACE

TILT ANGLE 75 D AZIMUTH ANGLE 45 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.0	5.2	3.6	4.8	4.1	5.0	4.0	4.7
APPALACHICOLA	2.6	3.9	2.3	3.6	3.1	4.1	2.8	3.7
BISMARCK	3.3	4.5	3.5	4.8	3.2	4.0	2.8	3.3
BLUE HILL	2.5	3.7	2.1	3.6	2.4	3.2	2.3	2.9
BOSTON	2.5	3.7	2.3	3.7	2.2	3.1	2.0	2.6
BROWNSVILLE	1.8	3.3	2.2	3.6	2.5	3.7	2.0	3.1
CAPE HATTERAS	3.0	4.3	2.8	4.1	3.2	4.1	2.9	3.7
CARIBOU	3.0	4.2	2.5	3.9	2.0	2.8	2.5	3.1
CHARLESTON	2.6	3.9	2.1	3.6	2.8	3.8	2.5	3.3
COLUMBIA	2.5	3.7	2.6	4.0	2.7	3.6	2.4	3.0
DODGE CITY	2.9	4.1	3.0	4.2	3.5	4.4	3.2	3.9
EL PASO	4.0	5.2	3.2	4.4	3.9	4.9	4.0	4.8
ELY	3.9	5.1	3.8	5.1	4.2	5.0	3.5	4.2
FORT WORTH	2.4	3.7	2.6	3.9	2.9	3.9	2.7	3.5
GREAT FALLS	3.1	4.3	3.4	4.7	2.7	3.4	2.0	2.5
LAKE CHARLES	2.2	3.6	2.0	3.5	2.5	3.6	2.0	2.9
MADISON	3.0	4.3	3.1	4.5	2.7	3.5	2.6	3.2
MEDFORD	2.5	3.9	3.5	4.7	2.4	3.3	1.0	1.7
MIAMI	2.5	3.9	2.0	3.5	2.9	4.1	3.2	4.2
NASHVILLE	2.3	3.6	2.2	3.7	2.5	3.5	2.0	2.7
NEW YORK	2.2	3.5	1.9	3.4	2.3	3.1	1.8	2.4
OMAHA	2.8	4.0	2.7	4.1	2.8	3.7	2.8	3.4
PHOENIX	3.9	5.0	3.0	4.2	3.6	4.6	3.5	4.3
SANTA MARIA	3.3	4.5	2.6	3.8	3.4	4.3	3.1	3.9
SEATTLE	2.2	3.5	2.7	4.1	1.8	2.6	1.0	1.5
WASHINGTON,DC	2.5	3.8	2.2	3.7	2.5	3.4	2.3	3.0

FIXED SURFACE

TILT ANGLE 75 D AZIMUTH ANGLE 60 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.0	5.2	3.9	5.0	3.7	4.6	3.3	4.0
APPALACHICOLA	2.6	3.9	2.4	3.8	2.8	3.8	2.3	3.2
BISMARCK	3.2	4.4	3.6	4.8	2.8	3.6	2.2	2.7
BLUE HILL	2.4	3.6	2.2	3.6	2.1	2.9	1.8	2.4
BOSTON	2.4	3.6	2.3	3.8	2.0	2.8	1.6	2.2
BROWNSVILLE	1.9	3.4	2.5	3.9	2.4	3.6	1.8	2.8
CAPE HATTERAS	3.0	4.3	2.9	4.2	2.8	3.7	2.4	3.2
CARIBOU	2.8	4.0	2.6	3.9	1.7	2.5	2.0	2.6
CHARLESTON	2.6	3.8	2.2	3.7	2.5	3.5	2.1	2.9
COLUMBIA	2.4	3.6	2.7	4.1	2.4	3.2	1.9	2.6
DODGE CITY	2.8	4.0	3.1	4.3	3.1	3.9	2.6	3.3
EL PASO	4.1	5.2	3.5	4.6	3.5	4.5	3.4	4.2
ELY	3.8	5.1	4.0	5.3	3.7	4.5	2.8	3.5
FORT WORTH	2.4	3.7	2.7	4.1	2.5	3.5	2.2	3.0
GREAT FALLS	2.9	4.2	3.5	4.8	2.3	3.1	1.6	2.1
LAKE CHARLES	2.2	3.7	2.2	3.7	2.3	3.4	1.7	2.6
MADISON	2.9	4.2	3.2	4.6	2.3	3.1	2.1	2.7
MEDFORD	2.4	3.7	3.6	4.7	2.1	2.9	.8	1.5
MIAMI	2.6	4.0	2.3	3.7	2.6	3.8	2.8	3.8
NASHVILLE	2.3	3.5	2.3	3.8	2.2	3.2	1.6	2.3
NEW YORK	2.1	3.4	1.9	3.4	2.0	2.8	1.4	2.0
OMAHA	2.7	3.9	2.8	4.1	2.5	3.3	2.3	2.9
PHOENIX	3.9	5.0	3.1	4.3	3.2	4.2	2.9	3.7
SANTA MARIA	3.2	4.4	2.6	3.8	2.9	3.8	2.6	3.3
SEATTLE	2.0	3.3	2.7	4.1	1.5	2.3	.8	1.3
WASHINGTON,DC	2.4	3.7	2.3	3.7	2.2	3.1	1.9	2.5

FIXED SURFACE

TILT ANGLE 75 D AZIMUTH ANGLE 75 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	3.8	5.0	4.0	5.2	3.1	4.0	2.6	3.3
APPALACHICOLA	2.5	3.8	2.5	3.9	2.4	3.4	1.8	2.7
BISMARCK	2.9	4.1	3.5	4.8	2.3	3.1	1.6	2.2
BLUE HILL	2.2	3.4	2.1	3.6	1.7	2.6	1.4	2.0
BOSTON	2.2	3.4	2.3	3.7	1.6	2.4	1.2	1.8
BROWNSVILLE	1.9	3.4	2.6	4.0	2.1	3.3	1.5	2.5
CAPE HATTERAS	2.8	4.1	2.9	4.3	2.4	3.3	1.9	2.6
CARIBOU	2.6	3.8	2.4	3.8	1.4	2.2	1.5	2.1
CHARLESTON	2.4	3.7	2.3	3.8	2.1	3.1	1.6	2.4
COLUMBIA	2.2	3.5	2.7	4.0	1.9	2.8	1.4	2.1
DODGE CITY	2.7	3.9	3.0	4.3	2.6	3.4	2.0	2.7
EL PASO	4.0	5.1	3.6	4.7	3.1	4.0	2.7	3.5
ELY	3.6	4.9	4.1	5.4	3.1	3.9	2.2	2.9
FORT WORTH	2.3	3.6	2.8	4.1	2.2	3.2	1.8	2.5
GREAT FALLS	2.7	3.9	3.4	4.7	1.9	2.6	1.1	1.7
LAKE CHARLES	2.2	3.6	2.3	3.8	2.0	3.1	1.3	2.2
MADISON	2.6	4.0	3.1	4.5	1.9	2.7	1.6	2.2
MEDFORD	2.2	3.5	3.5	4.7	1.7	2.6	.6	1.3
MIAMI	2.6	4.0	2.4	3.9	2.3	3.5	2.3	3.3
NASHVILLE	2.2	3.4	2.3	3.8	1.9	2.9	1.3	2.0
NEW YORK	2.0	3.2	1.8	3.3	1.6	2.5	1.0	1.7
OMAHA	2.5	3.8	2.7	4.1	2.1	2.9	1.7	2.4
PHOENIX	3.8	4.9	3.2	4.4	2.7	3.7	2.2	3.0
SANTA MARIA	3.0	4.2	2.5	3.7	2.4	3.2	2.0	2.7
SEATTLE	1.8	3.1	2.6	4.0	1.2	2.0	.6	1.1
WASHINGTON,DC	2.3	3.5	2.2	3.7	1.8	2.7	1.4	2.1

FIXED SURFACE

TILT ANGLE 75 D AZIMUTH ANGLE 90 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	3.5	4.8	3.9	5.1	2.6	3.5	1.9	2.6
APPALACHICOLA	2.4	3.6	2.5	3.9	2.0	3.0	1.4	2.3
BISMARCK	2.6	3.8	3.3	4.6	1.8	2.6	1.1	1.6
BLUE HILL	2.0	3.2	2.0	3.4	1.4	2.2	.9	1.6
BOSTON	2.0	3.2	2.2	3.6	1.3	2.1	.8	1.4
BROWNSVILLE	1.8	3.3	2.7	4.1	1.8	3.1	1.1	2.2
CAPE HATTERAS	2.6	3.9	2.8	4.2	1.9	2.8	1.3	2.1
CARIBOU	2.2	3.5	2.3	3.7	1.1	1.9	1.0	1.6
CHARLESTON	2.3	3.5	2.3	3.7	1.7	2.7	1.2	2.0
COLUMBIA	2.0	3.2	2.5	3.9	1.5	2.4	1.0	1.7
DODGE CITY	2.4	3.6	2.9	4.1	2.1	2.9	1.4	2.1
EL PASO	3.7	4.8	3.6	4.7	2.5	3.5	2.1	2.8
ELY	3.3	4.6	4.0	5.3	2.5	3.3	1.5	2.3
FORT WORTH	2.1	3.4	2.8	4.1	1.8	2.8	1.3	2.1
GREAT FALLS	2.3	3.6	3.2	4.5	1.4	2.2	.7	1.3
LAKE CHARLES	2.1	3.5	2.3	3.8	1.7	2.8	1.0	1.9
MADISON	2.4	3.7	3.0	4.4	1.5	2.3	1.1	1.7
MEDFORD	1.9	3.2	3.3	4.5	1.3	2.2	.4	1.1
MIAMI	2.4	3.8	2.5	3.9	2.0	3.2	1.8	2.8
NASHVILLE	2.0	3.2	2.3	3.8	1.5	2.5	.9	1.6
NEW YORK	1.8	3.0	1.7	3.2	1.3	2.1	.7	1.3
OMAHA	2.3	3.5	2.6	4.0	1.6	2.5	1.2	1.9
PHOENIX	3.5	4.6	3.2	4.4	2.2	3.2	1.6	2.4
SANTA MARIA	2.7	3.9	2.4	3.6	1.8	2.7	1.4	2.2
SEATTLE	1.6	2.9	2.4	3.8	.9	1.7	.4	.9
WASHINGTON,DC	2.0	3.3	2.1	3.6	1.4	2.3	1.0	1.6

FIXED SURFACE

TILT ANGLE 60 D AZIMUTH ANGLE -90 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	3.8	5.1	4.1	5.4	2.8	3.8	2.1	2.9
APPALACHICOLA	3.0	4.3	2.9	4.3	2.4	3.5	1.8	2.8
BISMARCK	2.8	4.1	3.8	5.2	1.8	2.6	1.2	1.8
BLUE HILL	2.1	3.4	2.5	4.0	1.5	2.3	1.1	1.7
BOSTON	2.1	3.4	2.5	4.1	1.4	2.3	1.0	1.6
BROWNSVILLE	2.3	3.9	3.1	4.7	1.8	3.1	1.2	2.3
CAPE HATTERAS	3.4	4.7	3.6	5.0	2.3	3.3	1.6	2.4
CARIBOU	2.3	3.7	2.7	4.2	1.2	2.0	1.0	1.6
CHARLESTON	2.6	3.9	2.4	4.0	1.8	2.9	1.3	2.2
COLUMBIA	2.4	3.7	3.3	4.8	2.0	2.9	1.2	1.9
DODGE CITY	3.1	4.4	3.8	5.1	2.5	3.4	1.7	2.5
EL PASO	4.2	5.4	4.1	5.3	2.9	3.9	2.3	3.1
ELY	3.4	4.7	3.8	5.2	2.6	3.5	1.7	2.4
FORT WORTH	2.9	4.2	3.5	4.9	2.2	3.3	1.6	2.4
GREAT FALLS	2.3	3.6	3.3	4.7	1.5	2.3	.8	1.4
LAKE CHARLES	2.4	3.9	2.4	4.0	1.7	3.0	1.3	2.3
MADISON	2.7	4.1	3.6	5.0	1.6	2.5	1.2	1.9
MEDFORD	2.6	3.9	4.2	5.5	1.8	2.7	.6	1.4
MIAMI	2.8	4.2	2.5	4.0	2.1	3.4	2.0	3.1
NASHVILLE	2.3	3.6	2.7	4.3	1.7	2.7	1.0	1.8
NEW YORK	2.0	3.3	2.3	3.8	1.5	2.4	1.0	1.7
OMAHA	2.7	4.0	3.5	4.9	1.9	2.8	1.4	2.1
PHOENIX	4.0	5.2	4.0	5.3	2.6	3.6	2.0	2.8
SANTA MARIA	4.0	5.3	4.8	6.1	2.9	3.8	1.7	2.5
SEATTLE	2.2	3.6	3.8	5.2	1.2	2.0	.4	1.0
WASHINGTON,DC	2.3	3.7	2.7	4.3	1.7	2.7	1.2	1.9

FIXED SURFACE

TILT ANGLE 60 D AZIMUTH ANGLE -75 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.1	5.4	4.2	5.5	3.4	4.4	2.9	3.7
APPALACHICOLA	3.2	4.5	2.9	4.4	2.8	3.9	2.3	3.3
BISMARCK	3.2	4.4	4.0	5.4	2.3	3.1	1.7	2.3
BLUE HILL	2.4	3.7	2.6	4.2	1.8	2.7	1.5	2.2
BOSTON	2.4	3.7	2.7	4.2	1.8	2.6	1.4	2.0
BROWNSVILLE	2.4	4.0	3.1	4.6	2.1	3.4	1.5	2.6
CAPE HATTERAS	3.6	5.0	3.7	5.1	2.8	3.8	2.2	3.0
CARIBOU	2.7	4.0	2.9	4.4	1.5	2.3	1.5	2.1
CHARLESTON	2.8	4.2	2.4	4.0	2.3	3.3	1.8	2.7
COLUMBIA	2.7	4.0	3.5	5.0	2.4	3.3	1.7	2.4
DODGE CITY	3.4	4.7	4.0	5.3	3.1	4.0	2.4	3.1
EL PASO	4.5	5.7	4.2	5.4	3.4	4.4	3.0	3.8
ELY	3.7	5.1	3.9	5.3	3.3	4.1	2.3	3.1
FORT WORTH	3.1	4.5	3.5	4.9	2.7	3.7	2.1	2.9
GREAT FALLS	2.7	4.0	3.6	4.9	1.9	2.7	1.2	1.8
LAKE CHARLES	2.6	4.1	2.4	4.0	2.1	3.3	1.7	2.6
MADISON	3.0	4.4	3.7	5.2	2.1	2.9	1.7	2.4
MEDFORD	2.8	4.2	4.4	5.7	2.2	3.1	.9	1.6
MIAMI	2.9	4.4	2.5	4.0	2.5	3.7	2.5	3.6
NASHVILLE	2.5	3.9	2.8	4.4	2.1	3.1	1.4	2.2
NEW YORK	2.3	3.6	2.4	4.0	1.8	2.7	1.4	2.0
OMAHA	3.0	4.3	3.6	5.1	2.4	3.3	1.9	2.6
PHOENIX	4.3	5.5	4.1	5.4	3.2	4.1	2.6	3.5
SANTA MARIA	4.3	5.6	4.9	6.2	3.5	4.4	2.3	3.1
SEATTLE	2.5	3.9	4.0	5.4	1.5	2.3	.6	1.2
WASHINGTON,DC	2.6	3.9	2.9	4.4	2.1	3.1	1.7	2.4

FIXED SURFACE

TILT ANGLE 60 D AZIMUTH ANGLE -60 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.3	5.6	4.3	5.6	4.0	5.0	3.6	4.4
APPALACHICOLA	3.3	4.6	2.9	4.3	3.2	4.3	2.8	3.8
BISMARCK	3.5	4.7	4.2	5.5	2.8	3.6	2.3	2.9
BLUE HILL	2.6	3.9	2.7	4.3	2.2	3.1	2.0	2.6
BOSTON	2.6	3.9	2.8	4.3	2.1	3.0	1.8	2.4
BROWNSVILLE	2.4	4.0	3.0	4.5	2.4	3.7	1.8	2.9
CAPE HATTERAS	3.8	5.2	3.7	5.1	3.3	4.3	2.7	3.5
CARIBOU	3.0	4.3	3.0	4.5	1.8	2.6	2.0	2.6
CHARLESTON	3.0	4.3	2.5	4.1	2.6	3.7	2.3	3.1
COLUMBIA	2.9	4.2	3.5	5.0	2.8	3.7	2.1	2.9
DODGE CITY	3.6	4.9	4.0	5.3	3.6	4.5	3.0	3.7
EL PASO	4.7	5.9	4.1	5.3	3.9	4.9	3.7	4.5
ELY	4.0	5.3	4.0	5.4	3.8	4.7	2.9	3.7
FORT WORTH	3.2	4.6	3.5	4.9	3.1	4.1	2.6	3.4
GREAT FALLS	3.0	4.3	3.8	5.1	2.3	3.2	1.6	2.2
LAKE CHARLES	2.7	4.2	2.3	4.0	2.4	3.6	2.0	3.0
MADISON	3.3	4.7	3.8	5.3	2.4	3.3	2.2	2.9
MEDFORD	3.1	4.5	4.6	5.8	2.6	3.5	1.1	1.8
MIAMI	3.0	4.5	2.4	4.0	2.8	4.1	3.0	4.1
NASHVILLE	2.7	4.0	2.8	4.4	2.4	3.4	1.8	2.5
NEW YORK	2.5	3.8	2.5	4.1	2.2	3.1	1.7	2.4
OMAHA	3.2	4.5	3.7	5.1	2.8	3.7	2.4	3.1
PHOENIX	4.5	5.7	4.1	5.4	3.7	4.6	3.3	4.1
SANTA MARIA	4.5	5.8	4.9	6.2	4.0	5.0	2.9	3.7
SEATTLE	2.7	4.1	4.1	5.5	1.8	2.6	.8	1.4
WASHINGTON,DC	2.8	4.2	2.9	4.5	2.5	3.5	2.1	2.8

FIXED SURFACE

TILT ANGLE 60 D AZIMUTH ANGLE -45 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.5	5.8	4.2	5.5	4.5	5.5	4.2	5.0
APPALACHICOLA	3.3	4.7	2.8	4.3	3.6	4.7	3.3	4.2
BISMARCK	3.7	5.0	4.2	5.6	3.2	4.0	2.8	3.4
BLUE HILL	2.8	4.1	2.7	4.3	2.5	3.4	2.4	3.0
BOSTON	2.8	4.0	2.8	4.3	2.4	3.3	2.1	2.8
BROWNSVILLE	2.5	4.1	2.9	4.4	2.6	3.9	2.1	3.2
CAPE HATTERAS	4.0	5.3	3.7	5.1	3.7	4.7	3.2	4.0
CARIBOU	3.2	4.5	3.1	4.5	2.1	2.9	2.5	3.1
CHARLESTON	3.1	4.4	2.4	4.0	3.0	4.1	2.7	3.5
COLUMBIA	3.0	4.3	3.5	5.0	3.2	4.1	2.6	3.3
DODGE CITY	3.7	5.0	4.0	5.3	4.1	5.0	3.5	4.3
EL PASO	4.8	6.0	4.1	5.3	4.4	5.4	4.3	5.1
ELY	4.2	5.5	4.0	5.4	4.4	5.2	3.5	4.3
FORT WORTH	3.3	4.7	3.4	4.8	3.4	4.5	3.0	3.9
GREAT FALLS	3.2	4.5	3.9	5.2	2.7	3.6	2.0	2.6
LAKE CHARLES	2.7	4.2	2.3	3.9	2.7	3.9	2.4	3.3
MADISON	3.4	4.8	3.9	5.4	2.8	3.6	2.7	3.4
MEDFORD	3.2	4.6	4.6	5.8	2.9	3.8	1.3	2.0
MIAMI	3.0	4.5	2.4	3.9	3.1	4.4	3.5	4.6
NASHVILLE	2.8	4.1	2.8	4.4	2.7	3.8	2.1	2.9
NEW YORK	2.6	3.9	2.5	4.1	2.5	3.4	2.1	2.8
OMAHA	3.3	4.6	3.7	5.1	3.2	4.1	2.9	3.6
PHOENIX	4.6	5.8	4.0	5.3	4.1	5.1	3.9	4.7
SANTA MARIA	4.6	5.9	4.8	6.1	4.5	5.4	3.4	4.3
SEATTLE	2.9	4.2	4.1	5.5	2.1	2.9	1.0	1.6
WASHINGTON,DC	3.0	4.3	3.0	4.5	2.9	3.8	2.5	3.3

FIXED SURFACE

TILT ANGLE 60 D AZIMUTH ANGLE -30 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.6	5.9	4.2	5.4	4.9	5.9	4.8	5.6
APPALACHICOLA	3.4	4.7	2.7	4.2	3.9	5.0	3.6	4.6
BISMARCK	3.9	5.1	4.2	5.6	3.6	4.4	3.3	3.8
BLUE HILL	2.9	4.2	2.7	4.3	2.8	3.6	2.7	3.4
BOSTON	2.9	4.2	2.8	4.3	2.7	3.5	2.5	3.1
BROWNSVILLE	2.4	4.0	2.7	4.2	2.8	4.1	2.4	3.5
CAPE HATTERAS	4.0	5.4	3.5	5.0	4.0	5.0	3.7	4.5
CARIBOU	3.4	4.7	3.1	4.6	2.3	3.2	2.9	3.5
CHARLESTON	3.2	4.5	2.4	4.0	3.3	4.4	3.1	3.9
COLUMBIA	3.1	4.4	3.4	4.9	3.5	4.4	2.9	3.7
DODGE CITY	3.8	5.1	3.9	5.2	4.4	5.4	4.0	4.8
EL PASO	4.8	6.0	3.9	5.1	4.8	5.7	4.9	5.7
ELY	4.3	5.7	4.0	5.4	4.8	5.7	4.1	4.8
FORT WORTH	3.3	4.7	3.3	4.7	3.7	4.8	3.4	4.2
GREAT FALLS	3.4	4.8	3.9	5.3	3.1	3.9	2.4	3.0
LAKE CHARLES	2.7	4.3	2.2	3.8	2.9	4.2	2.6	3.6
MADISON	3.6	5.0	3.8	5.3	3.1	3.9	3.1	3.8
MEDFORD	3.3	4.7	4.5	5.8	3.2	4.1	1.5	2.2
MIAMI	3.0	4.5	2.2	3.8	3.4	4.6	3.9	5.0
NASHVILLE	2.8	4.2	2.7	4.4	3.0	4.1	2.4	3.1
NEW YORK	2.7	4.0	2.5	4.1	2.8	3.7	2.4	3.0
OMAHA	3.4	4.7	3.6	5.0	3.5	4.4	3.3	4.0
PHOENIX	4.7	5.9	3.8	5.1	4.5	5.5	4.4	5.2
SANTA MARIA	4.7	6.0	4.5	5.8	4.8	5.8	3.9	4.7
SEATTLE	3.0	4.3	4.0	5.4	2.3	3.1	1.2	1.7
WASHINGTON,DC	3.1	4.4	2.9	4.5	3.2	4.1	2.9	3.6

FIXED SURFACE

TILT ANGLE 60 D AZIMUTH ANGLE -15 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.6	5.9	4.1	5.4	5.2	6.2	5.2	6.0
APPALACHICOLA	3.4	4.7	2.6	4.1	4.1	5.2	3.9	4.8
BISMARCK	4.0	5.2	4.1	5.5	3.9	4.7	3.6	4.1
BLUE HILL	3.0	4.3	2.7	4.2	3.0	3.8	3.0	3.6
BOSTON	3.0	4.3	2.8	4.3	2.8	3.7	2.7	3.3
BROWNSVILLE	2.4	4.0	2.6	4.1	3.0	4.3	2.6	3.7
CAPE HATTERAS	4.0	5.4	3.4	4.9	4.2	5.2	4.0	4.8
CARIBOU	3.5	4.8	3.1	4.5	2.5	3.3	3.2	3.8
CHARLESTON	3.2	4.6	2.4	4.0	3.5	4.6	3.3	4.2
COLUMBIA	3.1	4.5	3.3	4.8	3.7	4.6	3.2	3.9
DODGE CITY	3.8	5.1	3.8	5.1	4.7	5.6	4.4	5.1
EL PASO	4.9	6.0	3.8	5.0	5.0	6.0	5.3	6.1
ELY	4.4	5.8	4.0	5.3	5.2	6.1	4.5	5.2
FORT WORTH	3.3	4.7	3.1	4.6	3.9	4.9	3.7	4.5
GREAT FALLS	3.6	4.9	4.0	5.3	3.3	4.1	2.6	3.2
LAKE CHARLES	2.7	4.3	2.1	3.7	3.1	4.3	2.8	3.8
MADISON	3.6	5.0	3.8	5.3	3.3	4.2	3.4	4.1
MEDFORD	3.4	4.8	4.4	5.7	3.3	4.3	1.5	2.3
MIAMI	3.0	4.5	2.2	3.7	3.6	4.8	4.2	5.3
NASHVILLE	2.9	4.2	2.7	4.3	3.2	4.3	2.6	3.3
NEW YORK	2.8	4.1	2.5	4.1	3.0	3.9	2.5	3.2
OMAHA	3.4	4.7	3.5	4.9	3.7	4.6	3.6	4.3
PHOENIX	4.7	5.9	3.7	5.0	4.7	5.7	4.7	5.6
SANTA MARIA	4.6	5.9	4.3	5.5	5.0	6.0	4.2	5.0
SEATTLE	3.0	4.4	3.8	5.3	2.4	3.2	1.3	1.8
WASHINGTON,DC	3.2	4.5	2.9	4.5	3.3	4.3	3.1	3.9

FIXED SURFACE

TILT ANGLE 60 D AZIMUTH ANGLE 0 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.7	6.0	4.1	5.4	5.4	6.3	5.4	6.1
APPALACHICOLA	3.4	4.7	2.6	4.1	4.2	5.3	3.9	4.9
BISMARCK	4.0	5.3	4.1	5.5	4.0	4.8	3.7	4.2
BLUE HILL	3.0	4.3	2.7	4.2	3.0	3.9	3.0	3.7
BOSTON	3.0	4.3	2.8	4.3	2.9	3.8	2.7	3.4
BROWNSVILLE	2.4	4.0	2.5	4.0	3.1	4.4	2.7	3.8
CAPE HATTERAS	4.0	5.4	3.4	4.8	4.3	5.3	4.0	4.9
CARIBOU	3.6	4.9	3.1	4.6	2.6	3.4	3.3	3.9
CHARLESTON	3.3	4.6	2.4	4.0	3.6	4.7	3.4	4.3
COLUMBIA	3.2	4.5	3.3	4.8	3.7	4.7	3.3	4.0
DODGE CITY	3.8	5.1	3.7	5.0	4.8	5.7	4.4	5.2
EL PASO	4.9	6.1	3.8	5.0	5.1	6.1	5.4	6.3
ELY	4.5	5.9	4.0	5.4	5.3	6.2	4.6	5.4
FORT WORTH	3.3	4.6	3.1	4.5	3.9	5.0	3.7	4.6
GREAT FALLS	3.7	5.0	4.0	5.4	3.4	4.3	2.7	3.2
LAKE CHARLES	2.8	4.3	2.1	3.8	3.2	4.4	2.9	3.8
MADISON	3.6	5.1	3.8	5.3	3.4	4.3	3.5	4.1
MEDFORD	3.4	4.8	4.4	5.6	3.4	4.3	1.6	2.3
MIAMI	3.0	4.5	2.2	3.7	3.7	5.0	4.3	5.4
NASHVILLE	2.9	4.3	2.7	4.3	3.3	4.4	2.7	3.4
NEW YORK	2.8	4.1	2.5	4.1	3.0	3.9	2.6	3.2
OMAHA	3.4	4.8	3.4	4.8	3.8	4.7	3.7	4.4
PHOENIX	4.8	5.9	3.6	4.9	4.9	5.9	4.8	5.7
SANTA MARIA	4.6	5.8	4.0	5.3	5.0	6.0	4.3	5.1
SEATTLE	2.9	4.3	3.7	5.2	2.4	3.3	1.3	1.9
WASHINGTON,DC	3.2	4.6	2.9	4.4	3.4	4.4	3.2	3.9

FIXED SURFACE

TILT ANGLE 60 D AZIMUTH ANGLE 15 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.8	6.1	4.3	5.6	5.3	6.3	5.2	6.0
APPALACHICOLA	3.4	4.7	2.7	4.2	4.1	5.2	3.8	4.8
BISMARCK	4.0	5.3	4.2	5.5	4.0	4.8	3.6	4.2
BLUE HILL	3.1	4.4	2.7	4.2	3.0	3.9	3.0	3.6
BOSTON	3.1	4.3	2.8	4.3	2.9	3.8	2.7	3.3
BROWNSVILLE	2.4	4.0	2.6	4.1	3.1	4.4	2.7	3.8
CAPE HATTERAS	4.0	5.3	3.4	4.9	4.2	5.2	3.9	4.8
CARIBOU	3.6	4.9	3.1	4.6	2.5	3.4	3.2	3.8
CHARLESTON	3.3	4.6	2.5	4.1	3.6	4.7	3.3	4.2
COLUMBIA	3.2	4.5	3.3	4.8	3.6	4.6	3.2	3.9
DODGE CITY	3.8	5.1	3.7	5.1	4.7	5.6	4.3	5.0
EL PASO	5.0	6.2	3.9	5.1	5.1	6.1	5.3	6.2
ELY	4.6	6.0	4.3	5.6	5.3	6.2	4.5	5.3
FORT WORTH	3.2	4.6	3.1	4.6	3.8	4.9	3.6	4.5
GREAT FALLS	3.7	5.0	4.1	5.5	3.4	4.2	2.6	3.2
LAKE CHARLES	2.8	4.3	2.2	3.9	3.2	4.4	2.8	3.7
MADISON	3.6	5.1	3.8	5.3	3.4	4.2	3.4	4.0
MEDFORD	3.3	4.7	4.4	5.7	3.2	4.2	1.5	2.2
MIAMI	3.1	4.6	2.3	3.9	3.7	4.9	4.2	5.3
NASHVILLE	2.9	4.3	2.8	4.4	3.3	4.3	2.6	3.4
NEW YORK	2.8	4.1	2.5	4.1	3.0	3.9	2.5	3.1
OMAHA	3.4	4.8	3.4	4.8	3.7	4.6	3.6	4.3
PHOENIX	4.8	6.0	3.7	5.0	4.8	5.8	4.7	5.5
SANTA MARIA	4.5	5.7	3.8	5.1	4.8	5.7	4.2	5.0
SEATTLE	2.9	4.3	3.6	5.1	2.4	3.2	1.3	1.8
WASHINGTON,DC	3.2	4.6	2.9	4.4	3.3	4.3	3.1	3.8

FIXED SURFACE

TILT ANGLE 60 D AZIMUTH ANGLE 30 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.9	6.2	4.5	5.8	5.1	6.8	4.9	5.6
APPALACHICOLA	3.4	4.7	2.9	4.3	3.9	5.0	3.5	4.5
BISMARCK	4.0	5.3	4.3	5.6	3.8	4.6	3.3	3.9
BLUE HILL	3.0	4.3	2.7	4.3	2.9	3.7	2.7	3.4
BOSTON	3.1	4.3	2.9	4.4	2.7	3.6	2.4	3.1
BROWNSVILLE	2.4	4.0	2.8	4.3	3.1	4.4	2.5	3.6
CAPE HATTERAS	3.9	5.3	3.5	5.0	4.0	5.0	3.6	4.5
CARIBOU	3.5	4.9	3.2	4.6	2.4	3.2	3.0	3.6
CHARLESTON	3.3	4.6	2.6	4.2	3.5	4.5	3.1	3.9
COLUMBIA	3.1	4.4	3.4	4.8	3.4	4.3	2.9	3.6
DODGE CITY	3.7	5.0	3.8	5.1	4.4	5.3	3.9	4.7
EL PASO	5.0	6.2	4.1	5.3	4.9	5.8	5.0	5.8
ELY	4.7	6.0	4.5	5.9	5.0	5.9	4.2	4.9
FORT WORTH	3.2	4.5	3.3	4.7	3.6	4.7	3.4	4.2
GREAT FALLS	3.7	5.0	4.2	5.6	3.2	4.0	2.4	3.0
LAKE CHARLES	2.8	4.3	2.4	4.0	3.1	4.3	2.6	3.5
MADISON	3.6	5.0	3.9	5.4	3.2	4.0	3.1	3.8
MEDFORD	3.2	4.6	4.5	5.7	3.0	4.0	1.3	2.1
MIAMI	3.2	4.7	2.5	4.1	3.6	4.8	4.0	5.1
NASHVILLE	2.9	4.3	2.8	4.5	3.1	4.2	2.4	3.2
NEW YORK	2.8	4.1	2.5	4.1	2.8	3.7	2.2	2.9
OMAHA	3.4	4.7	3.4	4.9	3.5	4.4	3.3	4.0
PHOENIX	4.9	6.0	3.8	5.1	4.5	5.5	4.3	5.2
SANTA MARIA	4.3	5.6	3.7	5.0	4.4	5.4	3.9	4.7
SEATTLE	2.8	4.2	3.5	5.0	2.2	3.0	1.2	1.7
WASHINGTON,DC	3.2	4.5	2.9	4.5	3.1	4.1	2.9	3.6

FIXED SURFACE

TILT ANGLE 60 D AZIMUTH ANGLE 45 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.9	6.2	4.7	6.0	4.7	5.6	4.3	5.1
APPALACHICOLA	3.3	4.7	3.0	4.5	3.6	4.7	3.1	4.1
BISMARCK	3.9	5.1	4.3	5.7	3.5	4.3	2.8	3.4
BLUE HILL	3.0	4.3	2.7	4.3	2.6	3.5	2.4	3.0
BOSTON	3.0	4.3	2.9	4.4	2.5	3.4	2.1	2.8
BROWNSVILLE	2.4	4.0	3.0	4.5	2.9	4.2	2.3	3.4
CAPE HATTERAS	3.8	5.2	3.6	5.1	3.6	4.6	3.2	4.0
CARIBOU	3.4	4.8	3.1	4.6	2.2	3.0	2.6	3.2
CHARLESTON	3.3	4.6	2.8	4.4	3.2	4.3	2.7	3.6
COLUMBIA	3.0	4.4	3.4	4.9	3.1	4.0	2.5	3.2
DODGE CITY	3.6	4.9	3.9	5.2	4.0	4.9	3.4	4.1
EL PASO	5.0	6.2	4.3	5.5	4.5	5.5	4.4	5.3
ELY	4.6	6.0	4.8	6.1	4.6	5.5	3.7	4.4
FORT WORTH	3.1	4.5	3.4	4.8	3.3	4.4	3.0	3.8
GREAT FALLS	3.6	4.9	4.2	5.6	2.9	3.7	2.0	2.6
LAKE CHARLES	2.8	4.3	2.6	4.2	2.9	4.1	2.3	3.2
MADISON	3.5	4.9	3.9	5.4	2.9	3.8	2.7	3.4
MEDFORD	3.1	4.5	4.5	5.8	2.7	3.6	1.1	1.8
MIAMI	3.2	4.7	2.8	4.3	3.4	4.6	3.6	4.7
NASHVILLE	2.9	4.2	2.9	4.5	2.9	3.9	2.1	2.9
NEW YORK	2.7	4.0	2.5	4.0	2.6	3.5	1.9	2.6
OMAHA	3.3	4.7	3.5	4.9	3.2	4.1	2.9	3.6
PHOENIX	4.9	6.0	4.0	5.3	4.2	5.2	3.8	4.7
SANTA MARIA	4.2	5.5	3.6	4.9	3.9	4.9	3.4	4.2
SEATTLE	2.6	4.0	3.5	4.9	1.9	2.8	1.0	1.6
WASHINGTON,DC	3.1	4.4	2.9	4.5	2.8	3.8	2.5	3.2

FIXED SURFACE

TILT ANGLE 60 D AZIMUTH ANGLE 60 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.8	6.1	4.9	6.2	4.2	5.2	3.6	4.4
APPALACHICOLA	3.3	4.6	3.2	4.6	3.3	4.4	2.6	3.6
BISMARCK	3.7	4.9	4.3	5.6	3.1	3.9	2.3	2.9
BLUE HILL	2.8	4.1	2.7	4.2	2.3	3.2	2.0	2.6
BOSTON	2.9	4.1	2.9	4.4	2.2	3.1	1.7	2.4
BROWNSVILLE	2.4	4.0	3.2	4.7	2.7	4.1	2.0	3.1
CAPE HATTERAS	3.7	5.1	3.7	5.1	3.2	4.2	2.7	3.5
CARIBOU	3.2	4.6	3.1	4.6	1.9	2.7	2.1	2.7
CHARLESTON	3.2	4.5	2.9	4.4	2.9	4.0	2.3	3.2
COLUMBIA	2.9	4.2	3.4	4.9	2.7	3.6	2.1	2.8
DODGE CITY	3.5	4.7	3.8	5.2	3.5	4.4	2.8	3.6
EL PASO	5.0	6.2	4.5	5.7	4.1	5.1	3.8	4.6
ELY	4.5	5.8	4.9	6.3	4.1	5.0	3.1	3.8
FORT WORTH	3.0	4.4	3.5	4.9	3.0	4.0	2.5	3.4
GREAT FALLS	3.4	4.7	4.2	5.6	2.5	3.3	1.6	2.2
LAKE CHARLES	2.8	4.3	2.8	4.4	2.6	3.9	1.9	2.9
MADISON	3.3	4.8	3.9	5.4	2.6	3.4	2.2	2.9
MEDFORD	2.9	4.3	4.4	5.7	2.4	3.3	.9	1.6
MIAMI	3.2	4.7	2.9	4.5	3.1	4.4	3.2	4.3
NASHVILLE	2.8	4.1	2.9	4.6	2.6	3.6	1.8	2.6
NEW YORK	2.6	3.9	2.4	4.0	2.3	3.2	1.5	2.2
OMAHA	3.2	4.5	3.5	4.9	2.8	3.7	2.4	3.1
PHOENIX	4.8	5.9	4.0	5.3	3.8	4.7	3.2	4.1
SANTA MARIA	4.0	5.3	3.5	4.8	3.4	4.4	2.9	3.7
SEATTLE	2.4	3.8	3.4	4.8	1.7	2.5	.8	1.4
WASHINGTON,DC	2.9	4.3	2.9	4.4	2.5	3.5	2.0	2.8

FIXED SURFACE

TILT ANGLE 60 D AZIMUTH ANGLE 75 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.6	5.9	4.9	6.2	3.6	4.6	2.9	3.7
APPALACHICOLA	3.2	4.5	3.2	4.7	2.9	3.9	2.1	3.1
BISMARCK	3.4	4.6	4.1	5.5	2.6	3.4	1.8	2.3
BLUE HILL	2.6	3.9	2.6	4.2	2.0	2.9	1.5	2.2
BOSTON	2.7	3.9	2.8	4.4	1.9	2.7	1.3	2.0
BROWNSVILLE	2.3	3.9	3.3	4.8	2.5	3.8	1.7	2.8
CAPE HATTERAS	3.5	4.8	3.7	5.1	2.8	3.8	2.1	3.0
CARIBOU	3.0	4.3	3.0	4.4	1.6	2.4	1.6	2.2
CHARLESTON	3.0	4.4	2.9	4.5	2.5	3.6	1.9	2.7
COLUMBIA	2.7	4.0	3.3	4.8	2.3	3.2	1.6	2.3
DODGE CITY	3.2	4.5	3.8	5.1	3.0	3.9	2.2	2.9
EL PASO	4.8	6.0	4.5	5.7	3.6	4.6	3.1	4.0
ELY	4.3	5.6	4.9	6.3	3.6	4.4	2.4	3.2
FORT WORTH	2.8	4.2	3.5	4.9	2.6	3.6	2.0	2.9
GREAT FALLS	3.1	4.4	4.1	5.4	2.1	2.9	1.2	1.8
LAKE CHARLES	2.7	4.2	2.8	4.5	2.3	3.6	1.6	2.5
MADISON	3.1	4.5	3.8	5.3	2.2	3.0	1.7	2.4
MEDFORD	2.7	4.1	4.3	5.6	2.0	2.9	.7	1.4
MIAMI	3.2	4.7	3.1	4.6	2.8	4.0	2.7	3.8
NASHVILLE	2.6	4.0	2.9	4.5	2.2	3.3	1.4	2.2
NEW YORK	2.4	3.7	2.3	3.9	1.9	2.8	1.2	1.9
OMAHA	3.0	4.3	3.4	4.8	2.4	3.3	1.9	2.6
PHOENIX	4.6	5.8	4.1	5.4	3.3	4.3	2.6	3.4
SANTA MARIA	3.7	5.0	3.4	4.7	2.9	3.8	2.3	3.1
SEATTLE	2.2	3.6	3.2	4.6	1.4	2.2	.6	1.2
WASHINGTON,DC	2.7	4.1	2.8	4.4	2.1	3.1	1.6	2.3

FIXED SURFACE

TILT ANGLE 60 D AZIMUTH ANGLE 90 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.2	5.6	4.8	6.1	3.0	4.0	2.2	3.0
APPALACHICOLA	3.0	4.3	3.2	4.7	2.4	3.5	1.6	2.6
BISMARCK	3.0	4.3	3.9	5.3	2.1	2.9	1.2	1.8
BLUE HILL	2.4	3.7	2.4	4.0	1.6	2.5	1.1	1.7
BOSTON	2.4	3.7	2.7	4.2	1.5	2.4	.9	1.6
BROWNSVILLE	2.2	3.8	3.3	4.9	2.2	3.5	1.4	2.5
CAPE HATTERAS	3.2	4.6	3.6	5.0	2.3	3.3	1.6	2.4
CARIBOU	2.6	3.9	2.8	4.2	1.3	2.1	1.1	1.7
CHARLESTON	2.8	4.2	2.8	4.4	2.1	3.1	1.4	2.3
COLUMBIA	2.5	3.8	3.1	4.6	1.8	2.7	1.2	1.9
DODGE CITY	2.9	4.2	3.6	4.9	2.4	3.3	1.6	2.3
EL PASO	4.5	5.7	4.5	5.7	3.0	4.0	2.4	3.2
ELY	3.9	5.2	4.8	6.1	2.9	3.8	1.8	2.6
FORT WORTH	2.6	4.0	3.4	4.9	2.1	3.2	1.5	2.4
GREAT FALLS	2.7	4.1	3.8	5.2	1.6	2.5	.9	1.4
LAKE CHARLES	2.5	4.1	2.8	4.5	2.0	3.2	1.2	2.2
MADISON	2.8	4.2	3.6	5.1	1.8	2.6	1.2	1.9
MEDFORD	2.4	3.8	4.1	5.3	1.6	2.5	.5	1.2
MIAMI	3.0	4.5	3.1	4.6	2.4	3.7	2.1	3.2
NASHVILLE	2.4	3.8	2.8	4.4	1.8	2.9	1.1	1.8
NEW YORK	2.1	3.4	2.2	3.7	1.6	2.5	.8	1.5
OMAHA	2.7	4.1	3.2	4.6	1.9	2.8	1.4	2.1
PHOENIX	4.3	5.4	4.0	5.3	2.7	3.7	2.0	2.8
SANTA MARIA	3.4	4.7	3.2	4.5	2.3	3.2	1.7	2.5
SEATTLE	1.9	3.3	3.0	4.4	1.1	1.9	.4	1.0
WASHINGTON,DC	2.5	3.8	2.6	4.2	1.7	2.7	1.1	1.9

FIXED SURFACE

TILT ANGLE 45 D AZIMUTH ANGLE -90 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.4	5.8	5.0	6.3	3.2	4.3	2.4	3.3
APPALACHICOLA	3.5	4.9	3.5	5.0	2.8	3.9	2.0	3.1
BISMARCK	3.1	4.5	4.3	5.8	2.0	2.8	1.3	1.9
BLUE HILL	2.5	3.9	2.9	4.5	1.6	2.6	1.2	1.9
BOSTON	2.5	3.8	3.0	4.6	1.6	2.5	1.1	1.7
BROWNSVILLE	2.7	4.4	3.7	5.4	2.1	3.5	1.4	2.6
CAPE HATTERAS	3.9	5.4	4.2	5.8	2.6	3.7	1.8	2.7
CARIBOU	2.7	4.1	3.1	4.7	1.3	2.2	1.1	1.7
CHARLESTON	3.1	4.5	2.9	4.6	2.2	3.3	1.6	2.5
COLUMBIA	2.8	4.2	3.9	5.5	2.2	3.2	1.4	2.1
DODGE CITY	3.6	4.9	4.4	5.8	2.8	3.8	1.9	2.7
EL PASO	4.9	6.1	4.9	6.2	3.3	4.3	2.6	3.5
ELY	3.9	5.3	4.5	5.9	3.0	3.9	1.8	2.7
FORT WORTH	3.3	4.8	4.1	5.6	2.6	3.7	1.8	2.7
GREAT FALLS	2.7	4.1	3.9	5.3	1.6	2.5	.9	1.5
LAKE CHARLES	2.8	4.5	2.8	4.6	2.0	3.4	1.5	2.5
MADISON	3.1	4.5	4.1	5.6	1.8	2.7	1.3	2.0
MEDFORD	2.9	4.4	4.9	6.2	2.0	3.0	.7	1.5
MIAMI	3.3	4.9	3.1	4.7	2.5	3.8	2.3	3.4
NASHVILLE	2.7	4.1	3.2	4.9	1.9	3.0	1.2	2.0
NEW YORK	2.4	3.7	2.7	4.3	1.7	2.6	1.1	1.8
OMAHA	3.1	4.5	4.0	5.5	2.1	3.1	1.5	2.2
PHOENIX	4.7	5.9	4.8	6.2	3.0	4.1	2.3	3.2
SANTA MARIA	4.6	6.0	5.6	6.9	3.3	4.3	1.9	2.8
SEATTLE	2.5	4.0	4.2	5.8	1.3	2.2	.5	1.1
WASHINGTON,DC	2.7	4.2	3.2	4.9	2.0	3.0	1.4	2.1

FIXED SURFACE

TILT ANGLE 45 D AZIMUTH ANGLE -75 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.7	6.1	5.1	6.4	3.8	4.8	3.1	3.9
APPALACHICOLA	3.7	5.1	3.5	5.1	3.2	4.3	2.5	3.5
BISMARCK	3.5	4.8	4.6	6.0	2.4	3.3	1.8	2.4
BLUE HILL	2.7	4.1	3.0	4.7	2.0	2.9	1.6	2.3
BOSTON	2.7	4.1	3.1	4.8	1.9	2.8	1.4	2.1
BROWNSVILLE	2.8	4.5	3.8	5.4	2.4	3.8	1.7	2.9
CAPE HATTERAS	4.2	5.7	4.4	5.9	3.1	4.2	2.3	3.2
CARIBOU	3.0	4.4	3.3	4.9	1.6	2.5	1.5	2.2
CHARLESTON	3.3	4.7	3.0	4.7	2.6	3.7	2.0	2.9
COLUMBIA	3.1	4.5	4.0	5.6	2.6	3.6	1.8	2.5
DODGE CITY	3.8	5.2	4.6	6.0	3.4	4.3	2.4	3.2
EL PASO	5.2	6.4	5.0	6.3	3.8	4.9	3.2	4.1
ELY	4.2	5.7	4.6	6.1	3.6	4.5	2.4	3.2
FORT WORTH	3.6	5.0	4.2	5.7	3.0	4.1	2.2	3.1
GREAT FALLS	3.0	4.4	4.1	5.6	2.1	2.9	1.3	1.9
LAKE CHARLES	3.0	4.6	2.9	4.6	2.4	3.7	1.8	2.8
MADISON	3.4	4.9	4.3	5.9	2.2	3.1	1.8	2.5
MEDFORD	3.2	4.7	5.1	6.5	2.4	3.4	.9	1.7
MIAMI	3.4	5.0	3.1	4.7	2.8	4.2	2.8	3.9
NASHVILLE	2.9	4.3	3.3	5.0	2.3	3.4	1.5	2.3
NEW YORK	2.6	4.0	2.8	4.5	2.0	3.0	1.4	2.1
OMAHA	3.3	4.7	4.1	5.7	2.6	3.5	2.0	2.7
PHOENIX	5.0	6.2	4.9	6.2	3.5	4.6	2.9	3.8
SANTA MARIA	4.9	6.3	5.7	7.1	3.8	4.8	2.5	3.3
SEATTLE	2.8	4.2	4.4	6.0	1.6	2.5	.6	1.2
WASHINGTON,DC	3.0	4.4	3.4	5.0	2.3	3.4	1.8	2.5

