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PILOT PLANT
ENVIRONMENTAL
CONDITIONS
(OPDD APPENDIX C)

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REA

FOREWORD

This report is written as a partial account of work performed for the Department of Energy, on the 10 MW Solar Thermal Pilot Plant Project, under Contract Number E(04-3)-1101, Project Agreement No. 2. The material herein has been developed for inclusion in the Pilot Plant Overall Plant Design Description document (OPDD), and is presented in that format.

APPENDIX C

PILOT PLANT DESIGN ENVIRONMENTAL CONDITIONS

C.0 INTRODUCTION

Environmental conditions must be specified in varying degrees of detail for various purposes in the design of the Solar Thermal Electric Pilot Plant. This appendix specifies in separate sections the environmental design criteria to be used for plant design day performance, operational environmental limits and survival environmental limits. Also included is a summary of primary data used in determination of these limits. In some cases, as noted, the selected design data apply to specific components of the plant.

The data summaries on which this appendix are based cover various time periods. They have been summarized by various organizations for other purposes and not specifically for the construction of this plant. While they are believed to be generally consistent, some minor inconsistencies may exist because of the variety of sources.

The Barstow/Daggett plant site is at 34.87 degrees north latitude and 116.83 degrees west longitude. The surface elevation is about 591m (1940 ft) above MSL.

C.1 DESIGN DAY ENVIRONMENTAL CONDITIONS

The Pilot Plant performance requirements noted in Section 1 are referred to two design days. These are the winter solstice day, December 21, and the summer solstice day, June 21.

Based on the environmental data at the Barstow Pilot Plant location, the following conditions are to be used for design day performance studies. The insolation values noted are typical for the "best" and "worst" days for a surround field. The temperature and wind values selected reflect a typical day.

C.1.1 Design Days Direct Solar Insolation

Best Day: See Figure 1 (Ref. 8)

Worst Day: See Figure 2 (Ref. 8)

Basis: Barstow data collected by SCE (Ref. 1 & Ref. 2).

24 June was adopted to represent 21 June since for the available 1976 insolation data this specific day was cloudy.

C.1.2 Temperature

C.1.2.1 Dry Bulb Temperature

Summer: See Figure 3 (Ref. 8)

Winter: See Figure 4 (Ref. 8)

Basis: Typical Barstow Data

C.1.3 Winds

C.1.3.1 Wind Speed at Ten Meter Altitude: 29 mph (13 m/sec)*

Basis: 97 percentile of annual wind velocity during time which plant is expected to be operational. (Daylight hours, clear skies) (Ref. 4). See Figure 5.

C.1.3.2 Wind Direction: 280°

Basis: Greater than 50% of wind observations occur within the direction from 258° to 304° Azimuth. (Ref. 4)

C.1.4 Ambient Atmospheric Pressure 13.72 psia (946 mbar)

Basis: Mean atmospheric pressure measured at plant site.
(Ref. 11).

*Wind Variation with Height (H) is given by $V = V_{10 \text{ meters}} \left(\frac{H}{10}\right)^{0.15}$

FIGURE 1. INSOLATION PROFILE FOR

21 JUNE (BEST DAY)

FIGURE 2. INSOLATION PROFILE FOR 21 DECEMBER (WORST DAY)

FIGURE 3. TEMPERATURE PROFILE FOR 21 JUNE (SUMMER DAY)

FIGURE 4. TEMPERATURE PROFILE FOR 21 DECEMBER (WINTER DAY)

Figure 5. Wind Speed Frequency of Occurance for Daggett. The ordinate value is the fraction of hours for which observations were made which were clear and had wind speeds corresponding to the bin number definitions. The total number of annual observations is 96911 hours.

C.2 OPERATIONAL ENVIRONMENTAL CONDITIONS

The operational environmental conditions are those environmental data limits within which the plant is to remain fully operational. The plant performance, however, need not match the design performance throughout the total operational environmental data range. The operational environmental conditions are based on statistical selection of data.

C.2.1 Direct Insolation

The direct insolation minimum for which the plant is to remain operational is 690 watts/m^2 .

Basis: The collector field shall provide predictable solar flux when the sun is 15° above the horizon.

C.2.2 Temperature

C.2.2.1 Dry Bulb Temperature

The dry bulb temperature range within which the plant is to remain operational is from $16^\circ\text{F} (-9^\circ\text{C})$ to $113^\circ\text{F} (45^\circ\text{C})$.

Basis: The temperature operating limits were selected on the basis of statistical (97 percentile) temperatures at Daggett. (Ref. 11 and Tables 7.1 and 7.2).

C.2.2.2 Wet Bulb Temperature

The wet bulb temperature operating range is from $14^\circ\text{F} (-10^\circ\text{C})$ to $77^\circ\text{F} (25^\circ\text{C})$.

Basis: Daggett statistical data.

C.2.3 Winds Same requirement as C.1.3.1

C.2.4 Atmospheric Pressure

The plant shall be operational when the atmospheric pressure conditions range from 940 mBars (13.86 psia) to 956 mBars (13.6 psia).

Basis: Thirty year measurements at Barstow and greater than 99% probability within range (Ref. 11).

C.2.5 Precipitation

The average and maximum monthly precipitation is listed in Table 20. The Plant shall remain operational in cloudburst activity when the precipitation rates may reach 15 cm/hr for 2 minutes, and 6 cm/hr for 30 minutes (Ref. 10).

C.3

SURVIVAL ENVIRONMENTAL CONDITIONS

The plant shall be designed to survive without damage within the survival environmental conditions specified below. The plant may take measures to protect vulnerable equipment at points beyond the specific operational limits. The plant, however, shall return to operational status after the environments return to within the operational limits.

C.3.1 Direct Insolation

The maximum direct insolation will not exceed 1.15 kw/m^2 .

C.3.2 Temperature

C.3.2.1 Dry Bulb Temperature

The plant shall be designed to survive maximum ambient dry bulb temperatures of 117°F (47°C) and minimum ambient temperatures of -9°F (-13°C).

Basis: Statistical (99.9 percentile) temperature at Daggett.

C.3.2.2 Wet Bulb Temperature

The wet bulb temperature range is -14°C (5°F) to 28°C (82°F).

C.3.3 Winds (At 32 ft. above grade . . . see C.1.3.1 footnote)

C.3.3.1 Heliostats

The heliostat at any altitude shall withstand, without damage, a maximum wind of 50 mph (22 m/sec) from any direction. The heliostats shall be designed to survive, in the stowed position, winds of 90 mph (40 m/sec).

C.3.3.2 Remaining Equipment and Structures

The remaining equipment and structures, including the tower and receiver, shall survive without damage in winds both sustained and gusts of 90 mph (40 m/sec). See Figure 5.

Basis: Maximum wind speeds measured in Daggett for a 29 year period as noted in Table 18. (Ref. 11). Estimated mean recurrence interval of 90 mph (40 m/sec). winds at Daggett is once per 200 years (Ref. 26).

C.3.3.3 Tornadoes

Tornadoes need not be considered in wind-resistant design criteria.

Basis: Tornadoes are not a significant threat as calculated in risk model for Daggett, California (Ref. 26).

C.3.4 Seismic Structural Design Environment

All structures including but not limited to the receiver tower, heliostat assemblies, buildings, and equipment, shall be designed so as not to sustain damage when subjected to the following dynamic environment. The horizontal response spectrum of the base of the structure may occur in any horizontal direction and is given by the curve of Figure 6. A vertical response spectrum of the base of $\frac{2}{3}$ the spectral ordinates of Figure 6 shall be considered to occur concurrently with the horizontal spectrum applied in the most damaging (combined) direction. Suitable modal superposition, such as the square root of the sum of the squares of the responses of an appropriate number of modes shall be employed. Alternatively, a suitable collection of spectra-compatible time histories each at least 20 seconds in duration may be derived and employed.

Basis: The proposed site is within the jurisdiction of the Building and Safety Department of the County of San Bernardino. The local building code is currently the 1976 edition of the Uniform Building Code. The UBC includes a Section 2315 entitled "Earthquake Regulations" which is a seismic design criterion. This is a pseudo-static design criterion that yields a base shear of about 0.2 Weight of structure.

Various seismic risk maps have been developed for the State of California. These maps contain contours of equal ground acceleration for a given probability of not being exceeded in a specified period of time. The peak ground motion parameters for this location as taken from several sources are noted in Table 1.

Statistical calculations were made, and a single damping ratio of five percent was selected as being typical and reasonable for the structures of interest. The resultant design response spectrum (Figure 6) defines the response of a single-degree-of-freedom oscillator that has a probability of non-exceedance of 0.9 in 30 years.

C.3.5 Lightning

The plant design shall consider the effects of lightning strikes which result from 5-10 thunderstorms per year.

Basis: The proposed pilot plant site with a nominal 100 m tower may be expected to experience a direct lightning strike about every four years.

Figure 6. Design Response Spectrum for Horizontal Motion for Proposed Solar Thermal Electric Pilot Plant near Barstow, California. (curve shifted upward one decade for convenience)

Table 1. Peak Ground Motion Parameters Estimated by Various Researchers for 116.83 Degrees West Longitude and 34.87 Degrees North Latitude

Reference	Statistical Basis	Peak Motion		
		A(g)	V(in/sec)	D(in.)
15	$P_n = .9$ in 50 years	0.25	19.	8.8
16	$P_n = .9$ in 50 years	0.16		
17	$P_n = .9$ in 50 years	0.22 ⁽¹⁾		
18, 19	Maximum Probable	0.26 ⁽²⁾		

- (1) Adjustment was required to bring value quoted to a basis of $P_n = .9$ in 50 years. P_n = probability of non-occurrence.
- (2) Richter estimate of MMI of VIII converted to acceleration by correlation given by Trifunac and Brady.

This expectation is based on the assumption of 5 to 10 thunderstorms per year at the plant site (Ref. 20 and 21). An empirical study indicates at a frequency of 32 thunderstorms per year the number of lightning strikes to structures of various heights is that provided in Table 21 (Ref. 22). The lightning strike rates have been multiplied by a factor of 0.25 to arrive at an estimated rate for the pilot plant site, based on an estimate of a thunderstorm rate of 8 per year. ($8/32 = 0.25$). References 24, 25, and 28 contain information applicable to large installations, like the Pilot Plant.

C.3.6 Flooding

The site is nearly flat. However, flooding is not expected to be a problem due to the porous nature of the soil and low rainfall (Ref. 10).

C.3.7 Snow/Ice

The power plant including the heliostats shall be designed to withstand snow loads of 5 lb/ft^2 and ice loads of 2 in. (50 mm).

Basis: Precipitation in the area is usually in the form of rainfall. Occasionally, however, an exceptionally strong cold frontal system will move through the area with precipitation in the form of snow. During the period 1956-1970, a total of fifteen snowfall occurrences have been noted at the Daggett airport, with eleven amounting to only a trace. The greatest monthly snowfall during the above period was 13.0 inches in December, 1968 (Ref. 10).

C.3.8 Hail

The power plant, including the heliostat operating at any orientation, shall survive continued impact of hail stones $3/4$ in. (19 mm) at 65 ft/sec (20 m/sec). At the stowed position the heliostat shall survive hail impacts of 1 in. (25 mm) diameter at velocities of 75 ft/sec (23 m/sec).

C.3.9 Dust Devils

The plant shall survive dust devils with wind speeds up to 38 mph (17 m/sec).

C.4 SPECIAL ENVIRONMENTAL CONDITIONS

C.4.1 Clouds

The plant design shall take the transient effect of clouds into account.

Basis: Measurements are underway to define the cloud environment at the plant site. These measurements will define the cloud cover, cloud type, cloud velocity and direction. Until this data becomes available, a preliminary cloud description is defined for preliminary design purposes. (Ref. 27).

The following cloud is to be used as the basis for design. The design cloud is a water cloud with a base below 5,000 ft. which has sharply defined boundaries, as shown in Figure 7. The cloud is larger than the pilot plant heliostat field and, therefore, the assumption of a single cloud moving over the field is an adequate representation of actual expected conditions. The cloud velocity is 13 m/sec. referenced to ground speed, the highest wind velocity in which the plant is expected to remain operational. The single cloud may arrive from any direction.

