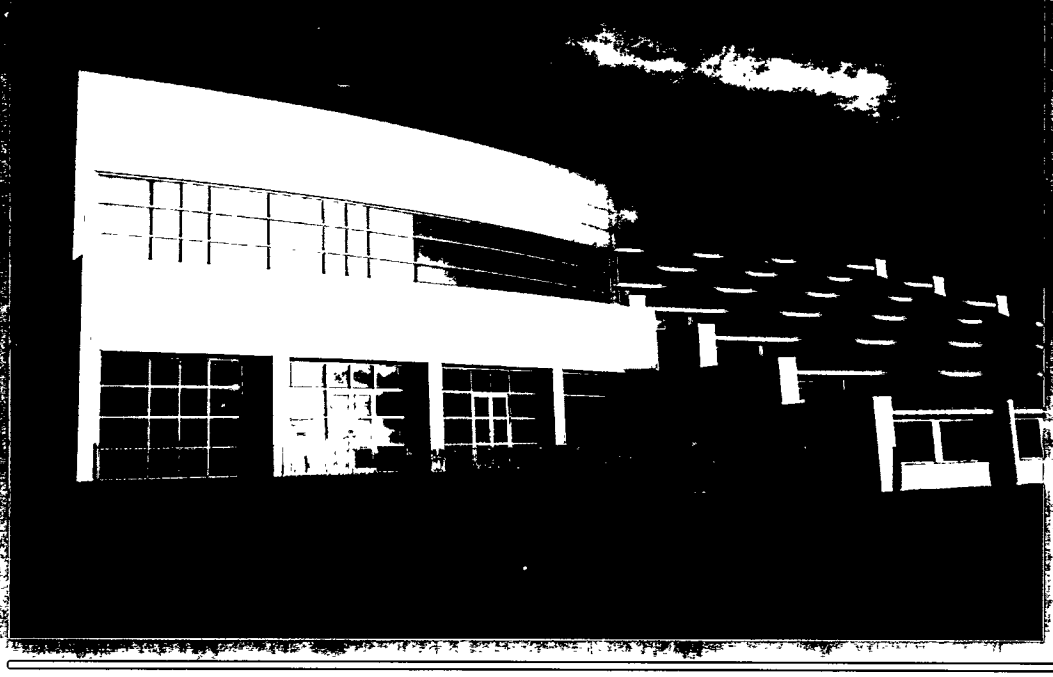

Solar Radiation Data Manual for Buildings

NREL

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Solar Radiation Data Manual for Buildings

NREL

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Acknowledgments

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Preface

For use by architects and engineers, the *Solar Radiation Data Manual for Buildings* provides solar resource information for common window orientations for the United States and its territories. This information was modeled using solar radiation and meteorological data gathered from 1961 to 1990 and will permit quick evaluations of passive solar and daylighting features for buildings.

This manual was produced by the National Renewable Energy Laboratory's (NREL's) Analytic Studies Division under the Resource Assessment Program, which is funded and monitored by the U.S. Department of Energy's Office of Solar Energy Conversion.

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Approved for the
National Renewable Energy Laboratory

Thomas D. Bath, Director
Analytic Studies Division

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Resource Assessment Program

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Architects and engineers use solar resource information to help design passive solar and daylighting features for buildings. Solar resource information includes data on how much solar radiation and illuminance are available for different window orientations, and how they vary.

This manual provides solar radiation and illuminance values for a horizontal window and four vertical windows (facing north, east, south, and west) for 239 stations in the United States and its territories. The solar radiation values are monthly and yearly averages for the period of 1961–1990. Included are values showing the solar radiation incident on the window and the amount transmitted into the living space, with and without exterior shading of the window. Illuminance values are presented for average diurnal profiles for 4 months of the year.

In addition to the solar radiation and illuminance data, this manual contains tables listing climatic conditions such as average temperature, average daily minimum and maximum temperature, record minimum and maximum temperature, average heating and cooling degree days, average humidity ratio, average wind speed, and average clearness index.

The solar radiation, illuminance, and climatic data are presented in tables. Data for each station are presented on a single page, and the pages are arranged alphabetically by the state or territory two-letter abbreviation. Within a state or territory, the pages are arranged alphabetically by city or island.

Map showing the location of the 239 stations in the National Solar Radiation Data Base from which data were used to calculate values for this manual

Technical Background

The solar radiation and illuminance data in this manual were modeled using data from the National Solar Radiation Data Base (NSRDB) Version 1.1, which was completed in March 1994 by the National Renewable Energy Laboratory (NREL). The NSRDB contains hourly values of measured or modeled solar radiation and meteorological data for 239 stations for the 30-year period from 1961–1990. A complete description of the NSRDB and how it was produced is presented in its user's manual (NSRDB—Vol. 1 1992) and the final technical report (NSRDB—Vol. 2 1995). The original version of the NSRDB, Version 1.0, was completed in August 1992. Version 1.1 corrects two types of minor errors in Version 1.0 that affected about 10% of the stations (Rymes 1994).

There are two types of stations in the NSRDB: primary (denoted by asterisks in the station map) and secondary (denoted by dots in the station map). Primary stations, of which there are 56, measured solar radiation for a part (from 1 to 27 years) of the 30-year period. The remaining 183 stations, designated secondary stations, made no solar radiation measurements. Their data are modeled solar radiation values derived from meteorological data such as cloud cover. Both primary and secondary stations are National Weather Service stations that collected meteorological data for the period 1961–1990.

Succeeding the older 1952–1975 SOLMET/ERSATZ data base, the NSRDB accounts for any recent climate changes and provides more accurate values of solar radiation. The NSRDB data are more accurate for several reasons:

- More measured data
- Better model for estimating values (More than 90% of the solar radiation data in both data bases are modeled.)
- Improved instrument calibration methods
- Rigorous procedures for assessing quality of data.

Results of a comparison of the NSRDB with the SOLMET/ERSATZ data base provide the incentive to develop new solar radiation resource products, such as this data manual. On an annual basis, 40% of the NSRDB and SOLMET/ERSATZ station values are in disagreement for global horizontal radiation by more than 5%; some station values show disagreement of up to 18% (Marion and Myers 1992). For direct beam radiation, 60% of the NSRDB and SOLMET/ERSATZ station values are in disagreement by more than 5%; some stations show disagreement of up to 33%. Disagreement between the two data bases is even greater when compared on a monthly basis. Most of the disagreement is attributed to differences in the instruments' calibration procedures and models.

This manual presents solar radiation and illuminance values to enable quick estimates of the incident solar energy for common window orientations. The solar radiation and illuminance values were computed using models and NSRDB hourly values of direct beam, global horizontal, and diffuse horizontal solar radiation, and dew point temperature. Climatic data were obtained from the NSRDB and from climatic data sets provided by the National Climatic Data Center, Asheville, North Carolina. The Appendix describes in more detail how this manual was produced.

References

Marion, W.; Myers, D. (1992). *A Comparison of Data from SOLMET/ERSATZ and the National Solar Radiation Data Base*. NREL/TP-463-5118, Golden, CO: National Renewable Energy Laboratory.

NSRDB—Vol. 1 (1992). *User's Manual—National Solar Radiation Data Base (1961–1990). Version 1.0.* Golden, CO: National Renewable Energy Laboratory and Asheville, NC: National Climatic Data Center.

NSRDB—Vol. 2 (1995). Final Technical Report: *National Solar Radiation Data Base (1961–1990).* NREL/TP-463-5784, Golden, CO: National Renewable Energy Laboratory.

Rymes, M. (1994). "Beyond the NSRDB Version 1.0." *Proceedings of the 1994 Annual American Solar Energy Society Conference; June 25-30, 1994, San Jose, CA.*

For each of the 239 stations, a data page contains a description of the station location; presents average solar radiation and illuminance values for a horizontal window and vertical windows facing north, east, south, and west; and gives average climatic conditions. Standard International (SI) units are used for illuminance; otherwise, English units are used. To convert values to other units, use the conversion factor table on the inside back cover.

Station Description

Information at the top of each page describes the station.

- City and state in which the station is located
- Station Weather Bureau Army Navy (WBAN) identification number
- Latitude (degrees; north)
- Longitude (degrees; east or west)
- Elevation of station (feet)
- Mean atmospheric pressure of station (pounds per square inch absolute)
- Type of station (primary or secondary).

Solar Radiation

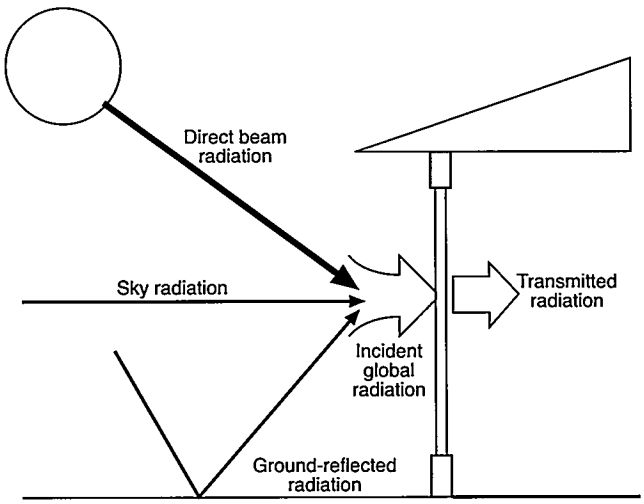
For the period 1961–1990, tables provide solar radiation data in units of Btu/ft^2/day for five surfaces: a horizontal window and vertical windows facing north, east, south, and west. An estimate of the uncertainty (± %) of the solar radiation data is given in the table headings. The manual includes the solar radiation incident on the outside of the window and the solar radiation transmitted through the window into the living space.

Incident solar radiation. For the five windows, monthly and yearly averages of incident solar radiation are given in terms of global radiation, clear-day global radiation, and diffuse radiation.

Global radiation is the total radiation received by the window and is the sum of the direct beam radiation component, sky radiation, and radiation reflected from the ground in front of the surface. Clear-day global radiation represents the global radiation obtainable under clear skies.

The diffuse radiation data in the tables do not include the direct beam radiation component. Diffuse radiation is the sum of sky radiation and radiation reflected from the ground in front of the surface. The ground-reflected radiation was calculated using a ground reflectivity or albedo of 0.2, a nominal value for green vegetation and some soil types. Values in the tables may be adjusted for other albedo values by using equation 4 from the Appendix.

Standard deviations and minimum and maximum monthly and yearly values of global horizontal radiation are provided to show the variability of the solar resource at a station. These quantities pertain to monthly and yearly values, rather than to single days.



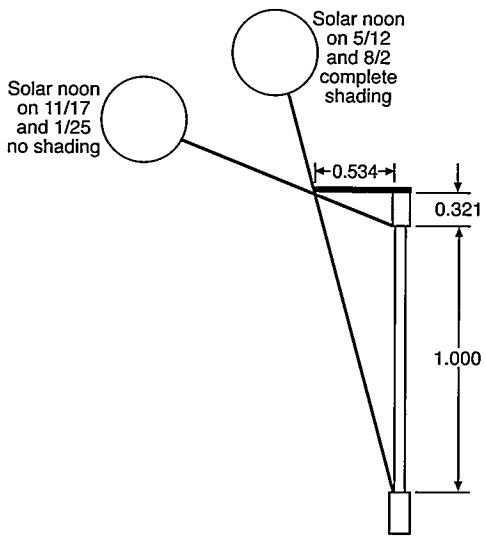
Incident global solar radiation includes direct beam, sky, and ground-reflected radiation

Transmitted solar radiation. The solar radiation transmitted into a living space is less than the radiation that strikes the outside of a window because of losses associated with radiation reflected off of and absorbed by the glass. The manual presents data for windows with conventional, single-strength clear double glazing and a glass thickness of 0.125 in. (3.18 mm).

Tables contain values for unshaded and shaded windows. Unshaded values are for windows with no external shading. Shaded values are for windows shaded by a roof overhang. The roof overhang and window geometry are shown at the top of each data page. The overhang width and the vertical distance from the window to the overhang are given in dimensionless units for a window height of 1.0.

For south-facing windows, the geometry balances the need for maximum heat gain during the heating season without creating unreasonable heat gain during the cooling season. The same shading geometry is used for all vertical windows for a station. The shading geometry is not applicable for the horizontal surface; consequently, shaded transmitted solar radiation values for a horizontal surface are not included.

As described in the Appendix, the shading geometry is generally a function of the station latitude but consideration is also given to heating and cooling requirements. For example, Hawaii, Guam, and Puerto Rico have zero heating degree days; consequently, their shading geometry provides complete shading of south-facing windows at noon throughout the year. Alaskan stations, with no summer cooling loads, have shading geometries that do not shade south-facing windows at noon throughout the year.



Shading geometry and sun positions for 40° north latitude

For south-facing windows, the shading geometries provide guidance for the appropriate dimensions of roof overhangs. However, situations may require a different geometry, depending on the balance between heating and cooling loads for the particular building and factors such as required window sizes and building practices. For east- and west-facing windows, overhangs are not particularly effective in preventing unwanted heat gain. Additional shading strategies such as vertical louvers may be needed.

Solar Radiation Graph

A graph at the top of each data page shows the variability, by month and window orientation, of the average amount of solar radiation transmitted through the windows into the living space. For the vertical windows, the graphs are based on the data values for transmitted solar radiation with external shading. The shading geometry is shown adjacent to the graph.

Climatic Conditions

The tables containing average climatic condition information list monthly and yearly values for the following parameters.

- Monthly and yearly average temperature (°F)
- Average daily minimum temperature (°F)
- Average daily maximum temperature (°F)
- Record minimum temperature (°F)
- Record maximum temperature (°F)
- Average heating degree days (HDD), base 65°F
- Average cooling degree days (CDD), base 65°F
- Average humidity ratio (lb water per lb dry air)
- Average wind speed (mph)
- Average clearness index, K_t.

Degree days indicate heating and cooling requirements of buildings. They are defined as the difference between the average temperature for the day and a base temperature. If the average for the day (calculated by averaging the maximum and minimum temperature for the day) is less than the base value, then the difference is designated as heating degree days. If the average is greater than the base value, the difference is designated as cooling degree days.

The clearness index (K_t) is the station's global horizontal solar radiation divided by its extraterrestrial horizontal radiation. Because clouds decrease the amount of solar radiation reaching the earth, stations in cloudy regions will have lower values for K_t than stations in regions with fewer clouds.

Illuminance

The illuminance tables contain diurnal profiles of the average illuminance incident on five surfaces: a horizontal window and vertical windows facing north, east, south, and west. The illuminance profiles are given for 4 months of the year (March, June, September, and December) and consist of two data values, separated by a slash, for each of the following hours: 9 a.m., 11 a.m., 1 p.m., 3 p.m., and 5 p.m. The value before the slash is the average illuminance for mostly clear conditions (total cloud cover less than 50%), and the value after the slash is the average illuminance for mostly cloudy conditions (total cloud cover equal to or greater than 50%).

The last line in the illuminance tables indicates the percentage of time during the hour that the station location was mostly clear (M. Clr.). These values, along with the illuminance values, can be used to determine the average hourly illuminance:

Average illuminance =

[(M. Clr .) * (illuminance for mostly clear)

+ (100 – M. Clr.) * (illuminance for mostly cloudy)] / 100.

The illuminance data are given in units of kilolux-hours (klux-hr) and represent the illuminance received during the preceding hour. For example, data for 3 p.m. include the illuminance received from 2 p.m. to 3 p.m. The hours for March and December are local standard time. The hours for June and September are either local standard time or daylight saving time, depending on whether the station observes daylight saving time. Arizona, Hawaii, Indiana (except for Evansville), Puerto Rico, and Guam do not observe daylight saving time; consequently, the hours for June and September for these stations are local standard time. For all other stations, the hours for June and September are daylight saving time. An estimate of the uncertainty (± %) of the illuminance data is given in the table headings.

Electronic Data

The data presented in the data tables, with the exception of the graph and shading geometry figure, are also available in ASCII format. These data can be imported into popular spreadsheet programs.

To obtain the data set on floppy disk, please contact the NREL Technical Inquiry Service at 303/275-4099. A "readme" file that describes the contents of the data set is included on the floppy disk.

The data set is available over Internet from NREL's Renewable Resource Data Center (RReDC). The Uniform Resource Locator (URL) address of the RReDC is "http://rredc.nrel.gov." Users should have World Wide Web (WWW) browsing software, such as Mosaic or Netscape, to access the RReDC.

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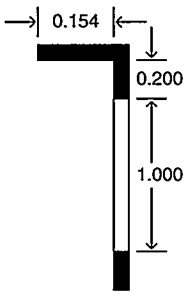
Anchorage, AK

WBAN NO. 26451

LATITUDE: 61.17° N
LONGITUDE: 150.02° W
ELEVATION: 115 feet
MEAN PRESSURE: 14.6 psia

STATION TYPE: Secondary



Shading Geometry
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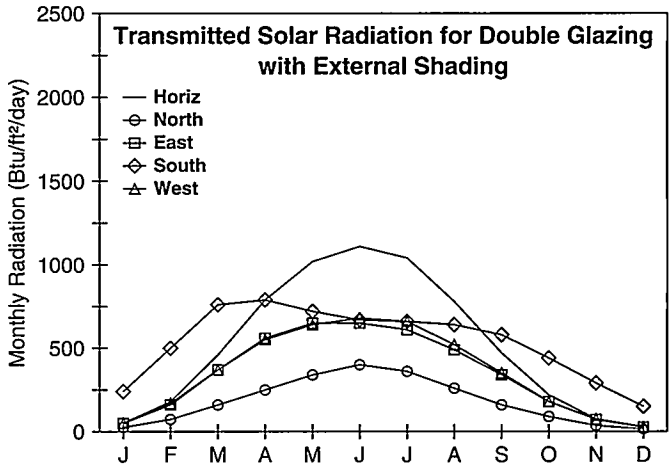


Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	90	300	720	1150	1440	1560	1470	1120	710	350	130	49	760
	Std.Dev.	10	41	65	115	129	149	134	105	70	31	15	6	25
	Minimum	70	230	550	1000	1190	1310	1160	920	580	280	110	38	710
	Maximum	110	400	830	1420	1660	1890	1700	1320	820	430	160	57	800
	Diffuse	66	190	410	600	750	850	800	630	410	230	92	39	420
	Clear-Day Global	110	370	910	1640	2210	2490	2330	1790	1110	500	160	60	1150
North	Global	38	110	240	370	510	600	550	390	240	130	53	22	270
	Diffuse	38	110	240	360	460	520	490	370	240	130	53	22	250
	Clear-Day Global	38	100	210	370	630	840	730	430	240	120	51	25	320
East	Global	81	240	540	800	930	940	870	710	490	260	110	44	500
	Diffuse	49	140	310	460	550	600	560	450	300	160	69	27	310
	Clear-Day Global	140	400	830	1310	1610	1740	1650	1370	950	500	190	82	900
South	Global	310	660	1040	1120	1060	1010	990	930	810	600	380	190	760
	Diffuse	110	250	420	530	580	620	590	490	360	240	140	70	370
	Clear-Day Global	690	1340	1840	1910	1750	1660	1670	1770	1800	1470	840	470	1440
West	Global	82	250	540	790	920	980	950	740	500	270	120	44	520
	Diffuse	49	150	310	460	550	610	580	450	300	160	69	28	310
	Clear-Day Global	140	400	830	1310	1610	1740	1650	1370	950	500	190	82	900

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	51	180	460	790	1020	1110	1040	780	470	220	75	28	520
North	Unshaded	26	76	160	250	350	410	370	270	170	91	37	15	190
	Shaded	25	74	160	250	340	400	360	260	160	89	36	15	180
East	Unshaded	51	170	380	570	670	670	620	500	340	180	73	27	350
	Shaded	50	160	370	560	650	650	610	490	340	180	72	26	350
South	Unshaded	240	500	770	800	730	690	680	650	590	450	290	150	540
	Shaded	240	500	760	790	720	670	660	640	580	440	290	150	540
West	Unshaded	52	170	380	560	660	700	680	530	350	180	76	27	360
	Shaded	51	170	370	550	640	680	660	520	350	180	75	26	360

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	14.9	18.7	25.7	35.8	46.6	54.4	58.4	56.3	48.4	34.6	21.2	16.3	35.9
Daily Minimum Temp	8.4	11.5	18.1	28.6	38.8	47.2	51.7	49.5	41.6	28.7	15.1	10.0	29.1
Daily Maximum Temp	21.4	25.8	33.1	42.8	54.4	61.6	65.2	63.0	55.2	40.5	27.2	22.5	42.7
Record Minimum Temp	-34.0	-26.0	-24.0	-4.0	17.0	33.0	38.0	31.0	20.0	-5.0	-21.0	-30.0	-34.0
Record Maximum Temp	50.0	48.0	51.0	65.0	77.0	85.0	82.0	82.0	73.0	61.0	53.0	47.0	85.0
HDD, Base 65°F	1553	1296	1218	876	570	318	205	270	498	942	1314	1510	10570
CDD, Base 65°F	0	0	0	0	0	0	0	0	0	0	0	0	0
Humidity Ratio (#w/#da)	0.0016	0.0017	0.0020	0.0028	0.0041	0.0058	0.0073	0.0072	0.0055	0.0033	0.0020	0.0017	0.0038
Wind Speed (mph)	6.5	6.9	6.8	7.3	8.3	8.4	7.2	6.9	6.6	6.8	6.4	6.2	7.0
Clearness Index, Kt	0.34	0.42	0.48	0.48	0.45	0.43	0.43	0.41	0.38	0.35	0.34	0.29	0.43

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

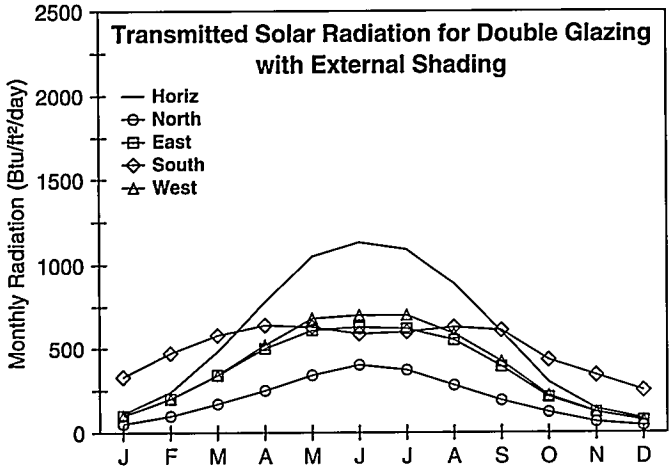
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	9/7	31/21	45/31	42/29	24/17	34/20	59/35	76/47	80/50	68/43	7/4	30/16	48/26	51/28	39/21	0/0	0/0	6/5	4/3	0/0
North	4/3	9/9	11/12	10/11	7/7	15/10	13/13	15/16	15/16	14/14	3/2	8/7	11/10	11/11	10/8	0/0	0/0	3/2	2/1	0/0
East	30/9	54/23	25/17	10/11	7/7	70/24	76/34	48/28	15/16	14/14	27/6	59/18	41/18	11/11	10/8	0/0	0/0	6/3	2/1	0/0
South	13/5	57/24	85/37	79/34	43/17	9/8	39/22	67/36	74/40	55/31	5/2	42/14	75/27	83/30	58/20	0/0	0/0	28/7	16/4	0/0
West	4/3	9/9	11/12	39/21	54/20	9/8	13/13	15/16	26/21	64/35	3/2	8/7	11/10	24/14	56/19	0/0	0/0	3/2	8/2	0/0
M. Clr (%hrs)	30	29	30	31	29	14	17	17	18	18	18	18	20	20	21	27	24	24	24	26

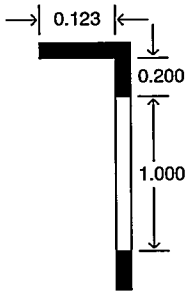
Annette, AK

WBAN NO. 25308

LATITUDE: 55.03° N
LONGITUDE: 131.57° W
ELEVATION: 112 feet
MEAN PRESSURE: 14.6 psia

STATION TYPE: Secondary





Shading Geometry
(Not to Scale)

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	190	390	710	1120	1480	1590	1540	1260	870	450	230	140	830
	Std.Dev.	32	68	90	126	118	180	189	133	90	41	37	18	41
	Minimum	130	270	520	850	1260	1290	1120	1010	680	390	180	100	740
	Maximum	270	520	930	1400	1700	2020	1880	1530	1040	550	340	180	890
	Diffuse	130	250	430	600	760	860	820	670	480	310	160	100	470
	Clear-Day Global	310	630	1190	1870	2400	2630	2500	2030	1400	780	370	230	1360
North	Global	76	140	250	370	520	600	570	430	290	170	91	58	300
	Diffuse	76	140	250	360	460	520	500	400	290	170	91	58	280
	Clear-Day Global	73	130	230	370	620	800	720	440	260	160	82	57	330
East	Global	150	290	480	710	870	900	880	780	560	310	170	110	520
	Diffuse	94	170	300	430	540	590	570	470	340	210	110	71	330
	Clear-Day Global	360	620	1010	1400	1640	1740	1680	1470	1120	710	400	280	1040
South	Global	430	640	810	920	950	900	920	920	860	580	450	330	730
	Diffuse	160	250	370	480	560	590	580	500	400	280	170	130	370
	Clear-Day Global	1380	1770	1980	1830	1590	1450	1490	1680	1890	1820	1470	1210	1630
West	Global	150	290	490	740	960	1000	990	830	600	310	170	110	560
	Diffuse	94	170	300	440	550	610	580	480	350	210	110	72	330
	Clear-Day Global	360	620	1010	1400	1640	1740	1680	1470	1120	710	400	280	1040

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	110	240	480	780	1050	1130	1090	890	600	300	140	82	580
North	Unshaded	52	99	170	250	350	400	380	290	200	120	63	40	200
	Shaded	52	97	170	250	340	400	370	280	190	120	62	40	200
East	Unshaded	100	200	340	510	620	640	630	550	400	210	120	72	370
	Shaded	99	200	340	500	610	630	620	550	390	210	120	71	360
South	Unshaded	330	480	590	640	640	600	620	630	620	430	340	260	510
	Shaded	330	470	580	640	630	590	600	630	610	430	340	250	510
West	Unshaded	100	200	350	530	690	710	710	590	430	220	120	72	390
	Shaded	100	200	340	520	680	700	700	590	420	220	120	72	390

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	34.3	37.0	39.3	43.3	49.0	54.3	58.3	58.6	54.2	46.9	39.3	35.7	45.9
Daily Minimum Temp	29.7	32.1	33.9	37.0	42.3	47.8	52.0	52.3	48.1	41.9	34.7	31.4	40.3
Daily Maximum Temp	38.9	41.9	44.7	49.5	55.7	60.8	64.5	64.9	60.2	51.8	43.8	40.0	51.4
Record Minimum Temp	1.0	2.0	1.0	21.0	31.0	37.0	40.0	40.0	33.0	18.0	-3.0	1.0	-3.0
Record Maximum Temp	61.0	63.0	62.0	82.0	88.0	89.0	89.0	90.0	82.0	71.0	67.0	62.0	90.0
HDD, Base 65°F	952	784	797	651	496	325	214	204	324	561	771	908	6987
CDD, Base 65°F	0	0	0	0	0	0	7	6	0	0	0	0	13
Humidity Ratio (#w/#da)	0.0031	0.0033	0.0034	0.0040	0.0049	0.0063	0.0073	0.0075	0.0065	0.0051	0.0038	0.0033	0.0049
Wind Speed (mph)	10.9	11.1	9.9	9.8	8.4	8.3	7.5	7.5	8.3	10.8	11.2	10.7	9.5
Clearness Index, Kt	0.34	0.37	0.40	0.42	0.45	0.43	0.44	0.43	0.41	0.35	0.33	0.32	0.42

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

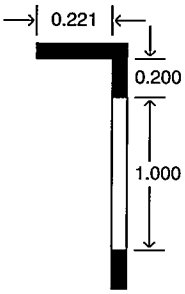
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	30/15	50/29	55/32	41/21	13/8	54/30	77/45	88/52	82/51	60/37	27/14	53/28	64/34	57/32	32/18	1/1	14/9	16/9	5/3	0/0
North	8/7	11/11	11/12	10/9	5/4	11/12	14/16	15/17	15/17	12/13	8/6	11/11	13/12	12/12	8/8	0/0	5/4	6/4	2/1	0/0
East	64/17	43/20	11/12	10/9	5/4	83/29	64/32	21/19	15/17	12/13	68/17	60/23	17/14	12/12	8/8	4/1	20/6	6/4	2/1	0/0
South	46/14	80/29	88/33	63/21	19/7	21/14	53/28	68/36	59/34	30/19	30/11	69/25	86/33	75/30	38/14	4/1	55/12	60/13	22/4	0/0
West	8/7	11/11	25/16	60/20	46/12	11/12	14/16	15/17	54/32	80/36	8/6	11/11	13/12	53/24	69/21	0/0	5/4	16/6	18/3	0/0
M. Clr (%hrs)	16	16	15	17	17	15	16	16	18	20	16	18	20	19	21	14	14	14	14	17

Barrow, AK

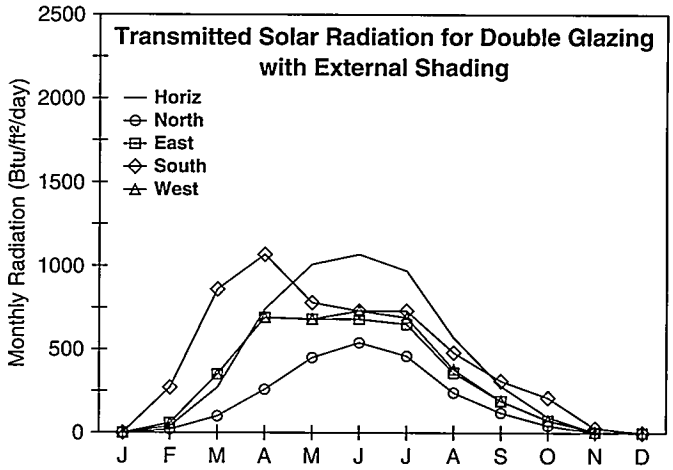
WBAN NO. 27502

LATITUDE: 71.30° N
LONGITUDE: 156.78° W
ELEVATION: 13 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	0	75	490	1160	1470	1550	1410	830	420	150	5	0	630
	Std.Dev.	0	5	23	73	82	141	152	71	33	13	1	0	21
	Minimum	0	67	430	1030	1280	1380	1170	700	380	120	3	0	590
	Maximum	0	82	530	1290	1650	1980	1860	960	490	180	6	0	680
	Diffuse	0	49	240	570	1060	990	830	620	350	130	3	0	410
	Clear-Day Global	0	67	500	1310	2100	2450	2200	1480	710	160	0	0	920
North	Global	0	30	160	400	690	810	690	370	190	67	3	0	280
	Diffuse	0	30	160	370	610	630	540	340	190	67	3	0	250
	Clear-Day Global	0	29	140	380	930	1410	1130	480	180	60	0	0	400
East	Global	0	91	500	980	990	1000	950	540	280	110	6	0	460
	Diffuse	0	43	230	490	710	680	600	400	220	85	3	0	290
	Clear-Day Global	0	110	590	1280	1800	1960	1820	1370	770	230	0	0	830
South	Global	0	360	1150	1500	1140	1100	1080	700	440	280	35	0	650
	Diffuse	0	100	350	580	760	700	620	450	280	150	7	0	340
	Clear-Day Global	0	520	1520	1990	2060	1980	1930	1880	1640	830	0	0	1200
West	Global	0	90	500	990	1000	1060	990	560	290	110	6	0	470
	Diffuse	0	42	230	500	710	690	600	400	230	86	3	0	290
	Clear-Day Global	0	110	590	1280	1800	1960	1820	1370	770	230	0	0	830

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

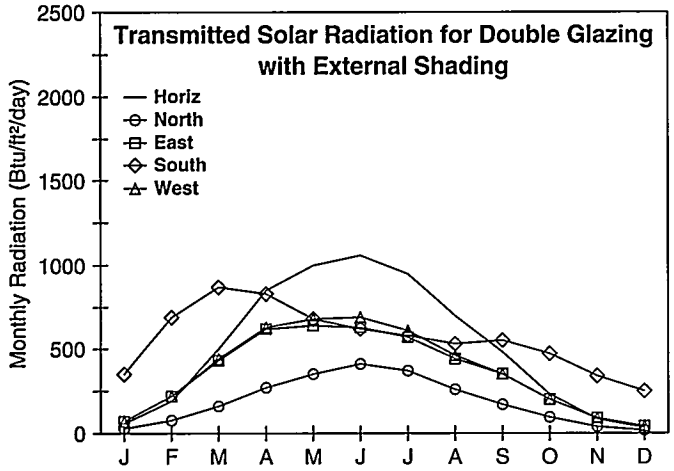
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	0	39	270	740	1010	1070	970	570	280	94	3	0	420
North	Unshaded	0	21	110	270	470	560	480	250	130	46	2	0	200
	Shaded	0	20	100	260	450	540	460	240	120	43	1	0	190
East	Unshaded	0	58	350	710	710	710	680	380	200	76	3	0	320
	Shaded	0	58	350	690	680	680	650	360	190	73	3	0	310
South	Unshaded	0	270	860	1090	810	770	760	490	320	210	27	0	470
	Shaded	0	270	860	1070	780	730	730	480	310	210	27	0	460
West	Unshaded	0	58	360	710	710	760	710	400	200	78	3	0	330
	Shaded	0	57	350	690	680	730	690	380	190	75	3	0	320

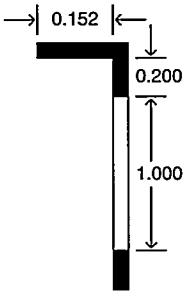
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	-13.4	-17.8	-15.1	-2.2	19.3	34.0	39.3	37.9	30.5	13.5	-1.7	-11.2	9.4
Daily Minimum Temp	-19.3	-23.7	-21.1	-9.1	14.4	29.7	33.6	33.3	27.0	8.8	-6.9	-17.2	4.1
Daily Maximum Temp	-7.4	-11.8	-9.0	4.7	24.2	38.3	45.0	42.3	33.8	18.1	3.5	-5.2	14.7
Record Minimum Temp	-53.0	-56.0	-52.0	-42.0	-19.0	4.0	22.0	20.0	1.0	-32.0	-40.0	-55.0	-56.0
Record Maximum Temp	36.0	36.0	33.0	42.0	45.0	71.0	78.0	76.0	62.0	43.0	39.0	34.0	78.0
HDD, Base 65°F	2430	2318	2483	2016	1417	930	797	840	1035	1597	2001	2362	20226
CDD, Base 65°F	0	0	0	0	0	0	0	0	0	0	0	0	0
Humidity Ratio (#w/#da)	0.0004	0.0003	0.0003	0.0007	0.0020	0.0036	0.0044	0.0044	0.0032	0.0016	0.0007	0.0004	0.0018
Wind Speed (mph)	12.4	11.1	11.4	11.6	11.9	11.8	11.6	12.5	13.5	13.0	12.6	11.6	12.1
Clearness Index, Kt	0.11	0.37	0.53	0.57	0.47	0.41	0.41	0.34	0.31	0.33	0.23	0.00	0.43

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	3/2	15/12	25/20	26/20	17/13	32/18	49/29	62/37	67/41	62/38	3/2	16/9	27/16	33/18	27/15	0/0	0/0	0/0	0/0	0/0
North	1/1	6/5	8/8	8/8	6/6	16/10	12/12	13/14	14/15	13/14	2/1	6/4	8/7	9/8	8/7	0/0	0/0	0/0	0/0	0/0
East	11/5	38/18	26/16	8/8	6/6	68/20	75/28	53/25	14/15	13/14	10/2	40/9	36/12	9/8	8/7	0/0	0/0	0/0	0/0	0/0
South	4/2	35/17	66/33	68/34	39/19	9/8	37/18	69/29	81/37	68/31	1/1	25/7	57/15	70/18	53/15	0/0	0/0	0/0	0/0	0/0
West	1/1	6/5	8/8	23/15	39/19	9/8	12/12	13/14	15/16	54/27	1/1	6/4	8/7	11/9	38/12	0/0	0/0	0/0	0/0	0/0
M. Clr (%hrs)	53	54	54	53	52	15	16	18	18	19	5	5	6	6	6	49	46	45	46	47





Shading Geometry
(Not to Scale)

Bethel, AK

WBAN NO. 26615

LATITUDE: 60.78° N
LONGITUDE: 161.80° W
ELEVATION: 151 feet
MEAN PRESSURE: 14.5 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	110	350	780	1240	1430	1510	1350	1010	710	370	150	63	760
	Std.Dev.	14	39	81	136	158	157	114	106	92	30	15	7	34
	Minimum	86	290	620	970	1160	1220	1160	830	560	330	130	51	680
	Maximum	140	420	950	1500	1680	1840	1630	1210	850	440	180	76	820
	Diffuse	71	180	390	630	780	890	870	690	440	240	100	43	450
	Clear-Day Global	140	420	980	1720	2300	2580	2420	1870	1180	560	180	76	1200
North	Global	43	110	240	400	540	630	560	400	260	140	59	26	280
	Diffuse	43	110	240	380	470	530	500	380	250	140	59	26	260
	Clear-Day Global	41	98	200	370	680	920	790	450	230	120	48	25	330
East	Global	110	320	620	890	920	910	810	630	500	290	140	68	520
	Diffuse	56	150	320	480	560	610	570	440	310	170	75	33	320
	Clear-Day Global	210	490	940	1420	1710	1840	1750	1480	1060	590	250	130	990
South	Global	450	910	1190	1190	1010	940	870	770	780	630	450	320	790
	Diffuse	130	250	420	550	580	620	590	490	380	250	150	90	380
	Clear-Day Global	980	1580	2000	1970	1760	1650	1670	1810	1910	1680	1100	740	1570
West	Global	110	330	640	890	960	980	870	660	500	290	130	70	540
	Diffuse	56	150	320	490	570	620	580	460	320	180	76	34	320
	Clear-Day Global	210	490	940	1420	1710	1840	1750	1480	1060	590	250	130	990

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	57	190	500	850	1000	1060	950	700	480	230	83	32	510
North	Unshaded	29	79	170	270	360	420	380	270	180	97	41	18	190
	Shaded	29	77	160	270	350	410	370	260	170	94	39	18	190
East	Unshaded	72	220	440	630	650	640	580	450	360	200	90	42	370
	Shaded	71	220	430	620	640	630	570	440	350	200	89	41	360
South	Unshaded	350	690	880	840	700	640	590	540	560	470	340	250	570
	Shaded	350	690	870	830	680	620	580	530	550	470	340	250	560
West	Unshaded	71	220	450	640	690	700	620	470	360	200	89	43	380
	Shaded	70	220	440	630	680	690	610	460	350	200	88	42	370

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	6.7	6.0	13.3	23.6	39.9	50.5	55.0	52.9	45.2	29.4	16.8	8.5	29.0
Daily Minimum Temp	0.4	-0.8	5.4	15.7	31.7	42.3	47.7	46.3	38.3	23.8	10.9	2.2	22.0
Daily Maximum Temp	12.9	12.8	21.1	31.3	48.2	58.8	62.3	59.5	52.0	35.0	22.6	14.7	35.9
Record Minimum Temp	-48.0	-38.0	-39.0	-22.0	4.0	28.0	31.0	28.0	18.0	-5.0	-24.0	-37.0	-48.0
Record Maximum Temp	48.0	46.0	46.0	55.0	79.0	86.0	83.0	84.0	72.0	56.0	48.0	45.0	86.0
HDD, Base 65°F	1807	1652	1603	1242	778	435	310	375	594	1104	1446	1752	13098
CDD, Base 65°F	0	0	0	0	0	0	0	0	0	0	0	0	0
Humidity Ratio (#w/#da)	0.0013	0.0012	0.0016	0.0023	0.0039	0.0057	0.0072	0.0071	0.0053	0.0030	0.0018	0.0014	0.0035
Wind Speed (mph)	14.6	15.1	14.1	13.0	11.7	11.1	10.8	11.0	11.7	12.5	13.3	14.3	12.7
Clearness Index, Kt	0.39	0.48	0.52	0.51	0.44	0.42	0.39	0.37	0.38	0.37	0.37	0.35	0.42

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

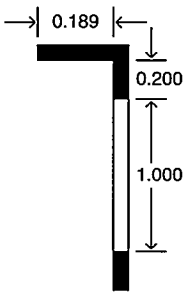
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	3/2	25/17	43/30	47/32	34/24	25/14	51/29	72/41	80/50	75/46	1/1	21/12	42/24	51/30	45/27	0/0	0/0	6/4	7/5	0/0
North	1/1	7/7	10/11	10/12	9/10	23/9	11/11	14/15	15/17	14/16	2/1	7/6	10/9	11/12	10/10	0/0	0/0	3/2	3/3	0/0
East	15/4	60/22	42/22	10/12	9/10	63/17	80/29	62/30	21/19	.14/16	7/2	57/17	53/21	16/13	10/10	0/0	0/0	12/4	3/3	0/0
South	3/2	45/18	83/35	91/38	64/26	7/6	24/15	58/28	74/39	65/35	1/1	27/10	66/24	84/32	72/28	0/0	0/0	32/8	37/9	0/0
West	1/1	7/7	10/11	24/17	58/24	7/6	11/11	14/15	15/17	52/30	1/1	7/6	10/9	11/12	47/21	0/0	0/0	3/2	10/4	0/0
M. Clr (%hrs)	34	34	35	36	38	12	13	13	11	12	16	14	14	12	11	40	33	31	30	31

Bettles, AK

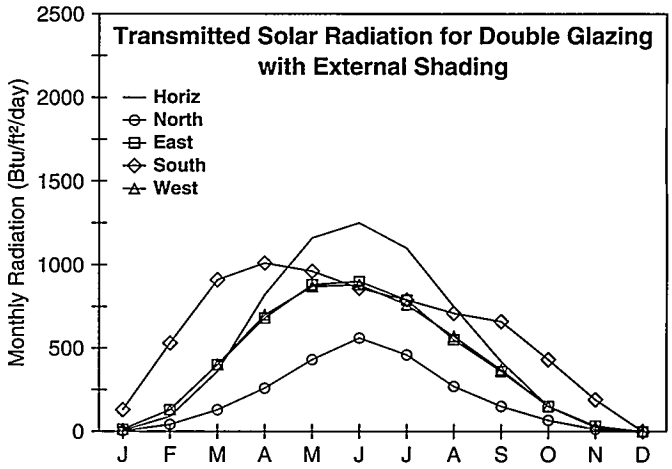
WBAN NO. 26533

LATITUDE: 66.92° N
LONGITUDE: 151.52° W
ELEVATION: 673 feet
MEAN PRESSURE: 14.3 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	14	180	620	1240	1680	1800	1580	1100	650	260	47	0	770
	Std.Dev.	2	20	55	127	120	120	147	113	81	23	5	0	40
	Minimum	13	140	460	870	1440	1480	1310	850	540	190	38	0	670
	Maximum	16	220	700	1380	1890	1980	1850	1330	830	300	54	0	820
	Diffuse	8	97	290	590	740	840	810	620	360	180	33	0	380
	Clear-Day Global	6	190	710	1500	2160	2480	2290	1670	910	320	35	0	1030
North	Global	6	63	190	400	660	840	690	420	220	100	20	0	300
	Diffuse	6	63	190	380	520	590	540	380	220	100	20	0	250
	Clear-Day Global	0	60	170	380	770	1120	920	470	200	89	13	0	350
East	Global	24	200	580	970	1250	1290	1130	790	520	230	55	0	590
	Diffuse	6	88	260	500	630	680	630	460	280	130	26	0	310
	Clear-Day Global	32	280	780	1380	1770	1920	1810	1450	930	400	70	0	900
South	Global	170	690	1230	1430	1400	1290	1180	1030	910	580	250	0	850
	Diffuse	22	180	380	580	660	690	650	520	360	220	68	0	360
	Clear-Day Global	260	1080	1830	2040	1930	1850	1850	1900	1830	1320	440	0	1360
West	Global	24	200	580	1000	1240	1250	1090	820	530	230	54	0	590
	Diffuse	6	88	260	500	630	690	640	480	290	130	27	0	310
	Clear-Day Global	32	280	780	1380	1770	1920	1810	1450	930	400	70	0	900

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	6	90	360	820	1160	1250	1100	750	420	150	25	0	510
North	Unshaded	3	44	130	270	450	570	470	280	150	70	13	0	210
	Shaded	3	42	130	260	430	560	460	270	150	67	13	0	200
East	Unshaded	13	130	410	700	910	930	810	570	370	160	34	0	420
	Shaded	13	130	400	680	880	900	790	550	360	150	33	0	410
South	Unshaded	130	530	910	1030	980	890	820	730	660	440	190	0	610
	Shaded	130	530	910	1010	960	860	790	710	660	430	190	0	600
West	Unshaded	13	140	410	720	890	900	780	590	380	160	33	0	420
	Shaded	13	130	400	700	870	880	760	570	370	150	32	0	410

Average Climatic Conditions

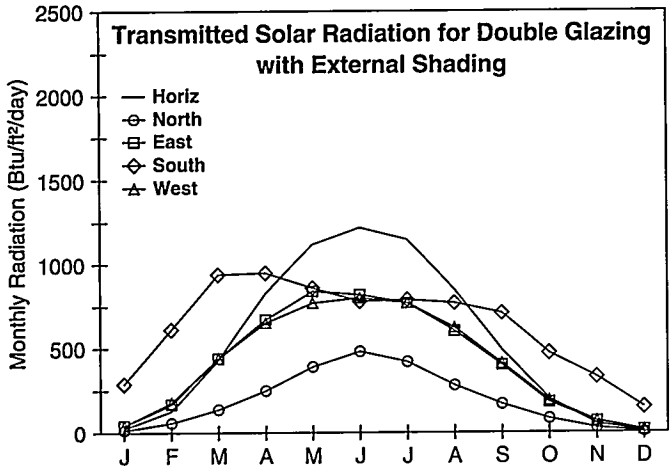
Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	-12.7	-9.0	2.9	20.7	43.2	57.2	59.4	53.3	40.8	18.5	-1.8	-9.3	21.9
Daily Minimum Temp	-20.4	-18.3	-8.6	9.7	33.5	47.0	49.2	43.8	32.4	12.1	-8.8	-16.7	12.9
Daily Maximum Temp	-4.9	0.3	14.4	31.5	52.9	67.5	69.6	62.7	49.0	24.9	5.1	-1.8	30.9
Record Minimum Temp	-70.0	-60.0	-56.0	-37.0	-10.0	27.0	29.0	22.0	2.0	-32.0	-57.0	-59.0	-70.0
Record Maximum Temp	48.0	40.0	44.0	56.0	86.0	92.0	93.0	87.0	79.0	53.0	45.0	38.0	93.0
HDD, Base 65°F	2409	2072	1925	1329	676	238	192	373	726	1442	2004	2303	15689
CDD, Base 65°F	0	0	0	0	0	0	18	11	0	0	0	0	29
Humidity Ratio (#w/#da)	0.0005	0.0006	0.0008	0.0017	0.0036	0.0060	0.0073	0.0066	0.0041	0.0019	0.0007	0.0006	0.0029
Wind Speed (mph)	6.0	6.3	7.2	7.7	7.7	7.2	6.6	6.1	6.7	6.6	6.0	5.6	6.6
Clearness Index, Kt	0.32	0.44	0.53	0.57	0.54	0.49	0.46	0.43	0.42	0.39	0.35	0.19	0.48

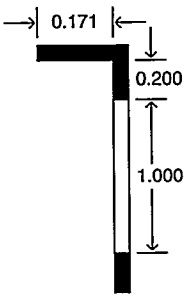
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	6/5	24/17	35/26	33/24	19/14	35/23	55/39	69/49	71/53	63/47	6/4	24/14	39/23	42/26	33/20	0/0	0/0	0/0	0/0	0/0
North	3/2	7/7	9/10	9/9	6/6	14/11	12/13	14/15	14/16	13/14	3/2	7/6	9/9	10/10	9/8	0/0	0/0	0/0	0/0	0/0
East	26/9	49/22	24/16	9/9	6/6	74/34	75/43	48/33	14/16	13/14	24/6	55/19	40/18	10/10	9/8	0/0	0/0	0/0	0/0	0/0
South	10/4	52/23	81/39	76/36	41/19	9/9	41/27	70/45	77/52	59/40	4/2	39/14	73/29	80/34	58/24	0/0	0/0	0/0	0/0	0/0
West	3/2	7/7	9/10	33/19	49/21	9/9	12/13	14/15	23/21	60/41	3/2	7/6	9/9	20/13	51/22	0/0	0/0	0/0	0/0	0/0
M. Clr (%hrs)	45	45	45	46	45	30	30	25	21	18	24	23	23	22	23	46	40	38	38	42

Big Delta, AK

WBAN NO. 26415





Shading Geometry
(Not to Scale)

LATITUDE: 64.00° N
LONGITUDE: 145.73° W
ELEVATION: 1273 feet
MEAN PRESSURE: 14.0 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	54	260	710	1230	1610	1730	1630	1230	750	330	100	16	810
	Std.Dev.	6	25	50	88	97	104	113	83	59	23	10	3	30
	Minimum	41	220	560	1020	1390	1490	1420	1050	620	270	76	13	750
	Maximum	63	330	800	1350	1810	1950	1850	1370	880	380	110	19	860
	Diffuse	32	140	320	570	730	860	800	620	400	220	65	10	400
	Clear-Day Global	63	300	840	1600	2230	2540	2370	1780	1060	440	100	19	1120
North	Global	21	87	210	390	600	720	650	430	250	130	39	6	290
	Diffuse	21	87	210	360	490	570	520	390	250	130	39	6	260
	Clear-Day Global	19	76	180	370	730	1010	870	460	220	100	32	3	340
East	Global	73	260	630	950	1180	1170	1090	860	570	260	110	27	600
	Diffuse	28	120	280	470	590	660	620	480	310	160	52	7	320
	Clear-Day Global	130	410	880	1410	1750	1890	1810	1490	1020	530	170	57	970
South	Global	370	800	1280	1340	1270	1180	1170	1110	980	630	430	190	900
	Diffuse	78	220	390	550	630	670	640	530	400	260	120	24	380
	Clear-Day Global	740	1440	1960	2020	1860	1760	1770	1880	1920	1590	890	470	1520
West	Global	74	270	630	920	1100	1150	1100	890	590	270	110	27	600
	Diffuse	28	120	290	480	600	670	630	490	320	170	53	6	320
	Clear-Day Global	130	410	880	1410	1750	1890	1810	1490	1020	530	170	57	970

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	25	130	430	830	1120	1220	1150	850	490	200	52	7	540
North	Unshaded	15	60	150	260	400	490	440	290	170	87	27	3	200
	Shaded	14	59	140	250	390	480	420	280	170	84	27	3	190
East	Unshaded	43	180	440	680	850	840	790	610	410	180	68	14	430
	Shaded	43	170	440	670	840	820	770	600	400	180	67	14	420
South	Unshaded	290	620	950	960	880	810	810	790	720	480	330	150	650
	Shaded	290	610	940	950	860	780	790	770	710	470	330	150	640
West	Unshaded	44	180	450	660	790	820	790	640	420	190	70	14	420
	Shaded	43	180	440	650	770	800	770	620	410	190	69	14	420

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	-4.0	2.2	13.5	30.4	46.8	56.8	60.2	55.4	44.4	24.5	5.5	-1.6	27.8
Daily Minimum Temp	-11.0	-6.2	2.5	20.5	36.9	47.2	50.7	46.0	35.7	17.8	-1.7	-8.5	19.2
Daily Maximum Temp	3.1	10.5	24.5	40.3	56.6	66.4	69.6	64.7	53.2	31.2	12.7	5.4	36.5
Record Minimum Temp	-63.0	-60.0	-49.0	-37.0	-1.0	30.0	32.0	22.0	-2.0	-39.0	-47.0	-62.0	-63.0
Record Maximum Temp	48.0	51.0	58.0	72.0	90.0	92.0	91.0	88.0	79.0	66.0	52.0	55.0	92.0
HDD, Base 65°F	2139	1758	1597	1038	564	250	158	307	618	1256	1785	2065	13535
CDD, Base 65°F	0	0	0	0	0	0	9	9	0	0	0	0	18
Humidity Ratio (#w/#da)	0.0005	0.0007	0.0010	0.0017	0.0029	0.0050	0.0060	0.0051	0.0034	0.0018	0.0008	0.0006	0.0025
Wind Speed (mph)	12.0	10.5	9.2	8.4	8.5	7.8	6.5	7.1	8.5	8.7	10.2	11.7	9.1
Clearness Index, Kt	0.39	0.46	0.54	0.54	0.51	0.48	0.48	0.46	0.44	0.40	0.39	0.33	0.48

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

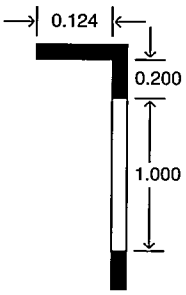
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	11/9	31/23	40/31	36/27	19/14	39/25	61/42	73/51	74/54	63/46	10/6	31/20	45/28	46/30	33/22	0/0	0/0	3/3	0/0	0/0
North	4/4	8/9	9/11	9/10	6/6	10/10	13/14	14/15	14/16	13/14	4/3	8/8	10/10	10/11	9/9	0/0	0/0	2/1	0/0	0/0
East	44/16	52/27	18/15	9/10	6/6	76/34	73/42	41/29	14/16	13/14	40/11	61/24	35/19	10/11	9/9	0/0	0/0	2/2	0/0	0/0
South	21/9	65/32	87/46	77/39	38/18	10/10	46/29	71/45	73/49	52/35	10/5	50/21	79/36	81/39	53/25	0/0	0/0	23/7	0/0	0/0
West	4/4	8/9	9/11	43/25	54/25	10/10	13/14	14/15	32/26	67/42	4/3	8/8	10/10	29/18	57/26	0/0	0/0	2/1	0/0	0/0
M. Clr (%hrs)	38	40	40	39	37	24	22	21	15	14	19	20	23	20	21	40	33	32	32	34

Cold Bay, AK

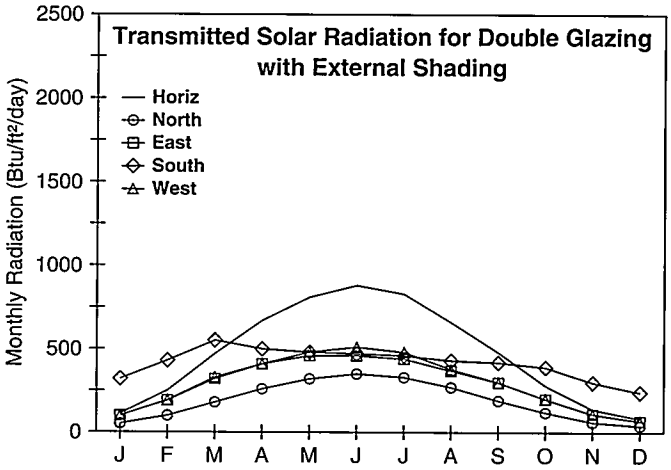
WBAN NO. 25624

LATITUDE: 55.20° N
LONGITUDE: 162.72° W
ELEVATION: 95 feet
MEAN PRESSURE: 14.5 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	190	390	700	970	1160	1250	1180	950	690	430	220	140	690
	Std.Dev.	23	37	77	91	84	92	98	74	67	36	22	15	35
	Minimum	150	320	560	820	980	1040	1000	810	570	360	160	100	630
	Maximum	230	490	870	1300	1300	1460	1380	1120	820	510	270	160	780
	Diffuse	140	280	470	710	850	940	910	750	520	320	170	110	510
	Clear-Day Global	300	620	1190	1870	2400	2630	2500	2020	1390	770	360	220	1360
North	Global	78	150	260	380	480	530	500	400	280	170	94	59	280
	Diffuse	78	150	260	370	460	500	480	390	280	170	94	59	270
	Clear-Day Global	70	130	230	370	630	800	720	440	260	160	82	57	330
East	Global	150	270	470	590	660	670	640	530	430	290	160	110	420
	Diffuse	97	190	320	440	520	560	540	450	330	210	120	73	320
	Clear-Day Global	350	620	1010	1400	1650	1740	1680	1460	1110	710	400	280	1040
South	Global	420	590	770	730	710	700	680	630	590	540	400	310	590
	Diffuse	180	280	400	490	540	570	550	480	380	280	190	140	370
	Clear-Day Global	1370	1770	1990	1830	1590	1460	1500	1680	1890	1820	1450	1200	1630
West	Global	150	270	470	590	690	730	690	550	430	280	160	100	430
	Diffuse	98	190	320	450	530	570	550	450	330	210	110	75	320
	Clear-Day Global	350	620	1010	1400	1650	1740	1680	1460	1110	710	400	280	1040

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	110	250	470	670	810	880	830	660	480	280	140	83	470
North	Unshaded	54	100	180	260	330	360	340	270	190	120	65	41	190
	Shaded	52	100	180	260	320	350	330	270	190	120	63	40	190
East	Unshaded	100	190	330	410	470	470	450	370	300	210	110	70	290
	Shaded	99	190	320	410	460	460	440	370	300	200	110	69	290
South	Unshaded	320	440	560	510	490	480	470	430	420	390	300	240	420
	Shaded	320	430	550	500	480	470	460	430	420	390	300	240	420
West	Unshaded	100	190	330	420	490	520	490	390	300	200	110	70	300
	Shaded	99	190	330	410	480	510	480	380	300	200	110	69	300

Average Climatic Conditions

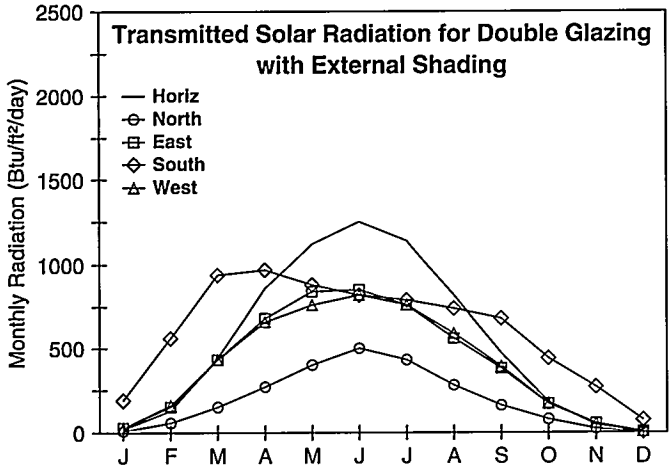
Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	28.6	27.4	29.9	33.3	39.6	45.7	50.5	51.5	47.7	39.6	34.4	31.0	38.3
Daily Minimum Temp	24.1	22.8	25.0	28.6	34.8	40.9	46.0	47.1	43.2	34.8	29.9	26.6	33.7
Daily Maximum Temp	33.1	32.0	34.8	37.9	44.4	50.4	55.1	55.9	52.2	44.3	38.9	35.3	42.9
Record Minimum Temp	-8.0	-9.0	-13.0	4.0	18.0	29.0	33.0	33.0	27.0	10.0	1.0	-1.0	-13.0
Record Maximum Temp	50.0	50.0	56.0	60.0	67.0	69.0	77.0	78.0	76.0	69.0	59.0	54.0	78.0
HDD, Base 65°F	1128	1053	1088	951	787	579	450	419	519	787	918	1054	9733
CDD, Base 65°F	0	0	0	0	0	0	0	0	0	0	0	0	0
Humidity Ratio (#w/#da)	0.0029	0.0027	0.0030	0.0033	0.0041	0.0053	0.0065	0.0070	0.0060	0.0043	0.0036	0.0032	0.0043
Wind Speed (mph)	17.8	18.0	17.2	18.0	16.4	15.8	15.7	16.2	16.6	17.0	17.4	17.4	17.0
Clearness Index, Kt	0.35	0.38	0.39	0.37	0.35	0.34	0.34	0.33	0.33	0.33	0.32	0.32	0.35

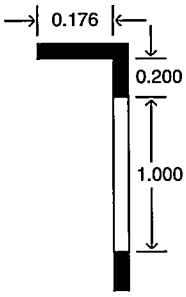
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	2/2	26/17	47/29	52/31	39/24	20/11	50/25	74/36	86/45	78/43	1/1	22/12	47/25	59/32	53/28	0/0	1/0	13/9	15/9	5/3
North	1/1	8/7	11/12	11/12	10/10	21/7	11/11	14/15	15/18	14/17	1/0	7/6	11/10	12/13	12/11	0/0	0/0	5/4	5/4	2/2
East	10/3	59/19	43/20	11/12	10/10	54/10	79/21	64/24	23/20	14/17	5/1	54/14	54/20	18/14	12/11	0/0	3/1	19/7	5/4	2/2
South	2/1	42/15	76/29	85/32	62/23	7/5	19/12	51/22	67/29	58/27	1/0	24/9	60/21	82/30	69/25	0/0	3/1	47/13	52/13	19/5
West	1/1	8/7	11/12	22/15	56/22	7/5	11/11	14/15	15/18	50/25	1/0	7/6	11/10	12/13	47/20	0/0	0/0	5/4	14/6	15/4
M. Clr (%hrs)	12	11	13	12	12	3	3	4	5	6	5	5	4	3	3	14	12	11	12	9

Fairbanks, AK

WBAN NO. 26411





Shading Geometry
(Not to Scale)

LATITUDE: 64.82° N
LONGITUDE: 147.87° W
ELEVATION: 453 feet
MEAN PRESSURE: 14.4 psia

STATION TYPE: Primary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	38	240	720	1270	1610	1780	1630	1190	720	300	83	5	800
	Std.Dev.	4	18	49	94	99	134	122	81	76	23	7	2	26
	Minimum	32	220	570	1030	1430	1490	1300	1020	570	250	73	3	750
	Maximum	44	290	810	1470	1820	2010	1840	1350	920	340	98	6	860
	Diffuse	26	140	360	640	770	900	840	660	400	210	58	3	420
	Clear-Day Global	44	260	810	1580	2190	2500	2320	1730	1000	390	79	6	1080
North	Global	16	87	230	410	610	750	650	430	240	120	34	1	300
	Diffuse	16	87	230	390	500	590	540	400	240	120	34	1	260
	Clear-Day Global	19	73	180	370	710	1000	840	460	220	100	29	0	340
East	Global	46	230	620	970	1190	1210	1090	810	550	240	84	11	590
	Diffuse	20	120	310	520	620	690	630	480	310	150	45	2	330
	Clear-Day Global	86	340	830	1380	1720	1870	1770	1440	960	460	130	25	920
South	Global	240	740	1280	1380	1290	1230	1180	1060	940	590	350	94	860
	Diffuse	60	240	440	600	650	700	660	540	390	240	110	5	390
	Clear-Day Global	500	1250	1890	2030	1870	1780	1790	1870	1860	1430	680	240	1430
West	Global	47	240	620	950	1080	1180	1090	850	560	250	85	11	580
	Diffuse	21	120	310	520	620	700	650	500	310	150	45	2	330
	Clear-Day Global	86	340	830	1380	1720	1870	1770	1440	960	460	130	25	920

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	19	130	440	860	1120	1250	1140	820	470	180	45	3	540
North	Unshaded	10	60	160	280	410	510	440	290	170	82	24	0	200
	Shaded	10	58	150	270	400	500	430	280	160	79	23	0	200
East	Unshaded	27	160	440	700	860	870	780	580	390	170	54	5	420
	Shaded	27	150	430	680	840	850	760	560	380	170	53	5	410
South	Unshaded	190	570	950	990	900	850	810	750	690	440	270	74	620
	Shaded	190	560	940	970	880	820	790	740	680	440	270	73	610
West	Unshaded	28	160	440	680	780	840	780	610	400	170	54	5	410
	Shaded	27	160	430	660	760	820	760	590	390	170	54	5	400