FIXED SURFACE

TILT ANGLE 45 D AZIMUTH ANGLE -60 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.0	6.3	5.2	6.5	4.3	5.3	3.7	4.5
APPALACHICOLA	3.8	5.3	3.5	5.1	3.6	4.7	3.0	4.0
BISMARCK	3.8	5.1	4.7	6.2	2.9	3.7	2.3	2.9
BLUE HILL	3.0	4.3	3.1	4.8	2.3	3.2	2.0	2.7
BOSTON	2.9	4.3	3.2	4.9	2.2	3.2	1.8	2.5
BROWNSVILLE	2.9	4.6	3.7	5.3	2.7	4.1	2.0	3.1
CAPE HATTERAS	4.4	5.9	4.4	5.9	3.5	4.6	2.8	3.7
CARIBOU	3.3	4.7	3.4	5.0	1.9	2.8	2.0	2.6
CHARLESTON	3.5	4.9	3.0	4.7	2.9	4.1	2.4	3.3
COLUMBIA	3.3	4.7	4.1	5.7	3.0	4.0	2.2	3.0
DODGE CITY	4.1	5.4	4.7	6.1	3.8	4.8	3.0	3.8
EL PASO	5.4	6.7	5.0	6.3	4.3	5.3	3.9	4.7
ELY	4.5	5.9	4.8	6.2	4.1	5.0	3.0	3.8
FORT WORTH	3.7	5.2	4.2	5.7	3.3	4.5	2.7	3.6
GREAT FALLS	3.3	4.7	4.3	5.8	2.4	3.3	1.6	2.3
LAKE CHARLES	3.1	4.7	2.9	4.6	2.7	4.0	2.1	3.2
MADISON	3.6	5.1	4.4	6.0	2.6	3.5	2.2	2.9
MEDFORD	3.4	4.9	5.3	6.6	2.7	3.7	1.1	1.9
MIAMI	3.5	5.1	3.1	4.7	3.1	4.5	3.2	4.4
NASHVILLE	3.1	4.5	3.4	5.1	2.6	3.7	1.8	2.6
NEW YORK	2.8	4.2	2.9	4.6	2.3	3.3	1.8	2.5
OMAHA	3.5	4.9	4.2	5.8	3.0	3.9	2.4	3.2
PHOENIX	5.2	6.5	4.9	6.3	4.0	5.0	3.4	4.3
SANTA MARIA	5.1	6.5	5.7	7.1	4.3	5.3	3.0	3.9
SEATTLE	3.0	4.4	4.6	6.1	1.9	2.8	.8	1.4
WASHINGTON,DC	3.2	4.6	3.5	5.1	2.7	3.7	2.2	2.9

FIXED SURFACE

TILT ANGLE 45 D AZIMUTH ANGLE -45 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.2	6.6	5.2	6.6	4.8	5.8	4.3	5.1
APPALACHICOLA	4.0	5.4	3.5	5.1	3.9	5.1	3.4	4.4
BISMARCK	4.1	5.4	4.8	6.3	3.3	4.1	2.7	3.3
BLUE HILL	3.1	4.5	3.2	4.9	2.6	3.5	2.3	3.0
BOSTON	3.1	4.5	3.3	4.9	2.5	3.4	2.1	2.8
BROWNSVILLE	2.9	4.6	3.6	5.3	2.9	4.3	2.3	3.4
CAPE HATTERAS	4.6	6.0	4.4	6.0	3.9	5.0	3.3	4.2
CARIBOU	3.5	4.9	3.5	5.1	2.1	3.0	2.4	3.0
CHARLESTON	3.6	5.1	3.1	4.7	3.3	4.4	2.8	3.7
COLUMBIA	3.4	4.8	4.2	5.7	3.3	4.3	2.6	3.3
DODGE CITY	4.2	5.6	4.7	6.1	4.3	5.2	3.5	4.3
EL PASO	5.6	6.8	5.0	6.3	4.7	5.8	4.4	5.3
ELY	4.8	6.2	4.9	6.3	4.6	5.5	3.5	4.3
FORT WORTH	3.8	5.3	4.2	5.7	3.7	4.8	3.1	4.0
GREAT FALLS	3.6	5.0	4.5	5.9	2.8	3.7	2.0	2.6
LAKE CHARLES	3.2	4.8	2.9	4.6	2.9	4.2	2.4	3.5
MADISON	3.8	5.3	4.5	6.1	2.9	3.8	2.6	3.3
MEDFORD	3.6	5.1	5.4	6.7	3.0	4.0	1.3	2.1
MIAMI	3.6	5.2	3.0	4.7	3.4	4.8	3.6	4.8
NASHVILLE	3.2	4.6	3.4	5.1	2.9	4.0	2.1	2.9
NEW YORK	3.0	4.4	3.0	4.7	2.6	3.6	2.1	2.8
OMAHA	3.7	5.1	4.3	5.8	3.3	4.3	2.9	3.6
PHOENIX	5.4	6.7	4.9	6.3	4.4	5.5	4.0	4.9
SANTA MARIA	5.3	6.7	5.7	7.0	4.7	5.7	3.5	4.4
SEATTLE	3.1	4.6	4.6	6.1	2.1	3.0	1.0	1.6
WASHINGTON,DC	3.4	4.8	3.5	5.2	3.0	4.1	2.5	3.3

FIXED SURFACE

TILT ANGLE 45 D AZIMUTH ANGLE -30 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.3	6.7	5.2	6.6	5.2	6.2	4.8	5.6
APPALACHICOLA	4.0	5.5	3.5	5.1	4.2	5.4	3.7	4.7
BISMARCK	4.2	5.6	4.9	6.3	3.6	4.5	3.1	3.7
BLUE HILL	3.3	4.6	3.2	4.9	2.8	3.8	2.6	3.3
BOSTON	3.3	4.6	3.3	5.0	2.7	3.7	2.4	3.1
BROWNSVILLE	2.9	4.6	3.5	5.2	3.1	4.9	2.5	3.7
CAPE HATTERAS	4.6	6.1	4.4	5.9	4.2	5.3	3.6	4.5
CARIBOU	3.7	5.1	3.6	5.1	2.3	3.2	2.7	3.4
CHARLESTON	3.7	5.2	3.1	4.8	3.5	4.7	3.1	4.0
COLUMBIA	3.5	4.9	4.1	5.7	3.6	4.6	2.9	3.6
DODGE CITY	4.3	5.7	4.7	6.1	4.6	5.6	3.9	4.7
EL PASO	5.7	6.9	5.0	6.3	5.1	6.1	4.9	5.8
ELY	4.9	6.4	4.9	6.4	5.0	5.9	4.0	4.8
FORT WORTH	3.9	5.3	4.1	5.6	3.9	5.0	3.4	4.3
GREAT FALLS	3.8	5.2	4.6	6.0	3.1	4.0	2.2	2.9
LAKE CHARLES	3.3	4.9	2.8	4.5	3.1	4.5	2.7	3.7
MADISON	3.9	5.4	4.6	6.1	3.2	4.1	3.0	3.7
MEDFORD	3.7	5.2	5.4	6.7	3.3	4.3	1.4	2.2
MIAMI	3.7	5.2	3.0	4.6	3.7	5.0	4.0	5.2
NASHVILLE	3.3	4.7	3.4	5.1	3.2	4.3	2.4	3.2
NEW YORK	3.1	4.5	3.0	4.7	2.9	3.8	2.3	3.0
OMAHA	3.8	5.2	4.2	5.8	3.6	4.5	3.2	3.9
PHOENIX	5.5	6.8	4.8	6.2	4.8	5.8	4.4	5.3
SANTA MARIA	5.4	6.7	5.5	6.9	5.0	6.0	3.9	4.8
SEATTLE	3.2	4.7	4.5	6.1	2.3	3.2	1.1	1.7
WASHINGTON,DC	3.5	4.9	3.5	5.2	3.3	4.3	2.8	3.6

FIXED SURFACE

TILT ANGLE 45 D AZIMUTH ANGLE -15 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.4	6.8	5.3	6.6	5.4	6.5	5.1	5.9
APPALACHICOLA	4.1	5.5	3.5	5.1	4.4	5.5	3.9	4.9
BISMARCK	4.3	5.7	4.9	6.3	3.9	4.7	3.3	3.9
BLUE HILL	3.4	4.7	3.2	4.9	3.0	3.9	2.8	3.5
BOSTON	3.4	4.7	3.4	5.0	2.9	3.8	2.5	3.2
BROWNSVILLE	3.0	4.6	3.5	5.1	3.3	4.7	2.7	3.8
CAPE HATTERAS	4.7	6.2	4.4	5.9	4.4	5.5	3.9	4.8
CARIBOU	3.8	5.2	3.6	5.2	2.5	3.4	3.0	3.6
CHARLESTON	3.8	5.3	3.1	4.8	3.7	4.9	3.3	4.2
COLUMBIA	3.6	5.0	4.1	5.7	3.8	4.7	3.1	3.8
DODGE CITY	4.4	5.7	4.7	6.1	4.8	5.8	4.2	4.9
EL PASO	5.8	7.0	5.0	6.2	5.3	6.3	5.2	6.1
ELY	5.1	6.5	5.0	6.4	5.3	6.2	4.3	5.1
FORT WORTH	3.9	5.3	4.1	5.6	4.1	5.2	3.6	4.5
GREAT FALLS	3.9	5.3	4.7	6.1	3.3	4.2	2.4	3.0
LAKE CHARLES	3.3	4.9	2.8	4.5	3.3	4.6	2.8	3.8
MADISON	4.0	5.5	4.6	6.2	3.4	4.3	3.2	3.9
MEDFORD	3.8	5.3	5.4	6.7	3.4	4.4	1.5	2.3
MIAMI	3.7	5.3	3.0	4.6	3.9	5.2	4.2	5.4
NASHVILLE	3.4	4.8	3.4	5.1	3.4	4.5	2.5	3.3
NEW YORK	3.2	4.6	3.0	4.7	3.0	4.0	2.4	3.1
OMAHA	3.9	5.3	4.2	5.7	3.8	4.7	3.4	4.2
PHOENIX	5.6	6.9	4.8	6.1	5.0	6.1	4.7	5.6
SANTA MARIA	5.4	6.7	5.3	6.7	5.2	6.2	4.1	5.0
SEATTLE	3.3	4.7	4.5	6.0	2.4	3.3	1.2	1.8
WASHINGTON,DC	3.6	5.0	3.5	5.2	3.4	4.5	3.0	3.8

FIXED SURFACE

TILT ANGLE 45 D AZIMUTH ANGLE 0 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.5	6.9	5.3	6.7	5.6	6.6	5.2	6.1
APPALACHICOLA	4.1	5.5	3.5	5.1	4.5	5.6	3.9	5.0
BISMARCK	4.4	5.8	4.9	6.4	4.0	4.8	3.4	4.0
BLUE HILL	3.4	4.8	3.2	4.9	3.1	4.0	2.9	3.6
BOSTON	3.4	4.8	3.4	5.0	3.0	3.9	2.6	3.3
BROWNSVILLE	2.9	4.6	3.5	5.1	3.4	4.8	2.7	3.9
CAPE HATTERAS	4.7	6.1	4.4	5.9	4.5	5.5	4.0	4.8
CARIBOU	3.9	5.3	3.6	5.2	2.5	3.4	3.1	3.7
CHARLESTON	3.9	5.3	3.2	4.8	3.8	5.0	3.3	4.3
COLUMBIA	3.6	5.0	4.1	5.7	3.8	4.8	3.1	3.9
DODGE CITY	4.4	5.7	4.6	6.0	4.9	5.8	4.2	5.0
EL PASO	5.8	7.1	5.0	6.3	5.4	6.5	5.4	6.3
ELY	5.2	6.6	5.1	6.5	5.5	6.4	4.4	5.2
FORT WORTH	3.9	5.3	4.0	5.6	4.1	5.2	3.7	4.6
GREAT FALLS	4.0	5.4	4.8	6.2	3.4	4.3	2.5	3.1
LAKE CHARLES	3.3	4.9	2.9	4.6	3.4	4.7	2.8	3.9
MADISON	4.1	5.6	4.6	6.2	3.5	4.3	3.3	4.0
MEDFORD	3.8	5.3	5.4	6.7	3.4	4.4	1.5	2.3
MIAMI	3.8	5.3	3.0	4.7	4.0	5.3	4.3	5.5
NASHVILLE	3.4	4.8	3.4	5.1	3.5	4.5	2.6	3.4
NEW YORK	3.2	4.6	3.0	4.7	3.1	4.1	2.4	3.2
OMAHA	3.9	5.3	4.2	5.7	3.8	4.8	3.5	4.3
PHOENIX	5.7	6.9	4.7	6.1	5.1	6.1	4.8	5.6
SANTA MARIA	5.3	6.7	5.1	6.5	5.2	6.2	4.2	5.1
SEATTLE	3.2	4.7	4.4	5.9	2.4	3.3	1.2	1.8
WASHINGTON,DC	3.7	5.1	3.5	5.2	3.5	4.5	3.1	3.8

FIXED SURFACE

TILT ANGLE 45 D AZIMUTH ANGLE 15 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.6	7.0	5.4	6.8	5.5	6.5	5.1	6.0
APPALACHICOLA	4.1	5.5	3.6	5.1	4.4	5.6	3.8	4.9
BISMARCK	4.4	5.8	4.9	6.4	4.0	4.8	3.3	3.9
BLUE HILL	3.4	4.8	3.2	4.9	3.0	4.0	2.8	3.5
BOSTON	3.4	4.8	3.4	5.0	2.9	3.9	2.5	3.2
BROWNSVILLE	2.9	4.6	3.5	5.1	3.4	4.8	2.7	3.9
CAPE HATTERAS	4.6	6.1	4.4	5.9	4.4	5.5	3.9	4.7
CARIBOU	3.9	5.3	3.7	5.2	2.5	3.4	3.0	3.6
CHARLESTON	3.9	5.3	3.2	4.9	3.8	4.9	3.3	4.2
COLUMBIA	3.6	5.0	4.1	5.6	3.7	4.7	3.1	3.8
DODGE CITY	4.3	5.7	4.6	6.0	4.8	5.7	4.1	4.9
EL PASO	5.9	7.1	5.0	6.3	5.3	6.4	5.3	6.2
ELY	5.2	6.7	5.2	6.7	5.4	6.3	4.3	5.1
FORT WORTH	3.8	5.3	4.1	5.6	4.0	5.2	3.6	4.5
GREAT FALLS	4.0	5.4	4.8	6.2	3.4	4.2	2.4	3.0
LAKE CHARLES	3.3	5.0	3.8	4.7	3.4	4.7	2.8	3.8
MADISON	4.1	5.6	4.6	6.2	3.4	4.3	3.2	3.9
MEDFORD	3.8	5.2	5.3	6.7	3.3	4.3	1.4	2.2
MIAMI	3.8	5.4	3.2	4.8	4.0	5.3	4.3	5.4
NASHVILLE	3.4	4.8	3.5	5.2	3.4	4.5	2.5	3.4
NEW YORK	3.2	4.6	3.0	4.7	3.1	4.0	2.4	3.1
OMAHA	3.9	5.3	4.1	5.7	3.7	4.7	3.5	4.2
PHOENIX	5.7	6.9	4.8	6.1	5.0	6.1	4.6	5.5
SANTA MARIA	5.2	6.6	4.9	6.3	5.0	6.0	4.1	5.0
SEATTLE	3.2	4.6	4.3	5.8	2.4	3.2	1.2	1.8
WASHINGTON,DC	3.7	5.1	3.5	5.2	3.4	4.5	3.0	3.8

FIXED SURFACE

TILT ANGLE 45 D AZIMUTH ANGLE 30 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.6	7.0	5.6	6.9	5.3	6.3	4.8	5.7
APPALACHICOLA	4.0	5.5	3.7	5.2	4.2	5.4	3.6	4.6
BISMARCK	4.3	5.7	4.9	6.4	3.8	4.6	3.1	3.7
BLUE HILL	3.4	4.8	3.2	4.9	2.9	3.8	2.6	3.3
BOSTON	3.4	4.7	3.4	5.0	2.8	3.7	2.4	3.0
BROWNSVILLE	2.9	4.6	3.6	5.3	3.3	4.7	2.6	3.8
CAPE HATTERAS	4.5	6.0	4.4	5.9	4.2	5.2	3.6	4.5
CARIBOU	3.8	5.2	3.7	5.2	2.4	3.3	2.8	3.4
CHARLESTON	3.8	5.3	3.3	5.0	3.7	4.8	3.1	4.0
COLUMBIA	3.6	4.9	4.1	5.6	3.5	4.5	2.8	3.6
DODGE CITY	4.3	5.6	4.6	6.0	4.5	5.5	3.8	4.6
EL PASO	5.9	7.1	5.1	6.4	5.1	6.2	5.0	5.9
ELY	5.2	6.7	5.4	6.8	5.2	6.1	4.1	4.9
FORT WORTH	3.7	5.2	4.1	5.6	3.8	5.0	3.4	4.3
GREAT FALLS	4.0	5.4	4.8	6.3	3.2	4.1	2.2	2.9
LAKE CHARLES	3.3	4.9	3.1	4.8	3.3	4.6	2.6	3.6
MADISON	4.0	5.5	4.6	6.2	3.3	4.1	3.0	3.7
MEDFORD	3.7	5.1	5.3	6.7	3.1	4.1	1.3	2.1
MIAMI	3.8	5.4	3.3	4.9	3.8	5.2	4.1	5.2
NASHVILLE	3.3	4.8	3.5	5.2	3.3	4.4	2.4	3.2
NEW YORK	3.2	4.5	3.0	4.7	2.9	3.9	2.2	2.9
OMAHA	3.8	5.2	4.1	5.6	3.6	4.5	3.2	4.0
PHOENIX	5.7	6.9	4.8	6.2	4.8	5.9	4.4	5.3
SANTA MARIA	5.1	6.4	4.7	6.1	4.7	5.7	3.9	4.7
SEATTLE	3.1	4.5	4.2	5.7	2.2	3.1	1.1	1.7
WASHINGTON,DC	3.6	5.0	3.5	5.2	3.2	4.3	2.8	3.6

FIXED SURFACE

TILT ANGLE 45 D AZIMUTH ANGLE 45 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.5	6.9	5.7	7.0	4.9	6.0	4.3	5.2
APPALACHICOLA	4.0	5.4	3.8	5.3	3.9	5.1	3.2	4.3
BISMARCK	4.2	5.5	4.9	6.4	3.5	4.3	2.7	3.3
BLUE HILL	3.3	4.7	3.2	4.9	2.7	3.6	2.3	3.0
BOSTON	3.3	4.7	3.4	5.0	2.6	3.5	2.1	2.8
BROWNSVILLE	2.9	4.6	3.8	5.4	3.2	4.6	2.4	3.6
CAPE HATTERAS	4.4	5.9	4.4	5.9	3.9	4.9	3.3	4.1
CARIBOU	3.7	5.1	3.6	5.2	2.2	3.1	2.5	3.1
CHARLESTON	3.8	5.2	3.4	5.1	3.4	4.6	2.8	3.7
COLUMBIA	3.5	4.8	4.0	5.6	3.2	4.2	2.5	3.3
DODGE CITY	4.1	5.5	4.5	6.0	4.2	5.2	3.4	4.2
EL PASO	5.8	7.1	5.3	6.5	4.8	5.9	4.5	5.4
ELY	5.2	6.6	5.5	7.0	4.8	5.8	3.6	4.5
FORT WORTH	3.6	5.1	4.2	5.7	3.6	4.7	3.0	3.9
GREAT FALLS	3.9	5.3	4.8	6.3	2.9	3.8	2.0	2.6
LAKE CHARLES	3.3	4.9	3.2	4.9	3.1	4.4	2.4	3.4
MADISON	3.9	5.4	4.6	6.2	3.0	3.9	2.6	3.3
MEDFORD	3.5	5.0	5.3	6.6	2.9	3.9	1.1	1.9
MIAMI	3.8	5.4	3.4	5.1	3.7	5.0	3.8	4.9
NASHVILLE	3.3	4.7	3.5	5.2	3.1	4.2	2.2	3.0
NEW YORK	3.1	4.4	2.9	4.6	2.7	3.7	1.9	2.6
OMAHA	3.7	5.1	4.1	5.6	3.3	4.2	2.9	3.6
PHOENIX	5.6	6.9	4.9	6.2	4.5	5.6	3.9	4.8
SANTA MARIA	4.9	6.3	4.6	6.0	4.3	5.3	3.5	4.3
SEATTLE	2.9	4.4	4.1	5.6	2.0	2.9	1.0	1.6
WASHINGTON,DC	3.5	4.9	3.5	5.2	3.0	4.0	2.5	3.2

FIXED SURFACE

TILT ANGLE 45 D AZIMUTH ANGLE 60 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.4	6.8	5.7	7.1	4.5	5.5	3.8	4.6
APPALACHICOLA	3.8	5.3	3.8	5.4	3.6	4.7	2.8	3.8
BISMARCK	4.0	5.3	4.8	6.3	3.1	4.0	2.3	2.9
BLUE HILL	3.1	4.5	3.1	4.8	2.4	3.4	2.0	2.7
BOSTON	3.2	4.5	3.3	5.0	2.3	3.2	1.8	2.4
BROWNSVILLE	2.8	4.5	3.9	5.5	3.0	4.4	2.1	3.3
CAPE HATTERAS	4.2	5.7	4.4	5.9	3.5	4.6	2.8	3.7
CARIBOU	3.5	4.9	3.5	5.1	2.0	2.8	2.1	2.7
CHARLESTON	3.6	5.1	3.4	5.1	3.1	4.3	2.4	3.3
COLUMBIA	3.3	4.7	4.0	5.5	2.9	3.9	2.1	2.9
DODGE CITY	3.9	5.3	4.5	5.9	3.7	4.7	2.9	3.7
EL PASO	5.7	6.9	5.3	6.6	4.4	5.5	4.0	4.9
ELY	5.0	6.4	5.6	7.0	4.4	5.3	3.1	3.9
FORT WORTH	3.5	4.9	4.2	5.7	3.2	4.4	2.6	3.5
GREAT FALLS	3.7	5.1	4.8	6.2	2.6	3.5	1.6	2.3
LAKE CHARLES	3.2	4.8	3.3	5.0	2.9	4.2	2.0	3.1
MADISON	3.7	5.2	4.5	6.1	2.7	3.6	2.2	2.9
MEDFORD	3.3	4.8	5.2	6.5	2.6	3.5	.9	1.7
MIAMI	3.8	5.3	3.5	5.2	3.4	4.7	3.4	4.5
NASHVILLE	3.2	4.6	3.5	5.2	2.8	3.9	1.9	2.7
NEW YORK	2.9	4.3	2.9	4.5	2.4	3.4	1.6	2.3
OMAHA	3.6	5.0	4.0	5.6	2.9	3.9	2.5	3.2
PHOENIX	5.5	6.7	4.9	6.2	4.1	5.1	3.4	4.3
SANTA MARIA	4.7	6.0	4.4	5.8	3.8	4.8	3.0	3.9
SEATTLE	2.7	4.2	3.9	5.5	1.8	2.7	.8	1.4
WASHINGTON,DC	3.3	4.7	3.4	5.1	2.7	3.7	2.1	2.9

FIXED SURFACE

TILT ANGLE 45 D AZIMUTH ANGLE 75 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.2	6.5	5.7	7.1	4.0	5.0	3.1	4.0
APPALACHICOLA	3.7	5.1	3.8	5.4	3.2	4.4	2.4	3.4
BISMARCK	3.7	5.0	4.7	6.1	2.7	3.5	1.8	2.4
BLUE HILL	3.0	4.3	3.0	4.7	2.1	3.0	1.6	2.3
BOSTON	3.0	4.3	3.3	4.9	2.0	2.9	1.4	2.1
BROWNSVILLE	2.8	4.5	3.9	5.5	2.7	4.1	1.9	3.0
CAPE HATTERAS	4.0	5.5	4.3	5.9	3.1	4.1	2.3	3.2
CARIBOU	3.2	4.6	3.4	4.9	1.7	2.5	1.6	2.3
CHARLESTON	3.5	4.9	3.4	5.1	2.8	3.9	2.0	2.9
COLUMBIA	3.1	4.5	3.9	5.4	2.5	3.5	1.7	2.5
DODGE CITY	3.7	5.1	4.4	5.8	3.3	4.2	2.3	3.1
EL PASO	5.5	6.7	5.3	6.6	3.9	5.0	3.4	4.2
ELY	4.7	6.2	5.5	7.0	3.8	4.7	2.5	3.3
FORT WORTH	3.3	4.8	4.2	5.7	2.9	4.0	2.2	3.1
GREAT FALLS	3.4	4.8	4.6	6.0	2.2	3.1	1.3	1.9
LAKE CHARLES	3.1	4.7	3.3	5.0	2.6	3.9	1.7	2.7
MADISON	3.5	4.9	4.4	6.0	2.3	3.2	1.8	2.5
MEDFORD	3.1	4.6	5.0	6.3	2.2	3.2	.7	1.5
MIAMI	3.7	5.3	3.6	5.2	3.1	4.4	2.9	4.1
NASHVILLE	3.0	4.4	3.4	5.2	2.5	3.5	1.5	2.3
NEW YORK	2.7	4.1	2.7	4.4	2.1	3.1	1.3	2.0
OMAHA	3.4	4.8	3.9	5.4	2.5	3.5	2.0	2.7
PHOENIX	5.3	6.5	4.8	6.2	3.6	4.7	2.8	3.7
SANTA MARIA	4.4	5.7	4.3	5.6	3.3	4.3	2.4	3.3
SEATTLE	2.5	3.9	3.7	5.3	1.5	2.4	.6	1.2
WASHINGTON,DC	3.1	4.5	3.3	5.0	2.3	3.3	1.7	2.4

FIXED SURFACE

TILT ANGLE 45 D AZIMUTH ANGLE 90 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.9	6.2	5.6	7.0	3.4	4.4	2.5	3.3
APPALACHICOLA	3.5	4.9	3.8	5.3	2.8	3.9	1.9	2.9
BISMARCK	3.3	4.7	4.4	5.9	2.2	3.1	1.3	1.9
BLUE HILL	2.7	4.1	2.9	4.5	1.8	2.7	1.2	1.9
BOSTON	2.7	4.1	3.1	4.7	1.7	2.6	1.0	1.7
BROWNSVILLE	2.7	4.4	3.9	5.6	2.4	3.8	1.5	2.7
CAPE HATTERAS	3.8	5.2	4.2	5.7	2.6	3.7	1.8	2.7
CARIBOU	2.9	4.3	3.2	4.7	1.4	2.2	1.2	1.8
CHARLESTON	3.3	4.7	3.3	5.0	2.4	3.5	1.6	2.5
COLUMBIA	2.9	4.3	3.7	5.3	2.1	3.1	1.3	2.1
DODGE CITY	3.4	4.8	4.2	5.7	2.7	3.7	1.8	2.6
EL PASO	5.2	6.4	5.3	6.5	3.4	4.5	2.7	3.6
ELY	4.4	5.8	5.4	6.8	3.2	4.2	2.8	2.8
FORT WORTH	3.1	4.5	4.1	5.6	2.5	3.6	1.7	2.6
GREAT FALLS	3.1	4.5	4.3	5.8	1.8	2.7	.9	1.5
LAKE CHARLES	3.0	4.6	3.3	5.0	2.3	3.6	1.4	2.4
MADISON	3.1	4.6	4.2	5.8	1.9	2.8	1.3	2.0
MEDFORD	2.8	4.3	4.8	6.1	1.8	2.8	.5	1.3
MIAMI	3.5	5.1	3.6	5.3	2.7	4.1	2.4	3.6
NASHVILLE	2.8	4.2	3.3	5.1	2.1	3.2	1.2	2.0
NEW YORK	2.5	3.9	2.6	4.3	1.8	2.7	.9	1.7
OMAHA	3.1	4.5	3.7	5.3	2.1	3.1	1.5	2.2
PHOENIX	5.0	6.2	4.8	6.1	3.1	4.2	2.2	3.1
SANTA MARIA	4.1	5.4	4.1	5.5	2.7	3.7	1.9	2.8
SEATTLE	2.2	3.7	3.5	5.0	1.2	2.1	.5	1.1
WASHINGTON,DC	2.9	4.3	3.2	4.8	1.9	3.0	1.3	2.0

FIXED SURFACE

TILT ANGLE 30 D AZIMUTH ANGLE -90 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.0	6.4	5.7	7.1	3.6	4.6	2.6	3.5
APPALACHICOLA	4.0	5.5	4.0	5.7	3.1	4.3	2.2	3.3
BISMARCK	3.4	4.8	4.8	6.3	2.1	3.0	1.3	2.0
BLUE HILL	2.8	4.2	3.2	5.0	1.8	2.8	1.3	2.0
BOSTON	2.8	4.2	3.4	5.1	1.7	2.7	1.1	1.8
BROWNSVILLE	3.1	4.8	4.3	6.0	2.4	3.9	1.6	2.8
CAPE HATTERAS	4.4	5.9	4.8	6.4	2.9	4.0	2.0	2.9
CARIBOU	2.9	4.4	3.5	5.1	1.4	2.3	1.2	1.8
CHARLESTON	3.5	5.0	3.4	5.2	2.5	3.7	1.7	2.7
COLUMBIA	3.2	4.6	4.3	6.0	2.4	3.4	1.5	2.3
DODGE CITY	4.0	5.4	5.0	6.4	3.1	4.1	2.0	2.8
EL PASO	5.5	6.8	5.6	7.0	3.6	4.7	2.8	3.8
ELY	4.3	5.8	5.1	6.6	3.3	4.2	2.0	2.8
FORT WORTH	3.7	5.2	4.6	6.2	2.8	4.0	1.9	2.9
GREAT FALLS	3.0	4.4	4.4	5.9	1.8	2.7	1.0	1.6
LAKE CHARLES	3.2	4.9	3.3	5.1	2.3	3.7	1.6	2.7
MADISON	3.4	4.9	4.6	6.2	2.0	2.9	1.4	2.1
MEDFORD	3.3	4.8	5.5	6.9	2.2	3.2	.7	1.5
MIAMI	3.8	5.4	3.6	5.3	2.8	4.2	2.5	3.8
NASHVILLE	3.0	4.5	3.7	5.4	2.2	3.3	1.3	2.1
NEW YORK	2.7	4.1	3.0	4.8	1.9	2.9	1.1	1.9
OMAHA	3.4	4.9	4.4	6.0	2.3	3.3	1.6	2.3
PHOENIX	5.3	6.6	5.4	6.9	3.4	4.5	2.5	3.4
SANTA MARIA	5.1	6.5	6.2	7.6	3.6	4.6	2.1	3.0
SEATTLE	2.7	4.2	4.6	6.2	1.4	2.3	.5	1.1
WASHINGTON,DC	3.1	4.6	3.7	5.4	2.1	3.2	1.4	2.2

FIXED SURFACE

TILT ANGLE 30 D AZIMUTH ANGLE -75 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.2	6.7	5.8	7.2	4.0	5.1	3.1	4.0
APPALACHICOLA	4.1	5.6	4.1	5.7	3.4	4.6	2.6	3.7
BISMARCK	3.7	5.1	5.0	6.5	2.5	3.4	1.7	2.3
BLUE HILL	3.0	4.4	3.4	5.1	2.1	3.0	1.6	2.3
BOSTON	3.0	4.4	3.5	5.2	2.0	3.0	1.4	2.1
BROWNSVILLE	3.2	4.9	4.3	6.0	2.6	4.1	1.8	3.0
CAPE HATTERAS	4.6	6.1	4.9	6.5	3.3	4.4	2.4	3.3
CARIBOU	3.2	4.7	3.6	5.2	1.6	2.6	1.5	2.1
CHARLESTON	3.7	5.2	3.5	5.2	2.8	4.0	2.1	3.0
COLUMBIA	3.4	4.8	4.5	6.1	2.7	3.7	1.8	2.6
DODGE CITY	4.2	5.6	5.1	6.6	3.5	4.5	2.4	3.2
EL PASO	5.7	7.0	5.7	7.0	4.1	5.1	3.3	4.3
ELY	4.6	6.1	5.3	6.8	3.7	4.7	2.5	3.3
FORT WORTH	3.9	5.4	4.7	6.3	3.1	4.3	2.3	3.2
GREAT FALLS	3.3	4.7	4.6	6.1	2.1	3.0	1.2	1.9
LAKE CHARLES	3.4	5.0	3.3	5.1	2.6	3.9	1.9	2.9
MADISON	3.6	5.2	4.7	6.4	2.3	3.2	1.8	2.5
MEDFORD	3.5	5.0	5.7	7.1	2.5	3.5	.9	1.7
MIAMI	3.9	5.5	3.6	5.3	3.1	4.5	2.9	4.1
NASHVILLE	3.2	4.7	3.7	5.5	2.5	3.6	1.5	2.4
NEW YORK	2.9	4.3	3.2	4.9	2.1	3.1	1.4	2.2
OMAHA	3.6	5.1	4.5	6.1	2.6	3.6	2.0	2.7
PHOENIX	5.6	6.8	5.5	6.9	3.8	4.9	3.0	3.9
SANTA MARIA	5.4	6.8	6.3	7.7	4.0	5.0	2.5	3.5
SEATTLE	2.9	4.4	4.7	6.3	1.6	2.6	.6	1.2
WASHINGTON,DC	3.3	4.8	3.8	5.5	2.5	3.5	1.8	2.6

FIXED SURFACE

TILT ANGLE 30 D AZIMUTH ANGLE -60 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.4	6.9	5.9	7.3	4.4	5.5	3.6	4.5
APPALACHICOLA	4.3	5.8	4.1	5.7	3.7	4.9	3.0	4.0
BISMARCK	4.0	5.4	5.1	6.6	2.8	3.7	2.1	2.7
BLUE HILL	3.2	4.6	3.5	5.2	2.3	3.3	1.9	2.6
BOSTON	3.2	4.6	3.6	5.3	2.2	3.2	1.7	2.4
BROWNSVILLE	3.2	5.0	4.3	6.0	2.8	4.3	2.0	3.3
CAPE HATTERAS	4.8	6.3	5.0	6.6	3.6	4.7	2.8	3.7
CARIBOU	3.4	4.9	3.7	5.4	1.9	2.8	1.8	2.5
CHARLESTON	3.8	5.3	3.5	5.3	3.1	4.3	2.4	3.3
COLUMBIA	3.5	5.0	4.6	6.2	3.0	4.0	2.1	2.9
DODGE CITY	4.4	5.8	5.2	6.7	3.9	4.9	2.9	3.7
EL PASO	5.9	7.3	5.8	7.1	4.4	5.5	3.8	4.8
ELY	4.9	6.4	5.4	6.9	4.2	5.1	2.9	3.7
FORT WORTH	4.0	5.5	4.7	6.3	3.4	4.6	2.6	3.6
GREAT FALLS	3.5	5.0	4.8	6.3	2.4	3.3	1.5	2.2
LAKE CHARLES	3.5	5.1	3.3	5.1	2.8	4.2	2.1	3.2
MADISON	3.8	5.4	4.9	6.5	2.6	3.5	2.1	2.8
MEDFORD	3.7	5.2	5.8	7.2	2.8	3.8	1.0	1.9
MIAMI	4.0	5.6	3.6	5.3	3.3	4.7	3.3	4.5
NASHVILLE	3.3	4.8	3.8	5.6	2.7	3.9	1.8	2.6
NEW YORK	3.0	4.5	3.2	5.0	2.4	3.4	1.7	2.4
OMAHA	3.8	5.2	4.6	6.2	3.0	4.0	2.3	3.1
PHOENIX	5.8	7.0	5.6	7.0	4.2	5.3	3.4	4.4
SANTA MARIA	5.5	7.0	6.3	7.7	4.4	5.4	2.9	3.9
SEATTLE	3.1	4.6	4.8	6.4	1.8	2.8	.8	1.4
WASHINGTON,DC	3.5	5.0	3.9	5.6	2.7	3.8	2.1	2.9

FIXED SURFACE

TILT ANGLE 30 D AZIMUTH ANGLE -45 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.6	7.1	6.0	7.4	4.8	5.9	4.1	4.9
APPALACHICOLA	4.4	5.9	4.1	5.8	4.0	5.2	3.2	4.3
BISMARCK	4.2	5.6	5.2	6.7	3.1	4.0	2.4	3.0
BLUE HILL	3.3	4.8	3.5	5.3	2.5	3.5	2.1	2.9
BOSTON	3.3	4.7	3.7	5.4	2.5	3.4	1.9	2.6
BROWNSVILLE	3.3	5.0	4.3	5.9	3.0	4.5	2.2	3.5
CAPE HATTERAS	4.9	6.4	5.0	6.6	3.9	5.0	3.1	4.0
CARIBOU	3.6	5.1	3.8	5.5	2.1	3.0	2.1	2.8
CHARLESTON	4.0	5.5	3.6	5.3	3.3	4.5	2.6	3.6
COLUMBIA	3.7	5.1	4.6	6.2	3.3	4.3	2.4	3.2
DODGE CITY	4.5	5.9	5.3	6.7	4.2	5.2	3.2	4.0
EL PASO	6.1	7.4	5.8	7.1	4.8	5.9	4.3	5.2
ELY	5.1	6.6	5.5	7.0	4.6	5.5	3.3	4.1
FORT WORTH	4.1	5.6	4.8	6.3	3.7	4.8	2.9	3.9
GREAT FALLS	3.7	5.2	4.9	6.4	2.7	3.6	1.8	2.4
LAKE CHARLES	3.6	5.2	3.4	5.1	3.0	4.4	2.3	3.4
MADISON	4.0	5.5	5.0	6.6	2.8	3.8	2.4	3.1
MEDFORD	3.8	5.4	5.9	7.3	3.0	4.0	1.2	2.0
MIAMI	4.1	5.7	3.6	5.3	3.6	5.0	3.6	4.8
NASHVILLE	3.5	5.0	3.9	5.7	3.0	4.1	2.0	2.9
NEW YORK	3.2	4.6	3.3	5.1	2.6	3.6	1.9	2.6
OMAHA	3.9	5.4	4.7	6.3	3.2	4.2	2.6	3.4
PHOENIX	5.9	7.2	5.6	7.0	4.5	5.6	3.8	4.7
SANTA MARIA	5.7	7.1	6.3	7.7	4.7	5.7	3.3	4.2
SEATTLE	3.2	4.7	4.9	6.5	2.0	2.9	.9	1.5
WASHINGTON,DC	3.6	5.1	3.9	5.7	3.0	4.1	2.4	3.2

FIXED SURFACE

TILT ANGLE 30 D AZIMUTH ANGLE -30 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.8	7.2	6.1	7.5	5.1	6.2	4.4	5.3
APPALACHICOLA	4.4	5.9	4.2	5.8	4.2	5.4	3.5	4.6
BISMARCK	4.3	5.7	5.3	6.8	3.4	4.3	2.7	3.3
BLUE HILL	3.4	4.9	3.6	5.3	2.7	3.7	2.3	3.1
BOSTON	3.4	4.8	3.7	5.4	2.6	3.6	2.1	2.8
BROWNSVILLE	3.3	5.1	4.2	5.9	3.2	4.7	2.4	3.6
CAPE HATTERAS	5.0	6.5	5.0	6.6	4.1	5.2	3.4	4.3
CARIBOU	3.8	5.2	3.9	5.5	2.2	3.1	2.4	3.0
CHARLESTON	4.1	5.6	3.6	5.4	3.5	4.7	2.9	3.8
COLUMBIA	3.8	5.2	4.6	6.3	3.5	4.5	2.6	3.4
DODGE CITY	4.6	6.0	5.3	6.7	4.4	5.4	3.5	4.3
EL PASO	6.2	7.6	5.8	7.2	5.0	6.1	4.6	5.5
ELY	5.3	6.8	5.6	7.1	4.9	5.8	3.6	4.5
FORT WORTH	4.2	5.7	4.8	6.3	3.9	5.0	3.2	4.1
GREAT FALLS	3.9	5.3	5.0	6.5	2.9	3.8	2.0	2.6
LAKE CHARLES	3.6	5.3	3.4	5.2	3.2	4.6	2.5	3.6
MADISON	4.1	5.7	5.0	6.7	3.0	4.0	2.6	3.4
MEDFORD	3.9	5.5	6.0	7.4	3.2	4.2	1.3	2.1
MIAMI	4.1	5.8	3.6	5.4	3.8	5.2	3.9	5.1
NASHVILLE	3.6	5.0	3.9	5.7	3.2	4.3	2.2	3.0
NEW YORK	3.3	4.7	3.4	5.1	2.8	3.8	2.1	2.8
OMAHA	4.0	5.5	4.7	6.3	3.4	4.4	2.9	3.6
PHOENIX	6.1	7.4	5.6	7.0	4.7	5.8	4.1	5.0
SANTA MARIA	5.8	7.2	6.2	7.6	4.9	6.0	3.6	4.5
SEATTLE	3.3	4.8	4.9	6.5	2.1	3.1	1.0	1.6
WASHINGTON,DC	3.8	5.2	4.0	5.7	3.2	4.2	2.6	3.4

FIXED SURFACE

TILT ANGLE 30 D AZIMUTH ANGLE -15 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.9	7.3	6.1	7.5	5.3	6.4	4.7	5.5
APPALACHICOLA	4.5	6.0	4.2	5.8	4.4	5.6	3.6	4.7
BISMARCK	4.4	5.8	5.3	6.9	3.6	4.5	2.9	3.5
BLUE HILL	3.5	5.0	3.6	5.3	2.8	3.8	2.5	3.2
BOSTON	3.5	4.9	3.8	5.5	2.7	3.7	2.2	3.0
BROWNSVILLE	3.3	5.1	4.2	5.9	3.3	4.8	2.5	3.7
CAPE HATTERAS	5.1	6.6	5.0	6.6	4.3	5.4	3.5	4.5
CARIBOU	3.9	5.4	3.9	5.6	2.3	3.2	2.6	3.2
CHARLESTON	4.2	5.7	3.6	5.4	3.7	4.9	3.0	4.0
COLUMBIA	3.8	5.3	4.6	6.3	3.6	4.6	2.7	3.5
DODGE CITY	4.7	6.1	5.3	6.7	4.6	5.6	3.7	4.5
EL PASO	6.3	7.6	5.8	7.2	5.2	6.3	4.9	5.8
ELY	5.4	6.9	5.7	7.2	5.1	6.0	3.8	4.7
FORT WORTH	4.2	5.7	4.7	6.3	4.0	5.2	3.3	4.3
GREAT FALLS	4.0	5.5	5.1	6.6	3.1	4.0	2.1	2.7
LAKE CHARLES	3.7	5.3	3.4	5.2	3.3	4.7	2.6	3.7
MADISON	4.2	5.7	5.1	6.7	3.2	4.1	2.8	3.5
MEDFORD	4.0	5.5	6.0	7.4	3.3	4.3	1.3	2.1
MIAMI	4.2	5.8	3.7	5.4	3.9	5.3	4.0	5.2
NASHVILLE	3.6	5.1	3.9	5.7	3.3	4.4	2.3	3.1
NEW YORK	3.3	4.8	3.4	5.1	2.9	3.9	2.1	2.9
OMAHA	4.1	5.5	4.7	6.3	3.6	4.6	3.0	3.8
PHOENIX	6.2	7.4	5.6	7.0	4.9	6.0	4.3	5.2
SANTA MARIA	5.8	7.2	6.1	7.5	5.0	6.1	3.8	4.7
SEATTLE	3.3	4.9	4.8	6.5	2.2	3.2	1.0	1.7
WASHINGTON,DC	3.8	5.3	4.0	5.7	3.3	4.4	2.7	3.5

FIXED SURFACE

TILT ANGLE 30 D AZIMUTH ANGLE 0 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	6.0	7.4	6.2	7.6	5.4	6.5	4.7	5.6
APPALACHICOLA	4.5	6.0	4.2	5.8	4.4	5.6	3.7	4.7
BISMARCK	4.5	5.9	5.4	6.9	3.7	4.5	2.9	3.6
BLUE HILL	3.6	5.0	3.6	5.3	2.9	3.9	2.5	3.3
BOSTON	3.6	5.0	3.8	5.5	2.8	3.8	2.3	3.0
BROWNSVILLE	3.3	5.1	4.2	5.9	3.4	4.8	2.6	3.8
CAPE HATTERAS	5.1	6.6	5.0	6.6	4.3	5.4	3.6	4.5
CARIBOU	3.9	5.4	4.0	5.6	2.4	3.3	2.6	3.3
CHARLESTON	4.2	5.7	3.7	5.5	3.7	4.9	3.1	4.0
COLUMBIA	3.9	5.3	4.6	6.3	3.6	4.6	2.8	3.6
DODGE CITY	4.7	6.1	5.3	6.7	4.6	5.6	3.8	4.6
EL PASO	6.4	7.7	5.9	7.2	5.3	6.4	4.9	5.9
ELY	5.5	7.0	5.8	7.3	5.2	6.1	3.9	4.8
FORT WORTH	4.2	5.7	4.7	6.3	4.0	5.2	3.4	4.3
GREAT FALLS	4.1	5.5	5.2	6.7	3.1	4.0	2.1	2.8
LAKE CHARLES	3.7	5.4	3.4	5.2	3.4	4.7	2.6	3.7
MADISON	4.2	5.8	5.1	6.8	3.2	4.2	2.9	3.6
MEDFORD	4.0	5.5	6.0	7.4	3.3	4.3	1.3	2.1
MIAMI	4.2	5.9	3.7	5.4	4.0	5.4	4.1	5.3
NASHVILLE	3.6	5.1	3.9	5.7	3.3	4.5	2.4	3.2
NEW YORK	3.4	4.8	3.4	5.1	3.0	4.0	2.2	2.9
OMAHA	4.1	5.6	4.6	6.2	3.6	4.6	3.1	3.9
PHOENIX	6.2	7.5	5.6	7.0	5.0	6.1	4.4	5.3
SANTA MARIA	5.8	7.2	5.9	7.3	5.0	6.1	3.8	4.7
SEATTLE	3.3	4.8	4.8	6.4	2.2	3.2	1.0	1.7
WASHINGTON,DC	3.9	5.3	4.0	5.7	3.3	4.4	2.7	3.5