The cloud frequency model is shown in Figure 8. This intermittent cloud model is to be used for basis of design in cyclic studies. The cloud characteristics are similar to the single cloud model except for its finite length. The model assumes a sky coverage of 50% and a solar elevation of 40° which yields a ground cloud coverage of 31%. The recommended cloud speed is the mean wind speed at the site referenced to ground.

C.4.2 Soils

The following preliminary soil condition description for the plant site is to be used for preliminary design until the geological surveys at the site are complete.

Soil Properties

The surface deposits of silty sand, which extends to depths of from 1 ft. to 5 ft. (0.3m to 1.5m), are only moderately firm and become weaker when wet. The sand below a depth of about 5 ft. (1.5m) is firm but contains thin layers of relatively soft silt. In general, the sand is firmer below 10 ft. (3m) and layers of soft silt were not encountered.

-15-

Figure 7. Schematic of Cloud Simulation.

Figure 8. Cloud Frequency Model

G, Shear Modulus, and E, Secant Modulus

$$\text{Shear Modulus} = G = \frac{\beta(h+z)}{2(1+\mu)} \approx \frac{\beta y}{2.6}$$

$$\text{Secant Modulus} = E = \beta(h+z) \approx y$$

Where β = function of soil depth (see chart)

h = depth of burden

z = depth from burden

μ = constant = 0.3

y = depth from surface

Soil Depth (y)		Density		β		Secant Modulus at the free surface	
(m)	(ft)	(kg/m ³)	(Lb/ft ³)	(MPa/m)	(psi/ft)	(MPa)	(psi)
0-1.5	(0-5)	1600	(100)	1.7	(75)	0.7	(100)
1.5-3.0	(5-10)	1840	(115)	2.5	(110)	1.4	(200)
3.0-	(10-)	1920	(120)	3.4	(150)	2.1	(300)

At depth of 5 ft. (1.5m) $G = 1500$ psi (10 MPa)
 $E = 4000$ psi (28 MPa)

At depth of 10 ft. (3.0m) $G = 4600$ psi (32 MPa),
 $E = 12,000$ psi (83 MPa)

Geophysical data (from seismic refraction investigation) indicates a shear modulus at a strain rate of 10^{-4} m/m of between 15,000 to 20,000 psi (100 to 140 MPa) at a depth of 10 ft. (3m).

Bearing Capacity (allowable for standard spread or mat-type foundations).

Depth, m(ft)	Load kPa(psf)
0.6 (2)	70 (1,500)
1.5 (5)	240 (5,000)
3.0 (10)	480 (10,000)

Penetration Data. The number of blows required to drive a materials sampler 12 in. (300mm) was recorded for a number of borings. To a depth of 25 ft. (7.5m) a weight of 1600 lb. (725 kg) (Kelly weight) falling a distance of 1 ft. (0.3m) was used to drive the 3 in. (76mm) diameter sampler.

Number of blows to drive an LC&A Sampler 12 in (300 m)

Depth (m)	(ft)	Average	Range	No. of Samples
0 - 1.5	(0-5)	2.6	0 - 9	74
1.5 - 3.0	(5-10)	4.2	1 - 10	42
3.0 - 4.5	(10-15)	5.9	2 - 11	31
4.5 - 6.0	(15-20)	8.0	4 - 15	19
6.0 - 7.5	(20-25)	9.0	5 - 20	17

Note: There does not appear to be a direct conversion between these data and a standard penetration test, so the results are qualitative in nature.

Water Table. Below 100 ft. (30 m)

C. 5 ENVIRONMENTAL DATA SUMMARY

C. 5. 1 Data Sources

C. 5. 1. 1 Southern California Edison Company-West Associates Data

The Southern California Edison Company/West Associates Data has been measuring direct and total insolation and dry bulb temperature in the city of Barstow about 10 miles from the pilot plant site. Data are recorded at 15 minute intervals and are available for the year 1976 on computer compatible magnetic tape. These 1976 data have been analyzed by West Associates and the results published. (Ref. 1, 2).

C. 5. 1. 2 Federal Aviation Agency

At the Daggett/San Bernardino County Airport, approximately 2 miles from the plant site, the FAA maintains a weather station which records hourly surface observations. These are forwarded to the National Climatic Center in Asheville, North Carolina where they are stored.

All hourly data from November of 1948 through December of 1964 have been converted to computer compatible format. Every third hour from January, 1965 to the present has been converted to computer compatible format. A copy of the magnetic tape containing these computer transcribed data from November, 1948 through 1976 was obtained from the National Climatic Center. This tape is the basis for several of the analyses reported in this Appendix.

C. 5. 1. 3 Aerospace Insolation/Meteorological Data Tape for 1976
Barstow

A 15 minute interval data tape for the entire year of 1976 is available. The insolation data are those observed by Southern California Edison Company. The hourly surface meteorological observations at the Daggett site, obtained from the National Climatic Center, containing temperature, wind, cloud cover and pressure information were included in the tape. Data values at 15 minute intervals were obtained by interpolation. The consistency of the data values was carefully evaluated and the resulting edited data placed on a magnetic tape in a modified SOLMET format. A separate report (Ref. 13) specifying in detail the contents, evaluation and format of this tape is available upon request.

C. 5.2 Environmental Data

C. 5.2.1 Insolation

Tables 2 and 3 provide values taken from the tape of direct normal and total hemispherical insolation and solar position at 15 minute intervals for the two design days. The insolation values listed in column 3 and 4 were measured by Southern California Edison (SCE) (Ref. 1 and 2). The values are of observed integrated energy during the 15 minute interval ending at the Local Standard Time (LST) indicated in columns 1 and 2. This time is for the end of the 15 minute period to which the values to the right apply.

The monthly mean daily direct-normal insolation is given in Table 4 (Ref. 8).

The observed number of days with direct insolation exceeding a given value is shown by months in Figure 9.1 to 9.12 (Ref. 2).

The number of days per month with insolation greater than a given insolation value D, for n or more consecutive 15 minute intervals is shown as a function of D for each month in Figures 10.1 to 10.12 (Ref. 9).

C. 5.2.2 Temperature

The dry bulb, wet bulb and dew point temperatures for the design days as taken from the environmental data tape are shown in Tables 2 and 3.

C. 5.2.2.1 Dry Bulb Temperature

The mean monthly minimum, average and maximum temperatures for the Daggett airport data are specified in Table 5 (Ref. 11).

The monthly mean and standard deviation of the dry bulb temperature is given at hourly intervals in Table 6 (Ref. 11).

The maximum and minimum dry bulb temperatures observed during a 29 year period at Daggett are shown in Tables 7.1, 7.2, and 8 (Ref. 11). Tables 7.1 and 7.2 list the maximum and minimum temperatures observed for each month of each year. Table 8 presents maximum, second highest, minimum, and next lowest temperatures observed during

the 29 year period, and indicates the number of hours at maximum values.

C.5.2.2.2 Wet Bulb Temperature

The mean monthly minimum, average and maximum wet bulb temperatures at the Daggett Airport are specified in Table 9 (Ref. 11).

The monthly mean and standard deviation of the wet bulb temperature is given at hourly intervals in Table 10 (Ref. 11).

C.5.2.3 Winds

The frequency distribution of winds by direction and velocity for seasons and annually is shown in Tables 11 through 15 (Ref. 4).

The frequency of winds by velocity, irrespective of direction for each season and annually is shown in Table 16 (Ref. 4, 8).

The frequency distribution of winds during clear daylight hours by months is shown in Table 17 (Ref. 11).

A list of maximum wind speeds (by month), and the total number of hours that wind speeds exceed 30 m/sec (by month), observed over a 29 year period, is provided in Table 18 (Ref. 11).

C.5.2.4 Atmospheric Pressure

The monthly mean and standard deviation of the ambient atmospheric pressure is provided in Table 19 (Ref. 11).

C.5.2.5 Precipitation

The average precipitation, the maximum 24 precipitation rate and the minimum precipitation is provided by months in Table 20 (Ref. 10).

C.5.2.6 Lightning

The number of direct lightning strokes per year for various height structures is shown in Table 21.

TABLE 2. INSOLATION AND METEOROLOGICAL PARAMETERS
AT 15 MINUTE INTERVALS FOR BARSTOW, CALIFORNIA

21 JUNE

TIME (INTERVAL END, LST)		INSOLATION (KJ/M**2)		TEMPERATURE (DEG. C)		WINDS		SOLAR POSITION (DEG.)	
HR	MIN	DIRECT	HEMIS.	DRY BULB	WET BULB	DIREC. (DEG.)	SPEED (M/S)	AZIMUTH	ELEV.
0	15	0.00	0.00	26.65	15.11	280.	7.00	0.00	-1.00
0	30	0.00	0.00	26.55	15.14	280.	6.90	0.00	-1.00
0	45	0.00	0.00	26.45	15.16	230.	6.80	0.00	-1.00
1	0	0.00	0.00	26.35	15.19	280.	6.70	0.00	-1.00
1	15	0.00	0.00	26.10	15.09	280.	6.65	0.00	-1.00
1	30	0.00	0.00	25.70	14.86	280.	6.64	0.00	-1.00
1	45	0.00	0.00	25.30	14.64	280.	6.63	0.00	-1.00
2	0	0.00	0.00	24.90	14.41	280.	6.62	0.00	-1.00
2	15	0.00	0.00	24.59	14.25	280.	6.57	0.00	-1.00
2	30	0.00	0.00	24.36	14.15	280.	6.48	0.00	-1.00
2	45	0.00	0.00	24.14	14.05	280.	6.40	0.00	-1.00
3	0	0.00	0.00	23.91	13.95	280.	6.31	0.00	-1.00
3	15	0.00	0.00	23.81	13.94	280.	6.23	0.00	-1.00
3	30	0.00	0.00	23.84	14.01	280.	6.15	0.00	-1.00
3	45	0.00	0.00	23.86	14.09	280.	6.08	0.00	-1.00
4	0	0.00	0.00	23.89	14.16	280.	6.00	0.00	-1.00
4	15	0.00	0.00	23.78	14.13	280.	5.95	0.00	-1.00
4	30	0.00	0.00	23.53	13.98	280.	5.94	0.00	-1.00
4	45	27.25	7.95	23.28	13.83	280.	5.93	0.00	-1.00
5	0	203.66	33.39	23.03	13.68	280.	5.92	-117.22	2.22
5	15	338.03	62.81	23.09	13.71	280.	5.94	-115.16	4.98
5	30	447.05	98.59	23.46	13.94	280.	6.00	-113.16	7.78
5	45	525.64	138.34	23.84	14.16	280.	6.05	-111.20	10.63
6	0	586.49	182.86	24.21	14.39	280.	6.11	-109.28	13.52
6	15	643.10	228.98	24.70	14.66	280.	6.17	-107.40	16.44
6	30	686.20	276.68	25.30	14.99	280.	6.24	-105.53	19.39
6	45	717.47	323.59	25.90	15.31	280.	6.30	-103.68	22.37
7	0	740.29	369.70	26.50	15.64	280.	6.37	-101.84	25.37
7	15	760.56	415.02	27.19	15.95	280.	6.44	-99.99	28.39
7	30	772.40	456.36	27.96	16.25	280.	6.52	-98.12	31.42
7	45	793.52	501.68	28.74	16.55	280.	6.60	-96.23	34.47