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	-10.1	-3.6	11.0	30.7	48.6	59.8	62.5	56.8	45.5	25.1	2.7	-6.5	26.9
Daily Minimum Temp	-18.5	-14.4	-1.7	20.4	38.0	49.5	52.6	47.2	36.2	18.1	-5.6	-14.8	17.3
Daily Maximum Temp	-1.6	7.2	23.8	41.0	59.3	70.1	72.3	66.3	54.8	32.0	10.9	1.8	36.5
Record Minimum Temp	-61.0	-56.0	-49.0	-24.0	-1.0	31.0	35.0	27.0	10.0	-27.0	-46.0	-62.0	-62.0
Record Maximum Temp	50.0	47.0	51.0	74.0	89.0	96.0	94.0	90.0	84.0	65.0	46.0	44.0	96.0
HDD, Base 65°F	2328	1921	1674	1029	508	182	123	267	585	1237	1869	2217	13940
CDD, Base 65°F	0	0	0	0	0	26	45	13	0	0	0	0	84
Humidity Ratio (#w/#da)	0.0006	0.0007	0.0011	0.0020	0.0036	0.0060	0.0075	0.0069	0.0044	0.0022	0.0009	0.0007	0.0031
Wind Speed (mph)	3.3	4.2	5.7	6.9	7.8	7.5	6.9	6.4	6.3	5.5	3.7	3.3	5.6
Clearness Index, Kt	0.36	0.47	0.56	0.56	0.51	0.49	0.48	0.45	0.43	0.39	0.37	0.26	0.49

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

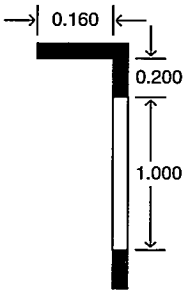
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	9/8	29/23	40/32	36/29	20/16	37/25	60/41	73/52	75/55	64/46	8/5	28/18	43/27	46/29	34/21	0/0	0/0	1/1	0/0	0/0
North	4/4	8/9	10/12	9/11	7/7	12/10	13/14	15/16	15/16	14/15	4/3	8/7	10/10	11/11	9/8	0/0	0/0	0/0	0/0	0/0
East	34/14	51/26	21/17	9/11	7/7	75/34	75/42	44/32	15/16	14/15	31/9	58/21	37/19	11/11	9/8	0/0	0/0	1/0	0/0	0/0
South	16/8	60/30	86/45	77/40	38/19	10/10	45/28	72/46	76/50	55/36	7/3	45/18	77/32	81/36	55/24	0/0	0/0	4/1	0/0	0/0
West	4/4	8/9	10/12	40/24	51/24	10/10	13/14	15/16	29/24	65/41	4/3	8/7	10/10	26/16	55/24	0/0	0/0	0/0	0/0	0/0
M. Clr (%hrs)	39	42	41	39	39	25	24	22	19	16	22	23	23	21	22	35	29	27	30	30

Gulkana, AK

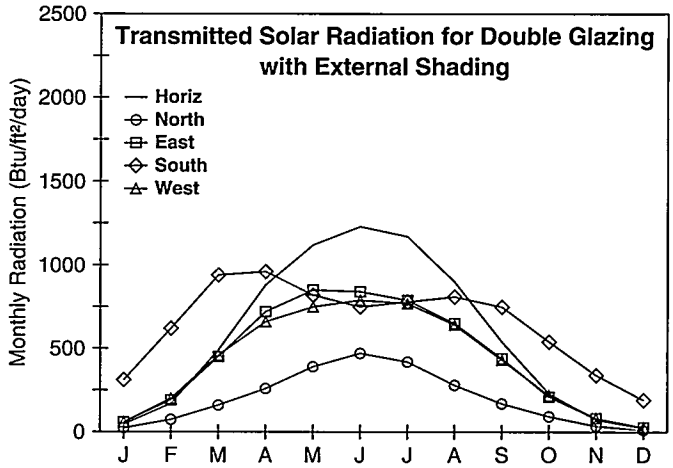
WBAN NO. 26425

LATITUDE: 62.15° N
LONGITUDE: 145.45° W
ELEVATION: 1578 feet
MEAN PRESSURE: 13.8 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	86	310	790	1300	1610	1740	1670	1300	820	380	130	41	850
	Std.Dev.	9	27	45	85	108	129	114	91	69	27	14	5	30
	Minimum	67	260	660	1160	1370	1480	1460	1120	670	340	110	32	800
	Maximum	100	380	880	1450	1780	1980	1870	1450	960	430	160	48	920
	Diffuse	58	180	380	590	750	860	800	620	410	230	91	30	420
	Clear-Day Global	98	370	940	1680	2290	2590	2420	1860	1140	510	150	51	1180
North	Global	34	110	240	400	590	710	640	430	260	140	53	18	300
	Diffuse	34	110	240	380	490	560	520	400	260	140	53	18	270
	Clear-Day Global	29	89	190	370	710	960	820	460	230	120	41	16	340
East	Global	93	290	650	1020	1190	1190	1130	920	630	310	130	46	630
	Diffuse	46	150	320	490	600	650	620	490	330	180	70	22	330
	Clear-Day Global	160	450	920	1420	1740	1880	1800	1500	1050	570	210	92	990
South	Global	400	820	1280	1360	1220	1140	1160	1170	1050	730	450	240	920
	Diffuse	120	270	450	570	630	660	640	550	410	280	150	68	400
	Clear-Day Global	850	1520	2010	2000	1810	1710	1730	1860	1930	1660	1000	600	1560
West	Global	94	290	650	930	1060	1120	1100	910	620	320	120	45	610
	Diffuse	47	150	330	500	600	670	630	500	330	180	71	21	340
	Clear-Day Global	160	450	920	1420	1740	1880	1800	1500	1050	570	210	92	990

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

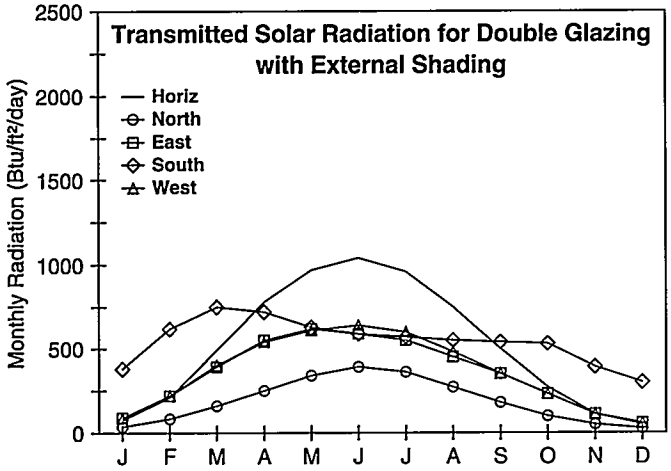
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	45	170	490	880	1120	1230	1170	900	540	230	74	22	580
North	Unshaded	24	75	170	270	400	480	430	290	180	96	37	12	210
	Shaded	23	73	160	260	390	470	420	280	170	93	36	12	200
East	Unshaded	58	190	460	730	860	860	810	660	450	220	82	27	450
	Shaded	58	190	450	720	850	840	790	650	440	210	81	27	440
South	Unshaded	310	620	940	970	840	770	790	820	760	550	340	190	660
	Shaded	310	620	940	960	820	750	780	810	750	540	340	190	650
West	Unshaded	59	200	460	670	770	810	790	660	440	220	82	27	430
	Shaded	58	200	460	660	750	790	770	640	430	220	81	27	420

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	-5.7	3.3	15.4	30.7	43.7	53.2	57.4	53.5	43.8	27.4	5.1	-3.2	27.1
Daily Minimum Temp	-13.9	-7.0	2.6	19.9	32.6	42.2	46.4	42.2	33.4	19.5	-2.5	-10.9	17.0
Daily Maximum Temp	2.5	13.6	28.1	41.5	54.8	64.2	68.3	64.7	54.1	35.3	12.7	4.6	37.0
Record Minimum Temp	-60.0	-65.0	-48.0	-42.0	5.0	28.0	29.0	20.0	5.0	-23.0	-44.0	-58.0	-65.0
Record Maximum Temp	46.0	46.0	50.0	67.0	85.0	90.0	91.0	86.0	74.0	65.0	48.0	44.0	91.0
HDD, Base 65°F	2192	1728	1538	1029	660	354	236	357	636	1166	1797	2114	13807
CDD, Base 65°F	0	0	0	0	0	0	0	0	0	0	0	0	0
Humidity Ratio (#w/#da)	0.0006	0.0008	0.0011	0.0019	0.0028	0.0043	0.0054	0.0049	0.0035	0.0021	0.0009	0.0006	0.0024
Wind Speed (mph)	3.6	5.0	6.1	7.6	8.2	8.4	7.5	7.9	7.1	6.2	4.0	4.0	6.3
Clearness Index, Kt	0.40	0.48	0.55	0.55	0.50	0.48	0.49	0.48	0.45	0.41	0.39	0.35	0.49

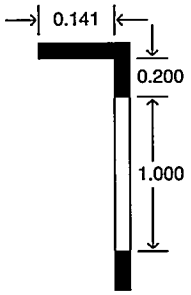
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	13/10	34/26	45/35	40/30	21/16	40/26	62/43	76/53	78/55	66/47	11/7	34/22	48/32	48/33	35/24	0/0	0/0	6/5	0/0	0/0
North	5/5	9/10	10/12	10/11	7/7	11/10	13/14	14/16	14/16	13/15	4/3	9/8	11/11	11/11	9/9	0/0	0/0	3/2	0/0	0/0
East	45/19	54/30	18/16	10/11	7/7	79/37	74/43	41/29	14/16	13/15	41/14	63/28	35/21	11/11	9/9	0/0	1/0	4/3	0/0	0/0
South	22/11	67/35	89/49	78/42	38/18	10/10	45/29	70/44	73/48	51/34	11/5	52/24	81/40	82/42	54/27	0/0	2/0	32/10	2/0	0/0
West	5/5	9/10	10/12	45/27	56/25	10/10	13/14	14/16	33/26	69/43	4/3	9/8	11/11	30/20	59/29	0/0	0/0	3/2	1/0	0/0
M. Clr (%hrs)	33	33	33	34	34	25	23	16	11	10	22	22	24	20	20	32	27	25	27	29



King Salmon, AK

WBAN NO. 25503



Shading Geometry
(Not to Scale)

LATITUDE: 58.68° N
LONGITUDE: 156.65° W
ELEVATION: 49 feet
MEAN PRESSURE: 14.6 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	140	370	750	1130	1380	1470	1370	1070	740	430	190	95	760
	Std.Dev.	17	45	105	97	137	133	95	101	75	34	18	12	36
	Minimum	110	300	570	940	1100	1230	1160	860	590	370	150	70	680
	Maximum	170	460	980	1270	1670	1750	1560	1270	890	530	230	110	830
	Diffuse	90	200	400	610	800	930	880	710	470	260	120	63	460
	Clear-Day Global	190	490	1050	1760	2330	2600	2460	1940	1260	640	250	130	1260
North	Global	55	130	240	380	520	590	550	410	270	150	72	38	280
	Diffuse	55	130	240	360	470	530	500	390	270	150	72	38	270
	Clear-Day Global	51	110	210	360	650	860	760	460	240	140	63	35	330
East	Global	140	320	560	780	890	850	790	650	500	340	170	94	510
	Diffuse	71	160	310	450	560	610	570	460	330	190	93	48	320
	Clear-Day Global	250	540	960	1380	1680	1800	1730	1470	1080	650	310	190	1010
South	Global	500	820	1030	1030	930	890	850	800	760	720	510	390	770
	Diffuse	150	260	400	500	580	620	590	500	390	280	170	110	380
	Clear-Day Global	1130	1660	1980	1910	1700	1580	1610	1780	1910	1750	1260	950	1600
West	Global	140	320	570	770	870	920	860	690	500	330	170	93	520
	Diffuse	71	160	310	450	560	620	580	470	330	190	93	49	330
	Clear-Day Global	250	540	960	1380	1680	1800	1730	1470	1080	650	310	190	1010

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	76	210	490	780	970	1040	960	750	500	270	110	50	520
North	Unshaded	38	87	170	260	350	400	370	280	190	110	50	26	190
	Shaded	37	84	160	250	340	390	360	270	180	100	49	26	190
East	Unshaded	90	220	400	560	630	610	560	460	360	240	110	59	360
	Shaded	89	220	390	550	620	590	550	450	350	230	110	58	350
South	Unshaded	380	620	750	720	640	600	580	560	550	540	390	300	550
	Shaded	380	620	750	720	630	590	570	550	540	530	390	300	550
West	Unshaded	88	220	400	550	620	660	610	490	360	230	110	59	370
	Shaded	87	220	400	540	610	640	600	480	350	230	110	58	360

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	14.9	14.8	22.4	31.2	42.4	50.0	54.7	53.9	47.2	32.4	22.3	15.9	33.5
Daily Minimum Temp	7.6	6.7	14.1	23.4	33.9	41.4	46.4	46.4	39.7	25.1	15.0	8.3	25.7
Daily Maximum Temp	22.1	22.9	30.7	39.0	50.9	58.6	63.0	61.4	54.7	39.7	29.6	23.4	41.3
Record Minimum Temp	-48.0	-41.0	-42.0	-15.0	4.0	29.0	33.0	25.0	15.0	-12.0	-28.0	-38.0	-48.0
Record Maximum Temp	53.0	57.0	56.0	65.0	77.0	88.0	86.0	84.0	74.0	67.0	56.0	48.0	88.0
HDD, Base 65°F	1553	1406	1321	1014	701	450	319	344	534	1011	1281	1522	11456
CDD, Base 65°F	0	0	0	0	0	0	0	0	0	0	0	0	0
Humidity Ratio (#w/#da)	0.0018	0.0017	0.0021	0.0027	0.0039	0.0055	0.0068	0.0069	0.0055	0.0033	0.0023	0.0019	0.0037
Wind Speed (mph)	10.9	11.3	11.5	11.2	11.1	11.0	10.1	10.5	10.6	10.4	10.5	10.9	10.8
Clearness Index, Kt	0.38	0.44	0.47	0.45	0.42	0.41	0.40	0.38	0.38	0.39	0.37	0.35	0.41

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

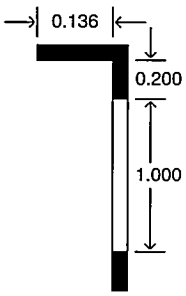
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	6/4	30/19	48/30	48/30	32/21	28/16	55/33	75/44	81/51	72/46	4/2	26/16	48/27	53/32	45/27	0/0	0/0	10/7	9/6	0/0
North	3/2	8/8	10/12	11/12	8/9	20/9	12/13	14/16	15/17	14/16	2/1	8/7	11/10	12/12	10/11	0/0	0/0	4/3	4/3	0/0
East	26/7	61/21	36/19	11/12	8/9	64/19	79/32	57/29	15/17	14/16	16/4	60/19	49/21	12/12	10/11	0/0	1/0	13/5	4/3	0/0
South	8/3	53/19	86/33	86/33	57/21	8/7	29/17	60/30	71/38	57/32	2/1	34/13	70/26	81/34	65/27	0/0	1/0	45/12	41/10	0/0
West	3/2	8/8	10/12	31/18	61/23	8/7	12/13	14/16	16/18	57/32	2/1	8/7	11/10	15/13	52/23	0/0	0/0	4/3	14/5	0/0
M. Clr (%hrs)	28	29	28	29	28	8	8	9	8	8	13	13	13	10	10	35	29	28	29	28

Kodiak, AK

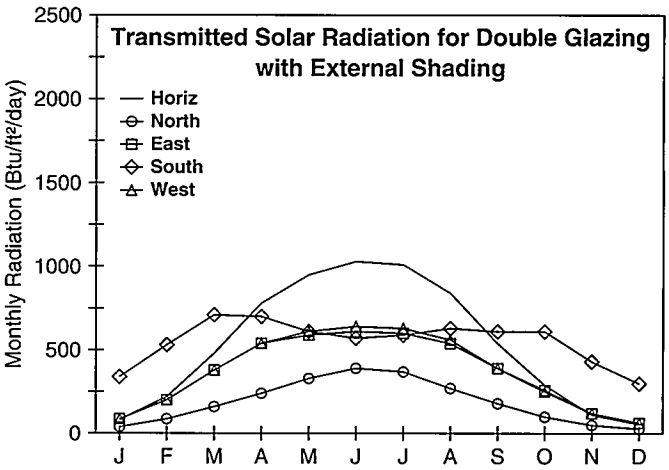
WBAN NO. 25501

LATITUDE: 57.75° N
LONGITUDE: 152.33° W
ELEVATION: 112 feet
MEAN PRESSURE: 14.5 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	150	360	730	1120	1350	1460	1430	1190	800	460	200	100	780
	Std.Dev.	24	60	110	116	140	211	128	108	75	38	20	17	39
	Minimum	98	250	450	910	1080	1060	1180	980	660	390	160	67	700
	Maximum	180	470	940	1270	1550	1910	1700	1380	980	520	230	130	850
	Diffuse	98	210	380	570	760	850	820	650	450	250	120	69	440
	Clear-Day Global	220	530	1090	1800	2360	2610	2460	1960	1300	680	280	150	1290
North	Global	58	130	230	360	510	590	560	410	270	150	73	42	280
	Diffuse	58	130	230	350	450	500	490	390	270	150	73	42	260
	Clear-Day Global	57	120	210	370	650	840	740	450	250	140	70	44	330
East	Global	130	290	550	770	850	870	860	770	560	370	180	99	530
	Diffuse	74	160	290	430	530	570	560	460	330	200	95	52	310
	Clear-Day Global	280	560	970	1410	1690	1790	1710	1470	1100	680	340	220	1020
South	Global	440	710	980	1010	900	860	890	920	850	810	560	380	780
	Diffuse	140	250	370	470	550	570	570	500	390	270	170	110	360
	Clear-Day Global	1200	1700	1990	1900	1680	1550	1580	1750	1910	1780	1310	1020	1610
West	Global	130	290	540	760	870	920	900	790	550	370	180	100	530
	Diffuse	73	160	290	430	530	580	570	470	330	200	95	54	320
	Clear-Day Global	280	560	970	1410	1690	1790	1710	1470	1100	680	340	220	1020

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

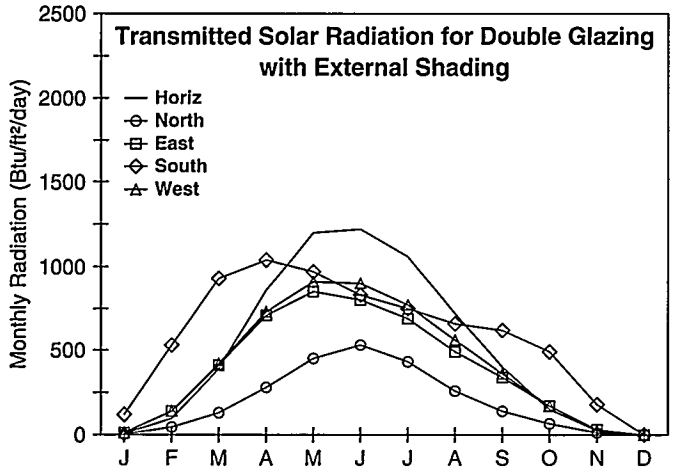
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	82	220	480	780	950	1030	1010	840	540	290	110	55	530
North	Unshaded	40	88	160	250	340	400	370	280	180	110	51	29	190
	Shaded	39	86	160	240	330	390	370	270	180	100	50	28	190
East	Unshaded	88	200	390	550	600	620	620	550	400	260	120	63	370
	Shaded	87	200	380	540	590	610	600	540	390	260	120	62	370
South	Unshaded	340	530	720	710	620	580	600	640	610	610	430	300	560
	Shaded	340	530	710	700	610	570	590	630	610	610	430	300	550
West	Unshaded	86	200	380	550	620	650	640	560	390	260	120	65	380
	Shaded	85	200	380	540	610	640	630	560	390	250	120	64	370

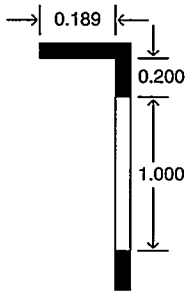
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	29.9	30.5	32.9	37.5	43.5	49.6	54.4	55.2	50.0	40.7	34.4	30.8	40.8
Daily Minimum Temp	24.7	24.9	26.9	31.4	37.5	43.6	48.2	48.4	43.4	34.2	28.8	25.2	34.8
Daily Maximum Temp	35.0	36.1	38.9	43.7	49.5	55.6	60.5	61.9	56.6	47.2	39.9	36.4	46.8
Record Minimum Temp	-16.0	-12.0	-6.0	7.0	20.0	30.0	37.0	36.0	26.0	10.0	0.0	-1.0	-16.0
Record Maximum Temp	54.0	56.0	57.0	64.0	80.0	86.0	82.0	83.0	73.0	62.0	54.0	56.0	86.0
HDD, Base 65°F	1088	966	995	825	667	462	329	304	450	753	918	1060	8817
CDD, Base 65°F	0	0	0	0	0	0	0	0	0	0	0	0	0
Humidity Ratio (#w/#da)	0.0030	0.0029	0.0030	0.0034	0.0045	0.0060	0.0073	0.0074	0.0062	0.0041	0.0033	0.0029	0.0045
Wind Speed (mph)	12.3	12.3	11.8	11.6	10.2	9.2	7.6	8.0	9.2	11.0	12.0	12.4	10.6
Clearness Index, Kt	0.35	0.40	0.44	0.44	0.41	0.40	0.41	0.42	0.40	0.40	0.36	0.33	0.41

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	9/6	34/20	50/29	48/27	30/18	33/17	60/32	80/42	84/48	74/42	6/4	32/17	52/28	56/33	44/26	0/0	2/1	12/7	9/6	0/0
North	4/3	9/8	11/11	11/11	8/7	18/9	12/13	14/15	15/17	14/15	3/2	8/7	11/11	12/12	10/10	0/0	1/1	5/3	4/3	0/0
East	38/9	61/21	30/16	11/11	8/7	73/20	80/28	52/26	15/17	14/15	27/6	65/20	46/20	12/12	10/10	0/0	9/2	11/5	4/3	0/0
South	14/5	59/21	88/33	84/30	50/18	9/7	34/17	63/29	71/35	54/27	4/2	42/15	76/28	82/34	62/25	0/0	12/2	49/12	41/9	0/0
West	4/3	9/8	11/11	38/18	61/21	9/7	12/13	14/15	23/19	64/30	3/2	8/7	11/11	22/15	57/23	0/0	1/1	5/3	17/5	0/0
M. Clr (%hrs)	28	29	28	27	26	15	15	15	15	16	21	21	21	19	19	32	28	27	26	28





Shading Geometry
(Not to Scale)

Kotzebue, AK

WBAN NO. 26616

LATITUDE: 66.87° N
LONGITUDE: 162.63° W
ELEVATION: 16 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	14	190	650	1290	1740	1750	1520	1050	620	270	46	0	770
	Std.Dev.	3	18	53	126	143	151	143	135	88	27	4	0	37
	Minimum	13	160	520	830	1450	1380	1280	760	470	230	38	0	700
	Maximum	19	210	730	1480	2050	2010	1850	1300	760	310	54	0	850
	Diffuse	9	110	320	630	850	810	780	590	350	160	33	0	390
	Clear-Day Global	6	190	720	1530	2210	2480	2280	1660	910	310	35	0	1030
North	Global	6	67	200	420	690	800	660	400	210	99	19	0	300
	Diffuse	6	67	200	390	550	570	510	360	210	99	19	0	250
	Clear-Day Global	0	57	170	380	800	1120	910	460	200	86	13	0	350
East	Global	23	210	590	1010	1220	1140	990	710	490	250	51	0	560
	Diffuse	6	95	280	520	670	640	580	430	270	130	25	0	310
	Clear-Day Global	32	280	780	1390	1800	1920	1800	1440	920	400	67	0	910
South	Global	150	700	1260	1460	1410	1240	1120	950	850	650	240	0	840
	Diffuse	21	200	410	610	700	650	600	480	330	220	64	0	360
	Clear-Day Global	270	1080	1830	2060	1980	1840	1840	1890	1820	1300	440	0	1370
West	Global	23	210	610	1040	1290	1280	1100	790	510	250	51	0	600
	Diffuse	6	95	280	520	680	660	600	450	270	130	25	0	310
	Clear-Day Global	32	280	780	1390	1800	1920	1800	1440	920	400	67	0	910

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	6	96	390	860	1200	1220	1060	720	400	150	25	0	510
North	Unshaded	3	46	140	280	470	550	450	270	150	68	13	0	200
	Shaded	3	45	130	280	450	530	430	260	140	66	13	0	200
East	Unshaded	12	140	420	720	880	820	710	510	350	170	32	0	400
	Shaded	12	140	410	710	850	800	690	490	340	170	31	0	390
South	Unshaded	120	540	930	1050	990	860	780	680	620	500	180	0	610
	Shaded	120	530	930	1040	970	830	750	660	620	490	180	0	590
West	Unshaded	12	140	430	750	930	920	790	570	360	170	31	0	430
	Shaded	12	140	420	730	910	900	770	560	360	170	31	0	420

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	-1.0	-4.8	0.4	11.3	31.2	43.8	53.8	52.1	42.0	22.9	7.8	-0.9	21.6
Daily Minimum Temp	-7.5	-12.0	-8.0	2.3	24.5	37.8	48.5	47.3	37.0	18.2	2.4	-7.4	15.3
Daily Maximum Temp	5.6	2.3	8.7	20.3	37.9	49.7	59.1	57.0	46.9	27.6	13.1	5.5	27.8
Record Minimum Temp	-49.0	-52.0	-48.0	-44.0	-18.0	20.0	30.0	30.0	15.0	-19.0	-36.0	-47.0	-52.0
Record Maximum Temp	39.0	40.0	39.0	48.0	74.0	85.0	85.0	80.0	69.0	51.0	38.0	37.0	85.0
HDD, Base 65°F	2046	1954	2003	1611	1048	636	353	407	690	1305	1716	2043	15812
CDD, Base 65°F	0	0	0	0	0	0	6	7	0	0	0	0	13
Humidity Ratio (#w/#da)	0.0008	0.0007	0.0008	0.0014	0.0030	0.0049	0.0070	0.0068	0.0045	0.0022	0.0011	0.0008	0.0028
Wind Speed (mph)	13.9	12.2	11.3	11.8	11.6	12.1	12.6	12.6	13.4	13.3	14.3	14.1	12.8
Clearness Index, Kt	0.32	0.46	0.55	0.59	0.56	0.48	0.45	0.41	0.40	0.39	0.34	0.17	0.48

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

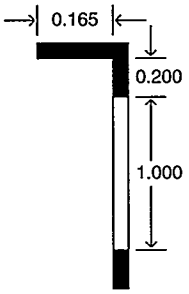
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	2/2	18/14	33/24	36/27	26/20	27/17	48/30	66/41	73/48	70/46	1/1	17/10	34/18	42/24	37/21	0/0	0/0	0/0	0/0	0/0
North	1/1	6/6	9/10	9/11	8/8	22/11	11/11	13/14	14/15	14/15	2/1	6/4	9/8	10/10	9/9	0/0	0/0	0/0	0/0	0/0
East	9/4	48/20	38/20	9/11	8/8	64/23	79/34	62/32	22/19	14/15	7/2	51/13	50/16	15/11	9/9	0/0	0/0	0/0	0/0	0/0
South	2/1	36/16	75/33	83/37	57/25	8/7	27/17	63/32	79/43	71/41	1/1	25/8	63/19	82/29	70/24	0/0	0/0	0/0	0/0	0/0
West	1/1	6/6	9/10	20/15	49/22	8/7	11/11	13/14	14/15	50/31	1/1	6/4	9/8	10/10	42/17	0/0	0/0	0/0	0/0	0/0
M. Clr (%hrs)	46	46	47	49	49	24	26	27	30	33	24	24	26	24	27	49	43	41	41	43

McGrath, AK

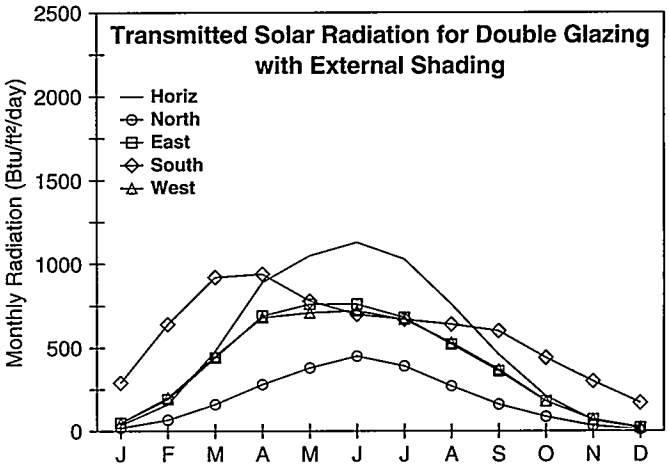
WBAN NO. 26510

LATITUDE: 62.97° N
LONGITUDE: 155.62° W
ELEVATION: 338 feet
MEAN PRESSURE: 14.5 psia

STATION TYPE: Secondary



Shading Geometry (Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	72	300	770	1320	1510	1610	1470	1090	700	340	120	32	780
	Std.Dev.	6	28	70	101	138	140	133	117	96	30	11	4	37
	Minimum	60	250	590	1090	1230	1360	1280	900	540	280	92	25	700
	Maximum	82	360	900	1480	1810	1860	1710	1300	880	390	130	38	870
	Diffuse	48	170	390	690	760	850	820	630	400	230	84	23	430
	Clear-Day Global	82	340	900	1680	2260	2550	2380	1810	1090	480	130	38	1150
North	Global	29	100	240	430	580	670	600	410	240	130	48	15	290
	Diffuse	29	100	240	410	480	540	500	380	240	130	48	15	260
	Clear-Day Global	29	82	190	390	720	980	840	470	220	110	38	13	340
East	Global	80	280	630	970	1070	1080	970	740	510	270	110	38	560
	Diffuse	38	140	320	530	580	630	590	450	300	170	63	18	320
	Clear-Day Global	140	420	910	1440	1750	1870	1780	1480	1030	550	200	76	970
South	Global	380	840	1260	1340	1140	1060	1000	930	840	590	400	210	830
	Diffuse	100	260	450	620	610	640	610	500	370	250	140	53	380
	Clear-Day Global	770	1460	2000	2060	1830	1720	1730	1860	1910	1610	920	510	1530
West	Global	82	290	640	960	1010	1030	950	760	520	270	110	39	560
	Diffuse	38	140	320	540	580	640	590	460	300	170	63	18	320
	Clear-Day Global	140	420	910	1440	1750	1870	1780	1480	1030	550	200	76	970

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	37	160	480	890	1050	1130	1030	760	460	210	65	17	530
North	Unshaded	20	71	160	290	390	460	400	270	170	90	33	10	200
	Shaded	19	68	160	280	380	450	390	270	160	87	32	10	190
East	Unshaded	50	190	450	700	770	770	690	530	370	180	73	22	400
	Shaded	49	190	440	690	760	760	680	520	360	180	71	21	390
South	Unshaded	290	640	930	950	790	730	690	650	610	450	310	170	600
	Shaded	290	640	920	940	780	700	670	640	600	440	300	170	590
West	Unshaded	51	200	460	690	730	740	680	540	370	190	72	22	400
	Shaded	50	200	450	680	710	720	670	530	370	180	71	22	390

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	-8.7	-2.6	10.2	26.5	44.5	55.3	58.7	54.3	44.2	24.7	4.4	-6.0	25.5
Daily Minimum Temp	-17.8	-14.2	-2.9	16.0	34.5	45.1	49.0	45.0	35.4	18.0	-3.7	-14.6	15.8
Daily Maximum Temp	0.4	8.9	23.4	37.0	54.5	65.5	68.4	63.5	52.9	31.3	12.4	2.7	35.1
Record Minimum Temp	-75.0	-64.0	-51.0	-40.0	-2.0	30.0	33.0	25.0	6.0	-28.0	-53.0	-67.0	-75.0
Record Maximum Temp	54.0	55.0	51.0	67.0	81.0	90.0	89.0	89.0	76.0	59.0	49.0	49.0	90.0
HDD, Base 65°F	2285	1893	1699	1155	636	291	207	338	624	1249	1818	2201	14396
CDD, Base 65°F	0	0	0	0	0	0	12	6	0	0	0	0	18
Humidity Ratio (#w/#da)	0.0007	0.0008	0.0012	0.0020	0.0036	0.0058	0.0071	0.0067	0.0045	0.0023	0.0011	0.0008	0.0031
Wind Speed (mph)	3.1	4.5	5.5	7.0	7.0	6.6	6.3	6.2	6.2	5.8	4.1	3.4	5.5
Clearness Index, Kt	0.40	0.49	0.56	0.56	0.48	0.45	0.43	0.41	0.40	0.38	0.38	0.34	0.46

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

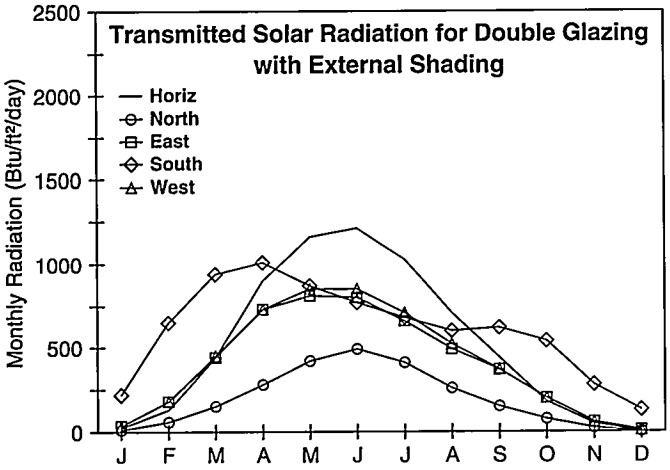
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	6/5	27/20	43/32	43/31	28/21	31/19	54/34	71/46	76/52	68/47	4/3	25/14	44/24	49/29	40/24	0/0	0/0	4/3	3/3	0/0
North	3/2	8/8	10/12	10/12	8/8	18/11	12/12	14/15	14/16	14/15	2/1	7/6	10/9	11/11	10/9	0/0	0/0	2/2	2/1	0/0
East	26/8	58/26	33/21	10/12	8/8	70/27	78/37	54/33	14/16	14/15	20/4	61/18	47/19	11/11	10/9	0/0	0/0	6/3	2/1	0/0
South	8/4	53/24	87/42	87/41	55/24	8/8	33/20	64/37	75/45	60/37	2/1	37/12	73/25	85/34	66/26	0/0	0/0	23/6	20/4	0/0
West	3/2	8/8	10/12	32/20	59/25	8/8	12/12	14/15	17/17	57/36	2/1	7/6	10/9	15/12	52/22	0/0	0/0	2/2	7/2	0/0
M. Clr (%hrs)	35	36	36	37	37	21	20	16	11	8	19	19	19	17	17	38	31	29	31	33

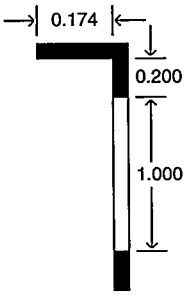
Nome, AK

WBAN NO. 26617

LATITUDE: 64.50° N
LONGITUDE: 165.43° W
ELEVATION: 23 feet
MEAN PRESSURE: 14.6 psia

STATION TYPE: Secondary





Shading Geometry
(Not to Scale)

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	45	260	730	1340	1670	1730	1470	1040	680	320	87	8	780
	Std.Dev.	5	26	66	109	149	184	152	114	105	30	10	3	38
	Minimum	35	200	550	1120	1280	1330	1060	790	500	260	70	6	720
	Maximum	57	310	820	1530	1950	2140	1730	1280	870	380	98	13	850
	Diffuse	30	140	360	650	790	780	790	620	370	180	60	3	400
	Clear-Day Global	48	280	840	1630	2270	2540	2360	1770	1030	410	86	10	1110
North	Global	19	87	220	430	640	740	620	400	230	110	35	3	300
	Diffuse	19	87	220	400	510	540	500	370	230	110	35	3	250
	Clear-Day Global	16	73	180	390	760	1050	890	470	210	95	25	0	350
East	Global	56	270	630	1030	1150	1140	950	700	530	290	90	20	570
	Diffuse	23	120	300	520	610	610	570	430	290	150	46	3	310
	Clear-Day Global	98	380	880	1460	1800	1920	1820	1500	1020	500	150	38	970
South	Global	290	850	1290	1430	1280	1160	1010	870	870	720	360	160	850
	Diffuse	67	230	420	600	630	610	580	470	350	230	110	9	360
	Clear-Day Global	590	1350	1970	2090	1900	1770	1780	1880	1900	1530	770	350	1490
West	Global	58	270	640	1030	1200	1210	1010	740	530	290	92	20	590
	Diffuse	24	120	310	530	620	620	570	440	290	150	46	3	310
	Clear-Day Global	98	380	880	1460	1800	1920	1820	1500	1020	500	150	38	970

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	23	130	440	900	1160	1210	1030	710	440	180	47	3	530
North	Unshaded	12	60	150	290	430	500	420	270	160	78	25	2	200
	Shaded	12	58	150	280	420	490	410	260	150	75	23	2	200
East	Unshaded	34	180	450	740	830	820	680	500	380	200	58	10	410
	Shaded	33	180	440	730	810	800	660	490	370	200	57	9	400
South	Unshaded	220	650	950	1020	890	790	700	610	630	540	280	130	620
	Shaded	220	650	940	1010	870	770	680	600	620	540	280	130	610
West	Unshaded	34	180	460	740	860	870	730	530	380	200	58	10	420
	Shaded	34	180	450	730	850	850	710	520	370	200	58	10	410

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	7.0	3.9	8.6	17.6	35.6	45.9	51.5	50.2	42.5	28.0	15.9	7.3	26.2
Daily Minimum Temp	-0.7	-4.5	-0.3	9.7	29.2	38.8	45.2	44.1	36.3	22.2	9.3	-0.5	19.1
Daily Maximum Temp	14.7	12.2	17.4	25.5	42.0	52.9	57.7	56.1	48.7	33.7	22.5	15.1	33.2
Record Minimum Temp	-54.0	-42.0	-46.0	-30.0	-11.0	23.0	31.0	27.0	15.0	-10.0	-39.0	-41.0	-54.0
Record Maximum Temp	43.0	48.0	43.0	51.0	78.0	81.0	86.0	81.0	71.0	59.0	45.0	43.0	86.0
HDD, Base 65°F	1798	1711	1748	1422	911	573	423	459	675	1147	1473	1789	14129
CDD, Base 65°F	0	0	0	0	0	0	0	0	0	0	0	0	0
Humidity Ratio (#w/#da)	0.0012	0.0010	0.0012	0.0017	0.0032	0.0048	0.0064	0.0063	0.0045	0.0025	0.0016	0.0012	0.0030
Wind Speed (mph)	11.6	10.2	10.1	10.6	10.4	10.0	10.1	10.9	11.7	11.0	11.4	11.1	10.8
Clearness Index, Kt	0.38	0.49	0.56	0.59	0.00	0.48	0.43	0.39	0.40	0.40	0.37	0.31	0.47

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

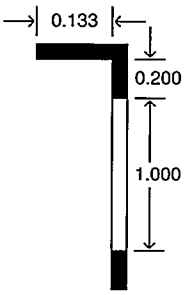
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	1/1	19/14	36/27	42/30	32/24	24/14	48/29	68/39	78/48	74/47	1/1	17/10	37/20	46/27	43/25	0/0	0/0	0/0	1/1	0/0
North	1/1	6/6	9/11	10/12	8/10	25/10	11/11	13/14	14/16	14/16	1/0	6/5	9/8	10/10	10/10	0/0	0/0	0/0	0/0	0/0
East	7/2	54/20	45/22	10/12	8/10	64/19	83/33	67/30	27/21	14/16	4/1	54/14	56/19	20/13	10/10	0/0	0/0	0/0	0/0	0/0
South	1/1	37/15	78/33	91/39	67/29	7/6	23/15	59/28	78/41	72/38	0/0	23/8	64/21	84/31	76/28	0/0	0/0	0/0	6/1	0/0
West	1/1	6/6	9/11	17/14	53/24	7/6	11/11	13/14	14/16	47/29	0/0	6/5	9/8	10/10	42/19	0/0	0/0	0/0	1/0	0/0
M. Clr (%hrs)	43	43	42	44	42	27	27	29	27	29	26	22	23	20	20	47	41	37	37	42

St Paul Is., AK

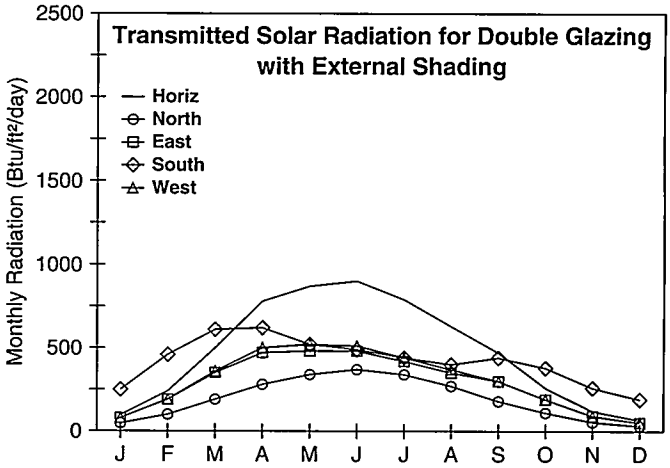
WBAN NO. 25713

LATITUDE: 57.15° N
LONGITUDE: 170.22° W
ELEVATION: 23 feet
MEAN PRESSURE: 14.6 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	160	380	750	1120	1240	1270	1130	910	690	400	190	110	700
	Std.Dev.	22	48	107	166	153	89	84	76	49	32	16	12	47
	Minimum	120	280	580	850	1010	1120	950	760	560	340	150	79	620
	Maximum	200	510	970	1400	1620	1500	1240	1060	760	460	210	140	790
	Diffuse	130	270	520	800	930	990	960	770	500	290	150	88	530
	Clear-Day Global	240	560	1130	1840	2380	2610	2470	1970	1320	700	300	170	1310
North	Global	67	150	280	420	510	550	510	400	270	160	81	47	290
	Diffuse	67	150	280	420	490	520	500	390	270	160	81	47	280
	Clear-Day Global	63	120	230	390	650	830	730	450	250	150	73	48	330
East	Global	120	270	510	680	690	690	610	510	430	270	140	80	420
	Diffuse	85	190	350	510	560	580	550	440	320	200	99	58	330
	Clear-Day Global	300	570	990	1430	1680	1770	1700	1460	1090	690	350	230	1020
South	Global	330	610	860	890	770	730	660	590	630	520	340	240	600
	Diffuse	160	290	460	580	590	590	560	470	380	270	170	120	390
	Clear-Day Global	1250	1720	2020	1920	1660	1520	1550	1740	1900	1780	1340	1060	1620
West	Global	120	280	510	710	740	740	650	540	440	270	140	80	440
	Diffuse	85	190	350	520	570	590	560	450	320	200	99	59	330
	Clear-Day Global	300	570	990	1430	1680	1770	1700	1460	1090	690	350	230	1020

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

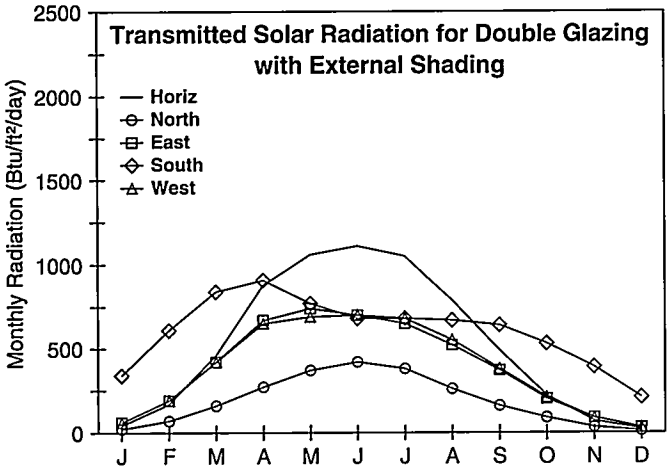
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	96	240	500	780	870	900	790	630	470	260	120	65	480
North	Unshaded	46	100	190	290	350	380	350	280	190	110	56	33	200
	Shaded	46	99	190	280	340	370	340	270	180	110	55	32	190
East	Unshaded	79	190	360	480	490	490	430	360	300	190	93	52	290
	Shaded	78	190	350	470	480	480	420	350	300	190	91	52	290
South	Unshaded	250	460	620	620	530	500	450	410	450	380	260	190	430
	Shaded	250	460	610	620	520	490	440	400	440	380	260	190	420
West	Unshaded	80	190	360	510	530	520	460	380	310	190	92	53	310
	Shaded	78	190	360	500	520	510	440	370	300	190	91	52	300

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	26.6	22.4	24.2	28.3	35.2	41.5	46.1	47.7	44.6	37.8	33.0	29.0	34.7
Daily Minimum Temp	22.4	17.9	19.4	23.9	31.2	37.1	42.5	44.4	40.3	33.6	28.9	24.8	30.5
Daily Maximum Temp	30.7	26.9	28.9	32.7	39.3	45.8	49.6	51.0	48.8	42.0	37.0	33.2	38.8
Record Minimum Temp	-26.0	-16.0	-19.0	-8.0	8.0	16.0	28.0	29.0	25.0	12.0	4.0	-5.0	-26.0
Record Maximum Temp	48.0	44.0	50.0	48.0	58.0	62.0	63.0	66.0	61.0	54.0	50.0	52.0	66.0
HDD, Base 65°F	1190	1193	1265	1101	924	705	586	536	612	843	960	1116	11031
CDD, Base 65°F	0	0	0	0	0	0	0	0	0	0	0	0	0
Humidity Ratio (#w/#da)	0.0025	0.0021	0.0023	0.0027	0.0035	0.0046	0.0057	0.0061	0.0052	0.0038	0.0031	0.0027	0.0037
Wind Speed (mph)	19.2	20.0	18.6	17.8	15.3	13.7	12.2	13.6	15.7	17.9	18.9	19.6	16.8
Clearness Index, Kt	0.35	0.41	0.45	0.44	0.38	0.35	0.33	0.32	0.34	0.33	0.32	0.32	0.36

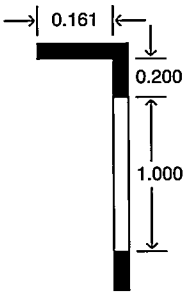
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	7/6	33/21	49/33	49/33	32/21	29/14	57/29	78/41	84/43	75/41	4/3	27/16	48/27	55/29	46/26	0/0	2/1	12/8	10/7	0/0
North	3/3	9/9	11/13	11/13	9/9	19/7	12/13	14/17	15/17	14/17	2/1	8/7	11/11	12/12	11/11	0/0	1/1	5/4	4/3	0/0
East	26/8	60/21	33/19	11/13	9/9	67/11	79/23	55/25	15/17	14/17	16/3	57/17	46/19	12/12	11/11	0/0	6/1	13/5	4/3	0/0
South	9/4	53/19	82/33	82/34	52/19	8/6	29/15	59/26	70/28	55/25	2/1	34/12	67/25	79/28	62/23	0/0	7/2	45/12	40/11	0/0
West	3/3	9/9	11/13	33/20	58/21	8/6	12/13	14/17	18/18	60/26	2/1	8/7	11/11	17/13	53/21	0/0	1/1	5/4	15/6	0/0
M. Clr (%hrs)	14	16	16	16	17	5	5	5	7	7	7	6	6	7	5	13	11	7	8	10



Talkeetna, AK

WBAN NO. 26528



Shading Geometry
(Not to Scale)

LATITUDE: 62.30° N
LONGITUDE: 150.10° W
ELEVATION: 345 feet
MEAN PRESSURE: 14.4 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	87	300	730	1290	1510	1570	1490	1130	740	370	140	42	790
	Std.Dev.	9	32	80	99	165	153	135	102	82	31	12	5	31
	Minimum	73	260	500	1090	1280	1360	1250	960	550	310	120	32	720
	Maximum	100	390	840	1490	1960	1890	1810	1360	890	420	160	51	850
	Diffuse	55	170	380	660	770	860	800	620	400	220	84	29	420
	Clear-Day Global	98	360	920	1670	2260	2540	2380	1820	1110	500	150	51	1160
North	Global	34	100	230	420	560	640	580	400	240	130	51	18	290
	Diffuse	34	100	230	400	480	530	500	380	240	130	51	18	260
	Clear-Day Global	29	89	190	380	690	950	820	450	230	110	38	19	330
East	Global	100	290	600	960	1060	1000	930	740	540	300	140	52	560
	Diffuse	45	140	310	510	580	610	570	450	300	170	68	22	320
	Clear-Day Global	170	460	920	1430	1720	1850	1760	1470	1040	570	230	110	980
South	Global	440	810	1150	1290	1130	1030	1020	960	890	710	510	270	850
	Diffuse	120	250	420	590	610	630	590	500	370	250	150	66	380
	Clear-Day Global	900	1530	2000	2020	1800	1690	1710	1830	1900	1640	1030	680	1560
West	Global	99	280	600	930	980	1000	970	780	550	300	140	52	560
	Diffuse	45	140	310	510	580	620	590	460	300	170	68	22	320
	Clear-Day Global	170	460	920	1430	1720	1850	1760	1470	1040	570	230	110	980

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	44	170	460	880	1060	1110	1050	790	490	220	71	21	530
North	Unshaded	23	72	160	280	380	430	390	270	170	91	36	12	190
	Shaded	23	70	160	270	370	420	380	260	160	89	34	12	190
East	Unshaded	62	200	420	690	760	720	660	530	380	210	91	30	400
	Shaded	61	190	420	670	740	700	650	520	370	200	90	30	390
South	Unshaded	340	620	850	920	780	700	700	680	650	530	390	210	610
	Shaded	340	610	840	910	770	680	680	670	640	530	390	210	610
West	Unshaded	62	190	420	660	710	710	690	560	390	210	90	30	400
	Shaded	61	190	420	650	690	700	680	550	380	210	88	30	390

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	9.9	14.7	21.6	32.9	45.0	54.5	58.4	55.1	46.1	31.2	16.5	11.3	33.1
Daily Minimum Temp	0.6	4.0	9.8	22.4	33.8	44.4	49.0	45.7	36.6	23.1	7.9	2.9	23.4
Daily Maximum Temp	19.2	25.4	33.4	43.4	56.0	64.4	67.7	64.5	55.6	39.3	25.2	19.7	42.8
Record Minimum Temp	-48.0	-46.0	-43.0	-37.0	-5.0	28.0	33.0	25.0	15.0	-21.0	-41.0	-45.0	-48.0
Record Maximum Temp	45.0	51.0	53.0	69.0	82.0	91.0	90.0	85.0	78.0	68.0	50.0	47.0	91.0
HDD, Base 65°F	1708	1408	1345	963	620	315	205	307	567	1048	1455	1665	11606
CDD, Base 65°F	0	0	0	0	0	0	0	0	0	0	0	0	0
Humidity Ratio (#w/#da)	0.0012	0.0014	0.0017	0.0025	0.0040	0.0059	0.0072	0.0068	0.0048	0.0027	0.0015	0.0013	0.0034
Wind Speed (mph)	6.5	6.0	6.1	5.6	5.6	5.8	5.3	4.5	4.2	4.7	6.0	6.3	5.6
Clearness Index, Kt	0.41	0.47	0.52	0.54	0.47	0.43	0.44	0.42	0.41	0.40	0.41	0.37	0.45

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

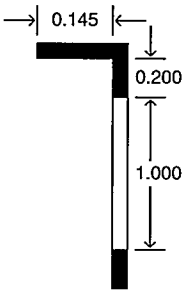
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	9/7	31/22	44/31	41/28	24/17	35/21	60/36	74/46	77/51	66/43	8/5	30/17	47/26	50/29	38/23	0/0	0/0	6/5	2/2	0/0
North	4/3	8/9	10/12	10/11	7/7	15/10	12/13	14/15	15/16	14/15	3/2	8/7	10/10	11/11	9/9	0/0	0/0	3/2	1/1	0/0
East	37/12	56/24	25/17	10/11	7/7	74/26	77/36	47/28	15/16	14/15	33/7	64/19	42/18	11/11	9/9	0/0	0/0	6/3	1/1	0/0
South	15/6	60/25	88/38	82/34	46/19	9/8	40/23	67/36	74/42	55/32	6/3	45/15	79/28	84/33	60/23	0/0	0/0	35/9	14/3	0/0
West	4/3	8/9	10/12	39/20	58/23	9/8	12/13	14/15	26/21	63/35	3/2	8/7	10/10	24/15	57/23	0/0	0/0	3/2	6/2	0/0
M. Clr (%hrs)	35	35	34	35	32	17	17	17	13	13	19	22	24	22	20	36	30	29	30	32

Yakutat, AK

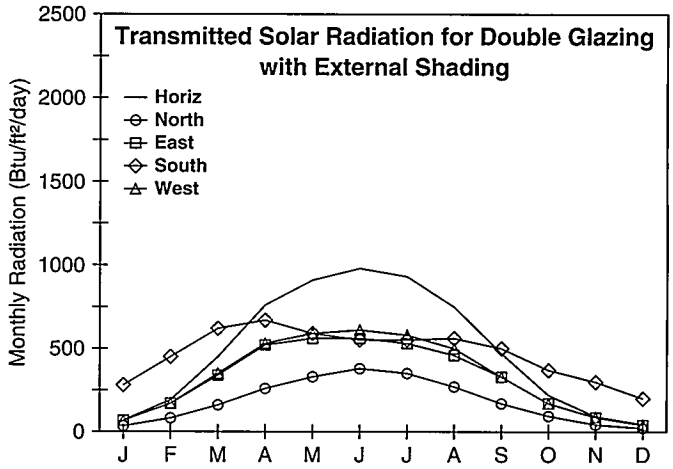
WBAN NO. 25339

LATITUDE: 59.52° N
LONGITUDE: 139.67° W
ELEVATION: 30 feet
MEAN PRESSURE: 14.6 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	120	320	680	1110	1300	1390	1320	1070	700	350	160	76	720
	Std.Dev.	21	51	89	155	118	128	125	130	85	38	27	14	37
	Minimum	73	220	490	810	1090	1040	1140	850	540	280	120	51	640
	Maximum	150	430	900	1480	1550	1610	1680	1290	940	410	230	100	780
	Diffuse	89	220	440	670	800	910	860	670	450	250	110	60	460
	Clear-Day Global	170	460	1030	1760	2320	2590	2430	1910	1220	600	220	110	1240
North	Global	50	120	240	390	510	580	540	400	260	140	64	33	280
	Diffuse	50	120	240	380	460	520	490	380	250	140	64	33	260
	Clear-Day Global	44	100	210	380	660	880	770	460	240	130	57	32	330
East	Global	100	250	490	750	800	810	760	660	470	260	130	67	460
	Diffuse	64	150	310	470	530	580	550	450	310	170	82	42	310
	Clear-Day Global	230	510	950	1420	1700	1810	1730	1470	1070	630	290	170	1000
South	Global	360	600	860	970	880	830	830	820	710	500	390	260	670
	Diffuse	140	250	410	530	560	590	570	480	360	230	150	99	360
	Clear-Day Global	1060	1630	2000	1950	1730	1610	1630	1790	1900	1710	1190	860	1590
West	Global	100	250	500	760	840	870	830	710	480	250	130	68	480
	Diffuse	64	160	310	470	540	590	560	450	310	170	81	43	310
	Clear-Day Global	230	510	950	1420	1700	1810	1730	1470	1070	630	290	170	1000

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

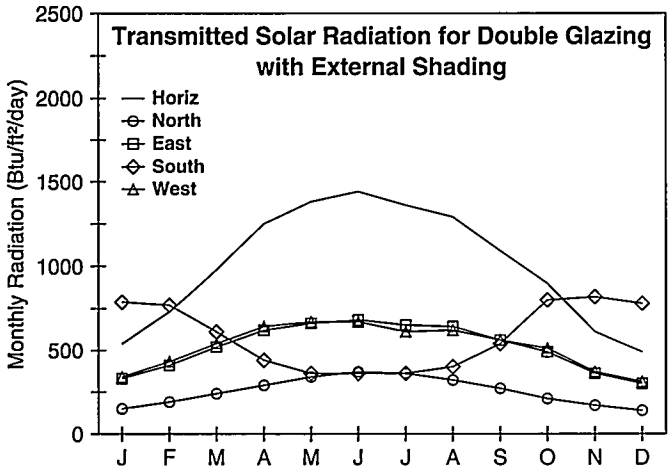
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	69	190	450	760	910	980	930	750	470	220	93	45	490
North	Unshaded	35	84	170	270	340	400	360	270	180	97	45	23	190
	Shaded	33	81	160	260	330	380	350	270	170	94	44	22	180
East	Unshaded	69	170	350	530	570	570	540	470	330	180	88	42	330
	Shaded	68	170	340	520	560	560	530	460	330	170	87	42	320
South	Unshaded	280	450	630	680	600	570	570	570	510	370	300	200	480
	Shaded	280	450	620	670	590	550	550	560	500	370	300	200	470
West	Unshaded	69	170	350	540	600	620	590	510	340	180	89	43	340
	Shaded	68	170	350	530	590	610	580	500	330	170	88	43	340

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	25.1	28.0	31.0	36.3	43.3	49.4	53.6	53.2	48.2	40.9	31.3	27.1	39.0
Daily Minimum Temp	18.6	21.1	23.7	29.1	36.5	43.3	47.8	46.5	41.0	34.7	25.2	21.1	32.4
Daily Maximum Temp	31.5	35.0	38.2	43.5	50.0	55.6	59.3	59.8	55.3	47.1	37.3	33.1	45.5
Record Minimum Temp	-22.0	-20.0	-20.0	3.0	21.0	29.0	35.0	29.0	21.0	6.0	-6.0	-24.0	-24.0
Record Maximum Temp	55.0	54.0	59.0	68.0	79.0	82.0	84.0	86.0	77.0	63.0	55.0	52.0	86.0
HDD, Base 65°F	1237	1036	1054	861	673	468	353	366	504	747	1011	1175	9485
CDD, Base 65°F	0	0	0	0	0	0	0	0	0	0	0	0	0
Humidity Ratio (#w/#da)	0.0027	0.0029	0.0031	0.0037	0.0049	0.0063	0.0076	0.0076	0.0064	0.0048	0.0033	0.0029	0.0047
Wind Speed (mph)	7.1	6.9	6.7	6.8	7.1	6.9	6.4	6.2	6.6	7.6	6.9	7.2	6.9
Clearness Index, Kt	0.36	0.40	0.44	0.45	0.40	0.38	0.38	0.38	0.36	0.33	0.34	0.33	0.39

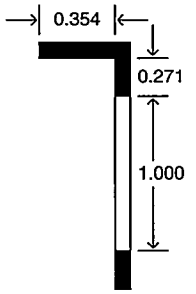
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	18/12	41/26	49/31	40/24	18/12	45/24	69/37	82/42	80/46	65/37	16/9	41/21	55/27	53/27	35/19	0/0	6/4	10/7	3/2	0/0
North	6/5	10/11	11/12	10/10	6/6	10/10	13/15	14/16	14/17	13/14	6/4	10/9	11/11	11/11	9/8	0/0	3/2	4/3	2/1	0/0
East	54/15	51/21	11/12	10/10	6/6	81/24	71/28	34/21	14/17	13/14	51/11	62/19	29/14	11/11	9/8	0/0	14/4	4/3	2/1	0/0
South	32/10	74/26	90/33	74/25	30/11	14/11	50/23	71/30	69/33	44/23	18/6	59/19	85/25	80/26	48/16	0/0	29/6	44/10	18/3	0/0
West	6/5	10/11	12/13	52/20	53/17	10/10	13/15	14/16	42/25	76/31	6/4	10/9	11/11	40/17	65/19	0/0	3/2	7/4	11/2	0/0
M. Clr (%hrs)	18	18	18	17	18	9	9	10	11	11	14	13	12	13	14	21	16	16	17	19



Birmingham, AL

WBAN NO. 13876



Shading Geometry
(Not to Scale)

LATITUDE: 33.57° N
LONGITUDE: 86.75° W
ELEVATION: 630 feet
MEAN PRESSURE: 14.4 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	810	1050	1380	1730	1900	1970	1870	1780	1510	1270	900	740	1410
	Std.Dev.	58	89	111	121	120	146	134	109	101	112	77	55	40
	Minimum	710	880	1170	1480	1690	1680	1670	1510	1260	1020	700	620	1330
	Maximum	950	1260	1640	1940	2170	2270	2160	2000	1710	1470	1020	840	1470
	Diffuse	380	470	600	720	850	920	930	850	700	500	400	350	640
	Clear-Day Global	1180	1510	1930	2310	2520	2580	2510	2300	1970	1560	1210	1060	1890
North	Global	240	300	370	460	560	630	590	500	410	330	260	220	410
	Diffuse	240	300	370	450	510	540	530	490	410	330	260	220	390
	Clear-Day Global	220	270	340	440	590	680	630	490	390	310	240	210	400
East	Global	510	640	800	960	1030	1060	1020	1000	860	760	550	460	800
	Diffuse	290	350	450	550	620	650	640	610	510	410	310	260	470
	Clear-Day Global	830	1010	1200	1330	1380	1370	1340	1270	1150	970	810	750	1120
South	Global	1080	1130	1070	930	740	670	690	840	1020	1250	1140	1060	970
	Diffuse	380	430	510	540	560	560	570	580	560	490	410	360	500
	Clear-Day Global	2040	1970	1670	1210	870	730	790	1040	1430	1750	1910	1960	1450
West	Global	530	670	830	980	1030	1040	960	950	870	770	570	490	810
	Diffuse	290	360	460	550	630	660	640	610	520	410	320	270	480
	Clear-Day Global	830	1010	1200	1330	1380	1370	1340	1270	1150	970	810	750	1120

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	540	730	980	1250	1380	1440	1360	1290	1090	900	610	490	1010
North	Unshaded	170	210	260	310	370	410	390	340	290	230	180	150	270
	Shaded	150	190	240	290	340	370	360	320	270	210	170	140	250
East	Unshaded	350	450	570	680	730	750	720	710	610	530	380	320	570
	Shaded	330	410	520	620	660	680	650	640	560	490	360	300	520
South	Unshaded	800	810	720	580	450	410	430	520	670	880	840	800	660
	Shaded	790	770	610	440	360	360	360	400	540	800	820	780	580
West	Unshaded	370	470	580	700	730	730	680	670	610	550	400	340	570
	Shaded	340	430	540	640	670	670	610	620	560	510	370	310	520

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	41.5	45.7	54.2	62.0	69.4	76.3	79.8	79.0	73.4	62.5	53.1	45.2	61.8
Daily Minimum Temp	31.3	34.5	42.3	49.2	57.7	65.2	69.5	68.8	62.9	50.2	41.6	34.8	50.7
Daily Maximum Temp	51.7	56.9	66.1	74.6	81.0	87.4	89.9	89.1	83.9	74.7	64.6	55.7	73.0
Record Minimum Temp	-6.0	3.0	11.0	26.0	35.0	42.0	51.0	51.0	37.0	27.0	5.0	1.0	-6.0
Record Maximum Temp	81.0	83.0	89.0	92.0	99.0	102.0	106.0	103.0	100.0	94.0	84.0	80.0	106.0
HDD, Base 65°F	729	540	350	135	31	0	0	0	7	148	364	614	2918
CDD, Base 65°F	0	0	15	45	168	339	459	434	259	71	7	0	1797
Humidity Ratio (#w/#da)	0.0043	0.0047	0.0061	0.0079	0.0109	0.0138	0.0157	0.0154	0.0129	0.0087	0.0065	0.0050	0.0093
Wind Speed (mph)	7.7	8.4	8.6	8.1	6.7	5.9	5.7	5.4	6.2	6.0	6.8	7.4	6.9
Clearness Index, Kt	0.47	0.49	0.51	0.54	0.53	0.54	0.52	0.53	0.52	0.54	0.49	0.46	0.52

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

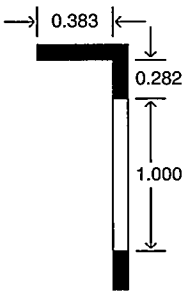
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	50/28	82/51	89/57	66/41	24/15	50/34	88/61	103/76	92/72	61/45	35/21	74/49	90/64	78/56	42/30	27/14	54/30	57/33	34/19	3/2
North	11/11	15/17	15/18	13/14	7/7	21/16	18/19	17/19	18/19	19/17	10/9	16/17	17/19	17/18	12/12	8/6	11/12	12/13	9/8	2/1
East	79/29	53/31	15/18	13/14	7/7	74/38	68/44	25/24	18/19	16/15	66/25	66/38	23/22	17/18	12/12	55/14	38/19	12/13	9/8	2/1
South	43/19	71/38	76/43	57/31	21/10	14/13	27/24	37/31	31/28	16/15	23/13	55/33	69/45	58/39	29/19	54/14	87/31	90/35	63/21	6/2
West	11/11	15/17	31/24	73/36	63/23	14/13	18/19	17/19	57/45	74/47	10/9	16/17	17/19	59/40	68/35	8/6	11/12	30/18	57/19	10/3
M. Clr (%hrs)	35	32	31	32	35	44	42	28	29	34	44	43	33	35	42	34	35	35	35	38