FIXED SURFACE

TILT ANGLE 30 D AZIMUTH ANGLE 15 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	6.0	7.4	6.3	7.7	5.3	6.4	4.7	5.5
APPALACHICOLA	4.5	6.0	4.2	5.8	4.4	5.6	3.6	4.7
BISMARCK	4.5	5.9	5.4	6.9	3.6	4.5	2.9	3.5
BLUE HILL	3.6	5.0	3.6	5.3	2.9	3.9	2.5	3.2
BOSTON	3.6	5.0	3.8	5.5	2.8	3.7	2.2	2.9
BROWNSVILLE	3.3	5.1	4.3	5.9	3.4	4.9	2.6	3.8
CAPE HATTERAS	5.0	6.5	5.0	6.6	4.3	5.4	3.5	4.4
CARIBOU	3.9	5.4	4.0	5.6	2.3	3.2	2.6	3.2
CHARLESTON	4.2	5.7	3.7	5.5	3.7	4.9	3.0	4.0
COLUMBIA	3.8	5.3	4.6	6.2	3.6	4.6	2.7	3.5
DODGE CITY	4.6	6.1	5.2	6.7	4.6	5.6	3.7	4.5
EL PASO	6.4	7.7	5.9	7.2	5.2	6.3	4.9	5.8
ELY	5.5	7.0	5.9	7.4	5.2	6.1	3.9	4.7
FORT WORTH	4.2	5.7	4.7	6.3	4.0	5.1	3.3	4.2
GREAT FALLS	4.1	5.6	5.2	6.7	3.1	4.0	2.1	2.7
LAKE CHARLES	3.7	5.4	3.5	5.3	3.3	4.7	2.6	3.7
MADISON	4.2	5.8	5.1	6.8	3.2	4.1	2.8	3.5
MEDFORD	3.9	5.5	6.0	7.4	3.2	4.2	1.3	2.1
MIAMI	4.2	5.9	3.8	5.5	4.0	5.4	4.1	5.3
NASHVILLE	3.6	5.1	4.0	5.7	3.3	4.5	2.3	3.2
NEW YORK	3.4	4.8	3.4	5.1	2.9	3.9	2.1	2.8
OMAHA	4.1	5.5	4.6	6.2	3.6	4.6	3.1	3.8
PHOENIX	6.2	7.5	5.6	7.0	4.9	6.0	4.3	5.2
SANTA MARIA	5.7	7.1	5.8	7.2	4.9	6.0	3.8	4.7
SEATTLE	3.3	4.8	4.7	6.3	2.2	3.1	1.0	1.6
WASHINGTON,DC	3.9	5.3	4.0	5.7	3.3	4.4	2.7	3.5

FIXED SURFACE

TILT ANGLE 30 D AZIMUTH ANGLE 30 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	6.0	7.4	6.3	7.7	5.2	6.3	4.5	5.3
APPALACHICOLA	4.4	5.9	4.3	5.9	4.2	5.4	3.4	4.5
BISMARCK	4.4	5.8	5.3	6.8	3.5	4.4	2.7	3.3
BLUE HILL	3.5	5.0	3.6	5.3	2.8	3.8	2.3	3.1
BOSTON	3.5	5.0	3.8	5.5	2.7	3.6	2.1	2.8
BROWNSVILLE	3.3	5.1	4.3	6.0	3.4	4.8	2.5	3.7
CAPE HATTERAS	4.9	6.5	5.0	6.6	4.1	5.2	3.4	4.3
CARIBOU	3.9	5.4	3.9	5.6	2.2	3.2	2.4	3.1
CHARLESTON	4.2	5.7	3.8	5.5	3.6	4.8	2.9	3.8
COLUMBIA	3.8	5.2	4.6	6.2	3.4	4.4	2.6	3.4
DODGE CITY	4.6	6.0	5.2	6.7	4.4	5.4	3.5	4.3
EL PASO	6.4	7.7	6.0	7.3	5.1	6.2	4.7	5.6
ELY	5.5	7.0	6.0	7.5	5.0	5.9	3.7	4.5
FORT WORTH	4.1	5.6	4.7	6.3	3.8	5.0	3.2	4.1
GREAT FALLS	4.1	5.5	5.2	6.7	3.0	3.9	2.0	2.6
LAKE CHARLES	3.7	5.4	3.5	5.3	3.3	4.6	2.5	3.5
MADISON	4.1	5.7	5.1	6.7	3.1	4.0	2.6	3.4
MEDFORD	3.9	5.4	5.9	7.3	3.1	4.1	1.2	2.0
MIAMI	4.2	5.9	3.9	5.6	3.9	5.3	3.9	5.1
NASHVILLE	3.6	5.1	4.0	5.8	3.2	4.4	2.2	3.1
NEW YORK	3.3	4.8	3.3	5.1	2.8	3.8	2.0	2.7
OMAHA	4.0	5.5	4.6	6.2	3.4	4.4	2.9	3.7
PHOENIX	6.2	7.5	5.6	7.0	4.8	5.9	4.1	5.0
SANTA MARIA	5.5	7.0	5.6	7.0	4.7	5.7	3.6	4.5
SEATTLE	3.2	4.7	4.6	6.2	2.1	3.0	1.0	1.6
WASHINGTON,DC	3.8	5.3	3.9	5.7	3.1	4.2	2.5	3.3

FIXED SURFACE

TILT ANGLE 30 D AZIMUTH ANGLE 45 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.9	7.3	6.4	7.8	4.9	6.0	4.1	5.0
APPALACHICOLA	4.4	5.9	4.3	5.9	4.0	5.2	3.2	4.2
BISMARCK	4.3	5.7	5.3	6.8	3.3	4.2	2.4	3.1
BLUE HILL	3.4	4.9	3.5	5.3	2.6	3.6	2.1	2.9
BOSTON	3.5	4.9	3.7	5.4	2.5	3.5	1.9	2.6
BROWNSVILLE	3.3	5.0	4.4	6.1	3.2	4.7	2.3	3.5
CAPE HATTERAS	4.8	6.3	5.0	6.6	3.9	5.0	3.1	4.0
CARIBOU	3.8	5.2	3.9	5.5	2.1	3.0	2.2	2.9
CHARLESTON	4.1	5.6	3.8	5.6	3.4	4.6	2.7	3.6
COLUMBIA	3.7	5.1	4.5	6.1	3.2	4.2	2.4	3.2
DODGE CITY	4.4	5.9	5.2	6.6	4.1	5.1	3.2	4.0
EL PASO	6.3	7.6	6.0	7.3	4.8	5.9	4.3	5.3
ELY	5.4	6.9	6.0	7.5	4.7	5.7	3.4	4.2
FORT WORTH	4.0	5.5	4.7	6.3	3.6	4.8	2.9	3.8
GREAT FALLS	3.9	5.4	5.2	6.7	2.8	3.7	1.8	2.4
LAKE CHARLES	3.6	5.3	3.6	5.4	3.1	4.5	2.3	3.4
MADISON	4.0	5.6	5.0	6.7	2.9	3.8	2.4	3.1
MEDFORD	3.7	5.3	5.8	7.2	2.9	3.9	1.1	1.9
MIAMI	4.2	5.8	3.9	5.6	3.7	5.1	3.7	4.9
NASHVILLE	3.5	5.0	4.0	5.7	3.1	4.2	2.0	2.9
NEW YORK	3.2	4.7	3.3	5.0	2.7	3.7	1.8	2.5
OMAHA	3.9	5.4	4.5	6.1	3.2	4.2	2.6	3.4
PHOENIX	6.1	7.4	5.6	7.0	4.5	5.6	3.8	4.7
SANTA MARIA	5.4	6.8	5.4	6.8	4.3	5.4	3.3	4.2
SEATTLE	3.0	4.6	4.5	6.1	1.9	2.9	.9	1.5
WASHINGTON,DC	3.7	5.2	3.9	5.6	2.9	4.0	2.3	3.1

FIXED SURFACE

TILT ANGLE 30 D AZIMUTH ANGLE 60 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.8	7.2	6.4	7.8	4.6	5.6	3.7	4.5
APPALACHICOLA	4.3	5.8	4.3	5.9	3.8	5.0	2.8	3.9
BISMARCK	4.1	5.5	5.2	6.7	3.0	3.9	2.1	2.7
BLUE HILL	3.3	4.7	3.5	5.2	2.4	3.4	1.9	2.6
BOSTON	3.3	4.7	3.7	5.4	2.3	3.3	1.7	2.4
BROWNSVILLE	3.2	5.0	4.4	6.1	3.1	4.3	2.2	3.4
CAPE HATTERAS	4.7	6.2	5.0	6.5	3.6	4.7	2.8	3.7
CARIBOU	3.6	5.1	3.8	5.4	1.9	2.8	1.9	2.6
CHARLESTON	4.0	5.5	3.8	5.6	3.2	4.4	2.4	3.4
COLUMBIA	3.6	5.0	4.4	6.1	2.9	3.9	2.1	2.9
DODGE CITY	4.3	5.7	5.1	6.5	3.8	4.8	2.8	3.6
EL PASO	6.2	7.5	6.0	7.3	4.5	5.6	3.9	4.8
ELY	5.2	6.7	6.0	7.5	4.4	5.3	3.0	3.8
FORT WORTH	3.8	5.4	4.7	6.3	3.4	4.5	2.6	3.5
GREAT FALLS	3.8	5.2	5.1	6.6	2.5	3.5	1.5	2.2
LAKE CHARLES	3.6	5.2	3.6	5.4	3.0	4.3	2.1	3.1
MADISON	3.9	5.4	4.9	6.6	2.7	3.6	2.1	2.8
MEDFORD	3.6	5.1	5.7	7.1	2.6	3.6	.9	1.7
MIAMI	4.1	5.8	4.0	5.7	3.5	4.9	3.4	4.6
NASHVILLE	3.4	4.9	3.9	5.7	2.8	4.0	1.8	2.7
NEW YORK	3.1	4.5	3.2	4.9	2.5	3.5	1.5	2.3
OMAHA	3.8	5.3	4.4	6.0	2.9	3.9	2.3	3.1
PHOENIX	5.9	7.2	5.5	7.0	4.2	5.3	3.4	4.3
SANTA MARIA	5.2	6.6	5.3	6.7	4.0	5.0	2.9	3.8
SEATTLE	2.9	4.4	4.3	5.9	1.8	2.7	.7	1.4
WASHINGTON,DC	3.6	5.0	3.8	5.6	2.7	3.8	2.0	2.8

FIXED SURFACE

TILT ANGLE 30 D AZIMUTH ANGLE 75 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.6	7.0	6.3	7.7	4.1	5.2	3.2	4.1
APPALACHICOLA	4.1	5.6	4.3	5.9	3.4	4.6	2.5	3.6
BISMARCK	3.9	5.3	5.0	6.5	2.7	3.6	1.7	2.4
BLUE HILL	3.2	4.6	3.4	5.1	2.2	3.1	1.6	2.3
BOSTON	3.2	4.6	3.6	5.3	2.1	3.0	1.4	2.1
BROWNSVILLE	3.1	4.9	4.4	6.1	2.9	4.3	1.9	3.1
CAPE HATTERAS	4.5	6.0	4.9	6.5	3.3	4.4	2.4	3.3
CARIBOU	3.4	4.8	3.7	5.3	1.7	2.6	1.6	2.2
CHARLESTON	3.8	5.3	3.8	5.5	2.9	4.1	2.1	3.0
COLUMBIA	3.4	4.8	4.3	6.0	2.6	3.6	1.8	2.6
DODGE CITY	4.1	5.5	5.0	6.4	3.4	4.4	2.4	3.2
EL PASO	6.0	7.3	6.0	7.3	4.2	5.2	3.4	4.4
ELY	5.0	6.5	6.0	7.5	3.9	4.9	2.5	3.4
FORT WORTH	3.7	5.2	4.7	6.3	3.1	4.2	2.3	3.2
GREAT FALLS	3.6	5.0	4.9	6.4	2.2	3.2	1.3	1.9
LAKE CHARLES	3.5	5.1	3.6	5.4	2.7	4.1	1.8	2.9
MADISON	3.7	5.2	4.8	6.5	2.4	3.3	1.7	2.5
MEDFORD	3.4	4.9	5.6	7.0	2.3	3.4	.8	1.6
MIAMI	4.1	5.7	4.0	5.7	3.3	4.7	3.0	4.2
NASHVILLE	3.3	4.8	3.9	5.6	2.6	3.7	1.6	2.4
NEW YORK	2.9	4.4	3.1	4.8	2.2	3.2	1.3	2.0
OMAHA	3.6	5.1	4.3	5.9	2.6	3.6	2.0	2.7
PHOENIX	5.8	7.0	5.5	6.9	3.8	4.9	2.9	3.9
SANTA MARIA	4.9	6.3	5.1	6.5	3.6	4.6	2.5	3.4
SEATTLE	2.7	4.2	4.2	5.8	1.5	2.5	.6	1.2
WASHINGTON,DC	3.4	4.9	3.7	5.5	2.4	3.5	1.7	2.5

FIXED SURFACE

TILT ANGLE 30 D AZIMUTH ANGLE 90 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.3	6.8	6.2	7.6	3.7	4.8	2.7	3.5
APPALACHICOLA	4.0	5.5	4.3	5.9	3.1	4.3	2.1	3.2
BISMARCK	3.6	5.0	4.8	6.4	2.3	3.2	1.3	2.0
BLUE HILL	3.0	4.4	3.2	5.0	1.9	2.9	1.3	2.0
BOSTON	3.0	4.4	3.5	5.2	1.8	2.8	1.1	1.8
BROWNSVILLE	3.8	4.8	4.4	6.1	2.7	4.1	1.7	2.9
CAPE HATTERAS	4.2	5.8	4.8	6.4	2.9	4.0	2.0	2.9
CARIBOU	3.1	4.6	3.5	5.1	1.5	2.4	1.2	1.9
CHARLESTON	3.7	5.2	3.7	5.5	2.6	3.8	1.8	2.7
COLUMBIA	3.2	4.6	4.2	5.8	2.3	3.3	1.4	2.2
DODGE CITY	3.8	5.3	4.8	6.3	3.0	4.0	1.9	2.7
EL PASO	5.7	7.0	5.9	7.3	3.7	4.8	2.9	3.9
ELY	4.8	6.2	5.8	7.4	3.5	4.4	2.1	2.9
FORT WORTH	3.5	5.0	4.6	6.2	2.7	3.9	1.9	2.8
GREAT FALLS	3.3	4.7	4.7	6.2	1.9	2.8	1.0	1.6
LAKE CHARLES	3.3	5.0	3.6	5.4	2.5	3.8	1.5	2.6
MADISON	3.4	5.0	4.7	6.3	2.1	3.0	1.4	2.1
MEDFORD	3.1	4.7	5.4	6.8	2.0	3.1	.6	1.4
MIAMI	3.9	5.6	4.0	5.7	3.0	4.4	2.7	3.9
NASHVILLE	3.1	4.6	3.8	5.6	2.3	3.4	1.3	2.1
NEW YORK	2.8	4.2	3.0	4.7	1.9	2.9	1.0	1.8
OMAHA	3.4	4.9	4.2	5.8	2.3	3.3	1.6	2.4
PHOENIX	5.5	6.8	5.4	6.8	3.4	4.5	2.5	3.4
SANTA MARIA	4.7	6.1	5.0	6.4	3.1	4.2	2.1	3.0
SEATTLE	2.5	4.0	4.0	5.6	1.3	2.2	.5	1.1
WASHINGTON,DC	3.2	4.7	3.6	5.4	2.1	3.2	1.4	2.2

FIXED SURFACE

TILT ANGLE 15 D AZIMUTH ANGLE -90 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.4	6.9	6.3	7.8	3.8	4.9	2.8	3.7
APPALACHICOLA	4.3	5.9	4.5	6.1	3.3	4.6	2.4	3.5
BISMARCK	3.7	5.1	5.1	6.6	2.2	3.1	1.4	2.0
BLUE HILL	3.0	4.5	3.5	5.3	1.9	2.9	1.3	2.0
BOSTON	3.0	4.5	3.7	5.4	1.9	2.9	1.2	1.9
BROWNSVILLE	3.3	5.1	4.7	6.4	2.6	4.1	1.7	3.0
CAPE HATTERAS	4.7	6.3	5.2	6.9	3.1	4.3	2.1	3.1
CARIBOU	3.1	4.7	3.7	5.4	1.5	2.4	1.2	1.9
CHARLESTON	3.9	5.4	3.8	5.6	2.7	3.9	1.9	2.8
COLUMBIA	3.4	4.9	4.7	6.3	2.5	3.6	1.5	2.4
DODGE CITY	4.2	5.7	5.3	6.8	3.2	4.3	2.1	2.9
EL PASO	6.0	7.3	6.2	7.6	3.9	5.0	3.0	4.0
ELY	4.8	6.3	5.7	7.3	3.5	4.5	2.1	3.0
FORT WORTH	4.0	5.5	5.0	6.6	3.0	4.2	2.1	3.0
GREAT FALLS	3.3	4.7	4.8	6.3	1.9	2.9	1.0	1.7
LAKE CHARLES	3.5	5.2	3.6	5.5	2.5	3.9	1.7	2.8
MADISON	3.6	5.2	4.9	6.6	2.1	3.0	1.4	2.2
MEDFORD	3.5	5.1	5.9	7.3	2.3	3.3	.7	1.6
MIAMI	4.1	5.8	4.0	5.8	3.1	4.5	2.7	4.0
NASHVILLE	3.3	4.8	4.0	5.9	2.4	3.5	1.4	2.2
NEW YORK	2.9	4.4	3.3	5.1	2.0	3.1	1.2	2.0
OMAHA	3.6	5.1	4.6	6.3	2.4	3.5	1.6	2.4
PHOENIX	5.8	7.1	5.9	7.4	3.6	4.8	2.7	3.6
SANTA MARIA	5.4	6.9	6.4	7.9	3.7	4.8	2.3	3.2
SEATTLE	2.8	4.4	4.7	6.4	1.5	2.4	.5	1.1
WASHINGTON,DC	3.4	4.9	4.0	5.8	2.3	3.4	1.5	2.3

FIXED SURFACE

TILT ANGLE 15 D AZIMUTH ANGLE -75 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.5	7.0	6.4	7.9	4.1	5.2	3.1	4.0
APPALACHICOLA	4.4	5.9	4.5	6.2	3.5	4.7	2.6	3.7
BISMARCK	3.8	5.3	5.2	6.8	2.4	3.3	1.6	2.2
BLUE HILL	3.1	4.6	3.6	5.4	2.1	3.1	1.5	2.2
BOSTON	3.1	4.6	3.7	5.5	2.0	3.0	1.3	2.1
BROWNSVILLE	3.4	5.2	4.7	6.4	2.8	4.2	1.8	3.1
CAPE HATTERAS	4.8	6.4	5.3	6.9	3.3	4.5	2.3	3.3
CARIBOU	3.3	4.8	3.8	5.5	1.6	2.5	1.4	2.1
CHARLESTON	4.0	5.5	3.8	5.6	2.9	4.1	2.0	3.0
COLUMBIA	3.5	5.0	4.7	6.4	2.7	3.7	1.7	2.5
DODGE CITY	4.3	5.8	5.4	6.9	3.5	4.5	2.3	3.1
EL PASO	6.1	7.4	6.2	7.6	4.1	5.2	3.3	4.3
FLY	4.9	6.4	5.8	7.3	3.8	4.7	2.4	3.2
FORT WORTH	4.1	5.6	5.1	6.7	3.2	4.4	2.3	3.2
GREAT FALLS	3.4	4.9	4.9	6.4	2.1	3.0	1.2	1.8
LAKE CHARLES	3.6	5.3	3.7	5.5	2.7	4.1	1.8	2.9
MADISON	3.7	5.3	5.0	6.7	2.3	3.2	1.6	2.4
MEDFORD	3.6	5.2	6.0	7.4	2.5	3.5	.8	1.7
MIAMI	4.2	5.9	4.0	5.8	3.2	4.6	2.9	4.2
NASHVILLE	3.4	4.9	4.1	5.9	2.5	3.7	1.5	2.4
NEW YORK	3.0	4.5	3.4	5.2	2.2	3.2	1.3	2.1
OMAHA	3.7	5.2	4.7	6.4	2.6	3.6	1.8	2.6
PHOENIX	5.9	7.2	6.0	7.4	3.9	5.0	2.9	3.9
SANTA MARIA	5.5	7.0	6.5	7.9	4.0	5.0	2.5	3.4
SEATTLE	2.9	4.5	4.8	6.5	1.6	2.5	.6	1.2
WASHINGTON,DC	3.5	5.0	4.1	5.8	2.5	3.6	1.7	2.5

FIXED SURFACE

TILT ANGLE -15 D AZIMUTH ANGLE -60 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.7	7.2	6.5	7.9	4.3	5.4	3.3	4.2
APPALACHICOLA	4.5	6.0	4.5	6.2	3.7	4.9	2.8	3.9
BISMARCK	4.0	5.4	5.3	6.8	2.6	3.5	1.8	2.4
BLUE HILL	3.2	4.7	3.6	5.4	2.2	3.2	1.7	2.4
BOSTON	3.2	4.7	3.8	5.5	2.1	3.1	1.5	2.2
BROWNSVILLE	3.4	5.2	4.7	6.4	2.9	4.4	2.0	3.2
CAPE HATTERAS	4.9	6.5	5.3	6.9	3.5	4.6	2.6	3.5
CARIBOU	3.4	4.9	3.9	5.6	1.7	2.7	1.6	2.2
CHARLESTON	4.1	5.6	3.9	5.7	3.0	4.3	2.2	3.2
COLUMBIA	3.6	5.1	4.8	6.5	2.9	3.9	1.9	2.7
DODGE CITY	4.5	5.9	5.5	7.0	3.7	4.7	2.5	3.4
EL PASO	6.2	7.6	6.3	7.6	4.3	5.5	3.6	4.5
ELY	5.1	6.6	5.8	7.4	4.0	5.0	2.6	3.5
FORT WORTH	4.1	5.7	5.1	6.7	3.3	4.5	2.4	3.4
GREAT FALLS	3.5	5.0	5.0	6.5	2.3	3.2	1.3	2.0
LAKE CHARLES	3.7	5.4	3.7	5.5	2.8	4.2	2.0	3.1
MADISON	3.8	5.4	5.1	6.8	2.4	3.4	1.8	2.6
MEDFORD	3.7	5.3	6.1	7.5	2.6	3.7	.9	1.7
MIAMI	4.3	5.9	4.0	5.8	3.4	4.8	3.1	4.4
NASHVILLE	3.5	5.0	4.1	5.9	2.7	3.8	1.6	2.5
NEW YORK	3.1	4.6	3.4	5.2	2.3	3.3	1.5	2.2
OMAHA	3.8	5.3	4.8	6.4	2.8	3.8	2.0	2.8
PHOENIX	6.0	7.4	6.8	7.4	4.1	5.2	3.2	4.1
SANTA MARIA	5.7	7.1	6.5	8.0	4.2	5.2	2.7	3.7
SEATTLE	3.0	4.6	4.9	6.5	1.7	2.7	.6	1.3
WASHINGTON,DC	3.6	5.1	4.1	5.9	2.6	3.7	1.9	2.7

FIXED SURFACE

TILT ANGLE 15 D AZIMUTH ANGLE -45 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.8	7.3	6.5	8.0	4.5	5.6	3.6	4.5
APPALACHICOLA	4.5	6.1	4.5	6.2	3.8	5.1	2.9	4.0
BISMARCK	4.1	5.5	5.4	6.9	2.8	3.7	2.0	2.6
BLUE HILL	3.3	4.8	3.7	5.5	2.3	3.3	1.8	2.5
BOSTON	3.3	4.8	3.9	5.6	2.3	3.3	1.6	2.4
BROWNSVILLE	3.4	5.2	4.7	6.4	3.0	4.5	2.1	3.3
CAPE HATTERAS	5.0	6.6	5.3	7.0	3.7	4.8	2.7	3.7
CARIBOU	3.5	5.1	3.9	5.6	1.8	2.8	1.7	2.4
CHARLESTON	4.1	5.7	3.9	5.7	3.2	4.4	2.4	3.3
COLUMBIA	3.7	5.2	4.8	6.5	3.0	4.1	2.1	2.9
DODGE CITY	4.5	6.0	5.5	7.0	3.8	4.9	2.7	3.6
EL PASO	6.3	7.7	6.3	7.7	4.5	5.7	3.8	4.8
ELY	5.2	6.7	5.9	7.5	4.2	5.2	2.8	3.7
FORT WORTH	4.2	5.8	5.1	6.7	3.5	4.7	2.6	3.6
GREAT FALLS	3.7	5.2	5.1	6.6	2.4	3.4	1.4	2.1
LAKE CHARLES	3.7	5.4	3.7	5.5	2.9	4.3	2.1	3.2
MADISON	3.9	5.5	5.2	6.9	2.6	3.5	2.0	2.7
MEDFORD	3.8	5.4	6.2	7.6	2.7	3.8	1.0	1.8
MIAMI	4.3	6.0	4.1	5.8	3.5	4.9	3.3	4.6
NASHVILLE	3.5	5.1	4.1	6.0	2.8	4.0	1.8	2.6
NEW YORK	3.2	4.7	3.5	5.2	2.4	3.5	1.6	2.4
OMAHA	3.9	5.4	4.8	6.5	2.9	4.0	2.2	3.0
PHOENIX	6.2	7.5	6.0	7.5	4.3	5.4	3.4	4.3
SANTA MARIA	5.7	7.2	6.5	8.0	4.3	5.4	2.9	3.8
SEATTLE	3.1	4.7	4.9	6.6	1.8	2.7	.7	1.4
WASHINGTON,DC	3.7	5.2	4.2	5.9	2.7	3.9	2.0	2.8

FIXED SURFACE

TILT ANGLE 15 D AZIMUTH ANGLE -30 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.9	7.4	6.6	8.0	4.7	5.8	3.8	4.7
APPALACHICOLA	4.6	6.1	4.6	6.2	4.0	5.2	3.0	4.1
BISMARCK	4.2	5.6	5.4	7.0	3.0	3.9	2.1	2.8
BLUE HILL	3.4	4.9	3.7	5.5	2.4	3.4	1.9	2.6
BOSTON	3.4	4.9	3.9	5.6	2.4	3.4	1.7	2.5
BROWNSVILLE	3.5	5.3	4.7	6.4	3.1	4.6	2.2	3.4
CAPE HATTERAS	5.1	6.6	5.4	7.0	3.8	4.9	2.9	3.8
CARIBOU	3.6	5.1	4.0	5.7	1.9	2.9	1.9	2.5
CHARLESTON	4.2	5.7	3.9	5.7	3.3	4.5	2.5	3.5
COLUMBIA	3.8	5.3	4.9	6.5	3.1	4.2	2.2	3.0
DODGE CITY	4.6	6.1	5.5	7.0	4.0	5.0	2.9	3.7
EL PASO	6.4	7.8	6.3	7.7	4.7	5.8	4.8	5.0
ELY	5.3	6.8	6.0	7.6	4.4	5.4	3.8	3.9
FORT WORTH	4.2	5.8	5.1	6.7	3.6	4.8	2.7	3.7
GREAT FALLS	3.8	5.3	5.2	6.7	2.5	3.5	1.5	2.2
LAKE CHARLES	3.8	5.5	3.7	5.6	3.0	4.4	2.2	3.3
MADISON	4.0	5.6	5.2	6.9	2.7	3.6	2.1	2.9
MEDFORD	3.9	5.5	6.2	7.6	2.8	3.9	1.0	1.9
MIAMI	4.4	6.0	4.1	5.8	3.6	5.0	3.5	4.7
NASHVILLE	3.6	5.1	4.2	6.0	2.9	4.1	1.9	2.7
NEW YORK	3.2	4.7	3.5	5.3	2.5	3.6	1.7	2.4
OMAHA	4.0	5.5	4.8	6.5	3.1	4.1	2.4	3.1
PHOENIX	6.2	7.6	6.8	7.5	4.4	5.5	3.5	4.5
SANTA MARIA	5.8	7.2	6.5	7.9	4.5	5.5	3.1	4.0
SEATTLE	3.2	4.7	4.9	6.6	1.9	2.8	.8	1.4
WASHINGTON,DC	3.7	5.3	4.2	6.0	2.9	4.0	2.1	2.9

FIXED SURFACE

TILT ANGLE 15 D AZIMUTH ANGLE -15 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	6.0	7.4	6.6	8.1	4.8	5.9	3.9	4.8
APPALACHICOLA	4.6	6.2	4.6	6.2	4.0	5.3	3.1	4.2
BISMARCK	4.2	5.7	5.5	7.0	3.1	3.9	2.2	2.8
BLUE HILL	3.5	4.9	3.7	5.5	2.5	3.5	2.0	2.7
BOSTON	3.5	4.9	3.9	5.7	2.4	3.4	1.8	2.5
BROWNSVILLE	3.5	5.3	4.7	6.4	3.1	4.6	2.2	3.5
CAPE HATTERAS	5.1	6.7	5.4	7.0	3.9	5.0	3.8	3.9
CARIBOU	3.7	5.2	4.0	5.7	2.0	2.9	2.0	2.6
CHARLESTON	4.2	5.8	4.0	5.8	3.4	4.6	2.6	3.5
COLUMBIA	3.8	5.3	4.9	6.5	3.2	4.2	2.2	3.1
DODGE CITY	4.6	6.1	5.5	7.0	4.1	5.1	3.8	3.8
EL PASO	6.5	7.8	6.4	7.7	4.8	5.9	4.1	5.1
ELY	5.4	6.9	6.1	7.6	4.5	5.5	3.1	4.0
FORT WORTH	4.3	5.8	5.1	6.7	3.6	4.8	2.8	3.8
GREAT FALLS	3.8	5.3	5.2	6.8	2.6	3.6	1.6	2.3
LAKE CHARLES	3.8	5.5	3.7	5.6	3.1	4.5	2.2	3.3
MADISON	4.1	5.7	5.3	7.0	2.8	3.7	2.2	3.0
MEDFORD	3.9	5.5	6.2	7.7	2.9	3.9	1.1	1.9
MIAMI	4.4	6.1	4.1	5.9	3.7	5.1	3.6	4.8
NASHVILLE	3.6	5.2	4.2	6.0	3.0	4.1	1.9	2.8
NEW YORK	3.3	4.8	3.5	5.3	2.6	3.6	1.7	2.5
OMAHA	4.0	5.5	4.8	6.5	3.1	4.2	2.4	3.2
PHOENIX	6.3	7.6	6.0	7.5	4.5	5.6	3.6	4.6
SANTA MARIA	5.8	7.3	6.4	7.9	4.5	5.6	3.2	4.1
SEATTLE	3.2	4.7	4.9	6.6	1.9	2.9	.8	1.4
WASHINGTON,DC	3.8	5.3	4.2	6.0	2.9	4.0	2.2	3.0

FIXED SURFACE

TILT ANGLE 15 D AZIMUTH ANGLE 0 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	6.0	7.5	6.7	8.1	4.8	5.9	3.9	4.8
APPALACHICOLA	4.6	6.2	4.6	6.3	4.1	5.3	3.1	4.2
BISMARCK	4.3	5.7	5.5	7.0	3.1	4.0	2.2	2.9
BLUE HILL	3.5	5.0	3.7	5.5	2.5	3.5	2.0	2.7
BOSTON	3.5	4.9	3.9	5.7	2.4	3.4	1.8	2.5
BROWNSVILLE	3.5	5.3	4.7	6.5	3.2	4.7	2.3	3.5
CAPE HATTERAS	5.1	6.7	5.4	7.0	3.9	5.0	3.0	3.9
CARIBOU	3.7	5.2	4.0	5.7	2.0	2.9	2.0	2.7
CHARLESTON	4.3	5.8	4.0	5.8	3.4	4.6	2.6	3.6
COLUMBIA	3.8	5.3	4.9	6.5	3.2	4.2	2.3	3.1
DODGE CITY	4.6	6.1	5.5	7.8	4.1	5.1	3.0	3.8
EL PASO	6.5	7.9	6.4	7.8	4.8	5.9	4.2	5.1
ELY	5.4	7.0	6.1	7.7	4.6	5.6	3.2	4.0
FORT WORTH	4.3	5.8	5.1	6.7	3.7	4.9	2.8	3.8
GREAT FALLS	3.9	5.4	5.3	6.8	2.7	3.6	1.6	2.3
LAKE CHARLES	3.8	5.5	3.8	5.6	3.1	4.5	2.3	3.4
MADISON	4.1	5.7	5.3	7.0	2.8	3.7	2.2	3.0
MEDFORD	3.9	5.5	6.2	7.7	2.9	3.9	1.1	1.9
MIAMI	4.4	6.1	4.1	5.9	3.7	5.1	3.6	4.8
NASHVILLE	3.6	5.2	4.2	6.0	3.0	4.2	1.9	2.8
NEW YORK	3.3	4.8	3.5	5.3	2.6	3.7	1.7	2.5
OMAHA	4.0	5.5	4.8	6.5	3.2	4.2	2.5	3.3
PHOENIX	6.3	7.7	6.0	7.5	4.5	5.7	3.7	4.6
SANTA MARIA	5.8	7.2	6.3	7.8	4.5	5.6	3.2	4.1
SEATTLE	3.2	4.7	4.9	6.5	1.9	2.9	.8	1.4
WASHINGTON,DC	3.8	5.3	4.2	6.0	2.9	4.0	2.2	3.0

FIXED SURFACE

TILT ANGLE 15 D AZIMUTH ANGLE 15 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	6.0	7.5	6.7	8.1	4.8	5.9	3.9	4.8
APPALACHICOLA	4.6	6.2	4.6	6.3	4.0	5.3	3.1	4.2
BISMARCK	4.3	5.7	5.5	7.0	3.1	4.0	2.2	2.8
BLUE HILL	3.5	5.0	3.7	5.5	2.5	3.5	2.0	2.7
BOSTON	3.5	4.9	3.9	5.7	2.4	3.4	1.8	2.5
BROWNSVILLE	3.5	5.3	4.7	6.5	3.2	4.7	2.3	3.5
CAPE HATTERAS	5.1	6.7	5.4	7.0	3.9	5.0	3.0	3.9
CARIBOU	3.7	5.2	4.0	5.7	2.0	2.9	2.0	2.6
CHARLESTON	4.3	5.8	4.0	5.8	3.4	4.6	2.6	3.5
COLUMBIA	3.8	5.3	4.8	6.5	3.2	4.2	2.2	3.0
DODGE CITY	4.6	6.1	5.5	7.0	4.1	5.1	3.0	3.8
EL PASO	6.5	7.9	6.4	7.8	4.8	5.9	4.1	5.1
ELY	5.4	7.0	6.2	7.7	4.6	5.5	3.1	4.0
FORT WORTH	4.2	5.8	5.1	6.7	3.6	4.8	2.8	3.8
GREAT FALLS	3.9	5.4	5.3	6.8	2.6	3.6	1.6	2.3
LAKE CHARLES	3.8	5.5	3.8	5.6	3.1	4.5	2.2	3.3
MADISON	4.1	5.7	5.3	7.0	2.8	3.7	2.2	2.9
MEDFORD	3.9	5.5	6.2	7.6	2.9	3.9	1.0	1.9
MIAMI	4.4	6.1	4.2	5.9	3.7	5.1	3.6	4.8
NASHVILLE	3.6	5.2	4.2	6.0	3.0	4.2	1.9	2.8
NEW YORK	3.3	4.8	3.5	5.3	2.6	3.6	1.7	2.5
OMAHA	4.0	5.5	4.8	6.5	3.1	4.2	2.4	3.2
PHOENIX	6.3	7.7	6.0	7.5	4.5	5.6	3.6	4.6
SANTA MARIA	5.7	7.2	6.2	7.7	4.5	5.5	3.2	4.1
SEATTLE	3.1	4.7	4.8	6.5	1.9	2.8	.8	1.4
WASHINGTON,DC	3.8	5.3	4.2	6.0	2.9	4.0	2.2	3.0

FIXED SURFACE

TILT ANGLE 15 D AZIMUTH ANGLE 30 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	6.0	7.5	6.7	8.2	4.7	5.8	3.8	4.7
APPALACHICOLA	4.6	6.1	4.6	6.3	4.0	5.2	3.0	4.1
BISMARCK	4.2	5.7	5.4	7.0	3.0	3.9	2.1	2.8
BLUE HILL	3.5	4.9	3.7	5.5	2.5	3.5	1.9	2.6
BOSTON	3.5	4.9	3.9	5.7	2.4	3.4	1.7	2.5
BROWNSVILLE	3.5	5.3	4.8	6.5	3.2	4.7	2.2	3.8
CAPE HATTERAS	5.0	6.6	5.4	7.0	3.8	4.9	2.9	3.8
CARIBOU	3.7	5.2	4.0	5.7	1.9	2.9	1.9	2.6
CHARLESTON	4.2	5.8	4.0	5.8	3.3	4.6	2.5	3.5
COLUMBIA	3.8	5.3	4.8	6.5	3.1	4.1	2.2	3.0
DODGE CITY	4.6	6.0	5.5	7.0	4.0	5.0	2.9	3.7
EL PASO	6.5	7.8	6.4	7.8	4.7	5.8	4.0	5.0
ELY	5.4	6.9	6.2	7.8	4.5	5.4	3.0	3.9
FORT WORTH	4.2	5.7	5.1	6.7	3.5	4.7	2.7	3.7
GREAT FALLS	3.9	5.4	5.3	6.8	2.6	3.5	1.6	2.2
LAKE CHARLES	3.8	5.5	3.8	5.7	3.1	4.5	2.2	3.3
MADISON	4.0	5.6	5.3	7.0	2.7	3.7	2.1	2.9
MEDFORD	3.8	5.4	6.2	7.6	2.8	3.8	1.0	1.8
MIAMI	4.4	6.1	4.2	6.0	3.7	5.1	3.5	4.7
NASHVILLE	3.6	5.1	4.2	6.0	2.9	4.1	1.9	2.7
NEW YORK	3.3	4.8	3.5	5.3	2.6	3.6	1.6	2.4
OMAHA	4.0	5.5	4.8	6.4	3.1	4.1	2.4	3.1
PHOENIX	6.3	7.6	6.0	7.5	4.4	5.6	3.5	4.5
SANTA MARIA	5.7	7.1	6.1	7.6	4.3	5.4	3.1	4.0
SEATTLE	3.1	4.7	4.8	6.4	1.8	2.8	.8	1.4
WASHINGTON,DC	3.8	5.3	4.2	5.9	2.8	4.0	2.1	2.9

FIXED SURFACE

TILT ANGLE 15 D AZIMUTH ANGLE 45 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	6.0	7.4	6.7	8.2	4.6	5.7	3.6	4.5
APPALACHICOLA	4.5	6.1	4.6	6.3	3.9	5.1	2.9	4.0
BISMARCK	4.2	5.6	5.4	7.0	2.9	3.8	2.0	2.6
BLUE HILL	3.4	4.9	3.7	5.5	2.4	3.4	1.8	2.5
BOSTON	3.4	4.9	3.9	5.6	2.3	3.3	1.6	2.3
BROWNSVILLE	3.4	5.2	4.8	6.5	3.1	4.6	2.1	3.4
CAPE HATTERAS	5.0	6.5	5.3	7.0	3.6	4.8	2.7	3.7
CARIBOU	3.6	5.1	4.0	5.6	1.9	2.8	1.8	2.4
CHARLESTON	4.2	5.7	4.0	5.8	3.2	4.5	2.4	3.4
COLUMBIA	3.7	5.2	4.8	6.4	3.0	4.0	2.0	2.9
DODGE CITY	4.5	6.0	5.4	7.0	3.8	4.9	2.7	3.5
EL PASO	6.4	7.8	6.4	7.8	4.6	5.7	3.9	4.8
ELY	5.4	6.9	6.2	7.8	4.3	5.3	2.9	3.7
FORT WORTH	4.1	5.7	5.1	6.7	3.4	4.6	2.6	3.5
GREAT FALLS	3.8	5.3	5.2	6.8	2.5	3.4	1.5	2.1
LAKE CHARLES	3.8	5.5	3.8	5.7	3.0	4.4	2.1	3.2
MADISON	4.0	5.6	5.2	6.9	2.6	3.6	2.0	2.7
MEDFORD	3.8	5.3	6.1	7.5	2.7	3.7	.9	1.8
MIAMI	4.4	6.1	4.2	6.0	3.6	5.0	3.4	4.6
NASHVILLE	3.6	5.1	4.2	6.0	2.8	4.0	1.8	2.6
NEW YORK	3.2	4.7	3.4	5.2	2.5	3.5	1.5	2.3
OMAHA	3.9	5.4	4.7	6.4	2.9	4.0	2.2	3.0
PHOENIX	6.2	7.6	6.0	7.5	4.3	5.4	3.4	4.3
SANTA MARIA	5.6	7.0	6.0	7.5	4.2	5.2	2.9	3.8
SEATTLE	3.0	4.6	4.7	6.3	1.8	2.7	.7	1.3
WASHINGTON,DC	3.7	5.2	4.1	5.9	2.7	3.8	2.0	2.8

FIXED SURFACE

TILT ANGLE 15 D AZIMUTH ANGLE 60 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.9	7.3	6.7	8.2	4.4	5.5	3.4	4.3
APPALACHICOLA	4.5	6.0	4.6	6.3	3.7	4.9	2.7	3.8
BISMARCK	4.0	5.5	5.3	6.9	2.7	3.6	1.8	2.4
BLUE HILL	3.3	4.8	3.6	5.4	2.3	3.3	1.7	2.4
BOSTON	3.3	4.8	3.8	5.6	2.2	3.2	1.5	2.2
BROWNSVILLE	3.4	5.2	4.8	6.5	3.0	4.5	2.0	3.3
CAPE HATTERAS	4.9	6.4	5.3	6.9	3.5	4.6	2.5	3.5
CARIBOU	3.5	5.0	3.9	5.6	1.8	2.7	1.6	2.3
CHARLESTON	4.1	5.7	4.0	5.8	3.1	4.3	2.2	3.2
COLUMBIA	3.6	5.1	4.7	6.4	2.8	3.9	1.9	2.7
DODGE CITY	4.4	5.9	5.4	6.9	3.6	4.7	2.5	3.3
EL PASO	6.3	7.7	6.4	7.8	4.4	5.5	3.6	4.6
ELY	5.3	6.8	6.2	7.8	4.1	5.1	2.7	3.5
FORT WORTH	4.0	5.6	5.1	6.7	3.3	4.5	2.4	3.4
GREAT FALLS	3.7	5.2	5.2	6.7	2.3	3.3	1.3	2.0
LAKE CHARLES	3.7	5.4	3.8	5.7	2.9	4.3	1.9	3.0
MADISON	3.9	5.5	5.2	6.9	2.5	3.4	1.8	2.6
MEDFORD	3.7	5.3	6.0	7.5	2.5	3.6	.8	1.7
MIAMI	4.3	6.0	4.3	6.0	3.5	4.9	3.2	4.4
NASHVILLE	3.5	5.0	4.2	6.0	2.7	3.9	1.7	2.5
NEW YORK	3.1	4.6	3.4	5.2	2.3	3.4	1.4	2.2
OMAHA	3.8	5.3	4.7	6.3	2.8	3.8	2.1	2.8
PHOENIX	6.1	7.5	6.0	7.4	4.1	5.2	3.2	4.1
SANTA MARIA	5.4	6.9	5.9	7.4	4.0	5.0	2.7	3.6
SEATTLE	2.9	4.5	4.6	6.2	1.7	2.6	.6	1.3
WASHINGTON,DC	3.6	5.1	4.1	5.9	2.6	3.7	1.8	2.7

FIXED SURFACE

TILT ANGLE 15 D AZIMUTH ANGLE 75 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.7	7.2	6.7	8.1	4.1	5.2	3.1	4.0
APPALACHICOLA	4.4	5.9	4.6	6.3	3.5	4.8	2.5	3.6
BISMARCK	3.9	5.3	5.3	6.8	2.6	3.5	1.6	2.2
BLUE HILL	3.2	4.7	3.6	5.4	2.1	3.1	1.5	2.2
BOSTON	3.2	4.7	3.8	5.5	2.0	3.0	1.3	2.1
BROWNSVILLE	3.4	5.2	4.8	6.5	2.9	4.4	1.9	3.2
CAPE HATTERAS	4.8	6.3	5.3	6.9	3.3	4.4	2.3	3.3
CARIBOU	3.4	4.9	3.8	5.5	1.6	2.6	1.4	2.1
CHARLESTON	4.1	5.6	4.0	5.8	3.0	4.2	2.1	3.0
COLUMBIA	3.5	5.0	4.7	6.3	2.6	3.7	1.7	2.5
DODGE CITY	4.3	5.7	5.3	6.8	3.4	4.4	2.3	3.1
EL PASO	6.2	7.6	6.4	7.8	4.2	5.3	3.4	4.3
ELY	5.1	6.7	6.2	7.7	3.9	4.9	2.4	3.3
FORT WORTH	4.0	5.5	5.0	6.7	3.1	4.3	2.2	3.2
GREAT FALLS	3.6	5.1	5.1	6.6	2.2	3.1	1.2	1.8
LAKE CHARLES	3.6	5.4	3.8	5.7	2.7	4.2	1.8	2.9
MADISON	3.8	5.4	5.1	6.8	2.3	3.3	1.6	2.4
MEDFORD	3.5	5.1	5.9	7.4	2.4	3.4	.8	1.6
MIAMI	4.3	6.0	4.3	6.0	3.3	4.8	3.0	4.2
NASHVILLE	3.4	5.0	4.1	6.0	2.6	3.8	1.5	2.4
NEW YORK	3.1	4.5	3.3	5.1	2.2	3.2	1.3	2.0
OMAHA	3.7	5.2	4.6	6.3	2.6	3.6	1.9	2.6
PHOENIX	6.0	7.3	5.9	7.4	3.9	5.0	2.9	3.9
SANTA MARIA	5.3	6.7	5.8	7.3	3.7	4.8	2.5	3.4
SEATTLE	2.8	4.4	4.5	6.1	1.5	2.5	.6	1.2
WASHINGTON,DC	3.5	5.0	4.0	5.8	2.4	3.6	1.7	2.5

FIXED SURFACE

TILT ANGLE 15 D AZIMUTH ANGLE 90 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.6	7.1	6.6	8.1	3.9	5.0	2.8	3.7
APPALACHICOLA	4.3	5.9	4.6	6.3	3.3	4.6	2.3	3.4
BISMARCK	3.7	5.2	5.1	6.7	2.3	3.2	1.4	2.0
BLUE HILL	3.1	4.6	3.5	5.3	2.0	3.0	1.3	2.1
BOSTON	3.1	4.6	3.7	5.5	1.9	2.9	1.2	1.9
BROWNSVILLE	3.3	5.1	4.8	6.5	2.8	4.3	1.8	3.0
CAPE HATTERAS	4.6	6.2	5.2	6.8	3.1	4.2	2.1	3.0
CARIBOU	3.3	4.8	3.8	5.4	1.5	2.4	1.2	1.9
CHARLESTON	4.0	5.5	4.0	5.8	2.8	4.0	1.9	2.9
COLUMBIA	3.4	4.9	4.6	6.3	2.5	3.5	1.5	2.3
DODGE CITY	4.2	5.6	5.3	6.8	3.2	4.2	2.0	2.8
EL PASO	6.1	7.4	6.4	7.7	4.0	5.1	3.1	4.0
ELY	5.0	6.5	6.1	7.7	3.6	4.6	2.2	3.0
FORT WORTH	3.9	5.4	5.0	6.6	2.9	4.1	2.0	3.0
GREAT FALLS	3.4	4.9	5.0	6.5	2.0	2.9	1.0	1.7
LAKE CHARLES	3.6	5.3	3.8	5.7	2.6	4.0	1.7	2.8
MADISON	3.6	5.2	5.0	6.7	2.2	3.1	1.4	2.2
MEDFORD	3.4	5.0	5.8	7.3	2.2	3.3	.7	1.5
MIAMI	4.2	5.9	4.3	6.0	3.2	4.6	2.8	4.0
NASHVILLE	3.3	4.9	4.1	5.9	2.4	3.6	1.4	2.2
NEW YORK	3.0	4.4	3.3	5.1	2.1	3.1	1.1	1.9
OMAHA	3.6	5.1	4.5	6.2	2.4	3.4	1.6	2.4
PHOENIX	5.9	7.2	5.9	7.4	3.7	4.8	2.7	3.6
SANTA MARIA	5.2	6.6	5.8	7.2	3.5	4.6	2.2	3.2
SEATTLE	2.7	4.3	4.4	6.0	1.4	2.4	.5	1.1
WASHINGTON,DC	3.4	4.9	4.0	5.7	2.3	3.4	1.5	2.3