TABLE 2. INSOLATION AND METEOROLOGICAL PARAMETERS
AT 15 MINUTE INTERVALS FOR BARSTOW, CALIFORNIA

21 JUNE

TIME (INTERVAL END, LST)		INSOLATION (KJ/M**2)		TEMPERATURE (DEG. C)		WINDS		SOLAR POSITION (DEG.)	
HR	MIN	DIRECT	HEMIS.	DRY BULB	WET BULB	DIREC. (DEG.)	SPEED (M/S)	AZIMUTH	ELEV.
8	0	807.89	543.82	29.51	16.85	280.	6.68	-94.29	37.54
8	15	824.79	539.15	30.19	17.11	280.	6.69	-92.23	40.61
8	30	829.86	619.34	30.76	17.34	280.	6.63	-90.20	43.68
8	45	835.78	653.54	31.34	17.56	280.	6.56	-88.00	46.76
9	0	845.87	691.72	31.91	17.79	280.	6.50	-85.67	49.83
9	15	852.22	722.70	32.40	17.98	280.	6.40	-83.15	52.89
9	30	850.83	743.94	32.80	18.13	280.	6.25	-80.39	55.94
9	45	867.89	784.72	33.20	18.28	280.	6.11	-77.31	58.95
10	0	874.65	810.95	33.60	18.43	280.	5.96	-73.81	61.93
10	15	877.19	834.80	34.03	18.55	280.	5.82	-69.74	64.85
10	30	882.29	854.68	34.48	18.55	280.	5.69	-64.90	67.69
10	45	883.94	871.38	34.93	18.75	280.	5.55	-58.97	70.41
11	0	884.79	884.89	35.38	18.85	280.	5.42	-51.53	72.94
11	15	885.64	896.02	35.74	18.94	280.	5.36	-42.00	75.19
11	30	890.70	903.97	36.01	19.01	280.	5.38	-29.73	77.00
11	45	888.17	904.77	36.29	19.09	280.	5.41	-14.67	78.17
12	0	890.70	910.33	36.56	19.16	280.	5.43	2.33	78.50
12	15	891.53	911.92	36.81	19.24	280.	5.45	19.81	77.93
12	30	891.55	907.15	37.04	19.31	280.	5.48	33.37	76.56
12	45	893.24	900.00	37.26	19.39	280.	5.50	44.82	74.62
13	0	892.40	886.48	37.49	19.46	280.	5.53	53.72	72.28
13	15	889.87	876.15	37.64	19.49	280.	5.59	60.70	69.69
13	30	885.64	857.06	37.71	19.46	280.	5.68	66.30	66.94
13	45	882.25	836.40	37.79	19.44	280.	5.77	70.91	64.07
14	0	876.34	810.95	37.86	19.41	280.	5.86	74.80	61.13
14	15	872.95	785.51	37.90	19.39	280.	5.96	78.18	58.14
14	30	868.73	757.68	37.90	19.36	280.	6.08	81.16	55.12
14	45	867.04	728.27	37.90	19.34	280.	6.20	83.85	52.07
15	0	859.44	693.29	37.90	19.31	280.	6.32	86.31	49.00
15	15	853.52	657.50	37.94	19.31	280.	6.45	88.61	45.93
15	30	845.92	620.94	38.01	19.34	280.	6.60	90.77	42.85
15	45	834.08	579.39	38.09	19.36	280.	6.74	92.83	39.78

TABLE 2. INSOLATION AND METEOROLOGICAL PARAMETERS
AT 15 MINUTE INTERVALS FOR BARSTOW, CALIFORNIA

21 JUNE

TIME (INTERVAL END, LST)		INSOLATION (KJ/M**2)		TEMPERATURE (DEG. C)		WINDS		SOLAR POSITION (DEG.)	
HR	MIN	DIRECT	HEMIS.	DRY BULB	WET BULB	DIREC. (DEG.)	SPEED (M/S)	AZIMUTH	ELEV.
16	0	324.79	539.05	38.16	19.39	280.	6.89	94.81	36.71
16	15	812.05	495.32	38.01	19.30	280.	7.08	96.74	33.65
16	30	799.44	451.59	37.64	19.10	280.	7.31	98.63	30.60
16	45	780.00	406.27	37.26	18.90	280.	7.54	100.49	27.57
17	0	756.34	357.78	36.89	18.70	280.	7.77	102.34	24.55
17	15	730.14	311.66	36.51	18.54	280.	7.92	104.18	21.56
17	30	695.49	262.37	36.14	18.41	280.	8.01	106.03	18.59
17	45	658.31	214.67	35.76	18.29	280.	8.09	107.90	15.65
18	0	604.76	166.96	35.39	18.16	280.	8.18	109.80	12.74
18	15	531.55	121.64	35.08	18.08	280.	8.20	111.73	9.86
18	30	434.37	79.51	34.83	18.03	280.	8.16	113.69	7.02
18	45	294.93	45.32	34.58	17.98	280.	8.11	115.71	4.23
19	0	92.11	16.70	34.33	17.93	280.	8.07	117.79	1.48
19	15	0.00	2.39	33.90	17.79	280.	8.05	0.00	-1.00
19	30	0.00	0.00	33.30	17.56	280.	8.05	0.00	-1.00
19	45	0.00	0.00	32.70	17.34	280.	8.05	0.00	-1.00
20	0	0.00	0.00	32.10	17.11	280.	8.05	0.00	-1.00
20	15	0.00	0.00	31.63	16.95	280.	8.02	0.00	-1.00
20	30	0.00	0.00	31.28	16.85	280.	7.97	0.00	-1.00
20	45	0.00	0.00	30.93	16.75	280.	7.91	0.00	-1.00
21	0	0.00	0.00	30.58	16.65	280.	7.86	0.00	-1.00
21	15	0.00	0.00	30.31	16.60	280.	7.79	0.00	-1.00
21	30	0.00	0.00	30.14	16.60	280.	7.70	0.00	-1.00
21	45	0.00	0.00	29.96	16.60	280.	7.61	0.00	-1.00
22	0	0.00	0.00	29.79	16.60	280.	7.52	0.00	-1.00
22	15	0.00	0.00	29.48	16.49	280.	7.46	0.00	-1.00
22	30	0.00	0.00	29.03	16.26	280.	7.42	0.00	-1.00
22	45	0.00	0.00	28.58	16.04	280.	7.38	0.00	-1.00
23	0	0.00	0.00	28.13	15.81	280.	7.34	0.00	-1.00
23	15	0.00	0.00	27.75	15.63	280.	7.29	0.00	-1.00
23	30	0.00	0.00	27.45	15.48	280.	7.22	0.00	-1.00
23	45	0.00	0.00	27.15	15.33	280.	7.15	0.00	-1.00

TABLE 3. INSOLATION AND METEOROLOGICAL PARAMETERS
AT 15 MINUTE INTERVALS FOR BARSTOW, CALIFORNIA

21 DECEMBER

TIME (INTERVAL END, LST)		INSOLATION (KJ/M**2)		TEMPERATURE (DEG. C)		WINDS		SOLAR POSITION (DEG.)	
HR	MIN	DIRECT	HEMIS.	DRY BULB	WET BULB	DIREC. (DEG.)	SPEED (M/S)	AZIMUTH	ELEV.
0	15	0.00	0.00	4.35	1.23	280.	3.92	0.00	-1.00
0	30	0.00	0.00	4.45	1.28	280.	3.90	0.00	-1.00
0	45	0.00	0.00	4.55	1.33	280.	3.88	0.00	-1.00
1	0	0.00	0.00	4.65	1.38	280.	3.86	0.00	-1.00
1	15	0.00	0.00	4.55	1.33	280.	3.87	0.00	-1.00
1	30	0.00	0.00	4.25	1.18	280.	3.92	0.00	-1.00
1	45	0.00	0.00	3.95	1.03	280.	3.97	0.00	-1.00
2	0	0.00	0.00	3.65	.88	280.	4.02	0.00	-1.00
2	15	0.00	0.00	3.45	.76	280.	4.05	0.00	-1.00
2	30	0.00	0.00	3.35	.69	280.	4.08	0.00	-1.00
2	45	0.00	0.00	3.25	.61	280.	4.11	0.00	-1.00
3	0	0.00	0.00	3.15	.54	280.	4.14	0.00	-1.00
3	15	0.00	0.00	3.16	.54	280.	4.12	0.00	-1.00
3	30	0.00	0.00	3.29	.61	280.	4.07	0.00	-1.00
3	45	0.00	0.00	3.41	.69	280.	4.02	0.00	-1.00
4	0	0.00	0.00	3.54	.76	280.	3.97	0.00	-1.00
4	15	0.00	0.00	3.48	.73	280.	3.97	0.00	-1.00
4	30	0.00	0.00	3.23	.58	280.	4.02	0.00	-1.00
4	45	0.00	0.00	2.98	.43	280.	4.07	0.00	-1.00
5	0	0.00	0.00	2.73	.28	280.	4.12	0.00	-1.00
5	15	0.00	0.00	2.55	.18	280.	4.13	0.00	-1.00
5	30	0.00	0.00	2.45	.13	280.	4.10	0.00	-1.00
5	45	0.00	0.00	2.35	.08	280.	4.07	0.00	-1.00
6	0	0.00	0.00	2.25	.03	280.	4.04	0.00	-1.00
6	15	0.00	0.00	2.29	.04	280.	4.01	0.00	-1.00
6	30	0.00	0.00	2.46	.11	280.	3.98	0.00	-1.00
6	45	0.00	1.59	2.64	.19	280.	3.95	0.00	-1.00
7	0	0.00	5.56	2.81	.26	280.	3.92	0.00	-1.00
7	15	1.84	20.67	3.13	.46	280.	3.91	-59.45	1.90
7	30	3.22	22.47	3.58	.79	280.	3.91	-57.21	4.52
7	45	4.44	27.45	4.03	1.11	280.	3.90	-54.89	7.07

TABLE 3. INSOLATION AND METEOROLOGICAL PARAMETERS
AT 15 MINUTE INTERVALS FOR BARSTOW, CALIFORNIA

21 DECEMBER

TIME (INTERVAL END, LST)		INSOLATION (KJ/M**2)		TEMPERATURE (DEG. C)		WINDS		SOLAR POSITION (DEG.)	
HR	MIN	DIRECT	HEMIS.	DRY BULB	WET BULB	DIREC. (DEG.)	SPEED (M/S)	AZIMUTH	ELEV.
8	0	576.72	127.21	4.48	1.44	280.	3.90	-52.48	9.55
8	15	642.26	163.38	5.10	1.84	280.	3.93	-49.97	11.95
8	30	688.73	203.54	5.90	2.31	280.	3.98	-47.35	14.26
8	45	719.15	240.90	6.70	2.79	280.	4.04	-44.62	16.47
9	0	748.64	272.72	7.50	3.26	280.	4.09	-41.76	18.53
9	15	778.31	307.68	8.16	3.63	280.	4.12	-38.78	20.56
9	30	801.97	342.67	8.69	3.88	280.	4.11	-35.67	22.43
9	45	819.72	371.29	9.21	4.13	280.	4.11	-32.43	24.15
10	0	831.56	398.32	9.74	4.38	280.	4.10	-29.06	25.72
10	15	838.31	421.38	10.28	4.64	280.	4.12	-25.53	27.13
10	30	848.46	442.85	10.83	4.91	280.	4.15	-21.92	28.37
10	45	857.74	461.93	11.38	5.19	280.	4.18	-18.18	29.43
11	0	866.20	477.83	11.93	5.46	280.	4.21	-14.34	30.29
11	15	866.20	488.16	12.36	5.68	280.	4.25	-10.42	30.95
11	30	864.51	496.12	12.69	5.83	280.	4.30	-6.43	31.40
11	45	869.94	502.47	13.01	5.98	280.	4.34	-2.41	31.64
12	0	870.43	504.86	13.34	6.13	280.	4.39	1.64	31.66
12	15	867.89	501.68	13.61	6.25	280.	4.39	5.67	31.46
12	30	862.73	496.91	13.84	6.35	280.	4.36	9.66	31.05
12	45	867.04	486.57	14.06	6.45	280.	4.32	13.60	30.43
13	0	864.51	473.85	14.29	6.55	280.	4.29	17.46	29.61
13	15	858.59	457.16	14.44	6.61	280.	4.30	21.22	28.59
13	30	848.46	436.48	14.51	6.64	280.	4.36	24.87	27.38
13	45	841.69	412.63	14.59	6.66	280.	4.42	28.40	26.00
14	0	825.63	384.80	14.66	6.69	280.	4.48	31.80	24.46
14	15	812.96	355.39	14.66	6.68	280.	4.52	35.06	22.77
14	30	790.99	321.99	14.59	6.53	280.	4.55	38.20	20.93
14	45	769.86	287.01	14.51	6.58	280.	4.57	41.20	18.96
15	0	747.05	251.24	14.44	6.53	280.	4.60	44.08	16.88
15	15	705.64	212.28	14.39	6.49	280.	4.57	46.84	14.69
15	30	649.02	170.15	14.36	6.46	280.	4.49	49.48	12.40
15	45	599.01	130.39	14.34	6.44	280.	4.42	52.01	10.01