Huntsville, AL

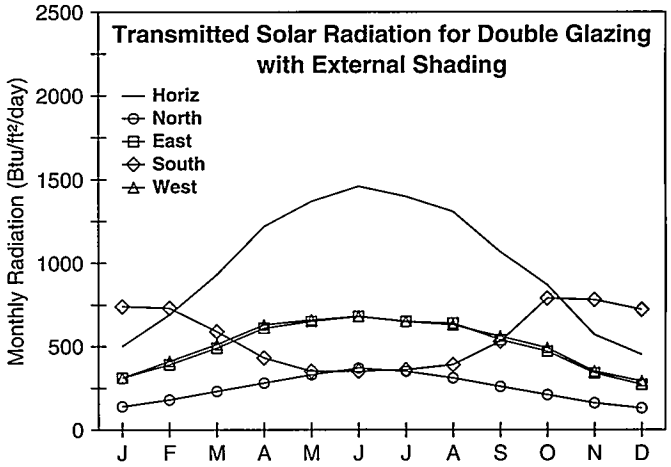
WBAN NO. 03856

LATITUDE: 34.65° N
LONGITUDE: 86.77° W
ELEVATION: 623 feet
MEAN PRESSURE: 14.4 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	750	990	1310	1690	1880	2000	1930	1810	1490	1220	840	680	1380
	Std.Dev.	64	84	116	119	123	126	131	119	101	107	69	59	35
	Minimum	600	860	1100	1440	1670	1650	1650	1480	1320	1010	700	590	1330
	Maximum	880	1230	1600	1900	2190	2290	2180	2000	1670	1470	960	780	1470
	Diffuse	370	460	580	690	810	860	870	780	650	480	380	330	610
	Clear-Day Global	1120	1450	1890	2290	2520	2580	2510	2290	1940	1520	1150	1000	1860
North	Global	230	290	360	440	550	620	580	490	400	320	250	210	400
	Diffuse	230	290	360	430	500	530	520	470	400	320	250	210	380
	Clear-Day Global	210	270	340	430	580	680	620	480	380	300	230	200	390
East	Global	480	600	760	950	1020	1070	1030	1000	840	730	520	430	790
	Diffuse	270	340	440	530	600	630	630	580	490	390	300	250	460
	Clear-Day Global	800	970	1190	1330	1390	1390	1350	1280	1150	960	780	710	1110
South	Global	1020	1070	1040	930	750	680	710	870	1030	1240	1090	980	950
	Diffuse	370	420	490	530	550	550	560	560	540	480	390	340	480
	Clear-Day Global	1990	1940	1680	1240	900	760	810	1070	1450	1760	1890	1920	1450
West	Global	490	630	790	970	1030	1070	1020	990	870	750	540	450	800
	Diffuse	280	350	450	540	610	640	630	590	510	400	300	250	460
	Clear-Day Global	800	970	1190	1330	1390	1390	1350	1280	1150	960	780	710	1110

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

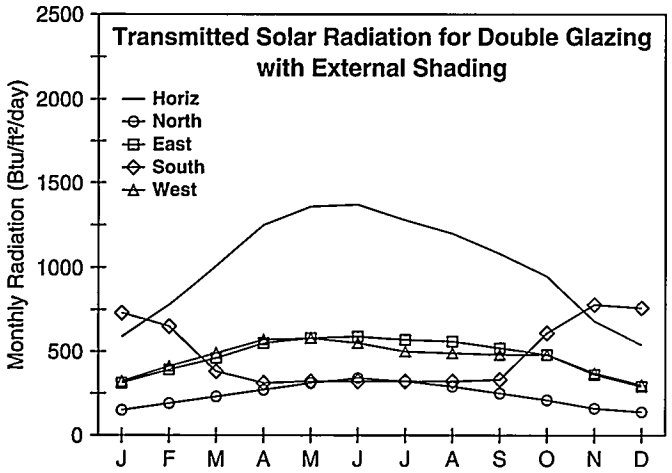
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	500	690	930	1220	1370	1460	1400	1310	1070	870	570	450	990
North	Unshaded	160	200	250	300	360	400	380	330	280	220	170	150	270
	Shaded	140	180	230	280	330	370	350	310	260	210	160	130	250
East	Unshaded	330	420	540	670	730	750	730	710	600	510	360	290	550
	Shaded	310	390	490	610	650	680	650	640	540	470	340	270	500
South	Unshaded	760	780	700	580	450	410	430	530	680	880	810	730	650
	Shaded	740	730	590	430	350	350	360	390	530	790	780	720	560
West	Unshaded	340	440	560	690	730	760	720	700	610	530	380	310	560
	Shaded	310	410	510	630	660	680	650	630	560	490	350	290	510

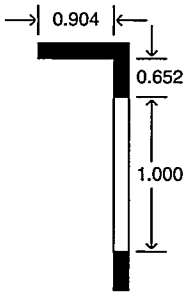
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	38.8	43.1	51.9	60.8	68.4	75.8	79.0	78.3	72.2	61.2	51.5	42.9	60.3
Daily Minimum Temp	29.2	32.6	40.9	49.0	57.3	64.9	68.9	67.9	61.6	49.3	40.5	33.1	49.6
Daily Maximum Temp	48.2	53.5	62.8	72.5	79.3	86.6	89.0	88.8	82.8	73.0	62.4	52.6	71.0
Record Minimum Temp	-11.0	6.0	6.0	26.0	36.0	45.0	54.0	54.0	40.0	29.0	15.0	-3.0	-11.0
Record Maximum Temp	76.0	79.0	84.0	90.0	93.0	101.0	102.0	103.0	101.0	90.0	83.0	77.0	103.0
HDD, Base 65°F	812	613	417	158	41	0	0	0	13	173	411	685	3323
CDD, Base 65°F	0	0	11	32	147	324	434	412	229	56	6	0	1651
Humidity Ratio (#w/#da)	0.0040	0.0044	0.0057	0.0075	0.0104	0.0135	0.0155	0.0150	0.0125	0.0082	0.0061	0.0046	0.0089
Wind Speed (mph)	9.2	9.8	10.1	9.4	7.9	6.8	6.2	6.0	7.0	7.3	8.5	9.3	8.1
Clearness Index, Kt	0.45	0.47	0.49	0.53	0.53	0.54	0.53	0.54	0.52	0.53	0.47	0.44	0.51

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	49/26	80/50	87/55	65/38	23/15	51/35	87/64	102/75	92/73	61/47	34/22	74/50	88/60	77/57	42/31	25/13	52/30	55/32	32/18	2/2
North	11/10	15/16	15/17	13/14	7/6	21/16	17/18	17/19	18/19	17/16	10/9	16/16	17/18	16/17	12/11	7/6	11/11	11/12	8/8	1/1
East	78/27	52/31	15/17	13/14	7/6	77/42	68/48	24/23	18/19	15/15	67/28	66/40	22/21	16/17	12/11	54/14	37/19	11/12	8/8	1/1
South	43/18	71/38	77/43	58/29	21/11	13/13	28/25	38/32	32/29	15/15	24/13	56/35	69/44	59/41	30/20	53/13	86/33	90/36	62/20	5/2
West	11/10	15/16	31/24	72/33	63/24	13/13	17/18	17/19	57/45	75/51	10/9	16/16	17/18	58/40	69/39	7/6	11/11	29/17	55/18	8/3
M. Clr (%hrs)	33	28	26	32	26	35	34	36	29	33	36	36	40	34	37	30	26	26	33	31





Shading Geometry
(Not to Scale)

Mobile, AL

WBAN NO. 13894

LATITUDE: 30.68° N
LONGITUDE: 88.25° W
ELEVATION: 220 feet
MEAN PRESSURE: 14.6 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	850	1120	1400	1720	1860	1880	1770	1660	1500	1330	980	800	1410
	Std.Dev.	70	93	106	134	120	140	121	131	106	116	89	68	38
	Minimum	700	910	1170	1480	1570	1600	1520	1410	1300	1110	720	690	1330
	Maximum	1020	1280	1630	2080	2200	2160	2060	1970	1750	1580	1170	940	1490
	Diffuse	410	480	610	710	830	890	910	830	700	500	410	370	640
	Clear-Day Global	1270	1590	1980	2320	2500	2550	2490	2320	2010	1640	1300	1160	1930
North	Global	260	310	380	450	560	620	570	490	410	340	270	240	410
	Diffuse	260	310	380	440	500	530	510	470	410	340	270	240	390
	Clear-Day Global	240	290	350	440	580	690	640	490	400	320	260	220	410
East	Global	520	660	790	940	1000	1030	990	970	870	790	600	500	810
	Diffuse	300	370	460	540	600	630	630	590	510	420	330	280	470
	Clear-Day Global	860	1020	1200	1310	1340	1340	1320	1260	1150	1000	840	780	1120
South	Global	1060	1130	1020	850	670	590	610	730	940	1230	1180	1070	920
	Diffuse	390	450	500	520	530	520	530	540	540	490	430	380	490
	Clear-Day Global	1990	1900	1570	1100	760	630	690	940	1340	1700	1880	1950	1370
West	Global	540	690	830	970	1000	960	880	850	820	800	610	510	790
	Diffuse	310	380	470	540	610	620	610	570	510	420	340	290	470
	Clear-Day Global	860	1020	1200	1310	1340	1340	1320	1260	1150	1000	840	780	1120

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	590	780	1010	1250	1360	1370	1280	1200	1080	950	680	540	1010
North	Unshaded	180	210	260	310	360	400	370	330	280	230	190	160	270
	Shaded	150	190	230	270	310	340	320	290	250	210	160	140	240
East	Unshaded	360	460	560	660	710	730	700	690	620	560	420	340	570
	Shaded	310	390	460	550	580	590	570	560	520	480	360	290	470
South	Unshaded	780	800	680	520	400	370	380	450	610	860	860	790	630
	Shaded	730	650	380	310	320	320	320	320	330	610	780	760	490
West	Unshaded	370	490	590	690	710	680	620	600	580	560	430	350	550
	Shaded	320	410	490	570	580	550	500	490	480	480	370	300	460

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	49.9	53.2	60.5	67.8	74.5	80.4	82.3	81.8	77.9	68.4	59.8	53.0	67.5
Daily Minimum Temp	40.0	42.7	50.1	57.1	64.4	70.7	73.2	72.9	68.7	57.3	49.1	43.1	57.4
Daily Maximum Temp	59.7	63.6	70.9	78.5	84.6	90.0	91.3	90.5	86.9	79.5	70.3	62.9	77.4
Record Minimum Temp	3.0	11.0	21.0	32.0	43.0	49.0	60.0	59.0	42.0	32.0	22.0	8.0	3.0
Record Maximum Temp	84.0	82.0	90.0	94.0	100.0	102.0	104.0	102.0	99.0	93.0	87.0	81.0	104.0
HDD, Base 65°F	492	344	177	48	0	0	0	0	0	52	196	393	1702
CDD, Base 65°F	24	14	38	132	295	462	536	521	387	157	40	21	2627
Humidity Ratio (#w/#da)	0.0060	0.0063	0.0081	0.0101	0.0126	0.0154	0.0169	0.0169	0.0149	0.0103	0.0083	0.0069	0.0110
Wind Speed (mph)	10.0	10.5	10.6	10.2	8.8	7.5	6.8	6.5	7.6	8.0	9.1	9.9	8.8
Clearness Index, Kt	0.46	0.49	0.50	0.53	0.53	0.52	0.49	0.49	0.50	0.54	0.49	0.46	0.50

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

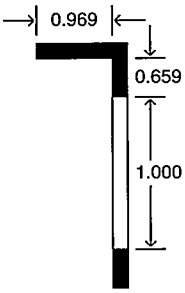
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	50/26	83/50	91/57	70/43	27/16	47/32	86/62	103/74	93/67	62/42	33/21	75/49	92/62	81/55	45/30	29/15	58/31	62/35	39/22	4/3
North	11/11	15/17	16/18	14/15	8/7	23/17	17/19	17/18	18/19	21/17	10/9	16/17	17/19	17/18	13/12	8/7	12/12	12/14	10/9	2/2
East	80/25	55/31	16/18	14/15	8/7	72/38	69/47	27/25	18/19	16/15	65/26	68/40	25/23	17/18	13/12	58/14	41/19	12/14	10/9	2/2
South	40/17	66/35	72/41	56/30	22/11	13/12	22/21	31/27	27/24	16/15	21/12	51/31	66/41	57/36	30/18	53/14	86/29	90/35	66/22	11/3
West	11/11	15/17	28/23	71/36	65/22	13/12	17/19	17/18	56/41	75/42	10/9	16/17	17/19	58/37	70/34	8/7	12/12	29/18	58/20	17/4
M. Clr (%hrs)	35	35	33	36	39	42	36	24	26	32	47	43	33	32	35	37	36	34	34	40

Montgomery, AL

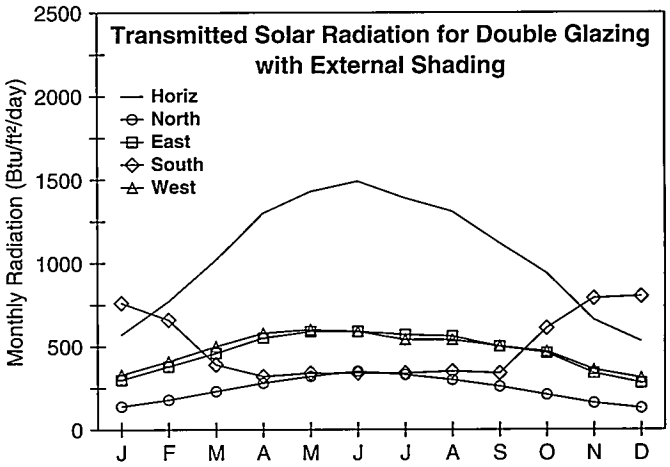
WBAN NO. 13895

LATITUDE: 32.30° N
LONGITUDE: 86.40° W
ELEVATION: 203 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Primary



Shading Geometry (Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	840	1100	1430	1790	1970	2040	1920	1810	1560	1320	960	790	1460
	Std.Dev.	78	120	129	133	116	141	130	124	115	121	87	61	47
	Minimum	690	820	1170	1520	1750	1630	1660	1600	1310	1120	770	670	1340
	Maximum	990	1310	1670	2040	2290	2250	2130	2090	1800	1540	1110	900	1540
	Diffuse	390	470	620	730	880	970	980	900	740	510	410	350	670
	Clear-Day Global	1230	1560	1960	2320	2510	2560	2490	2300	1990	1600	1260	1110	1910
North	Global	250	300	380	470	580	640	600	520	430	340	270	230	420
	Diffuse	250	300	380	450	520	560	550	500	430	340	270	230	400
	Clear-Day Global	220	280	350	440	590	680	630	490	400	320	250	210	410
East	Global	510	660	810	980	1050	1070	1020	990	880	780	580	490	820
	Diffuse	290	360	460	560	630	670	660	630	530	420	320	270	490
	Clear-Day Global	860	1030	1210	1330	1350	1340	1310	1250	1150	980	830	770	1120
South	Global	1100	1160	1080	930	740	670	690	830	1020	1260	1190	1120	980
	Diffuse	390	440	520	550	570	570	580	590	570	500	430	370	510
	Clear-Day Global	2050	1960	1630	1170	820	690	750	1000	1390	1730	1920	1980	1420
West	Global	550	700	850	1010	1050	1050	970	950	870	790	600	520	830
	Diffuse	300	370	480	570	640	680	660	620	540	420	330	280	490
	Clear-Day Global	860	1030	1210	1330	1350	1340	1310	1250	1150	980	830	770	1120

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

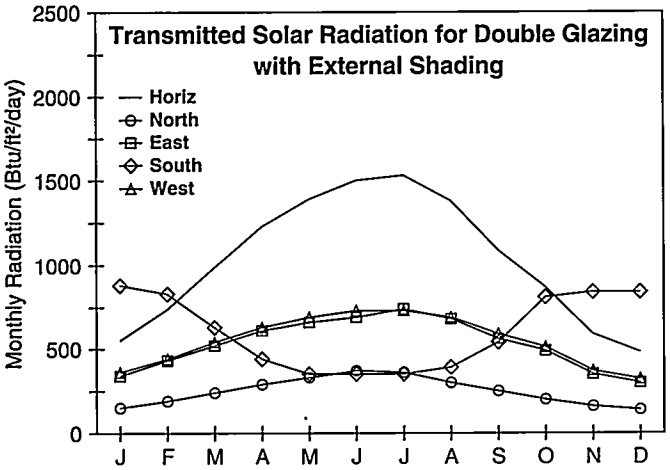
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	570	770	1020	1300	1430	1490	1390	1310	1120	940	660	530	1050
North	Unshaded	170	210	270	320	380	420	400	350	300	230	180	160	280
	Shaded	140	180	230	280	320	350	330	300	260	210	160	130	240
East	Unshaded	360	460	570	690	740	760	720	700	620	550	410	340	580
	Shaded	300	380	460	550	590	590	570	560	500	460	340	280	470
South	Unshaded	810	830	720	570	450	420	430	510	660	880	880	840	670
	Shaded	760	660	390	320	340	340	340	350	340	610	790	800	500
West	Unshaded	380	490	600	720	750	740	690	670	620	560	420	360	580
	Shaded	330	410	500	580	600	590	540	540	500	470	360	310	480

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	46.1	49.8	57.2	64.7	71.9	78.7	81.3	80.6	76.5	65.8	56.6	49.5	64.9
Daily Minimum Temp	35.8	38.8	45.7	52.9	60.8	67.9	71.5	70.8	66.1	53.3	44.6	38.7	53.9
Daily Maximum Temp	56.3	60.8	68.6	76.4	82.9	89.4	91.1	90.4	87.0	78.2	68.7	60.2	75.8
Record Minimum Temp	0.0	10.0	19.0	28.0	40.0	49.0	59.0	57.0	39.0	26.0	13.0	5.0	0.0
Record Maximum Temp	83.0	85.0	89.0	91.0	98.0	105.0	105.0	104.0	101.0	100.0	87.0	85.0	105.0
HDD, Base 65°F	594	426	263	78	6	0	0	0	0	91	274	492	2224
CDD, Base 65°F	8	0	21	69	220	411	505	484	345	116	22	11	2212
Humidity Ratio (#w/#da)	0.0048	0.0052	0.0068	0.0088	0.0116	0.0144	0.0163	0.0162	0.0137	0.0093	0.0071	0.0056	0.0100
Wind Speed (mph)	7.7	8.1	8.2	7.3	6.0	5.7	5.6	5.1	5.8	5.7	6.5	7.3	6.6
Clearness Index, Kt	0.47	0.50	0.52	0.55	0.55	0.56	0.53	0.54	0.53	0.55	0.50	0.48	0.53

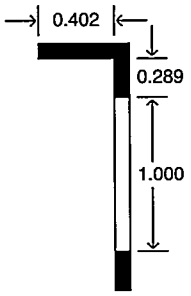
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	52/29	83/52	91/57	69/42	24/15	50/35	89/66	105/81	94/73	60/42	36/21	76/50	92/68	79/59	42/30	29/15	57/33	59/34	35/21	3/2
North	12/11	15/17	16/18	14/15	7/7	22/17	18/20	18/20	19/20	20/17	11/9	17/18	18/20	17/19	12/12	8/7	12/12	12/13	9/9	2/1
East	80/29	52/31	16/18	14/15	7/7	73/37	69/48	25/25	19/20	16/15	66/23	67/38	23/23	17/19	12/12	58/15	38/20	12/13	9/9	2/1
South	43/19	69/38	75/42	57/30	21/10	14/13	26/24	35/32	30/27	16/15	23/12	55/32	68/47	57/40	28/18	57/15	88/34	91/36	64/23	7/2
West	12/11	15/17	32/25	75/37	63/22	14/13	18/20	18/20	59/46	73/43	11/9	17/18	18/20	60/42	67/34	8/7	12/12	31/18	58/22	11/3
M. Clr (%hrs)	34	36	37	34	38	45	44	35	33	41	47	45	35	35	43	35	36	36	38	41



Fort Smith, AR

WBAN NO. 13964



Shading Geometry
(Not to Scale)

LATITUDE: 35.33° N
LONGITUDE: 94.37° W
ELEVATION: 463 feet
MEAN PRESSURE: 14.5 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	820	1070	1380	1700	1910	2060	2100	1890	1520	1230	870	730	1440
	Std.Dev.	68	68	106	119	130	111	134	108	112	116	80	52	37
	Minimum	680	900	1190	1500	1690	1820	1840	1600	1300	990	700	650	1380
	Maximum	940	1220	1640	1990	2190	2310	2430	2070	1770	1410	1010	860	1530
	Diffuse	360	460	600	720	800	820	760	710	630	470	380	330	590
	Clear-Day Global	1110	1450	1890	2310	2550	2630	2560	2330	1970	1540	1150	1000	1880
North	Global	240	300	380	460	560	640	600	490	400	320	250	210	400
	Diffuse	240	300	380	450	500	530	510	460	400	320	250	210	380
	Clear-Day Global	210	270	340	430	580	690	630	480	360	290	230	200	390
East	Global	530	660	810	960	1030	1090	1150	1060	880	760	550	480	830
	Diffuse	290	360	460	540	600	630	610	570	490	390	300	260	460
	Clear-Day Global	790	980	1190	1360	1430	1430	1400	1340	1200	1010	820	730	1140
South	Global	1210	1210	1120	950	770	700	750	910	1060	1260	1160	1140	1020
	Diffuse	390	450	510	540	550	550	540	550	530	470	400	360	490
	Clear-Day Global	2010	1980	1720	1270	910	770	820	1090	1500	1840	1950	1960	1480
West	Global	550	670	830	990	1080	1150	1140	1070	910	780	580	500	860
	Diffuse	290	360	460	550	610	640	620	580	500	400	300	260	470
	Clear-Day Global	790	980	1190	1360	1430	1430	1400	1340	1200	1010	820	730	1140

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	550	740	990	1230	1390	1500	1530	1380	1090	870	590	480	1030
North	Unshaded	160	210	260	310	370	410	390	320	270	220	170	150	270
	Shaded	150	190	240	290	330	370	360	300	250	200	160	140	250
East	Unshaded	370	470	570	680	730	780	820	760	620	530	380	330	590
	Shaded	340	430	520	610	660	690	740	680	560	490	350	300	530
South	Unshaded	900	880	760	600	470	420	440	550	700	900	860	860	690
	Shaded	880	830	630	440	350	350	350	390	540	810	840	840	600
West	Unshaded	390	480	590	700	770	820	810	760	650	550	400	340	610
	Shaded	360	440	540	630	690	730	730	690	590	510	370	320	550

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	36.9	41.9	51.6	61.4	69.1	76.9	81.5	80.6	73.6	62.3	50.6	40.3	60.6
Daily Minimum Temp	25.5	30.2	39.2	48.6	57.7	65.9	70.0	68.8	61.9	48.8	38.4	29.3	48.7
Daily Maximum Temp	48.3	53.5	64.0	74.1	80.5	87.9	93.0	92.4	85.2	75.7	62.8	51.2	72.4
Record Minimum Temp	-10.0	-9.0	7.0	22.0	35.0	47.0	50.0	51.0	33.0	22.0	8.0	-5.0	-10.0
Record Maximum Temp	81.0	86.0	94.0	95.0	98.0	105.0	111.0	110.0	106.0	96.0	86.0	82.0	111.0
HDD, Base 65°F	871	647	426	151	36	0	0	0	13	136	432	766	3478
CDD, Base 65°F	0	0	10	43	164	357	512	484	271	53	0	0	1894
Humidity Ratio (#w/#da)	0.0033	0.0038	0.0053	0.0075	0.0107	0.0139	0.0154	0.0146	0.0123	0.0081	0.0056	0.0039	0.0087
Wind Speed (mph)	8.1	8.6	9.3	8.9	7.6	6.5	6.2	6.3	6.6	6.8	7.9	8.2	7.6
Clearness Index, Kt	0.51	0.52	0.52	0.53	0.54	0.56	0.58	0.57	0.53	0.54	0.50	0.49	0.54

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

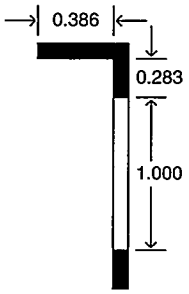
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	38/21	75/47	88/57	73/46	35/22	42/27	81/57	102/73	99/75	73/54	24/14	66/41	89/57	84/58	54/37	16/9	47/28	56/34	40/23	7/5
North	9/9	14/16	15/18	14/16	9/9	22/15	16/18	17/19	17/19	16/17	8/6	14/15	16/18	16/18	13/14	6/4	10/11	12/13	9/9	3/2
East	77/25	63/34	15/18	14/16	9/9	74/35	76/48	38/31	17/19	16/17	60/19	74/36	35/26	16/18	13/14	47/12	46/20	12/13	9/9	3/2
South	35/15	68/36	79/45	66/36	32/16	11/11	23/21	39/32	37/32	19/19	16/8	50/28	70/41	66/42	40/25	39/10	82/30	93/37	74/25	19/6
West	9/9	14/16	17/19	65/35	74/28	11/11	16/18	17/19	47/38	77/52	8/6	14/15	16/18	49/34	75/39	6/4	10/11	18/15	54/20	27/7
M. Clr (%hrs)	35	34	35	35	36	39	40	39	37	45	43	43	40	43	46	36	37	39	40	39

Little Rock, AR

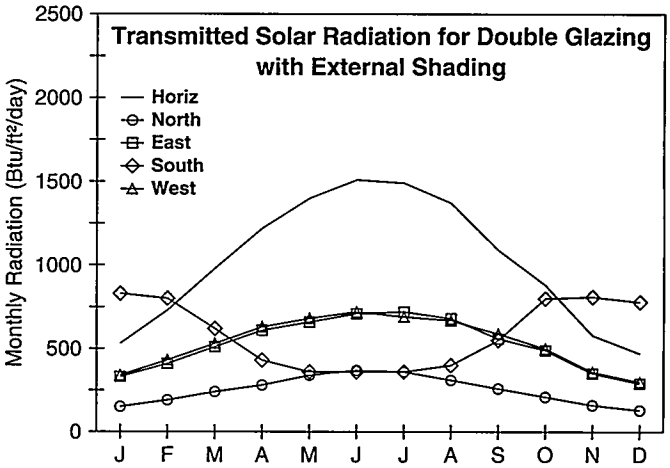
WBAN NO. 13963

LATITUDE: 34.73° N
LONGITUDE: 92.23° W
ELEVATION: 266 feet
MEAN PRESSURE: 14.6 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	800	1040	1370	1690	1920	2070	2040	1880	1520	1240	860	710	1430
	Std.Dev.	61	74	116	127	122	112	129	114	107	111	76	64	42
	Minimum	670	910	1170	1420	1700	1820	1790	1670	1300	990	700	600	1360
	Maximum	940	1190	1640	1970	2200	2300	2330	2080	1740	1450	980	830	1520
	Diffuse	360	450	580	710	820	850	830	750	650	470	380	330	600
	Clear-Day Global	1110	1450	1880	2300	2540	2610	2530	2320	1960	1530	1150	1000	1870
North	Global	230	290	370	450	560	640	600	500	400	320	250	210	400
	Diffuse	230	290	370	440	510	530	520	470	400	320	250	210	380
	Clear-Day Global	220	270	340	430	590	690	630	480	380	300	230	200	400
East	Global	510	640	790	950	1030	1110	1130	1060	870	760	540	460	820
	Diffuse	280	350	450	540	610	640	630	580	500	390	300	250	460
	Clear-Day Global	780	970	1170	1340	1410	1410	1380	1300	1180	980	790	710	1120
South	Global	1130	1170	1100	930	770	690	730	900	1060	1260	1130	1060	990
	Diffuse	380	440	500	540	550	550	550	560	540	480	400	350	490
	Clear-Day Global	1970	1940	1690	1250	900	750	810	1070	1470	1790	1890	1920	1450
West	Global	520	660	820	970	1070	1120	1080	1050	910	780	560	470	840
	Diffuse	280	360	450	550	620	650	640	600	510	400	300	260	470
	Clear-Day Global	780	970	1170	1340	1410	1410	1380	1300	1180	980	790	710	1120

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

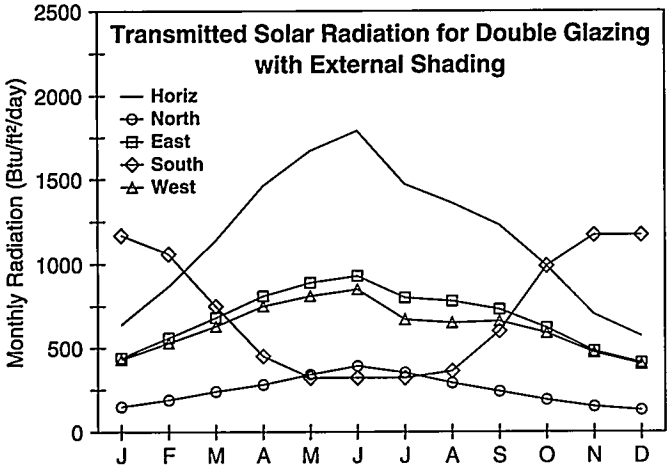
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	530	730	980	1220	1400	1510	1490	1370	1090	880	580	470	1020
North	Unshaded	160	200	260	310	370	410	390	330	280	220	170	150	270
	Shaded	150	190	240	280	340	370	360	310	260	210	160	130	250
East	Unshaded	350	450	560	680	730	790	800	750	620	530	370	310	580
	Shaded	330	410	510	610	660	710	720	680	560	490	350	290	530
South	Unshaded	840	840	750	590	460	420	440	550	690	890	830	800	670
	Shaded	830	800	620	430	360	360	360	400	550	800	810	780	590
West	Unshaded	360	470	580	690	760	800	770	740	640	550	390	330	590
	Shaded	340	430	530	630	680	720	690	670	590	500	360	300	540

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	39.1	43.6	53.1	62.1	70.2	78.4	81.9	80.6	74.1	63.0	52.1	42.8	61.8
Daily Minimum Temp	29.1	33.2	42.2	50.7	59.0	67.4	71.5	69.8	63.5	50.9	41.5	33.1	51.0
Daily Maximum Temp	49.0	53.9	64.0	73.4	81.3	89.3	92.4	91.4	84.6	75.1	62.7	52.5	72.5
Record Minimum Temp	-4.0	-5.0	11.0	28.0	40.0	46.0	54.0	52.0	37.0	29.0	17.0	-1.0	-5.0
Record Maximum Temp	83.0	85.0	91.0	95.0	98.0	105.0	112.0	108.0	106.0	97.0	86.0	80.0	112.0
HDD, Base 65°F	803	599	384	133	25	0	0	0	8	128	387	688	3155
CDD, Base 65°F	0	0	15	46	187	402	524	484	281	66	0	0	2005
Humidity Ratio (#w/#da)	0.0038	0.0043	0.0058	0.0082	0.0112	0.0142	0.0161	0.0153	0.0129	0.0085	0.0061	0.0044	0.0092
Wind Speed (mph)	8.2	8.7	9.2	8.5	7.2	6.7	6.2	6.0	6.3	6.5	7.8	7.9	7.4
Clearness Index, Kt	0.48	0.50	0.51	0.53	0.54	0.56	0.57	0.56	0.53	0.54	0.48	0.46	0.53

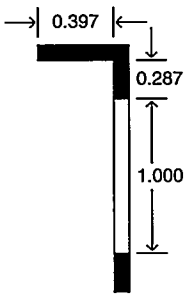
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	41/22	77/47	89/56	72/44	32/20	44/29	84/60	103/78	98/76	69/53	27/16	69/43	89/61	82/60	51/36	19/10	49/27	56/32	38/21	5/4
North	10/9	14/16	15/18	14/15	9/8	22/15	17/18	17/19	18/19	16/17	9/7	15/15	17/18	17/18	13/13	6/5	11/11	12/12	9/9	3/2
East	77/25	60/33	15/18	14/15	9/8	74/37	74/50	34/30	18/19	16/17	62/21	72/36	32/26	17/18	13/13	49/12	44/19	12/12	9/9	3/2
South	37/16	69/36	78/43	64/34	29/14	12/11	25/22	38/33	35/31	17/17	18/10	52/29	69/44	64/43	37/24	42/11	83/29	91/34	69/23	13/4
West	10/9	14/16	21/20	68/35	71/27	12/11	17/18	17/19	51/42	77/54	9/7	15/15	17/18	52/37	74/41	6/5	11/11	21/15	54/19	20/5
M. Clr (%hrs)	35	35	36	35	35	44	42	34	32	39	43	44	38	38	42	35	34	35	38	39



Flagstaff, AZ

WBAN NO. 03103



Shading Geometry
(Not to Scale)

LATITUDE: 35.13° N
LONGITUDE: 111.67° W
ELEVATION: 7005 feet
MEAN PRESSURE: 11.4 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	970	1260	1600	2000	2280	2440	2020	1870	1710	1410	1050	880	1630
	Std.Dev.	75	85	129	120	124	143	146	178	127	117	78	73	48
	Minimum	830	1100	1370	1720	1970	2090	1660	1390	1440	1070	820	700	1530
	Maximum	1110	1410	1870	2170	2470	2670	2340	2150	2040	1590	1180	1000	1690
	Diffuse	300	400	500	530	550	530	680	600	460	330	270	260	450
	Clear-Day Global	1190	1540	2010	2450	2710	2790	2690	2450	2090	1640	1240	1080	1990
North	Global	230	290	360	440	580	700	600	470	370	290	230	210	400
	Diffuse	230	290	360	420	460	490	480	420	360	290	230	210	350
	Clear-Day Global	200	250	320	420	600	730	660	470	340	270	210	180	390
East	Global	680	850	1030	1230	1360	1420	1240	1190	1110	940	730	630	1030
	Diffuse	280	360	450	510	550	560	570	520	450	350	280	250	430
	Clear-Day Global	870	1070	1290	1460	1540	1550	1510	1430	1300	1090	890	810	1230
South	Global	1580	1550	1340	1090	820	710	690	880	1220	1540	1600	1560	1210
	Diffuse	380	450	490	500	490	480	500	500	480	420	360	340	450
	Clear-Day Global	2200	2140	1830	1300	910	750	800	1090	1560	1970	2140	2180	1570
West	Global	660	810	960	1160	1250	1310	1040	1000	1010	900	720	610	950
	Diffuse	290	370	450	520	550	570	570	530	460	360	280	250	430
	Clear-Day Global	870	1070	1290	1460	1540	1550	1510	1430	1300	1090	890	810	1230

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	640	870	1140	1460	1670	1790	1470	1360	1230	990	700	570	1160
North	Unshaded	160	200	250	290	360	420	380	300	250	200	160	140	260
	Shaded	150	190	240	280	340	390	350	290	240	190	150	130	240
East	Unshaded	470	600	740	890	980	1020	890	860	800	670	510	430	740
	Shaded	440	560	680	810	890	930	800	780	730	620	480	410	680
South	Unshaded	1180	1120	900	670	470	400	410	520	790	1090	1190	1180	820
	Shaded	1170	1060	750	450	320	320	320	360	600	990	1170	1170	720
West	Unshaded	460	570	690	830	890	940	740	720	720	640	500	420	680
	Shaded	430	530	630	750	810	850	670	650	660	590	470	400	620

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	28.7	31.5	35.3	42.3	50.4	59.8	66.3	64.1	57.3	47.2	36.8	29.6	45.8
Daily Minimum Temp	15.2	17.7	21.3	26.7	33.3	41.4	50.5	48.9	41.2	31.0	22.4	15.8	30.5
Daily Maximum Temp	42.2	45.3	49.2	57.8	67.4	78.2	81.9	79.3	73.2	63.4	51.1	43.3	61.0
Record Minimum Temp	-22.0	-23.0	-16.0	-2.0	14.0	22.0	32.0	24.0	23.0	-2.0	-13.0	-23.0	-23.0
Record Maximum Temp	66.0	71.0	73.0	80.0	87.0	96.0	97.0	92.0	90.0	85.0	74.0	68.0	97.0
HDD, Base 65°F	1125	938	921	681	453	187	29	65	237	552	846	1097	7131
CDD, Base 65°F	0	0	0	0	0	31	70	38	6	0	0	0	145
Humidity Ratio (#w/#da)	0.0025	0.0026	0.0028	0.0030	0.0037	0.0044	0.0081	0.0087	0.0065	0.0042	0.0030	0.0024	0.0043
Wind Speed (mph)	6.5	6.3	7.0	7.4	7.1	6.7	5.2	4.5	5.2	5.3	6.2	5.8	6.1
Clearness Index, Kt	0.60	0.61	0.60	0.63	0.64	0.66	0.56	0.56	0.60	0.62	0.60	0.59	0.61

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

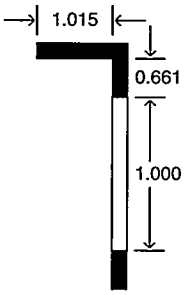
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	38/25	77/52	92/64	79/55	42/27	63/48	96/72	106/82	94/69	60/40	46/30	80/56	91/66	75/54	38/26	15/10	48/32	60/41	45/30	11/7
North	9/9	13/15	15/17	14/16	10/10	17/16	15/16	16/16	15/16	18/15	10/10	14/15	15/16	14/15	9/9	5/4	10/11	12/13	10/10	4/3
East	85/39	69/43	18/19	14/16	10/10	87/60	63/49	16/16	15/16	12/12	84/42	62/42	15/16	14/15	9/9	54/20	53/28	12/13	10/10	4/3
South	35/19	69/43	82/53	70/46	38/21	12/13	30/27	38/33	29/26	12/12	33/20	61/42	71/51	58/39	27/17	43/16	88/43	100/55	84/43	33/12
West	9/9	13/15	15/17	65/42	85/40	12/13	15/16	17/17	65/48	86/50	10/10	14/15	19/19	66/45	78/40	5/4	10/11	15/14	57/31	46/15
M. Clr (%hrs)	49	47	42	36	36	75	69	62	58	60	68	60	49	45	49	52	52	48	46	45

Phoenix, AZ

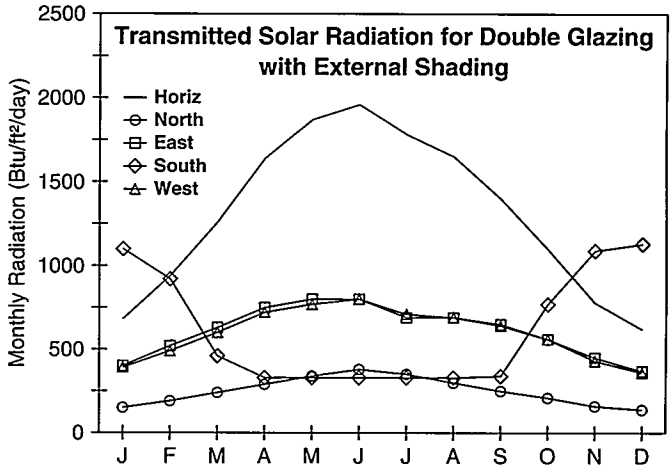
WBAN NO. 23183

LATITUDE: 33.43° N
LONGITUDE: 112.02° W
ELEVATION: 1112 feet
MEAN PRESSURE: 14.1 psia

STATION TYPE: Primary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	1020	1350	1750	2240	2540	2650	2410	2240	1930	1550	1140	930	1810
	Std.Dev.	76	98	128	90	61	64	89	98	105	83	73	77	47
	Minimum	870	1110	1490	2040	2360	2470	2190	1990	1730	1320	960	680	1670
	Maximum	1150	1510	2010	2440	2620	2760	2580	2390	2130	1680	1250	1080	1860
	Diffuse	330	410	520	560	600	590	710	630	500	410	330	300	490
	Clear-Day Global	1190	1530	1990	2420	2680	2760	2660	2440	2090	1640	1250	1080	1980
North	Global	250	310	390	470	620	720	640	510	400	330	260	230	430
	Diffuse	250	310	390	450	500	520	520	470	400	330	260	230	390
	Clear-Day Global	230	280	350	440	610	730	660	490	370	300	240	210	410
East	Global	670	870	1070	1310	1410	1420	1250	1220	1140	970	750	620	1060
	Diffuse	300	390	480	560	600	610	630	590	510	420	330	280	480
	Clear-Day Global	820	1010	1230	1410	1480	1490	1450	1390	1260	1060	850	760	1180
South	Global	1550	1590	1420	1160	860	720	760	990	1320	1610	1620	1540	1260
	Diffuse	420	490	530	540	530	520	540	540	520	500	440	400	500
	Clear-Day Global	2020	1980	1710	1230	870	720	770	1050	1490	1860	1990	1990	1470
West	Global	660	840	1040	1260	1370	1420	1280	1230	1120	960	730	610	1040
	Diffuse	310	390	490	560	610	620	630	590	500	430	330	280	480
	Clear-Day Global	820	1010	1230	1410	1480	1490	1450	1390	1260	1060	850	760	1180

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

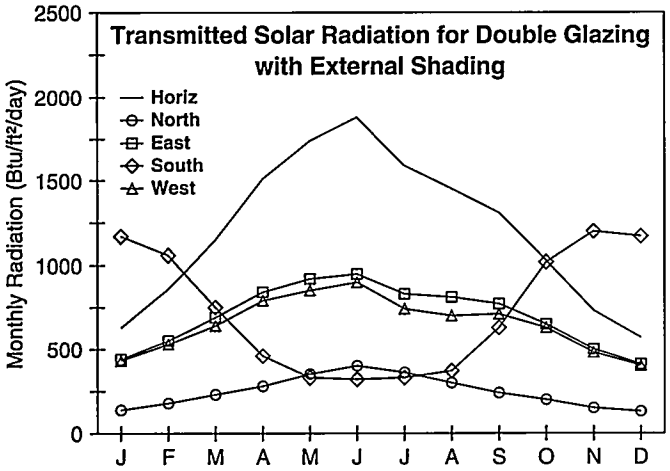
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	680	940	1260	1640	1870	1960	1780	1650	1400	1100	780	620	1310
North	Unshaded	170	220	270	310	380	440	400	330	270	230	180	160	280
	Shaded	150	190	240	290	340	380	350	300	250	210	160	140	250
East	Unshaded	470	610	760	940	1010	1020	890	880	810	690	530	430	750
	Shaded	400	520	630	750	800	800	690	690	650	560	450	370	610
South	Unshaded	1160	1150	950	700	480	400	440	580	850	1140	1200	1160	850
	Shaded	1100	920	460	330	330	330	330	330	340	770	1090	1130	620
West	Unshaded	460	590	740	910	980	1020	910	880	800	670	510	420	740
	Shaded	390	490	600	720	770	800	710	690	640	560	430	360	600

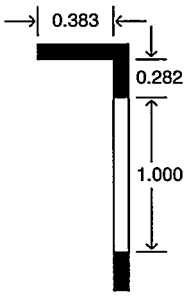
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	53.6	57.7	62.2	69.9	78.8	88.2	93.5	91.5	85.6	74.5	61.9	54.1	72.6
Daily Minimum Temp	41.2	44.7	48.8	55.3	63.9	72.9	81.0	79.2	72.8	60.8	48.9	41.8	59.3
Daily Maximum Temp	65.9	70.7	75.5	84.5	93.6	103.5	105.9	103.7	98.3	88.1	74.9	66.2	85.9
Record Minimum Temp	17.0	22.0	25.0	32.0	40.0	50.0	61.0	60.0	47.0	34.0	25.0	22.0	17.0
Record Maximum Temp	88.0	92.0	100.0	105.0	113.0	122.0	118.0	116.0	118.0	107.0	93.0	88.0	122.0
HDD, Base 65°F	362	227	182	75	8	0	0	0	0	17	134	345	1350
CDD, Base 65°F	8	22	95	222	436	696	884	822	618	311	41	7	4162
Humidity Ratio (#w/#da)	0.0042	0.0042	0.0043	0.0041	0.0045	0.0056	0.0105	0.0113	0.0092	0.0065	0.0049	0.0043	0.0061
Wind Speed (mph)	5.7	6.3	7.2	7.5	7.6	7.2	7.6	7.1	6.8	6.2	5.8	5.5	6.7
Clearness Index, Kt	0.59	0.63	0.65	0.70	0.72	0.72	0.67	0.67	0.66	0.66	0.62	0.58	0.67

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	36/24	77/57	94/72	81/61	42/30	62/50	97/81	110/95	97/84	60/50	45/33	83/64	96/75	80/61	38/28	15/10	48/34	61/45	46/33	10/8
North	9/9	14/16	16/18	15/17	10/10	19/19	16/19	16/18	16/19	20/19	11/12	15/18	17/19	15/17	10/10	5/4	11/11	12/14	10/11	4/4
East	78/38	69/47	19/20	15/17	10/10	86/62	65/55	16/19	16/19	13/14	80/44	64/47	17/19	15/17	10/10	44/18	50/30	12/14	10/11	4/4
South	31/19	65/45	79/58	68/49	36/23	13/14	28/28	37/36	28/29	13/14	31/21	60/45	71/55	58/43	26/17	34/15	80/44	95/57	78/44	25/11
West	9/9	14/16	16/18	65/46	81/45	13/14	16/19	17/19	67/58	85/62	11/12	15/18	20/21	68/49	75/40	5/4	11/11	15/15	54/32	34/14
M. Clr (%hrs)	61	59	52	50	50	82	83	84	83	83	75	76	76	76	74	55	57	54	54	53





Shading Geometry
(Not to Scale)

Prescott, AZ

WBAN NO. 23184

LATITUDE: 34.65° N
LONGITUDE: 112.43° W
ELEVATION: 5023 feet
MEAN PRESSURE: 12.3 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	960	1250	1610	2070	2370	2540	2170	1990	1810	1470	1080	890	1690
	Std.Dev.	76	102	143	116	101	108	124	147	118	101	78	71	39
	Minimum	820	1020	1330	1820	2150	2280	1920	1630	1620	1150	890	700	1600
	Maximum	1100	1430	1910	2260	2530	2680	2430	2210	2110	1640	1210	1000	1800
	Diffuse	270	360	470	510	550	510	670	600	450	330	270	250	440
	Clear-Day Global	1190	1540	2000	2450	2710	2800	2690	2460	2100	1650	1260	1080	2000
North	Global	220	280	360	450	600	720	620	480	370	300	230	200	400
	Diffuse	220	280	350	420	470	490	490	440	370	300	230	200	360
	Clear-Day Global	200	250	320	420	600	740	660	470	340	270	210	180	390
East	Global	680	840	1040	1270	1400	1460	1280	1240	1160	980	760	630	1060
	Diffuse	270	350	430	510	560	560	580	540	460	360	290	250	430
	Clear-Day Global	870	1050	1280	1460	1530	1550	1500	1430	1300	1100	890	800	1230
South	Global	1570	1530	1350	1110	840	720	720	910	1280	1600	1640	1570	1230
	Diffuse	360	430	480	500	500	490	510	510	480	430	370	340	450
	Clear-Day Global	2180	2100	1790	1280	890	740	790	1080	1540	1960	2120	2150	1550
West	Global	660	810	980	1200	1310	1390	1140	1070	1070	950	730	610	990
	Diffuse	270	350	440	520	570	570	590	540	470	370	290	250	440
	Clear-Day Global	870	1050	1280	1460	1530	1550	1500	1430	1300	1100	890	800	1230

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	630	860	1150	1510	1740	1880	1590	1450	1310	1030	730	570	1210
North	Unshaded	150	200	250	290	370	430	390	310	260	210	160	140	260
	Shaded	140	180	230	280	350	400	360	300	240	200	150	130	250
East	Unshaded	470	590	750	920	1010	1050	920	890	840	700	530	440	760
	Shaded	440	550	690	840	920	950	830	810	770	650	500	410	700
South	Unshaded	1180	1110	900	670	470	400	420	540	820	1130	1220	1180	840
	Shaded	1170	1060	750	460	330	320	330	370	630	1020	1200	1170	730
West	Unshaded	460	570	700	860	940	1000	810	770	770	670	510	420	710
	Shaded	430	530	640	790	850	900	740	700	710	630	480	400	650

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	36.2	39.1	42.7	49.3	57.6	67.2	73.1	70.4	64.5	54.7	44.0	36.6	53.0
Daily Minimum Temp	21.9	24.1	28.0	33.5	41.2	49.9	57.9	55.8	48.8	38.1	28.5	22.2	37.5
Daily Maximum Temp	50.3	54.0	57.4	65.0	73.9	84.5	88.1	84.9	80.1	71.2	59.5	51.0	68.3
Record Minimum Temp	-0.9	-0.9	7.0	21.0	26.1	36.0	46.9	39.9	34.0	19.0	8.1	-9.0	-9.0
Record Maximum Temp	73.9	77.0	81.0	87.1	95.0	102.9	102.0	99.0	95.0	90.0	79.0	70.0	102.9
HDD, Base 65°F	893	725	691	471	248	57	0	0	73	327	630	880	4995
CDD, Base 65°F	0	0	0	0	19	123	251	172	58	8	0	0	631
Humidity Ratio (#w/#da)	0.0030	0.0031	0.0033	0.0033	0.0040	0.0047	0.0091	0.0099	0.0074	0.0049	0.0035	0.0030	0.0049
Wind Speed (mph)	6.9	7.9	9.1	9.4	9.6	9.2	7.8	7.0	7.6	7.3	7.4	6.8	8.0
Clearness Index, Kt	0.58	0.59	0.60	0.65	0.67	0.69	0.60	0.60	0.63	0.64	0.61	0.58	0.63

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

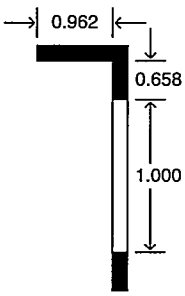
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	36/23	76/51	91/65	80/56	43/28	63/47	96/73	108/85	96/73	62/44	45/31	81/59	93/70	77/59	40/28	15/10	48/31	60/40	46/31	12/8
North	9/8	13/15	15/17	14/15	10/10	18/17	15/17	16/17	15/17	18/16	10/11	14/16	15/17	14/16	10/10	5/4	10/10	11/12	10/10	4/4
East	83/38	69/42	19/19	14/15	10/10	88/59	65/50	16/17	15/17	12/13	84/44	64/45	15/17	14/16	10/10	52/19	53/29	12/12	10/10	4/4
South	33/18	67/41	80/54	70/46	38/22	12/13	29/27	38/34	29/27	12/13	32/20	61/44	71/53	59/43	28/18	41/15	86/43	99/54	84/42	35/13
West	9/8	13/15	15/17	63/43	84/41	12/13	15/17	16/17	64/51	87/54	10/11	14/16	18/19	66/48	80/42	5/4	10/10	14/13	56/30	47/17
M. Clr (%hrs)	56	51	42	37	40	79	78	70	66	68	73	69	56	53	57	55	52	50	49	49

Tucson, AZ

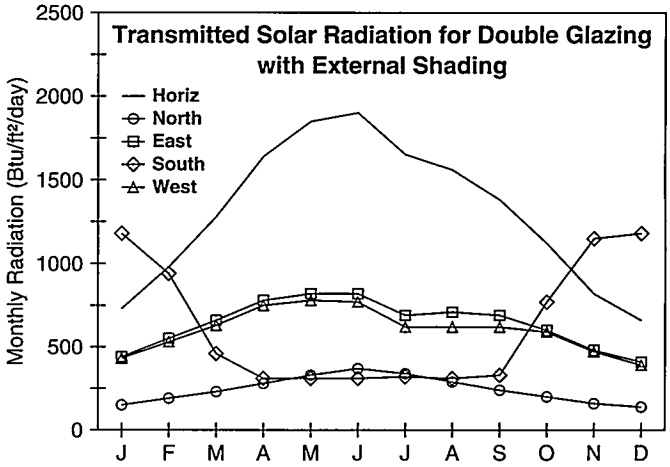
WBAN NO. 23160

LATITUDE: 32.12° N
LONGITUDE: 110.93° W
ELEVATION: 2556 feet
MEAN PRESSURE: 13.4 psia

STATION TYPE: Primary



Shading Geometry (Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	1090	1400	1780	2240	2500	2580	2240	2120	1900	1580	1200	990	1800
	Std.Dev.	78	92	113	87	74	93	77	106	83	91	73	69	35
	Minimum	880	1230	1580	2060	2300	2350	2070	1840	1760	1380	990	850	1730
	Maximum	1230	1560	2000	2390	2600	2720	2400	2270	2090	1720	1320	1130	1870
	Diffuse	300	370	470	500	520	540	700	610	480	360	300	280	450
	Clear-Day Global	1270	1610	2050	2460	2680	2740	2630	2430	2110	1700	1330	1160	2020
North	Global	250	300	370	460	610	710	610	490	390	320	260	230	420
	Diffuse	250	300	370	430	470	500	500	450	390	320	260	230	370
	Clear-Day Global	220	270	340	430	610	730	660	480	360	290	230	210	400
East	Global	730	910	1110	1330	1420	1430	1230	1230	1170	1010	800	680	1090
	Diffuse	300	370	460	530	560	580	600	550	480	400	320	280	450
	Clear-Day Global	880	1060	1260	1430	1490	1490	1440	1390	1270	1100	900	820	1210
South	Global	1650	1630	1400	1100	790	650	690	900	1250	1610	1690	1610	1250
	Diffuse	400	450	500	500	490	480	510	510	490	460	410	380	470
	Clear-Day Global	2110	2020	1700	1180	800	650	700	980	1440	1870	2050	2090	1460
West	Global	720	880	1050	1280	1360	1350	1100	1080	1060	980	790	660	1030
	Diffuse	310	380	460	540	570	580	600	560	490	400	320	280	460
	Clear-Day Global	880	1060	1260	1430	1490	1490	1440	1390	1270	1100	900	820	1210

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

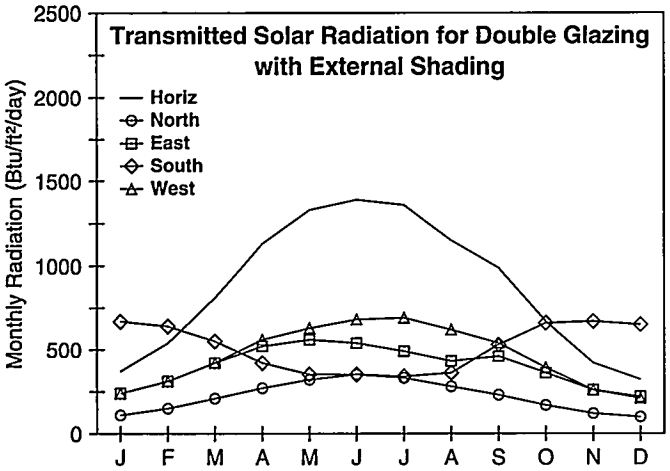
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	730	980	1280	1640	1850	1900	1650	1560	1380	1120	820	660	1300
North	Unshaded	170	210	260	300	370	430	390	320	270	220	180	160	270
	Shaded	150	190	230	280	330	370	340	290	240	200	160	140	240
East	Unshaded	510	640	790	950	1020	1020	880	880	840	720	560	470	770
	Shaded	440	550	660	780	820	820	690	710	690	600	480	410	640
South	Unshaded	1230	1170	930	650	430	370	400	520	790	1120	1250	1210	840
	Shaded	1180	940	460	310	310	310	320	310	330	770	1150	1180	630
West	Unshaded	500	620	750	920	980	970	780	770	760	690	550	450	730
	Shaded	430	530	630	750	780	770	620	620	620	590	470	390	600

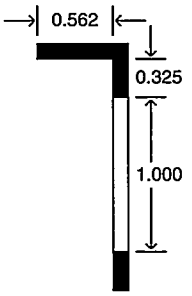
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	51.3	54.4	58.7	65.8	74.0	83.8	86.6	84.5	80.4	70.4	59.2	52.0	68.4
Daily Minimum Temp	38.6	41.0	44.6	50.4	58.0	67.9	73.6	72.1	67.5	56.6	45.6	39.8	54.6
Daily Maximum Temp	63.9	67.8	72.8	81.2	89.9	99.6	99.4	96.8	93.3	84.3	72.7	64.3	82.2
Record Minimum Temp	16.0	20.0	20.0	27.0	38.0	47.0	62.0	61.0	44.0	26.0	24.0	16.0	16.0
Record Maximum Temp	87.0	92.0	99.0	104.0	107.0	117.0	114.0	109.0	107.0	101.0	90.0	84.0	117.0
HDD, Base 65°F	425	302	229	97	7	0	0	0	0	27	188	403	1678
CDD, Base 65°F	0	5	33	121	286	564	670	605	462	194	14	0	2954
Humidity Ratio (#w/#da)	0.0038	0.0037	0.0037	0.0035	0.0039	0.0054	0.0109	0.0117	0.0092	0.0060	0.0044	0.0039	0.0058
Wind Speed (mph)	8.5	8.4	9.0	9.6	9.2	9.2	8.9	8.3	8.8	8.4	8.3	8.0	8.7
Clearness Index, Kt	0.61	0.63	0.65	0.69	0.71	0.70	0.62	0.63	0.65	0.66	0.63	0.60	0.65

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	40/28	80/60	95/72	81/60	42/28	63/53	97/85	108/94	94/77	59/43	48/35	85/65	95/75	78/59	38/26	19/13	53/36	64/46	48/34	12/8
North	9/10	14/16	15/18	14/16	10/10	20/19	16/18	16/17	16/18	21/18	11/12	15/17	16/18	15/17	10/10	6/5	11/12	12/14	10/11	5/4
East	84/45	68/48	17/19	14/16	10/10	87/65	62/56	16/17	16/18	12/13	84/48	62/47	16/18	15/17	10/10	55/24	52/32	12/14	10/11	5/4
South	34/21	65/47	77/57	66/47	35/21	13/14	26/27	33/32	25/24	12/13	32/22	59/45	68/53	55/40	25/15	44/19	86/48	97/59	80/44	32/12
West	9/10	14/16	15/18	66/46	84/43	13/14	16/18	19/20	66/55	86/55	11/12	15/17	21/22	68/48	77/37	6/5	11/12	17/16	57/33	45/15
M. Clr (%hrs)	60	58	53	51	50	81	82	78	73	70	77	76	69	63	58	54	57	52	52	53





Shading Geometry
(Not to Scale)

Arcata, CA

WBAN NO. 24283

LATITUDE: 40.98° N
LONGITUDE: 124.10° W
ELEVATION: 226 feet
MEAN PRESSURE: 14.6 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	570	790	1150	1570	1830	1910	1870	1600	1390	970	640	510	1230
	Std.Dev.	58	99	120	131	142	168	126	114	111	84	68	62	33
	Minimum	470	570	900	1300	1510	1590	1610	1410	1160	790	520	360	1150
	Maximum	680	1070	1410	1820	2090	2210	2170	1890	1680	1170	770	630	1290
	Diffuse	310	440	580	710	810	870	840	780	590	470	340	270	580
	Clear-Day Global	860	1210	1710	2230	2570	2700	2620	2330	1870	1350	930	760	1760
North	Global	190	260	350	440	550	620	580	480	380	290	210	170	370
	Diffuse	190	260	350	430	500	540	520	460	380	290	210	170	360
	Clear-Day Global	170	230	310	420	590	700	650	470	340	250	180	150	370
East	Global	400	510	690	870	960	920	850	730	770	590	430	360	670
	Diffuse	230	310	420	520	590	610	590	530	450	350	250	200	420
	Clear-Day Global	680	880	1140	1380	1500	1540	1510	1400	1210	950	730	620	1130
South	Global	910	960	1010	1000	870	790	820	890	1090	1060	930	880	940
	Diffuse	330	410	490	550	570	580	570	550	500	430	350	300	470
	Clear-Day Global	1920	1970	1830	1460	1120	970	1020	1290	1670	1910	1920	1850	1570
West	Global	390	500	690	930	1060	1140	1150	1030	890	640	430	350	770
	Diffuse	230	310	420	540	600	640	620	560	470	350	250	200	430
	Clear-Day Global	680	880	1140	1380	1500	1540	1510	1400	1210	950	730	620	1130

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	370	540	810	1130	1330	1390	1360	1150	990	670	420	320	870
North	Unshaded	130	180	240	300	360	410	380	320	260	200	140	110	250
	Shaded	110	150	210	270	320	350	330	280	230	170	120	99	220
East	Unshaded	270	360	490	620	680	650	590	510	540	410	300	240	470
	Shaded	240	310	420	520	560	540	490	430	460	360	260	220	400
South	Unshaded	690	700	710	660	550	490	510	580	750	760	690	670	650
	Shaded	670	640	550	420	350	350	340	360	530	660	670	650	510
West	Unshaded	270	350	490	660	750	820	820	740	630	450	300	240	540
	Shaded	240	310	420	560	630	680	690	620	540	390	260	210	460

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	46.1	47.6	48.1	49.1	52.1	55.0	56.4	56.8	55.8	53.0	49.8	46.4	51.4
Daily Minimum Temp	38.9	40.4	41.0	41.5	44.9	48.2	50.1	50.8	48.3	45.5	42.6	39.4	44.3
Daily Maximum Temp	53.9	54.9	54.9	56.1	58.5	61.3	63.0	63.3	63.9	61.0	57.5	54.0	58.5
Record Minimum Temp	19.9	23.0	25.0	28.9	32.0	35.1	37.0	39.9	33.1	26.1	27.0	17.1	17.1
Record Maximum Temp	75.0	78.1	75.0	78.1	88.0	81.0	82.0	89.1	90.0	84.9	75.9	73.9	90.0
HDD, Base 65°F	592	497	531	484	407	308	272	259	283	380	463	583	5056
CDD, Base 65°F	0	0	0	0	0	0	0	0	0	0	0	0	0
Humidity Ratio (#w/#da)	0.0054	0.0057	0.0058	0.0059	0.0068	0.0077	0.0082	0.0085	0.0081	0.0073	0.0064	0.0056	0.0068
Wind Speed (mph)	6.5	7.2	7.8	7.7	7.7	6.8	6.2	5.3	5.2	5.1	6.3	6.3	6.5
Clearness Index, Kt	0.44	0.44	0.47	0.51	0.52	0.52	0.52	0.49	0.52	0.48	0.44	0.43	0.49

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

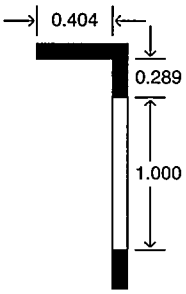
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	34/20	68/42	80/48	66/41	31/18	44/24	81/47	100/65	98/66	74/47	24/13	63/34	83/51	80/50	53/31	10/6	36/21	45/25	29/18	3/3
North	9/8	13/15	15/16	13/15	9/8	19/12	15/18	16/20	16/20	15/16	7/6	13/14	15/18	15/17	12/12	4/3	9/9	10/10	8/8	2/1
East	72/24	60/31	15/16	13/15	9/8	78/24	75/34	36/29	16/20	15/16	63/14	73/27	34/24	15/17	12/12	34/9	42/17	10/10	8/8	2/1
South	35/15	71/35	83/41	68/34	31/14	11/10	30/22	48/33	46/33	25/20	18/8	56/23	76/39	73/39	45/22	29/8	78/26	90/29	67/22	10/3
West	9/8	13/15	17/17	63/32	69/23	11/10	15/18	16/20	47/34	80/41	7/6	13/14	15/18	49/30	78/31	4/3	9/9	16/11	46/17	13/4
M. Clr (%hrs)	23	24	26	24	23	19	25	33	38	45	31	35	42	47	48	29	28	29	27	27