FIXED SURFACE

TILT ANGLE 0 D AZIMUTH ANGLE -90 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.7	7.1	6.7	8.2	3.9	5.1	2.9	3.8
APPALACHICOLA	4.5	6.0	4.7	6.4	3.4	4.7	2.4	3.5
BISMARCK	3.8	5.2	5.2	6.8	2.3	3.2	1.4	2.0
BLUE HILL	3.2	4.6	3.6	5.4	2.0	3.0	1.3	2.1
BOSTON	3.2	4.6	3.8	5.6	1.9	2.9	1.2	1.9
BROWNSVILLE	3.4	5.2	4.9	6.6	2.8	4.3	1.8	3.0
CAPE HATTERAS	4.8	6.4	5.4	7.0	3.2	4.3	2.2	3.1
CARIBOU	3.3	4.8	3.8	5.5	1.5	2.5	1.2	1.9
CHARLESTON	4.0	5.6	4.0	5.8	2.8	4.1	1.9	2.9
COLUMBIA	3.5	5.0	4.8	6.5	2.6	3.6	1.6	2.4
DODGE CITY	4.3	5.8	5.5	7.0	3.3	4.3	2.1	2.9
EL PASO	6.2	7.6	6.5	7.9	4.0	5.1	3.1	4.1
ELY	5.0	6.5	6.1	7.6	3.7	4.6	2.2	3.1
FORT WORTH	4.0	5.6	5.2	6.8	3.0	4.2	2.1	3.1
GREAT FALLS	3.4	4.9	5.0	6.6	2.0	2.9	1.0	1.7
LAKE CHARLES	3.7	5.4	3.9	5.7	2.6	4.0	1.7	2.8
MADISON	3.7	5.3	5.1	6.8	2.2	3.1	1.5	2.2
MEDFORD	3.6	5.2	6.1	7.5	2.3	3.4	.7	1.6
MIAMI	4.3	6.0	4.3	6.1	3.2	4.6	2.8	4.1
NASHVILLE	3.4	5.0	4.2	6.0	2.5	3.6	1.4	2.3
NEW YORK	3.0	4.5	3.4	5.2	2.1	3.1	1.2	2.0
OMAHA	3.7	5.2	4.7	6.4	2.5	3.5	1.7	2.5
PHOENIX	6.0	7.3	6.1	7.6	3.8	4.9	2.7	3.7
SANTA MARIA	5.4	6.9	6.3	7.8	3.7	4.8	2.3	3.3
SEATTLE	2.8	4.4	4.7	6.3	1.5	2.4	.5	1.1
WASHINGTON,DC	3.5	5.0	4.1	5.9	2.3	3.5	1.5	2.4

FIXED SURFACE

TILT ANGLE 0 D AZIMUTH ANGLE -75 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.7	7.1	6.7	8.2	3.9	5.1	2.9	3.8
APPALACHICOLA	4.5	6.0	4.7	6.4	3.4	4.7	2.4	3.5
BISMARCK	3.8	5.2	5.2	6.8	2.3	3.2	1.4	2.0
BLUE HILL	3.2	4.6	3.6	5.4	2.0	3.0	1.3	2.1
BOSTON	3.2	4.6	3.8	5.6	1.9	2.9	1.2	1.9
BROWNSVILLE	3.4	5.2	4.9	6.6	2.8	4.3	1.8	3.0
CAPE HATTERAS	4.8	6.4	5.4	7.0	3.2	4.3	2.2	3.1
CARIBOU	3.3	4.8	3.8	5.5	1.5	2.5	1.2	1.9
CHARLESTON	4.0	5.6	4.0	5.8	2.8	4.1	1.9	2.9
COLUMBIA	3.5	5.0	4.8	6.5	2.6	3.6	1.6	2.4
DODGE CITY	4.3	5.8	5.5	7.0	3.3	4.3	2.1	2.9
EL PASO	6.2	7.6	6.5	7.9	4.0	5.1	3.1	4.1
ELY	5.0	6.5	6.1	7.6	3.7	4.6	2.2	3.1
FORT WORTH	4.0	5.6	5.2	6.8	3.0	4.2	2.1	3.1
GREAT FALLS	3.4	4.9	5.0	6.6	2.0	2.9	1.0	1.7
LAKE CHARLES	3.7	5.4	3.9	5.7	2.6	4.0	1.7	2.8
MADISON	3.7	5.3	5.1	6.8	2.2	3.1	1.5	2.2
MEDFORD	3.6	5.2	6.1	7.5	2.3	3.4	.7	1.6
MIAMI	4.3	6.0	4.3	6.1	3.2	4.6	2.8	4.1
NASHVILLE	3.4	5.0	4.2	6.0	2.5	3.6	1.4	2.3
NEW YORK	3.0	4.5	3.4	5.2	2.1	3.1	1.2	2.0
OMAHA	3.7	5.2	4.7	6.4	2.5	3.5	1.7	2.5
PHOENIX	6.0	7.3	6.1	7.6	3.8	4.9	2.7	3.7
SANTA MARIA	5.4	6.9	6.3	7.8	3.7	4.8	2.3	3.3
SEATTLE	2.8	4.4	4.7	6.3	1.5	2.4	.5	1.1
WASHINGTON,DC	3.5	5.0	4.1	5.9	2.3	3.5	1.5	2.4

FIXED SURFACE

TILT ANGLE 0 D AZIMUTH ANGLE -60 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.7	7.1	6.7	8.2	3.9	5.1	2.9	3.8
APPALACHICOLA	4.5	6.0	4.7	6.4	3.4	4.7	2.4	3.5
BISMARCK	3.8	5.2	5.2	6.8	2.3	3.2	1.4	2.0
BLUE HILL	3.2	4.6	3.6	5.4	2.0	3.0	1.3	2.1
BOSTON	3.2	4.6	3.8	5.6	1.9	2.9	1.2	1.9
BROWNSVILLE	3.4	5.2	4.9	6.6	2.8	4.3	1.8	3.0
CAPE HATTERAS	4.8	6.4	5.4	7.0	3.2	4.3	2.2	3.1
CARIBOU	3.3	4.8	3.8	5.5	1.5	2.5	1.2	1.9
CHARLESTON	4.0	5.6	4.0	5.8	2.8	4.1	1.9	2.9
COLUMBIA	3.5	5.0	4.8	6.5	2.6	3.6	1.6	2.4
DODGE CITY	4.3	5.8	5.5	7.0	3.3	4.3	2.1	2.9
EL PASO	6.2	7.6	6.5	7.9	4.8	5.1	3.1	4.1
ELY	5.0	6.5	6.1	7.6	3.7	4.6	2.2	3.1
FORT WORTH	4.0	5.6	5.2	6.8	3.0	4.2	2.1	3.1
GREAT FALLS	3.4	4.9	5.0	6.6	2.0	2.9	1.0	1.7
LAKE CHARLES	3.7	5.4	3.9	5.7	2.6	4.0	1.7	2.8
MADISON	3.7	5.3	5.1	6.8	2.2	3.1	1.5	2.2
MEDFORD	3.6	5.2	6.1	7.5	2.3	3.4	.7	1.6
MIAMI	4.3	6.0	4.3	6.1	3.2	4.6	2.8	4.1
NASHVILLE	3.4	5.0	4.2	6.0	2.5	3.6	1.4	2.3
NEW YORK	3.0	4.5	3.4	5.2	2.1	3.1	1.2	2.0
OMAHA	3.7	5.2	4.7	6.4	2.5	3.5	1.7	2.5
PHOENIX	6.0	7.3	6.1	7.6	3.8	4.9	2.7	3.7
SANTA MARIA	5.4	6.9	6.3	7.8	3.7	4.8	2.3	3.3
SEATTLE	2.8	4.4	4.7	6.3	1.5	2.4	.5	1.1
WASHINGTON,DC	3.5	5.0	4.1	5.9	2.3	3.5	1.5	2.4

FIXED SURFACE

TILT ANGLE 0 D AZIMUTH ANGLE -45 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.7	7.1	6.7	8.2	3.9	5.1	2.9	3.8
APPALACHICOLA	4.5	6.0	4.7	6.4	3.4	4.7	2.4	3.5
BISMARCK	3.8	5.2	5.2	6.8	2.3	3.2	1.4	2.0
BLUE HILL	3.2	4.6	3.6	5.4	2.0	3.0	1.3	2.1
BOSTON	3.2	4.6	3.8	5.6	1.9	2.9	1.2	1.9
BROWNSVILLE	3.4	5.2	4.9	6.6	2.8	4.3	1.8	3.0
CAPE HATTERAS	4.8	6.4	5.4	7.0	3.2	4.3	2.2	3.1
CARIBOU	3.3	4.8	3.8	5.5	1.5	2.5	1.2	1.9
CHARLESTON	4.0	5.6	4.0	5.8	2.8	4.1	1.9	2.9
COLUMBIA	3.5	5.0	4.8	6.5	2.6	3.6	1.6	2.4
DODGE CITY	4.3	5.8	5.5	7.0	3.3	4.3	2.1	2.9
EL PASO	6.2	7.6	6.5	7.9	4.0	5.1	3.1	4.1
ELY	5.0	6.5	6.1	7.6	3.7	4.6	2.2	3.1
FORT WORTH	4.0	5.6	5.2	6.8	3.0	4.2	2.1	3.1
GREAT FALLS	3.4	4.9	5.0	6.6	2.0	2.9	1.0	1.7
LAKE CHARLES	3.7	5.4	3.9	5.7	2.6	4.0	1.7	2.8
MADISON	3.7	5.3	5.1	6.8	2.2	3.1	1.5	2.2
MEDFORD	3.6	5.2	6.1	7.5	2.3	3.4	.7	1.6
MIAMI	4.3	6.0	4.3	6.1	3.2	4.6	2.8	4.1
NASHVILLE	3.4	5.0	4.2	6.0	2.5	3.6	1.4	2.3
NEW YORK	3.0	4.5	3.4	5.2	2.1	3.1	1.2	2.0
OMAHA	3.7	5.2	4.7	6.4	2.5	3.5	1.7	2.5
PHOENIX	6.0	7.3	6.1	7.6	3.8	4.9	2.7	3.7
SANTA MARIA	5.4	6.9	6.3	7.8	3.7	4.8	2.3	3.3
SEATTLE	2.8	4.4	4.7	6.3	1.5	2.4	.5	1.1
WASHINGTON,DC	3.5	5.0	4.1	5.9	2.3	3.5	1.5	2.4

FIXED SURFACE

TILT ANGLE 0 D AZIMUTH ANGLE -30 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.7	7.1	6.7	8.2	3.9	5.1	2.9	3.8
APPALACHICOLA	4.5	6.0	4.7	6.4	3.4	4.7	2.4	3.5
BISMARCK	3.8	5.2	5.2	6.8	2.3	3.2	1.4	2.0
BLUE HILL	3.2	4.6	3.6	5.4	2.0	3.0	1.3	2.1
BOSTON	3.2	4.6	3.8	5.6	1.9	2.9	1.2	1.9
BROWNSVILLE	3.4	5.2	4.9	6.6	2.8	4.3	1.8	3.0
CAPE HATTERAS	4.8	6.4	5.4	7.0	3.2	4.3	2.2	3.1
CARIBOU	3.3	4.8	3.8	5.5	1.5	2.5	1.2	1.9
CHARLESTON	4.0	5.6	4.0	5.8	2.8	4.1	1.9	2.9
COLUMBIA	3.5	5.0	4.8	6.5	2.6	3.6	1.6	2.4
DODGE CITY	4.3	5.8	5.5	7.0	3.3	4.3	2.1	2.9
EL PASO	6.2	7.6	6.5	7.9	4.0	5.1	3.1	4.1
ELY	5.0	6.5	6.1	7.6	3.7	4.6	2.2	3.1
FORT WORTH	4.0	5.6	5.2	6.8	3.0	4.2	2.1	3.1
GREAT FALLS	3.4	4.9	5.0	6.6	2.0	2.9	1.0	1.7
LAKE CHARLES	3.7	5.4	3.9	5.7	2.6	4.0	1.7	2.8
MADISON	3.7	5.3	5.1	6.8	2.2	3.1	1.5	2.2
MEDFORD	3.6	5.2	6.1	7.5	2.3	3.4	.7	1.6
MIAMI	4.3	6.0	4.3	6.1	3.2	4.6	2.8	4.1
NASHVILLE	3.4	5.0	4.2	6.0	2.5	3.6	1.4	2.3
NEW YORK	3.0	4.5	3.4	5.2	2.1	3.1	1.2	2.0
OMAHA	3.7	5.2	4.7	6.4	2.5	3.5	1.7	2.5
PHOENIX	6.0	7.3	6.1	7.6	3.8	4.9	2.7	3.7
SANTA MARIA	5.4	6.9	6.3	7.8	3.7	4.8	2.3	3.3
SEATTLE	2.8	4.4	4.7	6.3	1.5	2.4	.5	1.1
WASHINGTON,DC	3.5	5.0	4.1	5.9	2.3	3.5	1.5	2.4

FIXED SURFACE

TILT ANGLE 0 D AZIMUTH ANGLE -15 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.7	7.1	6.7	8.2	3.9	5.1	2.9	3.8
APPALACHICOLA	4.5	6.0	4.7	6.4	3.4	4.7	2.4	3.5
BISMARCK	3.8	5.2	5.2	6.8	2.3	3.2	1.4	2.0
BLUE HILL	3.2	4.6	3.6	5.4	2.0	3.0	1.3	2.1
BOSTON	3.2	4.6	3.8	5.6	1.9	2.9	1.2	1.9
BROWNSVILLE	3.4	5.2	4.9	6.6	2.8	4.3	1.8	3.0
CAPE HATTERAS	4.8	6.4	5.4	7.0	3.2	4.3	2.2	3.1
CARIBOU	3.3	4.8	3.8	5.5	1.5	2.5	1.2	1.9
CHARLESTON	4.0	5.6	4.0	5.8	2.8	4.1	1.9	2.9
COLUMBIA	3.5	5.0	4.8	6.5	2.6	3.6	1.6	2.4
DODGE CITY	4.3	5.8	5.5	7.0	3.3	4.3	2.1	2.9
EL PASO	6.2	7.6	6.5	7.9	4.0	5.1	3.1	4.1
ELY	5.0	6.5	6.1	7.6	3.7	4.6	2.2	3.1
FORT WORTH	4.0	5.6	5.2	6.8	3.0	4.2	2.1	3.1
GREAT FALLS	3.4	4.9	5.0	6.6	2.0	2.9	1.0	1.7
LAKE CHARLES	3.7	5.4	3.9	5.7	2.6	4.0	1.7	2.8
MADISON	3.7	5.3	5.1	6.8	2.2	3.1	1.5	2.2
MEDFORD	3.6	5.2	6.1	7.5	2.3	3.4	.7	1.6
MIAMI	4.3	6.0	4.3	6.1	3.2	4.6	2.8	4.1
NASHVILLE	3.4	5.0	4.2	6.0	2.5	3.6	1.4	2.3
NEW YORK	3.0	4.5	3.4	5.2	2.1	3.1	1.2	2.0
OMAHA	3.7	5.2	4.7	6.4	2.5	3.5	1.7	2.5
PHOENIX	6.0	7.3	6.1	7.6	3.8	4.9	2.7	3.7
SANTA MARIA	5.4	6.9	6.3	7.8	3.7	4.8	2.3	3.3
SEATTLE	2.8	4.4	4.7	6.3	1.5	2.4	.5	1.1
WASHINGTON,DC	3.5	5.0	4.1	5.9	2.3	3.5	1.5	2.4

FIXED SURFACE

TILT ANGLE 0 D AZIMUTH ANGLE 0 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.7	7.1	6.7	8.2	3.9	5.1	2.9	3.8
APPALACHICOLA	4.5	6.0	4.7	6.4	3.4	4.7	2.4	3.5
BISMARCK	3.8	5.2	5.2	6.8	2.3	3.2	1.4	2.0
BLUE HILL	3.2	4.6	3.6	5.4	2.0	3.0	1.3	2.1
BOSTON	3.2	4.6	3.8	5.6	1.9	2.9	1.2	1.9
BROWNSVILLE	3.4	5.2	4.9	6.6	2.8	4.3	1.8	3.0
CAPE HATTERAS	4.8	6.4	5.4	7.0	3.2	4.3	2.2	3.1
CARIBOU	3.3	4.8	3.8	5.5	1.5	2.5	1.2	1.9
CHARLESTON	4.0	5.6	4.0	5.8	2.8	4.1	1.9	2.9
COLUMBIA	3.5	5.0	4.8	6.5	2.6	3.6	1.6	2.4
DODGE CITY	4.3	5.8	5.5	7.0	3.3	4.3	2.1	2.9
EL PASO	6.2	7.6	6.5	7.9	4.0	5.1	3.1	4.1
ELY	5.0	6.5	6.1	7.6	3.7	4.6	2.2	3.1
FORT WORTH	4.0	5.6	5.2	6.8	3.0	4.2	2.1	3.1
GREAT FALLS	3.4	4.9	5.0	6.6	2.0	2.9	1.0	1.7
LAKE CHARLES	3.7	5.4	3.9	5.7	2.6	4.0	1.7	2.8
MADISON	3.7	5.3	5.1	6.8	2.2	3.1	1.5	2.2
MEDFORD	3.6	5.2	6.1	7.5	2.3	3.4	.7	1.6
MIAMI	4.3	6.0	4.3	6.1	3.2	4.6	2.8	4.1
NASHVILLE	3.4	5.0	4.2	6.0	2.5	3.6	1.4	2.3
NEW YORK	3.0	4.5	3.4	5.2	2.1	3.1	1.2	2.0
OMAHA	3.7	5.2	4.7	6.4	2.5	3.5	1.7	2.5
PHOENIX	6.0	7.3	6.1	7.6	3.8	4.9	2.7	3.7
SANTA MARIA	5.4	6.9	6.3	7.8	3.7	4.8	2.3	3.3
SEATTLE	2.8	4.4	4.7	6.3	1.5	2.4	.5	1.1
WASHINGTON,DC	3.5	5.0	4.1	5.9	2.3	3.5	1.5	2.4

FIXED SURFACE

TILT ANGLE 0 D AZIMUTH ANGLE 15 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.7	7.1	6.7	8.2	3.9	5.1	2.9	3.8
APPALACHICOLA	4.5	6.0	4.7	6.4	3.4	4.7	2.4	3.5
BISMARCK	3.8	5.2	5.2	6.8	2.3	3.2	1.4	2.0
BLUE HILL	3.2	4.6	3.6	5.4	2.0	3.0	1.3	2.1
BOSTON	3.2	4.6	3.8	5.6	1.9	2.9	1.2	1.9
BROWNSVILLE	3.4	5.2	4.9	6.6	2.8	4.3	1.8	3.0
CAPE HATTERAS	4.8	6.4	5.4	7.0	3.2	4.3	2.2	3.1
CARIBOU	3.3	4.8	3.8	5.5	1.5	2.5	1.2	1.9
CHARLESTON	4.0	5.6	4.0	5.8	2.8	4.1	1.9	2.9
COLUMBIA	3.5	5.0	4.8	6.5	2.6	3.6	1.6	2.4
DODGE CITY	4.3	5.8	5.5	7.0	3.3	4.3	2.1	2.9
EL PASO	6.2	7.6	6.5	7.9	4.0	5.1	3.1	4.1
ELY	5.0	6.5	6.1	7.6	3.7	4.6	2.2	3.1
FORT WORTH	4.0	5.6	5.2	6.8	3.0	4.2	2.1	3.1
GREAT FALLS	3.4	4.9	5.0	6.6	2.0	2.9	1.0	1.7
LAKE CHARLES	3.7	5.4	3.9	5.7	2.6	4.0	1.7	2.8
MADISON	3.7	5.3	5.1	6.8	2.2	3.1	1.5	2.2
MEDFORD	3.6	5.2	6.1	7.5	2.3	3.4	.7	1.6
MIAMI	4.3	6.0	4.3	6.1	3.2	4.6	2.8	4.1
NASHVILLE	3.4	5.0	4.2	6.0	2.5	3.6	1.4	2.3
NEW YORK	3.0	4.5	3.4	5.2	2.1	3.1	1.2	2.0
OMAHA	3.7	5.2	4.7	6.4	2.5	3.5	1.7	2.5
PHOENIX	6.0	7.3	6.1	7.6	3.8	4.9	2.7	3.7
SANTA MARIA	5.4	6.9	6.3	7.8	3.7	4.8	2.3	3.3
SEATTLE	2.8	4.4	4.7	6.3	1.5	2.4	.5	1.1
WASHINGTON,DC	3.5	5.0	4.1	5.9	2.3	3.5	1.5	2.4

FIXED SURFACE

TILT ANGLE 0 D AZIMUTH ANGLE 30 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.7	7.1	6.7	8.2	3.9	5.1	2.9	3.8
APPALACHICOLA	4.5	6.0	4.7	6.4	3.4	4.7	2.4	3.5
BISMARCK	3.8	5.2	5.2	6.8	2.3	3.2	1.4	2.0
BLUE HILL	3.2	4.6	3.6	5.4	2.0	3.0	1.3	2.1
BOSTON	3.2	4.6	3.8	5.6	1.9	2.9	1.2	1.9
BROWNSVILLE	3.4	5.2	4.9	6.6	2.8	4.3	1.8	3.0
CAPE HATTERAS	4.8	6.4	5.4	7.0	3.2	4.3	2.2	3.1
CARIBOU	3.3	4.8	3.8	5.5	1.5	2.5	1.2	1.9
CHARLESTON	4.0	5.6	4.0	5.8	2.8	4.1	1.9	2.9
COLUMBIA	3.5	5.0	4.8	6.5	2.6	3.6	1.6	2.4
DODGE CITY	4.3	5.8	5.5	7.0	3.3	4.3	2.1	2.9
EL PASO	6.2	7.6	6.5	7.9	4.0	5.1	3.1	4.1
ELY	5.0	6.5	6.1	7.6	3.7	4.6	2.2	3.1
FORT WORTH	4.0	5.6	5.2	6.8	3.0	4.2	2.1	3.1
GREAT FALLS	3.4	4.9	5.0	6.6	2.0	2.9	1.0	1.7
LAKE CHARLES	3.7	5.4	3.9	5.7	2.6	4.0	1.7	2.8
MADISON	3.7	5.3	5.1	6.8	2.2	3.1	1.5	2.2
MEDFORD	3.6	5.2	6.1	7.5	2.3	3.4	.7	1.6
MIAMI	4.3	6.0	4.3	6.1	3.2	4.6	2.8	4.1
NASHVILLE	3.4	5.0	4.2	6.0	2.5	3.6	1.4	2.3
NEW YORK	3.0	4.5	3.4	5.2	2.1	3.1	1.2	2.0
OMAHA	3.7	5.2	4.7	6.4	2.5	3.5	1.7	2.5
PHOENIX	6.0	7.3	6.1	7.6	3.8	4.9	2.7	3.7
SANTA MARIA	5.4	6.9	6.3	7.8	3.7	4.8	2.3	3.3
SEATTLE	2.8	4.4	4.7	6.3	1.5	2.4	.5	1.1
WASHINGTON,DC	3.5	5.0	4.1	5.9	2.3	3.5	1.5	2.4

FIXED SURFACE

TILT ANGLE 0 D AZIMUTH ANGLE 45 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.7	7.1	6.7	8.2	3.9	5.1	2.9	3.8
APPALACHICOLA	4.5	6.0	4.7	6.4	3.4	4.7	2.4	3.5
BISMARCK	3.8	5.2	5.2	6.8	2.3	3.2	1.4	2.0
BLUE HILL	3.2	4.6	3.6	5.4	2.0	3.0	1.3	2.1
BOSTON	3.2	4.6	3.8	5.6	1.9	2.9	1.2	1.9
BROWNSVILLE	3.4	5.2	4.9	6.6	2.8	4.3	1.8	3.0
CAPE HATTERAS	4.8	6.4	5.4	7.0	3.2	4.3	2.2	3.1
CARIBOU	3.3	4.8	3.8	5.5	1.5	2.5	1.2	1.9
CHARLESTON	4.0	5.6	4.0	5.8	2.8	4.1	1.9	2.9
COLUMBIA	3.5	5.0	4.8	6.5	2.6	3.6	1.6	2.4
DODGE CITY	4.3	5.8	5.5	7.0	3.3	4.3	2.1	2.9
EL PASO	6.2	7.6	6.5	7.9	4.8	5.1	3.1	4.1
ELY	5.0	6.5	6.1	7.6	3.7	4.6	2.2	3.1
FORT WORTH	4.0	5.6	5.2	6.8	3.0	4.2	2.1	3.1
GREAT FALLS	3.4	4.9	5.0	6.6	2.0	2.9	1.0	1.7
LAKE CHARLES	3.7	5.4	3.9	5.7	2.6	4.0	1.7	2.8
MADISON	3.7	5.3	5.1	6.8	2.2	3.1	1.5	2.2
MEDFORD	3.6	5.2	6.1	7.5	2.3	3.4	.7	1.6
MIAMI	4.3	6.0	4.3	6.1	3.2	4.6	2.8	4.1
NASHVILLE	3.4	5.0	4.2	6.0	2.5	3.6	1.4	2.3
NEW YORK	3.0	4.5	3.4	5.2	2.1	3.1	1.2	2.0
OMAHA	3.7	5.2	4.7	6.4	2.5	3.5	1.7	2.5
PHOENIX	6.0	7.3	6.1	7.6	3.8	4.9	2.7	3.7
SANTA MARIA	5.4	6.9	6.3	7.8	3.7	4.8	2.3	3.3
SEATTLE	2.8	4.4	4.7	6.3	1.5	2.4	.5	1.1
WASHINGTON,DC	3.5	5.0	4.1	5.9	2.3	3.5	1.5	2.4

FIXED SURFACE

TTLT ANGLE 0 D AZIMUTH ANGLE 60 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.7	7.1	6.7	8.2	3.9	5.1	2.9	3.8
APPALACHICOLA	4.5	6.0	4.7	6.4	3.4	4.7	2.4	3.5
BISMARCK	3.8	5.2	5.2	6.8	2.3	3.2	1.4	2.0
BLUE HILL	3.2	4.6	3.6	5.4	2.0	3.0	1.3	2.1
BOSTON	3.2	4.6	3.8	5.6	1.9	2.9	1.2	1.9
BROWNSVILLE	3.4	5.2	4.9	6.6	2.8	4.3	1.8	3.0
CAPE HATTERAS	4.8	6.4	5.4	7.0	3.2	4.3	2.2	3.1
CARIBOU	3.3	4.8	3.8	5.5	1.5	2.5	1.2	1.9
CHARLESTON	4.0	5.6	4.0	5.8	2.8	4.1	1.9	2.9
COLUMBIA	3.5	5.0	4.8	6.5	2.6	3.6	1.6	2.4
DODGE CITY	4.3	5.8	5.5	7.0	3.3	4.3	2.1	2.9
EL PASO	6.2	7.6	6.5	7.9	4.0	5.1	3.1	4.1
ELY	5.0	6.5	6.1	7.6	3.7	4.6	2.2	3.1
FORT WORTH	4.0	5.6	5.2	6.8	3.0	4.2	2.1	3.1
GREAT FALLS	3.4	4.9	5.0	6.6	2.0	2.9	1.0	1.7
LAKE CHARLES	3.7	5.4	3.9	5.7	2.6	4.0	1.7	2.8
MADISON	3.7	5.3	5.1	6.8	2.2	3.1	1.5	2.2
MEDFORD	3.6	5.2	6.1	7.5	2.3	3.4	.7	1.6
MIAMI	4.3	6.0	4.3	6.1	3.2	4.6	2.8	4.1
NASHVILLE	3.4	5.0	4.2	6.0	2.5	3.6	1.4	2.3
NEW YORK	3.0	4.5	3.4	5.2	2.1	3.1	1.2	2.0
OMAHA	3.7	5.2	4.7	6.4	2.5	3.5	1.7	2.5
PHOENIX	6.0	7.3	6.1	7.6	3.8	4.9	2.7	3.7
SANTA MARIA	5.4	6.9	6.3	7.8	3.7	4.8	2.3	3.3
SEATTLE	2.8	4.4	4.7	6.3	1.5	2.4	.5	1.1
WASHINGTON,DC	3.5	5.0	4.1	5.9	2.3	3.5	1.5	2.4

FIXED SURFACE

TILT ANGLE 0 D AZIMUTH ANGLE 75 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.7	7.1	6.7	8.2	3.9	5.1	2.9	3.8
APPALACHICOLA	4.5	6.0	4.7	6.4	3.4	4.7	2.4	3.5
BISMARCK	3.8	5.2	5.2	6.8	2.3	3.2	1.4	2.0
BLUE HILL	3.2	4.6	3.6	5.4	2.0	3.0	1.3	2.1
BOSTON	3.2	4.6	3.8	5.6	1.9	2.9	1.2	1.9
BROWNSVILLE	3.4	5.2	4.9	6.6	2.8	4.3	1.8	3.0
CAPE HATTERAS	4.8	6.4	5.4	7.0	3.2	4.3	2.2	3.1
CARIBOU	3.3	4.8	3.8	5.5	1.5	2.5	1.2	1.9
CHARLESTON	4.0	5.6	4.0	5.8	2.8	4.1	1.9	2.9
COLUMBIA	3.5	5.0	4.8	6.5	2.6	3.6	1.6	2.4
DODGE CITY	4.3	5.8	5.5	7.0	3.3	4.3	2.1	2.9
EL PASO	6.2	7.6	6.5	7.9	4.0	5.1	3.1	4.1
ELY	5.0	6.5	6.1	7.6	3.7	4.6	2.2	3.1
FORT WORTH	4.0	5.6	5.2	6.8	3.0	4.2	2.1	3.1
GREAT FALLS	3.4	4.9	5.0	6.6	2.0	2.9	1.0	1.7
LAKE CHARLES	3.7	5.4	3.9	5.7	2.6	4.0	1.7	2.8
MADISON	3.7	5.3	5.1	6.8	2.2	3.1	1.5	2.2
MEDFORD	3.6	5.2	6.1	7.5	2.3	3.4	.7	1.6
MIAMI	4.3	6.0	4.3	6.1	3.2	4.6	2.8	4.1
NASHVILLE	3.4	5.0	4.2	6.0	2.5	3.6	1.4	2.3
NEW YORK	3.0	4.5	3.4	5.2	2.1	3.1	1.2	2.0
OMAHA	3.7	5.2	4.7	6.4	2.5	3.5	1.7	2.5
PHOENIX	6.0	7.3	6.1	7.6	3.8	4.9	2.7	3.7
SANTA MARIA	5.4	6.9	6.3	7.8	3.7	4.8	2.3	3.3
SEATTLE	2.8	4.4	4.7	6.3	1.5	2.4	.5	1.1
WASHINGTON,DC	3.5	5.0	4.1	5.9	2.3	3.5	1.5	2.4

FIXED SURFACE

TILT ANGLE 0 D AZIMUTH ANGLE 90 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.7	7.1	6.7	8.2	3.9	5.1	2.9	3.8
APPALACHICOLA	4.5	6.0	4.7	6.4	3.4	4.7	2.4	3.5
BISMARCK	3.8	5.2	5.2	6.8	2.3	3.2	1.4	2.0
BLUE HILL	3.2	4.6	3.6	5.4	2.0	3.0	1.3	2.1
BOSTON	3.2	4.6	3.8	5.6	1.9	2.9	1.2	1.9
BROWNSVILLE	3.4	5.2	4.9	6.6	2.8	4.3	1.8	3.0
CAPE HATTERAS	4.8	6.4	5.4	7.0	3.2	4.3	2.2	3.1
CARIBOU	3.3	4.8	3.8	5.5	1.5	2.5	1.2	1.9
CHARLESTON	4.0	5.6	4.0	5.8	2.8	4.1	1.9	2.9
COLUMBIA	3.5	5.0	4.8	6.5	2.6	3.6	1.6	2.4
DODGE CITY	4.3	5.8	5.5	7.0	3.3	4.3	2.1	2.9
EL PASO	6.2	7.6	6.5	7.9	4.0	5.1	3.1	4.1
ELY	5.0	6.5	6.1	7.6	3.7	4.6	2.2	3.1
FORT WORTH	4.0	5.6	5.2	6.8	3.0	4.2	2.1	3.1
GREAT FALLS	3.4	4.9	5.0	6.6	2.0	2.9	1.0	1.7
LAKE CHARLES	3.7	5.4	3.9	5.7	2.6	4.0	1.7	2.8
MADISON	3.7	5.3	5.1	6.8	2.2	3.1	1.5	2.2
MEDFORD	3.6	5.2	6.1	7.5	2.3	3.4	.7	1.6
MIAMI	4.3	6.0	4.3	6.1	3.2	4.6	2.8	4.1
NASHVILLE	3.4	5.0	4.2	6.0	2.5	3.6	1.4	2.3
NEW YORK	3.0	4.5	3.4	5.2	2.1	3.1	1.2	2.0
OMAHA	3.7	5.2	4.7	6.4	2.5	3.5	1.7	2.5
PHOENIX	6.0	7.3	6.1	7.6	3.8	4.9	2.7	3.7
SANTA MARIA	5.4	6.9	6.3	7.8	3.7	4.8	2.3	3.3
SEATTLE	2.8	4.4	4.7	6.3	1.5	2.4	.5	1.1
WASHINGTON,DC	3.5	5.0	4.1	5.9	2.3	3.5	1.5	2.4

FIXED SURFACE

TILT ANGLE -15 D AZIMUTH ANGLE -90 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.6	7.1	6.6	8.1	3.9	5.0	2.8	3.7
APPALACHICOLA	4.3	5.9	4.6	6.3	3.3	4.6	2.3	3.4
BISMARCK	3.7	5.2	5.1	6.7	2.3	3.2	1.4	2.0
BLUE HILL	3.1	4.6	3.5	5.3	2.0	3.0	1.3	2.1
BOSTON	3.1	4.6	3.7	5.5	1.9	2.9	1.2	1.9
BROWNSVILLE	3.3	5.1	4.8	6.5	2.8	4.3	1.8	3.0
CAPE HATTERAS	4.6	6.2	5.2	6.8	3.1	4.2	2.1	3.0
CARIBOU	3.3	4.8	3.8	5.4	1.5	2.4	1.2	1.9
CHARLESTON	4.0	5.5	4.0	5.8	2.8	4.0	1.9	2.9
COLUMBIA	3.4	4.9	4.6	6.3	2.5	3.5	1.5	2.3
DODGE CITY	4.2	5.6	5.3	6.8	3.2	4.2	2.0	2.8
EL PASO	6.1	7.4	6.4	7.7	4.0	5.1	3.1	4.0
ELY	5.0	6.5	6.1	7.7	3.6	4.6	2.2	3.0
FORT WORTH	3.9	5.4	5.0	6.6	2.9	4.1	2.0	3.0
GREAT FALLS	3.4	4.9	5.0	6.5	2.0	2.9	1.0	1.7
LAKE CHARLES	3.6	5.3	3.8	5.7	2.6	4.0	1.7	2.8
MADISON	3.6	5.2	5.0	6.7	2.2	3.1	1.4	2.2
MEDFORD	3.4	5.0	5.8	7.3	2.2	3.3	.7	1.5
MIAMI	4.2	5.9	4.3	6.0	3.2	4.6	2.8	4.0
NASHVILLE	3.3	4.9	4.1	5.9	2.4	3.6	1.4	2.2
NEW YORK	3.0	4.4	3.3	5.1	2.1	3.1	1.1	1.9
OMAHA	3.6	5.1	4.5	6.2	2.4	3.4	1.6	2.4
PHOENIX	5.9	7.2	5.9	7.4	3.7	4.8	2.7	3.6
SANTA MARIA	5.2	6.6	5.8	7.2	3.5	4.6	2.2	3.2
SEATTLE	2.7	4.3	4.4	6.0	1.4	2.4	.5	1.1
WASHINGTON,DC	3.4	4.9	4.0	5.7	2.3	3.4	1.5	2.3

FIXED SURFACE

TILT ANGLE —15 D AZIMUTH ANGLE -75 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.5	6.9	6.6	8.0	3.6	4.7	2.5	3.4
APPALACHICOLA	4.2	5.8	4.6	6.2	3.1	4.4	2.1	3.2
BISMARCK	3.6	5.0	5.0	6.6	2.1	3.0	1.1	1.8
BLUE HILL	3.0	4.5	3.5	5.2	1.8	2.8	1.1	1.9
BOSTON	3.0	4.5	3.7	5.4	1.8	2.7	1.0	1.8
BROWNSVILLE	3.2	5.1	4.8	6.5	2.6	4.1	1.6	2.9
CAPE HATTERAS	4.5	6.1	5.2	6.8	2.9	4.0	1.9	2.8
CARIBOU	3.1	4.6	3.7	5.3	1.4	2.3	1.0	1.7
CHARLESTON	3.9	5.4	3.9	5.8	2.6	3.8	1.7	2.7
COLUMBIA	3.3	4.8	4.5	6.2	2.3	3.3	1.3	2.2
DODGE CITY	4.0	5.5	5.2	6.7	2.9	4.0	1.8	2.6
EL PASO	6.0	7.3	6.3	7.7	3.7	4.8	2.8	3.7
ELY	4.8	6.3	6.0	7.6	3.4	4.3	1.9	2.8
FORT WORTH	3.8	5.3	5.0	6.6	2.8	4.0	1.8	2.8
GREAT FALLS	3.3	4.8	4.9	6.4	1.8	2.7	.9	1.5
LAKE CHARLES	3.5	5.2	3.8	5.7	2.5	3.9	1.5	2.6
MADISON	3.5	5.1	4.9	6.6	2.0	2.9	1.2	2.0
MEDFORD	3.3	4.9	5.7	7.2	2.0	3.1	.6	1.4
MIAMI	4.1	5.8	4.3	6.0	3.0	4.4	2.6	3.8
NASHVILLE	3.2	4.8	4.0	5.9	2.3	3.4	1.2	2.1
NEW YORK	2.9	4.3	3.2	5.0	1.9	2.9	1.0	1.7
OMAHA	3.5	5.0	4.5	6.1	2.2	3.3	1.4	2.2
PHOENIX	5.8	7.1	5.9	7.3	3.5	4.6	2.4	3.4
SANTA MARIA	5.0	6.5	5.7	7.2	3.2	4.3	2.0	2.9
SEATTLE	2.6	4.1	4.3	5.9	1.3	2.2	.4	1.1
WASHINGTON,DC	3.3	4.8	3.9	5.7	2.1	3.2	1.3	2.1

FIXED SURFACE

TILT ANGLE -15 D AZIMUTH ANGLE -60 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.3	6.8	6.5	8.0	3.4	4.5	2.2	3.1
APPALACHICOLA	4.1	5.7	4.6	6.2	3.0	4.2	1.9	3.0
BISMARCK	3.4	4.9	4.9	6.5	1.9	2.8	.9	1.6
BLUE HILL	2.9	4.4	3.4	5.2	1.7	2.7	1.0	1.7
BOSTON	2.9	4.4	3.6	5.3	1.6	2.6	.9	1.6
BROWNSVILLE	3.2	5.0	4.8	6.5	2.5	4.0	1.5	2.7
CAPE HATTERAS	4.4	6.0	5.1	6.7	2.7	3.8	1.7	2.6
CARIBOU	3.0	4.5	3.6	5.2	1.2	2.2	.9	1.5
CHARLESTON	3.8	5.3	3.9	5.7	2.4	3.7	1.5	2.5
COLUMBIA	3.2	4.7	4.5	6.1	2.1	3.1	1.2	2.0
DODGE CITY	3.9	5.4	5.1	6.6	2.7	3.7	1.5	2.3
EL PASO	5.8	7.2	6.3	7.7	3.5	4.6	2.5	3.5
ELY	4.7	6.2	5.9	7.5	3.1	4.1	1.7	2.5
FORT WORTH	3.7	5.2	4.9	6.6	2.6	3.8	1.6	2.6
GREAT FALLS	3.1	4.6	4.8	6.3	1.6	2.6	.7	1.4
LAKE CHARLES	3.4	5.2	3.8	5.6	2.3	3.7	1.4	2.5
MADISON	3.4	5.0	4.8	6.5	1.8	2.8	1.0	1.8
MEDFORD	3.2	4.8	5.6	7.1	1.9	2.9	.5	1.3
MIAMI	4.1	5.8	4.3	6.0	2.9	4.3	2.4	3.6
NASHVILLE	3.1	4.7	4.0	5.8	2.1	3.3	1.1	2.0
NEW YORK	2.8	4.2	3.2	4.9	1.8	2.8	.8	1.6
OMAHA	3.4	4.9	4.4	6.0	2.0	3.1	1.2	2.0
PHOENIX	5.6	6.9	5.8	7.3	3.2	4.4	2.2	3.1
SANTA MARIA	4.9	6.3	5.7	7.1	3.0	4.1	1.8	2.7
SEATTLE	2.5	4.0	4.2	5.9	1.2	2.1	.3	1.0
WASHINGTON,DC	3.2	4.7	3.8	5.6	1.9	3.1	1.1	2.0

FIXED SURFACE

TILT ANGLE -15 D AZIMUTH ANGLE -45 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.2	6.6	6.4	7.9	3.2	4.3	2.0	2.9
APPALACHICOLA	4.1	5.6	4.5	6.2	2.8	4.0	1.7	2.8
BISMARCK	3.3	4.7	4.8	6.4	1.7	2.6	.8	1.4
BLUE HILL	2.8	4.3	3.3	5.1	1.5	2.5	.8	1.6
BOSTON	2.8	4.3	3.5	5.3	1.5	2.5	.7	1.5
BROWNSVILLE	3.2	5.0	4.8	6.5	2.4	3.9	1.4	2.6
CAPE HATTERAS	4.3	5.9	5.1	6.7	2.5	3.7	1.5	2.4
CARIBOU	2.8	4.3	3.5	5.2	1.1	2.0	.7	1.3
CHARLESTON	3.7	5.2	3.9	5.7	2.3	3.5	1.4	2.3
COLUMBIA	3.1	4.6	4.4	6.1	2.0	3.0	1.0	1.8
DODGE CITY	3.8	5.3	5.1	6.6	2.5	3.6	1.3	2.1
EL PASO	5.7	7.0	6.2	7.6	3.3	4.4	2.3	3.2
ELY	4.5	6.0	5.8	7.4	2.9	3.8	1.4	2.3
FORT WORTH	3.6	5.2	4.9	6.5	2.4	3.6	1.5	2.4
GREAT FALLS	3.0	4.5	4.7	6.2	1.5	2.4	.6	1.2
LAKE CHARLES	3.4	5.1	3.8	5.6	2.2	3.6	1.2	2.3
MADISON	3.2	4.8	4.7	6.4	1.6	2.6	.9	1.6
MEDFORD	3.1	4.7	5.6	7.0	1.8	2.8	.4	1.3
MIAMI	4.0	5.7	4.2	6.0	2.7	4.1	2.2	3.4
NASHVILLE	3.1	4.6	3.9	5.8	2.0	3.1	1.0	1.8
NEW YORK	2.7	4.1	3.1	4.9	1.6	2.7	.7	1.5
OMAHA	3.3	4.8	4.3	6.0	1.9	2.9	1.1	1.8
PHOENIX	5.5	6.8	5.8	7.2	3.0	4.2	1.9	2.9
SANTA MARIA	4.8	6.2	5.7	7.1	2.8	3.9	1.6	2.5
SEATTLE	2.4	3.9	4.1	5.8	1.1	2.0	.3	.9
WASHINGTON,DC	3.1	4.6	3.8	5.6	1.8	2.9	1.0	1.8

FIXED SURFACE

TILT ANGLE —15 D AZIMUTH ANGLE -30 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.1	6.5	6.4	7.8	3.0	4.1	1.8	2.7
APPALACHICOLA	4.0	5.5	4.5	6.2	2.7	3.9	1.6	2.7
BISMARCK	3.2	4.6	4.8	6.3	1.6	2.5	.6	1.3
BLUE HILL	2.7	4.2	3.3	5.1	1.4	2.4	.7	1.4
BOSTON	2.7	4.2	3.5	5.2	1.4	2.4	.6	1.4
BROWNSVILLE	3.1	4.9	4.8	6.5	2.3	3.8	1.3	2.5
CAPE HATTERAS	4.2	5.8	5.0	6.7	2.4	3.5	1.3	2.3
CARIBOU	2.7	4.2	3.4	5.1	1.0	2.0	.6	1.2
CHARLESTON	3.6	5.1	3.8	5.6	2.2	3.4	1.2	2.2
COLUMBIA	3.1	4.6	4.4	6.0	1.8	2.9	.9	1.7
DODGE CITY	3.7	5.2	5.0	6.5	2.4	3.4	1.2	2.0
EL PASO	5.6	6.9	6.2	7.6	3.1	4.2	2.1	3.0
ELY	4.4	5.9	5.7	7.3	2.7	3.6	1.3	2.1
FORT WORTH	3.5	5.1	4.9	6.5	2.3	3.5	1.3	2.3
GREAT FALLS	2.9	4.4	4.6	6.1	1.3	2.3	.5	1.1
LAKE CHARLES	3.3	5.0	3.7	5.6	2.1	3.5	1.2	2.2
MADISON	3.1	4.7	4.7	6.4	1.5	2.5	.7	1.5
MEDFORD	3.0	4.6	5.5	6.9	1.7	2.7	.4	1.2
MIAMI	4.0	5.6	4.2	6.0	2.6	4.0	2.0	3.3
NASHVILLE	3.0	4.5	3.9	5.7	1.9	3.0	.9	1.7
NEW YORK	2.6	4.1	3.1	4.9	1.5	2.6	.6	1.4
OMAHA	3.2	4.7	4.3	5.9	1.8	2.8	.9	1.7
PHOENIX	5.4	6.7	5.8	7.2	2.9	4.0	1.8	2.7
SANTA MARIA	4.7	6.2	5.7	7.2	2.7	3.8	1.4	2.4
SEATTLE	2.3	3.9	4.1	5.8	1.0	1.9	.2	.9
WASHINGTON,DC	3.0	4.5	3.8	5.5	1.7	2.8	.9	1.7

FIXED SURFACE

TILT ANGLE —15 D AZIMUTH ANGLE -15 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.0	6.4	6.3	7.8	2.8	4.0	1.6	2.5
APPALACHICOLA	4.0	5.5	4.5	6.1	2.6	3.8	1.5	2.6
BISMARCK	3.1	4.5	4.7	6.3	1.4	2.3	.5	1.2
BLUE HILL	2.7	4.1	3.3	5.0	1.3	2.3	.6	1.4
BOSTON	2.7	4.1	3.5	5.2	1.3	2.3	.6	1.3
BROWNSVILLE	3.1	4.9	4.8	6.5	2.2	3.7	1.2	2.5
CAPE HATTERAS	4.2	5.8	5.0	6.6	2.3	3.5	1.3	2.2
CARIBOU	2.6	4.1	3.4	5.1	1.0	1.9	.5	1.1
CHARLESTON	3.6	5.1	3.8	5.6	2.1	3.3	1.2	2.1
COLUMBIA	3.0	4.5	4.4	6.0	1.8	2.8	.8	1.6
DODGE CITY	3.7	5.2	5.0	6.5	2.3	3.3	1.0	1.9
EL PASO	5.5	6.9	6.2	7.5	3.0	4.1	1.9	2.9
ELY	4.3	5.8	5.7	7.2	2.5	3.5	1.1	2.0
FORT WORTH	3.5	5.1	4.9	6.5	2.2	3.4	1.3	2.2
GREAT FALLS	2.8	4.3	4.5	6.0	1.3	2.2	.4	1.1
LAKE CHARLES	3.3	5.0	3.7	5.6	2.0	3.4	1.1	2.2
MADISON	3.1	4.7	4.6	6.3	1.4	2.4	.6	1.4
MEDFORD	3.0	4.6	5.5	6.9	1.6	2.6	.4	1.2
MIAMI	3.9	5.6	4.2	5.9	2.5	3.9	1.9	3.2
NASHVILLE	3.0	4.5	3.9	5.7	1.8	3.0	.8	1.7
NEW YORK	2.5	4.0	3.1	4.8	1.5	2.5	.6	1.3
OMAHA	3.1	4.7	4.3	5.9	1.7	2.7	.8	1.6
PHOENIX	5.3	6.6	5.8	7.2	2.8	3.9	1.7	2.6
SANTA MARIA	4.7	6.1	5.8	7.2	2.6	3.7	1.3	2.3
SEATTLE	2.3	3.8	4.1	5.8	.9	1.9	.2	.8
WASHINGTON,DC	3.0	4.5	3.7	5.5	1.6	2.7	.8	1.6