TABLE 3. INSOLATION AND METEOROLOGICAL PARAMETERS
AT 15 MINUTE INTERVALS FOR BARSTOW, CALIFORNIA

21 DECEMBER

TIME (INTERVAL END, LST) HR MIN	INSOLATION (KJ/H*2)		TEMPERATURE (DEG. C)		WINDS		SOLAR POSITION (DEG.)	
	DIRECT	HEMIS.	DRY BULB	WET BULB	DIREC. (DEG.)	SPEED (M/S)	AZIMUTH	ELEV.
16 0	518.88	91.43	14.31	6.41	280.	4.34	54.44	7.55
16 15	419.16	55.66	13.93	6.23	280.	4.23	56.77	5.01
16 30	143.66	23.67	13.18	5.88	280.	4.10	59.03	2.41
16 45	0.00	5.56	12.43	5.53	280.	3.97	0.00	-1.00
17 0	0.00	1.59	11.68	5.18	280.	3.84	0.00	-1.00
17 15	0.00	0.00	11.06	4.89	280.	3.74	0.00	-1.00
17 30	0.00	0.00	10.59	4.66	280.	3.68	0.00	-1.00
17 45	0.00	0.00	10.11	4.44	280.	3.61	0.00	-1.00
18 0	0.00	0.00	9.64	4.21	280.	3.55	0.00	-1.00
18 15	0.00	0.00	9.35	4.06	280.	3.48	0.00	-1.00
18 30	0.00	0.00	9.25	3.99	280.	3.40	0.00	-1.00
18 45	0.00	0.00	9.15	3.91	280.	3.31	0.00	-1.00
19 0	0.00	0.00	9.05	3.84	280.	3.23	0.00	-1.00
19 15	0.00	0.00	8.75	3.68	280.	3.21	0.00	-1.00
19 30	0.00	0.00	8.25	3.43	280.	3.26	0.00	-1.00
19 45	0.00	0.00	7.75	3.18	280.	3.31	0.00	-1.00
20 0	0.00	0.00	7.25	2.93	280.	3.36	0.00	-1.00
20 15	0.00	0.00	6.89	2.74	280.	3.38	0.00	-1.00
20 30	0.00	0.00	6.66	2.61	280.	3.38	0.00	-1.00
20 45	0.00	0.00	6.44	2.49	280.	3.38	0.00	-1.00
21 0	0.00	0.00	6.21	2.36	280.	3.38	0.00	-1.00
21 15	0.00	0.00	6.13	2.30	280.	3.38	0.00	-1.00
21 30	0.00	0.00	6.18	2.30	280.	3.37	0.00	-1.00
21 45	0.00	0.00	6.23	2.30	280.	3.37	0.00	-1.00
22 0	0.00	0.00	6.28	2.30	280.	3.36	0.00	-1.00
22 15	0.00	0.00	6.11	2.21	280.	3.46	0.00	-1.00
22 30	0.00	0.00	5.74	2.04	280.	3.49	0.00	-1.00
22 45	0.00	0.00	5.36	1.86	280.	3.58	0.00	-1.00
23 0	0.00	0.00	4.99	1.69	280.	3.67	0.00	-1.00
23 15	0.00	0.00	4.74	1.55	280.	3.74	0.00	-1.00
23 30	0.00	0.00	4.61	1.45	280.	3.79	0.00	-1.00
23 45	0.00	0.00	4.49	1.35	280.	3.85	0.00	-1.00

Table 4. Monthly Mean Daily Direct Insolation
(MJoules/m²)

	1975	1976
January		25.56
February		22.14
March		26.40
April		28.80
May		32.22
June		38.02
July		29.63
August	32.98	36.47
September	27.68	20.81
October	25.67	26.90
November	24.30	25.88
December	22.79	23.04

Figure 9. Monthly Solar Duration Curves (Number of Days Having a Daily Insolation Level Equal to or Greater Than a Specified Value).

9.1 JANUARY

9.2 FEBRUARY

Figure 9. (Continued)

9.3 MARCH

9.4 APRIL

Figure 9. (Continued)

9.5 MAY

9.6 JUNE

Figure 9. (Continued)

9.7 JULY

9.8 AUGUST

Figure 9. (Continued)

9.9 SEPTEMBER

9.10 OCTOBER

Figure 9. (Continued)

9.11 NOVEMBER

9.12 DECEMBER

Figure 10.1

JANUARY DAYS DIR. INSL. GT. D FOR N OR MORE INT.

Figure 10.2

FEBRUARY DAYS DIR. INSL. GT. D FOR N OR MORE INT.

Figure 10, 3

MARCH DAYS DIR. INSL. GT. D FOR N OR MORE INT.

Figure 10.4

APRIL DAYS DIR. INSL. GT. D FOR N OR MORE INT.

Figure 10.5

MAY DAYS DIR. INSL. GT. D FOR N OR MORE INT.

Figure 10.6

JUNE DAYS DIR. INSL. GT. D FOR N OR MORE INT.

Figure 10.7

JULY DAYS DIR. INSL. GT. D FOR N OR MORE INT.

Figure 10.8

AUGUST DAYS DIR. INSL. GT. D FOR N OR MORE INT.

Figure 10.9

SEPTEMBER DAYS DIR. INSL. GT. D FOR N OR MORE INT.

Figure 10.10

OCTOBER DAYS DIR. INSL. GT. D FOR N OR MORE INT.

Figure 10.11

NOVEMBER DAYS DIR. INSL. GT. D FOR N OR MORE INT.

Figure 10.12

DECEMBER DAYS DIR. INSL. GT. D FOR N OR MORE INT.

TABLE 5. MEAN MONTHLY MINIMUM, AVERAGE, AND MAXIMUM
 DRY BULB TEMPERATURES FOR DAGGETT, 1948-1976 (REF. 11)

TEMPERATURE (DEGREES C)			
MONTH	MEAN MINIMUM	MEAN MAXIMUM	AVERAGE
1	-4.6	21.9	7.9
2	-1.6	24.5	11.0
3	.7	28.5	13.7
4	3.9	32.5	18.1
5	8.3	36.9	22.3
6	12.2	41.5	27.4
7	17.6	42.4	31.1
8	15.7	41.5	29.8
9	12.7	39.4	26.4
10	5.4	34.1	20.0
11	-1.6	26.9	12.8
12	-3.7	21.8	3.5

TABLE 6. (REF. 11)
MONTHLY MEAN AND STANDARD DEVIATION OF THE DRY BULB TEMPERATURE (C)

	MONTH											
HOUR	1	2	3	4	5	6	7	8	9	10	11	12
0	4.3	7.2	9.6	14.2	17.5	22.8	26.7	25.4	22.1	16.0	8.7	5.1
1	4.7	7.5	9.9	13.3	17.7	22.3	26.3	25.3	21.8	15.5	9.2	5.0
2	3.5	6.2	8.4	12.7	15.9	20.9	24.7	23.6	20.5	14.7	7.8	4.2
3	3.1	5.8	7.9	12.1	15.2	19.9	23.8	22.9	19.9	14.1	7.4	3.9
4	3.5	6.2	8.4	11.5	15.6	19.8	23.9	23.0	19.7	14.0	8.0	4.0
5	2.9	5.0	6.9	10.9	14.4	19.1	22.9	21.7	18.7	13.2	6.7	3.3
6	2.9	4.6	6.9	11.8	16.1	20.9	24.4	22.7	19.2	13.2	6.4	2.9
7	2.9	5.9	9.1	13.5	18.8	23.4	26.8	25.2	21.3	14.8	8.1	3.4
8	4.7	8.4	11.9	17.3	21.4	26.5	29.9	28.3	25.1	18.7	11.0	6.0
9	7.3	11.3	14.6	19.9	23.6	28.7	32.2	30.9	28.0	21.8	14.0	9.2
10	10.3	13.3	16.3	20.5	25.4	30.2	33.8	32.7	29.4	23.1	16.0	10.8
11	12.2	15.5	18.2	23.4	27.0	32.1	35.6	34.4	31.3	25.9	18.3	13.7
12	13.5	16.8	19.4	24.5	28.2	33.3	36.7	35.6	33.1	27.0	19.5	15.1
13	14.4	17.4	20.1	24.2	29.2	34.2	37.6	36.6	33.3	27.1	20.0	15.2
14	14.7	18.0	20.6	25.7	29.3	34.8	37.9	36.9	34.2	28.0	20.4	16.2
15	14.4	17.8	20.4	25.5	29.3	34.9	37.9	36.7	33.6	27.1	19.5	15.8
16	14.3	17.4	20.2	24.1	29.3	34.7	38.2	36.8	33.0	26.5	19.1	14.4
17	11.3	15.4	18.3	23.2	27.1	33.0	36.7	35.0	31.6	24.5	15.9	11.6
18	9.4	13.1	16.2	21.4	25.5	31.3	35.2	33.7	29.7	22.5	14.2	9.9
19	9.0	12.5	15.4	19.4	24.4	30.0	34.2	32.7	28.4	21.1	13.4	8.9
20	7.0	10.4	13.4	18.2	21.9	27.6	31.8	30.6	26.6	19.6	11.6	7.4
21	6.1	9.4	12.2	17.0	20.7	26.3	30.4	29.0	25.1	18.3	10.6	6.6
22	6.3	9.4	12.2	15.9	20.5	25.6	29.7	28.4	24.3	17.5	10.6	6.3
23	4.9	7.9	10.5	15.0	18.6	24.0	27.9	26.4	22.8	16.5	9.1	5.3
STD DEV	4.4	4.0	4.2	4.5	4.5	4.3	2.8	3.0	3.7	4.2	4.2	3.9

STD DEV IS APPROXIMATELY CONSTANT FOR ALL HOURS

TABLE 7.1 YEARLY LIST OF MONTHLY MAXIMUM AND MINIMUM TEMPERATURES
(REF. 11)

MAXIMUM VALUES OF DRY BULB TEMPERATURE (C)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
***	***	***	***	***	***	***	***	***	***	29	21	1948
16	24	25	37	38	41	44	42	41	34	29	24	1949
26	26	30	35	39	42	43	42	43	36	29	24	1950
23	27	29	32	41	42	42	41	40	36	25	22	1951
19	22	27	32	38	38	41	41	40	36	26	22	1952
24	24	30	33	32	41	42	41	41	34	27	22	1953
24	28	29	36	38	43	42	42	37	36	25	19	1954
19	25	28	30	35	43	41	41	42	34	30	24	1955
23	25	32	32	36	43	41	41	39	33	27	23	1956
17	27	29	32	36	42	41	41	41	30	22	23	1957
24	25	24	34	38	42	44	41	41	35	27	28	1958
24	23	23	35	36	42	43	41	39	35	27	23	1959
21	23	31	34	39	41	43	42	40	34	29	20	1960
22	25	29	36	34	44	44	41	37	34	25	19	1961
25	24	29	34	34	40	40	41	39	34	29	23	1962
22	28	29	31	36	39	41	33	39	36	27	21	1963
19	22	28	33	35	39	41	41	36	37	24	24	1964
24	25	29	33	33	37	40	41	36	34	28	18	1965
17	19	32	33	36	40	42	42	38	31	27	22	1966
22	24	29	26	39	42	43	41	36	33	23	19	1967
20	26	29	32	39	42	42	33	39	31	25	18	1968
23	18	32	32	39	39	42	43	41	34	27	24	1969
23	23	23	31	37	43	43	43	41	34	25	19	1970
27	27	31	31	34	41	43	43	42	36	24	17	1971
19	29	32	32	37	46	43	43	36	31	23	23	1972
18	29	29	32	37	43	44	41	38	33	29	22	1973
23	25	29	31	41	43	43	40	41	36	25	21	1974
26	26	29	27	38	41	44	43	39	34	28	25	1975
24	25	23	33	38	43	44	44	42	33	29	21	1976
MEAN	21.9	24.5	28.5	32.5	36.9	41.5	42.4	41.5	39.4	34.1	26.3	21.8