Bakersfield, CA

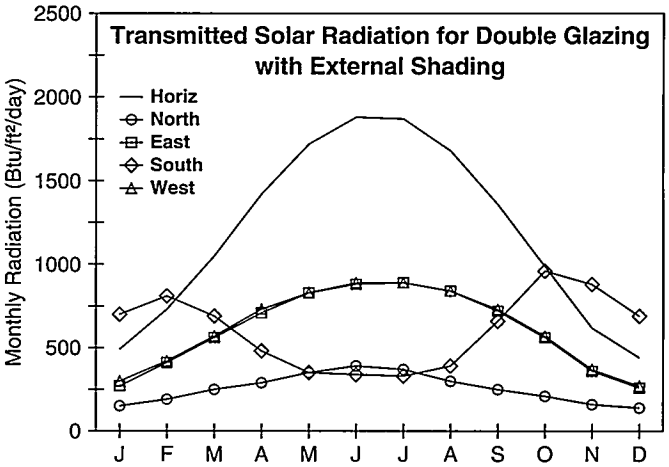
WBAN NO. 23155

LATITUDE: 35.42° N
LONGITUDE: 119.05° W
ELEVATION: 492 feet
MEAN PRESSURE: 14.5 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	730	1050	1470	1950	2340	2550	2530	2290	1880	1400	910	670	1650
	Std.Dev.	83	97	145	150	112	73	67	82	102	67	88	86	44
	Minimum	560	810	1140	1530	2110	2400	2360	2020	1610	1210	750	550	1520
	Maximum	920	1240	1740	2150	2510	2660	2650	2390	2020	1510	1030	870	1710
	Diffuse	400	490	600	650	640	590	550	520	470	430	390	360	510
	Clear-Day Global	1030	1370	1850	2310	2590	2700	2630	2380	1990	1510	1100	930	1870
North	Global	240	300	380	460	590	690	650	490	390	320	260	220	420
	Diffuse	240	300	380	450	490	510	490	450	380	320	260	220	380
	Clear-Day Global	230	290	360	440	600	700	650	480	380	310	240	210	410
East	Global	430	640	870	1110	1300	1390	1400	1310	1120	870	560	410	950
	Diffuse	290	370	480	560	600	610	590	560	490	420	320	260	460
	Clear-Day Global	700	890	1150	1340	1450	1480	1460	1370	1200	960	730	640	1110
South	Global	960	1190	1220	1090	880	760	810	1050	1360	1500	1230	950	1080
	Diffuse	400	490	550	560	530	510	510	510	520	510	440	380	490
	Clear-Day Global	1780	1830	1690	1290	940	780	830	1120	1520	1780	1790	1730	1420
West	Global	470	660	890	1130	1300	1400	1400	1310	1130	870	580	430	970
	Diffuse	290	380	490	570	610	610	590	560	500	420	320	270	470
	Clear-Day Global	700	890	1150	1340	1450	1480	1460	1370	1200	960	730	640	1110

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

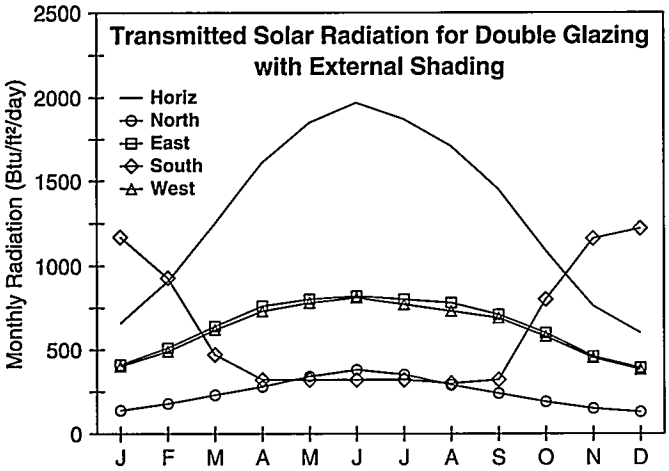
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	490	730	1050	1420	1720	1880	1870	1680	1360	990	620	440	1190
North	Unshaded	160	210	270	310	370	430	400	320	270	220	180	150	270
	Shaded	150	190	250	290	350	390	370	300	250	210	160	140	260
East	Unshaded	300	440	610	790	930	990	1000	930	790	610	390	280	670
	Shaded	270	410	560	710	830	880	890	840	720	560	360	260	610
South	Unshaded	720	860	830	680	500	420	450	620	880	1070	910	710	720
	Shaded	700	810	690	480	350	340	330	390	660	960	880	690	610
West	Unshaded	330	460	630	810	930	1000	1000	930	800	620	410	300	680
	Shaded	300	420	570	730	830	890	890	840	730	570	370	270	620

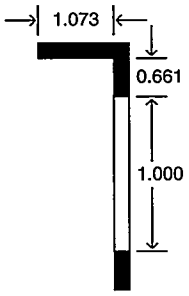
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	47.8	53.3	57.4	63.0	71.0	78.2	84.1	82.6	76.8	67.8	55.8	47.5	65.4
Daily Minimum Temp	38.6	42.6	45.8	50.1	57.3	64.0	69.6	68.5	63.5	54.8	44.7	38.3	53.2
Daily Maximum Temp	56.9	63.9	68.9	75.9	84.6	92.4	98.5	96.6	90.1	80.7	66.8	56.5	77.7
Record Minimum Temp	20.0	25.0	31.0	34.0	37.0	45.0	52.0	52.0	45.0	29.0	28.0	19.0	19.0
Record Maximum Temp	82.0	87.0	92.0	101.0	107.0	114.0	115.0	112.0	112.0	103.0	91.0	83.0	115.0
HDD, Base 65°F	533	331	246	144	28	6	0	0	8	60	283	543	2182
CDD, Base 65°F	0	0	11	84	214	402	592	546	362	147	7	0	2365
Humidity Ratio (#w/#da)	0.0053	0.0058	0.0059	0.0059	0.0064	0.0074	0.0084	0.0090	0.0084	0.0070	0.0061	0.0052	0.0067
Wind Speed (mph)	5.5	6.1	6.7	7.3	8.0	7.8	7.3	7.0	6.5	6.0	5.7	5.5	6.6
Clearness Index, Kt	0.45	0.51	0.56	0.61	0.66	0.69	0.70	0.69	0.66	0.62	0.52	0.45	0.62

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	45/29	79/54	88/61	67/47	26/18	51/37	90/70	107/88	100/82	70/54	33/21	74/50	93/67	84/63	49/33	20/12	47/29	51/32	31/20	3/2
North	11/11	15/17	16/18	14/15	8/7	21/17	16/17	16/18	16/18	14/15	9/8	15/16	16/18	16/17	12/12	7/5	12/11	12/12	9/8	2/1
East	75/36	56/37	16/18	14/15	8/7	82/50	73/56	28/27	16/18	14/15	71/30	71/43	26/24	16/17	12/12	42/13	37/19	12/12	9/8	2/1
South	40/22	70/44	78/50	60/39	23/13	12/12	27/25	40/36	35/32	14/15	22/13	56/36	72/52	65/47	35/23	39/13	77/31	83/35	56/23	5/2
West	11/11	15/17	27/24	70/43	61/28	12/12	16/17	16/18	56/48	84/59	9/8	15/16	16/18	58/43	79/43	7/5	12/11	25/16	47/20	7/3
M. Clr (%hrs)	41	40	39	39	46	80	80	81	82	82	79	81	81	80	81	30	31	34	35	38





Shading Geometry
(Not to Scale)

Daggett, CA

WBAN NO. 23161

LATITUDE: 34.87° N
LONGITUDE: 116.78° W
ELEVATION: 1929 feet
MEAN PRESSURE: 13.7 psia

STATION TYPE: Primary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	1000	1310	1750	2210	2510	2670	2540	2330	1990	1550	1130	930	1830
	Std.Dev.	72	78	94	98	70	56	100	107	111	63	52	49	35
	Minimum	820	1110	1550	2000	2280	2520	2200	2020	1620	1380	990	830	1750
	Maximum	1120	1480	1960	2380	2610	2760	2690	2510	2150	1650	1220	1010	1880
	Diffuse	300	390	490	540	560	520	550	480	400	340	290	260	430
	Clear-Day Global	1160	1510	1980	2430	2690	2790	2720	2480	2100	1630	1240	1060	1990
North	Global	240	300	380	470	620	730	670	500	380	310	250	220	420
	Diffuse	240	300	380	440	490	510	500	440	370	310	250	220	370
	Clear-Day Global	210	260	330	430	610	740	680	480	360	290	220	190	400
East	Global	700	870	1110	1330	1430	1490	1440	1380	1230	1010	780	660	1120
	Diffuse	290	370	470	550	590	580	580	540	460	390	310	270	450
	Clear-Day Global	840	1030	1270	1450	1530	1550	1530	1450	1310	1080	880	780	1220
South	Global	1640	1620	1480	1190	890	750	790	1040	1410	1700	1720	1650	1320
	Diffuse	410	470	520	530	520	500	510	490	480	450	410	380	470
	Clear-Day Global	2110	2050	1780	1290	910	760	810	1100	1560	1940	2090	2100	1540
West	Global	690	840	1070	1280	1400	1470	1380	1300	1200	990	760	650	1090
	Diffuse	300	380	480	550	600	600	600	540	470	390	310	270	460
	Clear-Day Global	840	1030	1270	1450	1530	1550	1530	1450	1310	1080	880	780	1220

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	660	910	1250	1610	1850	1970	1870	1710	1450	1090	760	600	1310
North	Unshaded	160	210	260	310	380	440	410	320	260	210	170	150	270
	Shaded	140	180	230	280	340	380	350	290	240	190	150	130	240
East	Unshaded	480	620	790	950	1030	1070	1030	990	880	720	540	450	800
	Shaded	410	510	640	760	800	820	800	780	710	600	460	390	640
South	Unshaded	1230	1170	1000	720	500	410	440	600	910	1200	1280	1250	890
	Shaded	1170	930	470	320	320	320	320	300	320	800	1160	1220	640
West	Unshaded	480	590	760	920	1000	1050	990	930	860	710	530	450	770
	Shaded	400	490	620	730	780	810	770	730	690	580	450	380	620

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	48.7	53.7	58.3	64.7	73.5	82.7	88.9	87.1	79.7	69.2	56.9	48.6	67.7
Daily Minimum Temp	36.6	41.3	46.0	51.4	59.5	67.5	74.0	72.8	65.7	55.6	44.4	36.6	54.3
Daily Maximum Temp	60.7	66.0	70.5	78.0	87.4	97.8	103.9	101.5	93.7	82.8	69.4	60.5	81.0
Record Minimum Temp	10.0	19.9	27.0	33.1	43.0	48.9	59.0	57.9	48.9	30.0	25.0	10.0	10.0
Record Maximum Temp	82.0	86.0	91.0	99.0	109.9	115.0	116.1	111.9	109.0	105.1	90.0	80.1	116.1
HDD, Base 65°F	505	321	232	121	14	0	0	0	0	39	250	508	1990
CDD, Base 65°F	0	0	24	112	277	531	741	685	441	169	7	0	2987
Humidity Ratio (#w/#da)	0.0034	0.0036	0.0038	0.0040	0.0049	0.0056	0.0071	0.0077	0.0066	0.0048	0.0039	0.0033	0.0049
Wind Speed (mph)	7.9	10.0	13.3	14.0	15.3	14.3	12.4	11.0	10.5	9.4	9.7	8.4	11.3
Clearness Index, Kt	0.61	0.63	0.66	0.69	0.71	0.73	0.70	0.70	0.70	0.68	0.64	0.61	0.68

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

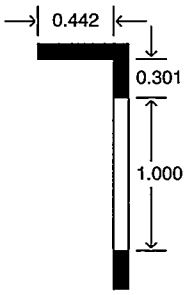
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	52/40	84/67	90/71	68/52	25/19	56/48	93/83	109/97	100/86	68/56	39/28	79/60	95/76	84/66	48/35	27/19	54/41	57/43	34/25	2/2
North	11/12	14/17	15/18	13/15	7/7	20/20	15/18	16/18	16/18	16/17	9/10	14/17	16/19	15/17	11/12	7/7	11/13	11/13	9/9	1/1
East	84/54	54/43	15/18	13/15	7/7	88/67	71/63	24/25	16/18	13/15	83/43	71/51	21/22	15/17	11/12	60/30	39/28	11/13	9/9	1/1
South	46/33	74/57	79/60	60/43	23/14	12/14	27/28	39/38	33/32	13/15	27/18	59/44	73/57	63/49	34/24	59/30	92/57	96/58	68/38	7/4
West	11/12	14/17	31/28	76/51	71/36	12/14	15/18	16/18	59/53	87/66	9/10	14/17	16/19	62/48	84/50	7/7	11/13	30/23	60/34	11/5
M. Clr (%hrs)	57	55	52	51	54	84	83	81	78	78	84	83	81	78	75	57	56	56	52	56

Fresno, CA

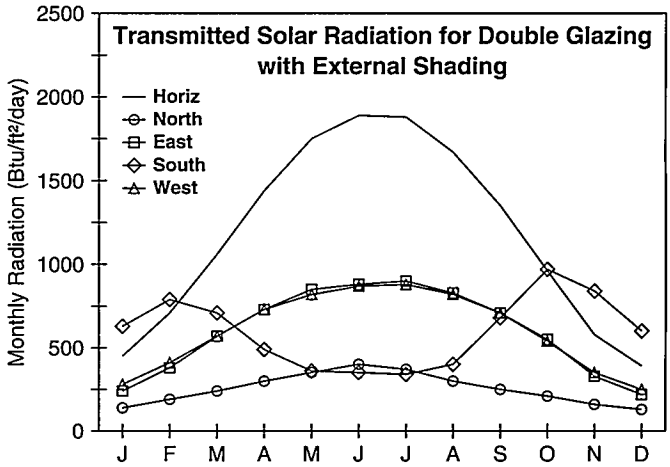
WBAN NO. 93193

LATITUDE: 36.77° N
LONGITUDE: 119.72° W
ELEVATION: 328 feet
MEAN PRESSURE: 14.6 psia

STATION TYPE: Primary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	670	1020	1480	1980	2390	2560	2550	2280	1860	1370	850	590	1640
	Std.Dev.	82	115	143	150	108	79	67	84	93	59	104	84	49
	Minimum	530	810	1180	1610	2090	2350	2410	2000	1660	1240	620	440	1500
	Maximum	860	1240	1740	2190	2550	2740	2650	2400	1990	1450	1010	820	1720
	Diffuse	400	490	600	670	670	630	540	530	490	450	400	350	520
	Clear-Day Global	970	1320	1800	2280	2590	2700	2630	2360	1950	1450	1040	870	1830
North	Global	230	300	380	470	600	690	650	490	390	330	250	200	420
	Diffuse	230	300	380	460	510	520	500	450	390	330	250	200	380
	Clear-Day Global	220	280	360	440	590	690	650	480	370	300	230	200	400
East	Global	390	610	900	1150	1340	1410	1420	1310	1110	860	530	350	950
	Diffuse	270	370	480	580	620	620	590	560	500	420	310	240	460
	Clear-Day Global	670	870	1130	1340	1460	1480	1470	1370	1190	940	710	610	1100
South	Global	880	1170	1270	1150	940	810	860	1100	1400	1510	1160	830	1090
	Diffuse	390	480	560	580	560	540	510	520	530	520	430	360	500
	Clear-Day Global	1750	1820	1710	1340	980	820	880	1160	1550	1780	1760	1690	1440
West	Global	440	640	890	1140	1300	1390	1400	1300	1110	850	550	400	950
	Diffuse	280	370	490	580	630	630	590	570	500	420	310	250	470
	Clear-Day Global	670	870	1130	1340	1460	1480	1470	1370	1190	940	710	610	1100

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

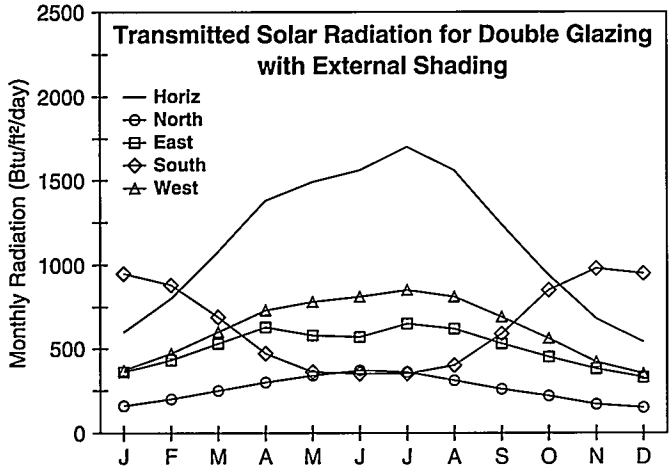
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	450	710	1060	1440	1750	1890	1880	1670	1350	960	580	390	1180
North	Unshaded	160	210	270	320	380	430	400	320	270	230	170	140	270
	Shaded	140	190	240	300	350	400	370	300	250	210	160	130	250
East	Unshaded	270	420	630	820	960	1000	1020	930	790	600	360	240	670
	Shaded	240	380	570	730	850	880	900	830	710	550	330	220	600
South	Unshaded	650	850	870	720	550	460	480	650	920	1080	860	620	730
	Shaded	630	790	710	490	360	350	340	400	680	970	840	600	590
West	Unshaded	310	450	630	810	930	990	1000	930	790	600	380	270	670
	Shaded	280	410	570	730	820	870	880	820	710	540	350	250	600

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	45.7	51.2	55.1	61.2	69.0	76.6	81.9	80.3	74.5	65.2	53.6	45.4	63.3
Daily Minimum Temp	37.4	40.5	43.4	47.3	53.7	60.4	65.1	63.8	58.8	50.7	42.5	37.1	50.1
Daily Maximum Temp	54.1	61.7	66.6	75.1	84.2	92.7	98.6	96.7	90.1	79.7	64.7	53.7	76.5
Record Minimum Temp	19.0	24.0	26.0	32.0	36.0	44.0	50.0	49.0	37.0	27.0	26.0	18.0	18.0
Record Maximum Temp	78.0	80.0	90.0	100.0	107.0	110.0	112.0	111.0	111.0	102.0	89.0	76.0	112.0
HDD, Base 65°F	598	386	314	182	34	0	0	0	8	84	342	608	2556
CDD, Base 65°F	0	0	7	68	158	352	524	474	293	91	0	0	1967
Humidity Ratio (#w/#da)	0.0052	0.0059	0.0061	0.0061	0.0066	0.0076	0.0086	0.0092	0.0084	0.0072	0.0061	0.0053	0.0069
Wind Speed (mph)	5.0	5.7	6.7	7.5	8.4	8.5	7.6	7.0	6.3	5.2	4.7	4.6	6.4
Clearness Index, Kt	0.43	0.51	0.57	0.63	0.68	0.69	0.71	0.69	0.66	0.62	0.51	0.42	0.62

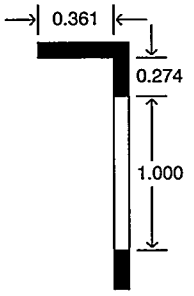
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	43/28	77/54	86/61	67/48	26/18	50/38	88/73	107/89	101/82	71/56	31/22	72/55	91/69	83/63	49/34	17/10	44/25	50/29	29/19	2/2
North	11/10	15/17	16/18	14/15	8/7	20/17	16/18	17/19	17/19	15/16	9/8	15/16	16/18	16/17	12/12	6/5	12/11	12/12	9/8	1/1
East	73/35	56/37	16/18	14/15	8/7	82/51	73/58	30/29	17/19	15/16	67/34	71/49	27/25	16/17	12/12	37/9	37/17	12/12	9/8	1/1
South	39/22	71/45	79/51	61/40	23/14	12/12	29/27	43/39	38/34	16/17	21/14	57/42	74/54	67/50	36/24	35/9	75/26	82/31	53/21	4/2
West	11/10	15/17	26/23	68/43	60/29	12/12	16/18	17/19	55/47	83/60	9/8	15/16	16/18	57/43	77/43	6/5	12/11	24/15	44/18	6/2
M. Clr (%hrs)	48	45	41	42	45	80	78	81	80	79	82	81	82	82	82	25	25	29	35	37



Long Beach, CA

WBAN NO. 23129



Shading Geometry
(Not to Scale)

LATITUDE: 33.82° N
LONGITUDE: 118.15° W
ELEVATION: 56 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	880	1140	1500	1900	2040	2130	2300	2120	1700	1320	990	820	1570
	Std.Dev.	75	107	110	101	132	177	85	73	112	78	63	62	37
	Minimum	740	930	1310	1700	1710	1650	2070	1920	1360	1140	870	670	1470
	Maximum	1050	1370	1760	2150	2270	2370	2460	2230	1880	1440	1090	920	1630
	Diffuse	360	460	600	690	810	830	720	650	600	490	380	330	580
	Clear-Day Global	1100	1420	1870	2280	2530	2610	2550	2340	1990	1540	1160	1000	1870
North	Global	240	300	380	460	560	620	590	490	400	330	260	220	410
	Diffuse	240	300	380	450	510	530	510	460	400	330	260	220	380
	Clear-Day Global	230	290	370	460	590	690	640	490	390	320	250	220	410
East	Global	560	670	830	980	920	920	1040	980	830	710	590	520	800
	Diffuse	300	380	480	560	600	610	600	560	490	410	320	280	470
	Clear-Day Global	740	910	1130	1290	1370	1390	1370	1300	1160	960	770	680	1090
South	Global	1290	1290	1200	1020	790	690	760	970	1160	1320	1350	1290	1090
	Diffuse	430	490	540	560	560	540	530	540	540	510	450	410	510
	Clear-Day Global	1830	1820	1630	1230	890	750	800	1060	1450	1740	1810	1800	1400
West	Global	580	720	920	1120	1210	1260	1310	1240	1070	860	650	540	960
	Diffuse	310	380	490	570	630	650	630	590	520	420	330	280	490
	Clear-Day Global	740	910	1130	1290	1370	1390	1370	1300	1160	960	770	680	1090

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	600	800	1080	1380	1490	1560	1700	1560	1240	940	680	540	1130
North	Unshaded	170	210	270	310	370	400	380	320	280	230	180	160	270
	Shaded	160	200	250	300	340	370	360	310	260	220	170	150	260
East	Unshaded	380	470	580	690	640	640	730	690	580	490	410	350	550
	Shaded	360	430	530	630	580	570	650	620	530	450	380	330	500
South	Unshaded	970	930	810	630	470	410	440	570	760	940	1000	970	740
	Shaded	950	880	690	470	360	350	350	400	590	850	980	950	650
West	Unshaded	400	500	650	800	860	890	930	890	760	600	450	370	680
	Shaded	370	470	600	730	780	810	850	810	690	560	420	350	620

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	55.9	57.3	58.5	61.7	64.8	68.5	73.1	74.4	72.4	68.1	61.3	56.0	64.3
Daily Minimum Temp	44.9	46.9	49.0	51.8	56.3	59.8	63.4	64.8	62.7	57.8	50.4	45.0	54.4
Daily Maximum Temp	66.8	67.7	68.0	71.5	73.3	77.0	82.7	84.0	82.1	78.4	72.1	67.0	74.2
Record Minimum Temp	25.0	33.0	33.0	38.0	40.0	47.0	51.0	52.0	50.0	39.0	34.0	28.0	25.0
Record Maximum Temp	91.0	91.0	98.0	105.0	103.0	109.0	107.0	105.0	110.0	111.0	101.0	92.0	111.0
HDD, Base 65°F	285	221	214	134	69	39	0	0	15	24	145	284	1430
CDD, Base 65°F	0	5	13	35	63	144	255	295	237	120	34	0	1201
Humidity Ratio (#w/#da)	0.0057	0.0063	0.0067	0.0072	0.0084	0.0095	0.0109	0.0114	0.0108	0.0092	0.0071	0.0059	0.0083
Wind Speed (mph)	5.5	6.2	7.0	7.3	7.4	7.0	6.8	6.7	6.3	5.7	5.5	5.1	6.4
Clearness Index, Kt	0.52	0.53	0.56	0.59	0.57	0.58	0.64	0.63	0.59	0.56	0.54	0.52	0.58

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

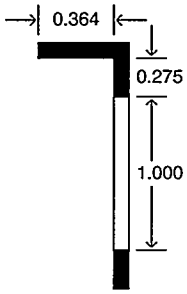
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	46/29	80/54	88/61	67/47	24/17	49/28	88/51	106/70	99/70	67/47	33/18	75/44	93/64	83/57	48/32	23/15	51/34	55/38	33/23	3/3
North	12/11	16/17	16/18	14/15	8/7	21/14	17/19	17/21	17/20	17/17	10/8	16/16	17/19	16/18	12/12	7/6	12/12	12/13	9/9	2/1
East	73/33	54/35	16/18	14/15	8/7	75/26	71/34	27/25	17/20	15/16	66/20	69/33	25/23	16/18	12/12	47/20	38/23	12/13	9/9	2/1
South	39/21	69/43	76/48	57/37	21/12	13/12	26/22	37/30	32/28	15/16	22/11	54/29	69/46	61/41	33/21	44/19	81/41	85/47	59/30	6/3
West	12/11	16/17	29/24	70/43	58/27	13/12	17/19	17/21	57/42	81/47	10/8	16/16	17/19	59/39	76/38	7/6	12/12	27/19	51/26	9/4
M. Clr (%hrs)	40	42	48	51	52	23	44	61	71	75	34	50	69	76	78	47	50	52	53	55

Los Angeles, CA

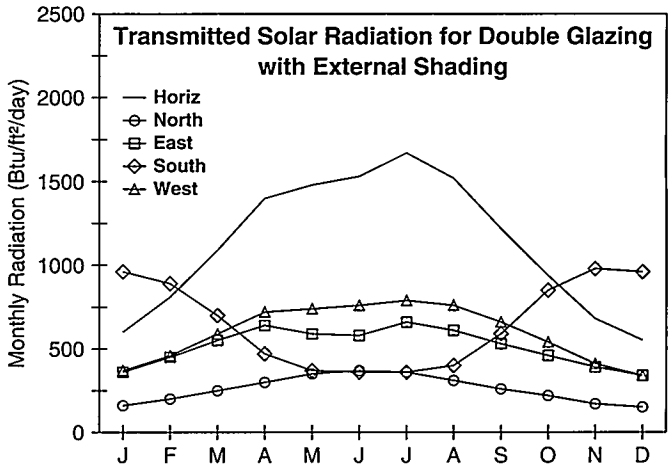
WBAN NO. 23174

LATITUDE: 33.93° N
LONGITUDE: 118.40° W
ELEVATION: 105 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Primary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	890	1150	1520	1920	2030	2090	2260	2070	1670	1320	1000	820	1560
	Std.Dev.	82	106	123	100	139	166	109	82	113	70	66	65	35
	Minimum	710	960	1280	1740	1820	1770	2030	1930	1400	1190	840	660	1500
	Maximum	1040	1390	1750	2150	2290	2360	2530	2200	1850	1430	1140	940	1630
	Diffuse	360	460	600	700	840	880	780	700	620	500	380	330	600
	Clear-Day Global	1090	1420	1860	2270	2520	2610	2550	2340	1980	1540	1160	990	1860
North	Global	240	310	390	470	560	620	600	490	410	340	260	220	410
	Diffuse	240	310	390	460	520	550	520	470	410	340	260	220	390
	Clear-Day Global	230	290	370	460	590	690	640	490	390	320	250	220	410
East	Global	570	690	850	1000	940	930	1050	980	840	720	610	530	810
	Diffuse	300	380	480	570	610	620	620	570	500	420	320	280	470
	Clear-Day Global	740	910	1130	1290	1370	1390	1370	1300	1160	960	770	680	1090
South	Global	1300	1300	1220	1040	800	700	770	960	1140	1320	1360	1300	1100
	Diffuse	430	490	550	560	570	560	550	550	540	520	450	410	510
	Clear-Day Global	1830	1820	1630	1230	890	750	800	1060	1450	1740	1810	1800	1400
West	Global	570	720	910	1110	1160	1190	1240	1180	1020	830	640	540	930
	Diffuse	300	380	490	580	640	660	640	600	520	430	330	280	490
	Clear-Day Global	740	910	1130	1290	1370	1390	1370	1300	1160	960	770	680	1090

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	600	810	1090	1400	1480	1530	1670	1520	1220	940	680	550	1130
North	Unshaded	170	210	270	320	370	410	390	330	280	230	180	160	280
	Shaded	160	200	250	300	350	370	360	310	260	220	170	150	260
East	Unshaded	390	480	600	710	660	650	730	680	590	510	420	360	570
	Shaded	360	450	550	640	590	580	660	610	530	460	390	340	510
South	Unshaded	970	940	830	640	480	420	450	570	750	940	1000	980	750
	Shaded	960	890	700	470	370	360	360	400	590	850	980	960	660
West	Unshaded	390	500	640	790	820	840	880	830	720	590	440	370	650
	Shaded	370	460	590	720	740	760	790	760	660	540	410	340	600

Average Climatic Conditions

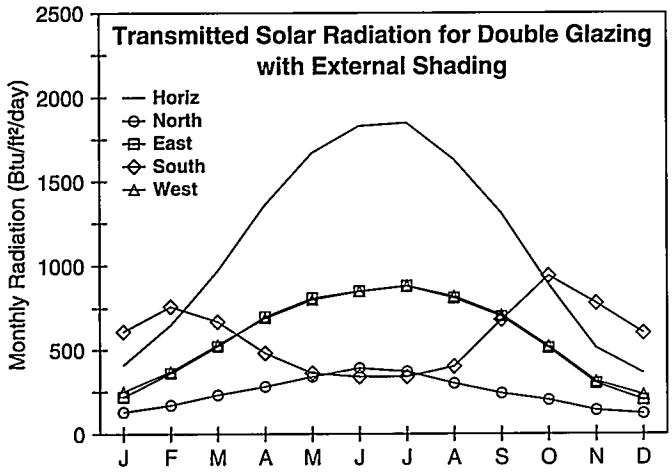
Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	56.8	57.6	58.0	60.1	62.7	65.7	69.1	70.5	69.9	66.8	61.6	56.9	63.0
Daily Minimum Temp	47.8	49.3	50.5	52.8	56.3	59.5	62.8	64.2	63.2	59.2	52.8	47.9	55.5
Daily Maximum Temp	65.7	65.9	65.5	67.4	69.0	71.9	75.3	76.6	76.6	74.4	70.3	65.9	70.4
Record Minimum Temp	23.0	32.0	34.0	39.0	43.0	48.0	49.0	51.0	47.0	41.0	34.0	32.0	23.0
Record Maximum Temp	88.0	92.0	95.0	102.0	97.0	104.0	97.0	98.0	110.0	106.0	101.0	94.0	110.0
HDD, Base 65°F	258	215	224	158	96	54	9	5	22	32	127	258	1458
CDD, Base 65°F	0	8	7	11	25	75	136	176	169	88	25	7	727
Humidity Ratio (#w/#da)	0.0059	0.0065	0.0069	0.0075	0.0086	0.0098	0.0111	0.0116	0.0109	0.0093	0.0072	0.0059	0.0084
Wind Speed (mph)	6.9	7.7	8.6	9.0	8.8	8.4	8.3	8.2	7.8	7.4	7.1	6.8	7.9
Clearness Index, Kt	0.53	0.54	0.56	0.60	0.57	0.57	0.63	0.62	0.58	0.57	0.55	0.53	0.58

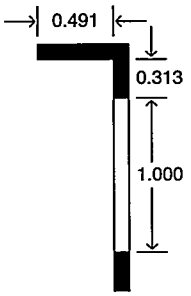
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	46/28	80/55	88/62	67/46	25/17	49/27	88/53	106/71	98/71	67/46	33/18	74/45	93/62	84/57	48/30	23/15	51/35	55/37	33/22	3/3
North	11/11	16/17	16/18	14/15	8/7	21/13	17/20	17/22	17/21	17/17	10/8	16/17	17/20	16/18	12/12	7/6	12/12	12/13	9/9	2/1
East	74/31	55/36	16/18	14/15	8/7	75/23	71/36	28/26	17/21	15/16	66/18	69/33	26/23	16/18	12/12	48/19	39/24	12/13	9/9	2/1
South	39/20	69/43	76/49	58/36	21/12	13/12	26/22	38/31	33/29	15/16	22/10	54/29	70/43	62/40	33/19	45/18	82/42	86/44	60/28	6/3
West	11/11	16/17	29/25	70/41	58/25	13/12	17/20	17/22	57/42	80/45	10/8	16/17	17/20	59/38	75/33	7/6	12/12	27/19	51/25	9/4
M. Clr (%hrs)	45	46	52	52	51	28	41	56	65	62	39	49	66	72	69	50	52	53	54	53

Sacramento, CA

WBAN NO. 23232





Shading Geometry
(Not to Scale)

LATITUDE: 38.52° N
LONGITUDE: 121.50° W
ELEVATION: 26 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	610	940	1370	1870	2280	2490	2520	2230	1810	1280	760	550	1560
	Std.Dev.	64	114	138	167	134	96	56	82	80	70	100	73	36
	Minimum	490	730	1070	1460	1970	2210	2330	2010	1610	1110	590	440	1460
	Maximum	750	1200	1690	2070	2460	2660	2600	2350	1920	1370	950	730	1620
	Diffuse	360	450	570	650	650	610	540	520	460	410	360	320	490
	Clear-Day Global	890	1240	1740	2240	2560	2690	2620	2340	1900	1390	960	790	1780
North	Global	210	280	360	460	580	680	640	490	380	310	230	190	400
	Diffuse	210	280	360	440	500	510	490	440	370	310	230	190	360
	Clear-Day Global	210	270	350	430	590	690	640	480	370	290	220	190	400
East	Global	370	570	830	1110	1300	1380	1410	1300	1110	810	480	340	920
	Diffuse	250	340	450	560	610	610	600	560	480	390	280	230	450
	Clear-Day Global	620	830	1100	1340	1470	1500	1470	1380	1180	910	670	570	1090
South	Global	850	1130	1220	1140	960	850	910	1140	1430	1470	1080	820	1080
	Diffuse	360	450	530	560	550	530	520	520	510	490	400	330	480
	Clear-Day Global	1690	1810	1730	1390	1050	890	940	1220	1590	1790	1720	1630	1450
West	Global	410	600	840	1100	1300	1380	1420	1310	1120	820	510	370	930
	Diffuse	260	350	460	560	610	610	590	560	480	390	290	230	450
	Clear-Day Global	620	830	1100	1340	1470	1500	1470	1380	1180	910	670	570	1090

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	410	650	970	1360	1670	1830	1850	1630	1310	890	510	360	1120
North	Unshaded	140	190	250	310	370	420	400	320	260	210	160	130	260
	Shaded	130	170	230	280	340	390	370	300	240	200	140	120	240
East	Unshaded	250	400	590	790	930	980	1010	930	790	570	330	230	650
	Shaded	220	360	520	700	810	850	880	810	700	510	300	200	570
South	Unshaded	640	820	840	730	560	480	520	690	950	1060	800	620	720
	Shaded	610	760	670	480	360	340	340	400	680	940	780	600	580
West	Unshaded	280	420	590	780	930	990	1010	930	800	580	350	250	660
	Shaded	250	370	530	690	800	850	880	820	710	520	310	230	580

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	45.2	50.7	53.6	58.3	65.3	71.6	75.7	75.1	71.5	64.2	53.3	45.3	60.8
Daily Minimum Temp	37.7	41.4	43.2	45.5	50.3	55.3	58.1	58.0	55.7	50.4	43.4	37.8	48.1
Daily Maximum Temp	52.7	60.0	64.0	71.1	80.3	87.8	93.2	92.1	87.3	77.9	63.1	52.7	73.5
Record Minimum Temp	23.0	23.0	26.0	32.0	36.0	41.0	48.0	49.0	43.0	36.0	26.0	18.0	18.0
Record Maximum Temp	70.0	76.0	88.0	93.0	105.0	115.0	114.0	109.0	108.0	101.0	87.0	72.0	115.0
HDD, Base 65°F	614	400	357	230	80	12	0	0	16	78	351	611	2749
CDD, Base 65°F	0	0	0	29	89	210	332	313	211	53	0	0	1237
Humidity Ratio (#w/#da)	0.0052	0.0058	0.0060	0.0062	0.0069	0.0079	0.0087	0.0088	0.0081	0.0072	0.0062	0.0052	0.0068
Wind Speed (mph)	5.7	6.9	7.8	8.1	8.7	9.0	8.4	8.0	7.0	5.7	5.5	5.7	7.2
Clearness Index, Kt	0.42	0.49	0.54	0.60	0.65	0.67	0.70	0.68	0.66	0.60	0.48	0.42	0.61

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

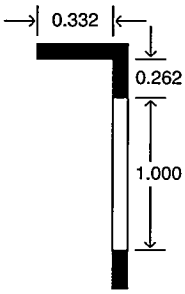
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	39/24	73/48	83/56	66/45	28/18	48/35	86/62	105/84	100/80	72/56	28/19	69/47	89/65	82/61	51/36	13/8	40/23	46/26	29/18	3/2
North	10/9	15/16	16/17	14/15	8/7	20/16	16/17	16/18	16/18	14/16	8/8	14/15	16/17	15/17	12/12	5/4	10/10	11/11	9/8	2/1
East	72/30	57/35	16/17	14/15	8/7	81/49	75/51	32/30	16/18	14/16	65/32	72/44	30/26	15/17	12/12	32/8	37/16	11/11	9/8	2/1
South	37/19	71/41	81/49	64/38	26/14	11/12	30/25	45/39	41/36	20/19	20/13	56/37	76/55	69/50	40/27	29/7	73/24	82/27	56/19	5/2
West	10/9	15/16	22/20	66/38	63/27	11/12	16/17	16/18	52/44	83/59	8/8	14/15	16/17	54/40	79/47	5/4	10/10	21/13	43/16	7/2
M. Clr (%hrs)	43	41	39	40	43	77	78	76	76	76	80	81	80	80	78	27	29	32	35	37

San Diego, CA

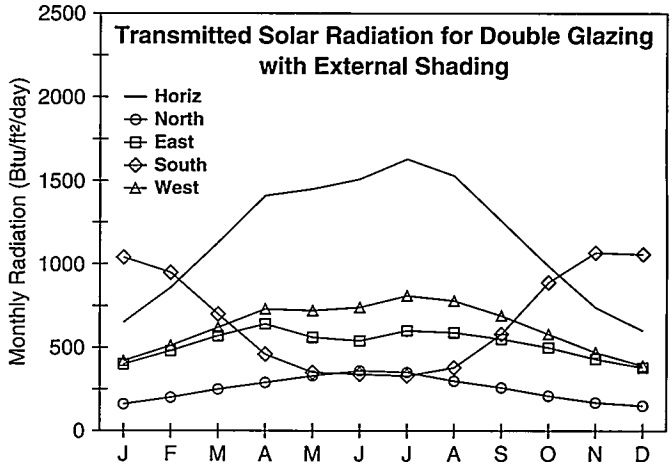
WBAN NO. 23188

LATITUDE: 32.73° N
LONGITUDE: 117.17° W
ELEVATION: 30 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Primary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	970	1230	1560	1930	1980	2050	2200	2070	1720	1390	1080	900	1590
	Std.Dev.	72	97	115	97	149	181	124	102	123	84	66	62	33
	Minimum	830	1030	1400	1740	1680	1580	1790	1870	1330	1220	930	760	1500
	Maximum	1090	1400	1800	2160	2280	2410	2350	2230	1910	1560	1180	1000	1630
	Diffuse	340	430	560	650	790	810	700	610	560	450	350	300	550
	Clear-Day Global	1190	1520	1950	2360	2590	2660	2590	2390	2050	1630	1260	1090	1940
North	Global	240	300	380	460	540	600	580	470	400	330	260	230	400
	Diffuse	240	300	380	440	500	520	500	450	390	330	260	230	380
	Clear-Day Global	230	280	350	430	590	700	640	480	360	300	240	210	400
East	Global	620	740	870	990	900	880	960	940	850	760	660	580	810
	Diffuse	300	370	470	540	580	590	570	530	480	400	320	280	450
	Clear-Day Global	820	990	1210	1360	1420	1440	1410	1350	1220	1030	850	760	1160
South	Global	1420	1380	1220	1000	750	650	700	900	1140	1380	1470	1430	1120
	Diffuse	410	470	520	540	540	530	510	510	510	480	430	390	480
	Clear-Day Global	1990	1920	1650	1180	820	680	730	1000	1430	1800	1950	1960	1420
West	Global	640	770	950	1120	1110	1150	1250	1200	1050	880	710	610	950
	Diffuse	310	380	480	550	600	620	600	560	500	410	330	280	470
	Clear-Day Global	820	990	1210	1360	1420	1440	1410	1350	1220	1030	850	760	1160

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

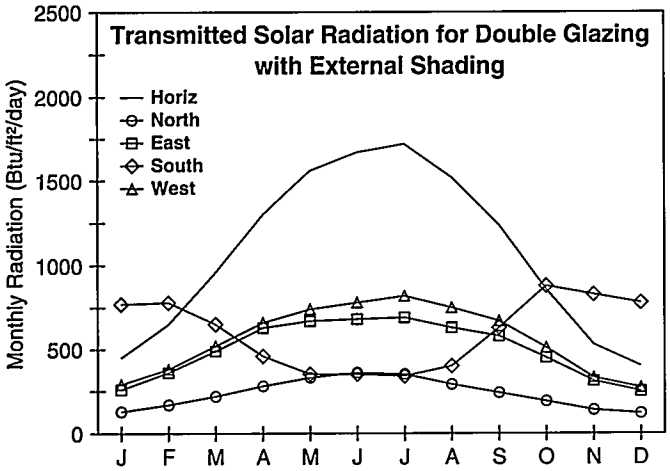
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	650	860	1130	1410	1450	1510	1630	1530	1260	990	740	600	1150
North	Unshaded	170	210	260	310	360	390	370	310	270	230	180	160	270
	Shaded	160	200	250	290	330	360	350	300	260	210	170	150	250
East	Unshaded	430	520	610	690	630	610	660	660	600	540	460	400	570
	Shaded	400	480	570	640	560	540	600	590	550	500	430	380	520
South	Unshaded	1060	990	820	610	440	390	400	530	730	970	1090	1080	760
	Shaded	1040	950	700	460	350	340	330	380	580	890	1070	1060	680
West	Unshaded	440	540	670	800	790	810	890	850	740	620	500	420	670
	Shaded	420	510	620	730	720	740	810	780	690	580	470	390	620

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	57.4	58.6	59.6	62.0	64.1	66.8	71.0	72.6	71.4	67.7	62.0	57.4	64.2
Daily Minimum Temp	48.9	50.7	52.8	55.6	59.1	61.9	65.7	67.3	65.6	60.9	53.9	48.8	57.6
Daily Maximum Temp	65.9	66.5	66.3	68.4	69.1	71.6	76.2	77.8	77.1	74.6	69.9	66.1	70.8
Record Minimum Temp	29.0	36.0	39.0	41.0	48.0	51.0	55.0	57.0	51.0	43.0	38.0	34.0	29.0
Record Maximum Temp	88.0	88.0	93.0	98.0	96.0	101.0	95.0	98.0	111.0	107.0	97.0	88.0	111.0
HDD, Base 65°F	245	189	177	113	73	51	13	0	19	24	109	243	1256
CDD, Base 65°F	9	10	9	23	45	105	199	240	211	107	19	7	984
Humidity Ratio (#w/#da)	0.0061	0.0066	0.0071	0.0076	0.0087	0.0100	0.0116	0.0121	0.0115	0.0097	0.0076	0.0062	0.0087
Wind Speed (mph)	6.1	6.8	7.8	8.3	8.3	8.1	7.8	7.8	7.6	6.9	6.3	5.9	7.3
Clearness Index, Kt	0.55	0.56	0.57	0.60	0.56	0.56	0.61	0.62	0.59	0.58	0.57	0.55	0.58

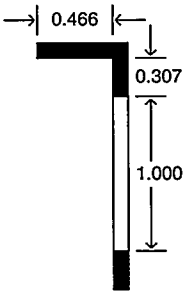
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	50/31	83/57	91/65	69/49	25/17	52/29	90/52	107/72	99/67	67/42	37/21	78/46	96/65	85/56	48/31	27/18	56/37	59/40	36/25	3/3
North	11/12	15/17	16/18	14/15	8/7	22/14	16/19	16/21	17/20	18/17	10/9	15/17	16/19	16/18	12/12	8/7	12/13	12/13	9/9	2/1
East	79/36	54/36	16/18	14/15	8/7	80/27	70/35	25/25	17/20	14/15	74/24	70/34	23/22	16/18	12/12	56/24	39/25	12/13	9/9	2/1
South	42/23	69/44	75/52	57/38	21/12	12/12	24/22	35/30	29/26	14/15	24/12	55/30	69/46	60/39	32/19	54/23	87/46	91/49	65/32	8/3
West	11/12	15/17	31/26	74/46	65/28	12/12	16/19	16/21	58/40	83/40	10/9	15/17	16/19	61/39	80/37	8/7	12/13	30/21	58/29	12/5
M. Clr (%hrs)	38	43	45	45	45	17	42	55	60	56	30	56	65	69	66	50	51	53	52	53



San Francisco, CA

WBAN NO. 23234



Shading Geometry
(Not to Scale)

LATITUDE: 37.62° N
LONGITUDE: 122.38° W
ELEVATION: 16 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	680	940	1340	1800	2120	2270	2330	2060	1700	1230	790	620	1490
	Std.Dev.	66	122	147	163	126	144	84	109	101	79	84	75	33
	Minimum	570	740	1060	1390	1790	1920	2190	1810	1480	1020	670	450	1400
	Maximum	790	1240	1680	2030	2360	2520	2490	2300	1910	1400	930	760	1540
	Diffuse	310	420	530	640	710	720	650	610	500	410	330	280	510
	Clear-Day Global	940	1280	1760	2230	2530	2640	2570	2310	1900	1410	1010	840	1790
North	Global	200	270	350	440	550	620	590	470	380	300	220	180	380
	Diffuse	200	270	350	430	490	520	500	450	380	300	220	180	360
	Clear-Day Global	200	260	340	430	580	680	630	480	370	290	220	190	390
East	Global	430	580	780	1000	1100	1120	1140	1030	930	720	500	400	810
	Diffuse	250	330	430	530	590	610	590	550	470	370	280	220	440
	Clear-Day Global	670	860	1100	1310	1420	1440	1410	1330	1170	930	710	610	1080
South	Global	1050	1140	1170	1070	900	800	860	1050	1300	1370	1150	1050	1080
	Diffuse	350	430	500	540	550	540	530	530	510	470	390	330	470
	Clear-Day Global	1790	1840	1710	1340	1020	870	920	1180	1550	1790	1790	1740	1460
West	Global	460	600	820	1060	1200	1260	1320	1210	1060	810	530	430	900
	Diffuse	250	330	440	550	610	630	610	570	480	380	280	230	450
	Clear-Day Global	670	860	1100	1310	1420	1440	1410	1330	1170	930	710	610	1080

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	450	650	960	1300	1560	1670	1720	1520	1240	860	530	400	1070
North	Unshaded	140	190	240	300	360	400	380	320	260	210	150	130	260
	Shaded	130	170	220	280	330	360	350	290	240	190	140	120	240
East	Unshaded	290	400	550	710	780	790	800	730	650	500	350	270	570
	Shaded	260	360	490	630	670	680	690	630	580	450	310	250	500
South	Unshaded	790	830	810	680	530	460	490	640	870	990	860	790	730
	Shaded	770	780	650	460	350	350	340	400	630	880	830	780	600
West	Unshaded	320	420	580	750	850	900	940	860	750	570	360	290	640
	Shaded	290	380	520	660	740	780	820	750	670	510	330	270	560

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	48.7	52.2	53.3	55.6	58.1	61.5	62.7	63.7	64.5	61.0	54.8	49.4	57.1
Daily Minimum Temp	41.8	45.0	45.8	47.2	49.7	52.6	53.9	55.0	55.2	51.8	47.1	42.7	49.0
Daily Maximum Temp	55.6	59.4	60.8	63.9	66.5	70.3	71.6	72.3	73.6	70.1	62.4	56.1	65.2
Record Minimum Temp	24.0	25.0	30.0	31.0	36.0	41.0	43.0	42.0	38.0	34.0	25.0	20.0	20.0
Record Maximum Temp	72.0	78.0	85.0	92.0	97.0	106.0	105.0	98.0	103.0	99.0	85.0	75.0	106.0
HDD, Base 65°F	505	358	363	287	218	121	92	68	79	135	306	484	3016
CDD, Base 65°F	0	0	0	5	0	16	21	28	64	11	0	0	145
Humidity Ratio (#w/#da)	0.0056	0.0061	0.0061	0.0062	0.0068	0.0075	0.0081	0.0085	0.0083	0.0076	0.0066	0.0057	0.0069
Wind Speed (mph)	7.4	9.0	10.8	12.2	13.9	13.9	13.9	12.7	11.2	9.6	8.3	7.8	10.9
Clearness Index, Kt	0.45	0.48	0.52	0.57	0.60	0.61	0.64	0.63	0.61	0.56	0.48	0.45	0.57

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

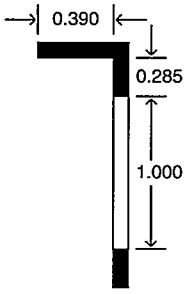
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	38/22	73/46	84/54	68/44	30/18	44/26	83/51	103/74	99/75	72/51	26/15	67/42	88/61	83/59	52/34	14/8	41/24	49/29	32/19	3/3
North	10/9	14/15	15/16	14/14	9/7	20/13	16/17	17/19	17/18	15/16	8/7	14/14	16/17	16/17	12/12	5/4	10/9	11/11	9/8	2/1
East	71/28	59/34	15/16	14/14	9/7	75/29	74/40	34/29	17/18	15/16	61/20	72/37	32/26	16/17	12/12	37/11	40/18	11/11	9/8	2/1
South	36/17	69/38	80/46	64/38	28/14	11/10	28/22	43/34	40/33	20/18	18/9	54/30	73/50	68/47	40/25	33/10	76/29	86/36	63/25	8/3
West	10/9	14/15	21/18	65/38	66/26	11/10	16/17	17/19	50/40	80/50	8/7	14/14	16/17	52/38	77/41	5/4	10/9	20/14	47/20	12/4
M. Clr (%hrs)	36	38	40	41	42	46	60	67	71	70	48	63	72	77	76	35	39	43	42	44

Santa Maria, CA

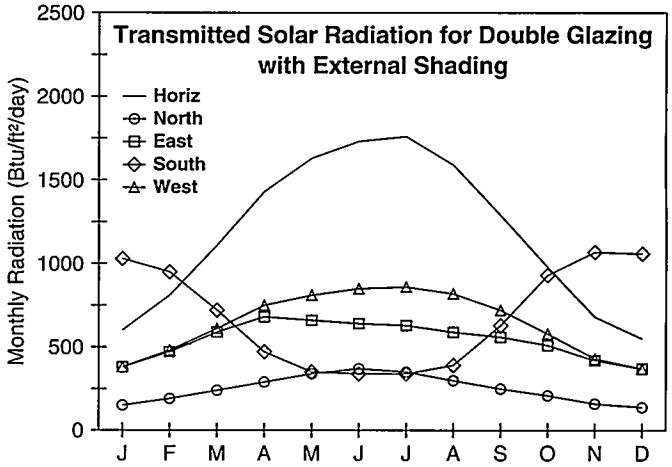
WBAN NO. 23273

LATITUDE: 34.90° N
LONGITUDE: 120.45° W
ELEVATION: 236 feet
MEAN PRESSURE: 14.6 psia

STATION TYPE: Primary



Shading Geometry (Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	900	1170	1540	1960	2210	2340	2370	2150	1770	1380	1010	840	1640
	Std.Dev.	77	105	135	131	143	130	61	72	85	78	78	57	41
	Minimum	720	960	1280	1670	1770	2010	2260	1980	1600	1210	860	720	1530
	Maximum	1040	1340	1820	2200	2490	2550	2500	2280	1940	1500	1140	950	1700
	Diffuse	320	420	550	630	710	710	640	590	530	430	330	290	510
	Clear-Day Global	1100	1440	1890	2330	2590	2690	2630	2400	2020	1560	1170	1000	1900
North	Global	230	300	370	460	560	630	580	470	390	320	250	210	400
	Diffuse	230	300	370	440	500	520	490	450	390	320	250	210	370
	Clear-Day Global	220	270	340	430	600	700	650	480	370	290	230	200	400
East	Global	600	730	910	1050	1060	1040	1040	960	890	790	660	570	860
	Diffuse	290	370	470	550	590	600	580	540	470	400	310	270	450
	Clear-Day Global	780	960	1190	1360	1450	1470	1450	1380	1230	1020	820	730	1150
South	Global	1390	1390	1280	1080	850	730	790	1000	1250	1450	1470	1430	1180
	Diffuse	400	470	520	540	540	530	520	520	510	480	420	380	490
	Clear-Day Global	1960	1930	1700	1260	910	760	820	1090	1500	1840	1940	1940	1470
West	Global	600	740	940	1150	1270	1340	1350	1280	1100	890	670	570	990
	Diffuse	290	370	470	550	610	620	600	560	490	400	320	270	460
	Clear-Day Global	780	960	1190	1360	1450	1470	1450	1380	1230	1020	820	730	1150

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

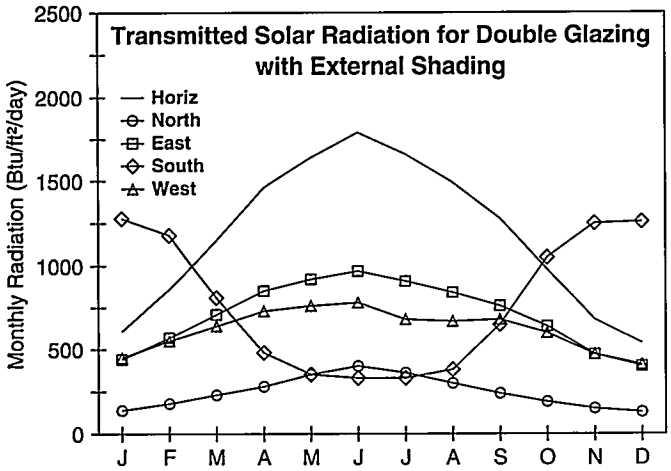
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	600	810	1110	1430	1630	1730	1760	1590	1290	980	680	550	1180
North	Unshaded	160	200	260	310	370	400	370	320	270	220	170	150	270
	Shaded	150	190	240	290	340	370	350	300	250	210	160	140	250
East	Unshaded	410	510	650	750	750	730	720	670	620	550	450	390	600
	Shaded	380	470	590	680	660	640	630	590	560	510	420	370	540
South	Unshaded	1040	1010	870	670	490	420	450	590	820	1030	1090	1080	800
	Shaded	1030	950	720	470	350	340	340	390	630	930	1070	1060	690
West	Unshaded	410	520	660	820	900	950	960	910	790	630	460	390	700
	Shaded	380	480	610	750	810	850	860	820	720	580	430	370	640

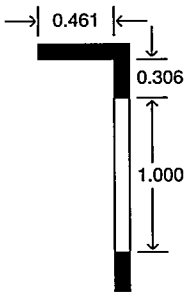
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	51.1	52.6	52.8	54.8	57.1	60.7	63.1	64.0	63.6	61.0	55.5	51.1	57.3
Daily Minimum Temp	38.3	40.4	41.3	42.5	46.4	50.3	52.9	53.9	52.3	48.0	42.3	37.8	45.5
Daily Maximum Temp	63.8	64.7	64.2	66.9	67.8	71.0	73.3	74.1	74.8	73.9	68.7	64.2	69.0
Record Minimum Temp	20.0	22.0	24.0	31.0	31.0	36.0	43.0	43.0	36.0	26.0	25.0	20.0	20.0
Record Maximum Temp	86.0	87.0	95.0	103.0	100.0	102.0	104.0	103.0	103.0	108.0	93.0	90.0	108.0
HDD, Base 65°F	431	347	378	311	248	138	96	72	100	143	289	431	2984
CDD, Base 65°F	0	0	0	5	0	9	37	41	58	19	0	0	169
Humidity Ratio (#w/#da)	0.0053	0.0059	0.0062	0.0065	0.0071	0.0078	0.0086	0.0090	0.0088	0.0075	0.0062	0.0052	0.0070
Wind Speed (mph)	6.2	7.2	8.2	8.5	8.9	8.3	7.1	6.6	6.2	6.3	6.7	6.2	7.2
Clearness Index, Kt	0.55	0.56	0.58	0.61	0.62	0.63	0.66	0.65	0.62	0.60	0.57	0.55	0.61

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	44/28	79/54	89/60	70/48	29/19	48/28	87/51	106/78	101/77	71/52	31/17	73/42	92/65	85/61	52/34	21/14	50/34	56/38	36/25	4/3
North	11/11	15/17	16/18	14/15	8/8	22/14	16/19	17/20	17/20	15/16	9/8	14/16	16/19	16/18	12/12	7/6	11/12	12/13	9/9	2/2
East	77/35	58/37	16/18	14/15	8/8	80/29	74/36	31/28	17/20	15/16	70/19	73/33	29/25	16/18	12/12	50/21	42/26	12/13	9/9	2/2
South	39/21	70/43	78/49	62/38	26/14	12/11	25/22	39/33	35/31	15/16	22/10	55/28	71/47	65/44	37/23	46/19	85/45	92/49	67/33	11/4
West	11/11	15/17	25/22	70/41	68/29	12/11	16/19	17/20	54/43	83/52	9/8	14/16	16/19	56/39	80/41	7/6	11/12	24/18	54/28	16/6
M. Clr (%hrs)	48	48	50	51	51	32	61	74	80	81	35	59	75	78	80	53	53	54	53	54





Shading Geometry
(Not to Scale)

Alamosa, CO

WBAN NO. 23061

LATITUDE: 37.45° N
LONGITUDE: 105.87° W
ELEVATION: 7536 feet
MEAN PRESSURE: 11.2 psia

STATION TYPE: Primary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	950	1260	1630	2010	2240	2440	2270	2050	1780	1410	1030	860	1660
	Std.Dev.	44	55	84	91	83	114	106	88	98	96	47	40	38
	Minimum	830	1140	1420	1710	2080	2250	2100	1830	1550	1130	940	750	1590
	Maximum	1020	1380	1760	2150	2410	2770	2500	2200	1950	1560	1150	930	1770
	Diffuse	270	340	490	580	650	590	630	580	440	340	280	240	450
	Clear-Day Global	1100	1470	1960	2450	2760	2860	2770	2500	2080	1590	1170	990	1980
North	Global	220	280	360	460	610	700	630	490	370	290	230	200	400
	Diffuse	220	280	360	430	490	490	490	440	360	290	230	200	360
	Clear-Day Global	180	230	300	400	610	750	670	460	310	250	190	170	380
East	Global	680	880	1100	1310	1440	1520	1440	1320	1170	980	740	630	1100
	Diffuse	270	340	450	530	580	560	570	530	440	360	290	250	430
	Clear-Day Global	840	1060	1320	1530	1630	1650	1610	1520	1350	1110	880	780	1270
South	Global	1720	1710	1470	1170	900	790	820	1020	1350	1650	1700	1680	1330
	Diffuse	380	440	510	540	540	510	520	520	470	430	390	360	470
	Clear-Day Global	2220	2200	1910	1400	990	820	880	1180	1660	2070	2190	2190	1640
West	Global	690	840	990	1150	1200	1250	1100	1060	1060	930	740	640	970
	Diffuse	270	350	460	550	600	590	590	560	460	370	290	250	450
	Clear-Day Global	840	1060	1320	1530	1630	1650	1610	1520	1350	1110	880	780	1270

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	610	860	1150	1460	1640	1790	1660	1490	1280	980	680	540	1180
North	Unshaded	150	190	250	310	380	430	390	320	250	200	160	140	270
	Shaded	140	180	230	280	350	400	360	300	240	190	150	130	250
East	Unshaded	470	620	790	950	1040	1100	1030	950	840	700	510	430	790
	Shaded	440	570	710	850	920	970	910	840	760	640	470	400	710
South	Unshaded	1290	1250	1000	740	530	440	470	620	890	1180	1270	1270	910
	Shaded	1280	1180	810	480	350	330	330	380	650	1050	1250	1260	780
West	Unshaded	480	590	710	820	850	890	780	760	760	660	510	440	690
	Shaded	450	550	640	730	760	780	680	670	680	600	470	410	620

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	14.7	22.4	32.3	41.1	50.4	59.4	64.9	62.4	54.8	43.5	29.9	17.5	41.1
Daily Minimum Temp	-3.9	4.8	15.8	23.5	32.8	41.0	47.8	45.4	36.7	24.6	12.3	-0.5	23.4
Daily Maximum Temp	33.3	39.9	48.7	58.6	68.0	77.8	82.0	79.2	72.7	62.5	47.4	35.4	58.8
Record Minimum Temp	-50.0	-35.0	-20.0	-6.0	11.0	24.0	34.0	29.0	15.0	-10.0	-30.0	-42.0	-50.0
Record Maximum Temp	62.0	66.0	73.0	80.0	85.0	93.0	96.0	90.0	87.0	81.0	71.0	61.0	96.0
HDD, Base 65°F	1559	1193	1014	717	453	174	42	98	306	667	1053	1473	8749
CDD, Base 65°F	0	0	0	0	0	6	39	17	0	0	0	0	62
Humidity Ratio (#w/#da)	0.0016	0.0020	0.0025	0.0029	0.0041	0.0058	0.0085	0.0084	0.0061	0.0038	0.0025	0.0017	0.0042
Wind Speed (mph)	7.7	7.5	10.6	11.4	10.8	10.0	8.0	7.7	6.1	7.7	8.9	5.9	8.5
Clearness Index, Kt	0.63	0.64	0.64	0.64	0.64	0.66	0.63	0.62	0.64	0.65	0.63	0.62	0.64

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

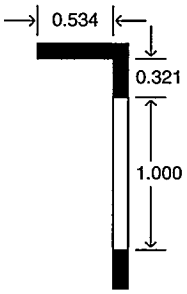
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	46/32	79/60	89/68	70/52	31/22	52/40	88/73	105/86	100/75	72/54	33/22	72/53	91/68	83/60	52/38	20/14	49/36	55/42	36/27	4/3
North	10/11	14/16	15/17	13/15	8/8	20/17	14/16	16/17	16/17	13/15	8/8	13/15	15/17	14/16	11/12	6/6	10/11	11/12	9/9	2/2
East	87/49	60/44	15/17	13/15	8/8	91/60	75/61	30/29	16/17	13/15	84/36	75/50	28/26	14/16	11/12	56/26	45/29	11/12	9/9	2/2
South	44/28	76/54	84/61	67/45	31/18	11/12	28/27	42/38	38/32	17/17	24/14	58/41	75/55	69/47	41/27	51/24	92/54	99/64	75/43	14/6
West	10/11	14/16	23/23	71/47	79/38	11/12	14/16	16/17	52/42	83/57	8/8	13/15	15/17	55/39	83/49	6/6	10/11	24/20	58/35	20/8
M. Clr (%hrs)	52	49	40	38	39	74	70	61	44	38	66	67	62	51	49	53	55	53	52	55

Boulder, CO

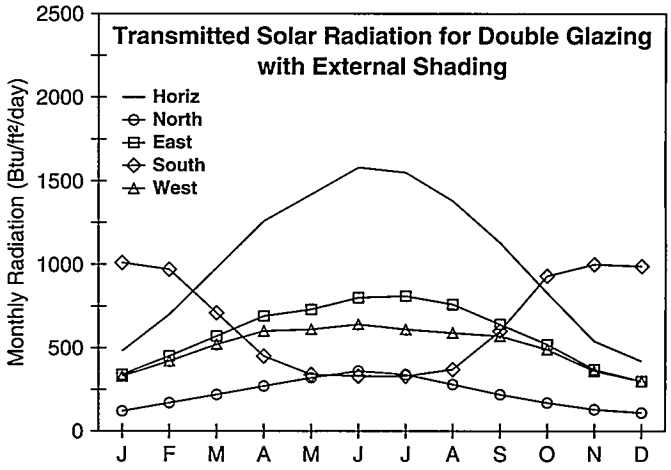
WBAN NO. 94018

LATITUDE: 40.02° N
LONGITUDE: 105.25° W
ELEVATION: 5361 feet
MEAN PRESSURE: 12.1 psia

STATION TYPE: Primary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	750	1030	1390	1750	1960	2160	2120	1890	1580	1200	830	670	1450
	Std.Dev.	52	51	96	115	152	164	116	115	119	95	46	41	54
	Minimum	660	880	1170	1510	1530	1810	1780	1590	1250	990	730	610	1340
	Maximum	850	1110	1570	1940	2270	2460	2350	2100	1760	1340	900	740	1520
	Diffuse	280	380	520	630	710	670	650	580	450	340	290	250	480
	Clear-Day Global	950	1310	1830	2330	2650	2770	2680	2390	1950	1440	1020	840	1850
North	Global	200	260	350	440	550	630	580	460	350	270	210	180	370
	Diffuse	200	260	350	420	480	490	480	430	350	270	210	180	340
	Clear-Day Global	170	230	310	410	590	720	650	460	320	250	190	160	370
East	Global	550	710	910	1110	1200	1320	1340	1220	1020	820	590	490	940
	Diffuse	250	330	430	520	570	570	570	520	420	340	270	220	420
	Clear-Day Global	750	960	1240	1460	1570	1590	1560	1460	1270	1020	780	680	1190
South	Global	1370	1410	1300	1110	890	810	850	1020	1270	1460	1370	1330	1180
	Diffuse	360	430	500	540	540	520	520	510	460	410	370	330	460
	Clear-Day Global	2060	2100	1920	1470	1080	920	980	1270	1690	2000	2050	2010	1630
West	Global	520	680	840	980	1020	1070	1010	970	920	780	570	480	820
	Diffuse	250	330	440	530	580	590	570	520	430	340	270	220	420
	Clear-Day Global	750	960	1240	1460	1570	1590	1560	1460	1270	1020	780	680	1190