FIXED SURFACE

TILT ANGLE −15 D AZIMUTH ANGLE 0 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.9	6.4	6.3	7.7	2.8	3.9	1.6	2.5
APPALACHICOLA	4.0	5.5	4.5	6.1	2.6	3.8	1.5	2.6
BISMARCK	3.0	4.5	4.7	6.2	1.4	2.3	.5	1.1
BLUE HILL	2.6	4.1	3.3	5.0	1.3	2.3	.6	1.3
BOSTON	2.6	4.1	3.5	5.2	1.3	2.3	.5	1.3
BROWNSVILLE	3.1	4.9	4.7	6.5	2.2	3.7	1.2	2.4
CAPE HATTERAS	4.2	5.8	5.0	6.6	2.3	3.4	1.2	2.2
CARIBOU	2.6	4.1	3.4	5.1	.9	1.9	.4	1.1
CHARLESTON	3.5	5.1	3.8	5.6	2.1	3.3	1.1	2.1
COLUMBIA	3.0	4.5	4.4	6.0	1.7	2.8	.8	1.6
DODGE CITY	3.7	5.1	5.0	6.5	2.2	3.3	1.0	1.8
EL PASO	5.5	6.8	6.1	7.5	3.0	4.1	1.9	2.8
ELY	4.2	5.8	5.6	7.2	2.5	3.5	1.1	1.9
FORT WORTH	3.5	5.1	4.9	6.5	2.2	3.4	1.2	2.2
GREAT FALLS	2.7	4.2	4.5	6.0	1.2	2.2	.4	1.0
LAKE CHARLES	3.3	5.0	3.7	5.5	2.0	3.4	1.1	2.2
MADISON	3.0	4.6	4.6	6.3	1.4	2.4	.6	1.4
MEDFORD	3.0	4.6	5.5	6.9	1.6	2.6	.3	1.2
MIAMI	3.9	5.6	4.1	5.9	2.5	3.9	1.9	3.1
NASHVILLE	2.9	4.5	3.9	5.7	1.7	2.9	.8	1.6
NEW YORK	2.5	4.0	3.1	4.8	1.4	2.5	.6	1.3
OMAHA	3.1	4.6	4.3	5.9	1.6	2.7	.8	1.6
PHOENIX	5.3	6.6	5.7	7.2	2.8	3.9	1.6	2.6
SANTA MARIA	4.7	6.2	5.9	7.3	2.6	3.7	1.3	2.2
SEATTLE	2.3	3.8	4.2	5.8	.9	1.9	.2	.8
WASHINGTON,DC	2.9	4.4	3.7	5.5	1.6	2.7	.8	1.6

FIXED SURFACE

TILT ANGLE -15 D AZIMUTH ANGLE 15 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.9	6.4	6.2	7.7	2.8	3.9	1.6	2.5
APPALACHICOLA	4.0	5.5	4.5	6.1	2.6	3.8	1.5	2.6
BISMARCK	3.0	4.5	4.7	6.2	1.4	2.3	.5	1.2
BLUE HILL	2.6	4.1	3.3	5.1	1.3	2.3	.6	1.4
BOSTON	2.6	4.1	3.5	5.2	1.3	2.3	.6	1.3
BROWNSVILLE	3.1	4.9	4.7	6.5	2.2	3.7	1.2	2.4
CAPE HATTERAS	4.2	5.8	5.0	6.7	2.3	3.5	1.3	2.2
CARIBOU	2.6	4.1	3.4	5.1	.9	1.9	.4	1.1
CHARLESTON	3.5	5.1	3.8	5.6	2.1	3.3	1.2	2.1
COLUMBIA	3.0	4.5	4.4	6.1	1.8	2.8	.8	1.6
DODGE CITY	3.7	5.2	5.0	6.5	2.3	3.3	1.1	1.9
EL PASO	5.5	6.8	6.1	7.5	3.0	4.1	1.9	2.9
ELY	4.2	5.8	5.6	7.1	2.5	3.5	1.1	2.0
FORT WORTH	3.6	5.1	4.9	6.5	2.3	3.5	1.3	2.2
GREAT FALLS	2.7	4.2	4.4	6.0	1.2	2.2	.4	1.1
LAKE CHARLES	3.3	5.0	3.7	5.5	2.0	3.4	1.1	2.2
MADISON	3.1	4.7	4.6	6.3	1.4	2.4	.6	1.4
MEDFORD	3.0	4.6	5.5	6.9	1.6	2.7	.4	1.2
MIAMI	3.9	5.6	4.1	5.9	2.5	3.9	1.9	3.2
NASHVILLE	2.9	4.5	3.9	5.7	1.8	2.9	.8	1.7
NEW YORK	2.5	4.0	3.1	4.9	1.5	2.5	.6	1.4
OMAHA	3.1	4.6	4.3	6.0	1.7	2.7	.8	1.6
PHOENIX	5.3	6.6	5.8	7.2	2.8	3.9	1.7	2.6
SANTA MARIA	4.8	6.2	6.0	7.4	2.7	3.8	1.3	2.3
SEATTLE	2.3	3.9	4.2	5.9	.9	1.9	.2	.8
WASHINGTON,DC	2.9	4.5	3.8	5.5	1.6	2.7	.8	1.6

FIXED SURFACE

TILT ANGLE −15 D AZIMUTH ANGLE 30 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.9	6.4	6.2	7.7	2.9	4.0	1.8	2.7
APPALACHICOLA	4.0	5.6	4.4	6.1	2.7	3.9	1.6	2.7
BISMARCK	3.1	4.5	4.7	6.3	1.5	2.4	.6	1.3
BLUE HILL	2.7	4.1	3.3	5.1	1.4	2.4	.7	1.4
BOSTON	2.7	4.1	3.5	5.2	1.4	2.4	.6	1.4
BROWNSVILLE	3.1	4.9	4.7	6.4	2.2	3.7	1.3	2.5
CAPE HATTERAS	4.3	5.8	5.0	6.7	2.4	3.5	1.4	2.3
CARIBOU	2.6	4.2	3.4	5.1	1.0	1.9	.5	1.2
CHARLESTON	3.6	5.1	3.7	5.6	2.1	3.4	1.2	2.2
COLUMBIA	3.1	4.6	4.4	6.1	1.9	2.9	.9	1.7
DODGE CITY	3.8	5.2	5.1	6.6	2.4	3.4	1.2	2.0
EL PASO	5.5	6.9	6.1	7.5	3.1	4.2	2.0	3.0
ELY	4.3	5.8	5.5	7.1	2.6	3.6	1.2	2.1
FORT WORTH	3.6	5.2	4.9	6.5	2.3	3.5	1.4	2.3
GREAT FALLS	2.8	4.3	4.5	6.0	1.3	2.2	.5	1.1
LAKE CHARLES	3.3	5.0	3.6	5.5	2.0	3.4	1.2	2.3
MADISON	3.1	4.7	4.7	6.4	1.5	2.4	.7	1.5
MEDFORD	3.1	4.7	5.5	7.0	1.7	2.7	.4	1.2
MIAMI	3.9	5.6	4.1	5.8	2.5	4.0	2.0	3.2
NASHVILLE	3.0	4.5	3.9	5.7	1.8	3.0	.9	1.7
NEW YORK	2.6	4.1	3.1	4.9	1.5	2.5	.7	1.4
OMAHA	3.2	4.7	4.4	6.0	1.8	2.8	.9	1.7
PHOENIX	5.3	6.7	5.8	7.2	2.9	4.0	1.8	2.7
SANTA MARIA	4.9	6.3	6.1	7.5	2.8	3.9	1.4	2.4
SEATTLE	2.4	3.9	4.3	6.0	1.3	2.0	.2	.9
WASHINGTON,DC	3.0	4.5	3.8	5.6	1.7	2.8	.9	1.7

FIXED SURFACE

TILT ANGLE —15 D AZIMUTH ANGLE 45 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.0	6.5	6.2	7.7	3.1	4.2	2.0	2.9
APPALACHICOLA	4.1	5.6	4.4	6.1	2.8	4.0	1.8	2.9
BISMARCK	3.2	4.6	4.8	6.3	1.6	2.5	.8	1.4
BLUE HILL	2.7	4.2	3.3	5.1	1.5	2.5	.8	1.6
BOSTON	2.7	4.2	3.5	5.3	1.5	2.4	.7	1.5
BROWNSVILLE	3.2	5.0	4.7	6.4	2.3	3.8	1.3	2.6
CAPE HATTERAS	4.4	5.9	5.1	6.7	2.5	3.7	1.5	2.4
CARIBOU	2.7	4.2	3.5	5.2	1.1	2.0	.7	1.3
CHARLESTON	3.6	5.2	3.7	5.6	2.2	3.5	1.4	2.3
COLUMBIA	3.1	4.6	4.5	6.1	2.0	3.0	1.0	1.8
DODGE CITY	3.9	5.3	5.1	6.6	2.5	3.6	1.4	2.2
EL PASO	5.6	6.9	6.1	7.5	3.2	4.4	2.2	3.2
ELY	4.3	5.9	5.5	7.1	2.8	3.8	1.4	2.3
FORT WORTH	3.7	5.2	4.9	6.5	2.5	3.7	1.5	2.4
GREAT FALLS	2.9	4.3	4.5	6.0	1.4	2.4	.6	1.2
LAKE CHARLES	3.3	5.0	3.6	5.5	2.1	3.5	1.3	2.4
MADISON	3.2	4.8	4.7	6.4	1.6	2.6	.9	1.6
MEDFORD	3.1	4.7	5.6	7.0	1.8	2.9	.5	1.3
MIAMI	3.9	5.6	4.1	5.8	2.6	4.1	2.1	3.4
NASHVILLE	3.0	4.6	3.9	5.7	1.9	3.1	1.0	1.8
NEW YORK	2.6	4.1	3.1	4.9	1.6	2.6	.8	1.5
OMAHA	3.3	4.8	4.4	6.1	1.9	2.9	1.0	1.8
PHOENIX	5.4	6.7	5.8	7.3	3.0	4.1	1.9	2.9
SANTA MARIA	5.0	6.4	6.2	7.6	3.0	4.1	1.6	2.5
SEATTLE	2.5	4.0	4.4	6.0	1.1	2.0	.3	.9
WASHINGTON,DC	3.1	4.6	3.8	5.6	1.8	2.9	1.0	1.8

FIXED SURFACE

TILT ANGLE −15 D AZIMUTH ANGLE 60 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.1	6.6	6.2	7.7	3.3	4.4	2.2	3.1
APPALACHICOLA	4.1	5.7	4.4	6.1	3.0	4.2	2.0	3.1
BISMARCK	3.3	4.8	4.9	6.4	1.8	2.7	.9	1.6
BLUE HILL	2.8	4.3	3.4	5.2	1.6	2.6	1.0	1.7
BOSTON	2.8	4.3	3.6	5.3	1.6	2.6	.9	1.6
BROWNSVILLE	3.2	5.0	4.7	6.4	2.4	3.9	1.5	2.7
CAPE HATTERAS	4.5	6.0	5.1	6.7	2.7	3.9	1.7	2.6
CARIBOU	2.9	4.4	3.6	5.2	1.2	2.1	.8	1.5
CHARLESTON	3.7	5.2	3.8	5.6	2.4	3.6	1.5	2.5
COLUMBIA	3.2	4.7	4.5	6.2	2.2	3.2	1.2	2.0
DODGE CITY	4.0	5.4	5.2	6.7	2.8	3.8	1.6	2.4
EL PASO	5.7	7.0	6.1	7.5	3.4	4.6	2.5	3.4
ELY	4.5	6.0	5.6	7.1	3.0	4.0	1.6	2.5
FORT WORTH	3.8	5.3	5.0	6.6	2.6	3.8	1.7	2.6
GREAT FALLS	3.0	4.5	4.6	6.1	1.6	2.5	.7	1.4
LAKE CHARLES	3.4	5.1	3.6	5.5	2.2	3.6	1.4	2.5
MADISON	3.3	4.9	4.8	6.5	1.8	2.7	1.0	1.8
MEDFORD	3.3	4.8	5.7	7.1	2.0	3.0	.6	1.4
MIAMI	4.0	5.7	4.0	5.8	2.8	4.2	2.3	3.6
NASHVILLE	3.1	4.6	3.9	5.8	2.1	3.2	1.1	1.9
NEW YORK	2.7	4.2	3.2	5.0	1.7	2.8	.9	1.7
OMAHA	3.4	4.9	4.5	6.1	2.1	3.1	1.2	2.0
PHOENIX	5.5	6.8	5.8	7.3	3.2	4.3	2.2	3.1
SANTA MARIA	5.1	6.6	6.3	7.7	3.2	4.3	1.8	2.7
SEATTLE	2.6	4.1	4.5	6.2	1.2	2.2	.3	1.0
WASHINGTON,DC	3.2	4.7	3.9	5.7	2.0	3.1	1.2	2.0

FIXED SURFACE

TILT ANGLE —15 D AZIMUTH ANGLE 75 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.3	6.7	6.3	7.7	3.6	4.7	2.5	3.4
APPALACHICOLA	4.2	5.8	4.5	6.1	3.1	4.4	2.2	3.3
BISMARCK	3.5	4.9	5.0	6.5	2.0	2.9	1.1	1.8
BLUE HILL	2.9	4.4	3.5	5.2	1.7	2.8	1.1	1.9
BOSTON	2.9	4.4	3.6	5.4	1.7	2.7	1.0	1.8
BROWNSVILLE	3.3	5.1	4.7	6.4	2.5	4.0	1.6	2.8
CAPE HATTERAS	4.6	6.1	5.2	6.8	2.9	4.1	1.9	2.8
CARIBOU	3.0	4.5	3.6	5.3	1.3	2.3	1.0	1.7
CHARLESTON	3.8	5.3	3.8	5.6	2.5	3.8	1.7	2.6
COLUMBIA	3.3	4.8	4.6	6.3	2.3	3.4	1.4	2.2
DODGE CITY	4.1	5.6	5.3	6.8	3.0	4.0	1.8	2.6
EL PASO	5.8	7.2	6.2	7.5	3.7	4.8	2.7	3.7
ELY	4.6	6.1	5.6	7.2	3.2	4.2	1.9	2.7
FORT WORTH	3.9	5.4	5.0	6.6	2.8	4.0	1.9	2.8
GREAT FALLS	3.1	4.6	4.7	6.2	1.7	2.7	.8	1.5
LAKE CHARLES	3.4	5.2	3.6	5.5	2.4	3.8	1.5	2.6
MADISON	3.4	5.0	4.9	6.6	1.9	2.9	1.2	2.0
MEDFORD	3.4	5.0	5.8	7.2	2.1	3.2	.7	1.5
MIAMI	4.1	5.7	4.0	5.8	2.9	4.3	2.5	3.8
NASHVILLE	3.2	4.7	4.0	5.8	2.2	3.4	1.2	2.1
NEW YORK	2.8	4.3	3.3	5.0	1.9	2.9	1.0	1.8
OMAHA	3.5	5.0	4.6	6.2	2.2	3.3	1.4	2.2
PHOENIX	5.6	7.0	5.9	7.3	3.4	4.5	2.4	3.4
SANTA MARIA	5.3	6.7	6.4	7.8	3.5	4.6	2.0	3.0
SEATTLE	2.7	4.3	4.6	6.3	1.3	2.3	.4	1.1
WASHINGTON,DC	3.3	4.8	3.9	5.7	2.1	3.2	1.3	2.2

FIXED SURFACE

TILT ANGLE —15 D AZIMUTH ANGLE 90 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.4	6.9	6.3	7.8	3.8	4.9	2.8	3.7
APPALACHICOLA	4.3	5.9	4.5	6.1	3.3	4.6	2.4	3.5
BISMARCK	3.7	5.1	5.1	6.6	2.2	3.1	1.4	2.0
BLUE HILL	3.0	4.5	3.5	5.3	1.9	2.9	1.3	2.0
BOSTON	3.0	4.5	3.7	5.4	1.9	2.9	1.2	1.9
BROWNSVILLE	3.3	5.1	4.7	6.4	2.6	4.1	1.7	3.0
CAPE HATTERAS	4.7	6.3	5.2	6.9	3.1	4.3	2.1	3.1
CARIBOU	3.1	4.7	3.7	5.4	1.5	2.4	1.2	1.9
CHARLESTON	3.9	5.4	3.8	5.6	2.7	3.9	1.9	2.8
COLUMBIA	3.4	4.9	4.7	6.3	2.5	3.6	1.5	2.4
DODGE CITY	4.2	5.7	5.3	6.8	3.2	4.3	2.1	2.9
EL PASO	6.0	7.3	6.2	7.6	3.9	5.0	3.0	4.0
ELY	4.8	6.3	5.7	7.3	3.5	4.5	2.1	3.0
FORT WORTH	4.0	5.5	5.0	6.6	3.0	4.2	2.1	3.0
GREAT FALLS	3.3	4.7	4.8	6.3	1.9	2.9	1.0	1.7
LAKE CHARLES	3.5	5.2	3.6	5.5	2.5	3.9	1.7	2.8
MADISON	3.6	5.2	4.9	6.6	2.1	3.0	1.4	2.2
MEDFORD	3.5	5.1	5.9	7.3	2.3	3.3	.7	1.6
MIAMI	4.1	5.8	4.0	5.8	3.1	4.5	2.7	4.0
NASHVILLE	3.3	4.8	4.0	5.9	2.4	3.5	1.4	2.2
NEW YORK	2.9	4.4	3.3	5.1	2.0	3.1	1.2	2.0
OMAHA	3.6	5.1	4.6	6.3	2.4	3.5	1.6	2.4
PHOENIX	5.8	7.1	5.9	7.4	3.6	4.8	2.7	3.6
SANTA MARIA	5.4	6.9	6.4	7.9	3.7	4.8	2.3	3.2
SEATTLE	2.8	4.4	4.7	6.4	1.5	2.4	.5	1.1
WASHINGTON,DC	3.4	4.9	4.0	5.8	2.3	3.4	1.5	2.3

FIXED SURFACE

TILT ANGLE —30 D AZIMUTH ANGLE -90 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.3	6.8	6.2	7.6	3.7	4.8	2.7	3.5
APPALACHICOLA	4.0	5.5	4.3	5.9	3.1	4.3	2.1	3.2
BISMARCK	3.6	5.0	4.8	6.4	2.3	3.2	1.3	2.0
BLUE HILL	3.0	4.4	3.2	5.0	1.9	2.9	1.3	2.0
BOSTON	3.0	4.4	3.5	5.2	1.8	2.8	1.1	1.8
BROWNSVILLE	3.0	4.8	4.4	6.1	2.7	4.1	1.7	2.9
CAPE HATTERAS	4.2	5.8	4.8	6.4	2.9	4.0	2.0	2.9
CARIBOU	3.1	4.6	3.5	5.1	1.5	2.4	1.2	1.9
CHARLESTON	3.7	5.2	3.7	5.5	2.6	3.8	1.8	2.7
COLUMBIA	3.2	4.6	4.2	5.8	2.3	3.3	1.4	2.2
DODGE CITY	3.8	5.3	4.8	6.3	3.0	4.0	1.9	2.7
EL PASO	5.7	7.0	5.9	7.3	3.7	4.8	2.9	3.9
ELY	4.8	6.2	5.8	7.4	3.5	4.4	2.1	2.9
FORT WORTH	3.5	5.0	4.6	6.2	2.7	3.9	1.9	2.8
GREAT FALLS	3.3	4.7	4.7	6.2	1.9	2.8	1.0	1.6
LAKE CHARLES	3.3	5.0	3.6	5.4	2.5	3.8	1.5	2.6
MADISON	3.4	5.0	4.7	6.3	2.1	3.0	1.4	2.1
MEDFORD	3.1	4.7	5.4	6.8	2.0	3.1	.6	1.4
MIAMI	3.9	5.6	4.0	5.7	3.0	4.4	2.7	3.9
NASHVILLE	3.1	4.6	3.8	5.6	2.3	3.4	1.3	2.1
NEW YORK	2.8	4.2	3.0	4.7	1.9	2.9	1.0	1.8
OMAHA	3.4	4.9	4.2	5.8	2.3	3.3	1.6	2.4
PHOENIX	5.5	6.8	5.4	6.8	3.4	4.5	2.5	3.4
SANTA MARIA	4.7	6.1	5.0	6.4	3.1	4.2	2.1	3.0
SEATTLE	2.5	4.0	4.0	5.6	1.3	2.2	.5	1.1
WASHINGTON,DC	3.2	4.7	3.6	5.4	2.1	3.2	1.4	2.2

FIXED SURFACE

TILT ANGLE -30 D AZIMUTH ANGLE -75 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.0	6.5	6.1	7.5	3.2	4.3	2.1	3.0
APPALACHICOLA	3.8	5.3	4.2	5.8	2.8	4.0	1.8	2.8
BISMARCK	3.3	4.7	4.6	6.1	1.9	2.8	1.0	1.6
BLUE HILL	2.7	4.2	3.1	4.8	1.6	2.6	1.0	1.7
BOSTON	2.8	4.2	3.3	5.0	1.5	2.5	.8	1.6
BROWNSVILLE	2.9	4.7	4.4	6.1	2.4	3.9	1.4	2.7
CAPE HATTERAS	4.0	5.5	4.7	6.3	2.5	3.6	1.6	2.5
CARIBOU	2.8	4.3	3.3	4.9	1.2	2.1	.9	1.5
CHARLESTON	3.5	5.0	3.6	5.4	2.3	3.5	1.4	2.4
COLUMBIA	3.0	4.4	4.0	5.7	2.0	3.0	1.1	1.9
DODGE CITY	3.6	5.0	4.7	6.1	2.6	3.6	1.5	2.3
EL PASO	5.4	6.8	5.8	7.2	3.3	4.4	2.4	3.3
ELY	4.4	5.9	5.7	7.2	3.0	3.9	1.6	2.5
FORT WORTH	3.3	4.8	4.5	6.1	2.4	3.6	1.5	2.5
GREAT FALLS	3.0	4.4	4.5	6.0	1.6	2.5	.7	1.4
LAKE CHARLES	3.2	4.9	3.6	5.4	2.2	3.6	1.3	2.3
MADISON	3.2	4.7	4.5	6.1	1.8	2.7	1.0	1.8
MEDFORD	2.9	4.5	5.2	6.5	1.7	2.8	.4	1.3
MIAMI	3.8	5.4	4.0	5.7	2.7	4.1	2.3	3.5
NASHVILLE	2.9	4.4	3.7	5.5	2.0	3.1	1.0	1.9
NEW YORK	2.6	4.0	2.9	4.6	1.7	2.7	.8	1.5
OMAHA	3.2	4.6	4.0	5.6	2.0	3.0	1.2	2.0
PHOENIX	5.2	6.5	5.3	6.7	3.0	4.1	2.0	3.0
SANTA MARIA	4.4	5.8	4.8	6.3	2.7	3.7	1.7	2.6
SEATTLE	2.2	3.8	3.7	5.4	1.1	2.0	.3	1.0
WASHINGTON,DC	3.0	4.4	3.5	5.2	1.8	2.9	1.1	1.9

FIXED SURFACE

TILT ANGLE -30 D AZIMUTH ANGLE -60 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.7	6.1	5.9	7.3	2.8	3.8	1.6	2.5
APPALACHICOLA	3.6	5.1	4.1	5.8	2.4	3.6	1.4	2.5
BISMARCK	2.9	4.3	4.4	5.9	1.5	2.4	.5	1.3
BLUE HILL	2.5	3.9	3.0	4.7	1.3	2.3	.7	1.4
BOSTON	2.5	3.9	3.2	4.9	1.3	2.2	.6	1.3
BROWNSVILLE	2.8	4.6	4.4	6.1	2.1	3.5	1.2	2.4
CAPE HATTERAS	3.8	5.3	4.5	6.1	2.2	3.3	1.2	2.1
CARIBOU	2.5	4.0	3.1	4.7	1.0	1.9	.6	1.2
CHARLESTON	3.3	4.8	3.6	5.3	2.0	3.2	1.1	2.1
COLUMBIA	2.8	4.2	3.9	5.5	1.6	2.7	.8	1.6
DODGE CITY	3.4	4.8	4.5	5.9	2.1	3.2	1.1	1.9
EL PASO	5.1	6.5	5.7	7.0	2.9	3.9	1.9	2.8
ELY	4.1	5.6	5.4	7.0	2.5	3.5	1.2	2.0
FORT WORTH	3.1	4.7	4.4	6.0	2.1	3.2	1.2	2.1
GREAT FALLS	2.7	4.1	4.2	5.7	1.3	2.2	.5	1.1
LAKE CHARLES	3.0	4.7	3.5	5.3	1.9	3.3	1.0	2.1
MADISON	2.9	4.4	4.2	5.9	1.4	2.4	.7	1.4
MEDFORD	2.7	4.2	4.9	6.3	1.4	2.5	.3	1.1
MIAMI	3.6	5.3	4.0	5.7	2.4	3.8	1.9	3.1
NASHVILLE	2.7	4.2	3.6	5.3	1.7	2.8	.8	1.6
NEW YORK	2.4	3.8	2.7	4.5	1.4	2.4	.6	1.3
OMAHA	2.9	4.4	3.8	5.4	1.6	2.6	.9	1.6
PHOENIX	4.9	6.2	5.2	6.6	2.6	3.7	1.6	2.5
SANTA MARIA	4.1	5.5	4.7	6.2	2.3	3.3	1.3	2.2
SEATTLE	2.0	3.6	3.5	5.2	.9	1.8	.2	.8
WASHINGTON,DC	2.7	4.2	3.4	5.1	1.5	2.6	.8	1.6

FIXED SURFACE

TILT ANGLE -30 D AZIMUTH ANGLE -45 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.4	5.8	5.8	7.2	2.3	3.4	1.2	2.1
APPALACHICOLA	3.4	4.9	4.1	5.7	2.1	3.3	1.1	2.2
BISMARCK	2.6	4.0	4.1	5.6	1.2	2.0	.3	1.0
BLUE HILL	2.3	3.7	2.8	4.6	1.1	2.0	.4	1.1
BOSTON	2.3	3.7	3.0	4.7	1.0	2.0	.4	1.1
BROWNSVILLE	2.7	4.5	4.3	6.0	1.9	3.4	1.0	2.2
CAPE HATTERAS	3.5	5.1	4.4	6.0	1.8	2.9	.9	1.8
CARIBOU	2.2	3.7	2.9	4.6	.7	1.7	.3	1.0
CHARLESTON	3.1	4.6	3.5	5.2	1.7	2.9	.8	1.8
COLUMBIA	2.6	4.0	3.8	5.4	1.3	2.4	.5	1.3
DODGE CITY	3.1	4.5	4.3	5.8	1.8	2.8	.7	1.5
EL PASO	4.9	6.2	5.6	6.9	2.4	3.5	1.4	2.4
ELY	3.8	5.3	5.2	6.7	2.0	3.0	.8	1.6
FORT WORTH	3.0	4.5	4.3	5.9	1.8	2.9	.9	1.8
GREAT FALLS	2.4	3.8	4.0	5.5	1.0	1.9	.3	.9
LAKE CHARLES	2.9	4.6	3.5	5.2	1.7	3.1	.8	1.9
MADISON	2.6	4.2	4.1	5.7	1.1	2.1	.4	1.2
MEDFORD	2.5	4.0	4.7	6.1	1.2	2.2	.2	1.0
MIAMI	3.5	5.1	3.9	5.6	2.1	3.5	1.5	2.7
NASHVILLE	2.6	4.0	3.4	5.2	1.4	2.6	.6	1.4
NEW YORK	2.2	3.6	2.6	4.4	1.1	2.2	.4	1.1
OMAHA	2.7	4.2	3.7	5.3	1.3	2.3	.6	1.3
PHOENIX	4.7	5.9	5.1	6.5	2.2	3.3	1.2	2.1
SANTA MARIA	3.9	5.3	4.7	6.1	1.9	3.0	.9	1.8
SEATTLE	1.8	3.4	3.4	5.0	.7	1.6	.1	.7
WASHINGTON,DC	2.5	4.0	3.2	5.0	1.2	2.3	.5	1.3

FIXED SURFACE

TILT ANGLE -30 D AZIMUTH ANGLE -30 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.1	5.6	5.6	7.0	1.9	3.0	.8	1.7
APPALACHICOLA	3.3	4.8	4.0	5.6	1.8	3.0	.8	1.9
BISMARCK	2.3	3.7	3.9	5.5	.9	1.7	.1	.8
BLUE HILL	2.1	3.5	2.8	4.5	.8	1.8	.2	.9
BOSTON	2.1	3.5	2.9	4.6	.8	1.8	.2	.9
BROWNSVILLE	2.6	4.4	4.3	6.0	1.7	3.1	.8	2.0
CAPE HATTERAS	3.4	4.9	4.3	5.9	1.5	2.6	.6	1.5
CARIBOU	2.0	3.5	2.8	4.4	.6	1.5	.1	.8
CHARLESTON	2.9	4.4	3.4	5.1	1.4	2.6	.6	1.5
COLUMBIA	2.4	3.9	3.7	5.3	1.1	2.1	.3	1.1
DODGE CITY	2.9	4.4	4.2	5.7	1.4	2.4	.4	1.2
EL PASO	4.6	5.9	5.5	6.8	2.1	3.2	1.0	2.0
ELY	3.5	5.0	5.0	6.5	1.6	2.6	.5	1.3
FORT WORTH	2.8	4.4	4.3	5.9	1.5	2.7	.6	1.6
GREAT FALLS	2.1	3.6	3.8	5.3	.7	1.6	.1	.8
LAKE CHARLES	2.8	4.4	3.4	5.2	1.5	2.8	.6	1.7
MADISON	2.4	4.0	3.9	5.6	.9	1.8	.2	.9
MEDFORD	2.3	3.8	4.6	6.0	1.0	2.0	.1	.9
MIAMI	3.4	5.0	3.8	5.6	1.9	3.3	1.2	2.4
NASHVILLE	2.4	3.9	3.4	5.2	1.2	2.3	.4	1.2
NEW YORK	2.0	3.5	2.6	4.3	.9	1.9	.2	.9
OMAHA	2.5	4.0	3.6	5.2	1.0	2.0	.3	1.1
PHOENIX	4.4	5.7	5.0	6.5	1.9	3.0	.8	1.8
SANTA MARIA	3.7	5.1	4.7	6.2	1.6	2.7	.6	1.5
SEATTLE	1.7	3.2	3.3	4.9	.5	1.4	.1	.7
WASHINGTON,DC	2.3	3.8	3.2	4.9	1.0	2.1	.3	1.1

FIXED SURFACE

TILT ANGLE -30 D AZIMUTH ANGLE -15 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	3.9	5.4	5.5	6.9	1.6	2.7	.5	1.4
APPALACHICOLA	3.2	4.7	4.0	5.6	1.6	2.8	.6	1.7
BISMARCK	2.2	3.6	3.9	5.4	.6	1.5	.1	.7
BLUE HILL	2.0	3.4	2.7	4.4	.7	1.6	.1	.8
BOSTON	2.0	3.4	2.9	4.6	.7	1.6	.1	.8
BROWNSVILLE	2.6	4.4	4.3	6.0	1.5	3.0	.6	1.8
CAPE HATTERAS	3.3	4.8	4.3	5.9	1.3	2.4	.4	1.3
CARIBOU	1.8	3.3	2.8	4.4	.4	1.3	0.0	.7
CHARLESTON	2.8	4.3	3.3	5.1	1.3	2.5	.4	1.3
COLUMBIA	2.3	3.8	3.6	5.3	.9	1.9	.2	1.0
DODGE CITY	2.8	4.3	4.2	5.7	1.2	2.2	.2	1.0
EL PASO	4.4	5.8	5.4	6.8	1.8	2.9	.7	1.7
ELY	3.3	4.8	4.9	6.4	1.3	2.3	.2	1.1
FORT WORTH	2.8	4.3	4.3	5.8	1.3	2.5	.4	1.4
GREAT FALLS	1.9	3.4	3.7	5.2	.6	1.5	0.0	.7
LAKE CHARLES	2.7	4.4	3.3	5.1	1.3	2.7	.4	1.5
MADISON	2.3	3.8	3.8	5.5	.7	1.6	.1	.8
MEDFORD	2.2	3.8	4.5	5.9	.8	1.9	.1	.9
MIAMI	3.3	4.9	3.8	5.5	1.7	3.1	1.0	2.2
NASHVILLE	2.3	3.8	3.3	5.1	1.0	2.2	.2	1.1
NEW YORK	1.9	3.4	2.5	4.3	.8	1.8	.1	.8
OMAHA	2.4	3.8	3.5	5.1	.8	1.8	.1	.9
PHOENIX	4.3	5.6	5.0	6.4	1.7	2.9	.6	1.5
SANTA MARIA	3.6	5.1	4.9	6.3	1.5	2.5	.4	1.3
SEATTLE	1.6	3.1	3.3	4.9	.4	1.3	0.0	.6
WASHINGTON,DC	2.2	3.7	3.1	4.9	.8	1.9	.2	1.0

FIXED SURFACE

TILT ANGLE -30 D AZIMUTH ANGLE 0 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	3.8	5.3	5.4	6.8	1.5	2.6	.4	1.2
APPALACHICOLA	3.2	4.7	3.9	5.6	1.6	2.8	.6	1.6
BISMARCK	2.1	3.5	3.8	5.3	.6	1.4	0.0	.7
BLUE HILL	1.9	3.3	2.7	4.4	.6	1.6	.1	.8
BOSTON	1.9	3.3	2.9	4.6	.6	1.6	.1	.8
BROWNSVILLE	2.6	4.3	4.3	5.9	1.4	2.9	.5	1.8
CAPE HATTERAS	3.3	4.8	4.3	5.9	1.2	2.4	.3	1.2
CARIBOU	1.7	3.2	2.7	4.4	.4	1.3	0.0	.7
CHARLESTON	2.8	4.3	3.3	5.0	1.2	2.4	.3	1.3
COLUMBIA	2.3	3.7	3.7	5.3	.9	1.9	.1	.9
DODGE CITY	2.8	4.2	4.2	5.7	1.1	2.1	.1	.9
EL PASO	4.4	5.7	5.4	6.7	1.7	2.8	.6	1.5
ELY	3.2	4.7	4.7	6.3	1.2	2.2	.2	1.0
FORT WORTH	2.8	4.3	4.2	5.8	1.3	2.4	.4	1.3
GREAT FALLS	1.9	3.3	3.6	5.1	.5	1.4	0.0	.7
LAKE CHARLES	2.6	4.3	3.3	5.1	1.2	2.6	.4	1.5
MADISON	2.2	3.8	3.8	5.5	.6	1.6	.1	.8
MEDFORD	2.2	3.7	4.5	5.9	.8	1.8	.1	.9
MIAMI	3.2	4.9	3.7	5.4	1.6	3.0	.9	2.1
NASHVILLE	2.3	3.8	3.3	5.1	.9	2.1	.2	1.0
NEW YORK	1.9	3.3	2.5	4.2	.7	1.7	.1	.8
OMAHA	2.3	3.8	3.6	5.2	.8	1.8	.1	.9
PHOENIX	4.2	5.5	5.0	6.4	1.6	2.7	.5	1.4
SANTA MARIA	3.7	5.1	5.0	6.4	1.4	2.5	.3	1.2
SEATTLE	1.6	3.1	3.4	5.0	.4	1.3	0.0	.6
WASHINGTON,DC	2.2	3.7	3.1	4.9	.8	1.9	.1	.9

FIXED SURFACE

TILT ANGLE -30 D AZIMUTH ANGLE 15 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	3.8	5.3	5.4	6.8	1.6	2.7	.5	1.4
APPALACHICOLA	3.2	4.7	3.9	5.5	1.6	2.8	.6	1.7
BISMARCK	2.1	3.5	3.8	5.3	.6	1.5	0.0	.7
BLUE HILL	1.9	3.4	2.7	4.4	.6	1.6	.1	.8
BOSTON	1.9	3.3	2.9	4.6	.6	1.6	.1	.8
BROWNSVILLE	2.6	4.4	4.2	5.9	1.4	2.9	.6	1.8
CAPE HATTERAS	3.3	4.9	4.3	5.9	1.3	2.4	.4	1.3
CARIBOU	1.8	3.2	2.7	4.4	.4	1.3	0.0	.7
CHARLESTON	2.8	4.3	3.2	5.0	1.2	2.4	.4	1.3
COLUMBIA	2.3	3.8	3.7	5.3	.9	1.9	.2	1.0
DODGE CITY	2.9	4.3	4.3	5.7	1.2	2.2	.2	1.0
EL PASO	4.4	5.7	5.3	6.7	1.8	2.9	.7	1.6
ELY	3.2	4.7	4.7	6.2	1.3	2.2	.2	1.0
FORT WORTH	2.8	4.3	4.3	5.8	1.4	2.5	.4	1.4
GREAT FALLS	1.9	3.3	3.6	5.1	.5	1.4	0.0	.7
LAKE CHARLES	2.6	4.3	3.2	5.0	1.2	2.6	.5	1.5
MADISON	2.2	3.8	3.8	5.5	.7	1.6	.1	.8
MEDFORD	2.2	3.8	4.6	6.0	.8	1.9	.1	.9
MIAMI	3.2	4.9	3.7	5.4	1.6	3.0	.9	2.1
NASHVILLE	2.3	3.8	3.3	5.1	1.0	2.1	.2	1.1
NEW YORK	1.9	3.3	2.5	4.3	.8	1.8	.1	.9
OMAHA	2.4	3.8	3.6	5.2	.8	1.8	.1	.9
PHOENIX	4.2	5.5	5.0	6.4	1.7	2.8	.6	1.5
SANTA MARIA	3.8	5.2	5.2	6.6	1.6	2.6	.4	1.3
SEATTLE	1.7	3.2	3.5	5.1	.4	1.4	0.0	.6
WASHINGTON,DC	2.2	3.7	3.2	4.9	.9	1.9	.2	1.0

FIXED SURFACE

TILT ANGLE -30 D AZIMUTH ANGLE 30 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	3.9	5.4	5.3	6.7	1.9	2.9	.8	1.6
APPALACHICOLA	3.3	4.8	3.9	5.5	1.8	3.0	.9	1.9
BISMARCK	2.3	3.7	3.9	5.4	.8	1.7	.1	.8
BLUE HILL	2.0	3.4	2.8	4.5	.8	1.8	.2	.9
BOSTON	2.0	3.4	2.9	4.6	.8	1.8	.2	.9
BROWNSVILLE	2.6	4.4	4.2	5.9	1.5	3.0	.7	1.9
CAPE HATTERAS	3.5	5.0	4.4	5.9	1.5	2.7	.6	1.5
CARIBOU	1.9	3.4	2.8	4.4	.5	1.5	.1	.8
CHARLESTON	2.9	4.4	3.2	5.0	1.4	2.6	.6	1.5
COLUMBIA	2.4	3.9	3.8	5.4	1.1	2.1	.3	1.1
DODGE CITY	3.0	4.4	4.3	5.8	1.5	2.5	.4	1.2
EL PASO	4.5	5.8	5.3	6.7	2.0	3.1	1.0	1.9
ELY	3.3	4.8	4.6	6.2	1.5	2.5	.4	1.3
FORT WORTH	3.0	4.5	4.3	5.9	1.6	2.7	.6	1.6
GREAT FALLS	2.0	3.4	3.6	5.1	.7	1.6	.1	.8
LAKE CHARLES	2.7	4.4	3.2	5.0	1.4	2.7	.6	1.7
MADISON	2.4	3.9	3.9	5.5	.8	1.8	.2	.9
MEDFORD	2.4	3.9	4.7	6.0	1.0	2.1	.1	1.0
MIAMI	3.3	4.9	3.6	5.3	1.8	3.2	1.1	2.4
NASHVILLE	2.4	3.9	3.3	5.1	1.1	2.3	.4	1.2
NEW YORK	2.0	3.4	2.6	4.3	.9	1.9	.2	1.0
OMAHA	2.5	4.0	3.7	5.3	1.0	2.0	.3	1.1
PHOENIX	4.3	5.6	5.1	6.5	1.9	3.0	.8	1.8
SANTA MARIA	4.0	5.4	5.4	6.8	1.9	2.9	.6	1.5
SEATTLE	1.8	3.3	3.6	5.3	.6	1.5	.1	.7
WASHINGTON,DC	2.3	3.8	3.2	4.9	1.0	2.1	.3	1.1

FIXED SURFACE

TILT ANGLE -30 D AZIMUTH ANGLE 45 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.1	5.6	5.4	6.8	2.2	3.3	1.2	2.0
APPALACHICOLA	3.4	4.9	3.9	5.5	2.1	3.3	1.2	2.2
BISMARCK	2.5	3.9	4.1	5.6	1.1	1.9	.3	1.0
BLUE HILL	2.2	3.6	2.8	4.6	1.0	2.0	.4	1.1
BOSTON	2.2	3.6	3.0	4.7	1.0	2.0	.4	1.1
BROWNSVILLE	2.7	4.5	4.2	5.9	1.7	3.2	.9	2.1
CAPE HATTERAS	3.7	5.2	4.4	6.0	1.8	2.9	.9	1.8
CARIBOU	2.1	3.6	2.9	4.6	.7	1.6	.3	.9
CHARLESTON	3.0	4.5	3.2	5.0	1.6	2.8	.8	1.8
COLUMBIA	2.6	4.0	3.9	5.5	1.4	2.4	.6	1.4
DODGE CITY	3.2	4.6	4.5	5.9	1.8	2.8	.7	1.5
EL PASO	4.7	6.0	5.4	6.7	2.4	3.5	1.4	2.3
ELY	3.5	5.0	4.7	6.2	1.9	2.9	.7	1.6
FORT WORTH	3.1	4.6	4.4	5.9	1.8	3.0	.9	1.9
GREAT FALLS	2.2	3.6	3.7	5.2	.9	1.8	.2	.9
LAKE CHARLES	2.8	4.5	3.2	5.0	1.6	2.9	.8	1.9
MADISON	2.6	4.1	4.0	5.6	1.1	2.0	.4	1.2
MEDFORD	2.6	4.1	4.8	6.2	1.3	2.3	.3	1.1
MIAMI	3.4	5.0	3.6	5.3	2.0	3.4	1.4	2.6
NASHVILLE	2.5	4.0	3.4	5.2	1.3	2.5	.6	1.4
NEW YORK	2.1	3.5	2.7	4.4	1.1	2.1	.4	1.2
OMAHA	2.7	4.1	3.8	5.4	1.3	2.3	.5	1.3
PHOENIX	4.5	5.8	5.1	6.5	2.2	3.3	1.2	2.1
SANTA MARIA	4.2	5.6	5.6	7.0	2.2	3.3	.9	1.8
SEATTLE	2.0	3.5	3.8	5.5	.7	1.7	.1	.8
WASHINGTON,DC	2.5	3.9	3.3	5.0	1.3	2.3	.6	1.3

FIXED SURFACE

TILT ANGLE -30 D AZIMUTH ANGLE 60 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.4	5.8	5.5	6.9	2.6	3.7	1.6	2.5
APPALACHICOLA	3.6	5.1	3.9	5.6	2.4	3.6	1.5	2.6
BISMARCK	2.8	4.2	4.3	5.8	1.4	2.3	.6	1.3
BLUE HILL	2.4	3.8	3.0	4.7	1.2	2.2	.7	1.4
BOSTON	2.4	3.8	3.1	4.8	1.2	2.2	.6	1.3
BROWNSVILLE	2.8	4.6	4.2	5.9	1.9	3.4	1.1	2.3
CAPE HATTERAS	3.9	5.4	4.6	6.1	2.2	3.3	1.2	2.1
CARIBOU	2.4	3.8	3.1	4.7	.9	1.8	.5	1.2
CHARLESTON	3.1	4.6	3.3	5.0	1.9	3.1	1.1	2.0
COLUMBIA	2.8	4.2	4.0	5.7	1.7	2.7	.8	1.6
DODGE CITY	3.4	4.9	4.6	6.1	2.2	3.2	1.1	1.9
EL PASO	4.9	6.2	5.4	6.8	2.8	3.9	1.8	2.8
ELY	3.7	5.2	4.8	6.3	2.3	3.3	1.1	2.0
FORT WORTH	3.3	4.8	4.4	6.0	2.1	3.3	1.2	2.2
GREAT FALLS	2.4	3.9	3.9	5.4	1.2	2.1	.5	1.1
LAKE CHARLES	2.9	4.6	3.2	5.0	1.8	3.2	1.1	2.1
MADISON	2.8	4.4	4.2	5.8	1.4	2.3	.7	1.5
MEDFORD	2.8	4.3	5.0	6.4	1.6	2.6	.4	1.2
MIAMI	3.5	5.1	3.6	5.3	2.2	3.6	1.8	3.0
NASHVILLE	2.7	4.2	3.5	5.2	1.6	2.7	.8	1.6
NEW YORK	2.3	3.7	2.8	4.5	1.3	2.3	.6	1.4
OMAHA	2.9	4.4	4.0	5.6	1.6	2.6	.9	1.6
PHOENIX	4.8	6.0	5.2	6.6	2.6	3.7	1.6	2.5
SANTA MARIA	4.5	5.9	5.8	7.3	2.7	3.7	1.3	2.2
SEATTLE	2.2	3.8	4.1	5.7	.9	1.9	.2	.9
WASHINGTON,DC	2.7	4.1	3.4	5.2	1.5	2.6	.8	1.6

FIXED SURFACE

TILT ANGLE -30 D AZIMUTH ANGLE 75 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.7	6.1	5.6	7.0	3.1	4.2	2.1	3.0
APPALACHICOLA	3.8	5.3	4.0	5.6	2.7	3.9	1.9	2.9
BISMARCK	3.1	4.5	4.5	6.0	1.7	2.6	1.0	1.6
BLUE HILL	2.6	4.0	3.1	4.8	1.5	2.5	1.0	1.7
BOSTON	2.6	4.0	3.2	4.9	1.5	2.4	.9	1.6
BROWNSVILLE	3.0	4.7	4.3	5.9	2.2	3.6	1.3	2.5
CAPE HATTERAS	4.1	5.7	4.7	6.3	2.5	3.7	1.6	2.5
CARIBOU	2.6	4.1	3.3	4.9	1.2	2.1	.8	1.5
CHARLESTON	3.3	4.8	3.3	5.1	2.2	3.4	1.4	2.3
COLUMBIA	3.0	4.4	4.2	5.8	2.0	3.1	1.1	1.9
DODGE CITY	3.7	5.1	4.8	6.3	2.6	3.6	1.6	2.4
EL PASO	5.2	6.5	5.5	6.9	3.2	4.3	2.3	3.2
ELY	4.0	5.5	4.9	6.5	2.8	3.7	1.5	2.4
FORT WORTH	3.5	5.0	4.5	6.1	2.5	3.6	1.6	2.5
GREAT FALLS	2.7	4.2	4.1	5.6	1.5	2.4	.7	1.3
LAKE CHARLES	3.1	4.8	3.2	5.0	2.0	3.4	1.3	2.4
MADISON	3.1	4.7	4.4	6.0	1.7	2.6	1.0	1.8
MEDFORD	3.0	4.6	5.3	6.6	1.9	2.9	.6	1.4
MIAMI	3.6	5.3	3.6	5.3	2.5	3.9	2.2	3.4
NASHVILLE	2.8	4.3	3.6	5.3	1.9	3.0	1.0	1.9
NEW YORK	2.5	3.9	2.9	4.7	1.6	2.6	.9	1.6
OMAHA	3.1	4.6	4.2	5.8	2.0	3.0	1.2	2.0
PHOENIX	5.0	6.3	5.3	6.8	3.0	4.1	2.0	3.0
SANTA MARIA	4.8	6.2	6.0	7.4	3.1	4.2	1.7	2.6
SEATTLE	2.5	4.0	4.3	6.0	1.2	2.1	.4	1.0
WASHINGTON,DC	2.9	4.4	3.6	5.3	1.8	2.9	1.1	1.9