TABLE 7.2 YEARLY LIST OF MONTHLY MAXIMUM AND MINIMUM TEMPERATURES
(REF. 11)

MINIMUM VALUES OF DRY BULB TEMPERATURE (C)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
***	***	***	***	***	***	***	***	***	***	-2	-7	1948
-8	-8	2	4	8	12	17	13	10	0	-2	-8	1949
-10	-4	-2	3	5	8	19	16	9	6	-2	1	1950
-3	-2	-2	3	7	11	18	13	13	5	-1	-6	1951
-5	0	-2	4	11	11	16	13	10	10	-2	-3	1952
0	-6	-2	6	6	9	17	13	12	3	-1	-7	1953
3	0	-2	6	6	8	18	13	12	3	-1	-6	1954
3	-6	-2	1	6	10	14	17	11	7	-1	-2	1955
-1	-4	0	2	6	13	14	15	13	2	-4	-8	1956
-4	-2	-1	2	8	12	17	13	13	6	-5	-2	1957
-1	-2	-1	2	8	12	17	21	9	4	-3	-2	1958
-4	-1	-1	8	7	15	16	13	11	8	0	-1	1959
-6	0	-1	9	7	16	19	14	14	7	-1	-4	1960
-4	0	-1	9	9	11	16	17	12	4	-1	-5	1961
-7	-6	-1	7	7	12	18	17	14	8	1	-5	1962
-1	4	-1	2	7	10	17	14	13	8	0	-3	1963
-5	3	-1	4	6	11	16	14	11	1	-2	-4	1964
-4	3	0	0	8	10	17	19	11	8	0	-3	1965
-4	-2	-2	3	11	14	17	19	13	6	0	-4	1966
-5	-2	-4	2	6	9	20	22	16	5	-2	-2	1967
-2	-2	-4	6	10	13	21	15	12	8	-1	-8	1968
-3	-2	-2	3	11	15	18	20	16	7	0	-1	1969
-7	-1	-2	3	10	13	21	22	11	1	2	0	1970
-8	-3	0	6	10	11	19	20	11	-1	1	-2	1971
-4	-3	4	5	9	14	18	19	13	8	2	-6	1972
-1	-1	4	5	9	16	20	15	12	8	2	1	1973
-7	0	3	8	11	17	19	21	19	8	1	-2	1974
-2	-1	1	5	9	14	18	13	18	4	-2	-6	1975
-4	1	2	6	13	14	16	17	16	8	-2	-1	1976
MEAN	-4.6	-1.6	.7	3.9	8.3	12.2	17.6	16.7	12.7	5.4	-.5	-3.7

TABLE 8. MAXIMUM AND MINIMUM DRY BULB TEMPERATURES
OBSERVED DURING A 29 YEAR PERIOD AT DAGGETT)

MONTH	MAXIMUM (C)	HOURS AT MAXIMUM VALUES	SECOND MAXIMUM (C)	HOURS AT SECOND MAX VALUES	MINIMUM (C)	HOURS AT MINIMUM VALUES	SECOND MINIMUM (C)	HOURS AT SECOND MIN VALUES
1	27	2	26	3	-12	2	-11	1
2	29	1	28	2	-8	1	-6	7
3	32	5	31	15	-2	11	-1	22
4	37	1	36	10	0	4	1	5
5	41	4	40	2	5	2	6	24
6	46	1	44	4	8	5	9	12
7	44	15	43	57	14	3	16	19
8	44	1	43	8	13	11	14	22
9	43	2	42	14	9	4	10	3
10	37	1	36	27	-1	1	0	3
11	30	2	29	17	-5	1	-4	5
12	28	1	26	6	-8	5	-7	7

TABLE 9. MEAN MONTHLY MINIMUM, AVERAGE, AND MAXIMUM
WET BULB TEMPERATURES FOR DAGGETT, 1948-1976 (REF. 11)

TEMPERATURE (DEGREES C)			
MONTH	MEAN MINIMUM	MEAN MAXIMUM	AVERAGE
1	-6.5	12.0	3.2
2	-1.5	12.5	4.9
3	-2.3	13.6	6.4
4	1.8	15.3	9.1
5	3.4	18.1	11.7
6	5.9	20.7	14.3
7	9.1	22.9	17.0
8	9.9	23.0	16.7
9	5.9	21.5	14.5
10	2.8	17.8	10.9
11	-2.8	14.4	6.5
12	-5.5	12.1	3.5

TABLE 10. (REF. 11)
MONTHLY MEAN AND STANDARD DEVIATION OF THE WET BULB TEMPERATURE (C)

	MONTH											
HOURL	1	2	3	4	5	6	7	8	9	10	11	12
0	1.2	3.1	4.5	7.6	9.8	12.5	15.1	14.8	12.8	9.1	4.2	1.6
1	1.4	3.2	4.9	7.1	10.0	12.5	15.2	15.1	13.0	8.9	4.6	1.6
2	1.3	2.5	3.8	7.0	9.1	11.6	14.3	14.0	12.2	8.5	3.7	1.1
3	.5	2.3	3.6	6.7	8.8	11.3	13.9	13.8	11.9	8.2	3.5	.9
4	.8	2.5	4.0	6.2	9.1	11.5	14.2	14.2	12.2	8.0	4.0	1.0
5	.2	1.9	3.1	6.1	8.5	11.0	13.6	13.3	11.4	7.7	3.1	.5
6	.0	1.5	3.0	6.7	9.4	12.1	14.5	13.9	11.7	7.7	2.9	.3
7	.3	2.4	4.5	7.5	10.8	13.4	15.8	15.4	13.1	8.6	4.0	.6
8	1.3	3.3	5.8	9.4	11.9	14.6	17.0	16.5	14.5	10.7	5.5	2.2
9	3.3	5.4	7.2	10.5	12.8	15.4	17.9	17.6	15.9	12.2	7.1	4.1
10	4.5	6.4	8.0	10.3	13.3	15.9	18.5	18.2	16.4	12.6	8.3	5.0
11	5.6	7.3	8.6	11.5	13.7	16.4	18.9	18.7	17.0	13.7	9.1	6.4
12	6.2	7.8	9.0	11.9	13.9	16.5	19.2	19.0	17.3	14.0	9.6	6.9
13	6.3	8.1	9.3	11.3	14.1	16.7	19.5	19.4	17.4	13.8	9.9	7.0
14	6.7	8.1	9.4	12.0	14.1	16.7	19.4	19.2	17.5	14.2	9.9	7.4
15	6.5	8.1	9.2	11.8	13.9	16.7	19.3	19.0	17.1	13.7	9.5	7.1
16	6.4	8.0	9.1	11.1	13.9	16.5	19.4	19.1	16.9	13.3	9.4	6.6
17	5.0	7.1	8.3	10.9	13.0	15.9	18.6	18.2	16.2	12.6	7.8	5.2
18	4.1	6.0	7.4	10.3	12.5	15.3	18.1	17.6	15.4	11.7	6.9	4.3
19	3.3	5.8	7.2	9.3	12.3	14.9	17.9	17.5	15.2	11.0	6.7	3.8
20	2.3	4.9	6.2	9.1	11.4	14.2	17.0	16.6	14.4	10.5	5.6	2.9
21	2.3	4.3	5.7	8.7	11.0	13.9	16.6	16.0	13.8	9.9	5.2	2.5
22	2.3	4.3	5.9	8.1	11.1	13.7	16.6	16.2	13.8	9.5	5.3	2.4
23	1.5	3.4	4.9	7.9	10.2	13.0	15.7	15.0	13.0	9.2	4.4	1.7
STD DEV	3.6	3.4	2.8	2.7	2.6	2.2	2.4	2.6	2.7	3.0	3.3	3.3
STD DEV IS APPROXIMATELY CONSTANT FOR ALL HOURS												

TABLE 11. RELATIVE WIND FREQUENCY DISTRIBUTION (DEC, JAN, FEB)

SPEED (METERS/SEC)

DIRECTION	0-1.8	1.8-3.4	3.4-5.4	5.4-8.5	8.5-11.1	11.1+	TOTAL
N	0.005512	0.005465	0.003639	0.001945	0.000324	0.000000	0.016904
NNE	0.004126	0.003334	0.003659	0.003195	0.001065	0.000000	0.015380
NE	0.009012	0.008568	0.009494	0.003427	0.000556	0.000000	0.031056
ENE	0.009750	0.009031	0.008336	0.001714	0.000046	0.000000	0.028876
E	0.021284	0.021164	0.021164	0.003473	0.000509	0.000000	0.067596
ESE	0.013366	0.012875	0.008753	0.001158	0.000463	0.000046	0.036661
SE	0.014937	0.014820	0.005233	0.000278	0.000000	0.000000	0.035268
SSE	0.004927	0.004677	0.001621	0.000046	0.000000	0.000000	0.011272
S	0.005479	0.005326	0.001389	0.000139	0.000000	0.000000	0.012333
SSW	0.002303	0.001899	0.001343	0.000509	0.000278	0.000093	0.006425
SW	0.008453	0.008012	0.005233	0.003705	0.004539	0.002223	0.032164
WSW	0.014478	0.014079	0.018663	0.014264	0.017784	0.008799	0.088065
W	0.043107	0.045478	0.080072	0.039504	0.017135	0.011207	0.236503
WNW	0.048694	0.052239	0.107396	0.052008	0.012550	0.003288	0.276175
NW	0.023567	0.023341	0.030010	0.010374	0.001250	0.000139	0.088681
NNW	0.006033	0.005372	0.003936	0.001158	0.000139	0.000000	0.016639
TOT	0.235029	0.235678	0.309961	0.136896	0.056639	0.025795	

TABLE 12. RELATIVE WIND FREQUENCY DISTRIBUTION (MAR,AP,MAY)
SPEED (METERS/SEC)

DIRECTION	0-1.8	1.8-3.4	3.4-5.4	5.4-8.5	8.5-11.1	11.1+	TOTAL
N	0.003574	0.004893	0.005300	0.002175	0.000362	0.000091	0.016394
NNE	0.003203	0.004258	0.005210	0.003081	0.000453	0.000227	0.016432
NE	0.005644	0.008562	0.010238	0.002220	0.000181	0.000000	0.026845
ENE	0.004250	0.005436	0.008834	0.003081	0.000045	0.000000	0.021646
E	0.005878	0.008472	0.013681	0.006161	0.000815	0.000045	0.035052
ESE	0.003162	0.004802	0.006206	0.002763	0.000725	0.000000	0.017659
SE	0.003528	0.004938	0.003941	0.000906	0.000362	0.000045	0.013721
SSE	0.001821	0.002628	0.001087	0.000680	0.000317	0.000045	0.006578
S	0.001360	0.002084	0.001133	0.000498	0.000272	0.000045	0.005392
SSW	0.000805	0.001133	0.001178	0.000951	0.001133	0.000181	0.005380
SW	0.002210	0.003171	0.003987	0.008970	0.015403	0.008426	0.042166
WSW	0.009657	0.005527	0.016852	0.042176	0.063468	0.028087	0.159768
W	0.008862	0.013092	0.071668	0.074613	0.058576	0.031485	0.258296
WNW	0.0011484	0.018076	0.094364	0.094863	0.032618	0.011779	0.263183
NW	0.008103	0.011914	0.040455	0.026774	0.003624	0.000951	0.091821
NNW	0.003449	0.004802	0.007565	0.003398	0.000453	0.000000	0.019667
TOT	0.070988	0.103787	0.291700	0.273308	0.178807	0.081408	

TABLE 13. RELATIVE WIND FREQUENCY DISTRIBUTION (JUNE, JULY, AUG)
SPEED (METERS/SEC)