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

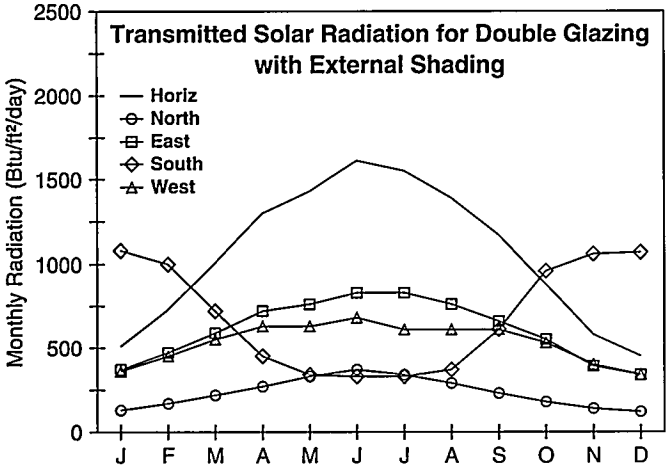
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	480	700	980	1260	1420	1580	1550	1380	1130	830	540	420	1020
North	Unshaded	140	180	240	300	360	400	370	310	240	190	150	120	250
	Shaded	120	170	220	270	320	360	340	280	220	170	130	110	230
East	Unshaded	370	500	650	790	860	950	960	880	730	580	410	330	670
	Shaded	340	450	570	690	730	800	810	760	640	520	370	300	580
South	Unshaded	1030	1040	900	710	540	470	500	640	850	1050	1030	1010	810
	Shaded	1010	970	710	450	340	330	330	370	600	930	1000	990	670
West	Unshaded	360	470	590	690	720	760	710	690	650	550	390	330	580
	Shaded	330	420	520	600	610	640	610	590	570	490	360	300	500

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	29.7	33.4	39.0	48.2	57.2	66.9	73.5	71.4	62.3	51.4	39.0	31.0	50.3
Daily Minimum Temp	16.1	20.2	25.8	34.5	43.6	52.4	58.6	56.9	47.6	36.4	25.4	17.4	36.2
Daily Maximum Temp	43.2	46.6	52.2	61.8	70.8	81.4	88.2	85.8	76.9	66.3	52.5	44.5	64.2
Record Minimum Temp	-25.0	-30.0	-11.0	-2.0	22.0	30.0	43.0	41.0	17.0	3.0	-8.0	-25.0	-30.0
Record Maximum Temp	73.0	76.0	84.0	89.0	96.0	104.0	104.0	101.0	97.0	89.0	79.0	75.0	104.0
HDD, Base 65°F	1094	885	806	504	253	71	0	0	144	429	780	1054	6020
CDD, Base 65°F	0	0	0	0	11	128	267	203	63	7	0	0	679
Humidity Ratio (#w/#da)	0.0021	0.0023	0.0028	0.0037	0.0056	0.0075	0.0090	0.0087	0.0064	0.0041	0.0029	0.0021	0.0048
Wind Speed (mph)	8.3	8.5	9.2	9.8	9.2	8.6	8.1	7.8	7.7	7.6	7.8	8.0	8.4
Clearness Index, Kt	0.55	0.56	0.56	0.57	0.56	0.59	0.59	0.58	0.58	0.58	0.55	0.54	0.57

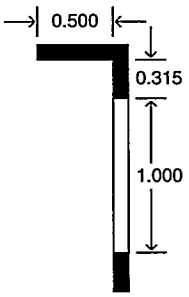
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	42/28	73/51	82/59	65/44	27/18	51/34	84/63	101/78	95/67	68/46	31/18	69/45	84/60	77/52	47/31	16/10	43/29	48/34	29/20	2/2
North	10/10	13/15	15/17	13/14	8/7	18/14	14/16	16/17	16/17	14/14	8/7	13/14	14/16	14/15	10/11	5/5	10/10	10/11	8/8	1/1
East	81/38	56/37	15/17	13/14	8/7	86/46	70/51	29/26	16/17	14/14	77/28	71/41	26/23	14/15	10/11	47/18	41/24	10/11	8/8	1/1
South	44/24	74/46	85/55	67/39	28/14	11/11	31/27	46/38	41/32	20/17	24/12	59/35	75/50	69/42	39/23	44/17	87/44	94/50	67/31	5/2
West	10/10	13/15	24/21	68/40	70/29	11/11	14/16	16/17	52/38	79/47	8/7	13/14	14/16	54/35	77/39	5/5	10/10	23/17	52/25	8/3
M. Clr (%hrs)	38	38	32	30	29	59	60	51	36	28	57	58	57	50	44	41	44	44	42	43



Colorado Springs, CO

WBAN NO. 93037



Shading Geometry
(Not to Scale)

LATITUDE: 38.82° N
LONGITUDE: 104.72° W
ELEVATION: 6172 feet
MEAN PRESSURE: 11.8 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	800	1070	1420	1790	1960	2200	2110	1910	1630	1270	880	720	1480
	Std.Dev.	49	54	97	97	113	136	117	107	104	97	49	42	41
	Minimum	690	950	1170	1530	1740	1950	1930	1650	1360	1010	800	640	1410
	Maximum	890	1150	1610	2000	2210	2440	2350	2120	1820	1420	990	800	1550
	Diffuse	260	350	500	610	710	670	660	600	470	350	280	240	480
	Clear-Day Global	1010	1370	1870	2380	2680	2790	2710	2430	2000	1500	1080	900	1900
North	Global	200	260	350	440	560	640	590	470	360	280	220	180	380
	Diffuse	200	260	350	420	480	500	480	430	360	280	220	180	350
	Clear-Day Global	180	230	310	420	600	730	660	470	330	260	190	160	380
East	Global	580	740	940	1140	1220	1340	1340	1220	1050	860	620	530	970
	Diffuse	250	320	430	520	570	580	570	530	440	350	270	230	420
	Clear-Day Global	780	990	1250	1470	1580	1600	1560	1470	1290	1050	810	710	1210
South	Global	1450	1450	1300	1090	860	790	820	1000	1270	1510	1450	1430	1200
	Diffuse	360	420	490	530	540	520	520	520	480	420	370	330	460
	Clear-Day Global	2110	2120	1900	1440	1050	880	940	1230	1670	2010	2080	2060	1620
West	Global	580	710	870	1010	1030	1110	1000	990	960	840	630	530	860
	Diffuse	250	330	440	530	580	590	580	530	450	350	270	230	430
	Clear-Day Global	780	990	1250	1470	1580	1600	1560	1470	1290	1050	810	710	1210

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	510	730	1010	1300	1430	1610	1550	1390	1170	880	580	450	1050
North	Unshaded	140	180	240	300	360	410	380	310	250	200	150	130	250
	Shaded	130	170	220	270	330	370	340	290	230	180	140	120	230
East	Unshaded	400	520	670	820	870	960	970	880	750	610	430	360	690
	Shaded	370	470	590	720	760	830	830	760	660	550	390	340	610
South	Unshaded	1100	1070	900	700	520	460	480	620	850	1080	1090	1080	830
	Shaded	1080	1000	720	450	340	330	330	370	610	960	1060	1070	690
West	Unshaded	400	500	610	720	730	790	710	700	680	590	430	370	600
	Shaded	360	450	550	630	630	680	610	610	610	530	400	340	530

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	28.8	32.0	37.3	46.4	55.4	65.0	70.8	68.3	60.4	49.9	37.8	29.8	48.5
Daily Minimum Temp	16.1	19.3	24.6	33.0	42.1	51.1	57.1	55.2	47.1	36.3	24.9	17.4	35.4
Daily Maximum Temp	41.4	44.6	50.0	59.8	68.7	79.0	84.4	81.3	73.6	63.5	50.7	42.2	61.6
Record Minimum Temp	-26.0	-27.0	-11.0	-3.0	21.0	32.0	42.0	43.0	22.0	5.0	-8.0	-24.0	-27.0
Record Maximum Temp	72.0	76.0	81.0	83.0	93.0	100.0	100.0	99.0	94.0	86.0	78.0	77.0	100.0
HDD, Base 65°F	1122	924	859	558	302	87	6	18	164	468	816	1091	6415
CDD, Base 65°F	0	0	0	0	0	87	186	120	26	0	0	0	419
Humidity Ratio (#w/#da)	0.0018	0.0020	0.0024	0.0033	0.0051	0.0070	0.0089	0.0089	0.0064	0.0038	0.0025	0.0019	0.0045
Wind Speed (mph)	9.2	9.6	10.6	11.3	10.8	9.7	8.9	8.5	9.2	9.5	9.4	8.9	9.6
Clearness Index, Kt	0.56	0.57	0.57	0.58	0.56	0.60	0.59	0.58	0.59	0.60	0.56	0.55	0.58

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

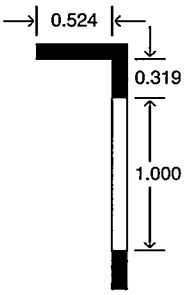
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	44/29	76/51	84/59	66/45	28/18	52/35	87/65	102/78	97/66	69/46	33/19	71/47	87/60	80/54	48/32	18/12	45/31	50/35	31/21	2/2
North	10/10	13/15	14/17	12/14	8/7	18/15	15/17	16/17	16/17	13/14	8/8	13/15	15/17	14/16	11/11	6/5	10/10	10/11	8/8	1/1
East	83/39	57/36	14/17	12/14	8/7	87/45	72/52	28/26	16/17	13/14	79/29	72/42	26/23	14/16	11/11	52/20	41/24	10/11	8/8	1/1
South	45/24	76/45	84/53	66/39	28/14	11/11	30/27	44/37	39/30	17/16	25/12	59/36	75/48	68/43	39/22	49/19	90/45	95/52	69/33	8/3
West	10/10	13/15	25/22	70/41	74/28	11/11	15/17	16/17	53/38	82/48	8/8	13/15	15/17	56/37	81/39	6/5	10/10	24/18	55/27	11/4
M. Clr (%hrs)	42	42	34	31	31	60	59	52	36	31	58	59	56	49	45	47	47	44	45	50

Eagle, CO

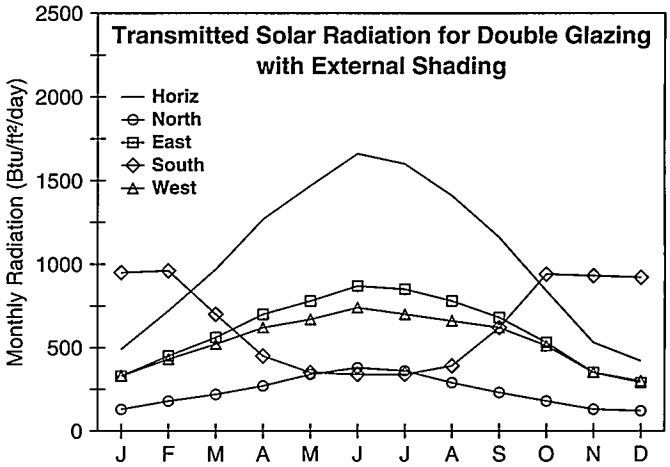
WBAN NO. 23063

LATITUDE: 39.65° N
LONGITUDE: 106.92° W
ELEVATION: 6513 feet
MEAN PRESSURE: 11.6 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	760	1060	1380	1760	2020	2270	2200	1940	1630	1220	800	660	1480
	Std.Dev.	65	88	87	80	113	104	71	100	103	93	59	44	34
	Minimum	640	870	1190	1600	1790	2100	2030	1670	1380	1000	620	580	1420
	Maximum	910	1230	1580	1910	2270	2590	2360	2150	1780	1390	940	730	1540
	Diffuse	340	420	550	640	720	670	670	610	470	360	310	280	500
	Clear-Day Global	990	1350	1850	2350	2680	2800	2710	2420	1980	1470	1040	870	1880
North	Global	220	280	360	450	580	670	620	480	360	280	220	190	390
	Diffuse	220	280	360	430	490	510	490	440	360	280	220	190	360
	Clear-Day Global	180	240	310	410	600	730	660	470	330	250	190	160	380
East	Global	530	710	890	1120	1260	1400	1380	1250	1080	840	550	470	960
	Diffuse	270	350	450	530	590	600	590	540	450	350	270	230	440
	Clear-Day Global	770	980	1240	1460	1590	1610	1570	1480	1290	1040	800	700	1210
South	Global	1290	1400	1270	1100	900	830	870	1040	1310	1470	1280	1240	1170
	Diffuse	400	470	520	550	560	540	540	540	490	430	370	350	480
	Clear-Day Global	2110	2130	1910	1460	1080	920	970	1270	1700	2020	2060	2050	1640
West	Global	530	690	840	1000	1100	1200	1140	1070	990	810	560	480	870
	Diffuse	280	360	450	540	610	620	610	560	460	350	270	240	450
	Clear-Day Global	770	980	1240	1460	1590	1610	1570	1480	1290	1040	800	700	1210

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

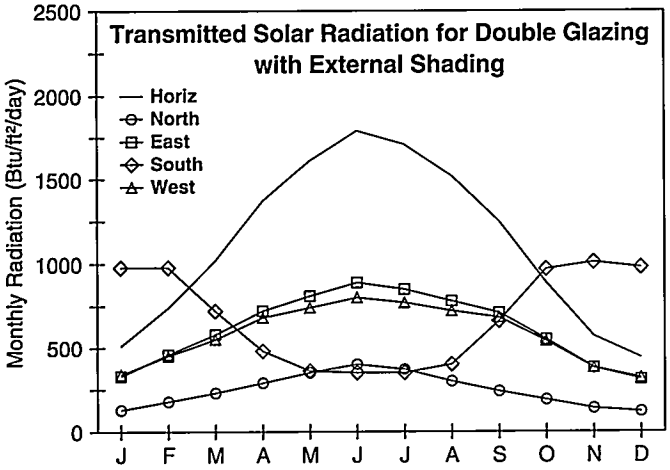
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	490	720	970	1270	1470	1660	1600	1410	1160	840	530	420	1050
North	Unshaded	150	200	250	300	370	420	390	320	250	200	150	130	260
	Shaded	130	180	220	270	340	380	360	290	230	180	130	120	240
East	Unshaded	360	500	630	800	910	1010	990	900	770	590	380	320	680
	Shaded	330	450	560	700	780	870	850	780	680	530	350	290	600
South	Unshaded	970	1030	880	710	550	480	510	650	880	1060	960	940	800
	Shaded	950	960	700	450	350	340	340	390	620	940	930	920	660
West	Unshaded	360	480	600	710	780	860	810	760	710	570	390	320	610
	Shaded	330	430	520	620	670	740	700	660	620	510	350	300	540

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	18.7	25.5	34.1	42.5	51.4	60.2	66.6	64.3	56.0	45.1	32.3	20.6	43.1
Daily Minimum Temp	3.7	10.4	19.8	26.4	33.8	40.4	47.2	45.4	37.0	26.7	17.5	6.1	26.2
Daily Maximum Temp	33.8	40.6	48.3	58.6	69.0	80.0	86.0	83.3	75.0	63.4	47.1	34.9	60.0
Record Minimum Temp	-51.0	-29.9	-16.1	-2.9	15.1	26.1	30.0	28.0	16.0	3.0	-20.0	-31.0	-51.0
Record Maximum Temp	55.9	62.1	71.1	79.0	87.1	93.9	96.1	96.1	91.0	82.0	69.1	60.1	96.1
HDD, Base 65°F	1435	1106	958	675	422	164	25	72	275	617	981	1376	8106
CDD, Base 65°F	0	0	0	0	0	20	75	51	5	0	0	0	151
Humidity Ratio (#w/#da)	0.0019	0.0024	0.0030	0.0035	0.0046	0.0059	0.0079	0.0077	0.0057	0.0040	0.0030	0.0021	0.0043
Wind Speed (mph)	4.2	4.7	5.9	7.0	6.8	6.1	5.6	5.3	5.5	4.8	4.6	4.0	5.4
Clearness Index, Kt	0.55	0.57	0.56	0.57	0.57	0.62	0.61	0.60	0.60	0.59	0.53	0.53	0.58

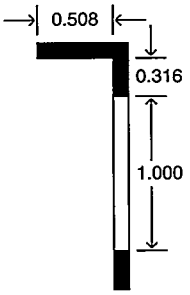
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	40/27	73/52	83/60	67/47	30/20	49/36	84/67	101/82	96/73	70/53	29/18	67/48	85/62	79/57	50/36	15/10	42/28	49/34	31/21	3/3
North	9/10	13/15	14/17	13/14	8/8	19/16	15/16	16/17	16/17	14/15	8/7	13/14	15/16	14/16	11/12	5/4	10/10	10/12	8/8	2/1
East	81/38	59/39	14/17	13/14	8/8	86/53	74/58	32/29	16/17	14/15	76/31	73/47	29/25	14/16	11/12	46/17	42/23	10/12	8/8	2/1
South	41/23	75/47	84/55	68/42	31/16	11/11	30/27	45/40	41/35	20/19	22/12	57/39	75/52	70/47	42/27	42/15	85/40	95/48	69/31	10/4
West	9/10	13/15	20/20	67/41	74/32	11/11	15/16	16/17	49/40	79/55	8/7	13/14	15/16	52/37	79/47	5/4	10/10	21/16	52/25	14/5
M. Clr (%hrs)	33	33	28	26	25	65	58	48	33	32	59	58	55	44	43	32	39	35	35	37



Grand Junction, CO

WBAN NO. 23066



Shading Geometry
(Not to Scale)

LATITUDE: 39.12° N
LONGITUDE: 108.53° W
ELEVATION: 4839 feet
MEAN PRESSURE: 12.4 psia

STATION TYPE: Primary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	780	1090	1450	1890	2200	2440	2330	2090	1750	1290	870	700	1580
	Std.Dev.	70	88	101	115	100	135	56	92	110	113	69	66	44
	Minimum	650	940	1190	1680	1990	2030	2240	1800	1440	980	680	480	1450
	Maximum	920	1280	1610	2070	2370	2750	2440	2230	1910	1450	1010	800	1640
	Diffuse	320	420	570	670	730	670	680	610	470	370	310	270	510
	Clear-Day Global	990	1350	1860	2370	2690	2810	2710	2420	1990	1480	1050	880	1890
North	Global	220	280	370	470	600	700	640	500	380	290	230	190	400
	Diffuse	220	280	370	450	510	530	510	450	370	290	230	190	370
	Clear-Day Global	180	240	310	420	600	740	670	470	340	260	190	170	380
East	Global	530	720	920	1150	1310	1430	1370	1250	1120	860	610	490	980
	Diffuse	260	350	460	560	610	620	610	550	460	360	280	230	450
	Clear-Day Global	760	970	1230	1470	1580	1610	1570	1460	1290	1040	800	690	1210
South	Global	1330	1440	1310	1170	950	860	900	1100	1390	1530	1390	1320	1220
	Diffuse	390	470	530	570	570	550	550	540	500	440	390	350	490
	Clear-Day Global	2070	2100	1900	1450	1070	900	950	1240	1680	2000	2050	2010	1610
West	Global	540	720	880	1090	1200	1310	1250	1170	1070	850	600	500	930
	Diffuse	270	360	460	570	620	630	630	570	470	370	280	240	460
	Clear-Day Global	760	970	1230	1470	1580	1610	1570	1460	1290	1040	800	690	1210

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	510	740	1020	1370	1610	1790	1710	1520	1250	890	570	440	1120
North	Unshaded	150	200	260	310	380	440	410	320	260	200	160	130	270
	Shaded	130	180	230	290	350	400	370	300	240	190	140	120	240
East	Unshaded	370	510	660	820	940	1030	980	900	800	610	420	340	700
	Shaded	330	460	580	720	810	890	850	780	710	550	380	310	620
South	Unshaded	1000	1050	910	750	570	490	520	670	920	1100	1040	1000	840
	Shaded	980	980	720	480	360	350	350	400	660	970	1010	980	690
West	Unshaded	380	510	620	780	850	930	890	830	770	600	420	340	660
	Shaded	340	450	550	680	740	800	770	720	680	540	380	320	580

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	25.0	34.5	43.4	52.2	62.0	72.4	78.8	76.4	67.0	54.7	40.4	28.7	53.0
Daily Minimum Temp	14.5	23.5	31.3	38.5	47.9	57.1	63.9	62.2	52.8	41.6	29.4	18.7	40.1
Daily Maximum Temp	35.5	45.4	55.6	65.8	76.0	87.7	93.6	90.5	81.1	67.7	51.4	38.7	65.8
Record Minimum Temp	-23.0	-18.0	5.0	11.0	26.0	34.0	46.0	43.0	29.0	18.0	-2.0	-17.0	-23.0
Record Maximum Temp	60.0	68.0	81.0	85.0	95.0	105.0	105.0	103.0	98.0	88.0	75.0	64.0	105.0
HDD, Base 65°F	1240	854	670	389	132	13	0	0	55	332	738	1125	5548
CDD, Base 65°F	0	0	0	0	39	235	428	353	115	13	0	0	1183
Humidity Ratio (#w/#da)	0.0022	0.0027	0.0031	0.0034	0.0045	0.0053	0.0076	0.0076	0.0059	0.0043	0.0033	0.0025	0.0044
Wind Speed (mph)	5.6	6.5	8.1	9.1	9.4	9.3	9.1	8.7	8.6	7.5	6.7	5.6	7.9
Clearness Index, Kt	0.55	0.58	0.58	0.61	0.63	0.66	0.65	0.64	0.64	0.61	0.56	0.54	0.62

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

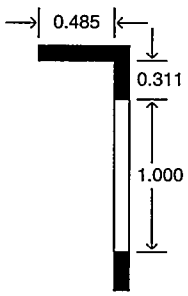
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	39/25	74/53	85/62	70/50	33/22	47/34	84/67	104/84	100/80	75/58	27/18	67/48	88/67	83/62	54/39	13/9	42/28	51/36	34/23	4/3
North	9/9	14/16	15/18	13/15	9/9	21/16	15/17	16/18	16/18	14/16	8/7	13/14	15/18	15/17	11/13	5/4	10/10	11/12	9/9	2/2
East	80/36	63/41	15/18	13/15	9/9	86/49	77/59	35/32	16/18	14/16	74/30	75/48	33/29	15/17	11/13	43/15	45/24	11/12	9/9	2/2
South	39/20	74/46	85/56	70/44	33/18	10/11	28/26	45/40	42/37	22/21	20/11	56/37	76/55	72/50	44/30	37/13	85/40	96/51	73/34	14/5
West	9/9	14/16	18/19	67/42	76/34	10/11	15/17	16/18	48/41	81/58	8/7	13/14	15/18	50/38	81/49	5/4	10/10	19/15	52/26	19/7
M. Clr (%hrs)	37	36	33	29	31	67	65	59	52	46	64	64	62	58	55	38	43	39	39	39

Pueblo, CO

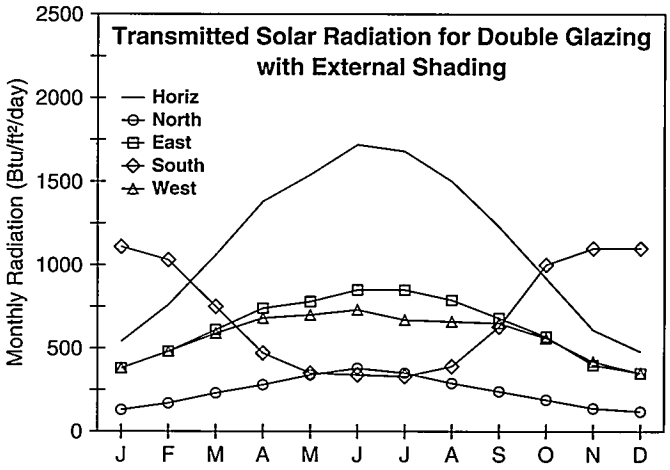
WBAN NO. 93058

LATITUDE: 38.28° N
LONGITUDE: 104.52° W
ELEVATION: 4721 feet
MEAN PRESSURE: 12.4 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	840	1120	1490	1900	2110	2340	2280	2060	1710	1330	920	760	1570
	Std.Dev.	52	62	97	83	103	110	95	82	87	93	50	43	31
	Minimum	720	1010	1240	1660	1930	2130	2110	1890	1540	1090	840	690	1510
	Maximum	920	1230	1640	2050	2330	2560	2460	2210	1870	1460	1030	830	1630
	Diffuse	270	360	500	590	690	640	620	580	460	350	290	250	470
	Clear-Day Global	1030	1390	1880	2380	2680	2790	2700	2430	2010	1520	1100	920	1900
North	Global	210	270	350	450	570	660	600	480	370	290	220	190	390
	Diffuse	210	270	350	430	490	510	490	440	360	290	220	190	360
	Clear-Day Global	190	240	310	420	610	730	670	470	340	260	200	170	380
East	Global	600	750	950	1180	1250	1370	1370	1260	1070	880	640	550	990
	Diffuse	260	340	440	530	580	590	580	540	450	360	280	240	430
	Clear-Day Global	790	990	1250	1470	1570	1590	1560	1470	1290	1050	820	720	1220
South	Global	1500	1500	1360	1140	900	810	860	1060	1320	1570	1500	1480	1250
	Diffuse	370	430	500	530	540	530	520	520	480	430	380	350	470
	Clear-Day Global	2100	2110	1870	1410	1030	860	920	1210	1650	2000	2080	2060	1610
West	Global	600	750	930	1080	1130	1200	1110	1080	1030	880	650	560	920
	Diffuse	260	340	450	540	600	610	590	550	460	360	280	240	440
	Clear-Day Global	790	990	1250	1470	1570	1590	1560	1470	1290	1050	820	720	1220

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

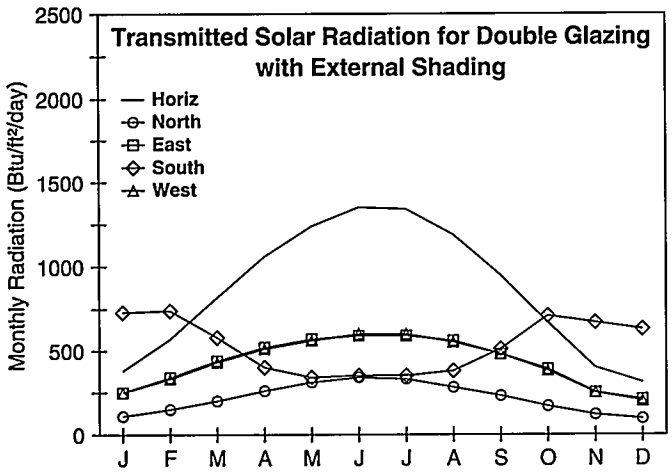
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	540	760	1060	1380	1540	1720	1680	1500	1230	920	610	480	1120
North	Unshaded	150	190	250	300	370	420	380	320	250	200	160	130	260
	Shaded	130	170	230	280	340	380	350	290	240	190	140	120	240
East	Unshaded	420	530	680	840	900	980	980	900	760	620	440	380	700
	Shaded	380	480	610	740	780	850	850	790	680	570	400	350	620
South	Unshaded	1130	1100	930	730	530	460	490	650	880	1120	1120	1120	850
	Shaded	1110	1030	750	470	350	340	330	390	630	1000	1100	1100	710
West	Unshaded	420	530	660	770	800	850	780	770	730	620	460	380	650
	Shaded	380	480	590	680	700	730	670	660	650	560	420	350	570

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	29.8	35.1	41.7	51.8	61.1	71.0	77.1	74.3	65.8	53.6	40.5	31.1	52.7
Daily Minimum Temp	14.2	19.5	26.1	35.7	45.6	54.2	61.2	59.0	50.2	36.6	24.3	15.5	36.8
Daily Maximum Temp	45.3	50.7	57.2	67.9	76.5	87.7	93.0	89.7	81.3	70.5	56.8	46.7	68.6
Record Minimum Temp	-29.0	-31.0	-20.0	2.0	25.0	37.0	44.0	40.0	27.0	13.0	-17.0	-25.0	-31.0
Record Maximum Temp	78.0	81.0	86.0	93.0	98.0	108.0	106.0	104.0	100.0	94.0	84.0	82.0	108.0
HDD, Base 65°F	1091	837	722	396	152	10	0	0	62	357	735	1051	5413
CDD, Base 65°F	0	0	0	0	31	190	375	291	86	0	0	0	973
Humidity Ratio (#w/#da)	0.0022	0.0025	0.0029	0.0039	0.0059	0.0079	0.0101	0.0100	0.0073	0.0044	0.0031	0.0023	0.0052
Wind Speed (mph)	8.2	8.8	10.3	11.4	10.9	10.1	9.5	8.7	8.8	8.2	8.2	8.1	9.3
Clearness Index, Kt	0.58	0.59	0.59	0.61	0.60	0.63	0.63	0.63	0.62	0.62	0.58	0.57	0.61

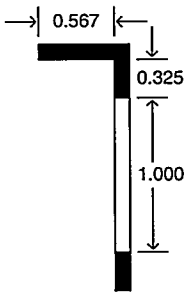
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	46/29	78/54	85/62	67/48	28/19	53/37	89/69	105/85	97/76	69/50	33/21	72/50	89/65	81/58	49/34	19/13	47/33	51/37	32/23	2/2
North	10/10	14/16	14/17	13/14	8/7	19/16	15/17	16/18	16/18	13/15	8/8	13/15	15/18	14/16	11/12	6/5	10/11	11/12	8/8	1/1
East	84/40	57/38	14/17	13/14	8/7	88/49	73/56	28/27	16/18	13/15	79/31	72/44	26/24	14/16	11/12	53/21	41/25	11/12	8/8	1/1
South	45/25	76/48	84/56	66/42	28/15	11/12	30/27	44/39	39/34	17/17	25/13	59/38	76/52	68/46	39/24	50/20	90/48	95/55	69/36	8/3
West	10/10	14/16	25/23	71/45	75/33	11/12	15/17	16/18	53/44	83/53	8/8	13/15	15/18	56/40	82/44	6/5	10/11	25/19	55/29	12/5
M. Clr (%hrs)	41	41	39	38	34	60	60	61	48	38	57	62	61	57	51	48	47	47	47	49



Bridgeport, CT

WBAN NO. 94702



Shading Geometry
(Not to Scale)

LATITUDE: 41.17° N
LONGITUDE: 73.13° W
ELEVATION: 7 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±11%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	590	840	1160	1480	1720	1860	1850	1640	1330	970	620	490	1210
	Std.Dev.	35	65	75	102	121	124	104	90	83	62	48	38	21
	Minimum	540	690	1010	1290	1500	1560	1590	1390	1200	870	530	390	1170
	Maximum	680	1000	1310	1700	1940	2080	2000	1820	1490	1100	720	540	1260
	Diffuse	290	410	540	700	820	880	850	750	590	430	310	260	570
	Clear-Day Global	830	1170	1650	2140	2460	2580	2490	2200	1770	1270	870	710	1680
North	Global	190	250	330	430	530	590	560	470	370	280	190	160	360
	Diffuse	190	250	330	420	490	530	510	450	370	280	190	160	350
	Clear-Day Global	180	240	320	430	570	670	620	470	360	260	190	160	370
East	Global	410	560	720	870	960	1010	1000	940	800	630	410	340	720
	Diffuse	230	310	410	510	590	620	610	560	460	340	240	200	420
	Clear-Day Global	630	830	1080	1290	1410	1430	1390	1290	1110	870	640	560	1050
South	Global	990	1090	1060	950	830	790	830	940	1060	1120	930	850	950
	Diffuse	340	410	480	530	560	580	580	560	510	430	330	290	470
	Clear-Day Global	1800	1890	1780	1440	1130	980	1030	1270	1590	1780	1740	1700	1510
West	Global	410	550	710	850	950	1020	1020	930	790	610	400	330	720
	Diffuse	230	310	410	510	590	630	620	560	460	340	240	190	430
	Clear-Day Global	630	830	1080	1290	1410	1430	1390	1290	1110	870	640	560	1050

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±11%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	380	570	820	1060	1240	1350	1340	1190	950	670	400	310	860
North	Unshaded	130	180	230	290	350	390	370	320	250	190	140	110	250
	Shaded	110	150	200	260	310	340	330	280	230	170	120	96	220
East	Unshaded	280	390	510	620	680	710	700	660	560	440	290	230	510
	Shaded	250	340	440	520	570	590	590	560	480	390	250	210	430
South	Unshaded	750	800	740	630	530	490	510	600	720	810	690	650	660
	Shaded	730	740	580	400	340	350	350	380	510	710	670	630	530
West	Unshaded	280	380	500	600	670	720	720	660	560	430	280	230	500
	Shaded	250	330	430	510	560	600	600	550	480	380	250	200	430

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	28.9	30.4	38.6	48.2	58.4	67.6	73.7	73.1	65.9	55.6	45.6	34.3	51.7
Daily Minimum Temp	21.9	23.2	30.9	39.8	50.0	59.1	65.7	65.1	57.6	47.1	38.2	27.6	43.9
Daily Maximum Temp	36.0	37.6	46.2	56.6	66.7	76.0	81.7	80.9	74.2	64.1	53.0	41.0	59.5
Record Minimum Temp	-7.0	-5.0	4.0	18.0	31.0	41.0	49.0	44.0	36.0	26.0	16.0	-4.0	-7.0
Record Maximum Temp	65.0	67.0	84.0	91.0	92.0	96.0	103.0	98.0	99.0	85.0	78.0	65.0	103.0
HDD, Base 65°F	1119	969	818	504	219	18	0	0	54	302	582	952	5537
CDD, Base 65°F	0	0	0	0	15	96	270	251	81	11	0	0	724
Humidity Ratio (#w/#da)	0.0024	0.0024	0.0032	0.0045	0.0072	0.0103	0.0127	0.0127	0.0102	0.0069	0.0047	0.0030	0.0067
Wind Speed (mph)	13.3	13.6	13.7	13.3	11.7	10.8	10.3	10.5	11.6	11.9	12.9	13.0	12.2
Clearness Index, Kt	0.45	0.48	0.48	0.48	0.49	0.50	0.51	0.51	0.50	0.48	0.43	0.42	0.49

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±11%

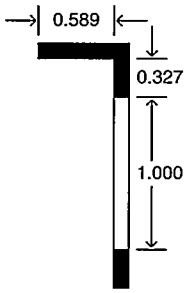
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	40/22	70/41	77/45	58/35	21/13	50/29	84/51	99/67	91/62	63/41	29/17	65/39	80/53	72/46	41/25	14/9	37/21	41/23	22/13	0/0
North	10/9	14/15	15/16	12/13	7/6	16/13	17/17	17/19	17/19	15/15	9/7	14/14	16/17	15/16	11/10	5/4	9/9	10/9	7/6	0/0
East	70/24	51/26	15/16	12/13	7/6	75/30	68/36	26/24	17/19	15/15	62/20	64/31	23/20	15/16	11/10	36/10	33/15	10/9	7/6	0/0
South	42/17	74/34	81/39	61/29	22/9	13/12	36/24	49/35	43/31	20/17	23/11	59/29	75/42	66/36	34/17	36/10	76/25	82/27	51/16	0/0
West	10/9	14/15	27/20	66/30	56/18	13/12	17/17	17/19	55/37	77/40	9/7	14/14	16/17	55/31	68/29	5/4	9/9	23/13	42/14	0/0
M. Clr (%hrs)	37	35	33	32	35	38	37	33	32	34	43	45	39	41	41	34	34	33	34	36

Hartford, CT

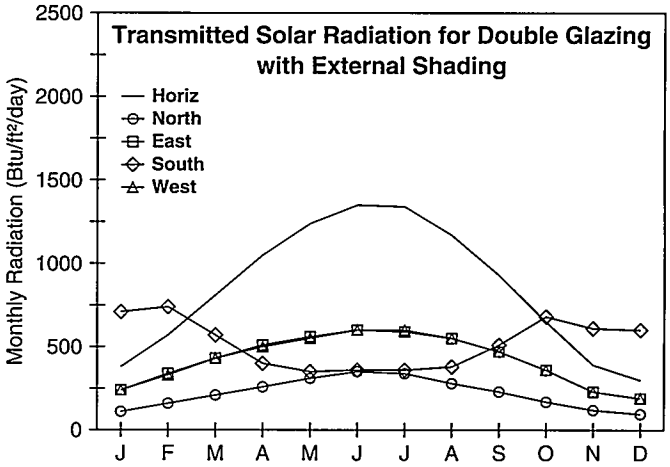
WBAN NO. 14740

LATITUDE: 41.93° N
LONGITUDE: 72.68° W
ELEVATION: 180 feet
MEAN PRESSURE: 14.6 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±11%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	590	850	1160	1470	1720	1870	1860	1630	1300	940	580	480	1210
	Std.Dev.	44	74	74	109	128	146	110	81	93	66	48	35	30
	Minimum	530	690	980	1260	1460	1500	1620	1480	1150	820	490	400	1140
	Maximum	690	1010	1290	1710	1980	2160	2060	1760	1500	1130	670	540	1270
	Diffuse	320	430	580	720	860	920	900	790	620	440	320	270	600
	Clear-Day Global	800	1150	1640	2140	2470	2590	2510	2210	1760	1250	840	690	1670
North	Global	190	260	350	440	540	610	580	480	380	280	190	160	370
	Diffuse	190	260	350	430	500	540	530	470	380	280	190	160	360
	Clear-Day Global	180	240	330	430	580	670	620	480	360	260	190	160	380
East	Global	400	550	710	860	960	1030	1020	940	780	590	380	330	710
	Diffuse	240	330	430	520	600	640	640	570	460	340	240	200	430
	Clear-Day Global	620	820	1090	1300	1420	1450	1410	1310	1120	860	630	540	1050
South	Global	980	1090	1060	960	850	810	850	940	1050	1080	850	820	940
	Diffuse	360	440	500	550	590	600	600	580	520	440	340	300	480
	Clear-Day Global	1780	1890	1800	1470	1160	1020	1060	1300	1620	1790	1730	1680	1520
West	Global	400	550	710	850	950	1020	1020	930	780	600	380	320	710
	Diffuse	240	330	430	520	610	650	650	580	470	340	240	200	440
	Clear-Day Global	620	820	1090	1300	1420	1450	1410	1310	1120	860	630	540	1050

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±11%

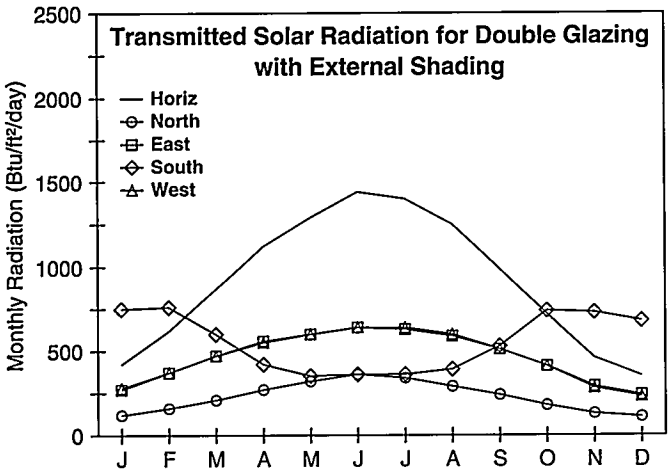
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	380	570	810	1050	1240	1350	1340	1170	930	650	390	300	850
North	Unshaded	130	180	240	300	360	400	390	330	260	190	140	110	250
	Shaded	110	160	210	260	310	350	340	280	230	170	120	96	220
East	Unshaded	280	390	500	610	680	730	720	660	550	420	260	220	500
	Shaded	240	340	430	510	560	600	590	550	470	360	230	190	420
South	Unshaded	730	810	740	630	540	510	530	610	720	780	640	620	650
	Shaded	710	740	570	400	350	360	360	380	510	680	610	600	520
West	Unshaded	270	380	500	600	670	720	720	660	550	420	260	220	500
	Shaded	240	330	430	500	550	600	600	550	470	360	230	190	420

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	24.6	27.5	37.5	48.7	59.6	68.5	73.7	71.6	63.3	52.2	41.9	29.5	49.9
Daily Minimum Temp	15.8	18.6	28.1	37.5	47.6	56.9	62.2	60.4	51.8	40.7	32.8	21.3	39.5
Daily Maximum Temp	33.2	36.4	46.8	59.9	71.6	80.0	85.0	82.7	74.8	63.7	51.0	37.5	60.2
Record Minimum Temp	-26.0	-21.0	-6.0	9.0	28.0	37.0	44.0	36.0	30.0	17.0	1.0	-14.0	-26.0
Record Maximum Temp	65.0	73.0	87.0	96.0	97.0	100.0	102.0	101.0	99.0	91.0	81.0	74.0	102.0
HDD, Base 65°F	1252	1050	853	489	194	20	0	6	96	397	693	1101	6151
CDD, Base 65°F	0	0	0	0	27	125	270	210	45	0	0	0	677
Humidity Ratio (#w/#da)	0.0019	0.0021	0.0029	0.0041	0.0068	0.0098	0.0118	0.0114	0.0090	0.0059	0.0040	0.0025	0.0060
Wind Speed (mph)	8.4	9.0	9.6	9.8	8.6	7.9	7.3	6.9	7.0	7.4	8.3	8.3	8.2
Clearness Index, Kt	0.47	0.49	0.48	0.48	0.49	0.51	0.52	0.51	0.49	0.47	0.42	0.42	0.49

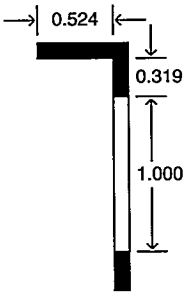
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±11%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	40/24	70/43	77/47	58/36	20/13	51/32	84/55	99/70	90/65	62/42	30/18	65/39	80/53	71/48	39/25	14/9	37/22	40/24	21/13	0/0
North	10/10	14/15	15/16	13/13	7/6	15/13	17/18	17/19	17/19	15/15	9/8	14/14	16/17	15/16	11/10	5/4	9/9	10/10	7/6	0/0
East	70/25	51/28	15/16	13/13	7/6	77/34	68/40	26/24	17/19	15/15	63/21	64/31	23/20	15/16	11/10	34/10	32/15	10/10	7/6	0/0
South	42/18	75/36	83/41	62/30	21/9	13/12	37/27	51/37	44/33	20/17	24/11	60/29	76/44	66/38	33/17	34/10	76/27	81/29	49/16	0/0
West	10/10	14/15	28/21	67/32	53/18	13/12	17/18	17/19	55/39	76/41	9/8	14/14	16/17	55/33	67/29	5/4	9/9	24/13	41/14	0/0
M. Clr (%hrs)	34	31	27	29	32	33	32	24	25	26	40	41	34	33	37	31	29	28	30	31



Wilmington, DE

WBAN NO. 13781



Shading Geometry
(Not to Scale)

LATITUDE: 39.67° N
LONGITUDE: 75.60° W
ELEVATION: 79 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±11%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	640	900	1230	1550	1790	1980	1920	1730	1390	1040	690	550	1290
	Std.Dev.	44	76	92	119	134	115	114	76	95	77	54	40	34
	Minimum	550	750	1070	1320	1600	1750	1670	1590	1240	900	550	470	1220
	Maximum	720	1090	1400	1810	2090	2180	2140	1910	1570	1200	820	620	1340
	Diffuse	320	420	550	710	840	880	870	770	630	450	340	280	590
	Clear-Day Global	910	1260	1740	2210	2500	2600	2510	2240	1820	1340	950	800	1740
North	Global	200	270	350	440	550	610	580	480	380	290	210	180	380
	Diffuse	200	270	350	430	500	540	520	470	380	290	210	180	360
	Clear-Day Global	180	240	320	430	580	680	620	480	370	280	200	160	380
East	Global	440	590	760	920	990	1060	1050	970	820	660	460	380	760
	Diffuse	240	330	420	530	600	640	630	570	480	360	260	220	440
	Clear-Day Global	700	900	1140	1340	1430	1440	1400	1300	1140	900	700	620	1080
South	Global	1020	1130	1100	960	830	790	820	950	1070	1170	1010	930	980
	Diffuse	350	420	490	540	570	590	590	580	530	450	360	320	480
	Clear-Day Global	1920	1970	1790	1420	1080	930	980	1230	1570	1800	1830	1830	1530
West	Global	440	590	760	900	990	1070	1060	980	830	660	460	380	760
	Diffuse	250	330	430	530	610	650	640	580	480	360	260	220	450
	Clear-Day Global	700	900	1140	1340	1430	1440	1400	1300	1140	900	700	620	1080

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±11%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	420	620	870	1120	1290	1440	1400	1250	990	720	460	350	910
North	Unshaded	140	180	240	300	360	400	380	330	270	200	150	120	260
	Shaded	120	160	210	270	320	360	340	290	240	180	130	110	230
East	Unshaded	300	410	540	650	700	750	740	690	580	460	320	260	540
	Shaded	270	370	470	560	600	640	630	590	510	410	290	240	460
South	Unshaded	770	830	760	630	520	480	500	610	720	840	760	700	680
	Shaded	750	760	600	420	350	360	360	390	530	740	730	680	560
West	Unshaded	310	410	540	640	700	760	750	700	580	470	320	260	540
	Shaded	280	370	470	550	600	640	640	600	510	410	280	230	460

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	30.6	33.4	42.7	52.2	62.5	71.5	76.4	75.0	68.0	56.2	46.3	35.8	54.2
Daily Minimum Temp	22.4	24.8	33.1	41.8	52.2	61.6	67.1	65.9	58.2	45.7	37.0	27.6	44.8
Daily Maximum Temp	38.7	41.9	52.1	62.6	72.9	81.4	85.6	84.1	77.7	66.6	55.5	43.9	63.6
Record Minimum Temp	-14.0	-6.0	2.0	18.0	30.0	41.0	48.0	43.0	36.0	24.0	14.0	-7.0	-14.0
Record Maximum Temp	75.0	78.0	86.0	94.0	95.0	99.0	102.0	101.0	100.0	91.0	85.0	74.0	102.0
HDD, Base 65°F	1066	885	691	384	122	0	0	0	35	288	561	905	4937
CDD, Base 65°F	0	0	0	0	44	199	353	310	125	15	0	0	1046
Humidity Ratio (#w/#da)	0.0026	0.0027	0.0037	0.0051	0.0080	0.0113	0.0133	0.0131	0.0105	0.0070	0.0048	0.0032	0.0071
Wind Speed (mph)	10.1	10.4	11.3	10.9	9.3	8.5	7.9	7.6	8.0	8.3	9.5	9.6	9.3
Clearness Index, Kt	0.46	0.49	0.50	0.50	0.51	0.53	0.53	0.53	0.51	0.50	0.45	0.44	0.51

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±11%

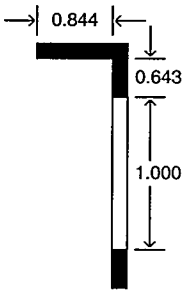
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	40/23	72/44	80/49	64/40	26/16	47/29	83/55	101/73	94/68	67/46	27/16	66/40	83/55	76/51	46/29	14/9	40/23	45/26	28/17	2/2
North	10/9	14/15	15/16	13/14	8/7	18/13	17/18	17/20	17/19	15/16	9/7	14/15	16/18	16/17	12/11	5/4	10/9	10/10	8/7	1/1
East	74/26	56/30	15/16	13/14	8/7	75/33	72/43	31/28	17/19	15/16	60/20	68/32	28/23	16/17	12/11	40/11	38/17	10/10	8/7	1/1
South	40/17	73/36	82/41	65/33	26/12	12/11	32/25	47/36	42/33	21/18	20/10	56/28	74/43	67/39	37/19	37/10	78/28	86/31	60/20	6/2
West	10/9	14/15	23/19	66/34	63/23	12/11	17/18	17/20	52/38	77/44	9/7	14/15	16/18	52/33	71/31	5/4	10/9	21/13	46/17	8/2
M. Clr (%hrs)	35	34	31	30	35	39	39	34	37	37	42	44	41	38	41	34	34	31	31	34

Daytona Beach, FL

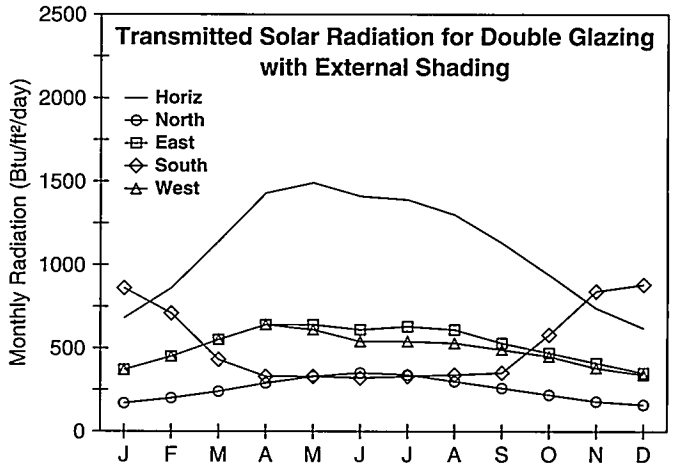
WBAN NO. 12834

LATITUDE: 29.18° N
LONGITUDE: 81.05° W
ELEVATION: 39 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Primary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	990	1220	1580	1950	2040	1940	1910	1800	1560	1320	1070	910	1530
	Std.Dev.	82	80	104	94	124	121	107	122	96	78	68	69	44
	Minimum	860	1010	1320	1770	1690	1720	1750	1510	1350	1120	930	750	1440
	Maximum	1160	1390	1730	2160	2220	2220	2070	2010	1760	1500	1170	1020	1630
	Diffuse	420	500	610	690	820	910	910	850	750	580	440	390	660
	Clear-Day Global	1330	1640	2010	2340	2510	2540	2490	2330	2050	1680	1350	1210	1960
North	Global	270	330	390	470	570	630	600	510	430	360	290	260	430
	Diffuse	270	330	390	450	510	540	530	480	430	360	290	260	400
	Clear-Day Global	240	290	360	440	590	700	640	490	400	330	260	230	420
East	Global	610	740	900	1070	1090	1050	1060	1020	890	790	670	570	870
	Diffuse	330	400	490	570	620	640	650	620	550	450	360	310	500
	Clear-Day Global	870	1030	1190	1310	1340	1330	1300	1250	1160	1020	870	800	1120
South	Global	1240	1220	1130	910	670	580	610	750	940	1150	1260	1220	970
	Diffuse	440	480	530	540	530	530	530	550	570	530	470	430	510
	Clear-Day Global	1990	1870	1530	1040	710	590	630	890	1300	1680	1880	1940	1340
West	Global	610	740	910	1070	1050	940	930	900	840	750	640	560	830
	Diffuse	340	400	490	570	620	630	620	590	540	450	360	310	490
	Clear-Day Global	870	1030	1190	1310	1340	1330	1300	1250	1160	1020	870	800	1120

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

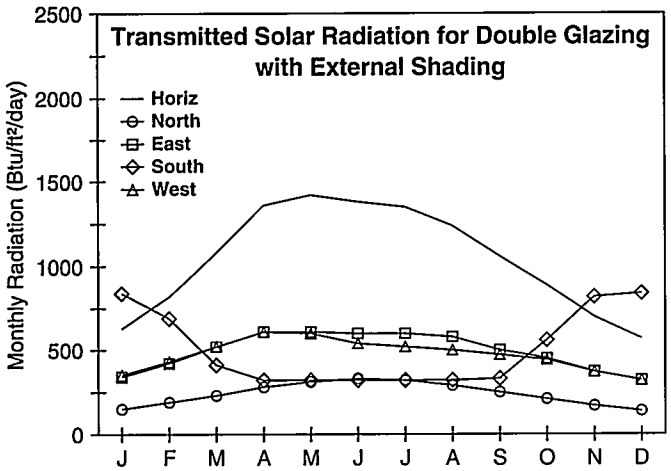
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	680	860	1140	1430	1490	1410	1390	1300	1130	940	740	620	1100
North	Unshaded	190	230	270	320	370	400	390	340	300	250	200	180	290
	Shaded	170	200	240	290	330	350	340	300	260	220	180	160	250
East	Unshaded	430	520	640	770	770	740	760	730	630	550	470	400	620
	Shaded	370	450	550	640	640	610	630	610	530	470	410	350	520
South	Unshaded	910	870	740	540	400	370	380	450	600	800	920	910	660
	Shaded	860	710	430	330	330	320	330	340	350	580	840	880	520
West	Unshaded	430	520	650	760	740	660	650	640	590	530	450	390	580
	Shaded	370	450	550	640	610	540	540	530	490	450	380	340	490

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	57.5	59.0	64.3	69.3	74.7	79.4	81.2	81.0	79.4	73.4	65.9	60.1	70.4
Daily Minimum Temp	46.9	48.4	53.9	58.6	64.9	70.8	72.5	72.9	71.9	65.2	56.3	49.7	61.0
Daily Maximum Temp	68.0	69.5	74.8	80.0	84.5	88.0	89.8	89.1	86.8	81.5	75.5	70.4	79.8
Record Minimum Temp	15.0	24.0	26.0	35.0	44.0	52.0	60.0	65.0	52.0	41.0	27.0	19.0	15.0
Record Maximum Temp	87.0	89.0	91.0	96.0	100.0	102.0	102.0	100.0	99.0	95.0	89.0	88.0	102.0
HDD, Base 65°F	282	205	112	21	0	0	0	0	0	0	82	207	909
CDD, Base 65°F	50	37	90	150	301	432	502	496	432	265	109	55	2919
Humidity Ratio (#w/#da)	0.0078	0.0078	0.0092	0.0104	0.0129	0.0158	0.0168	0.0172	0.0164	0.0130	0.0104	0.0086	0.0122
Wind Speed (mph)	8.6	9.1	9.3	9.2	8.6	7.6	7.2	6.7	7.9	8.9	8.2	8.0	8.3
Clearness Index, Kt	0.51	0.52	0.55	0.59	0.57	0.53	0.53	0.53	0.52	0.52	0.52	0.50	0.54

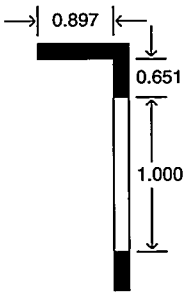
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	37/25	78/54	93/65	79/57	39/27	34/25	77/59	102/80	101/75	74/49	21/16	65/49	91/70	89/67	59/40	20/13	53/35	65/43	48/32	13/9
North	10/10	15/17	16/19	15/17	10/10	23/16	19/19	18/20	18/20	20/18	8/7	16/16	18/20	18/19	15/14	7/6	12/13	13/15	11/12	5/4
East	73/33	66/41	18/19	15/17	10/10	61/34	74/52	41/35	18/20	17/16	46/24	72/47	40/33	18/19	15/14	50/18	50/27	13/15	11/12	5/4
South	29/17	59/38	71/47	60/41	31/19	11/10	17/18	28/26	28/25	17/16	12/9	41/31	60/46	59/44	37/24	39/15	78/37	88/46	72/36	27/11
West	10/10	15/17	16/19	63/43	74/36	11/10	17/18	18/20	46/37	76/43	8/7	16/16	18/20	48/37	74/40	7/6	12/13	17/16	53/29	38/14
M. Clr (%hrs)	41	42	40	39	41	42	32	29	30	27	41	31	27	27	30	39	40	36	37	39



Jacksonville, FL

WBAN NO. 13889



Shading Geometry
(Not to Scale)

LATITUDE: 30.50° N
LONGITUDE: 81.70° W
ELEVATION: 30 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	920	1160	1500	1860	1940	1900	1850	1710	1470	1250	1010	850	1450
	Std.Dev.	68	90	99	115	131	123	99	97	129	97	83	73	37
	Minimum	820	1020	1280	1630	1570	1670	1550	1480	1140	1060	790	690	1380
	Maximum	1100	1350	1640	2180	2250	2170	2030	1870	1710	1420	1190	1000	1530
	Diffuse	380	460	580	670	790	870	870	810	710	550	410	360	620
	Clear-Day Global	1280	1600	1990	2340	2510	2550	2490	2320	2020	1650	1310	1160	1930
North	Global	250	310	380	450	560	610	580	490	410	340	270	240	410
	Diffuse	250	310	380	440	490	520	510	470	410	340	270	240	390
	Clear-Day Global	240	290	360	440	590	690	630	490	390	320	260	230	410
East	Global	570	700	870	1040	1050	1030	1030	980	860	760	620	530	840
	Diffuse	310	370	460	550	600	620	620	590	520	430	340	290	470
	Clear-Day Global	850	1020	1190	1320	1350	1340	1300	1250	1150	1010	850	780	1120
South	Global	1200	1190	1110	910	670	580	610	740	920	1130	1230	1170	950
	Diffuse	410	450	510	530	520	520	520	540	540	510	440	390	490
	Clear-Day Global	1990	1890	1570	1090	750	620	680	930	1340	1710	1890	1940	1360
West	Global	580	710	870	1030	1030	950	910	870	810	740	630	540	810
	Diffuse	310	370	470	550	600	610	600	570	510	430	340	290	470
	Clear-Day Global	850	1020	1190	1320	1350	1340	1300	1250	1150	1010	850	780	1120

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	630	820	1080	1360	1420	1380	1350	1240	1060	890	700	570	1040
North	Unshaded	180	210	260	310	360	390	370	330	280	240	190	170	270
	Shaded	150	190	230	280	310	330	320	290	250	210	170	140	240
East	Unshaded	400	490	610	740	750	730	730	700	610	540	430	370	590
	Shaded	340	420	520	610	610	600	600	580	500	450	370	320	490
South	Unshaded	890	850	730	550	400	370	380	450	590	780	900	870	650
	Shaded	840	690	410	320	320	320	320	320	330	560	820	840	510
West	Unshaded	410	500	620	740	730	670	640	610	570	520	440	370	570
	Shaded	350	430	520	610	600	540	520	500	470	440	370	320	470

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	52.4	55.2	61.1	67.0	73.4	79.1	81.6	81.2	78.1	69.8	61.9	55.1	68.0
Daily Minimum Temp	40.5	43.3	49.2	54.9	62.1	69.1	71.9	71.8	69.0	59.3	50.2	43.4	57.1
Daily Maximum Temp	64.2	67.0	73.0	79.1	84.7	89.3	91.4	90.7	87.2	80.2	73.6	66.8	78.9
Record Minimum Temp	7.0	19.0	23.0	34.0	45.0	47.0	61.0	63.0	48.0	36.0	21.0	11.0	7.0
Record Maximum Temp	85.0	88.0	91.0	95.0	100.0	103.0	105.0	102.0	100.0	96.0	88.0	84.0	105.0
HDD, Base 65°F	421	296	169	37	0	0	0	0	0	31	149	331	1434
CDD, Base 65°F	31	22	48	97	260	423	515	502	393	179	56	25	2551
Humidity Ratio (#w/#da)	0.0066	0.0069	0.0084	0.0098	0.0126	0.0157	0.0170	0.0173	0.0160	0.0121	0.0093	0.0074	0.0116
Wind Speed (mph)	8.0	8.7	8.8	8.2	7.5	7.2	6.7	6.3	7.0	7.6	7.3	7.4	7.6
Clearness Index, Kt	0.49	0.51	0.53	0.57	0.55	0.52	0.51	0.51	0.49	0.51	0.50	0.48	0.52

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

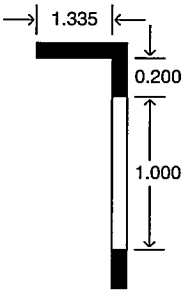
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	36/21	77/49	92/60	79/52	40/26	34/24	77/55	100/76	99/74	74/48	20/14	65/45	90/64	86/61	58/38	18/10	52/31	63/38	48/29	13/8
North	9/9	15/16	16/18	15/16	10/10	23/15	18/18	18/19	18/19	18/17	8/6	16/15	18/19	18/18	15/14	6/5	11/12	13/14	11/11	5/4
East	75/27	67/38	19/19	15/16	10/10	62/32	76/50	42/34	18/19	17/16	47/20	73/43	40/31	18/18	15/14	48/14	51/24	13/14	11/11	5/4
South	30/14	61/35	73/44	62/38	33/18	11/10	17/17	30/27	29/26	17/16	12/7	43/29	62/44	59/41	38/24	37/12	80/33	91/41	75/32	29/10
West	9/9	15/16	16/18	62/38	76/35	11/10	17/17	18/19	44/35	75/43	8/6	16/15	18/19	46/33	72/38	6/5	11/12	16/15	53/25	39/12
M. Clr (%hrs)	41	42	39	39	38	43	35	29	25	30	42	29	24	24	29	37	37	36	37	40

Key West, FL

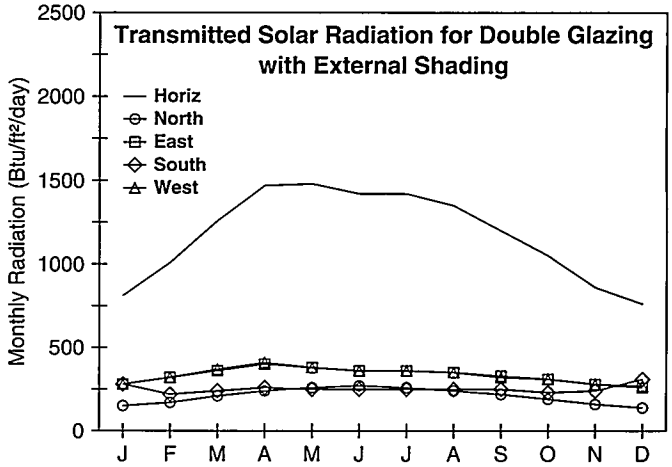
WBAN NO. 12836

LATITUDE: 24.55° N
LONGITUDE: 81.75° W
ELEVATION: 3 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	1160	1410	1730	2000	2010	1940	1940	1850	1650	1450	1220	1090	1620
	Std.Dev.	85	86	105	91	99	115	71	73	71	94	77	64	33
	Minimum	950	1170	1460	1810	1740	1640	1760	1660	1460	1280	1040	960	1560
	Maximum	1290	1540	1910	2180	2160	2130	2040	1950	1760	1620	1340	1210	1680
	Diffuse	390	440	530	610	750	830	840	800	720	560	440	380	610
	Clear-Day Global	1490	1770	2100	2360	2470	2480	2440	2330	2120	1810	1510	1390	2020
North	Global	280	320	380	450	570	650	610	490	420	360	300	270	430
	Diffuse	280	320	380	430	480	520	510	470	420	360	300	270	400
	Clear-Day Global	270	310	360	440	610	750	670	490	400	350	290	260	430
East	Global	710	820	960	1070	1040	980	990	960	890	830	720	660	890
	Diffuse	350	410	480	550	590	600	610	590	540	460	380	340	490
	Clear-Day Global	940	1070	1210	1290	1290	1270	1250	1230	1170	1060	930	880	1130
South	Global	1380	1320	1120	790	550	480	510	650	890	1170	1330	1380	960
	Diffuse	460	480	500	490	480	480	480	510	540	530	490	460	490
	Clear-Day Global	1960	1780	1380	870	560	470	500	730	1160	1590	1840	1950	1230
West	Global	700	830	990	1090	1040	980	980	950	870	820	720	670	890
	Diffuse	350	400	480	550	590	600	610	590	540	460	390	340	490
	Clear-Day Global	940	1070	1210	1290	1290	1270	1250	1230	1170	1060	930	880	1130