FIXED SURFACE

TILT ANGLE -30 D AZIMUTH ANGLE 90 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	5.0	6.4	5.7	7.1	3.6	4.6	2.6	3.5
APPALACHICOLA	4.0	5.5	4.3	5.7	3.1	4.3	2.2	3.3
BISMARCK	3.4	4.8	4.8	6.3	2.1	3.0	1.3	2.0
BLUE HILL	2.8	4.2	3.2	5.0	1.8	2.8	1.3	2.0
BOSTON	2.8	4.2	3.4	5.1	1.7	2.7	1.1	1.8
BROWNSVILLE	3.1	4.8	4.3	6.0	2.4	3.9	1.6	2.8
CAPE HATTERAS	4.4	5.9	4.8	6.4	2.9	4.0	2.0	2.9
CARIBOU	2.9	4.4	3.5	5.1	1.4	2.3	1.2	1.8
CHARLESTON	3.5	5.0	3.4	5.2	2.5	3.7	1.7	2.7
COLUMBIA	3.2	4.6	4.3	6.0	2.4	3.4	1.5	2.3
DODGE CITY	4.0	5.4	5.0	6.4	3.1	4.1	2.0	2.8
EL PASO	5.5	6.8	5.6	7.0	3.6	4.7	2.8	3.8
ELY	4.3	5.8	5.1	6.6	3.3	4.2	2.0	2.8
FORT WORTH	3.7	5.2	4.6	6.2	2.8	4.0	1.9	2.9
GREAT FALLS	3.0	4.4	4.4	5.9	1.8	2.7	1.0	1.6
LAKE CHARLES	3.2	4.9	3.3	5.1	2.3	3.7	1.6	2.7
MADISON	3.4	4.9	4.6	6.2	2.0	2.9	1.4	2.1
MEDFORD	3.3	4.8	5.5	6.9	2.2	3.2	.7	1.5
MIAMI	3.8	5.4	3.6	5.3	2.8	4.2	2.5	3.8
NASHVILLE	3.0	4.5	3.7	5.4	2.2	3.3	1.3	2.1
NEW YORK	2.7	4.1	3.0	4.8	1.9	2.9	1.1	1.9
OMAHA	3.4	4.9	4.4	6.0	2.3	3.3	1.6	2.3
PHOENIX	5.3	6.6	5.4	6.9	3.4	4.5	2.5	3.4
SANTA MARIA	5.1	6.5	6.2	7.6	3.6	4.6	2.1	3.0
SEATTLE	2.7	4.2	4.5	6.2	1.4	2.3	.5	1.1
WASHINGTON,DC	3.1	4.6	3.7	5.4	2.1	3.2	1.4	2.2

FIXED SURFACE

TILT ANGLE -45 D AZIMUTH ANGLE -90 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.9	6.2	5.6	7.0	3.4	4.4	2.5	3.3
APPALACHICOLA	3.5	4.9	3.8	5.3	2.8	3.9	1.9	2.9
BISMARCK	3.3	4.7	4.4	5.9	2.2	3.1	1.3	1.9
BLUE HILL	2.7	4.1	2.9	4.5	1.8	2.7	1.2	1.9
BOSTON	2.7	4.1	3.1	4.7	1.7	2.6	1.0	1.7
BROWNSVILLE	2.7	4.4	3.9	5.6	2.4	3.8	1.5	2.7
CAPE HATTERAS	3.8	5.2	4.2	5.7	2.6	3.7	1.8	2.7
CARIBOU	2.9	4.3	3.2	4.7	1.4	2.2	1.2	1.8
CHARLESTON	3.3	4.7	3.3	5.0	2.4	3.5	1.6	2.5
COLUMBIA	2.9	4.3	3.7	5.3	2.1	3.1	1.3	2.1
DODGE CITY	3.4	4.8	4.2	5.7	2.7	3.7	1.8	2.6
EL PASO	5.2	6.4	5.3	6.5	3.4	4.5	2.7	3.6
ELY	4.4	5.8	5.4	6.8	3.2	4.2	2.0	2.8
FORT WORTH	3.1	4.5	4.1	5.6	2.5	3.6	1.7	2.6
GREAT FALLS	3.1	4.5	4.3	5.8	1.8	2.7	.9	1.5
LAKE CHARLES	3.0	4.6	3.3	5.0	2.3	3.6	1.4	2.4
MADISON	3.1	4.6	4.2	5.8	1.9	2.8	1.3	2.0
MEDFORD	2.8	4.3	4.8	6.1	1.8	2.8	.5	1.3
MIAMI	3.5	5.1	3.6	5.3	2.7	4.1	2.4	3.6
NASHVILLE	2.8	4.2	3.3	5.1	2.1	3.2	1.2	2.0
NEW YORK	2.5	3.9	2.6	4.3	1.8	2.7	.9	1.7
OMAHA	3.1	4.5	3.7	5.3	2.1	3.1	1.5	2.2
PHOENIX	5.0	6.2	4.8	6.1	3.1	4.2	2.2	3.1
SANTA MARIA	4.1	5.4	4.1	5.5	2.7	3.7	1.9	2.8
SEATTLE	2.2	3.7	3.5	5.0	1.2	2.1	.5	1.1
WASHINGTON,DC	2.9	4.3	3.2	4.8	1.9	3.0	1.3	2.0

FIXED SURFACE

TILT ANGLE -45 D AZIMUTH ANGLE -75 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.5	5.8	5.4	6.7	2.8	3.8	1.8	2.6
APPALACHICOLA	3.3	4.7	3.7	5.2	2.3	3.5	1.4	2.5
BISMARCK	2.9	4.3	4.1	5.5	1.7	2.6	.9	1.5
BLUE HILL	2.4	3.8	2.7	4.3	1.4	2.3	.8	1.5
BOSTON	2.4	3.8	2.9	4.5	1.3	2.3	.7	1.4
BROWNSVILLE	2.5	4.2	3.9	5.5	2.1	3.5	1.2	2.4
CAPE HATTERAS	3.4	4.9	4.0	5.6	2.1	3.2	1.3	2.2
CARIBOU	2.5	3.9	2.9	4.5	1.1	1.9	.8	1.4
CHARLESTON	3.0	4.4	3.2	4.9	2.0	3.1	1.2	2.1
COLUMBIA	2.6	4.0	3.5	5.0	1.7	2.6	.9	1.7
DODGE CITY	3.1	4.5	4.0	5.4	2.2	3.2	1.3	2.0
EL PASO	4.8	6.0	5.1	6.4	2.8	3.9	2.0	2.9
ELY	4.0	5.4	5.1	6.6	2.6	3.5	1.4	2.2
FORT WORTH	2.8	4.3	3.9	5.4	2.0	3.1	1.3	2.2
GREAT FALLS	2.7	4.1	4.0	5.5	1.4	2.3	.6	1.2
LAKE CHARLES	2.8	4.4	3.2	4.9	1.9	3.2	1.0	2.1
MADISON	2.8	4.3	3.9	5.5	1.5	2.4	.9	1.6
MEDFORD	2.5	4.0	4.5	5.8	1.5	2.4	.4	1.1
MIAMI	3.3	4.9	3.6	5.2	2.4	3.7	1.9	3.1
NASHVILLE	2.5	4.0	3.2	4.9	1.7	2.8	.9	1.7
NEW YORK	2.2	3.6	2.4	4.1	1.4	2.4	.6	1.3
OMAHA	2.8	4.2	3.5	5.0	1.7	2.7	1.1	1.8
PHOENIX	4.6	5.8	4.6	5.9	2.6	3.6	1.7	2.6
SANTA MARIA	3.7	5.0	3.9	5.2	2.2	3.2	1.4	2.3
SEATTLE	1.9	3.4	3.2	4.7	.9	1.8	.3	.9
WASHINGTON,DC	2.6	4.0	3.0	4.6	1.5	2.6	.9	1.7

FIXED SURFACE

TILT ANGLE -45 D AZIMUTH ANGLE -60 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.0	5.4	5.1	6.5	2.2	3.2	1.2	2.0
APPALACHICOLA	3.0	4.4	3.5	5.1	1.9	3.0	1.0	2.0
BISMARCK	2.5	3.8	3.7	5.1	1.2	2.1	.5	1.1
BLUE HILL	2.1	3.5	2.4	4.1	1.0	2.0	.5	1.2
BOSTON	2.1	3.4	2.7	4.3	1.0	1.9	.4	1.1
BROWNSVILLE	2.3	4.0	3.8	5.4	1.6	3.2	.9	2.1
CAPE HATTERAS	3.1	4.5	3.8	5.3	1.7	2.7	.9	1.7
CARIBOU	2.1	3.5	2.6	4.2	.8	1.6	.4	1.0
CHARLESTON	2.7	4.2	3.0	4.7	1.5	2.7	.8	1.7
COLUMBIA	2.3	3.7	3.2	4.8	1.3	2.2	.6	1.3
DODGE CITY	2.7	4.1	3.7	5.1	1.7	2.6	.8	1.5
EL PASO	4.3	5.6	4.9	6.2	2.3	3.3	1.4	2.3
ELY	3.5	4.9	4.8	6.2	2.0	2.9	.9	1.7
FORT WORTH	2.6	4.0	3.7	5.2	1.6	2.7	.9	1.8
GREAT FALLS	2.3	3.6	3.6	5.1	1.0	1.9	.3	.9
LAKE CHARLES	2.5	4.1	3.1	4.8	1.6	2.9	.7	1.8
MADISON	2.4	3.9	3.6	5.2	1.1	2.0	.5	1.2
MEDFORD	2.1	3.6	4.1	5.4	1.1	2.1	.2	1.0
MIAMI	3.1	4.7	3.5	5.1	1.9	3.3	1.4	2.6
NASHVILLE	2.3	3.7	3.0	4.7	1.3	2.4	.6	1.4
NEW YORK	1.9	3.3	2.2	3.9	1.1	2.0	.4	1.1
OMAHA	2.4	3.8	3.2	4.7	1.3	2.2	.6	1.4
PHOENIX	4.1	5.4	4.4	5.7	2.0	3.1	1.1	2.0
SANTA MARIA	3.3	4.6	3.7	5.0	1.7	2.7	.9	1.8
SEATTLE	1.6	3.1	2.9	4.4	.7	1.5	.2	.8
WASHINGTON,DC	2.2	3.6	2.7	4.4	1.2	2.2	.6	1.3

FIXED SURFACE

TILT ANGLE -45 D AZIMUTH ANGLE -45 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	3.5	4.9	4.8	6.1	1.6	2.6	.7	1.5
APPALACHICOLA	2.7	4.1	3.4	4.9	1.4	2.6	.6	1.6
BISMARCK	2.0	3.3	3.3	4.7	.8	1.6	.2	.8
BLUE HILL	1.7	3.1	2.2	3.9	.7	1.6	.2	.9
BOSTON	1.8	3.1	2.4	4.0	.7	1.6	.2	.9
BROWNSVILLE	2.2	3.9	3.7	5.3	1.4	2.8	.6	1.8
CAPE HATTERAS	2.7	4.2	3.6	5.1	1.2	2.3	.5	1.3
CARIBOU	1.7	3.1	2.3	3.8	.5	1.4	.2	.8
CHARLESTON	2.4	3.8	2.9	4.5	1.1	2.3	.5	1.4
COLUMBIA	1.9	3.3	3.0	4.5	.9	1.8	.3	1.0
DODGE CITY	2.4	3.7	3.4	4.8	1.2	2.1	.4	1.1
EL PASO	3.9	5.1	4.6	5.9	1.7	2.7	.8	1.7
ELY	3.0	4.4	4.4	5.8	1.4	2.3	.4	1.2
FORT WORTH	2.3	3.7	3.5	5.0	1.2	2.3	.5	1.4
GREAT FALLS	1.8	3.2	3.2	4.6	.6	1.5	.1	.7
LAKE CHARLES	2.3	3.9	2.9	4.7	1.2	2.5	.4	1.5
MADISON	2.0	3.5	3.2	4.8	.8	1.7	.2	.9
MEDFORD	1.8	3.3	3.7	5.0	.8	1.8	.1	.9
MIAMI	2.8	4.4	3.3	5.0	1.5	2.9	1.0	2.1
NASHVILLE	2.0	3.4	2.8	4.5	1.0	2.1	.3	1.1
NEW YORK	1.6	3.0	2.0	3.7	.8	1.7	.2	.9
OMAHA	2.1	3.5	2.9	4.4	.9	1.8	.3	1.0
PHOENIX	3.7	4.9	4.1	5.5	1.5	2.6	.6	1.5
SANTA MARIA	2.9	4.2	3.5	4.9	1.2	2.2	.5	1.4
SEATTLE	1.3	2.8	2.5	4.1	.4	1.3	.1	.7
WASHINGTON,DC	1.9	3.3	2.6	4.2	.8	1.8	.3	1.0

FIXED SURFACE

TILT ANGLE -45 D AZIMUTH ANGLE -30 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	3.0	4.4	4.5	5.9	1.0	2.1	.2	1.1
APPALACHICOLA	2.4	3.9	3.3	4.8	1.0	2.2	.3	1.3
BISMARCK	1.6	2.9	2.9	4.3	.4	1.3	0.0	.6
BLUE HILL	1.4	2.8	2.0	3.7	.4	1.4	0.0	.7
BOSTON	1.5	2.8	2.2	3.8	.4	1.3	0.0	.7
BROWNSVILLE	2.0	3.7	3.6	5.2	1.1	2.5	.3	1.5
CAPE HATTERAS	2.4	3.8	3.4	4.9	.8	1.9	.2	1.0
CARIBOU	1.3	2.7	2.0	3.6	.3	1.2	0.0	.6
CHARLESTON	2.1	3.6	2.7	4.4	.8	1.9	.2	1.1
COLUMBIA	1.7	3.1	2.8	4.3	.5	1.5	.1	.8
DODGE CITY	2.0	3.4	3.2	4.6	.7	1.7	.1	.8
EL PASO	3.4	4.7	4.4	5.7	1.2	2.2	.4	1.2
ELY	2.5	3.9	4.0	5.4	.9	1.8	.1	.9
FORT WORTH	2.0	3.5	3.4	4.9	.8	1.9	.2	1.1
GREAT FALLS	1.4	2.8	2.8	4.3	.4	1.2	0.0	.7
LAKE CHARLES	2.1	3.7	2.8	4.5	.9	2.2	.2	1.2
MADISON	1.6	3.1	2.9	4.5	.4	1.3	0.0	.7
MEDFORD	1.5	3.0	3.4	4.7	.5	1.5	0.0	.8
MIAMI	2.6	4.2	3.2	4.9	1.2	2.5	.5	1.7
NASHVILLE	1.7	3.1	2.6	4.3	.6	1.7	.1	.9
NEW YORK	1.4	2.7	1.9	3.5	.5	1.4	0.0	.8
OMAHA	1.7	3.1	2.7	4.2	.5	1.5	.1	.8
PHOENIX	3.3	4.5	4.0	5.3	1.0	2.1	.3	1.1
SANTA MARIA	2.6	3.9	3.5	4.8	.8	1.8	.2	1.0
SEATTLE	1.0	2.5	2.3	3.8	.2	1.1	0.0	.6
WASHINGTON,DC	1.6	3.0	2.4	4.0	.5	1.5	.1	.8

FIXED SURFACE

TILT ANGLE -45 D AZIMUTH ANGLE -15 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	2.7	4.1	4.3	5.7	.7	1.7	0.0	.9
APPALACHIDOLA	2.3	3.7	3.2	4.7	.7	1.9	.1	1.1
BISMARCK	1.2	2.6	2.7	4.2	.2	1.0	0.0	.6
BLUE HILL	1.2	2.6	1.9	3.6	.2	1.2	0.0	.7
BOSTON	1.2	2.6	2.1	3.7	.2	1.2	0.0	.7
BROWNSVILLE	1.9	3.6	3.5	5.1	.8	2.2	.1	1.3
CAPE HATTERAS	2.2	3.7	3.3	4.8	.5	1.6	0.0	.9
CARIBOU	1.0	2.4	1.9	3.5	.1	1.0	0.0	.6
CHARLESTON	1.9	3.4	2.6	4.3	.5	1.7	0.0	.9
COLUMBIA	1.5	2.9	2.7	4.3	.3	1.3	0.0	.8
DODGE CITY	1.8	3.2	3.1	4.5	.4	1.4	0.0	.8
EL PASO	3.1	4.4	4.3	5.6	.8	1.8	.1	1.0
ELY	2.1	3.6	3.7	5.2	.5	1.4	0.0	.8
FORT WORTH	1.9	3.3	3.3	4.8	.6	1.7	0.0	.9
GREAT FALLS	1.1	2.5	2.6	4.0	.2	1.0	0.0	.6
LAKE CHARLES	1.9	3.5	2.7	4.4	.6	1.9	.1	1.1
MADISON	1.4	2.9	2.8	4.4	.2	1.1	0.0	.7
MEDFORD	1.3	2.8	3.3	4.6	.3	1.3	0.0	.8
MIAMI	2.4	4.0	3.1	4.8	.8	2.2	.2	1.4
NASHVILLE	1.5	3.0	2.5	4.3	.4	1.5	0.0	.8
NEW YORK	1.2	2.6	1.8	3.5	.3	1.2	0.0	.7
OMAHA	1.5	2.9	2.6	4.1	.3	1.2	0.0	.7
PHOENIX	3.0	4.2	3.9	5.3	.7	1.8	.1	1.0
SANTA MARIA	2.4	3.7	3.6	5.0	.5	1.5	0.0	.9
SEATTLE	.9	2.4	2.3	3.8	.1	1.0	0.0	.6
WASHINGTON,DC	1.4	2.8	2.7	4.0	.3	1.3	0.0	.8

FIXED SURFACE

TILT ANGLE -45 D AZIMUTH ANGLE 0 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	2.5	3.9	4.2	5.6	.5	1.5	0.0	.8
APPALACHICOLA	2.2	3.7	3.1	4.7	.6	1.8	0.0	1.1
BISMARCK	1.1	2.5	2.7	4.1	.1	.9	0.0	.6
BLUE HILL	1.1	2.5	1.9	3.6	.1	1.1	0.0	.7
BOSTON	1.1	2.5	2.1	3.7	.2	1.1	0.0	.7
BROWNSVILLE	1.9	3.6	3.5	5.1	.7	2.1	.1	1.2
CAPE HATTERAS	2.1	3.6	3.3	4.8	.4	1.5	0.0	.9
CARIBOU	.9	2.3	1.9	3.4	.1	.9	0.0	.6
CHARLESTON	1.9	3.3	2.5	4.2	.4	1.6	0.0	.9
COLUMBIA	1.4	2.8	2.7	4.3	.2	1.2	0.0	.8
DODGE CITY	1.8	3.1	3.1	4.5	.3	1.3	0.0	.8
EL PASO	3.0	4.2	4.2	5.5	.6	1.7	0.0	.9
ELY	1.9	3.4	3.6	5.0	.4	1.3	0.0	.8
FORT WORTH	1.9	3.3	3.3	4.8	.5	1.6	0.0	.9
GREAT FALLS	1.0	2.4	2.5	3.9	.1	1.0	0.0	.6
LAKE CHARLES	1.8	3.5	2.6	4.4	.5	1.8	0.0	1.0
MADISON	1.2	2.7	2.7	4.3	.1	1.0	0.0	.7
MEDFORD	1.3	2.8	3.3	4.6	.2	1.2	0.0	.8
MIAMI	2.3	3.9	3.0	4.7	.7	2.0	.1	1.3
NASHVILLE	1.4	2.9	2.5	4.2	.3	1.4	0.0	.8
NEW YORK	1.1	2.5	1.8	3.5	.2	1.2	0.0	.7
OMAHA	1.4	2.8	2.6	4.1	.2	1.2	0.0	.7
PHOENIX	2.8	4.1	3.9	5.3	.6	1.6	0.0	.9
SANTA MARIA	2.4	3.7	3.8	5.2	.5	1.5	0.0	.9
SEATTLE	.9	2.3	2.4	3.9	.1	1.0	0.0	.6
WASHINGTON,DC	1.3	2.7	2.3	4.0	.2	1.3	0.0	.8

FIXED SURFACE

TILT ANGLE -45 D AZIMUTH ANGLE 15 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	2.6	3.9	4.1	5.5	.6	1.6	0.0	.9
APPALACHICOLA	2.3	3.7	3.1	4.6	.7	1.9	.1	1.1
BISMARCK	1.2	2.5	2.7	4.2	.2	1.0	0.0	.6
BLUE HILL	1.1	2.5	1.9	3.6	.2	1.1	0.0	.7
BOSTON	1.1	2.5	2.1	3.7	.2	1.1	0.0	.7
BROWNSVILLE	1.9	3.6	3.4	5.1	.7	2.1	.1	1.3
CAPE HATTERAS	2.3	3.7	3.3	4.8	.5	1.6	0.0	.9
CARIBOU	1.0	2.4	1.9	3.5	.1	1.0	0.0	.6
CHARLESTON	1.9	3.3	2.5	4.2	.5	1.6	0.0	.9
COLUMBIA	1.5	2.9	2.8	4.3	.3	1.3	0.0	.8
DODGE CITY	1.9	3.2	3.2	4.6	.4	1.4	0.0	.8
EL PASO	3.0	4.3	4.2	5.5	.8	1.8	.1	1.0
ELY	2.0	3.4	3.5	4.9	.5	1.4	0.0	.8
FORT WORTH	2.0	3.4	3.3	4.9	.6	1.7	0.0	.9
GREAT FALLS	1.0	2.4	2.4	3.9	.1	1.0	0.0	.6
LAKE CHARLES	1.9	3.5	2.6	4.3	.5	1.9	.1	1.1
MADISON	1.3	2.8	2.7	4.3	.2	1.1	0.0	.7
MEDFORD	1.4	2.9	3.3	4.7	.3	1.3	0.0	.8
MIAMI	2.3	3.9	3.0	4.6	.8	2.1	.2	1.3
NASHVILLE	1.5	2.9	2.5	4.2	.4	1.5	0.0	.8
NEW YORK	1.1	2.5	1.8	3.5	.3	1.2	0.0	.7
OMAHA	1.5	2.9	2.7	4.2	.3	1.2	0.0	.7
PHOENIX	2.9	4.1	3.9	5.3	.7	1.7	.1	1.0
SANTA MARIA	2.6	3.9	4.1	5.4	.6	1.7	0.0	.9
SEATTLE	1.0	2.4	2.5	4.1	.1	1.0	0.0	.6
WASHINGTON,DC	1.4	2.8	2.3	4.0	.3	1.3	0.0	.8

FIXED SURFACE

TILT ANGLE -45 D AZIMUTH ANGLE 30 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	2.8	4.2	4.1	5.5	1.0	2.0	.2	1.0
APPALACHICOLA	2.4	3.9	3.1	4.6	1.0	2.2	.3	1.3
BISMARCK	1.5	2.8	2.8	4.3	.4	1.2	0.0	.6
BLUE HILL	1.3	2.7	2.0	3.7	.4	1.3	0.0	.7
BOSTON	1.3	2.7	2.1	3.8	.4	1.3	0.0	.7
BROWNSVILLE	2.0	3.7	3.4	5.0	.9	2.3	.3	1.5
CAPE HATTERAS	2.5	4.0	3.4	4.9	.8	1.9	.2	1.0
CARIBOU	1.2	2.6	2.0	3.6	.3	1.1	0.0	.6
CHARLESTON	2.0	3.5	2.5	4.2	.7	1.9	.2	1.1
COLUMBIA	1.7	3.1	2.9	4.4	.6	1.6	.1	.8
DODGE CITY	2.1	3.5	3.3	4.7	.8	1.7	.1	.9
EL PASO	3.2	4.5	4.2	5.5	1.1	2.2	.3	1.2
ELY	2.2	3.6	3.4	4.9	.8	1.7	.1	.9
FORT WORTH	2.2	3.6	3.4	4.9	.9	2.0	.2	1.1
GREAT FALLS	1.2	2.6	2.5	4.0	.3	1.2	0.0	.6
LAKE CHARLES	2.0	3.6	2.5	4.3	.8	2.1	.2	1.2
MADISON	1.6	3.1	2.8	4.4	.4	1.3	0.0	.7
MEDFORD	1.6	3.1	3.5	4.8	.5	1.5	0.0	.8
MIAMI	2.4	4.0	2.9	4.5	1.0	2.4	.5	1.6
NASHVILLE	1.7	3.1	2.5	4.3	.6	1.7	.1	.9
NEW YORK	1.3	2.7	1.9	3.6	.4	1.4	0.0	.8
OMAHA	1.7	3.1	2.8	4.3	.5	1.5	.1	.8
PHOENIX	3.1	4.3	4.0	5.4	1.0	2.1	.3	1.2
SANTA MARIA	2.9	4.3	4.4	5.7	1.0	2.0	.2	1.0
SEATTLE	1.2	2.7	2.8	4.3	.3	1.2	0.0	.6
WASHINGTON,DC	1.6	3.0	2.4	4.1	.5	1.5	.1	.8

FIXED SURFACE

TILT ANGLE -45 D AZIMUTH ANGLE 45 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	3.2	4.5	4.2	5.6	1.5	2.5	.6	1.5
APPALACHICOLA	2.7	4.1	3.2	4.7	1.4	2.6	.7	1.7
BISMARCK	1.9	3.2	3.2	4.6	.7	1.5	.2	.8
BLUE HILL	1.6	3.0	2.2	3.9	.6	1.6	.2	.9
BOSTON	1.6	2.9	2.3	4.0	.6	1.6	.2	.9
BROWNSVILLE	2.2	3.9	3.5	5.1	1.2	2.6	.5	1.7
CAPE HATTERAS	2.8	4.3	3.6	5.1	1.2	2.3	.5	1.3
CARIBOU	1.5	3.0	2.3	3.8	.5	1.4	.1	.8
CHARLESTON	2.3	3.7	2.5	4.2	1.0	2.2	.4	1.3
COLUMBIA	1.9	3.3	3.1	4.7	.9	1.9	.3	1.0
DODGE CITY	2.5	3.8	3.6	5.0	1.2	2.2	.4	1.2
EL PASO	3.6	4.9	4.3	5.6	1.6	2.7	.8	1.7
ELY	2.6	4.0	3.6	5.1	1.3	2.2	.4	1.2
FORT WORTH	2.5	3.9	3.6	5.1	1.3	2.4	.5	1.4
GREAT FALLS	1.6	2.9	2.8	4.3	.6	1.4	.1	.7
LAKE CHARLES	2.2	3.8	2.6	4.3	1.1	2.4	.5	1.5
MADISON	1.9	3.4	3.1	4.7	.7	1.6	.2	.9
MEDFORD	1.9	3.4	3.8	5.1	.8	1.8	.1	.9
MIAMI	2.6	4.2	2.9	4.5	1.4	2.7	.9	2.0
NASHVILLE	1.9	3.3	2.7	4.4	.9	2.0	.3	1.1
NEW YORK	1.5	2.9	2.1	3.7	.7	1.7	.2	.9
OMAHA	2.0	3.5	3.1	4.6	.9	1.8	.3	1.0
PHOENIX	3.5	4.7	4.2	5.5	1.5	2.5	.7	1.6
SANTA MARIA	3.3	4.7	4.7	6.1	1.5	2.5	.5	1.4
SEATTLE	1.5	3.0	3.1	4.7	.5	1.4	.1	.7
WASHINGTON,DC	1.8	3.2	2.6	4.3	.8	1.9	.3	1.0

FIXED SURFACE

TILT ANGLE -45 D AZIMUTH ANGLE 60 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	3.6	5.0	4.5	5.9	2.0	3.1	1.2	2.0
APPALACHICOLA	3.0	4.4	3.3	4.8	1.8	3.0	1.1	2.1
BISMARCK	2.3	3.6	3.6	5.1	1.1	1.9	.5	1.1
BLUE HILL	1.9	3.3	2.5	4.1	1.0	1.9	.5	1.2
BOSTON	1.9	3.2	2.6	4.2	.9	1.9	.4	1.1
BROWNSVILLE	2.4	4.1	3.6	5.2	1.5	2.9	.8	2.0
CAPE HATTERAS	3.2	4.7	3.8	5.3	1.7	2.8	.9	1.7
CARIBOU	1.9	3.3	2.6	4.1	.7	1.6	.4	1.0
CHARLESTON	2.5	4.0	2.7	4.4	1.4	2.5	.8	1.7
COLUMBIA	2.2	3.6	3.4	5.0	1.3	2.3	.6	1.4
DODGE CITY	2.9	4.2	3.9	5.3	1.7	2.7	.8	1.6
EL PASO	4.1	5.3	4.5	5.8	2.2	3.2	1.3	2.2
ELY	3.0	4.5	3.9	5.4	1.8	2.7	.8	1.6
FORT WORTH	2.8	4.2	3.8	5.3	1.7	2.8	.9	1.8
GREAT FALLS	1.9	3.3	3.2	4.6	.9	1.8	.3	.9
LAKE CHARLES	2.4	4.0	2.7	4.4	1.4	2.7	.8	1.8
MADISON	2.3	3.8	3.4	5.0	1.1	1.9	.5	1.2
MEDFORD	2.3	3.8	4.2	5.5	1.2	2.2	.3	1.1
MIAMI	2.9	4.4	3.0	4.6	1.7	3.1	1.3	2.5
NASHVILLE	2.2	3.6	2.9	4.6	1.2	2.3	.5	1.4
NEW YORK	1.8	3.2	2.3	4.0	1.0	2.0	.4	1.2
OMAHA	2.4	3.8	3.4	5.0	1.3	2.2	.6	1.4
PHOENIX	3.9	5.1	4.4	5.8	2.0	3.0	1.1	2.0
SANTA MARIA	3.8	5.1	5.1	6.4	2.1	3.1	.9	1.8
SEATTLE	1.9	3.3	3.6	5.1	.7	1.6	.2	.8
WASHINGTON,DC	2.1	3.6	2.8	4.5	1.2	2.2	.6	1.4

FIXED SURFACE

TILT ANGLE -45 D AZIMUTH ANGLE 75 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.0	5.4	4.7	6.1	2.6	3.7	1.8	2.6
APPALACHICOLA	3.3	4.7	3.4	4.9	2.3	3.5	1.6	2.6
BISMARCK	2.7	4.1	4.0	5.5	1.5	2.4	.8	1.4
BLUE HILL	2.2	3.6	2.7	4.3	1.3	2.2	.8	1.5
BOSTON	2.2	3.5	2.5	4.4	1.3	2.2	.7	1.4
BROWNSVILLE	2.5	4.2	3.7	5.3	1.8	3.2	1.1	2.3
CAPE HATTERAS	3.6	5.1	4.0	5.6	2.2	3.2	1.3	2.2
CARIBOU	2.3	3.7	2.9	4.4	1.0	1.9	.7	1.3
CHARLESTON	2.8	4.3	2.8	4.5	1.8	2.9	1.1	2.0
COLUMBIA	2.6	3.9	3.7	5.2	1.8	2.7	1.0	1.7
DODGE CITY	3.2	4.6	4.2	5.6	2.3	3.3	1.3	2.1
EL PASO	4.5	5.8	4.7	6.0	2.7	3.8	2.0	2.8
ELY	3.5	4.9	4.2	5.7	2.4	3.3	1.3	2.1
FORT WORTH	3.1	4.5	3.9	5.5	2.1	3.2	1.3	2.2
GREAT FALLS	2.3	3.7	3.5	5.0	1.2	2.1	.6	1.2
LAKE CHARLES	2.7	4.3	2.8	4.5	1.7	3.0	1.1	2.1
MADISON	2.7	4.2	3.8	5.4	1.4	2.3	.9	1.6
MEDFORD	2.6	4.1	4.6	5.9	1.6	2.6	.5	1.3
MIAMI	3.1	4.7	3.0	4.7	2.1	3.4	1.8	3.0
NASHVILLE	2.4	3.9	3.0	4.7	1.6	2.7	.8	1.7
NEW YORK	2.1	3.5	2.5	4.2	1.3	2.3	.7	1.5
OMAHA	2.8	4.2	3.7	5.3	1.7	2.7	1.0	1.8
PHOENIX	4.3	5.6	4.6	6.0	2.5	3.5	1.7	2.6
SANTA MARIA	4.2	5.6	5.4	6.7	2.7	3.7	1.4	2.3
SEATTLE	2.2	3.7	3.9	5.5	1.0	1.9	.3	.9
WASHINGTON,DC	2.5	3.9	3.1	4.7	1.6	2.6	1.0	1.7

FIXED SURFACE

TILT ANGLE -45 D AZIMUTH ANGLE 90 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.4	5.8	5.0	6.3	3.2	4.3	2.4	3.3
APPALACHICOLA	3.5	4.9	3.5	5.0	2.8	3.9	2.0	3.1
BISMARCK	3.1	4.5	4.3	5.8	2.0	2.8	1.3	1.9
BLUE HILL	2.5	3.9	2.9	4.5	1.6	2.6	1.2	1.9
BOSTON	2.5	3.8	3.0	4.6	1.6	2.5	1.1	1.7
BROWNSVILLE	2.7	4.4	3.7	5.4	2.1	3.5	1.4	2.6
CAPE HATTERAS	3.9	5.4	4.2	5.8	2.6	3.7	1.8	2.7
CARIBOU	2.7	4.1	3.1	4.7	1.3	2.2	1.1	1.7
CHARLESTON	3.1	4.5	2.9	4.6	2.2	3.3	1.6	2.5
COLUMBIA	2.8	4.2	3.9	5.5	2.2	3.2	1.4	2.1
DODGE CITY	3.6	4.9	4.4	5.8	2.8	3.8	1.9	2.7
EL PASO	4.9	6.1	4.9	6.2	3.3	4.3	2.6	3.5
ELY	3.9	5.3	4.5	5.9	3.0	3.9	1.8	2.7
FORT WORTH	3.3	4.8	4.1	5.6	2.6	3.7	1.8	2.7
GREAT FALLS	2.7	4.1	3.9	5.3	1.6	2.5	.9	1.5
LAKE CHARLES	2.8	4.5	2.8	4.6	2.0	3.4	1.5	2.5
MADISON	3.1	4.5	4.1	5.6	1.8	2.7	1.3	2.0
MEDFORD	2.9	4.4	4.9	6.2	2.0	3.0	.7	1.5
MIAMI	3.3	4.9	3.1	4.7	2.5	3.8	2.3	3.4
NASHVILLE	2.7	4.1	3.2	4.9	1.9	3.0	1.2	2.0
NEW YORK	2.4	3.7	2.7	4.3	1.7	2.6	1.1	1.8
OMAHA	3.1	4.5	4.0	5.5	2.1	3.1	1.5	2.2
PHOENIX	4.7	5.9	4.8	6.2	3.0	4.1	2.3	3.2
SANTA MARIA	4.6	6.0	5.6	6.9	3.3	4.3	1.9	2.8
SEATTLE	2.5	4.0	4.2	5.8	1.3	2.2	.5	1.1
WASHINGTON,DC	2.7	4.2	3.2	4.9	2.0	3.0	1.4	2.1

FIXED SURFACE

TILT ANGLE -60 D AZIMUTH ANGLE -90 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	4.2	5.6	4.8	6.1	3.0	4.0	2.2	3.0
APPALACHICOLA	3.0	4.3	3.2	4.7	2.4	3.5	1.6	2.6
BISMARCK	3.0	4.3	3.9	5.3	2.1	2.9	1.2	1.8
BLUE HILL	2.4	3.7	2.4	4.0	1.6	2.5	1.1	1.7
BOSTON	2.4	3.7	2.7	4.2	1.5	2.4	.9	1.6
BROWNSVILLE	2.2	3.8	3.3	4.9	2.2	3.5	1.4	2.5
CAPE HATTERAS	3.2	4.6	3.6	5.0	2.3	3.3	1.6	2.4
CARIBOU	2.6	3.9	2.8	4.2	1.3	2.1	1.1	1.7
CHARLESTON	2.8	4.2	2.8	4.4	2.1	3.1	1.4	2.3
COLUMBIA	2.5	3.8	3.1	4.6	1.8	2.7	1.2	1.9
DODGE CITY	2.9	4.2	3.6	4.9	2.4	3.3	1.6	2.3
EL PASO	4.5	5.7	4.5	5.7	3.0	4.0	2.4	3.2
ELY	3.9	5.2	4.8	6.1	2.9	3.8	1.8	2.6
FORT WORTH	2.6	4.0	3.4	4.9	2.1	3.2	1.5	2.4
GREAT FALLS	2.7	4.1	3.8	5.2	1.6	2.5	.9	1.4
LAKE CHARLES	2.5	4.1	2.8	4.5	2.0	3.2	1.2	2.2
MADISON	2.8	4.2	3.6	5.1	1.8	2.6	1.2	1.9
MEDFORD	2.4	3.8	4.1	5.3	1.6	2.5	.5	1.2
MIAMI	3.0	4.5	3.1	4.6	2.4	3.7	2.1	3.2
NASHVILLE	2.4	3.8	2.8	4.4	1.8	2.9	1.1	1.8
NEW YORK	2.1	3.4	2.2	3.7	1.6	2.5	.8	1.5
OMAHA	2.7	4.1	3.2	4.6	1.9	2.8	1.4	2.1
PHOENIX	4.3	5.4	4.0	5.3	2.7	3.7	2.0	2.8
SANTA MARIA	3.4	4.7	3.2	4.5	2.3	3.2	1.7	2.5
SEATTLE	1.9	3.3	3.0	4.4	1.1	1.9	.4	1.0
WASHINGTON,DC	2.5	3.8	2.6	4.2	1.7	2.7	1.1	1.9

FIXED SURFACE

TILT ANGLE -60 D AZIMUTH ANGLE -75 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	3.8	5.1	4.5	5.8	2.4	3.3	1.5	2.3
APPALACHICOLA	2.7	4.0	3.1	4.5	1.9	3.0	1.2	2.1
BISMARCK	2.5	3.8	3.5	4.9	1.5	2.3	.8	1.3
BLUE HILL	2.1	3.3	2.2	3.8	1.2	2.1	.7	1.3
BOSTON	2.1	3.3	2.4	4.0	1.1	2.0	.6	1.2
BROWNSVILLE	2.1	3.7	3.3	4.8	1.8	3.1	1.0	2.1
CAPE HATTERAS	2.8	4.2	3.3	4.8	1.8	2.8	1.1	1.9
CARIBOU	2.2	3.5	2.5	3.9	.9	1.8	.7	1.3
CHARLESTON	2.5	3.9	2.7	4.3	1.6	2.7	1.0	1.8
COLUMBIA	2.1	3.5	2.9	4.4	1.4	2.3	.8	1.5
DODGE CITY	2.6	3.9	3.3	4.7	1.9	2.8	1.1	1.8
EL PASO	4.1	5.2	4.3	5.5	2.4	3.4	1.7	2.5
ELY	3.4	4.8	4.5	5.8	2.2	3.1	1.2	1.9
FORT WORTH	2.3	3.7	3.3	4.7	1.7	2.7	1.1	1.9
GREAT FALLS	2.3	3.6	3.5	4.8	1.2	2.0	.5	1.1
LAKE CHARLES	2.3	3.8	2.7	4.4	1.6	2.9	.9	1.8
MADISON	2.4	3.8	3.3	4.8	1.3	2.2	.8	1.4
MEDFORD	2.0	3.4	3.7	5.0	1.2	2.1	.3	1.0
MIAMI	2.8	4.3	3.0	4.6	2.0	3.2	1.6	2.7
NASHVILLE	2.1	3.5	2.6	4.3	1.4	2.5	.7	1.5
NEW YORK	1.8	3.2	2.0	3.5	1.2	2.1	.5	1.2
OMAHA	2.4	3.7	2.9	4.4	1.4	2.4	.9	1.6
PHOENIX	3.9	5.0	3.8	5.1	2.1	3.1	1.3	2.2
SANTA MARIA	3.0	4.3	3.0	4.3	1.7	2.7	1.1	2.0
SEATTLE	1.6	3.0	2.6	4.1	.8	1.6	.3	.8
WASHINGTON,DC	2.1	3.5	2.4	4.0	1.3	2.2	.7	1.5

FIXED SURFACE

TILT ANGLE -60 D AZIMUTH ANGLE -60 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	3.3	4.6	4.2	5.4	1.7	2.7	.9	1.7
APPALACHICOLA	2.3	3.7	2.9	4.3	1.4	2.5	.7	1.7
BISMARCK	2.1	3.3	3.1	4.5	1.0	1.8	.4	.9
BLUE HILL	1.7	3.0	2.0	3.5	.8	1.7	.4	1.0
BOSTON	1.7	3.0	2.2	3.7	.8	1.7	.3	1.0
BROWNSVILLE	1.9	3.5	3.1	4.6	1.4	2.7	.7	1.8
CAPE HATTERAS	2.4	3.8	3.0	4.5	1.3	2.3	.6	1.4
CARIBOU	1.8	3.1	2.1	3.6	.6	1.5	.3	.9
CHARLESTON	2.1	3.5	2.5	4.1	1.2	2.3	.6	1.4
COLUMBIA	1.8	3.1	2.6	4.1	1.0	1.9	.4	1.1
DODGE CITY	2.2	3.5	3.0	4.3	1.3	2.2	.6	1.3
EL PASO	3.5	4.7	4.0	5.2	1.8	2.8	1.1	1.9
ELY	2.9	4.2	4.0	5.4	1.6	2.4	.6	1.4
FORT WORTH	2.0	3.4	3.0	4.4	1.2	2.3	.6	1.5
GREAT FALLS	1.9	3.2	3.0	4.4	.8	1.6	.2	.8
LAKE CHARLES	2.0	3.6	2.6	4.2	1.2	2.5	.5	1.5
MADISON	2.0	3.4	2.9	4.4	.9	1.8	.4	1.1
MEDFORD	1.7	3.1	3.3	4.5	.8	1.8	.1	.9
MIAMI	2.5	4.0	2.9	4.4	1.5	2.8	1.1	2.2
NASHVILLE	1.8	3.2	2.4	4.0	1.0	2.0	.4	1.2
NEW YORK	1.5	2.8	1.7	3.3	.8	1.7	.2	.9
OMAHA	2.0	3.3	2.6	4.0	1.0	1.9	.5	1.2
PHOENIX	3.3	4.5	3.5	4.8	1.6	2.6	.8	1.6
SANTA MARIA	2.5	3.8	2.7	4.0	1.2	2.1	.6	1.5
SEATTLE	1.3	2.7	2.3	3.7	.5	1.3	.1	.7
WASHINGTON,DC	1.8	3.1	2.2	3.7	.9	1.9	.4	1.1

FIXED SURFACE

TILT ANGLE -60 D AZIMUTH ANGLE -45 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	2.7	4.0	3.7	5.0	1.1	2.1	.4	1.2
APPALACHICOLA	2.0	3.3	2.6	4.1	.9	2.0	.3	1.3
BISMARCK	1.5	2.8	2.5	3.9	.6	1.4	.1	.7
BLUE HILL	1.3	2.6	1.6	3.2	.5	1.4	.1	.8
BOSTON	1.3	2.6	1.8	3.4	.5	1.4	.1	.8
BROWNSVILLE	1.6	3.2	2.9	4.4	1.0	2.3	.4	1.5
CAPE HATTERAS	2.0	3.3	2.7	4.1	.8	1.8	.2	1.1
CARIBOU	1.3	2.6	1.7	3.2	.4	1.2	.1	.7
CHARLESTON	1.8	3.1	2.2	3.8	.8	1.8	.2	1.1
COLUMBIA	1.4	2.7	2.2	3.7	.6	1.5	.2	.9
DODGE CITY	1.7	3.0	2.5	3.9	.8	1.7	.2	.9
EL PASO	2.9	4.1	3.6	4.8	1.2	2.2	.5	1.3
ELY	2.3	3.6	3.5	4.8	1.0	1.8	.2	1.0
FORT WORTH	1.6	3.0	2.7	4.1	.8	1.9	.3	1.1
GREAT FALLS	1.4	2.7	2.5	3.8	.5	1.3	.1	.7
LAKE CHARLES	1.7	3.2	2.3	4.0	.8	2.1	.2	1.2
MADISON	1.5	2.9	2.4	3.9	.5	1.4	.1	.8
MEDFORD	1.3	2.7	2.7	4.0	.5	1.4	0.0	.8
MIAMI	2.1	3.6	2.6	4.2	1.0	2.3	.6	1.7
NASHVILLE	1.5	2.8	2.1	3.7	.6	1.7	.2	.9
NEW YORK	1.2	2.5	1.4	3.0	.5	1.4	.1	.8
OMAHA	1.5	2.9	2.2	3.6	.6	1.5	.2	.9
PHOENIX	2.8	3.9	3.1	4.4	1.0	2.0	.4	1.2
SANTA MARIA	2.0	3.3	2.4	3.6	.7	1.7	.3	1.1
SEATTLE	.9	2.3	1.9	3.3	.3	1.1	0.0	.6
WASHINGTON,DC	1.4	2.7	1.8	3.4	.5	1.5	.1	.9

FIXED SURFACE

TILT ANGLE -60 D AZIMUTH ANGLE -30 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	2.0	3.3	3.2	4.5	.6	1.5	.1	.9
APPALACHICOLA	1.6	2.9	2.3	3.8	.5	1.6	.1	1.0
BISMARCK	1.0	2.3	2.0	3.3	.3	1.1	0.0	.6
BLUE HILL	.9	2.2	1.3	2.9	.2	1.1	0.0	.7
BOSTON	.9	2.2	1.4	3.0	.2	1.1	0.0	.7
BROWNSVILLE	1.3	2.9	2.6	4.2	.6	1.9	.1	1.2
CAPE HATTERAS	1.5	2.9	2.3	3.7	.4	1.4	0.0	.9
CARIBOU	.9	2.2	1.3	2.8	.2	1.0	0.0	.6
CHARLESTON	1.4	2.7	1.9	3.5	.4	1.5	0.0	.9
COLUMBIA	1.0	2.3	1.8	3.3	.3	1.2	0.0	.7
DODGE CITY	1.3	2.6	2.1	3.4	.4	1.3	0.0	.8
EL PASO	2.3	3.5	3.2	4.4	.6	1.6	.1	1.0
ELY	1.7	3.0	2.8	4.2	.5	1.3	0.0	.8
FORT WORTH	1.3	2.6	2.3	3.8	.4	1.5	.1	.9
GREAT FALLS	.9	2.2	1.9	3.3	.2	1.0	0.0	.6
LAKE CHARLES	1.4	2.9	2.1	3.7	.5	1.7	.1	1.0
MADISON	1.0	2.5	1.9	3.4	.2	1.1	0.0	.7
MEDFORD	.9	2.3	2.2	3.5	.3	1.2	0.0	.7
MIAMI	1.8	3.2	2.4	4.0	.6	1.9	.2	1.3
NASHVILLE	1.1	2.4	1.8	3.4	.3	1.4	0.0	.8
NEW YORK	.8	2.1	1.2	2.7	.2	1.2	0.0	.7
OMAHA	1.1	2.4	1.7	3.2	.3	1.2	0.0	.7
PHOENIX	2.1	3.3	2.8	4.0	.5	1.5	.1	.9
SANTA MARIA	1.5	2.8	2.1	3.4	.3	1.3	0.0	.9
SEATTLE	.6	2.0	1.4	2.9	.1	1.0	0.0	.6
WASHINGTON,DC	1.0	2.3	1.5	3.1	.2	1.2	0.0	.7