DIRECTION	0-1.8	1.8-3.4	3.4-5.4	5.4-8.5	8.5-11.1	11.1+	TOTAL
N	0.005435	0.007435	0.007526	0.001451	0.000181	0.000000	0.022028
NNE	0.002768	0.004670	0.004080	0.000453	0.000000	0.000045	0.012016
NE	0.005963	0.009430	0.009294	0.001360	0.000363	0.000000	0.026409
ENE	0.003581	0.005667	0.007888	0.002085	0.000635	0.000000	0.019857
E	0.004685	0.007344	0.010427	0.005848	0.001451	0.000181	0.029937
ESE	0.002000	0.003173	0.005531	0.004443	0.001587	0.000272	0.017006
SE	0.002576	0.002856	0.003763	0.001632	0.000589	0.000045	0.011462
SSE	0.000775	0.000907	0.001269	0.000771	0.000272	0.000045	0.004039
S	0.000891	0.001179	0.001405	0.000816	0.000635	0.000181	0.005107
SSW	0.000697	0.001179	0.001179	0.001995	0.001043	0.000136	0.006228
SW	0.002336	0.003355	0.006710	0.014235	0.013510	0.002131	0.042277
WSW	0.003149	0.005259	0.026068	0.056079	0.053541	0.010382	0.154477
W	0.007364	0.015142	0.091214	0.079790	0.040031	0.007208	0.240749
WNW	0.008093	0.016547	0.113353	0.102820	0.019585	0.003355	0.263783
NW	0.009025	0.016003	0.054991	0.033321	0.002856	0.000136	0.116333
NNW	0.004220	0.006710	0.012558	0.004488	0.000272	0.000045	0.028293
TOT	0.063560	0.106855	0.357285	0.311587	0.136549	0.024164	

TABLE 14. RELATIVE WIND FREQUENCY DISTRIBUTION (SEPT, OCT, NOV)

SPEED (METERS/SEC)

DIRECTION	0-1.8	1.8-3.4	3.4-5.4	5.4-8.5	8.5-11.1	11.1+	TOTAL
N	0.005615	0.006230	0.004077	0.001512	0.000458	0.000092	0.017933
NNE	0.003978	0.004306	0.004077	0.002245	0.000733	0.000092	0.015430
NE	0.010411	0.012505	0.011543	0.002565	0.000321	0.000000	0.037345
ENE	0.005691	0.007237	0.010581	0.003390	0.000046	0.000046	0.026991
E	0.012859	0.015941	0.018689	0.006734	0.000595	0.000092	0.054909
ESE	0.007139	0.008686	0.009024	0.002748	0.000595	0.000000	0.028393
SE	0.007624	0.009253	0.004718	0.000733	0.000321	0.000000	0.022649
SSE	0.003546	0.003344	0.000779	0.000275	0.000137	0.000000	0.008081
S	0.004333	0.004260	0.001054	0.000229	0.000183	0.000000	0.010059
SSW	0.002415	0.002153	0.002107	0.000779	0.000595	0.000046	0.008095
SW	0.004694	0.005680	0.007329	0.006505	0.005772	0.001832	0.031611
WSW	0.009099	0.011726	0.022308	0.022262	0.016857	0.006413	0.088665
W	0.025585	0.033484	0.106133	0.056159	0.015483	0.005817	0.242662
WNW	0.029926	0.040447	0.126380	0.072649	0.013146	0.003069	0.285617
NW	0.019242	0.023957	0.041088	0.016490	0.001924	0.000092	0.102793
NNW	0.004958	0.005726	0.005680	0.001970	0.000183	0.000000	0.018517
TOT	0.157116	0.195135	0.375567	0.197242	0.057350	0.017590	

TABLE 15. RELATIVE WIND FREQUENCY DISTRIBUTION (ANNUAL)
SPEED (METERS/SEC)

DIRECTION	0-1.8	1.8-3.4	3.4-5.4	5.4-8.5	8.5-11.1	11.1+	TOTAL
N	0.005505	0.006008	0.005151	0.001770	0.000331	0.000046	0.018811
NNE	0.003806	0.004146	0.004260	0.002239	0.000560	0.000091	0.015101
NE	0.008275	0.009765	0.010142	0.002387	0.000354	0.000000	0.030923
ENE	0.005954	0.006830	0.008909	0.002570	0.000194	0.000011	0.024468
E	0.010944	0.013180	0.015956	0.005562	0.000845	0.000080	0.046567
ESE	0.006153	0.007401	0.007367	0.002787	0.000845	0.000080	0.024633
SE	0.006841	0.007926	0.004409	0.000891	0.000320	0.000023	0.020409
SSE	0.002686	0.002878	0.001188	0.000445	0.000183	0.000023	0.007403
S	0.002905	0.003198	0.001245	0.000423	0.000274	0.000057	0.008102
SSW	0.001570	0.001588	0.001451	0.001062	0.000765	0.000114	0.006550
SW	0.004378	0.005037	0.005813	0.008383	0.009845	0.003666	0.037123
WSW	0.007443	0.009114	0.020981	0.033830	0.038078	0.013466	0.122912
W	0.020489	0.026680	0.087258	0.062657	0.032939	0.013968	0.243992
WNW	0.023735	0.031694	0.110352	0.080760	0.019530	0.005391	0.271462
NW	0.015332	0.018765	0.041699	0.021815	0.002421	0.000331	0.100363
NNW	0.005032	0.005654	0.007458	0.002764	0.000263	0.000011	0.021181
TOT	0.131047	0.159863	0.333638	0.230344	0.107748	0.037359	

Table 16. Fractional Distribution of Observed Winds
for Various Speeds by Season and Annually (Ref. 8).

Wind Speed Interval (m/s)	December January February	March April May	June July August	September October November	Annual
0-1.8	.235	.071	.064	.157	.131
1.8-3.4	.236	.104	.107	.195	.160
3.4-5.4	.309	.292	.356	.376	.334
5.4-8.5	.137	.273	.312	.197	.230
8.5-11.1	.057	.179	.137	.057	.108
>11.1	.026	.081	.024	.018	.037

TABLE 17.1 MONTHLY FREQUENCY DISTRIBUTION OF WINDS
DURING CLEAR DAYLIGHT HOURS. MONTH 1. (REF. 11)

SPEED (M/SEC)

[illegible]

NOTE: THE TABLE ABOVE IS NORMALIZED BY ROWS ONLY, E.G., THE NUMBER OF TIMES A GIVEN HOUR HAD WINDS IN A SPECIFIC RANGE, THE SUN WAS UP, AND THE SKY WAS CLEAR, WAS DIVIDED BY TOTHR, THE NUMBER OF CLEAR DAYLIGHT HOURS FOR WHICH OBSERVATIONS ARE AVAILABLE. TOTHR IS NOT A CONSTANT BECAUSE FOR SOME PERIODS, OBSERVATIONS WERE MADE ONLY EVERY THREE HOURS. CLRHR IS THE FRACTION OF DAYLIGHT HOURS WHICH HAD ZERO TOTAL SKY COVER.

TABLE 17.2. MONTHLY FREQUENCY DISTRIBUTION OF WINDS
DURING CLEAR DAYLIGHT HOURS. MONTH 2. (REF. 11)

SPEED (M/SEC)

HOUR	0.0-1.8	1.8-3.4	3.4-5.4	5.4-8.5	8.5-11.1	11.1-15.7	15.7-20.8	20.8+	CLRHRS	TOTHR
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0
5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0
6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0
7	.0594	.0872	.1568	.0721	.0114	.0114	.0013	0.0000	.3995	791
8	.0575	.0929	.1416	.0951	.0243	.0177	.0022	0.0000	.4314	452
9	.0686	.0774	.1416	.0819	.0420	.0155	.0044	0.0000	.4314	452
10	.0607	.0746	.1201	.0822	.0303	.0177	0.0000	0.0000	.3856	791
11	.0929	.0708	.1106	.0885	.0354	.0177	0.0000	0.0000	.4159	452
12	.1018	.0686	.0907	.0774	.0420	.0111	.0022	0.0000	.3938	452
13	.0518	.0759	.1125	.0645	.0265	.0139	.0013	0.0000	.3464	791
14	.0487	.0885	.1261	.0531	.0288	.0177	0.0000	0.0000	.3623	452
15	.0442	.0774	.1305	.0619	.0199	.0199	0.0000	0.0000	.3540	452
16	.0417	.0733	.1201	.0632	.0291	.0139	.0025	0.0000	.3439	791
17	.0575	.0996	.1106	.0619	.0243	.0155	.0022	0.0000	.3717	452
18	.1084	.1460	.0929	.0553	.0221	.0088	.0022	0.0000	.4358	452
19	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0
20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0

NOTE: THE TABLE ABOVE IS NORMALIZED BY ROWS ONLY, E.G., THE NUMBER OF TIMES A GIVEN HOUR HAD WINDS IN A SPECIFIC RANGE, THE SUN WAS UP, AND THE SKY WAS CLEAR, WAS DIVIDED BY TOTHR, THE NUMBER OF CLEAR DAYLIGHT HOURS FOR WHICH OBSERVATIONS ARE AVAILABLE. TOTHR IS NOT A CONSTANT BECAUSE FOR SOME PERIODS, OBSERVATIONS WERE MADE ONLY EVERY THREE HOURS. CLRHRS IS THE FRACTION OF DAYLIGHT HOURS WHICH HAD ZERO TOTAL SKY COVER.

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TABLE 17.3. MONTHLY FREQUENCY DISTRIBUTION OF WINDS
DURING CLEAR DAYLIGHT HOURS. MONTH 3. (REF. 11)

SPEED (M/SEC)

HOUR	0.0-1.8	1.8-3.4	3.4-5.4	5.4-8.5	8.5-11.1	11.1-15.7	15.7-20.8	20.8+	CLRHRS	TOTHR
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0
5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0
6	.0489	.0516	.1766	.1386	.0353	.0217	.0027	0.0000	.4755	368
7	.0380	.0553	.1843	.1118	.0369	.0127	.0035	0.0000	.4424	868
8	.0484	.0302	.1855	.1190	.0544	.0343	.0060	0.0000	.4778	496
9	.0444	.0685	.1310	.1089	.0665	.0383	.0060	0.0000	.4637	496
10	.0484	.0657	.1234	.1096	.0450	.0265	0.0000	0.0000	.4187	867
11	.0544	.0887	.1149	.1008	.0343	.0282	.0020	.0020	.4234	496
12	.0464	.0887	.1210	.0887	.0282	.0262	.0060	0.0000	.4052	496
13	.0392	.0680	.1164	.0864	.0323	.0196	.0046	0.0000	.3664	868
14	.0363	.0524	.1371	.0786	.0242	.0242	.0040	.0101	.3669	496
15	.0444	.0544	.1230	.0625	.0302	.0181	.0141	.0040	.3508	496
16	.0357	.0668	.1083	.0599	.0334	.0230	.0092	.0012	.3376	868
17	.0423	.0746	.1008	.0323	.0423	.0242	.0181	0.0000	.3347	496
18	.0565	.0988	.0827	.0444	.0464	.0403	.0060	.0020	.3770	496
19	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0
20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0

NOTE: THE TABLE ABOVE IS NORMALIZED BY ROWS ONLY, E.G., THE NUMBER OF TIMES A GIVEN HOUR HAD WINDS IN A SPECIFIC RANGE, THE SUN WAS UP, AND THE SKY WAS CLEAR, WAS DIVIDED BY TOTHR, THE NUMBER OF CLEAR DAYLIGHT HOURS FOR WHICH OBSERVATIONS ARE AVAILABLE. TOTHR IS NOT A CONSTANT BECAUSE FOR SOME PERIODS, OBSERVATIONS WERE MADE ONLY EVERY THREE HOURS. CLRHRS IS THE FRACTION OF DAYLIGHT HOURS WHICH HAD ZERO TOTAL SKY COVER.