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

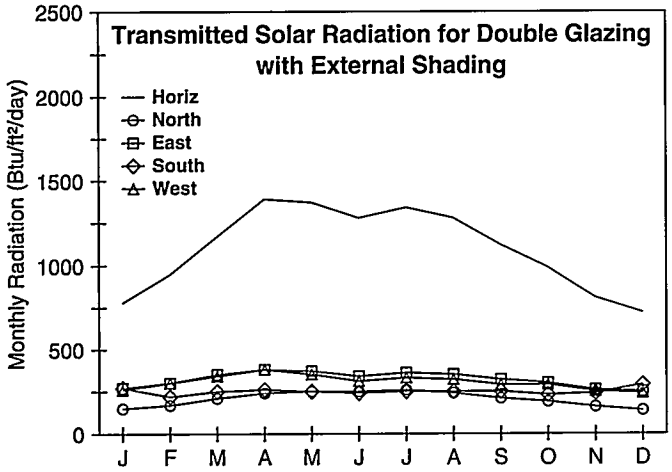
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	810	1010	1260	1470	1480	1420	1420	1350	1200	1050	860	760	1170
North	Unshaded	200	230	260	300	360	400	380	330	290	250	210	190	280
	Shaded	150	170	210	240	260	270	260	240	220	190	160	140	210
East	Unshaded	500	580	680	760	730	690	700	680	630	580	500	460	620
	Shaded	280	320	360	400	380	360	360	350	330	310	280	260	330
South	Unshaded	1000	920	700	450	340	330	340	390	550	790	960	1020	650
	Shaded	280	220	240	260	250	250	250	250	250	230	240	310	250
West	Unshaded	490	590	700	780	740	690	690	670	620	580	500	460	630
	Shaded	280	320	370	410	380	360	360	350	320	310	280	270	330

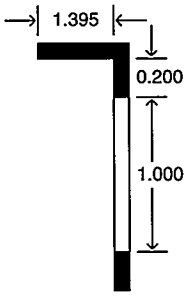
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	69.9	70.5	73.8	77.0	80.6	83.1	84.4	84.3	83.3	80.0	75.6	71.5	77.8
Daily Minimum Temp	65.0	65.6	69.0	72.2	76.1	78.5	79.6	79.3	78.5	75.5	71.2	66.8	73.1
Daily Maximum Temp	74.8	75.4	78.6	81.7	85.1	87.6	89.1	89.2	88.0	84.4	80.0	76.1	82.5
Record Minimum Temp	41.0	46.0	47.0	48.0	65.0	68.0	69.0	68.0	69.0	60.0	49.0	44.0	41.0
Record Maximum Temp	86.0	85.0	87.0	90.0	91.0	94.0	95.0	95.0	94.0	93.0	89.0	86.0	95.0
HDD, Base 65°F	44	30	7	0	0	0	0	0	0	0	0	19	100
CDD, Base 65°F	196	184	279	360	484	543	601	598	549	465	318	221	4798
Humidity Ratio (#w/#da)	0.0120	0.0119	0.0131	0.0139	0.0159	0.0179	0.0182	0.0185	0.0183	0.0163	0.0144	0.0127	0.0153
Wind Speed (mph)	11.6	12.0	12.4	11.8	10.8	10.0	9.6	9.2	9.7	11.6	12.2	11.9	11.1
Clearness Index, Kt	0.53	0.55	0.58	0.60	0.57	0.54	0.55	0.55	0.53	0.54	0.53	0.53	0.55

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	37/27	79/60	96/72	82/64	42/31	30/23	74/57	100/81	99/79	72/57	19/16	66/53	93/76	91/74	60/48	23/16	58/42	71/51	55/40	18/13
North	10/10	15/17	16/18	16/17	11/11	23/16	24/22	17/19	18/19	25/22	8/7	16/16	18/19	18/19	16/16	7/7	13/14	14/15	12/13	6/6
East	71/40	67/48	19/20	16/17	11/11	54/32	73/53	41/36	18/19	17/17	41/26	72/54	41/36	18/19	16/16	51/25	52/34	14/15	12/13	6/6
South	26/18	53/40	64/49	55/43	30/21	10/9	17/17	19/20	19/20	17/17	10/8	37/30	55/45	53/44	34/27	39/20	75/46	86/55	72/44	33/16
West	10/10	15/17	16/18	63/48	75/44	10/9	17/17	17/19	44/37	73/54	8/7	16/16	18/19	47/40	72/52	7/7	13/14	17/17	55/35	46/21
M. Clr (%hrs)	53	53	54	54	56	33	34	31	32	35	27	27	25	22	23	44	46	46	46	48





Shading Geometry
(Not to Scale)

Miami, FL

WBAN NO. 12839

LATITUDE: 25.80° N
LONGITUDE: 80.27° W
ELEVATION: 7 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Primary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	1120	1340	1630	1900	1890	1770	1850	1770	1550	1380	1160	1040	1530
	Std.Dev.	70	94	106	129	130	111	138	89	107	88	76	76	48
	Minimum	990	1150	1410	1610	1610	1560	1500	1550	1300	1230	1010	900	1430
	Maximum	1270	1480	1820	2110	2180	1980	2100	1900	1780	1580	1280	1160	1620
	Diffuse	460	540	680	780	890	950	960	920	810	660	520	440	720
	Clear-Day Global	1460	1750	2100	2380	2490	2510	2460	2340	2100	1780	1480	1350	2020
North	Global	300	350	420	480	580	630	610	520	440	390	320	290	440
	Diffuse	300	350	410	470	510	540	540	500	440	390	320	290	420
	Clear-Day Global	260	310	370	450	610	730	670	500	400	340	280	250	430
East	Global	690	800	940	1030	1020	960	990	960	880	810	710	650	870
	Diffuse	370	430	520	600	630	630	650	630	570	490	400	360	520
	Clear-Day Global	930	1070	1210	1310	1310	1290	1260	1240	1170	1050	920	860	1130
South	Global	1320	1250	1080	810	590	520	550	680	860	1100	1240	1310	940
	Diffuse	490	520	560	550	520	510	520	550	570	570	520	480	530
	Clear-Day Global	1990	1820	1440	930	600	500	540	770	1200	1620	1870	1960	1270
West	Global	670	780	920	1030	970	860	910	900	800	770	670	630	820
	Diffuse	380	430	530	590	620	610	630	610	550	490	400	360	520
	Clear-Day Global	930	1070	1210	1310	1310	1290	1260	1240	1170	1050	920	860	1130

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	780	950	1170	1390	1370	1280	1340	1280	1120	990	810	720	1100
North	Unshaded	210	240	290	330	370	400	400	350	310	270	220	200	300
	Shaded	150	170	210	240	250	250	260	240	210	190	160	140	200
East	Unshaded	480	570	670	740	720	680	700	680	620	570	490	450	610
	Shaded	270	300	350	380	370	340	360	350	320	300	260	250	320
South	Unshaded	960	870	690	480	370	350	370	420	540	750	900	960	640
	Shaded	270	220	250	260	250	240	250	250	250	230	240	290	250
West	Unshaded	470	550	650	730	680	600	640	630	560	540	470	430	580
	Shaded	260	300	340	380	350	310	330	320	290	290	250	240	310

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	67.2	68.5	71.7	75.2	78.7	81.4	82.6	82.8	81.9	78.3	73.6	69.1	75.9
Daily Minimum Temp	59.2	60.4	64.2	67.8	72.1	75.1	76.2	76.7	75.9	72.1	66.7	61.5	69.0
Daily Maximum Temp	75.2	76.5	79.1	82.4	85.3	87.6	89.0	89.0	87.8	84.5	80.4	76.7	82.8
Record Minimum Temp	30.0	32.0	32.0	46.0	53.0	60.0	69.0	68.0	68.0	51.0	39.0	30.0	30.0
Record Maximum Temp	88.0	89.0	92.0	96.0	95.0	98.0	98.0	98.0	97.0	95.0	89.0	87.0	98.0
HDD, Base 65°F	88	51	14	0	0	0	0	0	0	0	6	41	200
CDD, Base 65°F	156	149	221	306	425	492	546	552	507	412	264	168	4198
Humidity Ratio (#w/#da)	0.0105	0.0105	0.0115	0.0122	0.0144	0.0167	0.0173	0.0176	0.0174	0.0151	0.0128	0.0111	0.0139
Wind Speed (mph)	9.6	10.5	11.0	10.8	9.8	8.5	8.2	8.3	8.4	9.8	10.1	9.6	9.5
Clearness Index, Kt	0.53	0.54	0.55	0.57	0.54	0.49	0.52	0.52	0.50	0.52	0.52	0.52	0.53

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

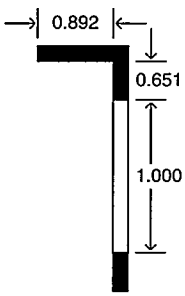
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	39/28	79/60	94/71	80/59	39/28	32/24	74/58	101/74	99/69	71/45	21/17	67/53	93/72	92/67	57/40	23/16	58/42	69/50	51/37	14/10
North	11/11	16/18	17/19	17/18	11/11	23/16	23/21	19/19	19/19	24/19	8/7	17/17	20/20	19/20	16/15	8/7	13/14	15/16	13/13	6/5
East	70/39	64/46	18/19	17/18	11/11	55/32	69/51	40/32	19/19	18/16	43/25	70/50	39/33	19/20	16/15	50/23	49/32	15/16	13/13	6/5
South	28/18	55/41	66/49	55/40	28/18	11/10	18/18	23/22	22/21	18/16	12/9	40/31	56/44	55/40	33/23	39/19	75/46	85/52	68/39	27/12
West	11/11	16/18	18/19	64/45	70/37	11/10	18/18	19/19	47/34	73/39	8/7	17/17	20/20	51/38	70/41	8/7	13/14	20/19	54/32	38/16
M. Clr (%hrs)	48	35	32	37	43	36	23	21	20	21	37	22	16	16	20	50	43	37	41	46

Tallahassee, FL

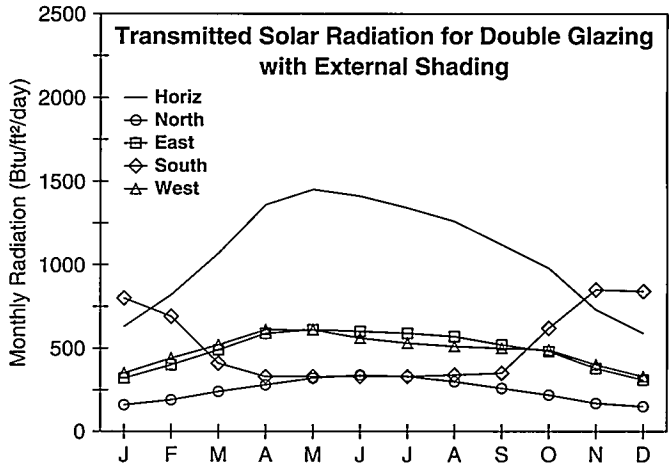
WBAN NO. 93805

LATITUDE: 30.38° N
LONGITUDE: 84.37° W
ELEVATION: 69 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Primary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	910	1170	1490	1870	1980	1940	1840	1730	1560	1370	1050	860	1480
	Std.Dev.	75	101	109	122	112	128	120	111	133	104	87	66	45
	Minimum	800	970	1260	1600	1710	1720	1610	1470	1090	1170	820	730	1370
	Maximum	1060	1380	1680	2130	2190	2220	2040	1960	1800	1570	1190	970	1570
	Diffuse	400	490	620	720	850	930	940	870	740	530	420	380	660
	Clear-Day Global	1280	1600	1990	2330	2510	2550	2480	2310	2020	1650	1310	1170	1940
North	Global	260	320	390	470	570	620	590	500	430	350	280	250	420
	Diffuse	260	320	390	450	510	540	530	480	430	350	280	250	400
	Clear-Day Global	240	290	360	440	590	690	630	490	400	330	260	230	410
East	Global	550	680	840	1010	1050	1040	1020	990	890	810	630	520	840
	Diffuse	310	380	470	560	620	650	640	610	540	430	340	290	490
	Clear-Day Global	860	1020	1200	1320	1340	1330	1300	1250	1150	1000	850	780	1120
South	Global	1160	1190	1090	910	690	600	620	760	970	1260	1270	1170	970
	Diffuse	410	460	520	540	540	540	540	560	570	520	450	400	510
	Clear-Day Global	1990	1890	1570	1100	750	620	670	930	1340	1700	1880	1950	1360
West	Global	590	730	880	1040	1040	970	920	890	840	820	660	550	830
	Diffuse	320	390	490	580	630	640	630	600	540	440	350	300	490
	Clear-Day Global	860	1020	1200	1320	1340	1330	1300	1250	1150	1000	850	780	1120

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

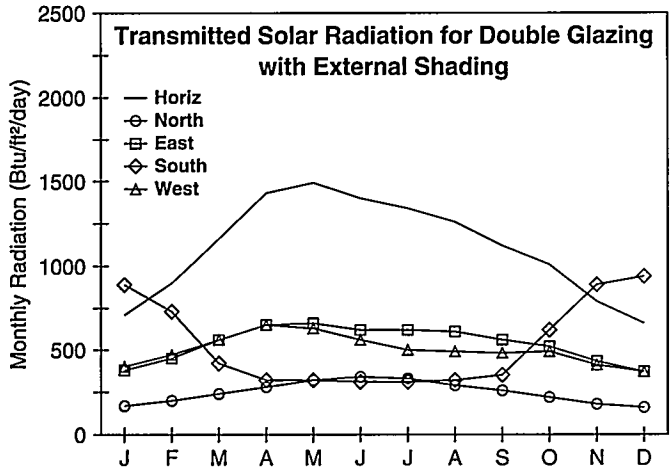
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	630	820	1070	1360	1450	1410	1340	1260	1120	980	730	590	1060
North	Unshaded	180	220	270	320	370	400	390	340	300	240	200	170	280
	Shaded	160	190	240	280	320	340	330	300	260	220	170	150	250
East	Unshaded	380	480	590	720	750	740	730	700	630	570	440	360	590
	Shaded	320	400	490	590	610	600	590	570	520	480	380	310	490
South	Unshaded	850	850	720	550	420	380	390	470	630	870	930	870	660
	Shaded	800	690	410	330	330	330	330	340	350	620	850	840	520
West	Unshaded	410	510	620	740	740	690	640	630	600	580	460	380	580
	Shaded	350	440	520	610	610	560	530	510	500	490	400	330	490

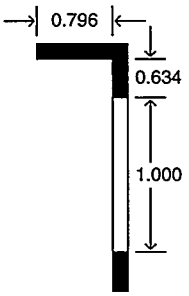
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	50.5	53.2	60.2	66.3	73.6	79.6	81.3	81.3	78.3	68.7	59.7	53.2	67.2
Daily Minimum Temp	38.1	40.1	46.8	52.2	60.8	68.5	71.1	71.4	68.0	55.9	46.3	40.3	55.0
Daily Maximum Temp	62.9	66.3	73.5	80.4	86.3	90.8	91.3	91.0	88.5	81.5	73.0	65.9	79.3
Record Minimum Temp	6.0	14.0	20.0	29.0	34.0	46.0	57.0	60.0	40.0	30.0	13.0	10.0	6.0
Record Maximum Temp	82.0	85.0	90.0	95.0	98.0	103.0	103.0	102.0	99.0	94.0	88.0	84.0	103.0
HDD, Base 65°F	471	344	191	59	0	0	0	0	0	48	203	389	1705
CDD, Base 65°F	21	13	42	98	267	438	505	505	399	163	44	23	2518
Humidity Ratio (#w/#da)	0.0062	0.0065	0.0081	0.0095	0.0123	0.0154	0.0170	0.0171	0.0153	0.0107	0.0084	0.0069	0.0111
Wind Speed (mph)	6.7	7.3	7.5	7.1	6.4	5.7	5.2	5.1	6.1	6.4	6.3	6.4	6.3
Clearness Index, Kt	0.48	0.51	0.53	0.57	0.56	0.53	0.51	0.52	0.52	0.55	0.52	0.49	0.53

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	32/18	74/45	93/61	81/54	45/29	29/21	74/54	99/77	100/78	75/53	16/10	62/41	89/66	88/66	60/43	14/8	50/29	64/38	50/32	16/10
North	9/8	14/16	16/18	15/17	11/11	21/14	19/19	18/20	18/19	18/17	7/5	15/15	18/19	18/19	16/15	5/4	11/11	13/14	11/12	6/5
East	70/22	69/36	24/22	15/17	11/11	54/27	76/50	46/38	18/19	18/17	39/15	74/40	44/35	18/19	16/15	42/11	53/24	14/14	11/12	6/5
South	25/12	58/31	73/44	64/39	36/20	10/9	17/18	29/27	30/27	18/17	9/6	41/25	62/44	61/44	41/27	31/9	76/31	91/40	77/35	35/12
West	9/8	14/16	16/18	59/37	77/36	10/9	17/18	18/20	40/34	71/46	7/5	15/15	18/19	42/33	70/41	5/4	11/11	13/14	51/26	45/14
M. Clr (%hrs)	38	40	36	38	39	42	39	32	26	28	46	44	35	32	35	36	37	37	38	41





Shading Geometry
(Not to Scale)

Tampa, FL

WBAN NO. 12842

LATITUDE: 27.97° N
LONGITUDE: 82.53° W
ELEVATION: 10 feet
MEAN PRESSURE: 14.8 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	1020	1270	1600	1960	2030	1930	1840	1730	1550	1410	1130	970	1540
	Std.Dev.	83	85	120	87	113	134	104	118	103	84	81	70	55
	Minimum	820	1080	1380	1830	1820	1630	1620	1470	1360	1150	950	840	1410
	Maximum	1160	1430	1760	2170	2230	2180	2030	1980	1720	1550	1260	1090	1640
	Diffuse	400	460	570	650	770	870	870	820	720	550	420	370	620
	Clear-Day Global	1370	1680	2050	2360	2500	2520	2470	2330	2060	1720	1400	1260	1980
North	Global	270	320	380	460	570	620	580	490	420	360	290	260	420
	Diffuse	270	320	380	440	490	520	510	470	420	360	290	260	390
	Clear-Day Global	250	300	360	440	600	710	640	490	400	340	270	240	420
East	Global	620	740	910	1080	1090	1040	1030	1010	920	850	690	600	880
	Diffuse	330	390	470	550	600	620	620	590	540	450	360	310	490
	Clear-Day Global	890	1050	1200	1310	1330	1300	1280	1240	1160	1030	880	820	1130
South	Global	1280	1250	1120	870	630	540	570	700	910	1220	1320	1300	980
	Diffuse	430	470	510	520	510	500	510	530	550	530	470	430	500
	Clear-Day Global	1990	1860	1500	1010	670	560	600	850	1260	1660	1880	1960	1310
West	Global	640	770	920	1070	1060	950	860	830	800	810	680	610	830
	Diffuse	340	390	480	560	600	610	600	570	520	450	360	320	480
	Clear-Day Global	890	1050	1200	1310	1330	1300	1280	1240	1160	1030	880	820	1130

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	710	900	1160	1430	1490	1400	1340	1260	1120	1010	790	660	1110
North	Unshaded	190	220	260	310	360	400	370	330	290	250	200	180	280
	Shaded	170	200	240	280	320	340	330	290	260	220	180	160	250
East	Unshaded	430	520	650	770	780	740	740	720	660	600	480	420	620
	Shaded	380	450	560	650	660	620	620	610	560	520	430	370	540
South	Unshaded	940	890	730	510	380	350	360	420	580	840	960	970	660
	Shaded	890	730	420	320	320	310	310	320	350	620	890	940	540
West	Unshaded	450	540	660	770	750	670	610	580	570	570	480	420	590
	Shaded	400	470	560	650	630	560	500	490	480	490	410	370	500

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	59.9	61.5	66.4	71.2	77.2	81.0	82.1	82.1	81.0	74.9	67.6	62.2	72.3
Daily Minimum Temp	50.0	51.6	56.5	60.8	67.5	72.9	74.5	74.5	72.8	65.2	57.2	52.3	63.0
Daily Maximum Temp	69.8	71.4	76.6	81.7	87.2	89.5	90.2	90.2	89.0	84.3	77.7	72.1	81.6
Record Minimum Temp	21.0	24.0	29.0	40.0	49.0	53.0	63.0	67.0	57.0	40.0	23.0	18.0	18.0
Record Maximum Temp	86.0	88.0	91.0	93.0	98.0	99.0	97.0	98.0	96.0	94.0	90.0	86.0	99.0
HDD, Base 65°F	234	160	84	7	0	0	0	0	0	0	70	171	726
CDD, Base 65°F	76	62	128	193	378	480	530	530	480	307	148	84	3396
Humidity Ratio (#w/#da)	0.0083	0.0085	0.0099	0.0111	0.0134	0.0163	0.0172	0.0175	0.0166	0.0132	0.0107	0.0090	0.0126
Wind Speed (mph)	8.7	9.2	9.5	9.2	8.8	8.0	7.3	7.0	7.6	8.6	8.4	8.4	8.4
Clearness Index, Kt	0.51	0.53	0.55	0.59	0.57	0.53	0.51	0.51	0.51	0.55	0.53	0.51	0.54

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

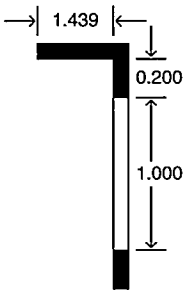
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	37/23	78/54	94/66	81/57	43/29	32/23	75/57	100/78	100/77	74/53	19/14	64/47	90/69	88/66	59/41	19/12	55/35	66/45	51/35	16/11
North	10/9	15/16	16/18	15/17	11/11	23/15	21/20	18/19	18/19	21/19	8/6	16/16	18/19	18/19	16/14	6/5	12/12	13/15	12/12	6/5
East	75/31	68/44	21/20	15/17	11/11	59/32	75/52	43/36	18/19	17/17	47/22	74/46	42/34	18/19	16/14	50/16	52/29	14/15	12/12	6/5
South	28/15	57/38	69/47	60/40	33/20	11/9	17/17	25/24	26/24	17/17	11/7	40/28	58/44	57/42	37/25	38/13	78/39	87/49	74/39	32/14
West	10/9	15/16	16/18	62/41	77/38	11/9	17/17	18/19	43/36	74/48	8/6	16/16	18/19	45/35	71/42	6/5	12/12	15/15	53/30	44/18
M. Clr (%hrs)	43	43	44	44	45	43	36	30	28	26	49	43	28	23	25	43	45	41	42	44

West Palm Beach, FL

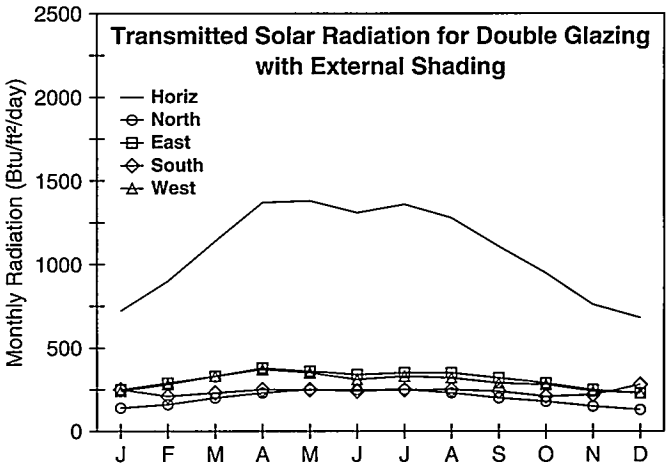
WBAN NO. 12844

LATITUDE: 26.68° N
LONGITUDE: 80.10° W
ELEVATION: 20 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	1030	1270	1570	1880	1900	1810	1860	1760	1530	1330	1090	980	1500
	Std.Dev.	102	87	101	128	147	157	116	110	121	101	81	60	60
	Minimum	770	1130	1310	1630	1570	1480	1580	1540	1230	1130	940	870	1390
	Maximum	1210	1470	1790	2150	2200	2100	2100	1990	1760	1520	1230	1110	1620
	Diffuse	430	510	620	700	810	900	890	850	750	610	480	410	660
	Clear-Day Global	1420	1720	2080	2370	2490	2510	2460	2330	2090	1750	1450	1310	2000
North	Global	280	330	390	460	560	620	600	500	430	370	300	270	430
	Diffuse	280	330	390	450	490	520	520	480	430	370	300	270	400
	Clear-Day Global	260	300	360	440	600	720	660	490	400	340	280	250	430
East	Global	650	770	900	1030	1020	980	1000	970	870	790	660	620	860
	Diffuse	350	410	490	570	600	620	630	610	540	460	370	330	500
	Clear-Day Global	910	1060	1200	1310	1310	1300	1270	1240	1170	1040	900	850	1130
South	Global	1240	1210	1070	820	590	520	550	690	870	1100	1200	1260	920
	Diffuse	460	490	530	520	500	500	510	530	550	540	490	450	510
	Clear-Day Global	1980	1830	1460	960	630	520	570	800	1220	1640	1870	1960	1280
West	Global	630	750	900	1030	980	880	920	900	800	750	650	600	820
	Diffuse	350	410	500	570	600	600	610	590	530	460	370	330	490
	Clear-Day Global	910	1060	1200	1310	1310	1300	1270	1240	1170	1040	900	850	1130

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

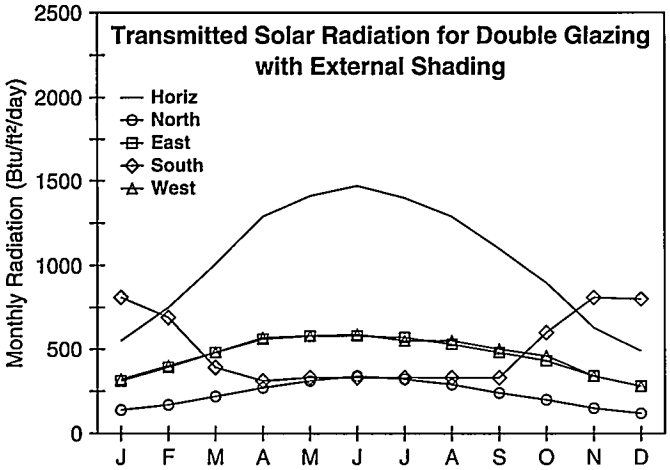
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	720	900	1140	1370	1380	1310	1360	1280	1110	950	760	680	1080
North	Unshaded	200	230	270	310	360	390	380	340	290	250	210	190	290
	Shaded	140	160	200	230	250	250	250	230	200	180	150	130	200
East	Unshaded	460	550	640	740	720	700	710	690	620	550	460	430	610
	Shaded	250	290	330	380	360	340	350	350	320	290	250	230	310
South	Unshaded	910	850	690	480	370	350	360	420	550	750	870	930	620
	Shaded	250	210	230	250	250	240	250	250	240	210	220	280	240
West	Unshaded	440	530	640	730	690	620	650	630	560	520	450	420	570
	Shaded	240	280	330	370	350	310	330	320	290	280	240	230	300

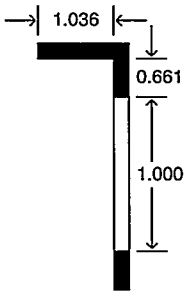
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	65.1	66.2	70.0	73.4	77.6	80.6	82.2	82.5	81.6	77.8	72.3	67.4	74.7
Daily Minimum Temp	55.7	56.5	61.2	64.7	69.7	73.1	74.5	75.0	74.6	70.7	64.5	58.7	66.6
Daily Maximum Temp	74.5	75.9	78.8	82.0	85.6	88.1	89.9	90.0	88.6	84.9	80.0	76.0	82.9
Record Minimum Temp	27.0	32.0	30.0	43.0	53.0	61.0	66.0	65.0	66.0	46.0	36.0	28.0	27.0
Record Maximum Temp	89.0	90.0	94.0	99.0	96.0	98.0	101.0	98.0	97.0	95.0	91.0	90.0	101.0
HDD, Base 65°F	122	85	27	0	0	0	0	0	0	0	15	74	323
CDD, Base 65°F	125	119	182	252	391	468	533	543	498	397	234	149	3891
Humidity Ratio (#w/#da)	0.0100	0.0100	0.0110	0.0118	0.0142	0.0167	0.0175	0.0176	0.0173	0.0147	0.0123	0.0106	0.0136
Wind Speed (mph)	10.2	10.8	11.3	10.9	10.3	8.7	8.2	8.2	8.8	10.8	10.8	10.4	9.9
Clearness Index, Kt	0.50	0.52	0.54	0.57	0.54	0.50	0.52	0.52	0.50	0.51	0.50	0.50	0.52

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	39/27	79/57	94/68	79/57	39/27	34/25	76/58	101/77	99/71	71/46	22/17	67/51	92/72	88/66	57/39	23/15	57/39	67/46	50/35	14/10
North	10/10	16/17	16/18	15/17	10/10	23/16	22/20	18/19	18/19	23/18	9/7	17/17	19/19	18/19	15/14	7/7	13/13	14/15	12/12	5/5
East	73/37	64/43	17/18	15/17	10/10	59/33	72/51	39/33	18/19	17/16	48/26	71/49	38/32	18/19	15/14	51/21	49/31	14/15	12/12	5/5
South	29/18	57/39	67/48	57/39	29/18	11/10	18/18	23/23	23/22	17/16	12/9	41/31	57/45	54/41	33/23	40/18	77/44	85/50	69/39	27/12
West	10/10	16/17	17/19	64/44	73/38	11/10	18/18	18/19	47/36	74/41	9/7	17/17	19/19	49/37	71/40	7/7	13/13	19/18	54/32	39/16
M. Clr (%hrs)	42	36	33	35	40	38	23	23	21	22	37	23	20	21	21	45	39	35	38	41





Shading Geometry
(Not to Scale)

Athens, GA

WBAN NO. 13873

LATITUDE: 33.95° N
LONGITUDE: 83.32° W
ELEVATION: 801 feet
MEAN PRESSURE: 14.3 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	830	1090	1410	1780	1940	2010	1920	1780	1520	1270	920	740	1440
	Std.Dev.	63	99	121	118	105	136	150	113	101	107	86	57	35
	Minimum	720	880	1210	1510	1690	1720	1580	1570	1320	1050	670	630	1370
	Maximum	1010	1320	1610	2010	2190	2260	2250	2010	1730	1480	1070	850	1500
	Diffuse	360	440	570	690	830	890	890	820	680	480	380	320	610
	Clear-Day Global	1160	1490	1920	2310	2530	2590	2520	2310	1970	1550	1190	1040	1880
North	Global	230	290	370	450	560	630	590	500	410	330	250	210	400
	Diffuse	230	290	370	440	510	540	520	480	410	330	250	210	380
	Clear-Day Global	220	270	340	430	580	690	630	490	390	310	230	200	400
East	Global	530	670	830	1000	1040	1060	1040	970	860	760	580	480	820
	Diffuse	280	350	450	540	610	640	630	590	510	400	310	250	460
	Clear-Day Global	820	1000	1190	1340	1380	1380	1340	1280	1150	980	800	730	1110
South	Global	1160	1210	1120	960	760	680	700	850	1030	1260	1220	1120	1000
	Diffuse	370	430	500	540	550	560	560	570	550	490	410	350	490
	Clear-Day Global	2020	1960	1680	1220	870	750	800	1050	1440	1760	1900	1940	1450
West	Global	550	690	850	1020	1050	1070	1010	980	890	790	590	490	830
	Diffuse	290	350	460	550	620	650	640	600	520	410	310	250	470
	Clear-Day Global	820	1000	1190	1340	1380	1380	1340	1280	1150	980	800	730	1110

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	550	750	1010	1290	1410	1470	1400	1290	1100	900	630	490	1030
North	Unshaded	160	200	260	310	370	410	380	340	280	230	180	150	270
	Shaded	140	170	220	270	310	340	320	290	240	200	150	120	230
East	Unshaded	370	470	590	710	740	750	730	690	610	530	400	330	580
	Shaded	310	390	480	560	580	580	570	530	480	430	340	280	460
South	Unshaded	860	880	760	600	460	410	430	520	680	890	900	840	680
	Shaded	810	690	390	310	330	330	330	330	330	600	810	800	510
West	Unshaded	380	490	610	730	750	760	710	700	630	550	410	340	590
	Shaded	320	400	480	570	580	590	550	550	500	460	340	280	470

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	41.8	45.5	53.6	61.6	69.3	76.4	79.6	78.5	72.9	62.2	53.4	45.1	61.7
Daily Minimum Temp	32.0	34.7	42.1	49.8	58.1	65.8	69.5	68.7	63.0	50.7	42.3	35.1	51.0
Daily Maximum Temp	51.6	56.3	65.1	73.4	80.5	87.0	89.6	88.1	82.7	73.6	64.4	55.1	72.3
Record Minimum Temp	-4.0	5.0	11.0	27.0	37.0	45.0	55.0	54.0	36.0	24.0	7.0	2.0	-4.0
Record Maximum Temp	80.0	81.0	88.0	93.0	97.0	104.0	104.0	107.0	99.0	98.0	86.0	79.0	107.0
HDD, Base 65°F	719	546	359	131	27	0	0	0	0	140	354	617	2893
CDD, Base 65°F	0	0	6	29	161	342	453	419	240	53	6	0	1709
Humidity Ratio (#w/#da)	0.0041	0.0043	0.0058	0.0075	0.0106	0.0136	0.0156	0.0155	0.0130	0.0086	0.0063	0.0048	0.0091
Wind Speed (mph)	8.4	8.9	8.7	8.2	7.0	6.5	6.3	5.9	6.5	6.7	7.4	8.0	7.4
Clearness Index, Kt	0.49	0.51	0.52	0.56	0.55	0.55	0.53	0.54	0.53	0.54	0.51	0.47	0.53

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

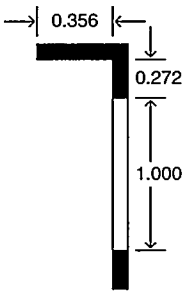
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	32/19	72/44	89/54	77/50	42/26	34/22	77/50	99/74	99/78	76/55	18/11	62/37	87/60	86/63	59/40	13/7	46/25	58/32	45/26	12/8
North	9/8	14/15	15/17	14/16	10/10	22/13	16/17	17/20	17/19	17/17	7/5	15/14	17/19	17/19	14/14	5/4	10/10	12/12	10/10	5/4
East	73/26	68/35	21/20	14/16	10/10	64/27	78/43	44/36	17/19	17/17	46/14	75/34	42/31	17/19	14/14	41/10	51/20	12/12	10/10	5/4
South	29/13	63/33	77/41	67/38	37/19	10/9	20/18	35/30	36/31	21/19	11/6	45/24	66/43	66/45	43/26	32/8	79/27	92/33	77/29	29/9
West	9/8	14/15	15/17	60/35	78/33	10/9	16/17	17/20	41/35	74/48	7/5	15/14	17/19	43/33	72/39	5/4	10/10	13/12	51/21	39/11
M. Clr (%hrs)	37	37	38	37	38	40	44	37	32	39	43	44	38	37	47	38	38	38	38	39

Atlanta, GA

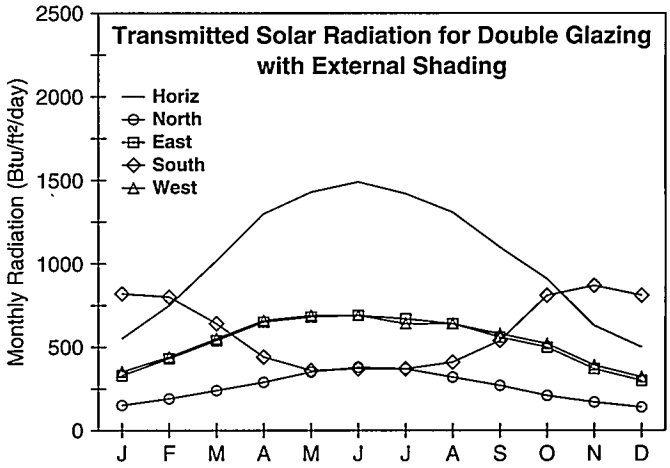
WBAN NO. 13874

LATITUDE: 33.65° N
LONGITUDE: 84.43° W
ELEVATION: 1034 feet
MEAN PRESSURE: 14.2 psia

STATION TYPE: Primary



Shading Geometry (Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	820	1080	1420	1790	1970	2040	1950	1810	1540	1280	930	750	1450
	Std.Dev.	66	101	123	127	136	139	161	106	120	123	78	58	44
	Minimum	690	900	1180	1580	1740	1740	1690	1600	1280	1070	760	650	1360
	Maximum	950	1300	1690	2060	2270	2320	2300	1980	1760	1540	1060	880	1540
	Diffuse	370	460	590	710	850	920	950	870	710	490	390	340	640
	Clear-Day Global	1170	1500	1930	2320	2530	2590	2520	2310	1970	1560	1200	1050	1890
North	Global	240	300	380	460	570	640	600	520	420	330	260	220	410
	Diffuse	240	300	380	450	510	550	540	500	420	330	260	220	390
	Clear-Day Global	220	270	340	440	580	690	630	490	390	310	240	200	400
East	Global	510	660	830	1000	1060	1080	1050	990	860	760	580	470	820
	Diffuse	280	350	460	550	620	650	650	610	520	400	310	260	470
	Clear-Day Global	820	1000	1200	1340	1380	1380	1340	1280	1150	980	810	730	1120
South	Global	1120	1180	1110	960	760	690	710	860	1030	1260	1200	1110	1000
	Diffuse	370	430	510	540	560	570	580	590	560	490	410	360	500
	Clear-Day Global	2020	1960	1670	1210	870	730	780	1040	1430	1760	1910	1940	1440
West	Global	540	680	850	1020	1060	1070	1010	990	890	790	590	500	830
	Diffuse	290	360	460	560	630	660	660	620	530	420	320	260	480
	Clear-Day Global	820	1000	1200	1340	1380	1380	1340	1280	1150	980	810	730	1120

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

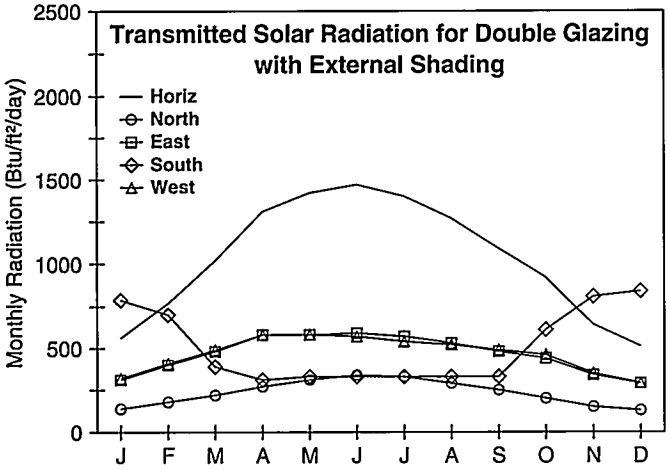
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	550	750	1020	1300	1430	1490	1420	1310	1100	910	630	500	1040
North	Unshaded	160	210	260	310	370	410	400	350	290	230	180	150	280
	Shaded	150	190	240	290	350	380	370	320	270	210	170	140	260
East	Unshaded	350	460	590	710	760	770	740	700	610	540	400	330	580
	Shaded	330	430	540	650	680	690	670	640	560	500	370	300	530
South	Unshaded	830	850	750	590	460	420	440	530	680	890	890	830	680
	Shaded	820	800	640	440	360	370	370	410	540	810	870	810	600
West	Unshaded	370	480	600	730	750	760	710	700	630	560	410	340	590
	Shaded	350	440	550	660	690	690	640	640	580	520	390	320	540

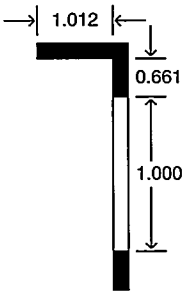
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	41.0	44.8	53.5	61.5	69.2	76.0	78.8	78.1	72.7	62.3	53.1	44.5	61.3
Daily Minimum Temp	31.5	34.5	42.5	50.2	58.7	66.2	69.5	69.0	63.5	51.9	42.8	35.0	51.3
Daily Maximum Temp	50.4	55.0	64.3	72.7	79.6	85.8	88.0	87.1	81.8	72.7	63.4	54.0	71.2
Record Minimum Temp	-8.0	5.0	10.0	26.0	37.0	46.0	53.0	55.0	36.0	28.0	3.0	0.0	-8.0
Record Maximum Temp	79.0	80.0	85.0	93.0	95.0	101.0	105.0	102.0	98.0	95.0	84.0	79.0	105.0
HDD, Base 65°F	744	566	365	138	27	0	0	0	10	138	367	636	2991
CDD, Base 65°F	0	0	8	33	157	330	428	406	241	54	10	0	1667
Humidity Ratio (#w/#da)	0.0040	0.0043	0.0056	0.0073	0.0103	0.0133	0.0153	0.0151	0.0126	0.0084	0.0062	0.0047	0.0089
Wind Speed (mph)	9.9	10.3	10.1	9.7	8.5	7.9	7.6	7.1	7.8	8.3	8.8	9.4	8.8
Clearness Index, Kt	0.48	0.50	0.53	0.56	0.55	0.56	0.54	0.54	0.53	0.55	0.50	0.47	0.53

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	32/17	73/43	91/57	80/50	44/26	32/20	76/51	101/75	101/77	77/56	16/10	61/37	88/60	88/63	61/42	12/7	46/25	60/34	47/27	13/8
North	8/7	14/15	16/18	15/17	10/10	22/13	17/17	18/20	18/20	17/18	6/5	14/14	17/19	18/19	15/15	5/3	10/10	12/13	10/11	5/4
East	73/22	70/33	23/21	15/17	10/10	63/25	79/44	47/37	18/20	17/18	43/12	76/33	44/32	18/19	15/15	40/8	52/20	13/13	10/11	5/4
South	28/12	63/31	78/43	69/38	38/19	10/9	19/18	35/30	36/31	22/20	10/5	44/23	67/41	66/44	44/27	30/7	78/26	94/35	79/29	33/10
West	8/7	14/15	16/18	60/34	78/31	10/9	17/17	18/20	40/34	73/48	6/5	14/14	17/19	42/32	72/40	5/3	10/10	12/13	51/21	42/12
M. Clr (%hrs)	36	38	36	35	37	43	45	37	35	40	41	44	37	36	42	36	36	37	37	38





Shading Geometry
(Not to Scale)

Augusta, GA

WBAN NO. 03820

LATITUDE: 33.37° N
LONGITUDE: 81.97° W
ELEVATION: 148 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	830	1110	1430	1800	1940	2010	1930	1750	1520	1290	940	770	1450
	Std.Dev.	65	102	122	119	122	144	155	147	124	114	73	59	45
	Minimum	710	970	1200	1580	1630	1730	1430	1430	1290	1080	720	680	1340
	Maximum	1020	1340	1620	2070	2160	2260	2250	2060	1780	1530	1090	910	1540
	Diffuse	360	450	580	680	820	880	890	820	690	490	380	330	620
	Clear-Day Global	1170	1510	1930	2310	2530	2590	2520	2310	1980	1560	1210	1060	1890
North	Global	240	300	370	460	560	620	590	490	410	330	260	220	400
	Diffuse	240	300	370	440	500	540	520	480	410	330	260	220	380
	Clear-Day Global	220	280	350	430	580	690	630	490	390	310	240	210	400
East	Global	520	680	840	1020	1050	1060	1030	960	860	770	590	490	820
	Diffuse	280	360	460	540	610	640	630	580	510	410	320	260	470
	Clear-Day Global	810	1000	1190	1330	1380	1370	1340	1270	1150	980	810	740	1110
South	Global	1140	1220	1120	960	750	670	690	820	1010	1270	1230	1160	1000
	Diffuse	380	440	500	540	550	550	560	560	550	490	420	360	490
	Clear-Day Global	2000	1950	1660	1200	860	720	770	1030	1420	1750	1900	1940	1430
West	Global	540	700	850	1020	1040	1040	980	930	860	790	600	500	820
	Diffuse	290	360	460	560	620	640	630	590	520	420	320	260	470
	Clear-Day Global	810	1000	1190	1330	1380	1370	1340	1270	1150	980	810	740	1110

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	560	770	1020	1310	1420	1470	1400	1270	1090	920	640	510	1030
North	Unshaded	160	210	260	310	370	400	380	330	290	230	180	150	270
	Shaded	140	180	220	270	310	340	330	290	250	200	150	130	230
East	Unshaded	360	480	600	730	740	760	730	680	610	540	410	340	580
	Shaded	310	400	480	580	580	590	570	530	480	440	340	290	470
South	Unshaded	850	880	750	590	450	410	420	510	660	890	910	870	680
	Shaded	790	700	390	310	330	330	330	330	330	610	810	840	510
West	Unshaded	380	490	610	730	740	740	690	660	610	560	420	350	580
	Shaded	320	410	490	580	580	570	540	520	490	460	350	290	470

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	43.9	47.4	55.5	62.7	70.7	77.5	80.8	79.7	74.5	63.8	55.0	47.2	63.2
Daily Minimum Temp	32.0	34.7	42.2	48.6	57.5	65.6	69.9	69.1	63.1	50.3	41.6	34.8	50.8
Daily Maximum Temp	55.7	60.1	68.8	76.6	83.7	89.3	91.7	90.3	85.7	77.2	68.3	59.5	75.6
Record Minimum Temp	-1.0	9.0	12.0	26.0	35.0	47.0	55.0	54.0	36.0	22.0	15.0	5.0	-1.0
Record Maximum Temp	80.0	86.0	88.0	96.0	99.0	105.0	107.0	108.0	101.0	97.0	90.0	82.0	108.0
HDD, Base 65°F	654	493	305	106	12	0	0	0	0	129	314	552	2565
CDD, Base 65°F	0	0	11	37	188	375	490	456	285	92	14	0	1948
Humidity Ratio (#w/#da)	0.0044	0.0047	0.0061	0.0077	0.0107	0.0136	0.0155	0.0155	0.0131	0.0088	0.0066	0.0051	0.0093
Wind Speed (mph)	7.1	7.6	7.9	7.6	6.5	6.2	6.0	5.4	5.5	5.7	6.2	6.6	6.5
Clearness Index, Kt	0.48	0.51	0.53	0.56	0.55	0.55	0.53	0.53	0.52	0.55	0.51	0.48	0.53

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

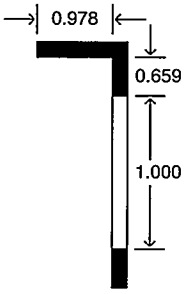
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	34/20	74/46	90/56	77/49	40/25	36/23	79/52	101/76	100/76	74/52	20/12	64/38	88/61	86/61	58/39	15/8	48/27	59/34	44/26	11/7
North	9/8	14/16	16/18	14/16	10/10	23/14	17/17	17/20	18/19	17/17	7/5	15/15	17/19	17/19	14/14	5/4	10/11	12/13	10/10	4/3
East	73/26	67/35	19/19	14/16	10/10	66/28	78/44	42/35	18/19	17/17	49/15	75/34	40/30	17/19	14/14	44/11	50/21	12/13	10/10	4/3
South	30/14	64/33	77/43	66/37	35/18	11/10	20/19	35/30	35/30	19/18	12/6	46/24	66/42	65/43	41/25	35/9	80/29	92/37	76/30	27/8
West	9/8	14/16	16/18	62/36	76/32	11/10	17/17	17/20	44/36	75/47	7/5	15/15	17/19	46/33	73/39	5/4	10/11	15/13	52/23	36/10
M. Clr (%hrs)	40	39	37	36	38	43	44	38	34	37	42	45	39	36	39	39	39	40	39	40

Columbus, GA

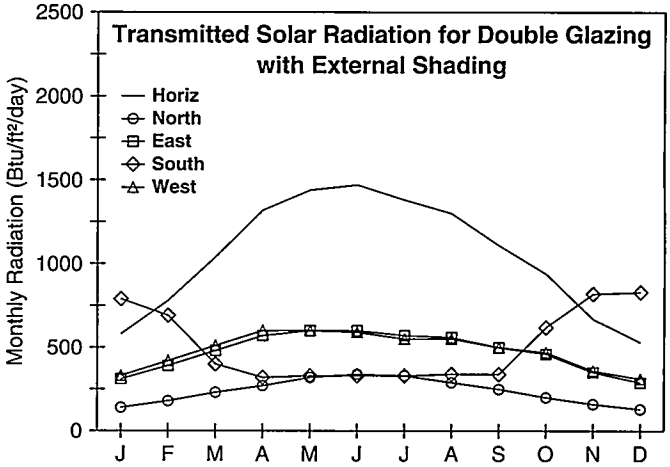
WBAN NO. 93842

LATITUDE: 32.52° N
LONGITUDE: 84.95° W
ELEVATION: 446 feet
MEAN PRESSURE: 14.6 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	860	1120	1450	1820	1970	2010	1900	1790	1550	1320	970	800	1460
	Std.Dev.	59	99	115	114	121	129	151	98	107	110	80	64	37
	Minimum	760	960	1220	1610	1730	1770	1510	1590	1350	1090	750	670	1360
	Maximum	1020	1340	1620	2040	2330	2210	2140	1960	1740	1540	1110	910	1520
	Diffuse	380	460	590	690	830	900	920	850	710	500	400	350	630
	Clear-Day Global	1220	1540	1950	2320	2520	2570	2500	2310	1990	1590	1240	1100	1910
North	Global	250	300	380	460	570	630	590	510	420	340	270	230	410
	Diffuse	250	300	380	450	510	540	530	490	420	340	270	230	390
	Clear-Day Global	220	270	350	440	590	680	630	490	400	320	240	210	400
East	Global	530	680	830	1000	1060	1070	1020	990	870	790	600	500	830
	Diffuse	290	360	460	550	610	640	640	600	520	420	320	270	470
	Clear-Day Global	850	1020	1210	1330	1360	1350	1320	1260	1150	990	830	760	1120
South	Global	1140	1190	1120	940	730	650	670	820	1020	1280	1230	1150	990
	Diffuse	390	440	510	540	550	550	560	570	560	500	420	370	500
	Clear-Day Global	2040	1950	1640	1180	830	700	750	1010	1400	1740	1910	1960	1420
West	Global	560	710	880	1040	1060	1040	980	960	880	800	620	530	840
	Diffuse	300	370	470	560	620	650	640	610	530	420	330	280	480
	Clear-Day Global	850	1020	1210	1330	1360	1350	1320	1260	1150	990	830	760	1120

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

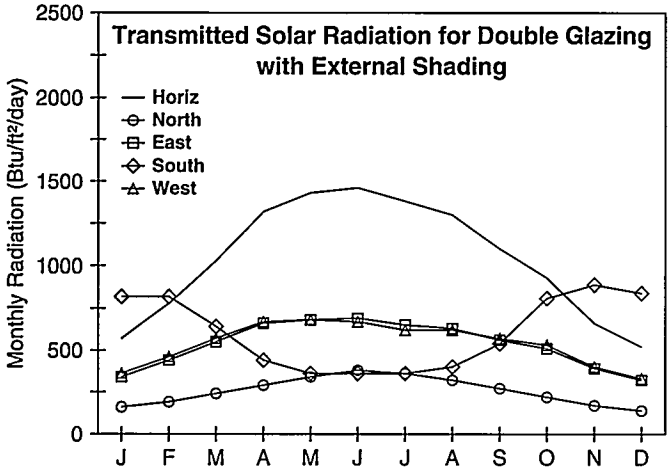
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	580	780	1040	1320	1440	1470	1380	1300	1110	940	670	530	1050
North	Unshaded	170	210	260	310	370	410	390	340	290	230	180	160	280
	Shaded	140	180	230	270	320	340	330	290	250	200	160	130	240
East	Unshaded	370	470	590	710	750	760	720	700	620	560	420	340	580
	Shaded	310	390	480	570	600	600	570	560	500	460	350	290	470
South	Unshaded	840	860	750	580	440	400	420	500	660	900	910	860	680
	Shaded	790	690	400	320	330	330	330	340	340	620	820	830	510
West	Unshaded	390	500	620	740	750	740	690	680	630	570	430	370	590
	Shaded	330	420	510	600	600	590	550	550	500	470	360	310	480

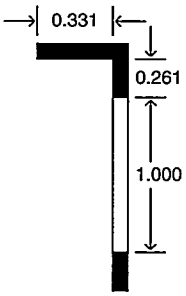
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	45.7	49.3	57.2	64.8	72.3	79.5	81.9	81.4	76.4	66.0	56.7	48.6	65.0
Daily Minimum Temp	35.2	37.6	45.1	52.2	61.0	68.4	71.8	71.4	66.3	54.1	45.0	38.2	53.9
Daily Maximum Temp	56.1	61.0	69.1	77.3	83.6	90.4	91.8	91.2	86.2	77.6	68.2	59.0	76.0
Record Minimum Temp	-2.0	11.0	16.0	28.0	39.0	44.0	59.0	57.0	38.0	24.0	10.0	4.0	-2.0
Record Maximum Temp	83.0	83.0	89.0	93.0	97.0	104.0	104.0	103.0	100.0	96.0	86.0	82.0	104.0
HDD, Base 65°F	607	440	260	76	7	0	0	0	0	86	268	517	2261
CDD, Base 65°F	9	0	18	70	234	435	524	508	342	117	19	8	2284
Humidity Ratio (#w/#da)	0.0049	0.0052	0.0067	0.0084	0.0113	0.0142	0.0163	0.0161	0.0138	0.0094	0.0071	0.0056	0.0099
Wind Speed (mph)	7.4	8.1	7.9	7.5	6.6	6.2	6.0	5.6	6.5	6.6	6.8	7.0	6.8
Clearness Index, Kt	0.48	0.51	0.53	0.56	0.56	0.55	0.53	0.53	0.53	0.55	0.51	0.48	0.53

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	31/18	72/44	91/57	81/53	45/29	30/19	74/49	99/76	101/78	77/55	15/10	61/37	87/62	88/64	61/42	12/7	47/26	61/35	48/29	15/10
North	8/7	14/15	16/18	15/17	11/11	22/12	17/17	18/20	18/20	17/17	6/5	14/14	18/19	18/19	15/15	5/3	10/10	12/13	11/11	5/5
East	72/23	70/35	24/22	15/17	11/11	59/24	78/44	47/38	18/20	17/17	40/13	76/34	45/33	18/19	15/15	40/10	53/21	14/14	11/11	5/5
South	26/12	61/31	76/43	67/40	38/21	10/8	17/17	33/29	34/30	20/19	9/5	43/23	64/42	65/45	43/27	29/8	78/26	93/36	79/32	35/12
West	8/7	14/15	16/18	59/36	79/35	10/8	17/17	18/20	39/33	72/47	6/5	14/14	18/19	41/32	71/40	5/3	10/10	12/13	51/24	45/14
M. Clr (%hrs)	36	37	38	37	38	45	48	40	34	39	45	45	40	36	43	37	37	39	38	39





Shading Geometry
(Not to Scale)

Macon, GA

WBAN NO. 03813

LATITUDE: 32.70° N
LONGITUDE: 83.65° W
ELEVATION: 361 feet
MEAN PRESSURE: 14.6 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	840	1110	1440	1810	1970	2010	1900	1780	1520	1310	960	780	1460
	Std.Dev.	64	101	119	108	133	137	183	116	112	122	75	68	42
	Minimum	700	930	1230	1610	1640	1730	1390	1580	1280	1080	750	650	1360
	Maximum	980	1350	1640	2060	2270	2320	2230	1990	1790	1560	1090	910	1540
	Diffuse	370	460	580	690	830	900	910	830	710	490	390	340	630
	Clear-Day Global	1200	1530	1940	2320	2520	2580	2510	2310	1990	1580	1230	1080	1900
North	Global	240	300	380	460	560	630	590	500	420	330	260	220	410
	Diffuse	240	300	380	440	510	540	520	480	420	330	260	220	390
	Clear-Day Global	230	280	350	440	580	690	630	490	390	320	250	210	410
East	Global	520	680	840	1010	1050	1070	1020	960	860	780	600	490	820
	Diffuse	290	360	460	550	610	640	630	590	520	410	320	270	470
	Clear-Day Global	830	1010	1190	1330	1360	1360	1330	1270	1150	980	820	740	1110
South	Global	1130	1200	1120	940	740	650	670	820	1000	1270	1240	1140	990
	Diffuse	380	440	500	540	550	550	550	570	560	500	420	370	490
	Clear-Day Global	2000	1940	1640	1180	830	700	750	1010	1410	1740	1900	1940	1420
West	Global	550	700	860	1020	1050	1030	970	960	870	800	610	510	830
	Diffuse	300	370	470	560	620	650	630	600	520	420	320	270	480
	Clear-Day Global	830	1010	1190	1330	1360	1360	1330	1270	1150	980	820	740	1110

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	570	780	1030	1320	1430	1460	1380	1300	1100	930	660	520	1040
North	Unshaded	170	210	260	310	370	400	380	340	290	230	180	150	280
	Shaded	160	190	240	290	340	380	360	320	270	220	170	140	260
East	Unshaded	360	480	590	720	750	760	720	680	610	550	410	340	580
	Shaded	340	440	550	660	680	690	650	630	560	510	390	320	540
South	Unshaded	840	860	750	580	440	400	420	500	650	890	910	850	670
	Shaded	820	820	640	440	360	360	360	400	540	810	890	840	600
West	Unshaded	380	490	610	730	750	730	680	680	610	570	430	350	580
	Shaded	360	460	570	670	680	670	620	620	570	530	400	330	540

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	45.4	48.8	56.9	64.3	71.9	78.5	81.2	80.4	75.3	64.8	56.0	48.7	64.4
Daily Minimum Temp	34.2	36.8	44.2	50.9	59.3	66.8	70.5	69.8	64.2	51.6	43.1	37.1	52.4
Daily Maximum Temp	56.6	60.8	69.5	77.7	84.5	90.2	91.9	91.1	86.4	77.9	68.7	60.3	76.3
Record Minimum Temp	-6.0	9.0	14.0	29.0	40.0	46.0	54.0	55.0	35.0	26.0	10.0	5.0	-6.0
Record Maximum Temp	84.0	85.0	95.0	96.0	99.0	106.0	108.0	105.0	102.0	100.0	88.0	82.0	108.0
HDD, Base 65°F	615	454	267	82	7	0	0	0	5	106	287	511	2334
CDD, Base 65°F	7	0	15	61	221	405	502	477	314	100	17	6	2125
Humidity Ratio (#w/#da)	0.0048	0.0051	0.0067	0.0083	0.0112	0.0141	0.0160	0.0161	0.0138	0.0092	0.0070	0.0055	0.0098
Wind Speed (mph)	7.7	8.5	8.5	8.2	7.1	6.9	6.7	6.2	6.5	6.5	6.7	7.3	7.2
Clearness Index, Kt	0.48	0.51	0.53	0.56	0.55	0.55	0.53	0.53	0.52	0.55	0.51	0.48	0.53

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

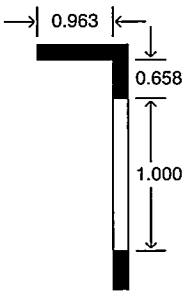
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	32/19	73/45	91/58	79/52	43/27	32/22	77/52	100/77	100/77	76/55	17/11	63/38	88/61	87/64	59/41	13/8	47/26	60/35	47/28	13/8
North	9/8	14/15	16/18	15/17	10/10	22/13	17/17	18/20	18/19	17/17	7/5	15/14	18/19	18/19	15/14	5/4	10/10	12/13	10/11	5/4
East	72/24	69/36	22/21	15/17	10/10	61/28	78/46	45/37	18/19	17/17	44/14	76/34	43/32	18/19	15/14	41/10	52/21	13/13	10/11	5/4
South	28/13	62/33	76/44	66/39	36/19	10/9	18/18	33/30	34/30	20/19	10/6	44/24	65/42	64/44	42/26	31/8	78/28	92/37	78/31	31/10
West	9/8	14/15	16/18	60/36	77/34	10/9	17/17	18/20	41/35	74/48	7/5	15/14	18/19	43/33	71/40	5/4	10/10	13/13	52/23	42/12
M. Clr (%hrs)	38	38	36	36	38	41	46	36	31	34	41	44	37	34	41	38	38	39	38	38

Savannah, GA

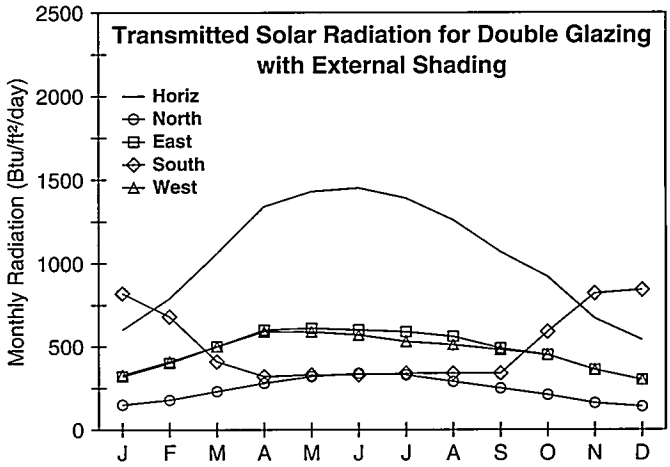
WBAN NO. 03822

LATITUDE: 32.13° N
LONGITUDE: 81.20° W
ELEVATION: 52 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Primary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	880	1120	1480	1850	1970	1990	1920	1740	1490	1290	980	810	1460
	Std.Dev.	69	98	102	122	150	130	117	129	133	117	82	69	34
	Minimum	770	870	1290	1600	1520	1720	1620	1450	1170	980	710	640	1390
	Maximum	1040	1340	1640	2160	2200	2210	2180	2000	1740	1470	1120	920	1540
	Diffuse	380	470	590	700	850	920	940	870	740	520	400	350	640
	Clear-Day Global	1210	1540	1940	2310	2510	2560	2490	2300	1990	1590	1240	1100	1900
North	Global	250	300	380	460	570	630	600	510	420	340	270	230	410
	Diffuse	250	300	380	450	520	540	530	490	420	340	270	230	390
	Clear-Day Global	230	280	350	430	580	680	630	490	390	320	240	210	400
East	Global	550	680	860	1050	1070	1060	1050	980	860	780	620	510	840
	Diffuse	300	370	470	560	630	650	650	610	530	420	330	280	480
	Clear-Day Global	820	1000	1170	1320	1360	1350	1320	1260	1150	990	820	750	1110
South	Global	1170	1190	1130	940	730	640	670	790	970	1220	1240	1170	990
	Diffuse	390	450	510	540	560	550	560	570	560	500	430	380	500
	Clear-Day Global	1980	1910	1610	1150	810	680	730	990	1380	1720	1880	1930	1390
West	Global	560	690	850	1030	1040	1010	950	900	830	760	610	520	810
	Diffuse	300	370	470	560	630	650	640	600	530	420	330	280	480
	Clear-Day Global	820	1000	1170	1320	1360	1350	1320	1260	1150	990	820	750	1110

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

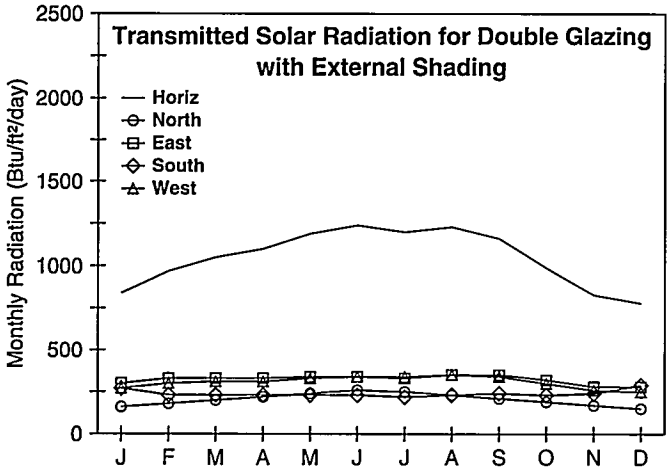
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	600	790	1060	1340	1430	1450	1390	1260	1070	920	670	540	1040
North	Unshaded	170	210	260	310	370	410	390	340	290	240	180	160	280
	Shaded	150	180	230	280	320	340	330	290	250	210	160	140	240
East	Unshaded	380	480	610	750	760	760	740	700	610	550	430	350	590
	Shaded	320	400	500	600	610	600	590	560	490	450	360	300	480
South	Unshaded	870	850	750	580	440	400	420	490	630	850	910	870	670
	Shaded	820	680	410	320	330	330	340	340	340	590	820	840	510
West	Unshaded	390	490	610	730	740	710	670	640	590	540	420	360	570
	Shaded	330	410	500	590	590	570	530	510	480	450	360	300	470