FIXED SURFACE

TILT ANGLE -60 D AZIMUTH ANGLE -15 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	1.5	2.8	2.9	4.1	.2	1.2	0.0	.8
APPALACHICOLA	1.3	2.6	2.2	3.6	.2	1.3	0.0	1.0
BISMARCK	.6	1.9	1.6	2.9	.1	.9	0.0	.6
BLUE HILL	.6	1.9	1.1	2.6	.1	1.0	0.0	.7
BOSTON	.6	1.9	1.2	2.7	.1	.9	0.0	.7
BROWNSVILLE	1.2	2.8	2.5	4.0	.3	1.6	0.0	1.1
CAPE HATTERAS	1.1	2.5	2.1	3.5	.2	1.2	0.0	.8
CARIBOU	.5	1.8	1.0	2.5	0.0	.9	0.0	.6
CHARLESTON	1.0	2.4	1.7	3.3	.2	1.2	0.0	.9
COLUMBIA	.7	2.0	1.6	3.1	.1	1.0	0.0	.7
DODGE CITY	.9	2.2	1.9	3.2	.1	1.0	0.0	.7
EL PASO	1.8	2.9	2.9	4.1	.3	1.2	0.0	.8
ELY	1.1	2.5	2.4	3.8	.2	1.0	0.0	.8
FORT WORTH	1.0	2.4	2.2	3.6	.2	1.2	0.0	.8
GREAT FALLS	.5	1.8	1.4	2.8	.1	.9	0.0	.6
LAKE CHARLES	1.1	2.6	1.9	3.5	.2	1.5	0.0	1.0
MADISON	.7	2.1	1.6	3.1	.1	.9	0.0	.7
MEDFORD	.6	2.0	1.8	3.1	.1	1.0	0.0	.7
MIAMI	1.5	2.9	2.3	3.8	.3	1.6	0.0	1.1
NASHVILLE	.8	2.1	1.6	3.2	.1	1.1	0.0	.8
NEW YORK	.5	1.9	1.0	2.6	.1	1.0	0.0	.7
OMAHA	.7	2.1	1.5	2.9	.1	1.0	0.0	.7
PHOENIX	1.7	2.8	2.6	3.9	.2	1.2	0.0	.8
SANTA MARIA	1.2	2.5	2.1	3.4	.1	1.1	0.0	.8
SEATTLE	.4	1.8	1.2	2.6	0.0	.9	0.0	.6
WASHINGTON,DC	.7	2.0	1.3	2.9	.1	1.1	0.0	.7

FIXED SURFACE

TILT ANGLE -60.0 AZIMUTH ANGLE 0.0

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	1.3	2.6	2.7	4.0	.1	1.0	0.0	.8
APPALACHICOLA	1.2	2.5	2.1	3.6	.1	1.2	0.0	1.0
BISMARCK	.4	1.7	1.4	2.8	0.0	.8	0.0	.6
BLUE HILL	.5	1.8	1.0	2.6	0.0	.9	0.0	.7
BOSTON	.5	1.7	1.1	2.7	0.0	.9	0.0	.7
BROWNSVILLE	1.1	2.7	2.5	4.0	.2	1.5	0.0	1.1
CAPE HATTERAS	1.0	2.4	2.1	3.5	.1	1.1	0.0	.8
CARIBOU	.3	1.7	.9	2.4	0.0	.8	0.0	.6
CHARLESTON	.9	2.3	1.6	3.2	.1	1.1	0.0	.9
COLUMBIA	.6	2.0	1.6	3.0	0.0	.9	0.0	.7
DODGE CITY	.8	2.1	1.8	3.2	0.0	.9	0.0	.7
EL PASO	1.5	2.7	2.8	4.0	.1	1.1	0.0	.8
ELY	.9	2.2	2.2	3.5	0.0	.9	0.0	.8
FORT WORTH	.9	2.3	2.2	3.6	.1	1.1	0.0	.8
GREAT FALLS	.4	1.7	1.2	2.6	0.0	.8	0.0	.6
LAKE CHARLES	1.0	2.5	1.8	3.4	.1	1.3	0.0	1.0
MADISON	.5	1.9	1.5	3.0	0.0	.8	0.0	.7
MEDFORD	.5	1.9	1.8	3.0	0.0	.9	0.0	.7
MIAMI	1.3	2.8	2.2	3.7	.2	1.4	0.0	1.1
NASHVILLE	.7	2.0	1.5	3.2	0.0	1.1	0.0	.8
NEW YORK	.4	1.8	1.0	2.5	0.0	.9	0.0	.7
OMAHA	.6	2.0	1.4	2.9	0.0	.9	0.0	.7
PHOENIX	1.5	2.6	2.6	3.9	.1	1.1	0.0	.8
SANTA MARIA	1.2	2.5	2.4	3.7	0.0	1.0	0.0	.8
SEATTLE	.3	1.7	1.2	2.7	0.0	.9	0.0	.6
WASHINGTON,DC	.5	1.9	1.3	2.9	0.0	1.0	0.0	.7

FIXED SURFACE

TILT ANGLE -60 D AZIMUTH ANGLE 15 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	1.3	2.6	2.6	3.9	.2	1.1	0.0	.8
APPALACHICOLA	1.3	2.7	2.1	3.5	.2	1.3	0.0	1.0
BISMARCK	.5	1.8	1.5	2.9	.1	.9	0.0	.6
BLUE HILL	.5	1.8	1.1	2.6	.1	.9	0.0	.7
BOSTON	.5	1.8	1.2	2.7	.1	.9	0.0	.7
BROWNSVILLE	1.2	2.8	2.4	4.0	.2	1.6	0.0	1.1
CAPE HATTERAS	1.2	2.6	2.1	3.5	.2	1.2	0.0	.8
CARIBOU	.4	1.8	1.0	2.5	0.0	.9	0.0	.6
CHARLESTON	1.0	2.3	1.6	3.2	.1	1.2	0.0	.9
COLUMBIA	.7	2.1	1.7	3.1	.1	1.0	0.0	.7
DODGE CITY	1.0	2.2	1.9	3.3	.1	1.0	0.0	.7
EL PASO	1.7	2.8	2.8	4.0	.2	1.2	0.0	.8
ELY	1.0	2.3	2.1	3.4	.1	1.0	0.0	.8
FORT WORTH	1.1	2.4	2.2	3.6	.2	1.2	0.0	.8
GREAT FALLS	.4	1.8	1.3	2.6	0.0	.9	0.0	.6
LAKE CHARLES	1.1	2.6	1.7	3.4	.2	1.4	0.0	1.0
MADISON	.6	2.0	1.5	3.0	.1	.9	0.0	.7
MEDFORD	.7	2.1	1.9	3.2	.1	1.0	0.0	.7
MIAMI	1.4	2.9	2.1	3.6	.2	1.5	0.0	1.1
NASHVILLE	.8	2.1	1.5	3.2	.1	1.1	0.0	.8
NEW YORK	.5	1.8	1.0	2.6	.1	1.0	0.0	.7
OMAHA	.8	2.1	1.6	3.0	.1	1.0	0.0	.7
PHOENIX	1.6	2.7	2.6	3.9	.2	1.2	0.0	.8
SANTA MARIA	1.4	2.7	2.7	4.0	.2	1.1	0.0	.8
SEATTLE	.5	1.9	1.5	2.9	0.0	.9	0.0	.6
WASHINGTON,DC	.6	2.0	1.4	2.9	.1	1.1	0.0	.7

FIXED SURFACE

TILT ANGLE -60 D AZIMUTH ANGLE 30 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	1.7	3.0	2.7	4.0	.5	1.5	.1	.9
APPALACHICOLA	1.6	2.9	2.1	3.6	.5	1.6	.1	1.1
BISMARCK	.9	2.2	1.9	3.3	.2	1.0	0.0	.6
BLUE HILL	.8	2.1	1.3	2.9	.2	1.1	0.0	.7
BOSTON	.8	2.1	1.4	2.9	.2	1.1	0.0	.7
BROWNSVILLE	1.3	2.9	2.5	4.0	.5	1.8	.1	1.2
CAPE HATTERAS	1.6	3.0	2.3	3.7	.4	1.4	0.0	.9
CARIBOU	.7	2.1	1.3	2.8	.2	1.0	0.0	.6
CHARLESTON	1.2	2.6	1.6	3.2	.3	1.4	0.0	.9
COLUMBIA	1.0	2.3	1.9	3.4	.3	1.2	0.0	.7
DODGE CITY	1.3	2.6	2.2	3.6	.4	1.3	0.0	.8
EL PASO	2.1	3.3	2.9	4.1	.6	1.6	.1	.9
ELY	1.4	2.7	2.2	3.6	.4	1.3	0.0	.8
FORT WORTH	1.4	2.8	2.4	3.8	.4	1.5	.1	.9
GREAT FALLS	.7	2.1	1.6	2.9	.2	1.0	0.0	.6
LAKE CHARLES	1.3	2.8	1.8	3.4	.4	1.6	.1	1.0
MADISON	1.0	2.4	1.8	3.3	.2	1.1	0.0	.7
MEDFORD	1.0	2.4	2.3	3.5	.3	1.2	0.0	.7
MIAMI	1.6	3.1	2.0	3.6	.5	1.8	.2	1.3
NASHVILLE	1.0	2.4	1.7	3.3	.3	1.3	0.0	.8
NEW YORK	.8	2.1	1.2	2.8	.2	1.1	0.0	.7
OMAHA	1.1	2.4	1.9	3.4	.3	1.2	0.0	.7
PHOENIX	2.0	3.2	2.8	4.1	.5	1.5	.1	.9
SANTA MARIA	1.9	3.2	3.1	4.4	.5	1.5	0.0	.9
SEATTLE	.8	2.2	1.9	3.4	.2	1.0	0.0	.6
WASHINGTON,DC	.9	2.3	1.6	3.2	.3	1.2	0.0	.7

FIXED SURFACE

TILT ANGLE -60 D AZIMUTH ANGLE 45 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	2.3	3.6	3.1	4.4	1.0	2.0	.4	1.2
APPALACHICOLA	2.0	3.3	2.4	3.8	.9	2.0	.4	1.4
BISMARCK	1.4	2.7	2.5	3.8	.5	1.3	.1	.7
BLUE HILL	1.1	2.4	1.6	3.2	.4	1.3	.1	.8
BOSTON	1.1	2.4	1.7	3.3	.4	1.3	.1	.8
BROWNSVILLE	1.6	3.2	2.7	4.2	.8	2.1	.3	1.4
CAPE HATTERAS	2.1	3.5	2.7	4.1	.8	1.8	.3	1.1
CARIBOU	1.1	2.5	1.7	3.2	.3	1.2	.1	.7
CHARLESTON	1.6	3.0	1.9	3.4	.7	1.7	.2	1.1
COLUMBIA	1.4	2.7	2.4	3.8	.6	1.6	.2	.9
DODGE CITY	1.8	3.1	2.7	4.0	.8	1.8	.2	1.0
EL PASO	2.7	3.9	3.2	4.4	1.1	2.1	.5	1.3
ELY	1.9	3.3	2.7	4.1	.9	1.7	.2	1.0
FORT WORTH	1.8	3.2	2.7	4.1	.8	1.9	.3	1.1
GREAT FALLS	1.1	2.4	2.1	3.4	.4	1.2	.1	.7
LAKE CHARLES	1.6	3.1	1.9	3.6	.7	1.9	.3	1.2
MADISON	1.4	2.8	2.3	3.8	.5	1.3	.1	.8
MEDFORD	1.4	2.8	2.9	4.1	.6	1.5	.1	.8
MIAMI	1.9	3.4	2.2	3.7	.9	2.1	.5	1.6
NASHVILLE	1.4	2.7	2.0	3.6	.6	1.6	.2	.9
NEW YORK	1.1	2.4	1.5	3.1	.5	1.4	.1	.8
OMAHA	1.5	2.9	2.4	3.8	.6	1.5	.2	.9
PHOENIX	2.6	3.7	3.2	4.5	.9	1.9	.4	1.2
SANTA MARIA	2.5	3.8	3.6	4.9	1.0	2.0	.3	1.1
SEATTLE	1.2	2.5	2.5	3.9	.3	1.2	0.0	.6
WASHINGTON,DC	1.3	2.6	1.9	3.5	.5	1.5	.2	.9

FIXED SURFACE

TILT ANGLE -60 D AZIMUTH ANGLE 60 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	2.8	4.1	3.5	4.8	1.6	2.5	.9	1.6
APPALACHICOLA	2.3	3.7	2.6	4.0	1.4	2.5	.8	1.8
BISMARCK	1.9	3.1	3.0	4.4	.9	1.7	.4	.9
BLUE HILL	1.5	2.8	2.0	3.5	.7	1.6	.4	1.0
BOSTON	1.5	2.8	2.0	3.6	.7	1.6	.3	1.0
BROWNSVILLE	1.9	3.5	2.9	4.4	1.1	2.5	.6	1.7
CAPE HATTERAS	2.6	3.9	3.1	4.5	1.3	2.3	.6	1.5
CARIBOU	1.6	2.9	2.1	3.6	.6	1.4	.3	.9
CHARLESTON	2.0	3.3	2.1	3.7	1.0	2.1	.5	1.4
COLUMBIA	1.8	3.1	2.8	4.2	1.0	2.0	.4	1.2
DODGE CITY	2.3	3.6	3.2	4.5	1.4	2.3	.6	1.4
EL PASO	3.2	4.4	3.6	4.8	1.7	2.7	1.0	1.8
ELY	2.4	3.8	3.1	4.5	1.4	2.3	.6	1.3
FORT WORTH	2.2	3.6	3.0	4.5	1.3	2.4	.7	1.5
GREAT FALLS	1.5	2.8	2.5	3.9	.7	1.5	.2	.8
LAKE CHARLES	1.9	3.4	2.1	3.8	1.0	2.3	.6	1.5
MADISON	1.9	3.3	2.8	4.3	.8	1.7	.4	1.1
MEDFORD	1.8	3.2	3.4	4.7	.9	1.9	.2	1.0
MIAMI	2.3	3.7	2.3	3.9	1.3	2.6	1.0	2.1
NASHVILLE	1.7	3.1	2.2	3.9	.9	1.9	.4	1.2
NEW YORK	1.4	2.7	1.8	3.4	.8	1.7	.3	1.0
OMAHA	2.0	3.3	2.8	4.3	1.0	1.9	.5	1.2
PHOENIX	3.1	4.3	3.5	4.8	1.5	2.5	.8	1.7
SANTA MARIA	3.1	4.3	4.1	5.4	1.6	2.6	.7	1.5
SEATTLE	1.5	2.9	3.0	4.5	.6	1.4	.1	.7
WASHINGTON,DC	1.7	3.0	2.2	3.8	.9	1.9	.4	1.2

FIXED SURFACE

TILT ANGLE -60 D AZIMUTH ANGLE 75 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	3.3	4.6	3.9	5.2	2.2	3.2	1.5	2.3
APPALACHICOLA	2.7	4.0	2.8	4.2	1.9	3.0	1.3	2.2
BISMARCK	2.3	3.6	3.4	4.8	1.3	2.1	.7	1.3
BLUE HILL	1.8	3.1	2.2	3.8	1.1	2.0	.7	1.3
BOSTON	1.8	3.1	2.3	3.9	1.1	1.9	.6	1.3
BROWNSVILLE	2.1	3.7	3.1	4.6	1.5	2.8	.9	2.0
CAPE HATTERAS	3.0	4.4	3.4	4.8	1.8	2.8	1.1	1.9
CARIBOU	2.0	3.3	2.4	3.9	.9	1.7	.6	1.2
CHARLESTON	2.3	3.7	2.2	3.8	1.4	2.5	.9	1.8
COLUMBIA	2.1	3.4	3.1	4.6	1.5	2.4	.8	1.5
DODGE CITY	2.7	4.0	3.5	4.9	1.9	2.9	1.1	1.9
EL PASO	3.7	4.9	3.9	5.1	2.3	3.3	1.6	2.4
ELY	2.9	4.3	3.5	4.9	2.0	2.9	1.1	1.8
FORT WORTH	2.6	3.9	3.3	4.7	1.8	2.8	1.1	1.9
GREAT FALLS	1.9	3.3	3.0	4.3	1.1	1.9	.5	1.1
LAKE CHARLES	2.2	3.7	2.3	3.9	1.4	2.6	.9	1.9
MADISON	2.3	3.7	3.2	4.7	1.2	2.1	.8	1.4
MEDFORD	2.2	3.6	3.8	5.1	1.4	2.3	.4	1.1
MIAMI	2.5	4.0	2.4	4.0	1.7	3.0	1.5	2.6
NASHVILLE	2.0	3.4	2.5	4.1	1.3	2.3	.7	1.5
NEW YORK	1.7	3.0	2.1	3.6	1.1	2.0	.6	1.3
OMAHA	2.3	3.7	3.2	4.6	1.5	2.4	.9	1.6
PHOENIX	3.6	4.8	3.8	5.1	2.0	3.0	1.4	2.2
SANTA MARIA	3.6	4.9	4.5	5.8	2.2	3.2	1.1	2.0
SEATTLE	1.9	3.3	3.4	4.9	.9	1.7	.3	.8
WASHINGTON,DC	2.0	3.4	2.5	4.1	1.3	2.3	.8	1.5

FIXED SURFACE

TILT ANGLE -60 D AZIMUTH ANGLE 90 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	3.8	5.1	4.1	5.4	2.8	3.8	2.1	2.9
APPALACHICOLA	3.0	4.3	2.9	4.3	2.4	3.5	1.8	2.8
BISMARCK	2.8	4.1	3.8	5.2	1.8	2.6	1.2	1.8
BLUE HILL	2.1	3.4	2.5	4.0	1.5	2.3	1.1	1.7
BOSTON	2.1	3.4	2.5	4.1	1.4	2.3	1.0	1.6
BROWNSVILLE	2.3	3.9	3.1	4.7	1.8	3.1	1.2	2.3
CAPE HATTERAS	3.4	4.7	3.6	5.0	2.3	3.3	1.6	2.4
CARIBOU	2.3	3.7	2.7	4.2	1.2	2.0	1.0	1.6
CHARLESTON	2.6	3.9	2.4	4.0	1.8	2.9	1.3	2.2
COLUMBIA	2.4	3.7	3.3	4.8	2.0	2.9	1.2	1.9
DODGE CITY	3.1	4.4	3.8	5.1	2.5	3.4	1.7	2.5
EL PASO	4.2	5.4	4.1	5.3	2.9	3.9	2.3	3.1
ELY	3.4	4.7	3.8	5.2	2.6	3.5	1.7	2.4
FORT WORTH	2.9	4.2	3.5	4.9	2.2	3.3	1.6	2.4
GREAT FALLS	2.3	3.6	3.3	4.7	1.5	2.3	.8	1.4
LAKE CHARLES	2.4	3.9	2.4	4.0	1.7	3.0	1.3	2.3
MADISON	2.7	4.1	3.5	5.0	1.6	2.5	1.2	1.9
MEDFORD	2.5	3.9	4.2	5.5	1.8	2.7	.6	1.4
MIAMI	2.8	4.2	2.5	4.0	2.1	3.4	2.0	3.1
NASHVILLE	2.3	3.6	2.7	4.3	1.7	2.7	1.0	1.8
NEW YORK	2.0	3.3	2.3	3.8	1.5	2.4	1.0	1.7
OMAHA	2.7	4.0	3.5	4.9	1.9	2.8	1.4	2.1
PHOENIX	4.0	5.2	4.0	5.3	2.6	3.6	2.0	2.8
SANTA MARIA	4.0	5.3	4.8	6.1	2.9	3.8	1.7	2.5
SEATTLE	2.2	3.6	3.8	5.2	1.2	2.0	.4	1.0
WASHINGTON,DC	2.3	3.7	2.7	4.3	1.7	2.7	1.2	1.9

FIXED SURFACE

TILT ANGLE -75 D AZIMUTH ANGLE -90 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	3.5	4.8	3.9	5.1	2.6	3.5	1.9	2.6
APPALACHICOLA	2.4	3.6	2.5	3.9	2.0	3.0	1.4	2.3
BISMARCK	2.6	3.8	3.3	4.6	1.8	2.6	1.1	1.6
BLUE HILL	2.0	3.2	2.0	3.4	1.4	2.2	.9	1.6
BOSTON	2.0	3.2	2.2	3.6	1.3	2.1	.8	1.4
BROWNSVILLE	1.8	3.3	2.7	4.1	1.8	3.1	1.1	2.2
CAPE HATTERAS	2.6	3.9	2.8	4.2	1.9	2.8	1.3	2.1
CARIBOU	2.2	3.5	2.3	3.7	1.1	1.9	1.0	1.6
CHARLESTON	2.3	3.5	2.3	3.7	1.7	2.7	1.2	2.0
COLUMBIA	2.0	3.2	2.5	3.9	1.5	2.4	1.0	1.7
DODGE CITY	2.4	3.6	2.9	4.1	2.1	2.9	1.4	2.1
EL PASO	3.7	4.8	3.6	4.7	2.5	3.5	2.1	2.8
ELY	3.3	4.6	4.0	5.3	2.5	3.3	1.5	2.3
FORT WORTH	2.1	3.4	2.8	4.1	1.8	2.8	1.3	2.1
GREAT FALLS	2.3	3.6	3.2	4.5	1.4	2.2	.7	1.3
LAKE CHARLES	2.1	3.5	2.3	3.8	1.7	2.8	1.0	1.9
MADISON	2.4	3.7	3.0	4.4	1.5	2.3	1.1	1.7
MEDFORD	1.9	3.2	3.3	4.5	1.3	2.2	.4	1.1
MIAMI	2.4	3.8	2.5	3.9	2.0	3.2	1.8	2.8
NASHVILLE	2.0	3.2	2.3	3.8	1.5	2.5	.9	1.6
NEW YORK	1.8	3.0	1.7	3.2	1.3	2.1	.7	1.3
OMAHA	2.3	3.5	2.6	4.0	1.6	2.5	1.2	1.9
PHOENIX	3.5	4.6	3.2	4.4	2.2	3.2	1.6	2.4
SANTA MARIA	2.7	3.9	2.4	3.6	1.8	2.7	1.4	2.2
SEATTLE	1.6	2.9	2.4	3.8	.9	1.7	.4	.9
WASHINGTON,DC	2.0	3.3	2.1	3.6	1.4	2.3	1.0	1.6

FIXED SURFACE

TILT ANGLE -75 D AZIMUTH ANGLE -75 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	3.1	4.3	3.7	4.9	1.9	2.8	1.2	2.0
APPALACHICOLA	2.1	3.4	2.4	3.8	1.5	2.5	.9	1.8
BISMARCK	2.2	3.3	3.0	4.2	1.3	2.1	.6	1.2
BLUE HILL	1.7	2.9	1.8	3.2	1.0	1.8	.6	1.2
BOSTON	1.7	2.9	2.0	3.4	.9	1.8	.5	1.1
BROWNSVILLE	1.6	3.1	2.6	4.0	1.5	2.7	.8	1.8
CAPE HATTERAS	2.2	3.5	2.6	4.0	1.4	2.4	.9	1.6
CARIBOU	1.9	3.1	2.0	3.4	.8	1.6	.6	1.1
CHARLESTON	2.0	3.2	2.1	3.6	1.3	2.3	.8	1.6
COLUMBIA	1.7	2.9	2.3	3.7	1.1	2.0	.6	1.3
DODGE CITY	2.1	3.3	2.6	3.9	1.5	2.4	.9	1.5
EL PASO	3.3	4.4	3.4	4.5	2.0	2.9	1.4	2.2
ELY	2.9	4.1	3.7	5.0	1.9	2.7	1.0	1.7
FORT WORTH	1.8	3.1	2.6	3.9	1.3	2.3	.8	1.6
GREAT FALLS	1.9	3.2	2.9	4.1	1.0	1.8	.4	1.0
LAKE CHARLES	1.9	3.3	2.2	3.7	1.3	2.5	.7	1.6
MADISON	2.0	3.3	2.7	4.1	1.1	1.9	.6	1.3
MEDFORD	1.6	2.9	3.0	4.2	1.0	1.8	.2	.9
MIAMI	2.2	3.6	2.4	3.9	1.6	2.7	1.3	2.3
NASHVILLE	1.7	3.0	2.1	3.6	1.1	2.1	.6	1.3
NEW YORK	1.5	2.7	1.5	3.0	1.0	1.8	.4	1.0
OMAHA	1.9	3.2	2.4	3.7	1.2	2.0	.8	1.4
PHOENIX	3.1	4.2	3.0	4.2	1.7	2.6	1.1	1.9
SANTA MARIA	2.3	3.5	2.1	3.3	1.3	2.2	.9	1.7
SEATTLE	1.3	2.6	2.1	3.5	.6	1.4	.2	.7
WASHINGTON,DC	1.7	2.9	1.9	3.4	1.0	1.9	.6	1.3

FIXED SURFACE

TILT ANGLE —75 D AZIMUTH ANGLE -60 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	2.6	3.8	3.3	4.5	1.3	2.2	.7	1.4
APPALACHICOLA	1.8	3.0	2.2	3.6	1.1	2.1	.5	1.4
BISMARCK	1.7	2.9	2.5	3.8	.9	1.6	.3	.8
BLUE HILL	1.3	2.5	1.5	3.0	.7	1.5	.3	.9
BOSTON	1.4	2.5	1.7	3.1	.6	1.4	.2	.8
BROWNSVILLE	1.4	2.9	2.4	3.8	1.1	2.3	.5	1.5
CAPE HATTERAS	1.8	3.1	2.3	3.7	1.0	1.9	.4	1.2
CARIBOU	1.4	2.7	1.7	3.1	.5	1.3	.3	.8
CHARLESTON	1.6	2.9	1.9	3.4	.9	1.9	.4	1.2
COLUMBIA	1.4	2.6	2.0	3.3	.7	1.6	.3	1.0
DODGE CITY	1.7	2.9	2.3	3.5	1.0	1.9	.4	1.1
EL PASO	2.8	3.9	3.1	4.2	1.4	2.3	.8	1.6
ELY	2.3	3.6	3.2	4.5	1.2	2.0	.5	1.2
FORT WORTH	1.5	2.8	2.3	3.6	.9	1.9	.5	1.2
GREAT FALLS	1.5	2.7	2.4	3.7	.6	1.4	.2	.7
LAKE CHARLES	1.6	3.0	2.0	3.5	.9	2.1	.4	1.3
MADISON	1.6	2.9	2.3	3.7	.7	1.5	.3	.9
MEDFORD	1.3	2.6	2.5	3.7	.6	1.5	.1	.8
MIAMI	1.9	3.3	2.2	3.7	1.1	2.3	.8	1.8
NASHVILLE	1.4	2.7	1.8	3.3	.8	1.7	.3	1.0
NEW YORK	1.2	2.4	1.3	2.7	.6	1.5	.2	.8
OMAHA	1.6	2.8	2.0	3.4	.8	1.6	.4	1.0
PHOENIX	2.6	3.7	2.7	3.9	1.2	2.1	.6	1.4
SANTA MARIA	1.9	3.1	1.8	3.0	.8	1.7	.5	1.2
SEATTLE	1.0	2.3	1.8	3.2	.4	1.2	.1	.6
WASHINGTON,DC	1.3	2.6	1.6	3.1	.6	1.6	.3	1.0

FIXED SURFACE

TILT ANGLE—75 D AZIMUTH ANGLE -45 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	2.0	3.2	2.7	3.9	.8	1.7	.2	1.0
APPALACHICOLA	1.4	2.6	1.9	3.2	.6	1.6	.2	1.1
BISMARCK	1.2	2.4	2.0	3.3	.5	1.2	.1	.6
BLUE HILL	1.0	2.2	1.2	2.6	.4	1.2	.1	.7
BOSTON	1.0	2.2	1.3	2.8	.3	1.2	.1	.7
BROWNSVILLE	1.1	2.6	2.1	3.5	.7	1.9	.2	1.2
CAPE HATTERAS	1.4	2.6	1.9	3.2	.5	1.5	.1	.9
CARIBOU	1.0	2.2	1.3	2.7	.3	1.0	.1	.6
CHARLESTON	1.2	2.5	1.6	3.1	.5	1.5	.1	.9
COLUMBIA	1.0	2.2	1.6	3.0	.4	1.2	.1	.8
DODGE CITY	1.2	2.4	1.8	3.1	.5	1.4	.1	.8
EL PASO	2.1	3.2	2.6	3.7	.8	1.7	.3	1.1
ELY	1.7	3.0	2.7	3.9	.7	1.5	.2	.9
FORT WORTH	1.1	2.4	1.9	3.3	.5	1.5	.2	1.0
GREAT FALLS	1.1	2.3	1.9	3.2	.3	1.1	.1	.6
LAKE CHARLES	1.2	2.6	1.7	3.3	.6	1.7	.1	1.0
MADISON	1.1	2.5	1.8	3.2	.4	1.2	.1	.7
MEDFORD	.9	2.2	2.0	3.2	.4	1.2	0.0	.7
MIAMI	1.5	2.9	1.9	3.4	.7	1.9	.4	1.4
NASHVILLE	1.0	2.3	1.5	3.0	.4	1.4	.1	.8
NEW YORK	.8	2.1	1.0	2.5	.3	1.2	0.0	.7
OMAHA	1.1	2.4	1.6	3.0	.4	1.3	.1	.8
PHOENIX	2.0	3.1	2.2	3.4	.7	1.6	.2	1.0
SANTA MARIA	1.4	2.6	1.5	2.7	.4	1.3	.1	.9
SEATTLE	.7	2.0	1.4	2.8	.2	1.0	0.0	.6
WASHINGTON,DC	1.0	2.2	1.3	2.8	.3	1.3	.1	.8

FIXED SURFACE

TILT ANGLE -75 D AZIMUTH ANGLE -30 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	1.3	2.5	2.1	3.3	.3	1.2	0.0	.8
APPALACHICOLA	.9	2.2	1.5	2.8	.3	1.3	0.0	.9
BISMARCK	.7	1.9	1.4	2.7	.2	.9	0.0	.5
BLUE HILL	.6	1.8	.8	2.3	.2	1.0	0.0	.6
BOSTON	.6	1.8	.9	2.4	.1	1.0	0.0	.6
BROWNSVILLE	.8	2.3	1.7	3.1	.3	1.6	0.0	1.1
CAPE HATTERAS	.9	2.2	1.4	2.8	.2	1.2	0.0	.8
CARIBOU	.6	1.8	.9	2.3	.1	.9	0.0	.6
CHARLESTON	.8	2.1	1.2	2.7	.2	1.2	0.0	.8
COLUMBIA	.6	1.9	1.1	2.5	.2	1.0	0.0	.7
DODGE CITY	.8	2.0	1.3	2.6	.2	1.1	0.0	.7
EL PASO	1.4	2.6	2.0	3.2	.4	1.3	.1	.8
ELY	1.1	2.4	2.0	3.2	.3	1.1	0.0	.7
FORT WORTH	.8	2.0	1.5	2.8	.2	1.2	0.0	.8
GREAT FALLS	.6	1.9	1.3	2.6	.1	.9	0.0	.6
LAKE CHARLES	.9	2.3	1.4	2.9	.3	1.4	0.0	.9
MADISON	.7	2.0	1.3	2.7	.2	.9	0.0	.6
MEDFORD	.5	1.9	1.4	2.6	.2	1.0	0.0	.7
MIAMI	1.1	2.5	1.6	3.0	.3	1.5	.1	1.1
NASHVILLE	.7	1.9	1.1	2.6	.2	1.1	0.0	.7
NEW YORK	.5	1.7	.7	2.2	.1	1.0	0.0	.6
OMAHA	.7	2.0	1.1	2.5	.2	1.0	0.0	.7
PHOENIX	1.3	2.4	1.7	2.9	.3	1.2	0.0	.8
SANTA MARIA	.9	2.1	1.1	2.3	.2	1.0	0.0	.8
SEATTLE	.4	1.7	1.0	2.3	.1	.9	0.0	.5
WASHINGTON,DC	.6	1.8	.9	2.4	.1	1.0	0.0	.7

FIXED SURFACE

TILT ANGLE -75 D AZIMUTH ANGLE -15 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	.7	1.9	1.4	2.6	.1	1.0	0.0	.7
APPALACHICOLA	.5	1.8	1.1	2.5	.1	1.1	0.0	.9
BISMARCK	.4	1.6	.9	2.2	.1	.8	0.0	.5
BLUE HILL	.3	1.5	.5	2.0	0.0	.9	0.0	.6
BOSTON	.3	1.5	.6	2.0	0.0	.9	0.0	.6
BROWNSVILLE	.5	2.0	1.4	2.8	.1	1.3	0.0	1.0
CAPE HATTERAS	.5	1.8	1.0	2.3	.1	1.0	0.0	.8
CARIBOU	.3	1.5	.5	1.9	0.0	.8	0.0	.5
CHARLESTON	.4	1.7	.8	2.3	0.0	1.1	0.0	.8
COLUMBIA	.3	1.5	.7	2.1	0.0	.9	0.0	.7
DODGE CITY	.4	1.6	.8	2.1	0.0	.9	0.0	.7
EL PASO	.8	1.9	1.5	2.6	.1	1.0	0.0	.8
ELY	.6	1.8	1.3	2.6	.1	.9	0.0	.7
FORT WORTH	.4	1.7	1.1	2.4	.1	1.0	0.0	.8
GREAT FALLS	.3	1.5	.8	2.1	0.0	.8	0.0	.5
LAKE CHARLES	.5	1.9	1.1	2.6	.1	1.2	0.0	.9
MADISON	.4	1.7	.8	2.2	0.0	.8	0.0	.6
MEDFORD	.3	1.6	.9	2.1	0.0	.9	0.0	.7
MIAMI	.7	2.1	1.3	2.7	.1	1.3	0.0	1.0
NASHVILLE	.4	1.6	.7	2.2	0.0	1.0	0.0	.7
NEW YORK	.2	1.5	.4	1.9	0.0	.9	0.0	.6
OMAHA	.4	1.6	.7	2.1	0.0	.9	0.0	.6
PHOENIX	.7	1.8	1.3	2.5	.1	1.0	0.0	.8
SANTA MARIA	.5	1.7	.8	2.0	0.0	.9	0.0	.8
SEATTLE	.2	1.5	.7	2.0	0.0	.8	0.0	.5
WASHINGTON,DC	.3	1.5	.6	2.0	0.0	.9	0.0	.7

FIXED SURFACE

TILT ANGLE -75.0 AZIMUTH ANGLE 0.0

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	.4	1.6	1.1	2.3	0.0	.9	0.0	.7
APPALACHICOLA	.4	1.7	1.0	2.4	0.0	1.0	0.0	.9
BISMARCK	.2	1.4	.7	2.0	0.0	.7	0.0	.5
BLUE HILL	.2	1.4	.4	1.8	0.0	.8	0.0	.6
BOSTON	.2	1.3	.4	1.8	0.0	.8	0.0	.6
BROWNSVILLE	.4	1.9	1.3	2.7	0.0	1.2	0.0	1.0
CAPE HATTERAS	.3	1.6	.8	2.2	0.0	.9	0.0	.8
CARIBOU	.2	1.4	.4	1.8	0.0	.8	0.0	.5
CHARLESTON	.3	1.5	.7	2.2	0.0	1.0	0.0	.8
COLUMBIA	.2	1.4	.6	1.9	0.0	.9	0.0	.7
DODGE CITY	.2	1.4	.7	1.9	0.0	.9	0.0	.7
EL PASO	.5	1.6	1.3	2.4	0.0	.9	0.0	.8
ELY	.3	1.6	.9	2.2	0.0	.8	0.0	.7
FORT WORTH	.3	1.6	1.0	2.3	0.0	1.0	0.0	.8
GREAT FALLS	.2	1.4	.6	1.8	0.0	.8	0.0	.5
LAKE CHARLES	.4	1.8	.9	2.4	0.0	1.2	0.0	.9
MADISON	.2	1.5	.6	2.0	0.0	.8	0.0	.6
MEDFORD	.2	1.5	.7	1.8	0.0	.9	0.0	.7
MIAMI	.5	1.9	1.1	2.6	0.0	1.2	0.0	1.0
NASHVILLE	.2	1.5	.6	2.1	0.0	1.0	0.0	.7
NEW YORK	.1	1.4	.3	1.8	0.0	.8	0.0	.6
OMAHA	.2	1.5	.6	1.9	0.0	.8	0.0	.6
PHOENIX	.5	1.6	1.1	2.3	0.0	.9	0.0	.8
SANTA MARIA	.4	1.6	.9	2.1	0.0	.9	0.0	.8
SEATTLE	.1	1.4	.6	2.0	0.0	.8	0.0	.5
WASHINGTON,DC	.2	1.4	.4	1.9	0.0	.9	0.0	.7

FIXED SURFACE

TILT ANGLE -75 D AZIMUTH ANGLE 15 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	.6	1.8	1.2	2.4	.1	1.0	0.0	.7
APPALACHICOLA	.6	1.8	1.0	2.4	.1	1.1	0.0	.9
BISMARCK	.3	1.5	.9	2.2	0.0	.8	0.0	.5
BLUE HILL	.2	1.5	.5	2.0	0.0	.9	0.0	.6
BOSTON	.2	1.4	.6	2.0	0.0	.8	0.0	.6
BROWNSVILLE	.5	2.0	1.3	2.7	.1	1.3	0.0	1.0
CAPE HATTERAS	.5	1.8	1.0	2.3	.1	1.0	0.0	.8
CARIBOU	.2	1.5	.6	2.0	0.0	.8	0.0	.5
CHARLESTON	.4	1.6	.7	2.2	0.0	1.1	0.0	.8
COLUMBIA	.3	1.6	.8	2.2	0.0	.9	0.0	.7
DODGE CITY	.4	1.6	.9	2.2	.1	.9	0.0	.7
EL PASO	.7	1.8	1.3	2.4	.1	1.0	0.0	.8
ELY	.5	1.7	1.0	2.3	.1	.9	0.0	.7
FORT WORTH	.5	1.7	1.1	2.4	.1	1.0	0.0	.8
GREAT FALLS	.2	1.5	.7	2.0	0.0	.8	0.0	.5
LAKE CHARLES	.5	1.9	.9	2.4	0.0	1.2	0.0	.9
MADISON	.3	1.6	.7	2.1	0.0	.8	0.0	.6
MEDFORD	.3	1.6	.9	2.1	0.0	.9	0.0	.7
MIAMI	.6	2.0	1.1	2.5	.1	1.2	0.0	1.0
NASHVILLE	.3	1.6	.7	2.2	0.0	1.0	0.0	.7
NEW YORK	.2	1.5	.5	1.9	0.0	.9	0.0	.6
OMAHA	.4	1.6	.8	2.2	0.0	.9	0.0	.6
PHOENIX	.7	1.8	1.3	2.5	.1	1.0	0.0	.8
SANTA MARIA	.7	1.8	1.3	2.5	.1	1.0	0.0	.8
SEATTLE	.3	1.6	.9	2.3	0.0	.8	0.0	.5
WASHINGTON,DC	.3	1.5	.6	2.1	0.0	.9	0.0	.7

FIXED SURFACE

TILT ANGLE -75 D AZIMUTH ANGLE 30 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	1.1	2.3	1.7	2.9	.3	1.2	0.0	.8
APPALACHICOLA	.9	2.2	1.3	2.7	.3	1.3	0.0	.9
BISMARCK	.6	1.8	1.4	2.7	.1	.9	0.0	.5
BLUE HILL	.5	1.7	.8	2.3	.1	.9	0.0	.6
BOSTON	.5	1.7	.9	2.3	.1	.9	0.0	.6
BROWNSVILLE	.8	2.3	1.6	3.0	.2	1.5	0.0	1.1
CAPE HATTERAS	1.0	2.3	1.4	2.8	.2	1.2	0.0	.8
CARIBOU	.5	1.8	.9	2.3	.1	.9	0.0	.5
CHARLESTON	.7	2.0	1.0	2.5	.2	1.2	0.0	.8
COLUMBIA	.7	1.9	1.3	2.7	.2	1.0	0.0	.7
DODGE CITY	.9	2.0	1.5	2.7	.2	1.1	0.0	.7
EL PASO	1.3	2.4	1.8	2.9	.3	1.2	0.0	.8
ELY	.9	2.1	1.5	2.7	.3	1.1	0.0	.7
FORT WORTH	.9	2.1	1.5	2.8	.2	1.2	0.0	.8
GREAT FALLS	.5	1.7	1.1	2.4	.1	.9	0.0	.6
LAKE CHARLES	.8	2.2	1.1	2.6	.2	1.4	0.0	.9
MADISON	.7	2.0	1.2	2.6	.1	.9	0.0	.6
MEDFORD	.6	1.9	1.5	2.7	.2	1.0	0.0	.7
MIAMI	1.0	2.4	1.2	2.7	.3	1.4	.1	1.1
NASHVILLE	.6	1.9	1.0	2.5	.1	1.1	0.0	.7
NEW YORK	.5	1.7	.8	2.2	.1	1.0	0.0	.6
OMAHA	.7	2.0	1.3	2.6	.2	1.0	0.0	.7
PHOENIX	1.2	2.3	1.8	3.0	.3	1.2	0.0	.8
SANTA MARIA	1.2	2.4	2.0	3.2	.3	1.2	0.0	.8
SEATTLE	.5	1.8	1.4	2.8	.1	.9	0.0	.5
WASHINGTON,DC	.6	1.8	1.0	2.5	.1	1.1	0.0	.7

FIXED SURFACE

TILT ANGLE -75 D AZIMUTH ANGLE 45 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	1.6	2.9	2.2	3.4	.7	1.6	.2	1.0
APPALACHICOLA	1.4	2.6	1.6	3.0	.6	1.6	.2	1.1
BISMARCK	1.1	2.2	1.9	3.2	.4	1.1	.1	.6
BLUE HILL	.8	2.0	1.2	2.6	.3	1.1	.1	.7
BOSTON	.8	2.0	1.3	2.7	.3	1.1	.1	.7
BROWNSVILLE	1.1	2.6	1.9	3.3	.5	1.7	.2	1.2
CAPE HATTERAS	1.5	2.8	1.9	3.3	.6	1.5	.2	.9
CARIBOU	.9	2.1	1.3	2.7	.3	1.0	.1	.6
CHARLESTON	1.1	2.4	1.3	2.8	.4	1.4	.1	.9
COLUMBIA	1.0	2.2	1.8	3.1	.4	1.3	.1	.8
DODGE CITY	1.3	2.5	2.0	3.2	.6	1.4	.2	.8
EL PASO	1.9	3.0	2.3	3.4	.7	1.7	.3	1.1
ELY	1.4	2.6	2.0	3.3	.6	1.4	.1	.8
FORT WORTH	1.3	2.6	2.0	3.3	.6	1.6	.2	1.0
GREAT FALLS	.8	2.1	1.6	2.8	.3	1.0	0.0	.6
LAKE CHARLES	1.1	2.5	1.4	2.9	.4	1.6	.2	1.1
MADISON	1.1	2.4	1.7	3.1	.3	1.1	.1	.7
MEDFORD	1.0	2.3	2.1	3.3	.4	1.3	.1	.7
MIAMI	1.4	2.7	1.5	2.9	.6	1.7	.3	1.4
NASHVILLE	1.0	2.2	1.4	2.9	.4	1.3	.1	.8
NEW YORK	.8	2.0	1.1	2.5	.3	1.2	.1	.7
OMAHA	1.2	2.4	1.8	3.2	.4	1.3	.1	.8
PHOENIX	1.8	2.9	2.3	3.5	.6	1.5	.2	1.0
SANTA MARIA	1.8	3.0	2.7	3.9	.7	1.6	.2	.9
SEATTLE	.9	2.2	2.0	3.3	.3	1.0	0.0	.6
WASHINGTON,DC	.9	2.2	1.4	2.8	.4	1.3	.1	.8

FIXED SURFACE

TILT ANGLE -75 D AZIMUTH ANGLE 60 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	2.2	3.4	2.7	3.9	1.2	2.1	.6	1.4
APPALACHICOLA	1.8	3.0	1.9	3.3	1.0	2.0	.6	1.5
BISMARCK	1.5	2.7	2.4	3.7	.7	1.4	.3	.8
BLUE HILL	1.2	2.4	1.5	3.0	.6	1.4	.3	.9
BOSTON	1.2	2.3	1.6	3.0	.6	1.4	.2	.8
BROWNSVILLE	1.4	2.9	2.2	3.6	.8	2.1	.4	1.4
CAPE HATTERAS	2.0	3.3	2.3	3.7	1.0	1.9	.5	1.2
CARIBOU	1.3	2.5	1.7	3.1	.5	1.2	.2	.8
CHARLESTON	1.5	2.7	1.5	3.0	.7	1.8	.4	1.2
COLUMBIA	1.4	2.6	2.2	3.6	.8	1.7	.3	1.0
DODGE CITY	1.8	3.0	2.5	3.7	1.1	1.9	.5	1.2
EL PASO	2.5	3.6	2.7	3.8	1.3	2.2	.7	1.5
ELY	1.9	3.2	2.4	3.7	1.1	1.9	.4	1.1
FORT WORTH	1.7	3.0	2.3	3.7	1.0	2.0	.5	1.3
GREAT FALLS	1.2	2.4	2.0	3.3	.5	1.3	.2	.7
LAKE CHARLES	1.4	2.9	1.6	3.1	.8	1.9	.4	1.3
MADISON	1.5	2.8	2.2	3.6	.6	1.4	.3	.9
MEDFORD	1.4	2.7	2.7	3.8	.7	1.6	.2	.8
MIAMI	1.7	3.1	1.7	3.2	.9	2.1	.7	1.7
NASHVILLE	1.3	2.6	1.7	3.2	.7	1.6	.3	1.0
NEW YORK	1.1	2.3	1.4	2.8	.6	1.4	.3	.9
OMAHA	1.6	2.8	2.2	3.6	.8	1.6	.4	1.0
PHOENIX	2.4	3.5	2.7	3.9	1.1	2.0	.6	1.4
SANTA MARIA	2.4	3.6	3.2	4.4	1.2	2.1	.5	1.2
SEATTLE	1.2	2.5	2.5	3.8	.5	1.3	.1	.6
WASHINGTON,DC	1.3	2.5	1.7	3.2	.7	1.6	.3	1.0

FIXED SURFACE

TILT ANGLE -75 D AZIMUTH ANGLE 75 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	2.7	3.9	3.0	4.2	1.8	2.7	1.2	1.9
APPALACHICOLA	2.1	3.4	2.1	3.5	1.5	2.6	1.0	1.9
BISMARCK	2.0	3.1	2.9	4.1	1.1	1.8	.6	1.2
BLUE HILL	1.5	2.7	1.8	3.2	.9	1.7	.6	1.2
BOSTON	1.5	2.7	1.9	3.3	.9	1.7	.5	1.1
BROWNSVILLE	1.6	3.1	2.4	3.8	1.2	2.4	.7	1.7
CAPE HATTERAS	2.4	3.7	2.7	4.0	1.6	2.4	.9	1.6
CARIBOU	1.6	2.9	2.0	3.4	.7	1.5	.5	1.1
CHARLESTON	1.8	3.1	1.7	3.2	1.1	2.1	.7	1.5
COLUMBIA	1.7	2.9	2.5	3.9	1.2	2.1	.6	1.3
DODGE CITY	2.2	3.4	2.9	4.1	1.6	2.5	1.0	1.6
EL PASO	3.0	4.1	3.0	4.1	1.8	2.8	1.3	2.1
ELY	2.4	3.6	2.8	4.1	1.7	2.5	.9	1.6
FORT WORTH	2.1	3.3	2.6	3.9	1.4	2.4	.9	1.7
GREAT FALLS	1.6	2.8	2.4	3.7	.9	1.6	.4	1.0
LAKE CHARLES	1.7	3.1	1.8	3.3	1.1	2.3	.7	1.6
MADISON	1.9	3.2	2.5	3.9	1.0	1.8	.7	1.3
MEDFORD	1.8	3.1	3.1	4.3	1.1	2.0	.3	1.0
MIAMI	2.0	3.4	1.9	3.3	1.3	2.5	1.2	2.2
NASHVILLE	1.6	2.9	1.9	3.5	1.0	2.0	.6	1.3
NEW YORK	1.4	2.6	1.6	3.1	.9	1.7	.5	1.2
OMAHA	1.9	3.2	2.6	4.0	1.2	2.1	.7	1.4
PHOENIX	2.9	3.9	3.0	4.2	1.6	2.5	1.1	1.9
SANTA MARIA	2.9	4.1	3.6	4.8	1.8	2.7	.9	1.7
SEATTLE	1.6	2.9	2.9	4.2	.7	1.5	.2	.7
WASHINGTON,DC	1.6	2.9	2.0	3.5	1.0	2.0	.6	1.3