TABLE 17.4. MONTHLY FREQUENCY DISTRIBUTION OF WINDS
DURING CLEAR DAYLIGHT HOURS. MONTH 4. (REF. 11)

HOUR	SPEED (M/SEC)								CLRHRS	TOTHR
	0.0-1.8	1.8-3.4	3.4-5.4	5.4-8.5	8.5-11.1	11.1-15.7	15.7-20.8	20.8+		
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0
5	0.0000	.0250	.2125	.1750	.0250	.0375	.0063	0.0000	.4813	160
6	.0208	.0313	.2292	.1688	.0292	.0313	.0021	0.0000	.5125	480
7	.0250	.0321	.2107	.1619	.0655	.0321	.0048	.0012	.5333	840
8	.0286	.0409	.1633	.1735	.0612	.0306	.0122	0.0000	.5102	490
9	.0479	.0458	.1375	.1625	.0521	.0354	.0063	0.0000	.4875	480
10	.0440	.0690	.1429	.1417	.0583	.0274	.0048	0.0000	.4881	840
11	.0429	.0776	.1592	.0857	.0490	.0245	.0102	0.0000	.4490	490
12	.0583	.0750	.1625	.0667	.0521	.0271	.0042	0.0000	.4458	480
13	.0583	.0607	.1679	.0821	.0417	.0333	.0060	0.0000	.4500	840
14	.0551	.0878	.1245	.0653	.0367	.0408	.0082	0.0000	.4184	490
15	.0396	.0604	.1354	.0729	.0438	.0417	.0125	0.0000	.4063	480
16	.0321	.0786	.1095	.0869	.0548	.0357	.0143	0.0000	.4119	840
17	.0408	.0755	.1000	.0633	.0735	.0449	.0102	0.0000	.4082	490
18	.0646	.0979	.0854	.0500	.0688	.0708	.0083	0.0000	.4458	480
19	.0788	.0936	.0776	.1047	.1121	.0530	.0037	0.0000	.5234	812
20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0

NOTE: THE TABLE ABOVE IS NORMALIZED BY ROWS ONLY, E.G., THE NUMBER OF TIMES A GIVEN HOUR HAD WINDS IN A SPECIFIC RANGE, THE SUN WAS UP, AND THE SKY WAS CLEAR, WAS DIVIDED BY TOTHR, THE NUMBER OF CLEAR DAYLIGHT HOURS FOR WHICH OBSERVATIONS ARE AVAILABLE. TOTHR IS NOT A CONSTANT BECAUSE FOR SOME PERIODS, OBSERVATIONS WERE MADE ONLY EVERY THREE HOURS. CLRHRS IS THE FRACTION OF DAYLIGHT HOURS WHICH HAD ZERO TOTAL SKY COVER.

TABLE 17.5. MONTHLY FREQUENCY DISTRIBUTION OF WINDS
DURING CLEAR DAYLIGHT HOURS. MONTH 5. (REF. 11)

SPEED (M/SEC)

HOUR	0.0-1.8	1.8-3.4	3.4-5.4	5.4-8.5	8.5-11.1	11.1-15.7	15.7-20.8	20.8+	CLRHRS	TOTHR
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0
5	.0121	.0242	.2520	.2157	.0383	.0282	.0020	0.0000	.5726	496
6	.0060	.0343	.2702	.1935	.0565	.0403	0.0000	0.0000	.6008	496
7	.0184	.0300	.2224	.2166	.0703	.0403	.0023	0.0000	.6002	868
8	.0242	.0282	.1815	.2117	.0887	.0524	.0040	0.0000	.5907	496
9	.0302	.0423	.1935	.2117	.0786	.0403	.0020	0.0000	.5988	496
10	.0426	.0726	.1820	.1878	.0657	.0253	.0023	0.0000	.5783	868
11	.0645	.0867	.1754	.1633	.0565	.0282	.0081	0.0000	.5827	496
12	.0605	.0948	.1452	.1210	.0524	.0464	.0101	0.0000	.5302	496
13	.0380	.0853	.1636	.1221	.0703	.0311	.0092	0.0000	.5196	868
14	.0383	.0685	.1371	.1149	.0766	.0464	.0121	.0020	.4960	496
15	.0262	.0706	.1250	.1028	.0927	.0464	.0181	0.0000	.4819	496
16	.0184	.0795	.1106	.1002	.1071	.0645	.0092	0.0000	.4896	868
17	.0242	.0565	.0887	.0927	.1169	.0867	.0161	0.0000	.4819	496
18	.0242	.0504	.1048	.0706	.1452	.1028	.0121	0.0000	.5101	496
19	.0415	.0887	.0484	.1152	.1809	.0680	.0035	0.0000	.5461	868
20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0

NOTE: THE TABLE ABOVE IS NORMALIZED BY ROWS ONLY, E.G., THE NUMBER OF TIMES A GIVEN HOUR HAD WINDS IN A SPECIFIC RANGE, THE SUN WAS UP, AND THE SKY WAS CLEAR, WAS DIVIDED BY TOTHR, THE NUMBER OF CLEAR DAYLIGHT HOURS FOR WHICH OBSERVATIONS ARE AVAILABLE. TOTHR IS NOT A CONSTANT BECAUSE FOR SOME PERIODS, OBSERVATIONS WERE MADE ONLY EVERY THREE HOURS. CLRHRS IS THE FRACTION OF DAYLIGHT HOURS WHICH HAD ZERO TOTAL SKY COVER.

TABLE 17.6. MONTHLY FREQUENCY DISTRIBUTION OF WINDS
DURING CLEAR DAYLIGHT HOURS. MONTH 6. (REF. 11)

	SPEED (M/SEC)								CLRHR	TOTHR
HOUR	0.0-1.8	1.8-3.4	3.4-5.4	5.4-8.5	8.5-11.1	11.1-15.7	15.7-20.8	20.8+		
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0
5	.0042	.0354	.3750	.2667	.0771	.0208	0.0000	0.0000	.7792	480
6	.0146	.0333	.3104	.3271	.0688	.0271	.0021	0.0000	.7833	480
7	.0095	.0226	.2595	.3357	.0893	.0357	.0012	0.0000	.7536	840
8	.0208	.0250	.2375	.3375	.1250	.0375	0.0000	.0021	.7854	480
9	.0333	.0500	.2208	.3271	.1188	.0333	0.0000	0.0000	.7833	480
10	.0476	.0964	.2250	.2571	.0964	.0238	.0012	0.0000	.7476	840
11	.0854	.1333	.2417	.2167	.0750	.0271	0.0000	0.0000	.7792	480
12	.0833	.1417	.2354	.1583	.0938	.0333	.0063	0.0000	.7521	480
13	.0631	.1298	.2048	.1548	.0881	.0417	.0036	0.0000	.6857	840
14	.0646	.1146	.2021	.1542	.1063	.0438	.0063	0.0000	.6917	480
15	.0647	.1044	.1712	.1294	.1336	.0626	.0084	0.0000	.6743	479
16	.0393	.0762	.1512	.1429	.1619	.0726	.0048	.0012	.6500	840
17	.0417	.0667	.1188	.1250	.2083	.1250	.0063	0.0000	.6917	480
18	.0438	.0646	.0813	.1271	.2521	.1271	.0042	0.0000	.7000	480
19	.0393	.0571	.0560	.1702	.2714	.0952	.0048	0.0000	.6940	840
20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0

NOTE: THE TABLE ABOVE IS NORMALIZED BY ROWS ONLY, E.G., THE NUMBER OF TIMES A GIVEN HOUR HAD WINDS IN A SPECIFIC RANGE, THE SUN WAS UP, AND THE SKY WAS CLEAR, WAS DIVIDED BY TOTHR, THE NUMBER OF CLEAR DAYLIGHT HOURS FOR WHICH OBSERVATIONS ARE AVAILABLE. TOTHR IS NOT A CONSTANT BECAUSE FOR SOME PERIODS, OBSERVATIONS WERE MADE ONLY EVERY THREE HOURS. CLRHR IS THE FRACTION OF DAYLIGHT HOURS WHICH HAD ZERO TOTAL SKY COVER.

TABLE 17.7. MONTHLY FREQUENCY DISTRIBUTION OF WINDS
DURING CLEAR DAYLIGHT HOURS. MONTH 7. (REF. 11)

SPEED (M/SEC)

HOUR	0.0-1.8	1.8-3.4	3.4-5.4	5.4-8.5	8.5-11.1	11.1-15.7	15.7-20.8	20.8+	CLRHS	TOTHS
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0
5	.0081	.0524	.4032	.1774	.0161	0.0000	0.0000	.0020	.6593	496
6	.0121	.0585	.3790	.1956	.0121	.0040	0.0000	0.0000	.6613	496
7	.0161	.0541	.3445	.2074	.0207	.0012	0.0000	0.0000	.6440	868
8	.0363	.0544	.2762	.2500	.0423	.0101	0.0000	0.0000	.6694	496
9	.0645	.0625	.2359	.2560	.0464	.0020	0.0000	0.0000	.6673	496
10	.0576	.1048	.2431	.1959	.0288	.0046	0.0000	.0012	.6359	868
11	.0827	.1250	.2621	.1331	.0383	.0040	0.0000	0.0000	.6452	496
12	.0827	.1270	.2036	.1492	.0403	.0060	0.0000	0.0000	.6089	496
13	.0611	.1198	.1601	.1256	.0403	.0058	0.0000	0.0000	.5127	868
14	.0585	.0806	.1774	.1069	.0585	.0101	0.0000	0.0000	.4919	496
15	.0302	.0907	.1351	.1250	.0706	.0262	0.0000	0.0000	.4778	496
16	.0265	.0461	.1094	.1417	.0991	.0230	.0012	0.0000	.4470	868
17	.0323	.0282	.0968	.1411	.1331	.0484	.0020	0.0000	.4819	496
18	.0181	.0282	.0605	.1492	.1956	.0605	0.0000	0.0000	.5121	496
19	.0138	.0208	.0461	.1822	.2272	.0311	0.0000	0.0000	.5213	867
20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0

NOTE: THE TABLE ABOVE IS NORMALIZED BY ROWS ONLY, E.G., THE NUMBER OF TIMES A GIVEN HOUR HAD WINDS IN A SPECIFIC RANGE, THE SUN WAS UP, AND THE SKY WAS CLEAR, WAS DIVIDED BY TOTHS. THE NUMBER OF CLEAR DAYLIGHT HOURS FOR WHICH OBSERVATIONS ARE AVAILABLE. TOTHS IS NOT A CONSTANT BECAUSE FOR SOME PERIODS, OBSERVATIONS WERE MADE ONLY EVERY THREE HOURS. CLRHS IS THE FRACTION OF DAYLIGHT HOURS WHICH HAD ZERO TOTAL SKY COVER.

TABLE 17.8. MONTHLY FREQUENCY DISTRIBUTION OF WINDS
DURING CLEAR DAYLIGHT HOURS. MONTH 8. (REF. 11)

SPEED (M/SEC)										
HOUR	0.0-1.8	1.8-3.4	3.4-5.4	5.4-8.5	8.5-11.1	11.1-15.7	15.7-20.8	20.8+	CLRHRS	TOTHR
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0
5	.0230	.0428	.3684	.2039	.0132	0.0000	0.0000	0.0000	.6513	304
6	.0242	.0565	.4194	.1935	.0081	0.0000	0.0000	0.0000	.7016	496
7	.0173	.0472	.3767	.2200	.0104	.0023	0.0000	0.0000	.6740	868
8	.0363	.0645	.3125	.2601	.0242	.0060	0.0000	0.0000	.7036	496
9	.0565	.0746	.2944	.2460	.0302	.0020	0.0000	0.0000	.7036	496
10	.0645	.1429	.2558	.1993	.0184	.0035	0.0000	0.0000	.6843	868
11	.1371	.1714	.2137	.1048	.0282	.0020	0.0000	0.0000	.6573	496
12	.1028	.1653	.1895	.1008	.0343	0.0000	0.0000	0.0000	.5927	496
13	.0795	.1256	.1855	.1141	.0265	.0069	0.0000	0.0000	.5380	868
14	.0747	.0970	.1636	.0990	.0384	.0162	0.0000	0.0000	.4889	495
15	.0645	.0927	.1593	.0786	.0706	.0181	0.0000	0.0000	.4839	496
16	.0426	.0726	.1267	.1302	.0818	.0230	.0012	0.0000	.4781	868
17	.0605	.0645	.0806	.1290	.1411	.0383	0.0000	0.0000	.5141	496
18	.0484	.0444	.0907	.1250	.1855	.0464	0.0000	0.0000	.5403	496
19	.0288	.0438	.0772	.2488	.1567	.0207	0.0000	0.0000	.5760	868
20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0

NOTE: THE TABLE ABOVE IS NORMALIZED BY ROWS ONLY, E.G., THE NUMBER OF TIMES A GIVEN HOUR HAD WINDS IN A SPECIFIC RANGE, THE SUN WAS UP, AND THE SKY WAS CLEAR, WAS DIVIDED BY TOTHR, THE NUMBER OF CLEAR DAYLIGHT HOURS FOR WHICH OBSERVATIONS ARE AVAILABLE. TOTHR IS NOT A CONSTANT BECAUSE FOR SOME PERIODS, OBSERVATIONS WERE MADE ONLY EVERY THREE HOURS. CLRHRS IS THE FRACTION OF DAYLIGHT HOURS WHICH HAD ZERO TOTAL SKY COVER.