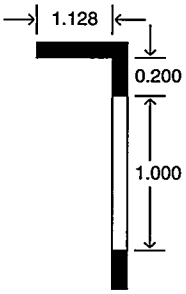
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	48.9	51.8	59.2	66.0	73.5	79.1	81.8	81.0	76.6	67.3	59.1	51.7	66.3
Daily Minimum Temp	38.1	41.1	48.3	54.5	62.9	69.2	72.4	72.2	67.8	56.9	48.1	41.0	56.0
Daily Maximum Temp	59.7	62.4	70.1	77.5	84.0	88.8	91.1	89.7	85.2	77.5	70.0	62.3	76.5
Record Minimum Temp	3.0	14.0	20.0	32.0	39.0	51.0	61.0	57.0	43.0	28.0	15.0	9.0	3.0
Record Maximum Temp	84.0	86.0	91.0	95.0	100.0	104.0	105.0	104.0	98.0	97.0	89.0	83.0	105.0
HDD, Base 65°F	516	378	204	47	0	0	0	0	0	63	213	426	1847
CDD, Base 65°F	16	9	24	77	266	423	521	496	348	135	36	14	2365
Humidity Ratio (#w/#da)	0.0053	0.0056	0.0072	0.0086	0.0117	0.0148	0.0165	0.0167	0.0146	0.0103	0.0078	0.0060	0.0104
Wind Speed (mph)	8.5	9.2	9.2	8.7	7.6	7.4	7.1	6.4	7.1	7.4	7.5	7.7	7.8
Clearness Index, Kt	0.49	0.51	0.53	0.57	0.55	0.54	0.53	0.52	0.51	0.53	0.51	0.48	0.53

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	36/22	76/50	91/60	78/51	39/25	36/26	78/57	102/77	99/76	73/51	21/14	65/43	89/64	85/62	55/38	17/10	50/30	61/37	45/28	11/7
North	9/9	14/16	16/18	15/16	10/10	23/15	17/18	18/20	18/20	17/17	8/6	15/16	18/19	18/19	15/14	6/5	11/11	12/13	10/11	4/3
East	74/28	66/38	18/19	15/16	10/10	64/33	76/49	41/35	18/20	17/17	48/18	73/40	39/31	18/19	15/14	46/14	49/23	12/13	10/11	4/3
South	31/15	63/37	75/45	64/38	33/18	11/10	19/19	33/29	32/29	18/17	13/8	46/28	65/44	62/43	38/24	37/12	79/33	91/40	75/32	26/9
West	9/9	14/16	16/18	63/38	75/33	11/10	17/18	18/20	45/37	75/45	8/6	15/16	18/19	46/35	70/38	6/5	11/11	16/14	53/25	36/11
M. Clr (%hrs)	41	39	37	36	36	39	39	33	31	34	39	37	30	28	33	36	38	37	37	38





Shading Geometry
(Not to Scale)

Hilo, HI

WBAN NO. 21504

LATITUDE: 19.72° N
LONGITUDE: 155.07° W
ELEVATION: 36 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	1190	1350	1450	1520	1630	1710	1650	1680	1590	1380	1170	1110	1450
	Std.Dev.	125	151	162	124	134	105	137	119	134	128	126	115	56
	Minimum	890	1090	1120	1330	1320	1470	1400	1390	1340	1160	920	880	1340
	Maximum	1460	1620	1730	1770	1830	1880	2020	1970	1800	1720	1410	1330	1590
	Diffuse	490	570	710	800	800	790	790	730	680	630	560	490	670
	Clear-Day Global	1720	1980	2280	2500	2580	2590	2580	2510	2330	2050	1760	1620	2210
North	Global	320	360	410	460	570	680	620	490	410	380	330	310	440
	Diffuse	320	360	410	440	480	510	490	440	410	380	330	310	410
	Clear-Day Global	290	310	350	430	710	970	850	510	350	320	290	270	470
East	Global	710	780	800	820	850	860	820	860	860	780	670	650	790
	Diffuse	390	430	490	540	550	550	540	530	510	470	400	370	480
	Clear-Day Global	1040	1170	1310	1390	1400	1390	1380	1380	1320	1210	1070	1000	1250
South	Global	1190	1080	810	580	460	450	440	510	730	950	1050	1160	780
	Diffuse	480	500	500	480	450	450	440	450	480	510	490	470	470
	Clear-Day Global	1980	1740	1270	680	390	380	380	520	1010	1580	1910	2020	1150
West	Global	650	720	760	770	820	870	850	880	840	730	640	610	760
	Diffuse	390	430	500	540	550	560	550	540	510	460	410	380	480
	Clear-Day Global	1040	1170	1310	1390	1400	1390	1380	1380	1320	1210	1070	1000	1250

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	840	970	1050	1100	1190	1240	1200	1230	1160	990	830	780	1050
North	Unshaded	220	250	280	310	350	410	380	320	280	260	230	210	290
	Shaded	160	180	200	220	240	260	250	230	210	190	170	150	200
East	Unshaded	490	550	570	580	600	600	580	610	610	550	470	460	560
	Shaded	300	330	330	330	340	340	330	350	350	320	280	280	320
South	Unshaded	850	730	510	360	310	310	310	320	430	620	740	840	530
	Shaded	270	230	230	230	230	230	220	230	240	230	240	290	240
West	Unshaded	450	500	530	540	580	610	600	630	590	510	440	430	540
	Shaded	270	300	310	310	330	340	340	350	340	300	260	250	310

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	71.7	71.7	72.0	72.7	73.9	75.2	75.8	76.3	76.2	75.7	74.2	72.4	74.0
Daily Minimum Temp	63.6	63.6	64.4	65.5	66.5	67.6	68.6	68.9	68.6	68.1	66.8	64.8	66.4
Daily Maximum Temp	79.8	79.8	79.5	79.8	81.2	82.7	83.0	83.6	83.8	83.2	81.4	80.0	81.5
Record Minimum Temp	54.0	53.0	54.0	56.0	58.0	60.0	62.0	63.0	61.0	62.0	58.0	55.0	53.0
Record Maximum Temp	91.0	92.0	93.0	89.0	94.0	90.0	89.0	93.0	92.0	91.0	90.0	93.0	94.0
HDD, Base 65°F	0	0	0	0	0	0	0	0	0	0	0	0	0
CDD, Base 65°F	208	188	217	231	276	306	335	350	336	332	276	229	3284
Humidity Ratio (#w/#da)	0.0123	0.0122	0.0126	0.0133	0.0137	0.0141	0.0148	0.0151	0.0149	0.0148	0.0140	0.0130	0.0137
Wind Speed (mph)	7.9	8.1	8.1	8.1	7.9	7.6	7.4	7.2	7.1	7.2	7.3	7.6	7.6
Clearness Index, Kt	0.49	0.49	0.46	0.45	0.47	0.49	0.47	0.50	0.50	0.48	0.46	0.48	0.48

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

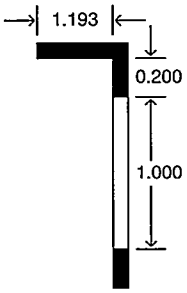
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	43/26	84/51	100/65	83/53	41/24	57/37	91/61	104/75	87/62	49/32	51/32	90/58	101/71	82/56	39/25	32/19	68/40	78/52	60/39	20/13
North	11/11	15/16	16/19	16/18	11/10	30/20	25/22	21/21	26/24	30/19	12/12	16/17	16/18	16/17	11/10	9/8	14/14	15/17	13/14	7/6
East	80/31	65/36	17/19	16/18	11/10	78/39	58/40	15/17	16/18	12/12	81/37	61/39	16/18	16/17	11/10	64/23	53/28	15/17	13/14	7/6
South	27/15	48/29	56/38	48/31	26/14	13/13	16/17	15/17	16/18	12/12	23/16	41/29	46/36	37/29	17/12	48/19	76/37	82/47	69/36	34/12
West	11/11	15/16	17/19	65/38	75/28	13/13	16/17	19/20	64/45	76/36	12/12	16/17	23/22	69/45	75/32	9/8	14/14	21/19	58/32	51/17
M. Clr (%hrs)	23	26	25	21	18	17	21	22	20	16	27	29	28	26	21	33	35	35	30	24

Honolulu, HI

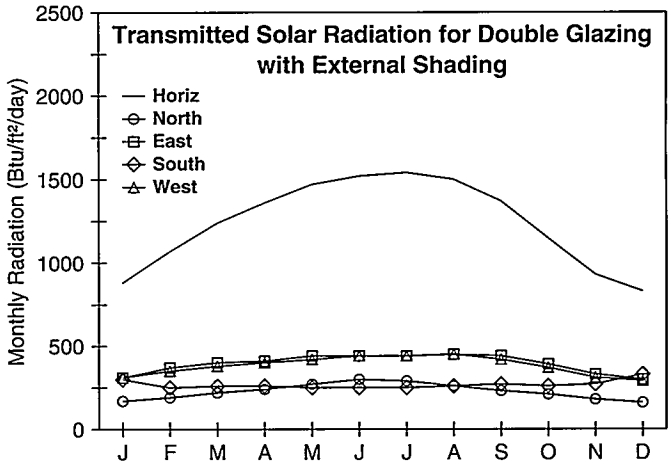
WBAN NO. 22521

LATITUDE: 21.33° N
LONGITUDE: 157.92° W
ELEVATION: 16 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Primary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	1240	1490	1710	1870	2010	2070	2090	2050	1880	1590	1310	1180	1710
	Std.Dev.	89	118	135	115	98	60	69	78	73	68	73	81	37
	Minimum	1020	1180	1410	1600	1780	1950	1940	1850	1700	1470	1150	1020	1590
	Maximum	1390	1630	1930	2060	2170	2170	2200	2180	2000	1710	1430	1300	1780
	Diffuse	500	550	660	750	740	740	700	'670	650	590	530	470	630
	Clear-Day Global	1650	1930	2250	2490	2600	2620	2600	2510	2320	2000	1700	1560	2190
North	Global	320	370	410	480	630	780	710	530	430	380	340	310	470
	Diffuse	320	370	410	460	490	530	500	460	420	380	340	310	420
	Clear-Day Global	280	310	350	430	680	910	800	500	350	320	280	260	460
East	Global	750	890	980	1030	1090	1100	1110	1110	1070	950	780	730	970
	Diffuse	410	460	520	580	590	590	580	570	550	490	430	390	510
	Clear-Day Global	1020	1160	1300	1390	1410	1400	1400	1390	1320	1190	1040	970	1250
South	Global	1330	1280	1010	680	490	460	450	580	890	1180	1300	1350	920
	Diffuse	520	540	540	510	460	460	450	470	520	550	540	510	500
	Clear-Day Global	2000	1780	1320	740	420	390	380	570	1070	1620	1930	2030	1180
West	Global	740	860	950	1000	1050	1090	1110	1110	1030	890	760	690	940
	Diffuse	400	460	530	580	590	590	580	570	550	490	430	390	510
	Clear-Day Global	1020	1160	1300	1390	1410	1400	1400	1390	1320	1190	1040	970	1250

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

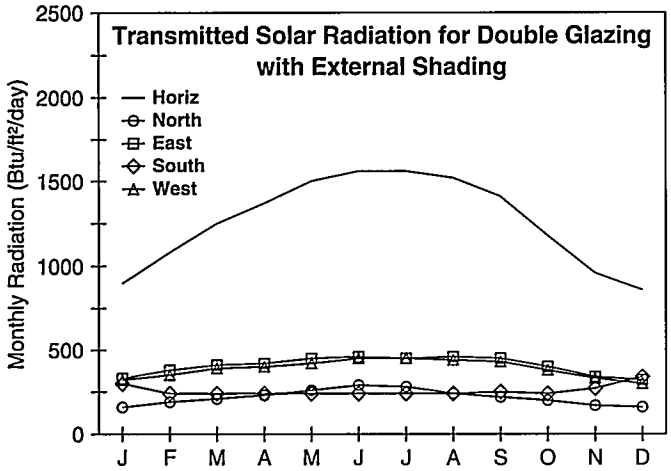
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	880	1070	1240	1360	1470	1520	1540	1500	1370	1150	930	830	1240
North	Unshaded	220	250	290	320	380	450	410	330	290	270	240	210	310
	Shaded	170	190	220	240	270	300	290	260	230	210	180	160	230
East	Unshaded	520	630	700	740	780	780	790	800	770	670	550	510	690
	Shaded	310	370	400	410	440	440	440	450	440	390	330	300	390
South	Unshaded	960	870	620	400	320	320	310	350	520	770	920	990	610
	Shaded	300	250	260	260	250	250	250	260	270	260	270	330	270
West	Unshaded	520	600	680	710	750	780	790	790	740	630	530	480	670
	Shaded	310	350	380	400	420	440	440	450	420	370	310	290	380

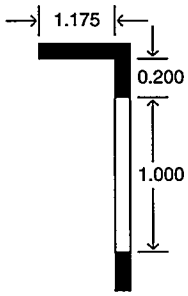
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	72.9	73.0	74.4	75.8	77.5	79.4	80.5	81.4	81.0	79.6	77.2	74.1	77.2
Daily Minimum Temp	65.6	65.4	67.2	68.7	70.3	72.2	73.5	74.2	73.5	72.3	70.3	67.0	70.0
Daily Maximum Temp	80.1	80.5	81.6	82.8	84.7	86.5	87.5	88.7	88.5	86.9	84.1	81.2	84.4
Record Minimum Temp	53.0	53.0	55.0	57.0	60.0	65.0	66.0	67.0	66.0	64.0	57.0	54.0	53.0
Record Maximum Temp	87.0	88.0	88.0	89.0	93.0	92.0	92.0	93.0	94.0	94.0	93.0	89.0	94.0
HDD, Base 65°F	0	0	0	0	0	0	0	0	0	0	0	0	0
CDD, Base 65°F	245	224	291	324	388	432	481	508	480	453	366	282	4474
Humidity Ratio (#w/#da)	0.0119	0.0115	0.0116	0.0119	0.0123	0.0127	0.0132	0.0135	0.0136	0.0136	0.0131	0.0123	0.0126
Wind Speed (mph)	9.6	9.7	11.1	11.4	11.4	12.3	12.7	12.0	10.9	10.2	10.4	9.6	11.0
Clearness Index, Kt	0.53	0.56	0.56	0.55	0.58	0.59	0.60	0.60	0.59	0.57	0.54	0.53	0.57

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	38/27	81/59	98/75	86/64	46/32	53/41	90/73	105/87	90/75	54/42	47/36	87/70	100/84	85/69	44/33	25/17	63/44	76/55	61/43	23/16
North	10/10	15/17	17/19	16/18	12/12	29/23	24/24	19/19	24/24	29/23	12/13	16/18	17/19	16/18	11/12	8/7	14/14	15/17	14/15	8/7
East	76/38	69/47	22/22	16/18	12/12	77/52	63/52	16/17	16/18	13/14	79/51	65/53	17/19	16/18	11/12	56/25	55/35	16/17	14/15	8/7
South	25/16	49/36	59/46	52/39	30/20	13/14	16/18	15/17	16/18	13/14	22/19	42/38	49/44	41/36	20/17	41/19	74/44	83/54	72/43	36/17
West	10/10	15/17	17/19	62/46	77/40	13/14	16/18	15/17	61/52	77/52	12/13	16/18	18/20	66/54	76/46	8/7	14/14	17/18	56/35	51/22
M. Clr (%hrs)	45	40	38	38	39	41	37	35	37	40	50	44	39	40	42	48	45	39	41	42





Shading Geometry
(Not to Scale)

Kahului, HI

WBAN NO. 22516

LATITUDE: 20.90° N
LONGITUDE: 156.43° W
ELEVATION: 49 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	1280	1500	1710	1870	2030	2120	2110	2070	1920	1630	1350	1230	1740
	Std.Dev.	101	126	163	140	112	101	102	99	71	98	106	77	62
	Minimum	1040	1210	1330	1450	1780	1950	1910	1840	1760	1420	1130	1050	1600
	Maximum	1480	1710	1990	2120	2230	2360	2290	2240	2050	1810	1530	1370	1850
	Diffuse	420	470	560	640	610	580	560	540	510	490	440	400	520
	Clear-Day Global	1670	1940	2260	2500	2590	2610	2590	2510	2320	2020	1720	1580	2190
North	Global	300	340	390	460	620	800	710	500	390	360	320	290	460
	Diffuse	300	340	390	430	460	480	460	420	390	360	320	290	390
	Clear-Day Global	280	310	350	430	690	930	810	500	350	320	280	270	460
East	Global	780	900	990	1060	1130	1130	1130	1130	1110	970	820	750	990
	Diffuse	380	420	480	530	530	530	520	510	490	450	390	360	470
	Clear-Day Global	1020	1150	1300	1390	1410	1400	1390	1380	1320	1200	1050	980	1250
South	Global	1390	1280	990	650	450	420	420	540	880	1200	1370	1430	920
	Diffuse	470	480	490	460	430	420	410	420	460	490	480	460	460
	Clear-Day Global	2000	1770	1310	720	410	380	380	560	1060	1610	1930	2030	1180
West	Global	740	850	950	990	1060	1120	1120	1110	1040	910	790	720	950
	Diffuse	370	430	490	530	540	530	530	520	490	450	400	360	470
	Clear-Day Global	1020	1150	1300	1390	1410	1400	1390	1380	1320	1200	1050	980	1250

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	900	1080	1250	1370	1500	1560	1560	1520	1410	1180	960	860	1260
North	Unshaded	210	240	270	300	370	440	400	310	270	250	220	200	290
	Shaded	160	190	210	230	260	290	280	240	220	200	170	160	220
East	Unshaded	550	640	710	760	810	810	810	810	800	690	580	530	710
	Shaded	330	380	410	420	450	460	450	460	450	400	340	320	410
South	Unshaded	1000	870	600	370	300	290	290	320	490	780	970	1040	610
	Shaded	300	240	240	240	240	240	240	240	250	240	270	340	260
West	Unshaded	520	600	670	700	750	800	800	790	740	640	550	500	670
	Shaded	320	350	390	400	420	450	450	440	430	380	330	300	390

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	71.7	71.8	73.0	74.2	75.7	77.5	78.7	79.3	78.8	77.9	75.7	73.1	75.6
Daily Minimum Temp	63.6	63.4	64.6	66.1	67.0	69.0	70.5	70.8	69.8	69.2	67.6	65.1	67.2
Daily Maximum Temp	79.9	80.1	81.2	82.2	84.2	85.9	86.8	87.6	87.7	86.4	83.7	81.1	83.9
Record Minimum Temp	48.0	50.0	55.0	54.0	57.0	58.0	58.0	61.0	60.0	58.0	55.0	52.0	48.0
Record Maximum Temp	89.0	88.0	90.0	91.0	92.0	93.0	94.0	96.0	95.0	96.0	93.0	90.0	96.0
HDD, Base 65°F	0	0	0	0	0	0	0	0	0	0	0	0	0
CDD, Base 65°F	208	190	248	276	332	375	425	443	414	400	321	251	3883
Humidity Ratio (#w/#da)	0.0124	0.0121	0.0123	0.0126	0.0130	0.0135	0.0140	0.0144	0.0142	0.0141	0.0136	0.0127	0.0132
Wind Speed (mph)	11.6	12.0	12.8	14.0	15.0	15.8	16.6	15.9	13.8	12.4	12.8	11.2	13.7
Clearness Index, Kt	0.54	0.56	0.56	0.55	0.58	0.60	0.61	0.61	0.60	0.58	0.55	0.54	0.58

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

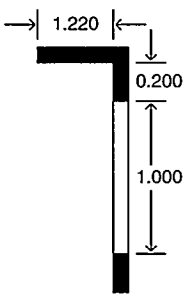
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	41/28	83/56	99/71	85/60	45/29	56/43	92/73	105/86	90/71	53/40	51/39	89/71	102/82	85/66	42/30	29/19	66/45	77/55	61/41	22/14
North	10/10	15/17	16/18	15/17	11/11	29/24	24/23	19/19	24/23	29/23	11/12	15/17	16/18	15/17	10/11	8/8	13/14	15/16	13/14	7/6
East	80/38	67/43	18/20	15/17	11/11	80/54	61/50	15/16	15/17	12/13	84/55	63/51	16/18	15/17	10/11	63/27	55/34	15/16	13/14	7/6
South	26/17	49/34	58/43	51/36	29/18	12/13	16/17	15/16	15/17	12/13	23/20	42/37	48/43	39/35	19/15	46/21	77/45	84/54	72/41	37/16
West	10/10	15/17	16/18	64/44	79/38	12/13	16/17	17/17	63/51	80/51	11/12	15/17	20/21	68/53	79/44	8/8	13/14	18/18	58/34	55/21
M. Clr (%hrs)	52	50	43	43	44	50	48	50	52	51	59	58	56	52	48	53	53	51	50	48

Lihue, HI

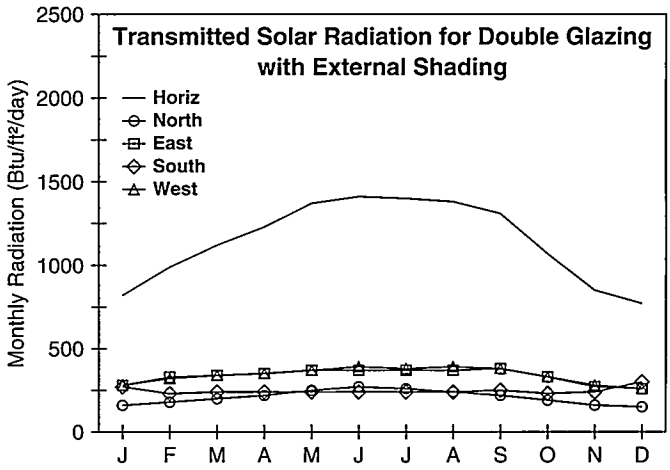
WBAN NO. 22536

LATITUDE: 21.98° N
LONGITUDE: 159.35° W
ELEVATION: 148 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	1170	1380	1540	1690	1870	1920	1900	1880	1790	1480	1190	1100	1570
	Std.Dev.	91	132	163	121	110	108	111	114	84	76	82	86	48
	Minimum	890	1080	1150	1430	1630	1700	1650	1640	1570	1310	980	910	1450
	Maximum	1340	1600	1890	1910	2110	2250	2120	2060	1930	1610	1350	1280	1690
	Diffuse	470	540	660	750	730	720	720	670	600	560	510	450	610
	Clear-Day Global	1620	1910	2230	2490	2590	2620	2590	2500	2300	1980	1670	1530	2170
North	Global	310	350	400	460	570	690	630	490	410	360	320	290	440
	Diffuse	310	350	400	440	470	500	480	440	400	360	320	290	400
	Clear-Day Global	270	310	340	430	670	890	770	490	350	310	280	260	450
East	Global	690	800	850	910	970	970	950	970	960	830	680	650	850
	Diffuse	380	440	500	550	560	560	560	550	520	450	400	360	480
	Clear-Day Global	1010	1150	1300	1390	1410	1410	1400	1390	1310	1180	1030	950	1250
South	Global	1250	1180	920	650	480	440	450	570	870	1100	1160	1250	860
	Diffuse	480	500	510	490	450	440	440	450	490	500	500	470	480
	Clear-Day Global	2000	1800	1340	760	430	380	390	600	1090	1630	1940	2030	1200
West	Global	680	790	850	890	950	1000	990	1010	980	820	680	640	860
	Diffuse	380	440	500	550	560	560	560	540	520	450	400	360	490
	Clear-Day Global	1010	1150	1300	1390	1410	1410	1400	1390	1310	1180	1030	950	1250

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

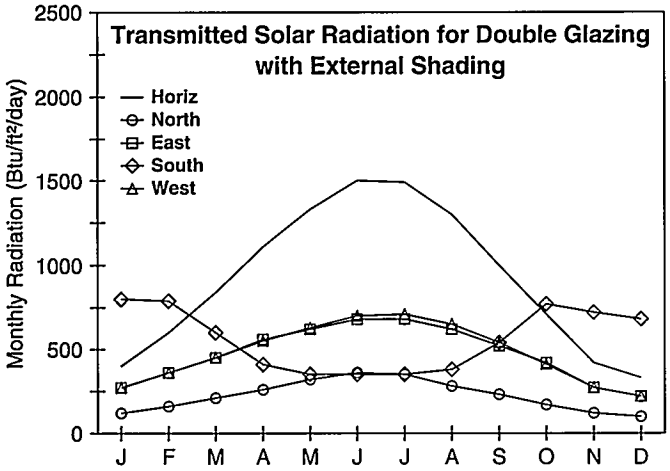
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	820	990	1120	1230	1370	1410	1400	1380	1310	1070	850	770	1140
North	Unshaded	210	240	280	310	350	410	380	320	280	250	220	200	290
	Shaded	160	180	200	220	250	270	260	240	220	190	160	150	210
East	Unshaded	480	570	600	640	680	680	670	680	690	580	480	450	600
	Shaded	280	330	340	350	370	370	370	370	380	330	270	260	340
South	Unshaded	900	810	570	390	320	310	310	340	510	720	830	910	580
	Shaded	270	230	240	240	240	240	240	240	250	230	240	300	250
West	Unshaded	480	560	600	630	680	710	700	720	700	580	480	450	610
	Shaded	280	320	340	350	370	390	380	390	380	330	280	260	340

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	71.6	71.6	72.7	74.0	75.8	77.8	78.9	79.5	79.2	77.6	75.5	72.9	75.6
Daily Minimum Temp	65.3	65.1	66.9	68.5	70.3	72.5	73.7	74.2	73.5	72.0	70.3	67.1	70.0
Daily Maximum Temp	77.9	78.1	78.5	79.5	81.2	83.1	84.1	84.8	84.8	83.2	80.7	78.6	81.2
Record Minimum Temp	50.0	52.0	51.0	56.0	59.0	61.0	62.0	66.0	65.0	62.0	57.0	52.0	50.0
Record Maximum Temp	85.0	86.0	88.0	88.0	88.0	89.0	89.0	90.0	89.0	90.0	87.0	86.0	90.0
HDD, Base 65°F	0	0	0	0	0	0	0	0	0	0	0	0	0
CDD, Base 65°F	209	188	239	270	335	384	431	450	426	391	315	245	3883
Humidity Ratio (#w/#da)	0.0119	0.0117	0.0121	0.0126	0.0133	0.0140	0.0146	0.0149	0.0149	0.0145	0.0137	0.0125	0.0134
Wind Speed (mph)	11.7	11.9	13.3	14.4	13.7	13.7	14.4	13.1	12.0	11.9	12.8	11.6	12.9
Clearness Index, Kt	0.50	0.52	0.50	0.50	0.53	0.54	0.54	0.55	0.56	0.53	0.49	0.50	0.53

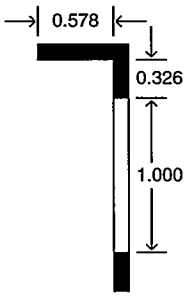
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	35/23	79/52	97/68	87/59	48/31	51/36	89/65	104/82	92/71	57/41	43/32	84/66	100/79	85/67	45/33	22/15	61/39	75/52	61/41	25/16
North	9/9	15/16	16/19	16/18	11/12	28/21	23/22	17/18	22/22	28/21	11/12	16/17	16/18	16/18	11/12	7/7	13/14	15/16	13/14	8/7
East	74/32	70/42	24/23	16/18	11/12	77/44	64/47	18/19	16/18	13/14	76/46	66/51	18/19	16/18	11/12	54/21	56/32	16/17	13/14	8/7
South	24/14	49/32	59/42	54/37	32/19	12/13	16/18	15/16	16/18	13/14	21/17	42/35	50/43	42/36	22/17	38/16	74/39	85/51	74/41	41/17
West	9/9	15/16	16/19	60/40	79/36	12/13	16/18	15/16	60/47	78/47	11/12	16/17	17/18	64/50	77/46	7/7	13/14	15/16	54/32	56/22
M. Clr (%hrs)	25	29	29	28	26	24	33	34	34	32	30	42	44	42	37	33	39	37	37	33



Des Moines, IA

WBAN NO. 14933



Shading Geometry
(Not to Scale)

LATITUDE: 41.53° N
LONGITUDE: 93.65° W
ELEVATION: 965 feet
MEAN PRESSURE: 14.2 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	630	890	1200	1550	1840	2060	2050	1790	1410	1030	650	520	1300
	Std.Dev.	45	60	97	121	122	122	132	112	122	90	55	43	40
	Minimum	530	770	950	1350	1510	1850	1820	1550	1140	880	550	430	1230
	Maximum	700	1010	1410	1770	2110	2390	2300	2000	1730	1230	780	620	1430
	Diffuse	300	420	560	680	790	800	770	670	550	400	310	270	550
	Clear-Day Global	850	1200	1690	2190	2520	2640	2550	2260	1810	1300	900	740	1720
North	Global	190	260	350	440	550	630	600	480	370	270	200	170	380
	Diffuse	190	260	350	420	500	530	510	450	360	270	200	170	350
	Clear-Day Global	170	230	320	420	580	690	630	470	340	250	180	150	370
East	Global	440	590	740	920	1050	1140	1150	1040	860	680	440	370	790
	Diffuse	240	330	420	510	590	630	620	550	450	340	240	210	430
	Clear-Day Global	660	870	1130	1350	1470	1500	1460	1360	1170	910	690	590	1100
South	Global	1090	1160	1100	990	880	840	890	1020	1150	1230	1010	930	1020
	Diffuse	350	430	490	530	570	580	570	550	500	420	340	310	470
	Clear-Day Global	1910	1990	1840	1470	1140	990	1040	1300	1660	1870	1870	1820	1570
West	Global	450	580	740	920	1060	1170	1180	1070	890	670	450	370	800
	Diffuse	240	330	420	520	600	640	630	560	460	340	250	210	430
	Clear-Day Global	660	870	1130	1350	1470	1500	1460	1360	1170	910	690	590	1100

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	400	600	840	1110	1330	1500	1490	1300	1000	710	420	330	920
North	Unshaded	130	180	240	300	360	410	390	320	250	190	140	120	250
	Shaded	120	160	210	260	320	360	350	280	230	170	120	100	220
East	Unshaded	300	420	530	650	740	810	820	740	610	480	310	250	560
	Shaded	270	360	450	560	620	680	680	620	520	420	270	220	470
South	Unshaded	820	860	770	650	550	510	540	650	780	890	750	700	710
	Shaded	800	790	600	410	350	350	350	380	540	770	720	680	560
West	Unshaded	310	410	520	650	750	840	850	770	630	470	310	250	560
	Shaded	270	360	450	550	630	700	710	650	540	410	270	220	480

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	19.4	24.7	37.3	50.9	62.3	71.8	76.6	73.9	65.1	53.5	39.0	24.4	49.9
Daily Minimum Temp	10.7	15.6	27.6	40.0	51.5	61.2	66.5	63.6	54.5	42.7	29.9	16.1	40.0
Daily Maximum Temp	28.1	33.7	46.9	61.8	73.0	82.2	86.7	84.2	75.6	64.3	48.0	32.6	59.8
Record Minimum Temp	-24.0	-20.0	-22.0	9.0	30.0	38.0	47.0	40.0	26.0	14.0	-4.0	-22.0	-24.0
Record Maximum Temp	65.0	73.0	91.0	93.0	98.0	103.0	105.0	108.0	101.0	95.0	76.0	69.0	108.0
HDD, Base 65°F	1414	1128	859	428	165	10	0	11	71	372	780	1259	6497
CDD, Base 65°F	0	0	0	5	81	214	360	287	74	15	0	0	1036
Humidity Ratio (#w/#da)	0.0018	0.0022	0.0033	0.0052	0.0078	0.0111	0.0134	0.0126	0.0096	0.0060	0.0038	0.0023	0.0066
Wind Speed (mph)	11.5	11.1	12.4	12.4	10.8	9.9	8.8	8.5	9.2	9.9	10.8	10.9	10.5
Clearness Index, Kt	0.49	0.51	0.50	0.51	0.53	0.56	0.57	0.56	0.53	0.52	0.46	0.45	0.53

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

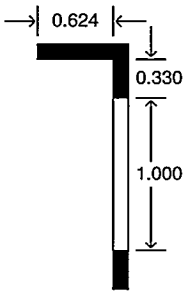
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	34/20	67/43	79/50	65/40	29/18	44/30	81/55	100/71	96/72	72/52	24/13	62/38	83/51	78/51	50/32	10/6	36/22	44/27	29/18	3/2
North	9/8	13/15	14/17	13/14	8/8	19/14	16/17	17/19	17/19	15/16	7/6	13/14	15/17	15/16	12/12	4/3	9/9	10/11	8/8	2/1
East	72/24	60/32	14/17	13/14	8/8	77/38	75/46	36/30	17/19	15/16	61/18	72/34	33/24	15/16	12/12	33/8	40/17	10/11	8/8	2/1
South	36/15	73/36	86/44	71/33	32/14	11/11	32/25	49/37	46/37	25/21	18/8	56/28	77/41	72/41	43/23	28/7	77/26	89/32	66/22	8/3
West	9/8	13/15	17/18	63/31	68/25	11/11	16/17	17/19	47/38	78/50	7/6	13/14	15/17	49/31	75/35	4/3	9/9	17/12	47/17	11/3
M. Clr (%hrs)	32	30	28	28	30	40	40	35	35	39	46	44	44	45	46	33	31	30	30	31

Mason City, IA

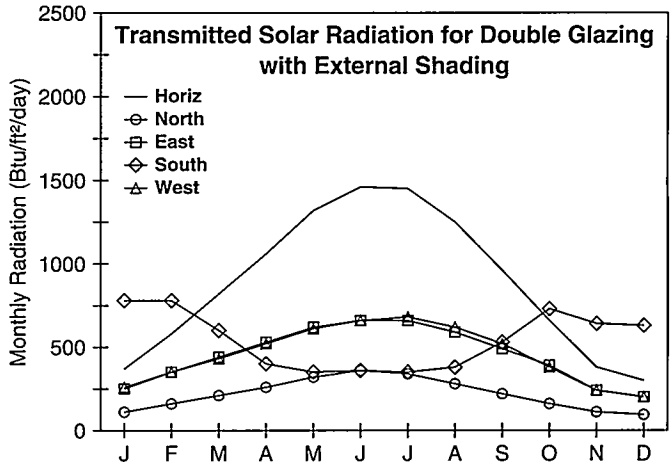
WBAN NO. 14940

LATITUDE: 43.15° N
LONGITUDE: 93.33° W
ELEVATION: 1224 feet
MEAN PRESSURE: 14.1 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	590	860	1170	1490	1830	2010	2000	1740	1350	960	580	480	1260
	Std.Dev.	44	58	107	123	108	125	110	106	114	79	46	41	39
	Minimum	510	710	950	1230	1520	1770	1780	1530	1070	770	460	420	1180
	Maximum	680	970	1370	1790	1990	2250	2250	1940	1580	1130	680	570	1350
	Diffuse	300	430	590	700	800	840	790	700	560	410	310	270	560
	Clear-Day Global	790	1150	1650	2160	2510	2650	2550	2230	1770	1240	830	670	1680
North	Global	190	260	350	440	550	630	600	480	360	270	190	160	370
	Diffuse	190	260	350	430	500	540	520	450	360	270	190	160	350
	Clear-Day Global	160	230	310	410	580	690	640	460	340	240	170	150	370
East	Global	420	580	740	890	1050	1140	1130	1010	830	640	400	340	760
	Diffuse	230	330	430	510	600	640	620	560	450	330	230	200	430
	Clear-Day Global	630	850	1120	1350	1480	1520	1480	1360	1160	890	650	560	1090
South	Global	1060	1160	1100	990	920	870	910	1030	1140	1170	900	870	1010
	Diffuse	350	440	510	540	580	590	590	560	500	420	330	310	480
	Clear-Day Global	1870	1990	1890	1520	1190	1050	1100	1350	1690	1870	1830	1770	1590
West	Global	420	570	720	880	1050	1140	1160	1050	860	630	400	340	770
	Diffuse	230	330	430	520	610	650	640	570	450	340	240	200	430
	Clear-Day Global	630	850	1120	1350	1480	1520	1480	1360	1160	890	650	560	1090

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

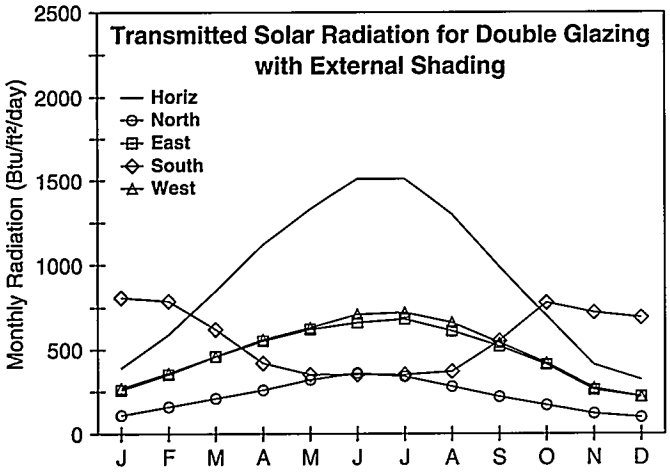
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	370	580	820	1060	1320	1460	1450	1250	960	660	380	300	890
North	Unshaded	130	180	240	300	360	410	390	320	250	190	130	110	250
	Shaded	110	160	210	260	320	360	340	280	220	160	110	94	220
East	Unshaded	290	400	520	640	750	810	800	720	590	450	270	230	540
	Shaded	250	350	440	530	620	660	660	590	490	390	240	200	450
South	Unshaded	800	860	780	660	580	530	560	660	780	850	680	650	700
	Shaded	780	780	600	400	350	360	350	380	530	730	640	630	540
West	Unshaded	290	400	510	630	750	810	830	750	610	440	280	230	540
	Shaded	260	350	430	520	610	660	680	620	520	380	240	200	460

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	13.2	18.7	31.4	46.3	58.7	68.4	72.5	69.8	60.7	49.2	34.0	18.3	45.1
Daily Minimum Temp	4.2	9.8	22.8	35.6	46.8	56.8	61.5	58.6	49.2	37.9	24.9	10.2	34.9
Daily Maximum Temp	22.1	27.5	40.0	57.0	70.5	79.9	83.6	80.9	72.2	60.5	42.9	26.5	55.3
Record Minimum Temp	-33.0	-24.0	-27.0	6.1	23.0	37.9	44.1	39.0	26.1	12.0	-16.1	-26.0	-33.0
Record Maximum Temp	59.0	66.0	82.9	93.0	93.9	102.9	102.9	100.0	97.0	95.0	73.0	64.9	102.9
HDD, Base 65°F	1606	1296	1042	561	233	39	10	27	149	496	930	1448	7837
CDD, Base 65°F	0	0	0	0	38	141	242	175	20	7	0	0	623
Humidity Ratio (#w/#da)	0.0015	0.0019	0.0030	0.0047	0.0072	0.0104	0.0129	0.0122	0.0090	0.0056	0.0035	0.0020	0.0062
Wind Speed (mph)	13.2	12.2	13.3	13.2	12.0	10.9	8.9	8.4	9.6	10.9	12.1	12.5	11.4
Clearness Index, Kt	0.50	0.52	0.50	0.49	0.52	0.54	0.56	0.54	0.52	0.50	0.44	0.45	0.52

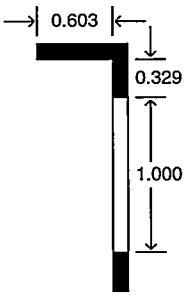
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	33/20	65/42	76/51	62/39	27/18	45/29	80/54	98/68	94/68	70/50	23/13	60/36	80/50	75/49	48/31	8/6	33/21	41/25	25/16	2/2
North	9/8	13/15	14/17	13/14	8/8	17/13	16/17	17/19	17/19	15/16	7/6	13/13	15/17	15/16	11/12	4/3	9/9	10/10	7/7	1/1
East	70/23	58/30	14/17	13/14	8/8	77/36	74/45	35/28	17/19	15/16	60/17	70/31	32/23	15/16	11/12	28/7	38/16	10/10	7/7	1/1
South	37/15	74/35	87/45	71/32	31/14	11/11	34/26	52/37	48/37	26/22	18/8	56/27	78/40	73/40	43/23	25/7	75/25	87/31	61/20	6/2
West	9/8	13/15	18/19	63/30	65/23	11/11	16/17	17/19	47/37	77/49	7/6	13/13	15/17	48/30	73/34	4/3	9/9	17/12	43/15	7/2
M. Clr (%hrs)	32	32	28	27	29	41	42	37	33	35	43	43	43	43	45	31	30	28	29	32



Sioux City, IA

WBAN NO. 14943



Shading Geometry
(Not to Scale)

LATITUDE: 42.40° N
LONGITUDE: 96.38° W
ELEVATION: 1102 feet
MEAN PRESSURE: 14.2 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	610	870	1210	1560	1850	2080	2070	1800	1390	1010	630	510	1300
	Std.Dev.	37	68	107	143	142	117	116	114	131	88	54	32	41
	Minimum	510	720	940	1250	1420	1810	1840	1600	1130	880	500	440	1220
	Maximum	680	1010	1410	1740	2120	2270	2320	2000	1680	1190	740	570	1400
	Diffuse	290	420	560	670	780	790	740	660	540	400	310	270	530
	Clear-Day Global	820	1180	1680	2180	2530	2650	2560	2260	1800	1280	870	700	1710
North	Global	190	260	350	430	550	630	600	470	360	270	190	160	370
	Diffuse	190	260	350	420	500	530	510	440	360	270	190	160	350
	Clear-Day Global	170	230	310	420	580	690	640	450	340	250	170	150	370
East	Global	430	580	760	920	1050	1130	1140	1020	850	670	430	360	780
	Diffuse	230	320	420	510	590	630	610	540	440	330	240	200	420
	Clear-Day Global	650	880	1130	1360	1490	1520	1480	1360	1180	920	680	580	1100
South	Global	1100	1170	1150	1030	910	870	920	1040	1160	1240	1010	940	1040
	Diffuse	350	430	500	530	570	580	570	550	490	420	330	310	470
	Clear-Day Global	1900	2000	1870	1500	1170	1010	1060	1310	1680	1890	1870	1810	1590
West	Global	440	590	760	930	1060	1190	1200	1090	890	680	450	360	800
	Diffuse	230	330	430	520	600	640	620	550	450	340	240	200	430
	Clear-Day Global	650	880	1130	1360	1490	1520	1480	1360	1180	920	680	580	1100

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	390	590	850	1120	1330	1510	1510	1300	990	700	410	320	920
North	Unshaded	130	180	240	290	360	410	390	320	250	190	130	110	250
	Shaded	110	160	210	260	320	360	340	280	220	170	120	97	220
East	Unshaded	300	400	540	660	750	800	820	730	610	470	300	250	550
	Shaded	260	350	460	550	620	660	680	610	520	410	260	220	470
South	Unshaded	830	860	800	680	570	530	560	660	790	900	750	710	720
	Shaded	810	790	620	420	350	350	350	370	550	780	720	690	560
West	Unshaded	300	410	540	670	760	850	860	780	630	480	310	250	570
	Shaded	270	360	460	560	630	710	720	660	540	420	270	220	480

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	17.7	23.6	35.8	50.2	61.6	70.8	75.7	72.8	63.4	51.8	36.4	21.8	48.5
Daily Minimum Temp	7.7	13.9	25.7	38.3	50.0	59.6	64.8	62.0	51.9	39.6	26.4	12.7	37.7
Daily Maximum Temp	27.6	33.2	45.8	62.2	73.2	82.1	86.5	83.5	74.9	64.0	46.4	30.9	59.2
Record Minimum Temp	-26.0	-26.0	-22.0	-2.0	25.0	38.0	42.0	37.0	24.0	13.0	-9.0	-24.0	-26.0
Record Maximum Temp	70.0	71.0	91.0	97.0	102.0	108.0	107.0	104.0	102.0	93.0	81.0	68.0	108.0
HDD, Base 65°F	1466	1159	905	444	171	19	0	12	103	417	858	1339	6893
CDD, Base 65°F	0	0	0	0	65	193	332	254	55	8	0	0	907
Humidity Ratio (#w/#da)	0.0017	0.0021	0.0032	0.0048	0.0076	0.0110	0.0135	0.0127	0.0091	0.0056	0.0034	0.0021	0.0064
Wind Speed (mph)	11.6	11.4	12.7	13.3	12.0	10.7	9.4	9.2	9.8	10.5	11.2	11.4	11.1
Clearness Index, Kt	0.50	0.51	0.51	0.52	0.53	0.56	0.58	0.56	0.53	0.52	0.46	0.46	0.53

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

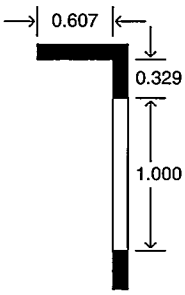
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	30/18	65/41	79/51	67/42	33/21	41/26	78/53	99/70	98/73	75/55	20/12	59/35	81/48	79/49	54/33	6/4	33/20	43/26	30/18	4/3
North	8/8	13/14	14/17	13/15	9/8	20/13	15/17	17/19	17/19	15/16	7/5	13/13	15/16	15/16	12/12	3/2	8/8	10/10	8/8	2/1
East	70/24	63/33	17/18	13/15	9/8	77/33	77/46	40/32	17/19	15/16	57/16	74/33	37/24	15/16	12/12	26/7	43/17	10/10	8/8	2/1
South	33/14	71/36	87/45	74/36	37/17	11/10	31/24	50/38	49/39	29/24	15/7	54/26	78/38	75/40	48/25	21/6	75/26	89/34	69/23	11/3
West	8/8	13/14	14/17	60/32	72/28	11/10	15/17	17/19	43/35	78/51	7/5	13/13	15/16	45/28	76/34	3/2	8/8	13/11	45/17	15/4
M. Clr (%hrs)	32	30	29	31	29	37	40	40	37	40	44	44	46	45	45	31	31	30	32	35

Waterloo, IA

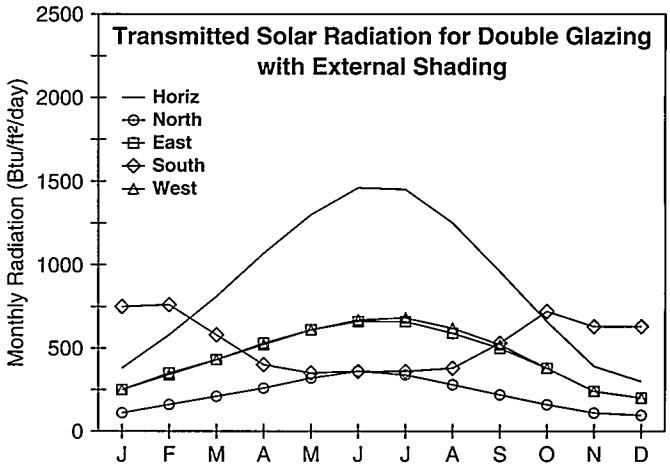
WBAN NO. 94910

LATITUDE: 42.55° N
LONGITUDE: 92.40° W
ELEVATION: 869 feet
MEAN PRESSURE: 14.3 psia

STATION TYPE: Secondary



Shading Geometry (Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	600	860	1150	1490	1810	2010	1990	1740	1350	960	590	480	1250
	Std.Dev.	49	51	93	121	121	116	123	102	117	82	46	40	40
	Minimum	490	740	940	1290	1540	1810	1740	1480	1090	770	470	410	1180
	Maximum	680	960	1350	1760	2060	2330	2230	1930	1630	1130	670	580	1380
	Diffuse	310	440	590	710	810	850	800	710	570	420	320	270	570
	Clear-Day Global	810	1170	1660	2170	2510	2640	2550	2240	1780	1260	850	690	1700
North	Global	190	260	350	440	550	630	600	480	370	270	190	160	370
	Diffuse	190	260	350	430	500	540	520	450	370	270	190	160	350
	Clear-Day Global	160	230	310	420	570	690	630	470	340	250	170	150	370
East	Global	420	570	720	890	1040	1120	1120	1000	820	630	390	340	760
	Diffuse	230	330	430	520	600	640	630	560	450	340	240	200	430
	Clear-Day Global	640	860	1130	1350	1470	1510	1470	1360	1170	900	670	560	1090
South	Global	1030	1130	1070	980	900	860	900	1010	1110	1140	880	860	990
	Diffuse	350	440	500	540	580	600	590	560	510	420	330	300	480
	Clear-Day Global	1880	2000	1870	1500	1170	1030	1080	1340	1670	1870	1850	1780	1580
West	Global	420	560	710	880	1030	1130	1150	1040	860	630	400	340	760
	Diffuse	240	330	430	520	610	660	640	570	460	340	240	200	440
	Clear-Day Global	640	860	1130	1350	1470	1510	1470	1360	1170	900	670	560	1090

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

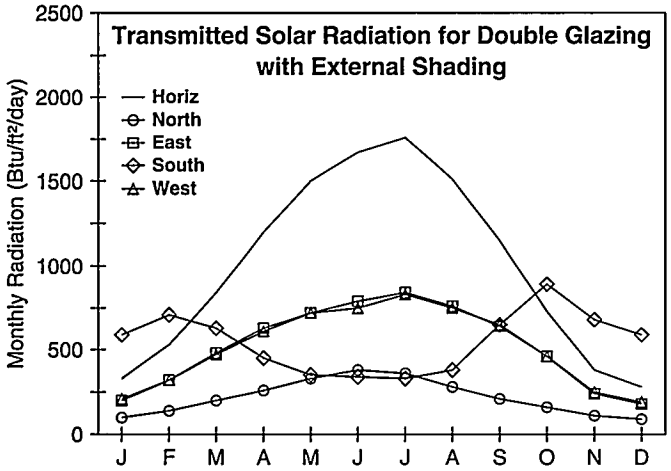
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	380	580	810	1070	1300	1460	1450	1250	960	660	390	300	880
North	Unshaded	130	180	240	300	360	410	390	320	250	190	140	110	250
	Shaded	110	160	210	260	320	360	340	280	220	160	110	96	220
East	Unshaded	290	400	510	640	740	800	800	710	580	440	270	230	540
	Shaded	250	350	430	530	610	660	660	590	500	380	240	200	450
South	Unshaded	780	830	750	650	570	530	550	650	760	830	660	650	680
	Shaded	750	760	580	400	350	360	360	380	530	720	630	630	540
West	Unshaded	290	390	510	620	730	810	820	740	610	440	280	230	540
	Shaded	250	340	430	520	610	670	680	620	520	380	240	200	460

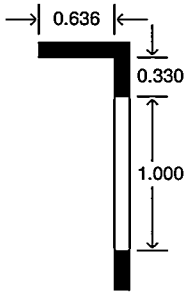
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	14.6	20.1	34.2	48.3	60.2	69.1	73.1	70.3	61.9	50.1	35.7	20.3	46.5
Daily Minimum Temp	5.4	10.6	25.0	37.1	48.7	57.6	62.2	59.0	50.0	38.4	26.2	11.7	36.0
Daily Maximum Temp	23.7	29.4	43.3	59.3	71.6	80.5	83.9	81.5	73.7	61.8	45.2	28.9	56.9
Record Minimum Temp	-31.0	-29.0	-34.0	-4.0	25.0	38.0	42.0	38.0	22.0	11.0	-17.0	-27.0	-34.0
Record Maximum Temp	58.0	66.0	87.0	100.0	94.0	103.0	105.0	105.0	98.0	95.0	79.0	65.0	105.0
HDD, Base 65°F	1562	1257	955	501	203	27	10	29	127	470	879	1386	7406
CDD, Base 65°F	0	0	0	0	55	150	261	194	34	8	0	0	702
Humidity Ratio (#w/#da)	0.0016	0.0019	0.0031	0.0048	0.0074	0.0106	0.0128	0.0119	0.0090	0.0056	0.0035	0.0021	0.0062
Wind Speed (mph)	11.7	11.2	12.5	12.5	11.0	9.8	8.4	8.4	9.1	10.1	11.1	11.3	10.6
Clearness Index, Kt	0.49	0.50	0.49	0.49	0.52	0.54	0.55	0.54	0.51	0.49	0.43	0.44	0.51

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	34/21	66/42	77/50	62/39	27/17	46/30	81/57	98/71	94/71	69/51	25/14	62/37	81/50	75/49	47/31	10/6	35/21	41/26	26/16	1/1
North	9/9	13/15	14/17	13/14	8/7	17/14	16/17	17/19	17/19	15/16	8/6	13/14	15/17	15/16	11/12	4/3	9/9	10/10	7/7	1/1
East	71/24	57/30	14/17	13/14	8/7	77/38	73/47	34/29	17/19	15/16	61/19	70/32	30/23	15/16	11/12	32/8	38/16	10/10	7/7	1/1
South	38/16	74/35	86/43	70/33	30/13	12/11	34/27	51/39	47/37	25/21	19/9	57/28	78/41	72/40	42/23	29/8	77/25	87/31	62/20	3/1
West	9/9	13/15	19/19	64/31	65/23	12/11	16/17	17/19	49/39	78/51	8/6	13/14	15/17	50/31	73/35	4/3	9/9	18/13	45/16	4/1
M. Clr (%hrs)	28	27	26	26	27	36	35	32	29	32	41	40	38	38	42	27	28	27	28	30





Shading Geometry
(Not to Scale)

Boise, ID

WBAN NO. 24131

LATITUDE: 43.57° N
LONGITUDE: 116.22° W
ELEVATION: 2868 feet
MEAN PRESSURE: 13.3 psia

STATION TYPE: Primary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	510	790	1200	1670	2070	2290	2410	2080	1620	1080	590	450	1400
	Std.Dev.	50	91	105	149	133	141	109	127	117	79	62	49	37
	Minimum	410	590	990	1340	1730	1870	2170	1780	1350	920	450	380	1340
	Maximum	630	950	1400	1930	2290	2540	2620	2290	1830	1240	720	560	1460
	Diffuse	310	390	530	660	700	680	530	500	410	350	300	260	470
	Clear-Day Global	780	1130	1660	2230	2610	2770	2680	2350	1840	1280	840	670	1740
North	Global	180	240	330	440	580	680	640	480	340	260	180	150	380
	Diffuse	180	240	330	430	490	520	480	430	340	260	180	150	340
	Clear-Day Global	150	210	290	400	600	730	660	470	320	230	160	140	360
East	Global	340	530	790	1050	1220	1340	1420	1270	1060	740	410	310	880
	Diffuse	220	300	410	530	590	610	570	520	420	330	220	190	410
	Clear-Day Global	650	880	1170	1440	1590	1640	1600	1480	1250	950	680	570	1160
South	Global	820	1060	1180	1150	1020	950	1040	1220	1440	1420	950	800	1090
	Diffuse	330	400	490	560	570	560	520	510	460	410	320	290	450
	Clear-Day Global	1920	2030	1930	1560	1220	1050	1110	1400	1770	1990	1920	1840	1640
West	Global	350	530	770	1010	1210	1290	1410	1270	1060	740	410	320	870
	Diffuse	220	300	420	540	600	620	570	520	430	330	230	190	410
	Clear-Day Global	650	880	1170	1440	1590	1640	1600	1480	1250	950	680	570	1160

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	330	530	840	1200	1500	1670	1760	1510	1150	730	380	280	990
North	Unshaded	120	170	230	300	370	430	400	310	240	180	130	110	250
	Shaded	100	140	200	260	330	380	360	280	210	160	110	89	220
East	Unshaded	240	370	560	750	870	960	1020	910	760	530	280	210	620
	Shaded	200	320	480	630	720	790	840	760	640	460	240	180	520
South	Unshaded	610	780	830	760	630	570	610	770	990	1030	710	610	740
	Shaded	590	710	630	450	350	340	330	380	650	890	680	590	550
West	Unshaded	240	370	550	720	870	920	1010	910	760	530	280	220	620
	Shaded	210	320	470	610	720	750	830	750	650	460	250	190	520

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	29.0	35.9	42.4	49.1	57.5	66.5	74.0	72.5	62.6	51.8	39.9	30.1	50.9
Daily Minimum Temp	21.6	27.5	31.9	36.7	43.9	52.1	57.7	56.8	48.2	39.0	31.1	22.5	39.1
Daily Maximum Temp	36.4	44.2	52.9	61.4	71.0	80.9	90.2	88.1	77.0	64.6	48.7	37.7	62.8
Record Minimum Temp	-17.0	-15.0	6.0	19.0	22.0	31.0	35.0	37.0	23.0	11.0	-3.0	-25.0	-25.0
Record Maximum Temp	63.0	70.0	81.0	92.0	98.0	109.0	111.0	110.0	102.0	91.0	74.0	65.0	111.0
HDD, Base 65°F	1116	815	701	477	242	75	6	20	160	414	753	1082	5861
CDD, Base 65°F	0	0	0	0	9	120	285	252	88	0	0	0	754
Humidity Ratio (#w/#da)	0.0028	0.0033	0.0035	0.0040	0.0051	0.0063	0.0067	0.0065	0.0055	0.0044	0.0038	0.0029	0.0046
Wind Speed (mph)	7.1	8.4	9.5	9.6	9.3	8.7	8.1	7.9	7.8	7.7	8.1	7.3	8.3
Clearness Index, Kt	0.44	0.48	0.52	0.56	0.59	0.62	0.67	0.65	0.63	0.57	0.45	0.43	0.58

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

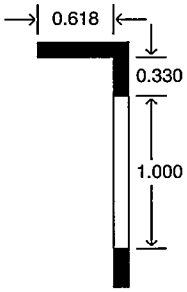
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	24/15	60/39	77/51	69/46	39/25	37/25	75/55	98/75	101/75	82/60	15/10	54/37	80/56	82/58	60/42	3/2	28/16	41/25	31/19	6/4
North	7/6	12/13	14/16	13/15	9/9	22/14	14/16	16/18	16/18	15/17	5/4	11/12	14/16	14/16	12/13	2/1	8/7	10/10	8/8	3/2
East	69/24	69/36	25/21	13/15	9/9	79/38	82/53	48/39	16/18	15/17	56/19	80/43	45/32	14/16	12/13	13/3	45/15	13/11	8/8	3/2
South	27/12	69/35	88/48	78/43	45/22	9/9	27/23	50/40	52/41	34/28	11/6	50/30	78/50	80/53	56/35	10/3	69/20	89/31	73/24	21/6
West	7/6	12/13	14/16	54/32	77/33	9/9	14/16	16/18	35/31	76/51	5/4	11/12	14/16	37/29	76/45	2/1	8/7	10/10	40/16	25/7
M. Clr (%hrs)	29	29	25	23	27	53	52	50	49	45	61	63	62	61	61	20	22	22	23	24

Pocatello, ID

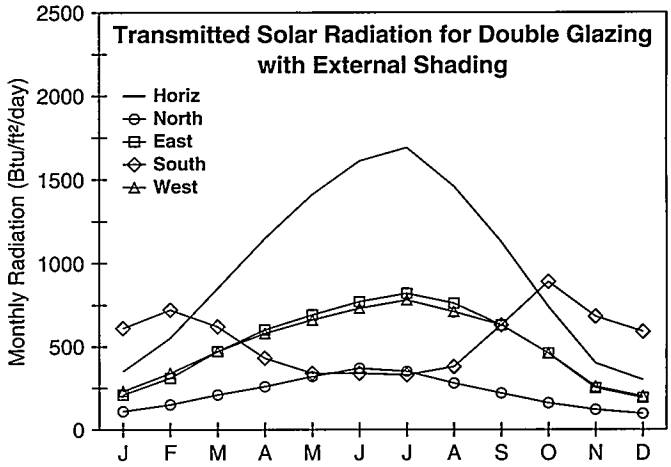
WBAN NO. 24156

LATITUDE: 42.92° N
LONGITUDE: 112.60° W
ELEVATION: 4479 feet
MEAN PRESSURE: 12.5 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	540	820	1210	1610	1950	2210	2310	2010	1590	1090	620	470	1370
	Std.Dev.	52	71	101	153	149	161	110	117	129	80	61	45	41
	Minimum	450	720	960	1320	1660	1850	2120	1680	1340	940	520	390	1270
	Maximum	650	960	1370	1940	2300	2460	2520	2220	1810	1270	760	560	1450
	Diffuse	330	420	550	670	710	670	560	520	430	350	330	290	480
	Clear-Day Global	820	1180	1710	2260	2630	2780	2690	2360	1870	1320	880	710	1770
North	Global	190	250	340	440	560	650	620	470	350	260	200	160	380
	Diffuse	190	250	340	430	490	510	480	420	350	260	200	160	340
	Clear-Day Global	160	210	290	410	600	740	670	450	320	230	160	140	370
East	Global	350	530	770	1000	1170	1300	1370	1250	1030	750	420	310	850
	Diffuse	230	310	430	520	580	600	570	520	430	330	250	200	410
	Clear-Day Global	680	900	1190	1440	1590	1630	1600	1470	1260	980	720	600	1170
South	Global	840	1070	1160	1080	960	900	990	1160	1380	1410	950	810	1060
	Diffuse	350	420	500	550	560	540	520	510	470	410	350	320	460
	Clear-Day Global	1980	2080	1950	1550	1200	1030	1090	1370	1770	2010	1980	1910	1660
West	Global	380	560	770	960	1110	1230	1310	1180	1020	750	430	340	840
	Diffuse	230	320	430	530	590	600	580	530	430	330	250	210	420
	Clear-Day Global	680	900	1190	1440	1590	1630	1600	1470	1260	980	720	600	1170

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

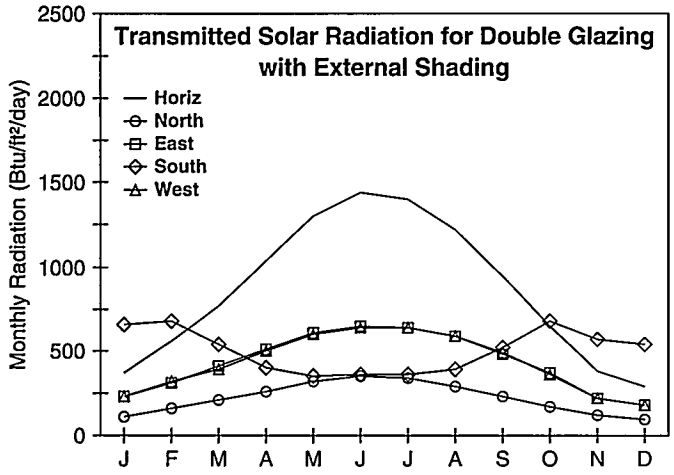
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	350	550	850	1150	1410	1610	1690	1460	1130	740	400	300	970
North	Unshaded	130	180	240	300	360	420	390	310	240	180	140	110	250
	Shaded	110	150	210	260	320	370	350	280	220	160	120	96	220
East	Unshaded	240	370	550	720	840	930	980	900	740	530	290	220	610
	Shaded	210	310	470	600	690	770	820	760	630	460	250	190	510
South	Unshaded	630	790	820	720	590	530	580	740	940	1030	710	610	720
	Shaded	610	720	620	430	340	340	330	380	630	890	680	590	540
West	Unshaded	260	390	550	690	790	880	940	850	730	530	300	230	600
	Shaded	230	340	470	580	660	730	780	710	630	460	260	200	500

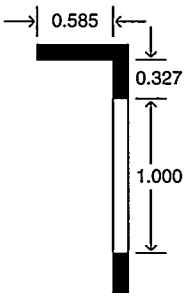
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	23.3	29.1	36.3	44.9	53.6	62.7	70.6	68.7	59.0	48.0	35.6	24.8	46.4
Daily Minimum Temp	14.4	19.8	25.9	32.3	39.6	47.3	53.0	50.9	42.8	33.5	26.0	15.8	33.4
Daily Maximum Temp	32.2	38.4	46.7	57.5	67.5	78.0	88.1	86.3	75.1	62.5	45.2	33.7	59.3
Record Minimum Temp	-30.0	-33.0	-12.0	15.0	20.0	30.0	34.0	32.0	19.0	10.0	-13.0	-29.0	-33.0
Record Maximum Temp	57.0	62.0	75.0	85.0	93.0	103.0	102.0	104.0	98.0	88.0	71.0	59.0	104.0
HDD, Base 65°F	1293	1005	890	603	353	125	9	29	218	527	882	1246	7180
CDD, Base 65°F	0	0	0	0	0	56	183	144	38	0	0	0	421
Humidity Ratio (#w/#da)	0.0024	0.0028	0.0032	0.0037	0.0049	0.0064	0.0071	0.0065	0.0052	0.0040	0.0033	0.0025	0.0044
Wind Speed (mph)	10.0	10.4	11.0	11.7	10.7	9.7	9.0	8.8	9.0	9.2	10.6	9.7	10.0
Clearness Index, Kt	0.45	0.48	0.52	0.53	0.56	0.60	0.64	0.63	0.61	0.57	0.46	0.44	0.56