FIXED SURFACE

TILT ANGLE -75 D AZIMUTH ANGLE 90 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	3.1	4.3	3.3	4.4	2.4	3.3	1.8	2.6
APPALACHICOLA	2.4	3.6	2.3	3.6	1.9	3.0	1.5	2.4
BISMARCK	2.4	3.5	3.2	4.5	1.6	2.3	1.1	1.6
BLUE HILL	1.8	3.0	2.0	3.4	1.2	2.1	.9	1.6
BOSTON	1.8	2.9	2.1	3.5	1.2	2.0	.8	1.4
BROWNSVILLE	1.8	3.3	2.5	3.9	1.5	2.7	1.0	2.0
CAPE HATTERAS	2.8	4.0	2.9	4.2	1.9	2.9	1.4	2.1
CARIBOU	2.0	3.2	2.3	3.6	1.0	1.8	.9	1.4
CHARLESTON	2.1	3.3	1.9	3.3	1.5	2.5	1.1	1.9
COLUMBIA	2.0	3.2	2.7	4.1	1.7	2.5	1.0	1.7
DODGE CITY	2.6	3.8	3.1	4.3	2.2	3.0	1.5	2.2
EL PASO	3.4	4.5	3.2	4.3	2.4	3.3	1.9	2.7
ELY	2.8	4.0	3.1	4.4	2.2	3.0	1.4	2.1
FORT WORTH	2.3	3.6	2.8	4.1	1.9	2.9	1.3	2.1
GREAT FALLS	1.9	3.2	2.7	4.0	1.3	2.0	.7	1.3
LAKE CHARLES	1.9	3.3	1.9	3.4	1.4	2.6	1.1	2.0
MADISON	2.3	3.6	2.8	4.2	1.4	2.2	1.1	1.7
MEDFORD	2.1	3.4	3.4	4.6	1.5	2.4	.6	1.2
MIAMI	2.2	3.6	1.9	3.4	1.7	2.9	1.7	2.7
NASHVILLE	1.9	3.1	2.1	3.6	1.4	2.3	.9	1.6
NEW YORK	1.6	2.9	1.8	3.3	1.2	2.1	.8	1.5
OMAHA	2.2	3.5	2.9	4.2	1.7	2.5	1.2	1.8
PHOENIX	3.3	4.3	3.2	4.4	2.1	3.1	1.7	2.5
SANTA MARIA	3.3	4.5	3.9	5.1	2.4	3.3	1.4	2.2
SEATTLE	1.9	3.2	3.2	4.6	1.0	1.8	.4	.9
WASHINGTON,DC	1.9	3.2	2.2	3.7	1.4	2.3	1.0	1.7

FIXED SURFACE

TILT ANGLE -90 D AZIMUTH ANGLE -90 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	2.8	3.9	3.0	4.1	2.1	2.9	1.5	2.2
APPALACHICOLA	1.8	2.9	1.9	3.1	1.5	2.5	1.1	1.9
BISMARCK	2.1	3.2	2.6	3.8	1.6	2.2	1.0	1.4
BLUE HILL	1.6	2.7	1.5	2.8	1.1	1.9	.8	1.4
BOSTON	1.6	2.7	1.7	3.0	1.0	1.8	.7	1.2
BROWNSVILLE	1.3	2.7	2.0	3.3	1.5	2.6	.9	1.8
CAPE HATTERAS	2.0	3.1	2.1	3.4	1.5	2.4	1.1	1.8
CARIBOU	1.8	3.0	1.8	3.0	.9	1.6	.9	1.4
CHARLESTON	1.7	2.9	1.7	3.0	1.3	2.3	.9	1.7
COLUMBIA	1.6	2.7	1.9	3.2	1.2	2.0	.8	1.4
DODGE CITY	1.9	3.0	2.2	3.3	1.7	2.4	1.2	1.8
EL PASO	2.9	3.9	2.7	3.8	2.0	2.9	1.7	2.4
ELY	2.6	3.8	3.1	4.3	2.0	2.8	1.3	1.9
FORT WORTH	1.6	2.8	2.1	3.3	1.4	2.3	1.0	1.8
GREAT FALLS	1.9	3.0	2.5	3.7	1.2	1.9	.6	1.1
LAKE CHARLES	1.6	2.9	1.8	3.2	1.3	2.4	.8	1.6
MADISON	1.9	3.1	2.3	3.6	1.3	2.0	.9	1.5
MEDFORD	1.5	2.7	2.5	3.6	1.0	1.8	.3	.9
MIAMI	1.9	3.1	1.9	3.2	1.5	2.6	1.4	2.4
NASHVILLE	1.5	2.7	1.7	3.1	1.2	2.1	.7	1.4
NEW YORK	1.4	2.5	1.3	2.6	1.0	1.8	.5	1.1
OMAHA	1.8	3.0	2.0	3.3	1.3	2.1	1.0	1.6
PHOENIX	2.7	3.7	2.4	3.5	1.8	2.6	1.3	2.0
SANTA MARIA	2.0	3.1	1.6	2.7	1.4	2.2	1.1	1.8
SEATTLE	1.2	2.4	1.9	3.1	.7	1.5	.3	.8
WASHINGTON,DC	1.5	2.7	1.6	2.9	1.1	1.9	.8	1.4

FIXED SURFACE

TILT ANGLE -90 D AZIMUTH ANGLE -75 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	2.4	3.5	2.8	3.9	1.5	2.3	1.0	1.6
APPALACHICOLA	1.5	2.7	1.8	3.0	1.1	2.1	.7	1.5
BISMARCK	1.7	2.8	2.4	3.5	1.1	1.8	.5	1.0
BLUE HILL	1.3	2.4	1.3	2.7	.8	1.6	.5	1.0
BOSTON	1.3	2.4	1.5	2.8	.7	1.5	.4	.9
BROWNSVILLE	1.2	2.6	2.0	3.3	1.2	2.3	.6	1.6
CAPE HATTERAS	1.7	2.8	2.0	3.2	1.1	1.9	.6	1.4
CARIBOU	1.5	2.6	1.5	2.8	.7	1.4	.5	1.0
CHARLESTON	1.5	2.6	1.6	2.9	1.0	1.9	.6	1.3
COLUMBIA	1.3	2.4	1.7	3.0	.9	1.6	.5	1.1
DODGE CITY	1.6	2.7	2.0	3.1	1.2	2.0	.7	1.3
EL PASO	2.5	3.6	2.6	3.6	1.5	2.4	1.1	1.8
ELY	2.2	3.4	2.9	4.1	1.5	2.2	.8	1.4
FORT WORTH	1.4	2.5	1.9	3.2	1.0	1.9	.7	1.4
GREAT FALLS	1.5	2.7	2.2	3.4	.8	1.5	.3	.8
LAKE CHARLES	1.4	2.7	1.7	3.1	1.0	2.1	.5	1.3
MADISON	1.6	2.8	2.1	3.4	.9	1.6	.5	1.1
MEDFORD	1.2	2.4	2.3	3.3	.7	1.5	.2	.8
MIAMI	1.7	2.9	1.8	3.1	1.2	2.3	1.0	1.9
NASHVILLE	1.3	2.5	1.5	2.9	.9	1.8	.5	1.1
NEW YORK	1.1	2.2	1.1	2.5	.7	1.5	.3	.9
OMAHA	1.5	2.7	1.8	3.1	.9	1.7	.6	1.2
PHOENIX	2.4	3.4	2.2	3.3	1.3	2.1	.8	1.5
SANTA MARIA	1.7	2.8	1.4	2.5	.9	1.8	.7	1.4
SEATTLE	1.0	2.2	1.6	2.9	.5	1.2	.2	.7
WASHINGTON,DC	1.3	2.4	1.4	2.7	.8	1.6	.5	1.1

FIXED SURFACE

TILT ANGLE -90 D AZIMUTH ANGLE -60 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	1.9	3.1	2.4	3.5	1.0	1.8	.5	1.2
APPALACHICOLA	1.2	2.4	1.6	2.8	.7	1.7	.3	1.2
BISMARCK	1.3	2.4	2.0	3.2	.7	1.4	.2	.7
BLUE HILL	1.0	2.1	1.1	2.5	.5	1.3	.2	.8
BOSTON	1.0	2.1	1.3	2.6	.5	1.2	.2	.7
BROWNSVILLE	1.0	2.4	1.8	3.1	.8	1.9	.4	1.3
CAPE HATTERAS	1.3	2.5	1.7	2.9	.7	1.6	.3	1.0
CARIBOU	1.1	2.3	1.3	2.5	.4	1.1	.2	.7
CHARLESTON	1.2	2.3	1.4	2.7	.6	1.5	.3	1.0
COLUMBIA	1.0	2.1	1.4	2.7	.5	1.3	.2	.8
DODGE CITY	1.2	2.3	1.7	2.8	.8	1.5	.3	.9
EL PASO	2.1	3.1	2.3	3.3	1.0	1.9	.6	1.3
ELY	1.8	2.9	2.5	3.7	.9	1.7	.4	1.0
FORT WORTH	1.1	2.3	1.7	2.9	.7	1.6	.3	1.1
GREAT FALLS	1.2	2.3	1.9	3.0	.5	1.2	.1	.6
LAKE CHARLES	1.1	2.4	1.5	2.9	.7	1.7	.3	1.1
MADISON	1.2	2.4	1.7	3.0	.6	1.3	.2	.8
MEDFORD	.9	2.1	1.9	3.0	.5	1.3	.1	.7
MIAMI	1.4	2.6	1.6	3.0	.8	1.9	.6	1.5
NASHVILLE	1.0	2.2	1.3	2.7	.6	1.4	.2	.9
NEW YORK	.9	2.0	.9	2.3	.4	1.2	.1	.7
OMAHA	1.2	2.4	1.5	2.8	.6	1.4	.3	.9
PHOENIX	1.9	2.9	1.9	3.0	.8	1.7	.4	1.1
SANTA MARIA	1.3	2.4	1.2	2.3	.6	1.4	.3	1.0
SEATTLE	.8	1.9	1.4	2.6	.3	1.0	.1	.6
WASHINGTON,DC	1.0	2.1	1.2	2.5	.5	1.3	.2	.8

FIXED SURFACE

TILT ANGLE -90 D AZIMUTH ANGLE -45 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	1.4	2.5	1.9	3.0	.5	1.4	.2	.8
APPALACHICOLA	.9	2.1	1.3	2.5	.4	1.3	.1	.9
BISMARCK	.9	2.0	1.5	2.7	.4	1.1	.1	.6
BLUE HILL	.7	1.8	.8	2.2	.3	1.0	.1	.6
BOSTON	.7	1.8	1.0	2.3	.2	1.0	0.0	.6
BROWNSVILLE	.8	2.1	1.5	2.8	.5	1.6	.1	1.1
CAPE HATTERAS	.9	2.1	1.3	2.6	.4	1.2	.1	.8
CARIBOU	.8	1.9	.9	2.2	.2	.9	.1	.6
CHARLESTON	.8	2.0	1.1	2.4	.3	1.2	.1	.8
COLUMBIA	.7	1.8	1.1	2.4	.3	1.1	.1	.7
DODGE CITY	.9	2.0	1.3	2.4	.4	1.2	.1	.7
EL PASO	1.5	2.5	1.8	2.9	.6	1.4	.2	.9
ELY	1.3	2.4	2.0	3.1	.5	1.2	.1	.8
FORT WORTH	.8	1.9	1.3	2.6	.4	1.3	.1	.8
GREAT FALLS	.8	1.9	1.4	2.6	.3	1.0	0.0	.5
LAKE CHARLES	.8	2.1	1.2	2.6	.4	1.5	.1	.9
MADISON	.9	2.1	1.3	2.6	.3	1.0	.1	.6
MEDFORD	.6	1.8	1.4	2.5	.2	1.0	0.0	.6
MIAMI	1.0	2.3	1.3	2.7	.5	1.5	.2	1.2
NASHVILLE	.7	1.9	1.0	2.4	.3	1.2	.1	.7
NEW YORK	.6	1.7	.7	2.0	.2	1.0	0.0	.6
OMAHA	.9	2.0	1.2	2.4	.3	1.1	.1	.7
PHOENIX	1.4	2.4	1.6	2.7	.4	1.3	.1	.9
SANTA MARIA	.9	2.0	.9	2.0	.3	1.1	.1	.8
SEATTLE	.5	1.7	1.0	2.3	.2	.9	0.0	.5
WASHINGTON,DC	.7	1.8	.9	2.2	.2	1.1	.1	.7

FIXED SURFACE

TILT ANGLE -90 D AZIMUTH ANGLE -30 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	.9	2.0	1.3	2.4	.2	1.0	0.0	.7
APPALACHICOLA	.5	1.7	.9	2.2	.2	1.1	0.0	.8
BISMARCK	.5	1.6	1.1	2.2	.1	.8	0.0	.5
BLUE HILL	.4	1.5	.5	1.9	.1	.9	0.0	.6
BOSTON	.4	1.5	.6	1.9	.1	.8	0.0	.6
BROWNSVILLE	.5	1.9	1.1	2.4	.2	1.3	0.0	1.0
CAPE HATTERAS	.5	1.7	.9	2.1	.1	1.0	0.0	.7
CARIBOU	.4	1.6	.6	1.9	.1	.8	0.0	.5
CHARLESTON	.5	1.7	.7	2.1	.1	1.0	0.0	.7
COLUMBIA	.4	1.5	.7	2.0	.1	.9	0.0	.6
DODGE CITY	.5	1.6	.8	2.0	.1	.9	0.0	.6
EL PASO	.9	2.0	1.3	2.3	.2	1.1	0.0	.7
ELY	.8	1.9	1.3	2.5	.2	.9	0.0	.7
FORT WORTH	.5	1.6	.9	2.1	.1	1.0	0.0	.7
GREAT FALLS	.5	1.6	1.0	2.1	.1	.8	0.0	.5
LAKE CHARLES	.5	1.8	.9	2.3	.2	1.2	0.0	.8
MADISON	.5	1.7	.9	2.2	.1	.8	0.0	.6
MEDFORD	.3	1.6	.9	2.0	.1	.9	0.0	.6
MIAMI	.6	1.9	1.0	2.3	.2	1.3	0.0	1.0
NASHVILLE	.4	1.6	.7	2.1	.1	1.0	0.0	.7
NEW YORK	.3	1.4	.4	1.8	.1	.9	0.0	.6
OMAHA	.5	1.7	.8	2.0	.1	.9	0.0	.6
PHOENIX	.9	1.9	1.1	2.2	.2	1.0	0.0	.7
SANTA MARIA	.5	1.6	.6	1.7	.1	.9	0.0	.7
SEATTLE	.3	1.5	.7	2.0	.1	.8	0.0	.5
WASHINGTON,DC	.4	1.5	.6	1.9	.1	.9	0.0	.6

FIXED SURFACE

TILT ANGLE -90 D AZIMUTH ANGLE -15 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	.4	1.5	.8	1.9	0.0	.9	0.0	.7
APPALACHICOLA	.2	1.4	.5	1.8	0.0	1.0	0.0	.8
BISMARCK	.3	1.3	.7	1.9	0.0	.7	0.0	.5
BLUE HILL	.2	1.3	.3	1.6	0.0	.8	0.0	.6
BOSTON	.2	1.3	.3	1.7	0.0	.8	0.0	.6
BROWNSVILLE	.2	1.6	.6	1.9	0.0	1.2	0.0	.9
CAPE HATTERAS	.2	1.4	.5	1.7	0.0	.9	0.0	.7
CARIBOU	.2	1.3	.4	1.6	0.0	.7	0.0	.5
CHARLESTON	.2	1.4	.4	1.8	0.0	1.0	0.0	.7
COLUMBIA	.2	1.3	.4	1.7	0.0	.8	0.0	.6
DODGE CITY	.2	1.3	.5	1.6	0.0	.8	0.0	.6
EL PASO	.4	1.5	.7	1.8	0.0	.9	0.0	.7
ELY	.3	1.5	.8	1.9	0.0	.8	0.0	.7
FORT WORTH	.2	1.4	.5	1.7	0.0	.9	0.0	.7
GREAT FALLS	.2	1.3	.6	1.7	0.0	.7	0.0	.5
LAKE CHARLES	.3	1.5	.5	1.9	0.0	1.1	0.0	.8
MADISON	.2	1.4	.5	1.8	0.0	.7	0.0	.6
MEDFORD	.1	1.4	.5	1.6	0.0	.8	0.0	.6
MIAMI	.3	1.6	.6	1.9	0.0	1.1	0.0	.9
NASHVILLE	.2	1.4	.4	1.7	0.0	.9	0.0	.7
NEW YORK	.1	1.3	.2	1.6	0.0	.8	0.0	.6
OMAHA	.2	1.4	.4	1.7	0.0	.8	0.0	.6
PHOENIX	.4	1.4	.6	1.7	0.0	.9	0.0	.7
SANTA MARIA	.2	1.3	.3	1.4	0.0	.8	0.0	.7
SEATTLE	.1	1.3	.5	1.7	0.0	.7	0.0	.5
WASHINGTON,DC	.2	1.3	.3	1.6	0.0	.9	0.0	.6

FIXED SURFACE

TILT ANGLE - 90 D AZIMUTH ANGLE 0 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	.2	1.3	.4	1.5	0.0	.8	0.0	.7
APPALACHICOLA	.1	1.3	.3	1.5	0.0	.9	0.0	.8
BISMARCK	.1	1.2	.5	1.7	0.0	.7	0.0	.5
BLUE HILL	.1	1.2	.2	1.5	0.0	.8	0.0	.6
BOSTON	.1	1.2	.2	1.5	0.0	.8	0.0	.6
BROWNSVILLE	.1	1.5	.4	1.7	0.0	1.1	0.0	.9
CAPE HATTERAS	.1	1.3	.3	1.5	0.0	.9	0.0	.7
CARIBOU	.1	1.2	.3	1.5	0.0	.7	0.0	.5
CHARLESTON	.1	1.2	.2	1.6	0.0	.9	0.0	.7
COLUMBIA	.1	1.2	.3	1.5	0.0	.8	0.0	.6
DODGE CITY	.1	1.2	.3	1.4	0.0	.8	0.0	.6
EL PASO	.2	1.2	.4	1.5	0.0	.8	0.0	.7
ELY	.2	1.3	.4	1.6	0.0	.7	0.0	.7
FORT WORTH	.1	1.3	.3	1.5	0.0	.9	0.0	.7
GREAT FALLS	.1	1.2	.4	1.5	0.0	.7	0.0	.5
LAKE CHARLES	.1	1.4	.3	1.7	0.0	1.1	0.0	.8
MADISON	.1	1.3	.3	1.6	0.0	.7	0.0	.6
MEDFORD	.1	1.3	.3	1.4	0.0	.8	0.0	.6
MIAMI	.1	1.4	.3	1.7	0.0	1.1	0.0	.9
NASHVILLE	.1	1.2	.2	1.6	0.0	.9	0.0	.7
NEW YORK	.1	1.2	.1	1.5	0.0	.8	0.0	.6
OMAHA	.1	1.3	.3	1.5	0.0	.8	0.0	.6
PHOENIX	.2	1.2	.4	1.5	0.0	.9	0.0	.7
SANTA MARIA	.1	1.2	.3	1.4	0.0	.8	0.0	.7
SEATTLE	.1	1.3	.4	1.7	0.0	.7	0.0	.5
WASHINGTON,DC	.1	1.2	.2	1.5	0.0	.8	0.0	.6

FIXED SURFACE

TILT ANGLE -90 D AZIMUTH ANGLE 15 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	.3	1.4	.6	1.7	0.0	.9	0.0	.7
APPALACHICOLA	.2	1.4	.4	1.7	0.0	1.0	0.0	.8
BISMARCK	.2	1.3	.7	1.8	0.0	.7	0.0	.5
BLUE HILL	.1	1.3	.3	1.6	0.0	.8	0.0	.6
BOSTON	.2	1.2	.3	1.6	0.0	.8	0.0	.6
BROWNSVILLE	.2	1.6	.6	1.9	0.0	1.2	0.0	.9
CAPE HATTERAS	.3	1.5	.5	1.7	0.0	.9	0.0	.7
CARIBOU	.2	1.3	.4	1.7	0.0	.7	0.0	.5
CHARLESTON	.2	1.3	.3	1.7	0.0	1.0	0.0	.7
COLUMBIA	.2	1.3	.5	1.7	0.0	.8	0.0	.6
DODGE CITY	.2	1.3	.5	1.7	0.0	.8	0.0	.6
EL PASO	.4	1.4	.6	1.6	0.0	.9	0.0	.7
ELY	.3	1.4	.6	1.8	0.0	.8	0.0	.7
FORT WORTH	.2	1.4	.6	1.8	0.0	.9	0.0	.7
GREAT FALLS	.2	1.3	.5	1.7	0.0	.7	0.0	.5
LAKE CHARLES	.2	1.5	.4	1.8	0.0	1.1	0.0	.8
MADISON	.2	1.4	.4	1.7	0.0	.7	0.0	.6
MEDFORD	.2	1.4	.6	1.6	0.0	.8	0.0	.6
MIAMI	.3	1.5	.4	1.7	0.0	1.1	0.0	.9
NASHVILLE	.2	1.3	.4	1.7	0.0	.9	0.0	.7
NEW YORK	.1	1.3	.3	1.6	0.0	.8	0.0	.6
OMAHA	.3	1.4	.5	1.7	0.0	.8	0.0	.6
PHOENIX	.3	1.3	.6	1.7	0.0	.9	0.0	.7
SANTA MARIA	.4	1.5	.7	1.8	0.0	.8	0.0	.7
SEATTLE	.2	1.4	.7	1.9	0.0	.7	0.0	.5
WASHINGTON,DC	.2	1.3	.3	1.7	0.0	.9	0.0	.6

FIXED SURFACE

TILT ANGLE -90 D AZIMUTH ANGLE 30 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	.7	1.8	1.0	2.1	.2	1.0	0.0	.7
APPALACHICOLA	.6	1.7	.8	2.0	.1	1.1	0.0	.8
BISMARCK	.5	1.6	1.0	2.2	.1	.8	0.0	.5
BLUE HILL	.3	1.4	.6	1.9	.1	.8	0.0	.6
BOSTON	.3	1.4	.6	1.9	.1	.8	0.0	.6
BROWNSVILLE	.5	1.8	.9	2.2	.1	1.3	0.0	1.0
CAPE HATTERAS	.6	1.8	.9	2.1	.1	1.0	0.0	.7
CARIBOU	.4	1.5	.7	2.0	.1	.8	0.0	.5
CHARLESTON	.4	1.6	.6	2.0	.1	1.0	0.0	.7
COLUMBIA	.4	1.6	.9	2.1	.1	.9	0.0	.6
DODGE CITY	.6	1.7	1.0	2.1	.2	.9	0.0	.6
EL PASO	.8	1.8	1.1	2.1	.2	1.0	0.0	.7
ELY	.6	1.8	1.0	2.2	.2	.9	0.0	.7
FORT WORTH	.5	1.7	1.0	2.2	.1	1.1	0.0	.7
GREAT FALLS	.4	1.5	.8	1.9	.1	.8	0.0	.5
LAKE CHARLES	.5	1.8	.7	2.1	.1	1.2	0.0	.8
MADISON	.5	1.7	.8	2.1	.1	.8	0.0	.6
MEDFORD	.4	1.6	1.0	2.1	.1	.9	0.0	.6
MIAMI	.6	1.9	.7	2.0	.1	1.2	0.0	1.0
NASHVILLE	.4	1.6	.6	2.0	.1	1.0	0.0	.7
NEW YORK	.3	1.4	.5	1.8	.1	.9	0.0	.6
OMAHA	.5	1.7	.9	2.1	.1	.9	0.0	.6
PHOENIX	.8	1.8	1.1	2.2	.1	1.0	0.0	.7
SANTA MARIA	.8	1.9	1.3	2.4	.2	1.0	0.0	.7
SEATTLE	.4	1.6	1.0	2.3	.1	.8	0.0	.5
WASHINGTON,DC	.4	1.5	.6	2.0	.1	.9	0.0	.6

FIXED SURFACE

TILT ANGLE -90 D AZIMUTH ANGLE 45 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	1.2	2.3	1.5	2.6	.5	1.3	.1	.8
APPALACHICOLA	.9	2.1	1.1	2.4	.4	1.3	.1	1.0
BISMARCK	.8	1.9	1.5	2.7	.3	.9	.1	.6
BLUE HILL	.6	1.7	.8	2.2	.2	1.0	.1	.6
BOSTON	.6	1.7	.9	2.2	.2	1.0	0.0	.6
BROWNSVILLE	.7	2.1	1.3	2.6	.3	1.5	.1	1.0
CAPE HATTERAS	1.0	2.2	1.3	2.6	.4	1.2	.1	.8
CARIBOU	.7	1.8	1.0	2.3	.2	.9	0.0	.5
CHARLESTON	.7	1.9	.9	2.2	.3	1.2	.1	.8
COLUMBIA	.7	1.8	1.3	2.5	.3	1.1	.1	.7
DODGE CITY	.9	2.0	1.4	2.6	.4	1.2	.1	.7
EL PASO	1.3	2.3	1.5	2.6	.5	1.3	.2	.9
ELY	1.0	2.2	1.4	2.6	.4	1.2	.1	.7
FORT WORTH	.9	2.1	1.4	2.6	.4	1.3	.1	.8
GREAT FALLS	.6	1.7	1.2	2.3	.2	.9	0.0	.5
LAKE CHARLES	.8	2.1	1.0	2.4	.3	1.4	.1	.9
MADISON	.8	2.0	1.2	2.5	.2	1.0	.1	.6
MEDFORD	.7	1.9	1.5	2.6	.3	1.1	0.0	.7
MIAMI	.9	2.2	1.0	2.3	.4	1.5	.2	1.2
NASHVILLE	.7	1.8	1.0	2.4	.2	1.1	.1	.7
NEW YORK	.5	1.7	.8	2.1	.2	1.0	.1	.6
OMAHA	.9	2.0	1.3	2.6	.3	1.1	.1	.7
PHOENIX	1.3	2.2	1.6	2.7	.4	1.3	.1	.9
SANTA MARIA	1.3	2.4	1.9	3.0	.5	1.3	.1	.8
SEATTLE	.7	1.9	1.5	2.8	.2	.9	0.0	.5
WASHINGTON,DC	.6	1.8	1.0	2.3	.3	1.1	.1	.7

FIXED SURFACE

TILT ANGLE -90 D AZIMUTH ANGLE 60 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	1.6	2.7	1.9	3.0	.9	1.7	.5	1.1
APPALACHICOLA	1.3	2.4	1.4	2.6	.7	1.6	.4	1.2
BISMARCK	1.2	2.3	1.9	3.1	.5	1.2	.2	.7
BLUE HILL	.9	2.0	1.1	2.5	.4	1.2	.2	.8
BOSTON	.9	1.9	1.2	2.5	.4	1.2	.2	.7
BROWNSVILLE	1.0	2.4	1.6	2.9	.6	1.7	.3	1.2
CAPE HATTERAS	1.5	2.6	1.7	2.9	.7	1.6	.3	1.0
CARIBOU	1.0	2.1	1.3	2.6	.4	1.1	.2	.7
CHARLESTON	1.0	2.2	1.1	2.4	.5	1.5	.3	1.0
COLUMBIA	1.0	2.1	1.6	2.9	.6	1.4	.2	.8
DODGE CITY	1.3	2.4	1.9	3.0	.8	1.6	.4	1.0
EL PASO	1.8	2.8	1.9	3.0	.9	1.8	.5	1.2
ELY	1.4	2.6	1.8	3.0	.8	1.6	.3	1.0
FORT WORTH	1.2	2.4	1.7	3.0	.7	1.6	.3	1.1
GREAT FALLS	.9	2.1	1.5	2.7	.4	1.1	.1	.6
LAKE CHARLES	1.0	2.3	1.2	2.6	.5	1.6	.3	1.1
MADISON	1.1	2.4	1.6	2.9	.5	1.2	.3	.8
MEDFORD	1.1	2.3	2.0	3.1	.5	1.3	.1	.8
MIAMI	1.2	2.5	1.2	2.5	.7	1.8	.5	1.5
NASHVILLE	1.0	2.1	1.2	2.6	.5	1.4	.2	.9
NEW YORK	.8	1.9	1.0	2.4	.4	1.2	.2	.8
OMAHA	1.2	2.3	1.7	3.0	.6	1.4	.3	.9
PHOENIX	1.7	2.7	2.0	3.1	.8	1.6	.4	1.1
SANTA MARIA	1.8	2.9	2.4	3.5	.9	1.7	.3	1.0
SEATTLE	1.0	2.2	1.9	3.2	.4	1.1	.1	.6
WASHINGTON,DC	.9	2.1	1.2	2.6	.5	1.3	.2	.9

FIXED SURFACE

TILT ANGLE -90 D AZIMUTH ANGLE 75 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	2.0	3.1	2.2	3.3	1.4	2.2	.9	1.6
APPALACHICOLA	1.6	2.7	1.6	2.8	1.1	2.0	.8	1.6
BISMARCK	1.6	2.6	2.3	3.4	.9	1.6	.5	1.0
BLUE HILL	1.1	2.2	1.3	2.7	.7	1.5	.5	1.0
BOSTON	1.1	2.2	1.4	2.7	.7	1.4	.4	1.0
BROWNSVILLE	1.2	2.6	1.8	3.1	.9	2.0	.5	1.5
CAPE HATTERAS	1.8	3.0	2.0	3.2	1.1	2.0	.7	1.4
CARIBOU	1.3	2.4	1.6	2.8	.6	1.3	.4	.9
CHARLESTON	1.3	2.5	1.3	2.6	.8	1.8	.5	1.3
COLUMBIA	1.3	2.4	1.9	3.2	1.0	1.7	.5	1.1
DODGE CITY	1.7	2.8	2.2	3.3	1.3	2.0	.8	1.4
EL PASO	2.3	3.3	2.2	3.2	1.4	2.2	1.0	1.7
ELY	1.8	3.0	2.1	3.3	1.3	2.0	.7	1.4
FORT WORTH	1.6	2.7	2.0	3.2	1.1	2.0	.7	1.4
GREAT FALLS	1.2	2.4	1.8	3.0	.7	1.4	.3	.8
LAKE CHARLES	1.3	2.6	1.3	2.7	.8	1.9	.6	1.4
MADISON	1.5	2.7	1.9	3.2	.8	1.5	.5	1.1
MEDFORD	1.4	2.6	2.4	3.5	.9	1.7	.3	.9
MIAMI	1.5	2.8	1.3	2.7	1.0	2.1	.9	1.8
NASHVILLE	1.2	2.4	1.4	2.8	.8	1.6	.4	1.1
NEW YORK	1.0	2.2	1.2	2.6	.7	1.5	.4	1.0
OMAHA	1.5	2.7	2.0	3.3	1.0	1.8	.6	1.2
PHOENIX	2.1	3.1	2.3	3.4	1.2	2.1	.8	1.6
SANTA MARIA	2.2	3.3	2.7	3.8	1.4	2.2	.7	1.4
SEATTLE	1.3	2.4	2.1	3.5	.6	1.3	.2	.7
WASHINGTON,DC	1.2	2.4	1.5	2.8	.8	1.6	.5	1.1

FIXED SURFACE

TILT ANGLE -90 D AZIMUTH ANGLE 90 D

	SPRING (M,A,M)		SUMMER (J,J,A)		FALL (S,O,N)		WINTER (D,J,F)	
	D	T	D	T	D	T	D	T
ALBUQUERQUE	2.4	3.5	2.4	3.5	1.9	2.7	1.5	2.2
APPALACHICOLA	1.8	2.9	1.6	2.9	1.5	2.4	1.2	2.0
BISMARCK	1.9	3.0	2.5	3.7	1.3	2.0	.9	1.4
BLUE HILL	1.4	2.5	1.5	2.8	1.0	1.8	.8	1.4
BOSTON	1.4	2.5	1.6	2.9	1.0	1.7	.7	1.3
BROWNSVILLE	1.3	2.7	1.8	3.1	1.1	2.2	.8	1.7
CAPE HATTERAS	2.1	3.3	2.1	3.4	1.5	2.4	1.1	1.8
CARIBOU	1.6	2.7	1.8	3.0	.9	1.6	.8	1.3
CHARLESTON	1.5	2.7	1.4	2.7	1.2	2.1	.9	1.6
COLUMBIA	1.5	2.7	2.1	3.4	1.3	2.1	.9	1.5
DODGE CITY	2.0	3.1	2.4	3.5	1.8	2.5	1.3	1.9
EL PASO	2.6	3.6	2.4	3.4	1.9	2.7	1.6	2.3
ELY	2.2	3.3	2.4	3.5	1.8	2.6	1.2	1.8
FORT WORTH	1.8	3.0	2.1	3.3	1.5	2.4	1.1	1.8
GREAT FALLS	1.5	2.7	2.1	3.3	1.0	1.7	.6	1.1
LAKE CHARLES	1.5	2.8	1.4	2.8	1.1	2.2	.9	1.7
MADISON	1.8	3.0	2.2	3.5	1.1	1.9	.9	1.5
MEDFORD	1.6	2.8	2.6	3.7	1.2	2.0	.5	1.1
MIAMI	1.7	2.9	1.4	2.7	1.3	2.4	1.3	2.3
NASHVILLE	1.4	2.6	1.6	3.0	1.1	2.0	.7	1.4
NEW YORK	1.3	2.4	1.4	2.7	1.0	1.7	.7	1.3
OMAHA	1.8	2.9	2.2	3.5	1.4	2.1	1.0	1.6
PHOENIX	2.5	3.5	2.4	3.5	1.7	2.5	1.3	2.1
SANTA MARIA	2.6	3.6	3.0	4.0	1.9	2.7	1.1	1.8
SEATTLE	1.5	2.7	2.5	3.8	.8	1.6	.3	.8
WASHINGTON,DC	1.5	2.6	1.6	3.0	1.1	2.0	.9	1.5

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Addendum to the Sandia Laboratories Energy Report, SAND77-0885

The results in the report, "Availability of Direct, Total, and Diffuse Solar Radiation to Fixed and Tracking Collectors in the USA", SAND77-0885, were based on all hourly total horizontal (TH) data which were available for the five years, 1958-1962, from 26 stations. Since the time of publication of the report, the data base for the 26 stations has been expanded. The new SOLMET data base for most stations covers the years 1952-1975. In addition, the raw TH values have been adjusted to correct for certain errors. Generally, the adjusted TH values (Standard Year corrected) do not result in mean daily totals of TH which are significantly different from those reported in SAND77-0885.

Also since publication of the report, a new empirical formula has been derived relating hourly direct normal (DN) values to percent possible (PP) values and hence to TH values. The new formula is based on a larger and more accurate data sample consisting of simultaneous DN and TH values for approximately one year at each of 5 locations. The formula was used to generate the hourly DN values on the SOLMET tapes. Using this new formula on the adjusted TH values in the new data base results in average daily DN values which are somewhat lower, particularly for more cloudy locations, than the values given in SAND77-0885. The new DN values are probably more accurate than the old ones.

Use of the new formula would result in a smaller direct component and larger diffuse component for various surfaces. The net effect relative to surfaces of primary interest for solar application is a small reduction in average solar availability.

The new, Standard Year corrected, mean daily values of DN and TH by season and location are given in Table A.

To completely reconstruct all of the tables in SAND77-0885 would require processing the new data base hour-by-hour. However, a simple technique has been developed for adjusting these tabulated values so that they are consistent with the new data base. It is as follows:

Simple Adjustment Technique

First a procedure is described for adjusting mean daily values of direct radiation, D. For a particular site and season, let

$$p = \frac{DN\ (New)}{DN\ (SAND)}$$

p is simply an adjustment factor for the mean daily direct normal radiation for that site and season; the values of p are listed in Table B.

By assuming that this seasonal adjustment factor is valid uniformly for DN values on an hourly basis, one can show that this same seasonal adjustment factor is valid for mean daily values of direct radiation for any other fixed or tracking surface. The tabulated D values in SAND77-0885 can be adjusted by simply multiplying by the appropriate value of p from Table B.

Next, a procedure for adjusting mean daily values of total radiation, T, is described. Let

$$r = \frac{\text{diffuse, horizontal (new)}}{\text{diffuse, horizontal (SAND)}}$$

r is an adjustment factor for the mean daily diffuse radiation on a horizontal surface for that site and season. The values of r, (which were calculated by first calculating new mean daily values of direct radiation on a horizontal surface using the procedure described above) are listed in Table B.

By assuming that r can equally well be applied on an hourly basis, one can show that r can also be used for adjusting mean daily diffuse radiation values on any other fixed or tracking surface.

Finally, the tabulated T values of total radiation on any surface can be adjusted by first adjusting the D and diffuse (T-D) separately, and then recombining them. Thus, adjusted T = pD + r(T-D).

A test of these adjustment techniques for four one-month data samples for Bismarck and Miami for DEW (direct radiation available to an East-West horizontal parabolic trough) and T(45,0) (total radiation on a south-facing, 45 degree tilted surface) indicates that it is quite accurate. Only two of the differences for these 16 tests were larger than 10%. The average difference for DEW was 8%, and the average difference for T(45,0) was 2%.

Example

Consider a fixed surface of Bismarck in winter with tilt angle 45° and azimuth angle 0°. The values of D = 3.4 and T = 4.0 are given on page 104 of SAND77-0885. The adjusted values are:

$$\text{adj. } D = pD = (.61)\ (3.4) = 2.1$$

$$\text{adj. } T = pD + r\ (T-D)$$

$$= 2.1 + 1.40\ (4.0 - 3.4) = 3.9$$

where p and r are given in Table B.

TABLE A

Mean Daily Values of Direct Normal (DN)
and Total Horizontal (TH) Radiation
as Compiled from the SOLMET Data Base (kWh/m^2)

	Spring (M,A,M)		Summer (J,J,A,)		Fall (S,O,N)		Winter (D,J,F,)	
	DN	TH	DN	TH	DN	TH	DN	TH
ALBUQUERQUE	7.6	6.9	8.2	7.8	6.9	4.9	5.8	3.5
APPALACHICOLA	5.0	5.7	4.5	5.8	4.4	4.1	3.3	2.9
BISMARCK	4.7	4.7	6.5	6.4	3.9	2.9	2.7	1.7
BLUE HILL	3.6	4.2	4.2	5.3	3.1	2.8	2.2	1.7
BOSTON	3.6	4.2	4.2	5.3	3.1	2.8	2.2	1.7
BROWNSVILLE	4.2	5.4	5.8	6.7	4.4	4.4	3.2	3.1
CAPE HATTERAS	4.8	5.3	4.9	5.9	4.0	3.7	3.1	2.4
CARIBOU	Data Not Available							
CHARLESTON	4.3	5.2	3.9	5.5	3.7	3.7	3.1	2.6
COLUMBIA	4.3	4.8	5.8	6.4	4.1	3.4	2.9	2.1
DODGE CITY	5.9	5.7	7.1	7.0	5.5	4.1	4.6	2.8
EL PASO	8.0	7.2	8.1	7.8	6.9	5.1	6.0	3.8
ELY	6.9	6.2	8.1	7.6	6.7	4.5	4.8	2.8
FORT WORTH	4.5	5.2	5.9	6.6	4.6	4.0	3.7	2.8
GREAT FALLS	4.5	4.7	6.7	6.7	3.9	2.9	2.3	1.5
LAKE CHARLES	3.8	5.0	4.3	5.7	3.8	3.9	2.7	2.6
MADISON	4.1	4.5	5.1	5.9	3.3	2.9	2.5	1.8
MEDFORD	4.5	5.0	7.5	7.2	3.7	3.2	1.5	1.6
MIAMI	4.3	5.6	3.5	5.4	3.5	4.1	3.9	3.6
NASHVILLE	3.9	4.7	4.6	5.9	3.6	3.4	2.4	2.0
NEW YORK	3.4	4.2	3.8	5.1	2.8	2.8	2.0	1.7
OMAHA	4.6	4.9	6.0	6.4	4.1	3.2	3.2	2.1
PHOENIX	7.8	7.2	8.0	7.9	6.6	5.0	5.3	3.5
SANTA MARIA	5.7	5.9	6.9	7.1	5.2	4.3	4.1	2.9
SEATTLE	Data Not Available							
WASHINGTON, D.C.	3.8	4.5	4.3	5.6	3.3	3.1	2.4	2.0

TABLE B

Seasonal Adjustment Factors p and r
for Mean Daily Direct Normal
and Diffuse-Horizontal Values, Respectively

	Spring (M,A,M)		Summer (J,J,A)		Fall (S,O,N)		Winter (D,J,F)	
	p	r	p	r	p	r	p	r
ALBUQUERQUE	.85	1.45	.86	1.35	.93	1.05	.89	1.01
APPALACHICOLA	.78	1.46	.70	1.47	.75	1.20	.69	1.14
BISMARCK	.69	1.48	.77	1.52	.72	1.38	.61	1.40
BLUE HILL	.69	1.42	.79	1.36	.76	1.29	.61	1.13
BOSTON	.69	1.42	.75	1.36	.80	1.29	.69	1.25
BROWNSVILLE	.86	1.38	.85	1.48	.94	1.19	.94	1.17
CAPE HATTERAS	.67	1.31	.65	1.51	.68	1.39	.65	1.09
CARIBOU	Data Not Available							
CHARLESTON	.73	1.43	.71	1.48	.76	1.22	.76	1.16
COLUMBIA	.78	1.38	.83	1.43	.82	1.27	.76	1.10
DODGE CITY	.87	1.31	.90	1.37	.85	1.31	.87	1.22
EL PASO	.84	1.41	.90	1.39	.95	1.20	.90	1.02
ELY	.84	1.33	.89	1.45	.92	1.23	.87	.98
FORT WORTH	.75	1.38	.81	1.50	.84	1.24	.82	1.07
GREAT FALLS	.75	1.43	.85	1.54	.89	1.25	.74	1.08
LAKE CHARLES	.70	1.41	.78	1.47	.83	1.25	.77	1.17
MADISON	.65	1.31	.66	1.48	.72	1.47	.60	1.30
MEDFORD	.80	1.32	.84	1.47	.82	1.19	.83	1.13
MIAMI	.69	1.54	.59	1.58	.65	1.45	.71	1.24
NASHVILLE	.75	1.34	.79	1.43	.80	1.27	.75	1.06
NEW YORK	.72	1.35	.79	1.34	.70	1.33	.67	1.13
OMAHA	.75	1.41	.83	1.46	.89	1.19	.71	1.11
PHOENIX	.86	1.58	.94	1.44	.99	1.14	.91	1.03
SANTA MARIA	.70	1.43	.81	1.32	.79	1.26	.80	1.05
SEATTLE	Data Not Available							
WASHINGTON, DC	.70	1.36	.74	1.42	.73	1.18	.63	1.17

Sandia Laboratories

Albuquerque, New Mexico 87115

January 30, 1978

Greetings,

Several months ago you were sent a copy of a Sandia Laboratory Energy Report entitled, "Availability of Direct, Total and Diffuse Solar Radiation for Fired and Tracking Collectors in the USA." The report number is SAND77-0885.

Since publication, new data has been developed and analyzed; this has prompted us to update this report by preparing the enclosed addendum. We suggest that this addendum be taken into consideration when using the report.

Sincerely,

Irving J. Hall

Irving J. Hall
Statistics, Computing and
Human Factors Division 1223

Addendum to the Sandia Laboratories Energy Report, SAND77-0885

The results in the report, "Availability of Direct, Total, and Diffuse Solar Radiation to Fixed and Tracking Collectors in the USA", SAND77-0885, were based on all hourly total horizontal (TH) data which were available for the five years, 1958-1962, from 26 stations. Since the time of publication of the report, the data base for the 26 stations has been expanded. The new SOLMET data base for most stations covers the years 1952-1975. In addition, the raw TH values have been adjusted to correct for certain errors. Generally, the adjusted TH values (Standard Year corrected) do not result in mean daily totals of TH which are significantly different from those reported in SAND77-0885.

Also since publication of the report, a new empirical formula has been derived relating hourly direct normal (DN) values to percent possible (PP) values and hence to TH values. The new formula is based on a larger and more accurate data sample consisting of simultaneous DN and TH values for approximately one year at each of 5 locations. The formula was used to generate the hourly DN values on the SOLMET tapes. Using this new formula on the adjusted TH values in the new data base results in average daily DN values which are somewhat lower, particularly for more cloudy locations, than the values given in SAND77-0885. The new DN values are probably more accurate than the old ones.

Use of the new formula would result in a smaller direct component and larger diffuse component for various surfaces. The net effect relative to surfaces of primary interest for solar application is a small reduction in average solar availability.

The new, Standard Year corrected, mean daily values of DN and TH by season and location are given in Table A.

To completely reconstruct all of the tables in SAND77-0885 would require processing the new data base hour-by-hour. However, a simple technique has been developed for adjusting these tabulated values so that they are consistent with the new data base. It is as follows:

Simple Adjustment Technique

First a procedure is described for adjusting mean daily values of direct radiation, D. For a particular site and season, let

$$p = \frac{DN\ (New)}{DN\ (SAND)}$$

p is simply an adjustment factor for the mean daily direct normal radiation for that site and season; the values of p are listed in Table B.

By assuming that this seasonal adjustment factor is valid uniformly for DN values on an hourly basis, one can show that this same seasonal adjustment factor is valid for mean daily values of direct radiation for any other fixed or tracking surface. The tabulated D values in SAND77-0885 can be adjusted by simply multiplying by the appropriate value of p from Table B.

TABLE A

Mean Daily Values of Direct Normal (DN)
and Total Horizontal (TH) Radiation
as Compiled from the SOLMET Data Base (kWh/m^2)

	Spring (M,A,M)		Summer (J,J,A,)		Fall (S,O,N)		Winter (D,J,F,)	
	DN	TH	DN	TH	DN	TH	DN	TH
ALBUQUERQUE	7.6	6.9	8.2	7.8	6.9	4.9	5.8	3.5
APPALACHICOLA	5.0	5.7	4.5	5.8	4.4	4.1	3.3	2.9
BISMARCK	4.7	4.7	6.5	6.4	3.9	2.9	2.7	1.7
BLUE HILL	3.6	4.2	4.2	5.3	3.1	2.8	2.2	1.7
BOSTON	3.6	4.2	4.2	5.3	3.1	2.8	2.2	1.7
BROWNSVILLE	4.2	5.4	5.8	6.7	4.4	4.4	3.2	3.1
CAPE HATTERAS	4.8	5.3	4.9	5.9	4.0	3.7	3.1	2.4
CARIBOU	Data Not Available							
CHARLESTON	4.3	5.2	3.9	5.5	3.7	3.7	3.1	2.6
COLUMBIA	4.3	4.8	5.8	6.4	4.1	3.4	2.9	2.1
DODGE CITY	5.9	5.7	7.1	7.0	5.5	4.1	4.6	2.8
EL PASO	8.0	7.2	8.1	7.8	6.9	5.1	6.0	3.8
ELY	6.9	6.2	8.1	7.6	6.7	4.5	4.8	2.8
FORT WORTH	4.5	5.2	5.9	6.6	4.6	4.0	3.7	2.8
GREAT FALLS	4.5	4.7	6.7	6.7	3.9	2.9	2.3	1.5
LAKE CHARLES	3.8	5.0	4.3	5.7	3.8	3.9	2.7	2.6
MADISON	4.1	4.5	5.1	5.9	3.3	2.9	2.5	1.8
MEDFORD	4.5	5.0	7.5	7.2	3.7	3.2	1.5	1.6
MIAMI	4.3	5.6	3.5	5.4	3.5	4.1	3.9	3.6
NASHVILLE	3.9	4.7	4.6	5.9	3.6	3.4	2.4	2.0
NEW YORK	3.4	4.2	3.8	5.1	2.8	2.8	2.0	1.7
OMAHA	4.6	4.9	6.0	6.4	4.1	3.2	3.2	2.1
PHOENIX	7.8	7.2	8.0	7.9	6.6	5.0	5.3	3.5
SANTA MARIA	5.7	5.9	6.9	7.1	5.2	4.3	4.1	2.9
SEATTLE	Data Not Available							
WASHINGTON, D.C.	3.8	4.5	4.3	5.6	3.3	3.1	2.4	2.0