TABLE 17.9. MONTHLY FREQUENCY DISTRIBUTION OF WINDS
DURING CLEAR DAYLIGHT HOURS. MONTH 9. (REF. 11)

SPEED (M/SEC)

HOUR	0.0-1.8	1.8-3.4	3.4-5.4	5.4-8.5	8.5-11.1	11.1-15.7	15.7-20.8	20.8+	CLRHR	TOTHR
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0
5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0
6	.0375	.0896	.4042	.2208	.0188	.0021	0.0000	0.0000	.7729	480
7	.0476	.0833	.3833	.2060	.0179	.0048	0.0000	0.0000	.7429	840
8	.0438	.0771	.3438	.2688	.0375	.0083	0.0000	0.0000	.7792	480
9	.0854	.1104	.3396	.1875	.0438	.0146	0.0000	0.0000	.7813	480
10	.1060	.1524	.2679	.1679	.0417	.0083	0.0000	0.0000	.7440	840
11	.1083	.1792	.2896	.1438	.0438	.0063	.0021	0.0000	.7729	480
12	.1104	.2000	.2438	.1146	.0417	.0146	0.0000	0.0000	.7250	480
13	.1012	.1595	.2214	.1179	.0440	.0119	.0012	0.0000	.6571	840
14	.1000	.1667	.2208	.1188	.0583	.0083	.0021	0.0000	.6750	480
15	.1000	.1292	.2146	.1333	.0667	.0188	.0021	0.0000	.6646	480
16	.0762	.1155	.1786	.1286	.0774	.0214	.0012	0.0000	.5988	840
17	.0939	.1378	.1524	.1420	.1086	.0334	0.0000	0.0000	.6681	479
18	.1188	.1417	.1646	.1583	.1146	.0167	0.0000	0.0000	.7146	480
19	.0893	.1250	.1488	.1905	.0536	.0179	0.0000	0.0000	.6250	168
20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0

NOTE: THE TABLE ABOVE IS NORMALIZED BY ROWS ONLY, E.G., THE NUMBER OF TIMES A GIVEN HOUR HAD WINDS IN A SPECIFIC RANGE, THE SUN WAS UP, AND THE SKY WAS CLEAR, WAS DIVIDED BY TOTHR. THE NUMBER OF CLEAR DAYLIGHT HOURS FOR WHICH OBSERVATIONS ARE AVAILABLE. TOTHR IS NOT A CONSTANT BECAUSE FOR SOME PERIODS, OBSERVATIONS WERE MADE ONLY EVERY THREE HOURS. CLRHR IS THE FRACTION OF DAYLIGHT HOURS WHICH HAD ZERO TOTAL SKY COVER.

TABLE 17.10. MONTHLY FREQUENCY DISTRIBUTION OF WINDS
DURING CLEAR DAYLIGHT HOURS. MONTH 10. (REF. 11)

SPEED (M/SEC)

HOUR	0.0-1.8	1.8-3.4	3.4-5.4	5.4-8.5	8.5-11.1	11.1-15.7	15.7-20.8	20.8+	CLRHS	TOTHS
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0
5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0
6	.0544	.0806	.2964	.1895	.0121	.0040	.0020	0.0000	.6391	496
7	.0508	.0947	.2968	.1605	.0219	.0046	0.0000	0.0000	.6293	866
8	.0766	.0524	.2480	.2359	.0222	.0141	.0040	0.0000	.6532	496
9	.0685	.0907	.2802	.1875	.0181	.0202	.0020	0.0000	.6673	496
10	.0855	.1409	.2390	.1305	.0231	.0127	.0012	0.0012	.6339	866
11	.1190	.1653	.2137	.1028	.0242	.0141	.0020	.0020	.6431	496
12	.1290	.1734	.1935	.0948	.0202	.0040	.0060	.0020	.6230	496
13	.0983	.1642	.2116	.0659	.0277	.0150	.0046	0.0000	.5873	865
14	.1230	.1371	.2177	.0726	.0323	.0121	.0101	0.0000	.6048	496
15	.1190	.1532	.1794	.0827	.0343	.0202	.0060	.0020	.5968	496
16	.0901	.1536	.1917	.0774	.0346	.0150	.0023	0.0000	.5647	866
17	.1452	.1694	.1411	.0544	.0383	.0081	.0040	0.0000	.5605	496
18	.1360	.1544	.1581	.0882	.0515	.0110	.0037	.0037	.6066	272
19	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0
20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0

NOTE: THE TABLE ABOVE IS NORMALIZED BY ROWS ONLY, E.G., THE NUMBER OF TIMES A GIVEN HOUR HAD WINDS IN A SPECIFIC RANGE, THE SUN WAS UP, AND THE SKY WAS CLEAR, WAS DIVIDED BY TOTHS, THE NUMBER OF CLEAR DAYLIGHT HOURS FOR WHICH OBSERVATIONS ARE AVAILABLE. TOTHS IS NOT A CONSTANT BECAUSE FOR SOME PERIODS, OBSERVATIONS WERE MADE ONLY EVERY THREE HOURS. CLRHS IS THE FRACTION OF DAYLIGHT HOURS WHICH HAD ZERO TOTAL SKY COVER.

TABLE 17.12. MONTHLY FREQUENCY DISTRIBUTION OF WINDS
DURING CLEAR DAYLIGHT HOURS. MONTH 12. (REF. 11)

SPEED (M/SEC)

HOUR	0.0-1.8	1.8-3.4	3.4-5.4	5.4-8.5	8.5-11.1	11.1-15.7	15.7-20.8	20.8+	CLRHR	TOTHR
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0
5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0
6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0
7	.0590	.0968	.1791	.0768	.0078	.0056	0.0000	0.0000	.4249	899
8	.0911	.0683	.1708	.0683	.0114	.0038	.0038	0.0000	.4175	527
9	.0854	.0607	.1537	.0930	.0133	.0114	0.0000	0.0000	.4175	527
10	.0756	.0834	.1635	.0667	.0111	.0067	.0011	0.0000	.4082	899
11	.1176	.0911	.1271	.0417	.0076	.0095	0.0000	0.0000	.3947	527
12	.1082	.1063	.1252	.0304	.0171	.0076	0.0000	0.0000	.3947	527
13	.0901	.1012	.1235	.0389	.0145	.0111	.0011	.0011	.3815	899
14	.1139	.0854	.1309	.0380	.0057	.0114	.0019	0.0000	.3871	527
15	.0968	.1233	.1328	.0228	.0114	.0095	.0019	0.0000	.3985	527
16	.0768	.1546	.0957	.0267	.0156	.0111	0.0000	0.0000	.3804	899
17	.1575	.1499	.0892	.0228	.0152	.0057	0.0000	0.0000	.4402	527
18	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0
19	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0
20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0

NOTE: THE TABLE ABOVE IS NORMALIZED BY ROWS ONLY, E.G., THE NUMBER OF TIMES A GIVEN HOUR HAD WINDS IN A SPECIFIC RANGE, THE SUN WAS UP, AND THE SKY WAS CLEAR, WAS DIVIDED BY TOTHR, THE NUMBER OF CLEAR DAYLIGHT HOURS FOR WHICH OBSERVATIONS ARE AVAILABLE. TOTHR IS NOT A CONSTANT BECAUSE FOR SOME PERIODS, OBSERVATIONS WERE MADE ONLY EVERY THREE HOURS. CLRHR IS THE FRACTION OF DAYLIGHT HOURS WHICH HAD ZERO TOTAL SKY COVER.

FRACTIONAL DISTRIBUTION OF OBSERVED WINDS FOR VARIOUS SPEEDS BY MONTH AND ANNUALLY

WIND SPEED INTERVAL (M/SEC)

MONTH	WIND SPEED INTERVAL (M/SEC)								CLRHRS	TOTHR
	0.0-1.8	1.8-3.4	3.4-5.4	5.4-8.5	8.5-11.1	11.1-15.7	15.7-20.8	20.8+		
JANUARY	.0830	.0852	.1159	.0408	.0138	.0117	.0033	.0003	.3540	7008
FEBRUARY	.0636	.0844	.1224	.0712	.0273	.0149	.0015	0.0000	.3853	6780
MARCH	.0439	.0661	.1308	.0877	.0388	.0250	.0060	.0013	.3996	7807
APRIL	.0450	.0655	.1444	.1093	.0582	.0374	.0075	.0001	.4673	8692
MAY	.0314	.0629	.1571	.1491	.0889	.0490	.0070	.0001	.5456	9300
JUNE	.0429	.0767	.2007	.2147	.1331	.0538	.0032	.0002	.7253	8999
JULY	.0390	.0700	.2032	.1694	.0737	.0153	.0002	.0002	.5710	9299
AUGUST	.0559	.0878	.2145	.1666	.0590	.0124	.0001	0.0000	.5962	9107
SEPTEMBER	.0861	.1327	.2609	.1615	.0531	.0129	.0006	0.0000	.7078	7847
OCTOBER	.0950	.1335	.2251	.1176	.0269	.0119	.0034	.0006	.6140	7703
NOVEMBER	.0950	.1088	.1705	.0813	.0203	.0121	.0013	.0003	.4897	7084
DECEMBER	.0929	.1034	.1366	.0487	.0119	.0085	.0008	.0001	.4030	7285
ANNUAL	.0645	.0897	.1735	.1182	.0504	.0221	.0029	.0000	.5216	96911

 

MONTHLY WIND SPEED MAXIMUM VALUES AND
NUMBER OF HOURS HAVING WIND SPEEDS
EQUAL TO OR GREATER THAN 30 M/SEC

MONTH	NUMBER GE 30M/SEC	MAXIMUM WIND (M/SEC)
JAN	0	27
FEB	0	28
MAR	0	28
APR	0	28
MAY	0	28
JUN	0	28
JUL	0	28
AUG	0	28
SEP	0	28
OCT	0	28
NOV	0	28
DEC	0	28

TABLE 18

TABLE 19. (REF. 11)

MONTHLY MEAN AND STANDARD DEVIATION
OF THE AMBIENT ATMOSPHERIC PRESSURE
(MBAR)

MEAN	STD DEV	MONTH
950.74	5.46	1
949.42	5.15	2
946.77	4.81	3
945.23	3.96	4
943.81	3.47	5
942.47	2.84	6
943.83	2.52	7
944.27	2.48	8
944.09	2.97	9
946.65	3.94	10
949.95	4.87	11
951.08	5.58	12

Table 20. Precipitation Summary Barstow-Daggett Airport (1956-1970)
10 MWe Pilot Plant Site

Precipitation (cm)	Month											
	J	F	M	A	M	J	J	A	S	O	N	D
Average	0.79	0.81	0.71	0.79	0.18	0.13	0.79	1.52	1.30	0.56	0.94	0.89
Maximum	1.85	1.78	2.24	1.65	0.94	0.81	2.44	5.23	2.82	1.68	2.74	2.57
24-hr												
Maximum	2.49	3.81	2.57	4.65	1.24	0.81	2.44	8.18	5.87	2.57	4.42	5.13
Monthly												
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Average Annual 9.40 cm

**Table 21. Number of Direct Lightning Strokes per Year
for Various Height Structures (Ref. 22)**

Height		Strikes/Year Observed for 32 Thunderstorms/Year	Strikes Estimated for 8 Thunderstorms/Year
(m)	(ft)		
30	100	0.15	.04
60	200	0.45	.11
90	300	0.90	.23
120	400	1.40	.35
150	500	1.75	.44
180	600	2.10	.53
210	700	2.30	.58

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