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	29/19	64/42	77/53	67/45	35/23	42/28	78/56	98/73	98/72	77/55	20/13	59/39	81/56	80/56	56/39	5/4	31/19	41/27	30/19	4/3
North	8/7	12/14	14/16	13/15	9/9	20/14	14/16	16/18	16/17	14/16	6/5	12/13	14/16	14/15	11/12	3/2	8/8	10/10	8/8	2/2
East	72/28	64/36	18/18	13/15	9/9	82/42	79/52	41/34	16/17	14/16	63/25	77/41	39/29	14/15	11/12	24/7	42/17	10/10	8/8	2/2
South	32/15	70/38	86/50	75/42	39/19	10/10	29/24	49/39	49/39	29/24	15/8	54/31	78/50	77/49	51/32	19/6	73/25	88/35	70/26	15/4
West	8/7	12/14	14/16	58/35	74/32	10/10	14/16	16/18	40/33	77/51	6/5	12/13	14/16	42/31	78/45	3/2	8/8	11/11	44/18	19/5
M. Clr (%hrs)	24	25	22	22	25	49	52	50	45	42	56	59	60	57	54	13	15	16	20	23





Shading Geometry
(Not to Scale)

Chicago, IL

WBAN NO. 94846

LATITUDE: 41.78° N
LONGITUDE: 87.75° W
ELEVATION: 623 feet
MEAN PRESSURE: 14.4 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	570	820	1100	1450	1800	1990	1940	1700	1330	950	570	460	1220
	Std.Dev.	46	70	68	115	147	115	105	111	98	68	47	43	36
	Minimum	460	710	970	1260	1510	1800	1730	1510	1140	790	450	380	1170
	Maximum	650	950	1220	1690	2130	2290	2110	1940	1560	1090	670	550	1330
	Diffuse	320	450	600	730	830	870	860	760	610	450	330	280	590
	Clear-Day Global	810	1160	1640	2150	2480	2600	2520	2220	1770	1260	850	690	1680
North	Global	190	260	350	430	550	620	590	480	370	280	200	160	370
	Diffuse	190	260	350	430	500	540	530	460	370	280	200	160	360
	Clear-Day Global	180	240	330	430	580	680	620	480	360	270	190	160	380
East	Global	390	520	680	860	1020	1100	1090	980	800	610	370	300	730
	Diffuse	230	320	420	520	600	650	640	570	460	350	230	190	430
	Clear-Day Global	620	820	1080	1300	1430	1460	1420	1310	1120	870	630	540	1050
South	Global	910	1020	980	940	880	840	870	980	1070	1080	800	740	930
	Diffuse	340	430	500	540	580	590	600	580	520	440	330	290	480
	Clear-Day Global	1770	1880	1790	1470	1150	1010	1060	1300	1620	1790	1730	1660	1520
West	Global	380	530	660	830	1010	1090	1080	980	800	590	370	310	720
	Diffuse	230	320	420	520	610	650	640	580	470	350	240	200	440
	Clear-Day Global	620	820	1080	1300	1430	1460	1420	1310	1120	870	630	540	1050

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	370	560	770	1040	1300	1440	1400	1220	950	650	380	290	870
North	Unshaded	130	180	240	300	360	410	390	330	260	190	140	110	250
	Shaded	110	160	210	260	320	350	340	290	230	170	120	95	220
East	Unshaded	260	360	480	610	730	780	770	700	570	430	260	200	510
	Shaded	230	310	410	510	610	650	640	590	480	370	220	180	430
South	Unshaded	690	750	690	620	550	520	540	630	730	780	600	560	640
	Shaded	660	680	540	400	350	360	360	390	520	680	570	540	500
West	Unshaded	260	370	460	590	720	770	770	700	570	420	260	210	510
	Shaded	230	320	390	500	600	640	640	590	490	360	220	180	430

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	21.0	25.4	37.2	48.6	58.9	68.6	73.2	71.7	64.4	52.8	40.0	26.6	49.0
Daily Minimum Temp	12.9	17.2	28.5	38.6	47.7	57.5	62.6	61.6	53.9	42.2	31.6	19.1	39.5
Daily Maximum Temp	29.0	33.5	45.8	58.6	70.1	79.6	83.7	81.8	74.8	63.3	48.4	34.0	58.6
Record Minimum Temp	-27.0	-17.0	-8.0	7.0	24.0	36.0	40.0	41.0	28.0	17.0	1.0	-25.0	-27.0
Record Maximum Temp	65.0	71.0	88.0	91.0	93.0	104.0	102.0	101.0	99.0	91.0	78.0	71.0	104.0
HDD, Base 65°F	1364	1109	862	492	235	35	5	19	84	391	750	1190	6536
CDD, Base 65°F	0	0	0	0	46	143	259	226	66	12	0	0	752
Humidity Ratio (#w/#da)	0.0020	0.0023	0.0034	0.0049	0.0071	0.0101	0.0123	0.0120	0.0095	0.0061	0.0041	0.0026	0.0064
Wind Speed (mph)	11.6	11.3	12.0	11.9	10.4	9.3	8.3	8.1	8.9	10.0	10.7	11.0	10.3
Clearness Index, Kt	0.45	0.47	0.46	0.48	0.51	0.54	0.54	0.53	0.50	0.48	0.40	0.40	0.49

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

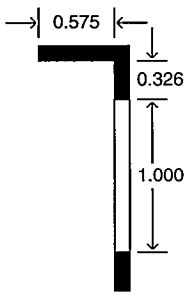
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	40/23	70/42	76/48	57/34	20/12	51/33	85/59	100/71	92/67	64/45	30/18	66/41	81/52	71/48	40/26	14/8	37/21	40/23	21/13	0/0
North	10/9	14/15	15/16	13/13	7/6	16/13	17/18	17/19	17/19	15/15	9/8	14/15	16/17	15/16	11/10	5/4	10/9	10/10	7/6	0/0
East	70/24	51/27	15/16	13/13	7/6	77/38	68/44	26/24	17/19	15/15	64/22	65/33	23/20	15/16	11/10	36/8	33/14	10/10	7/6	0/0
South	43/18	76/35	82/41	61/28	20/9	13/12	37/28	51/38	44/34	20/18	24/12	60/31	76/43	66/38	34/18	35/8	76/24	81/26	50/14	0/0
West	10/9	14/15	28/21	66/29	52/16	13/12	17/18	17/19	56/41	78/46	9/8	14/15	16/17	55/33	67/30	5/4	10/9	24/13	41/12	0/0
M. Clr (%hrs)	28	25	22	23	24	40	39	33	32	34	42	41	37	36	40	25	26	26	27	30

Moline, IL

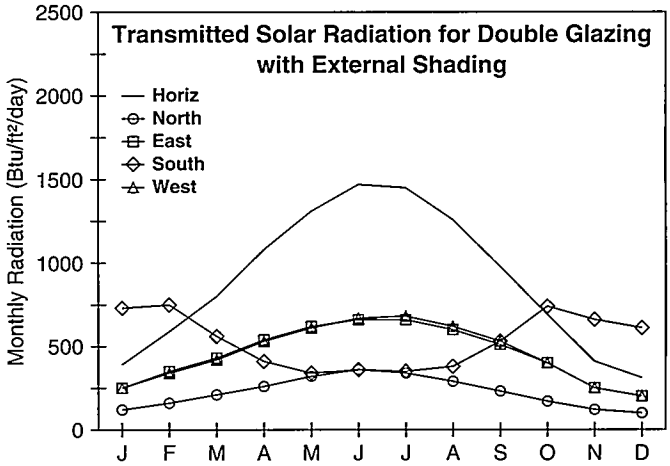
WBAN NO. 14923

LATITUDE: 41.45° N
LONGITUDE: 90.52° W
ELEVATION: 594 feet
MEAN PRESSURE: 14.4 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	600	870	1140	1500	1810	2020	1990	1750	1380	1000	620	490	1270
	Std.Dev.	49	60	84	114	148	105	122	102	109	77	56	43	39
	Minimum	480	750	980	1310	1500	1850	1720	1500	1190	840	490	420	1210
	Maximum	680	980	1310	1740	2170	2280	2200	1940	1670	1160	760	590	1390
	Diffuse	310	430	580	710	790	830	800	710	570	420	330	280	560
	Clear-Day Global	840	1190	1680	2180	2510	2630	2540	2250	1800	1290	890	730	1710
North	Global	190	260	350	440	550	630	590	480	370	280	200	170	370
	Diffuse	190	260	350	430	500	530	510	450	370	280	200	170	350
	Clear-Day Global	170	240	320	420	570	680	620	470	350	260	180	160	370
East	Global	410	570	710	890	1040	1120	1120	1010	840	650	410	340	760
	Diffuse	230	320	420	520	590	630	620	560	450	340	240	200	430
	Clear-Day Global	650	860	1120	1340	1460	1480	1450	1350	1160	900	680	580	1090
South	Global	1000	1110	1020	960	870	830	870	1000	1110	1170	920	840	970
	Diffuse	350	430	490	540	570	580	580	560	510	430	340	300	470
	Clear-Day Global	1870	1950	1830	1470	1140	990	1040	1300	1640	1850	1830	1780	1550
West	Global	420	560	700	880	1030	1130	1130	1030	860	650	420	340	760
	Diffuse	240	320	420	520	600	640	630	570	460	350	240	200	430
	Clear-Day Global	650	860	1120	1340	1460	1480	1450	1350	1160	900	680	580	1090

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

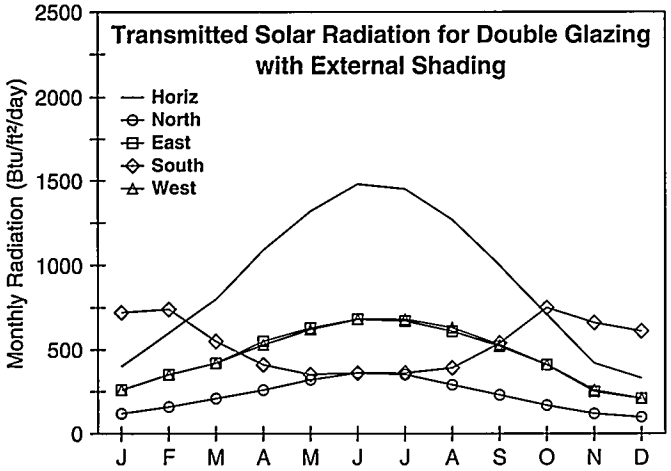
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	390	590	800	1080	1310	1470	1450	1260	980	690	410	310	900
North	Unshaded	130	180	240	300	360	410	390	320	250	190	140	120	250
	Shaded	120	160	210	260	320	360	340	290	230	170	120	99	220
East	Unshaded	280	400	500	630	740	790	790	720	590	460	290	230	540
	Shaded	250	350	430	540	620	660	660	600	510	400	250	200	460
South	Unshaded	750	810	720	630	540	510	530	640	760	850	680	630	670
	Shaded	730	750	560	410	340	360	350	380	530	740	660	610	530
West	Unshaded	290	390	490	620	730	800	810	740	610	460	290	230	540
	Shaded	250	340	420	530	610	670	680	620	530	400	250	200	460

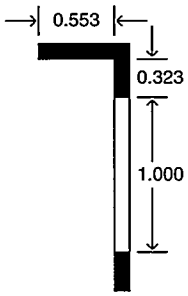
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	19.9	24.8	37.4	50.4	61.4	71.1	75.2	72.7	64.7	53.0	39.6	25.4	49.6
Daily Minimum Temp	11.3	15.9	28.1	39.4	49.9	59.6	64.5	61.8	53.3	41.8	30.7	17.5	39.5
Daily Maximum Temp	28.4	33.7	46.7	61.4	72.8	82.5	85.9	83.5	75.9	64.2	48.4	33.4	59.7
Record Minimum Temp	-27.0	-25.0	-19.0	7.0	26.0	39.0	46.0	40.0	24.0	16.0	-9.0	-24.0	-27.0
Record Maximum Temp	69.0	71.0	88.0	93.0	104.0	104.0	105.0	106.0	100.0	92.0	80.0	69.0	106.0
HDD, Base 65°F	1398	1126	856	438	188	10	0	11	73	384	762	1228	6474
CDD, Base 65°F	0	0	0	0	76	193	316	250	64	12	0	0	911
Humidity Ratio (#w/#da)	0.0019	0.0022	0.0034	0.0052	0.0078	0.0109	0.0133	0.0127	0.0097	0.0061	0.0039	0.0024	0.0066
Wind Speed (mph)	11.3	10.8	12.2	12.1	10.3	9.3	7.9	7.5	8.2	9.6	10.8	11.0	10.1
Clearness Index, Kt	0.47	0.49	0.47	0.49	0.52	0.55	0.55	0.54	0.52	0.50	0.43	0.43	0.51

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	38/22	69/42	78/47	60/37	25/15	48/31	83/58	100/73	94/68	67/48	28/16	65/39	82/52	75/49	46/29	12/8	37/22	43/25	25/15	0/0
North	9/9	14/15	15/17	13/14	7/7	17/14	16/17	17/19	17/19	15/16	8/7	14/14	16/17	15/16	11/11	5/4	9/9	10/10	7/7	0/0
East	73/24	55/29	15/17	13/14	7/7	78/37	72/47	31/27	17/19	15/16	64/20	68/33	27/22	15/16	11/11	35/9	37/15	10/10	7/7	0/0
South	40/16	74/35	84/40	65/30	26/11	12/12	34/27	50/38	45/35	22/19	22/10	58/29	77/42	70/38	39/20	33/9	77/25	86/28	59/16	1/0
West	9/9	14/15	23/19	65/30	62/20	12/12	16/17	17/19	52/39	78/48	8/7	14/14	16/17	53/32	74/33	5/4	9/9	21/13	45/14	1/0
M. Clr (%hrs)	29	27	26	27	28	40	38	33	34	37	45	44	41	40	44	30	29	29	31	32





Shading Geometry
(Not to Scale)

Peoria, IL

WBAN NO. 14842

LATITUDE: 40.67° N
LONGITUDE: 89.68° W
ELEVATION: 653 feet
MEAN PRESSURE: 14.4 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	620	880	1140	1520	1830	2030	1990	1760	1400	1030	640	510	1280
	Std.Dev.	46	60	82	126	160	115	102	97	110	83	61	50	39
	Minimum	500	770	970	1290	1400	1820	1820	1540	1210	850	520	420	1210
	Maximum	680	1010	1340	1750	2160	2270	2200	1920	1690	1170	780	600	1390
	Diffuse	320	440	600	710	800	840	820	730	580	430	340	290	570
	Clear-Day Global	860	1210	1700	2190	2510	2620	2540	2260	1810	1320	910	750	1730
North	Global	200	270	350	440	550	630	600	480	370	280	210	170	380
	Diffuse	200	270	350	430	500	530	520	460	370	280	210	170	360
	Clear-Day Global	180	240	320	430	580	680	630	480	360	270	190	160	380
East	Global	420	570	700	900	1050	1130	1120	1010	850	660	420	340	770
	Diffuse	240	330	420	520	600	640	630	570	460	350	250	210	430
	Clear-Day Global	660	860	1120	1340	1450	1470	1440	1340	1150	900	680	580	1080
South	Global	990	1100	1000	960	860	820	860	980	1120	1180	920	830	970
	Diffuse	350	430	490	540	570	580	580	570	510	440	340	300	480
	Clear-Day Global	1850	1930	1800	1450	1110	960	1020	1270	1610	1830	1810	1750	1530
West	Global	420	560	690	880	1030	1130	1120	1030	860	660	420	340	760
	Diffuse	240	330	430	530	610	650	640	580	470	350	250	210	440
	Clear-Day Global	660	860	1120	1340	1450	1470	1440	1340	1150	900	680	580	1080

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	400	600	800	1090	1320	1480	1450	1270	1000	710	420	330	910
North	Unshaded	140	190	240	300	360	410	390	320	260	200	140	120	260
	Shaded	120	160	210	260	320	360	350	290	230	170	120	100	230
East	Unshaded	290	400	490	640	750	800	800	720	600	470	290	230	540
	Shaded	260	350	420	550	630	680	670	610	520	410	250	210	460
South	Unshaded	750	800	700	630	540	500	520	620	760	850	690	630	660
	Shaded	720	740	550	410	350	360	360	390	540	750	660	610	530
West	Unshaded	290	390	480	620	730	810	800	740	610	470	290	230	540
	Shaded	260	350	420	530	620	680	680	630	530	410	260	210	460

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	21.6	26.3	39.0	51.4	61.9	71.5	75.5	73.1	66.1	54.0	41.2	27.0	50.7
Daily Minimum Temp	13.2	17.7	29.8	40.8	50.9	60.7	65.4	63.1	55.2	43.1	32.5	19.3	41.0
Daily Maximum Temp	29.9	34.9	48.1	62.0	72.8	82.2	85.7	83.1	76.9	64.8	49.8	34.6	60.4
Record Minimum Temp	-25.0	-18.0	-10.0	14.0	25.0	39.0	47.0	41.0	26.0	19.0	-2.0	-23.0	-25.0
Record Maximum Temp	70.0	72.0	86.0	92.0	93.0	105.0	103.0	103.0	100.0	90.0	81.0	71.0	105.0
HDD, Base 65°F	1345	1084	806	408	183	11	0	9	54	356	714	1178	6148
CDD, Base 65°F	0	0	0	0	87	206	326	261	87	15	0	0	982
Humidity Ratio (#w/#da)	0.0021	0.0025	0.0037	0.0054	0.0081	0.0112	0.0135	0.0128	0.0099	0.0064	0.0043	0.0027	0.0069
Wind Speed (mph)	11.0	10.7	11.9	11.5	9.6	8.6	7.6	7.4	8.0	9.2	10.5	10.6	9.7
Clearness Index, Kt	0.46	0.49	0.47	0.49	0.52	0.55	0.55	0.54	0.52	0.50	0.43	0.42	0.51

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

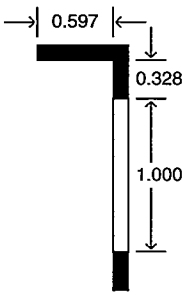
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	40/22	71/42	79/48	61/37	23/15	49/33	85/60	102/72	95/70	67/48	29/16	67/40	84/54	75/51	45/29	14/8	39/23	44/26	26/15	0/0
North	10/9	14/15	15/17	13/14	7/6	17/14	16/18	17/19	17/19	15/15	9/7	14/14	16/17	15/16	11/11	5/4	10/9	10/10	8/7	0/0
East	73/24	55/28	15/17	13/14	7/6	79/39	72/47	30/26	17/19	15/15	66/21	69/33	26/22	15/16	11/11	39/9	37/16	10/10	8/7	0/0
South	41/16	75/34	83/41	65/30	24/10	12/12	34/27	49/37	43/35	21/18	23/10	59/30	77/43	69/40	38/21	37/9	80/26	87/30	59/17	1/0
West	10/9	14/15	25/20	66/31	59/19	12/12	16/18	17/19	54/41	79/49	9/7	14/14	16/17	54/34	73/34	5/4	10/9	23/14	47/15	1/0
M. Clr (%hrs)	28	26	23	22	25	41	38	32	31	36	46	45	39	39	42	28	27	26	27	30

Rockford, IL

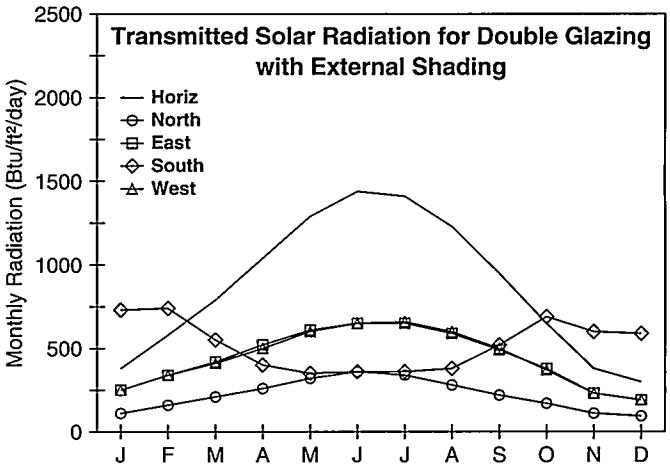
WBAN NO. 94822

LATITUDE: 42.20° N
LONGITUDE: 89.10° W
ELEVATION: 725 feet
MEAN PRESSURE: 14.4 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	590	860	1120	1460	1790	1980	1950	1710	1340	950	580	470	1240
	Std.Dev.	53	56	83	108	152	126	105	125	106	73	51	46	43
	Minimum	450	760	980	1260	1490	1720	1750	1470	1090	790	470	390	1170
	Maximum	690	970	1280	1650	2140	2260	2120	1910	1620	1080	660	560	1340
	Diffuse	310	430	590	720	820	860	830	740	580	430	320	280	580
	Clear-Day Global	810	1160	1650	2160	2490	2620	2520	2230	1770	1260	850	690	1690
North	Global	190	260	350	440	550	630	590	480	370	270	190	160	370
	Diffuse	190	260	350	430	500	540	520	460	370	270	190	160	350
	Clear-Day Global	170	240	320	430	580	680	630	470	350	260	180	150	370
East	Global	410	560	710	880	1030	1110	1100	990	820	620	380	320	750
	Diffuse	230	320	420	520	600	640	630	560	450	340	230	200	430
	Clear-Day Global	630	840	1100	1340	1450	1480	1450	1340	1140	880	640	560	1070
South	Global	1000	1110	1020	950	880	840	870	990	1090	1110	840	810	960
	Diffuse	350	430	490	540	580	590	590	570	510	430	330	300	480
	Clear-Day Global	1830	1930	1830	1490	1170	1020	1070	1320	1650	1830	1780	1730	1550
West	Global	410	560	690	850	1020	1110	1110	1000	820	610	380	320	740
	Diffuse	240	330	430	520	610	650	640	570	460	340	230	200	430
	Clear-Day Global	630	840	1100	1340	1450	1480	1450	1340	1140	880	640	560	1070

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

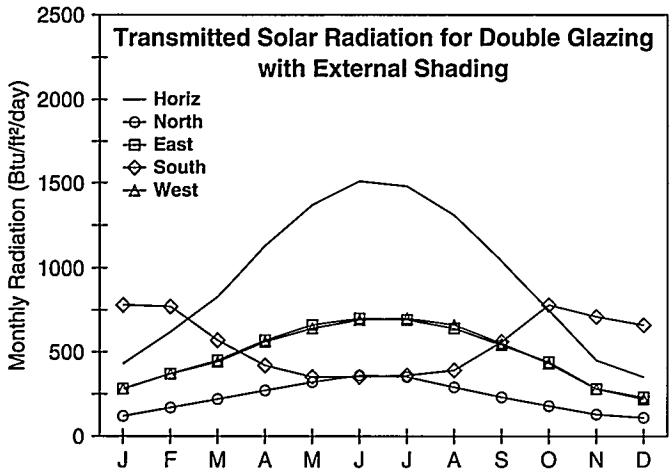
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	380	580	790	1040	1290	1440	1410	1230	950	650	380	300	870
North	Unshaded	130	180	240	300	360	410	390	320	260	190	130	110	250
	Shaded	110	160	210	260	320	360	340	280	220	170	110	95	220
East	Unshaded	280	390	500	620	730	790	780	710	580	440	260	220	530
	Shaded	250	340	420	520	610	650	650	590	490	380	230	190	440
South	Unshaded	750	810	720	630	560	520	540	640	740	800	630	610	660
	Shaded	730	740	550	400	350	360	360	380	520	690	600	590	520
West	Unshaded	280	390	480	600	720	790	790	710	580	430	260	220	520
	Shaded	250	340	410	500	600	650	660	600	500	370	230	190	440

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	18.2	22.9	35.0	47.7	59.1	68.8	73.2	70.9	63.1	51.5	38.0	24.0	47.7
Daily Minimum Temp	9.8	14.2	26.1	36.9	47.4	57.4	62.5	60.3	52.0	40.6	29.5	16.1	37.7
Daily Maximum Temp	26.6	31.6	43.8	58.4	70.8	80.2	83.8	81.4	74.1	62.3	46.3	31.8	57.6
Record Minimum Temp	-27.0	-22.0	-11.0	5.0	24.0	38.0	43.0	41.0	27.0	15.0	-10.0	-24.0	-27.0
Record Maximum Temp	63.0	68.0	85.0	91.0	95.0	101.0	103.0	104.0	102.0	90.0	76.0	66.0	104.0
HDD, Base 65°F	1451	1179	930	519	239	24	5	15	99	427	810	1271	6969
CDD, Base 65°F	0	0	0	0	56	138	259	198	42	9	0	0	702
Humidity Ratio (#w/#da)	0.0019	0.0022	0.0033	0.0048	0.0073	0.0104	0.0126	0.0121	0.0094	0.0060	0.0039	0.0024	0.0064
Wind Speed (mph)	11.1	10.7	12.0	11.9	10.5	9.5	8.2	7.9	8.5	9.7	10.7	10.8	10.1
Clearness Index, Kt	0.48	0.50	0.47	0.48	0.51	0.54	0.54	0.53	0.51	0.48	0.42	0.42	0.50

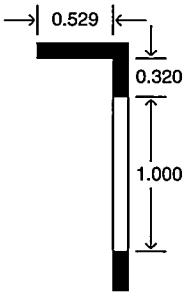
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	39/23	69/43	77/48	59/35	22/14	50/33	84/58	100/69	93/67	66/46	29/17	65/39	82/51	73/46	43/27	13/8	37/21	41/24	23/13	0/0
North	10/9	14/15	14/17	12/13	7/6	16/13	16/18	17/19	17/19	15/15	9/7	14/14	16/17	15/16	11/11	5/4	9/9	10/10	7/6	0/0
East	72/24	53/28	14/17	12/13	7/6	78/38	70/44	28/25	17/19	15/15	65/22	67/32	25/21	15/16	11/11	36/8	35/15	10/10	7/6	0/0
South	42/17	76/36	84/41	65/28	24/10	12/12	36/28	51/37	45/35	22/19	23/11	60/30	78/41	68/36	37/19	35/8	78/24	85/27	55/15	0/0
West	10/9	14/15	25/21	66/29	58/18	12/12	16/18	17/19	54/40	79/47	9/7	14/14	16/17	54/31	72/31	5/4	9/9	22/13	43/13	0/0
M. Clr (%hrs)	30	26	24	24	27	40	38	31	29	34	43	42	40	39	40	29	29	29	29	30



Springfield, IL

WBAN NO. 93822



Shading Geometry
(Not to Scale)

LATITUDE: 39.83° N
LONGITUDE: 89.67° W
ELEVATION: 614 feet
MEAN PRESSURE: 14.4 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	660	910	1180	1570	1890	2070	2030	1810	1460	1080	680	540	1330
	Std.Dev.	48	65	95	123	152	115	104	113	101	88	66	51	40
	Minimum	520	790	990	1350	1490	1860	1840	1550	1240	880	550	450	1260
	Maximum	740	1050	1400	1800	2200	2340	2260	2010	1690	1250	850	650	1440
	Diffuse	320	430	590	700	790	810	790	700	570	420	340	290	570
	Clear-Day Global	900	1250	1730	2210	2520	2630	2550	2270	1850	1360	950	790	1750
North	Global	200	270	350	440	550	630	600	480	380	290	210	180	380
	Diffuse	200	270	350	430	500	530	520	460	370	290	210	180	360
	Clear-Day Global	180	240	330	430	580	680	630	480	350	270	200	160	380
East	Global	450	590	730	930	1080	1150	1140	1050	880	700	450	370	790
	Diffuse	250	330	430	530	600	630	620	560	470	360	260	220	440
	Clear-Day Global	690	890	1140	1340	1450	1470	1440	1350	1170	930	710	610	1100
South	Global	1060	1130	1030	980	870	810	850	980	1150	1230	990	900	1000
	Diffuse	350	430	490	540	560	570	570	560	510	440	350	310	480
	Clear-Day Global	1900	1960	1800	1410	1080	930	980	1250	1610	1850	1860	1820	1530
West	Global	450	590	710	910	1050	1140	1150	1070	890	690	460	370	790
	Diffuse	250	330	430	530	610	640	630	570	470	360	260	220	440
	Clear-Day Global	690	890	1140	1340	1450	1470	1440	1350	1170	930	710	610	1100

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	430	620	830	1130	1370	1510	1480	1310	1040	750	450	350	940
North	Unshaded	140	190	250	300	360	410	390	320	260	200	150	120	260
	Shaded	120	170	220	270	320	360	350	290	230	180	130	110	230
East	Unshaded	310	410	510	660	770	820	810	740	630	490	310	250	560
	Shaded	280	370	450	570	660	700	690	640	540	440	280	230	490
South	Unshaded	800	830	720	640	530	490	510	620	770	890	740	680	680
	Shaded	780	770	570	420	350	350	360	390	560	780	710	660	560
West	Unshaded	310	410	500	650	750	810	820	760	630	490	320	250	560
	Shaded	280	370	440	560	640	690	700	660	550	430	280	220	490

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	24.2	28.7	40.8	53.2	63.5	72.9	76.5	73.7	67.3	55.6	42.9	29.7	52.4
Daily Minimum Temp	15.9	20.2	31.6	42.5	52.3	61.9	66.1	63.3	55.9	44.4	34.0	21.9	42.5
Daily Maximum Temp	32.5	37.2	50.0	63.9	74.7	83.9	86.9	84.2	78.7	66.8	51.7	37.3	62.3
Record Minimum Temp	-21.0	-22.0	-12.0	19.0	28.0	40.0	48.0	43.0	32.0	17.0	-3.0	-21.0	-22.0
Record Maximum Temp	71.0	74.0	87.0	90.0	95.0	103.0	112.0	103.0	101.0	93.0	83.0	74.0	112.0
HDD, Base 65°F	1265	1016	750	361	166	7	0	8	44	314	663	1094	5688
CDD, Base 65°F	0	0	0	7	120	244	357	278	113	22	0	0	1141
Humidity Ratio (#w/#da)	0.0023	0.0027	0.0041	0.0059	0.0085	0.0117	0.0140	0.0134	0.0104	0.0066	0.0046	0.0030	0.0073
Wind Speed (mph)	12.4	11.9	13.3	12.6	10.8	9.3	8.3	7.9	8.9	10.2	11.7	12.0	10.8
Clearness Index, Kt	0.48	0.50	0.48	0.51	0.54	0.56	0.56	0.56	0.54	0.52	0.45	0.44	0.52

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

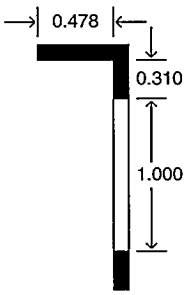
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	41/23	73/44	80/50	63/38	24/15	49/33	85/60	102/73	95/71	67/49	29/18	68/43	85/57	77/52	45/30	15/9	41/24	46/27	27/16	1/1
North	10/9	14/16	15/17	13/14	7/7	18/14	16/18	17/19	17/19	15/16	9/8	14/15	16/17	15/17	11/11	5/4	10/10	10/11	8/7	1/0
East	74/25	55/29	15/17	13/14	7/7	79/40	72/47	29/26	17/19	15/16	67/25	69/36	26/22	15/17	11/11	41/11	38/17	10/11	8/7	1/0
South	41/17	75/36	82/41	64/30	25/11	12/12	33/27	47/37	42/34	20/18	23/12	59/32	76/45	68/41	37/21	39/10	81/28	88/31	60/18	2/1
West	10/9	14/16	25/21	67/31	61/21	12/12	16/18	17/19	54/41	79/50	9/8	14/15	16/17	55/35	74/36	5/4	10/10	23/14	48/16	3/1
M. Clr (%hrs)	30	27	26	25	26	45	42	37	37	38	46	46	43	44	46	29	28	28	29	31

Evansville, IN

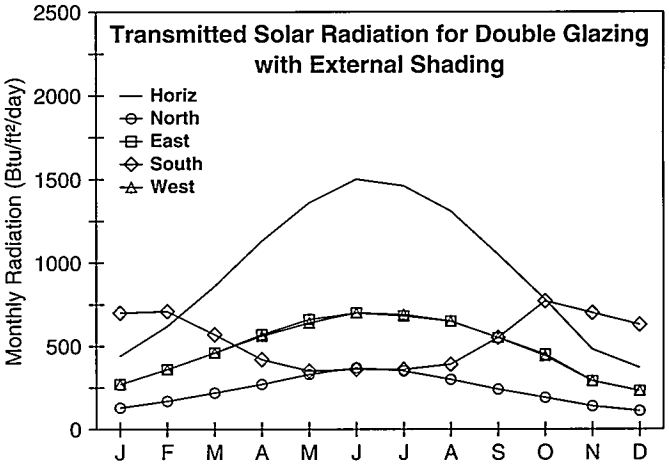
WBAN NO. 93817

LATITUDE: 38.05° N
LONGITUDE: 87.53° W
ELEVATION: 387 feet
MEAN PRESSURE: 14.6 psia

STATION TYPE: Secondary



Shading Geometry (Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	660	910	1220	1580	1870	2060	2000	1810	1470	1120	720	570	1330
	Std.Dev.	51	67	102	141	143	129	107	115	96	84	66	52	42
	Minimum	560	790	1060	1300	1530	1840	1700	1600	1290	940	590	480	1270
	Maximum	780	1050	1370	1860	2220	2430	2180	1990	1640	1330	850	690	1460
	Diffuse	350	450	590	710	800	830	820	740	610	440	360	310	590
	Clear-Day Global	970	1320	1790	2230	2520	2610	2530	2280	1880	1410	1020	860	1790
North	Global	210	280	360	440	550	630	600	490	390	300	220	190	390
	Diffuse	210	280	360	430	500	530	520	460	390	300	220	190	370
	Clear-Day Global	200	250	330	430	580	680	630	480	360	280	210	180	390
East	Global	440	580	740	920	1060	1130	1110	1040	880	710	460	380	790
	Diffuse	260	330	430	530	600	630	630	580	480	370	270	220	440
	Clear-Day Global	720	910	1150	1340	1430	1440	1410	1320	1150	930	720	630	1100
South	Global	970	1050	1030	940	820	760	800	950	1100	1220	980	870	960
	Diffuse	360	420	490	530	560	570	570	570	530	450	360	320	480
	Clear-Day Global	1930	1950	1760	1350	1020	870	930	1190	1550	1810	1850	1830	1500
West	Global	440	570	740	900	1030	1140	1110	1040	880	700	470	370	780
	Diffuse	260	340	440	530	610	640	640	590	490	370	270	220	450
	Clear-Day Global	720	910	1150	1340	1430	1440	1410	1320	1150	930	720	630	1100

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

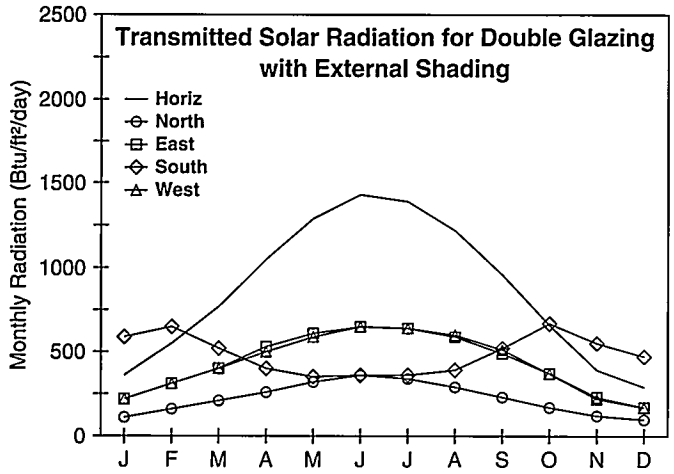
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	440	620	860	1130	1360	1500	1460	1310	1050	780	480	370	950
North	Unshaded	150	190	250	300	360	410	390	330	270	210	160	130	260
	Shaded	130	170	220	270	330	370	350	300	240	190	140	110	240
East	Unshaded	300	410	520	660	760	800	790	740	620	500	320	260	560
	Shaded	270	360	460	570	660	700	680	650	550	450	290	230	490
South	Unshaded	720	760	710	600	500	460	480	590	740	870	730	650	650
	Shaded	700	710	570	420	350	360	360	390	550	770	700	630	540
West	Unshaded	300	400	520	640	730	810	790	740	620	500	330	260	550
	Shaded	270	360	460	560	640	700	690	650	550	440	290	230	490

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	30.1	34.4	45.8	56.2	65.5	74.8	78.4	76.1	69.2	57.2	46.2	35.2	55.8
Daily Minimum Temp	21.2	25.0	35.7	45.0	54.2	63.3	67.5	64.9	57.6	44.7	36.5	26.7	45.2
Daily Maximum Temp	38.9	43.7	55.9	67.4	76.9	86.2	89.1	87.2	80.7	69.6	55.9	43.6	66.3
Record Minimum Temp	-21.0	-23.0	-9.0	23.0	28.0	41.0	47.0	43.0	31.0	21.0	-3.0	-15.0	-23.0
Record Maximum Temp	76.0	79.0	84.0	91.0	95.0	104.0	105.0	102.0	103.0	94.0	83.0	77.0	105.0
HDD, Base 65°F	1082	857	595	273	114	0	0	0	33	266	564	924	4708
CDD, Base 65°F	0	0	0	9	130	294	415	344	159	25	0	0	1376
Humidity Ratio (#w/#da)	0.0028	0.0032	0.0047	0.0065	0.0093	0.0124	0.0144	0.0137	0.0111	0.0069	0.0050	0.0035	0.0078
Wind Speed (mph)	8.9	8.9	9.7	9.2	7.7	6.9	6.0	5.6	6.0	6.6	8.1	8.6	7.7
Clearness Index, Kt	0.45	0.47	0.48	0.50	0.53	0.56	0.55	0.55	0.53	0.52	0.45	0.42	0.51

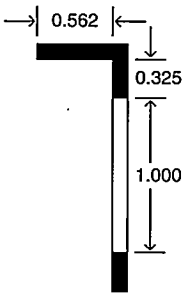
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	44/25	75/45	82/50	62/37	22/14	52/34	88/62	102/76	94/71	64/47	33/19	71/45	86/57	76/52	42/28	20/11	45/25	48/27	27/16	0/0
North	10/10	14/16	15/17	13/14	7/6	18/15	17/18	17/19	17/19	15/15	10/8	15/15	16/18	16/17	11/11	6/5	10/10	11/11	8/7	0/0
East	75/26	52/28	15/17	13/14	7/6	80/39	70/46	26/24	17/19	15/15	68/24	67/36	23/21	16/17	11/11	46/12	36/16	11/11	8/7	0/0
South	43/18	73/35	80/40	60/29	22/10	13/12	32/27	45/36	38/32	16/16	24/12	59/32	74/44	64/40	33/19	45/12	83/27	86/29	58/17	1/0
West	10/10	14/16	29/22	69/32	60/19	13/12	17/18	17/19	57/44	78/50	10/8	15/15	16/18	57/37	71/34	6/5	10/10	26/15	49/15	1/0
M. Clr (%hrs)	31	30	28	27	30	48	42	33	36	42	48	48	42	41	46	29	28	28	28	31



Fort Wayne, IN

WBAN NO. 14827



Shading Geometry
(Not to Scale)

LATITUDE: 41.00° N
LONGITUDE: 85.20° W
ELEVATION: 827 feet
MEAN PRESSURE: 14.3 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	560	810	1100	1460	1790	1970	1920	1700	1350	950	580	450	1220
	Std.Dev.	39	78	68	130	140	108	101	94	89	75	48	41	34
	Minimum	460	690	1000	1210	1460	1740	1680	1520	1170	790	460	360	1170
	Maximum	640	1050	1220	1710	2110	2270	2110	1930	1550	1140	660	520	1320
	Diffuse	330	460	610	730	840	890	860	770	620	460	350	300	600
	Clear-Day Global	830	1190	1670	2160	2490	2610	2520	2230	1790	1290	880	720	1700
North	Global	190	270	350	440	550	620	590	480	380	280	200	170	380
	Diffuse	190	270	350	430	500	540	530	460	380	280	200	170	360
	Clear-Day Global	190	250	330	430	580	680	620	480	360	270	190	160	380
East	Global	360	520	670	870	1020	1090	1080	970	800	610	370	290	720
	Diffuse	230	330	420	520	610	650	640	570	470	350	240	200	440
	Clear-Day Global	630	840	1090	1310	1420	1450	1420	1310	1120	880	640	560	1060
South	Global	820	970	950	930	860	820	840	960	1070	1060	770	650	890
	Diffuse	340	430	500	540	580	600	590	580	530	440	330	290	480
	Clear-Day Global	1780	1890	1790	1450	1130	980	1030	1280	1610	1800	1750	1690	1510
West	Global	360	510	660	830	990	1080	1070	990	820	600	370	290	720
	Diffuse	230	330	430	520	610	660	640	580	480	350	240	200	440
	Clear-Day Global	630	840	1090	1310	1420	1450	1420	1310	1120	880	640	560	1060

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	360	550	770	1050	1290	1430	1390	1220	960	660	390	290	870
North	Unshaded	130	190	240	300	360	410	390	330	260	200	140	120	260
	Shaded	110	160	210	260	320	360	340	290	230	170	120	98	220
East	Unshaded	250	360	470	620	720	770	770	690	570	430	260	200	510
	Shaded	220	310	400	530	610	650	640	590	490	370	230	170	430
South	Unshaded	620	710	670	610	540	500	520	620	730	770	580	490	610
	Shaded	590	650	520	400	350	360	360	390	520	670	550	470	480
West	Unshaded	250	360	460	590	700	770	760	700	590	420	250	200	510
	Shaded	220	310	400	500	590	650	640	600	510	370	220	170	430

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	22.9	25.9	37.6	49.2	60.2	70.2	74.0	71.6	64.9	52.9	41.3	28.6	49.9
Daily Minimum Temp	15.3	17.8	28.8	38.5	49.1	59.3	63.2	60.9	54.2	42.5	33.5	21.6	40.4
Daily Maximum Temp	30.4	34.0	46.3	59.8	71.2	80.9	84.6	82.2	75.6	63.1	49.1	35.5	59.4
Record Minimum Temp	-22.0	-18.0	-10.0	7.0	27.0	38.0	44.0	38.0	29.0	19.0	-1.0	-18.0	-22.0
Record Maximum Temp	69.0	69.0	82.0	88.0	94.0	106.0	103.0	101.0	100.0	90.0	79.0	71.0	106.0
HDD, Base 65°F	1305	1095	849	474	217	15	0	10	81	388	711	1128	6273
CDD, Base 65°F	0	0	0	0	68	171	279	215	78	13	0	0	824
Humidity Ratio (#w/#da)	0.0022	0.0024	0.0036	0.0052	0.0076	0.0106	0.0124	0.0121	0.0098	0.0062	0.0044	0.0029	0.0066
Wind Speed (mph)	11.8	11.0	12.0	11.5	9.9	9.1	8.0	7.5	8.1	9.1	10.5	11.1	10.0
Clearness Index, Kt	0.42	0.46	0.45	0.48	0.51	0.53	0.53	0.52	0.51	0.47	0.40	0.38	0.49

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

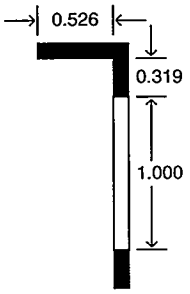
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	24/14	61/36	78/47	69/42	37/23	54/36	87/61	100/72	90/66	60/42	34/21	69/43	83/54	71/47	38/25	4/3	30/17	43/24	32/19	6/4
North	8/6	13/14	15/17	14/15	10/9	15/14	17/18	17/19	17/19	15/14	10/9	15/15	16/17	15/16	11/10	2/2	9/8	10/10	9/8	3/2
East	60/17	65/29	23/19	14/15	10/9	78/40	66/44	22/22	17/19	15/14	67/25	62/33	19/19	15/16	11/10	15/3	41/14	13/10	9/8	3/2
South	25/10	64/29	82/39	72/34	38/17	13/13	38/29	50/38	41/33	17/16	27/14	62/33	76/44	63/37	31/17	11/3	64/19	84/25	67/20	17/5
West	8/6	13/14	15/17	54/28	68/26	13/13	17/18	17/19	59/43	77/45	10/9	15/15	16/17	58/35	68/30	2/2	9/8	10/10	40/15	21/5
M. Clr (%hrs)	26	24	21	22	22	40	37	31	30	35	41	40	34	36	41	19	18	17	19	20

Indianapolis, IN

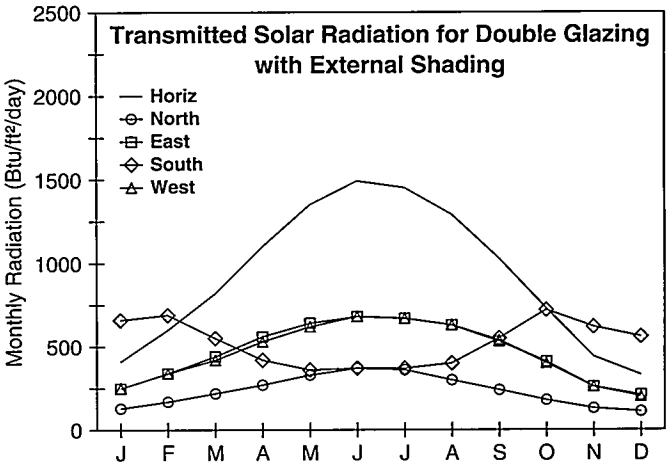
WBAN NO. 93819

LATITUDE: 39.73° N
LONGITUDE: 86.28° W
ELEVATION: 807 feet
MEAN PRESSURE: 14.3 psia

STATION TYPE: Primary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	620	880	1160	1540	1870	2050	1990	1790	1440	1050	650	510	1300
	Std.Dev.	45	71	79	142	153	115	111	108	81	75	61	54	37
	Minimum	520	720	1010	1310	1600	1860	1790	1600	1280	870	540	420	1240
	Maximum	740	1040	1310	1810	2180	2430	2200	2030	1630	1200	810	620	1410
	Diffuse	350	480	630	760	860	920	890	790	640	470	370	310	620
	Clear-Day Global	900	1250	1730	2200	2510	2620	2540	2260	1850	1350	950	790	1750
North	Global	210	280	360	450	560	640	610	500	390	300	220	180	390
	Diffuse	210	280	360	440	520	560	540	480	390	300	220	180	370
	Clear-Day Global	190	250	330	430	580	680	630	480	360	270	200	170	380
East	Global	410	560	710	910	1060	1130	1110	1030	860	670	420	340	770
	Diffuse	250	340	440	540	620	670	650	590	490	370	260	220	450
	Clear-Day Global	680	880	1130	1330	1420	1460	1430	1330	1160	910	690	610	1090
South	Global	920	1030	990	950	870	820	850	970	1120	1150	880	770	940
	Diffuse	360	440	510	560	590	610	600	590	550	460	360	310	500
	Clear-Day Global	1890	1940	1790	1410	1080	930	980	1240	1600	1830	1830	1800	1520
West	Global	410	550	690	870	1020	1120	1110	1030	870	650	420	330	760
	Diffuse	250	340	440	540	630	680	660	600	500	370	260	220	460
	Clear-Day Global	680	880	1130	1330	1420	1460	1430	1330	1160	910	690	610	1090

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

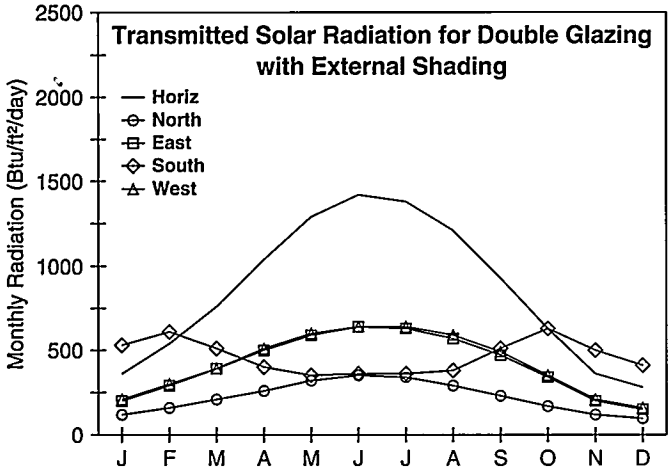
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	410	600	820	1100	1350	1490	1450	1290	1030	730	440	330	920
North	Unshaded	140	190	250	310	370	420	400	340	270	210	150	130	270
	Shaded	130	170	220	270	330	370	360	300	240	180	130	110	230
East	Unshaded	280	390	500	650	750	800	790	730	610	470	290	230	540
	Shaded	250	340	440	560	640	680	670	630	530	410	260	210	470
South	Unshaded	690	750	690	620	540	500	520	620	760	830	650	580	640
	Shaded	660	690	550	420	360	370	370	400	550	720	620	560	520
West	Unshaded	280	380	480	620	720	790	790	730	620	460	290	230	530
	Shaded	250	340	420	530	620	680	670	630	540	400	260	200	460

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	25.5	29.6	41.4	52.4	62.8	71.9	75.4	73.2	66.6	54.7	43.0	30.9	52.3
Daily Minimum Temp	17.2	20.9	31.9	41.5	51.7	61.0	65.2	62.8	55.6	43.5	34.1	23.2	42.4
Daily Maximum Temp	33.7	38.3	50.9	63.3	73.8	82.7	85.5	83.6	77.6	65.8	51.9	38.5	62.1
Record Minimum Temp	-22.0	-21.0	-7.0	16.0	28.0	39.0	44.0	41.0	28.0	17.0	-2.0	-23.0	-23.0
Record Maximum Temp	71.0	74.0	85.0	89.0	93.0	102.0	104.0	102.0	100.0	90.0	81.0	74.0	104.0
HDD, Base 65°F	1225	991	732	378	165	5	0	6	58	338	660	1057	5615
CDD, Base 65°F	0	0	0	0	96	212	322	260	106	18	0	0	1014
Humidity Ratio (#w/#da)	0.0025	0.0028	0.0041	0.0058	0.0085	0.0117	0.0139	0.0133	0.0106	0.0067	0.0047	0.0032	0.0073
Wind Speed (mph)	10.6	10.2	11.3	10.6	9.1	8.3	7.3	7.0	7.6	8.5	9.8	10.2	9.2
Clearness Index, Kt	0.45	0.47	0.47	0.50	0.53	0.55	0.55	0.55	0.53	0.50	0.43	0.41	0.51

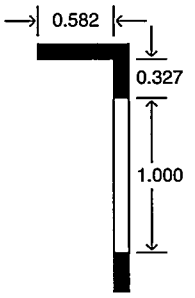
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	24/15	62/38	81/49	72/45	40/25	54/37	88/63	102/76	93/71	62/46	34/21	71/47	85/59	74/52	40/28	5/3	32/19	46/27	37/21	9/6
North	7/6	13/14	15/17	14/16	10/10	17/15	17/19	17/20	17/20	15/15	10/9	15/16	16/18	15/17	11/11	2/2	9/8	11/11	9/9	4/3
East	60/19	68/31	26/21	14/16	10/10	80/41	68/46	24/24	17/20	15/15	69/25	65/37	21/21	15/17	11/11	17/4	45/16	14/12	9/9	4/3
South	24/10	63/29	83/41	74/36	40/18	13/13	35/29	48/39	40/34	17/17	27/13	61/35	76/47	65/41	32/19	13/3	67/21	88/29	74/24	24/6
West	7/6	13/14	15/17	54/29	71/27	13/13	17/19	17/20	59/44	78/48	10/9	15/16	16/18	59/38	71/34	2/2	9/8	11/11	43/17	29/7
M. Clr (%hrs)	27	25	22	22	23	40	37	28	28	32	42	41	36	36	41	23	23	22	21	22



South Bend, IN

WBAN NO. 14848



Shading Geometry
(Not to Scale)

LATITUDE: 41.70° N
LONGITUDE: 86.32° W
ELEVATION: 774 feet
MEAN PRESSURE: 14.3 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	540	800	1080	1450	1790	1960	1910	1680	1310	910	550	430	1200
	Std.Dev.	41	62	67	120	136	121	96	102	92	75	44	36	36
	Minimum	460	690	950	1210	1490	1750	1680	1500	1140	760	450	350	1140
	Maximum	640	1000	1220	1670	2090	2310	2090	1860	1500	1050	640	500	1290
	Diffuse	370	490	630	730	840	880	860	770	620	460	350	310	610
	Clear-Day Global	810	1170	1650	2140	2480	2600	2520	2220	1770	1260	860	700	1680
North	Global	200	270	350	440	550	620	590	480	380	280	200	170	380
	Diffuse	200	270	350	430	510	540	530	460	380	280	200	170	360
	Clear-Day Global	180	250	330	430	580	680	620	480	360	270	190	160	380
East	Global	340	490	650	840	1000	1080	1060	960	780	570	340	260	700
	Diffuse	240	330	430	520	600	650	630	570	460	340	230	200	440
	Clear-Day Global	620	830	1090	1310	1420	1460	1420	1310	1120	860	630	540	1050
South	Global	750	920	940	930	870	830	850	970	1050	1010	710	580	870
	Diffuse	360	450	500	540	580	590	590	580	520	430	320	300	480
	Clear-Day Global	1780	1890	1800	1470	1150	1010	1050	1300	1620	1790	1730	1670	1520
West	Global	350	500	660	850	1010	1080	1090	990	810	580	350	280	710
	Diffuse	250	340	430	520	610	650	640	580	470	340	240	200	440
	Clear-Day Global	620	830	1090	1310	1420	1460	1420	1310	1120	860	630	540	1050

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	360	540	760	1040	1290	1420	1380	1210	930	630	360	280	850
North	Unshaded	140	190	250	300	360	410	390	330	260	190	140	120	260
	Shaded	120	160	210	260	320	350	340	290	230	170	120	97	220
East	Unshaded	230	340	460	600	710	770	750	680	550	400	240	180	490
	Shaded	200	290	390	500	590	640	630	570	470	340	200	150	420
South	Unshaded	560	670	660	620	550	510	530	620	710	730	530	430	590
	Shaded	530	610	510	400	350	360	360	380	510	630	500	410	460
West	Unshaded	240	350	460	600	720	770	770	700	570	410	240	190	500
	Shaded	210	300	390	510	600	640	640	590	490	350	210	160	430

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	23.3	26.4	37.4	48.7	59.4	69.1	72.9	70.9	63.9	52.6	40.9	28.9	49.5
Daily Minimum Temp	16.1	18.7	29.1	38.7	48.8	58.6	63.0	61.1	53.7	42.8	33.4	22.3	40.5
Daily Maximum Temp	30.4	34.1	45.6	58.7	70.0	79.5	82.9	80.7	74.1	62.3	48.5	35.4	58.5
Record Minimum Temp	-22.0	-17.0	-13.0	11.0	24.0	35.0	44.0	40.0	29.0	20.0	-7.0	-16.0	-22.0
Record Maximum Temp	68.0	69.0	85.0	91.0	95.0	104.0	101.0	103.0	99.0	92.0	82.0	70.0	104.0
HDD, Base 65°F	1293	1081	856	489	233	28	7	22	85	395	723	1119	6331
CDD, Base 65°F	0	0	0	0	59	151	251	205	52	10	0	0	728
Humidity Ratio (#w/#da)	0.0022	0.0024	0.0035	0.0050	0.0072	0.0101	0.0121	0.0118	0.0096	0.0062	0.0043	0.0029	0.0064
Wind Speed (mph)	11.9	11.1	11.9	11.5	9.9	9.0	8.0	7.6	8.3	9.4	10.7	11.4	10.1
Clearness Index, Kt	0.43	0.46	0.45	0.48	0.51	0.53	0.53	0.52	0.49	0.46	0.39	0.37	0.49

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

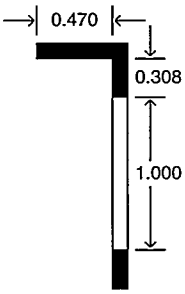
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	22/13	60/35	77/46	70/42	38/23	53/34	86/60	99/70	91/64	62/42	32/18	67/42	82/53	71/48	39/25	3/3	28/16	42/24	32/19	7/5
North	7/6	13/13	15/17	14/16	10/10	15/13	17/18	17/19	17/19	15/15	10/8	15/15	16/17	15/16	11/10	2/1	8/7	10/10	9/8	3/2
East	56/16	66/28	25/20	14/16	10/10	78/38	67/44	24/23	17/19	15/15	65/22	63/33	21/19	15/16	11/10	11/3	41/13	14/11	9/8	3/2
South	23/9	63/27	82/37	74/34	40/18	13/13	38/29	50/37	43/32	19/16	26/12	61/32	77/43	65/38	32/18	9/2	61/17	82/24	67/20	18/5
West	7/6	13/13	15/17	53/27	69/26	13/13	17/18	17/19	58/40	78/44	10/8	15/15	16/17	57/35	69/30	2/1	8/7	10/10	38/14	21/6
M. Clr (%hrs)	23	21	21	22	22	39	34	33	34	36	39	35	31	33	38	13	13	14	16	17

Dodge City, KS

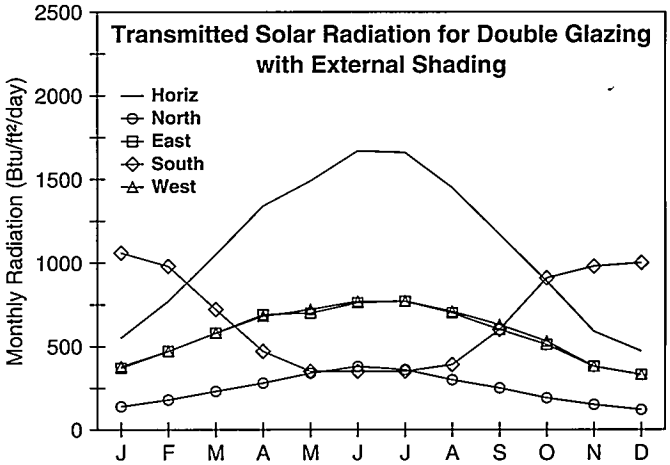
WBAN NO. 13985

LATITUDE: 37.77° N
LONGITUDE: 99.97° W
ELEVATION: 2582 feet
MEAN PRESSURE: 13.4 psia

STATION TYPE: Primary



Shading Geometry (Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	850	1130	1470	1850	2050	2270	2260	1990	1620	1270	890	740	1540
	Std.Dev.	69	83	123	103	142	141	108	121	111	129	76	47	38
	Minimum	690	950	1160	1630	1800	1960	1970	1720	1290	1010	690	600	1450
	Maximum	970	1270	1670	2050	2320	2530	2430	2240	1830	1490	1040	860	1600
	Diffuse	320	420	560	660	760	740	710	660	560	410	330	280	530
	Clear-Day Global	1040	1390	1870	2330	2600	2690	2610	2360	1960	1490	1100	930	1860
North	Global	220	290	370	460	570	650	620	490	390	300	230	200	400
	Diffuse	220	290	370	440	500	530	510	460	390	300	230	200	370
	Clear-Day Global	190	250	330	430	580	700	640	470	350	270	210	180	380
East	Global	590	740	910	1090	1130	1220	1240	1130	950	800	590	510	910
	Diffuse	280	350	460	550	600	620	610	560	480	370	290	240	450
	Clear-Day Global	790	970	1220	1410	1480	1500	1470	1390	1230	1020	800	710	1170
South	Global	1430	1430	1300	1100	870	800	850	1010	1220	1430	1350	1340	1170
	Diffuse	400	450	520	550	560	550	550	550	520	460	390	350	490
	Clear-Day Global	2070	2050	1820	1370	1000	840	900	1170	1590	1920	2020	2020	1560
West	Global	590	740	910	1070	1150	1240	1240	1140	990	830	600	520	920
	Diffuse	280	360	470	550	610	640	620	570	490	380	290	240	460
	Clear-Day Global	790	970	1220	1410	1480	1500	1470	1390	1230	1020	800	710	1170

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

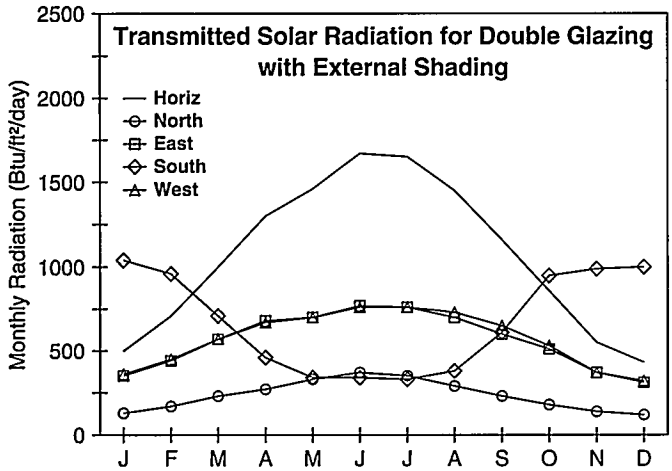
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	550	770	1050	1340	1490	1670	1660	1450	1170	890	590	470	1090
North	Unshaded	150	200	260	310	370	420	390	330	270	210	160	140	270
	Shaded	140	180	230	280	340	380	360	300	250	190	150	120	240
East	Unshaded	410	520	650	780	800	870	880	800	680	570	410	350	640
	Shaded	370	470	580	690	700	760	770	700	600	510	380	330	570
South	Unshaded	1080	1040	890	700	520	460	490	620	810	1020	1010	1010	800
	Shaded	1060	980	720	470	350	350	350	390	600	910	980	1000	680
West	Unshaded	410	520	640	760	820	890	890	810	700	590	420	360	650
	Shaded	380	470	580	680	720	770	770	710	630	530	380	330	580

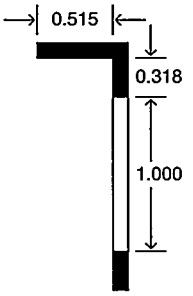
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	29.8	35.0	43.5	54.7	64.2	74.4	80.3	78.2	69.0	57.5	43.2	32.5	55.2
Daily Minimum Temp	18.1	22.7	30.4	41.4	52.0	61.8	67.5	65.7	56.7	44.3	31.1	21.2	42.7
Daily Maximum Temp	41.5	47.3	56.6	68.0	76.3	87.0	93.1	90.7	81.3	70.7	55.2	43.8	67.6
Record Minimum Temp	-13.0	-15.0	-15.0	15.0	26.0	41.0	46.0	47.0	29.0	17.0	0.0	-21.0	-21.0
Record Maximum Temp	80.0	85.0	93.0	100.0	102.0	108.0	109.0	107.0	106.0	96.0	91.0	86.0	109.0
HDD, Base 65°F	1091	840	667	323	119	7	0	0	39	253	654	1008	5001
CDD, Base 65°F	0	0	0	14	94	289	474	414	159	21	0	0	1465
Humidity Ratio (#w/#da)	0.0023	0.0027	0.0036	0.0054	0.0083	0.0111	0.0123	0.0120	0.0096	0.0059	0.0039	0.0026	0.0066
Wind Speed (mph)	13.2	13.4	15.0	14.9	14.1	13.4	12.9	12.3	13.0	13.0	13.3	13.1	13.5
Clearness Index, Kt	0.57	0.58	0.58	0.59	0.58	0.62	0.63	0.61	0.58	0.59	0.55	0.54	0.59

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	30/18	70/47	88/61	78/54	43/29	36/24	78/54	103/78	104/81	82/63	16/10	60/38	86/58	88/63	62/44	8/5	40/26	54/37	42/28	11/7
North	8/7	13/15	15/18	14/17	10/11	23/14	15/17	17/19	17/19	16/17	6/5	13/13	15/17	16/18	13/14	3/3	9/10	11/12	10/10	4/4
East	76/28	72/40	24/22	14/17	10/11	74/34	82/51	47/39	17/19	16/17	50/16	79/38	44/31	16/18	13/14	32/10	52/25	13/13	10/10	4/4
South	30/14	68/38	85/51	76/45	42/23	10/9	22/20	41/35	43/37	26/24	11/6	47/26	71/44	73/49	50/32	24/8	79/34	97/49	83/38	31/11
West	8/7	13/15	15/18	59/38	81/38	10/9	15/17	17/19	38/34	77/56	6/5	13/13	15/17	40/31	76/46	3/3	9/10	11/12	50/26	39/13
M. Clr (%hrs)	38	37	37	35	37	45	50	48	47	48	48	50	51	48	51	44	43	43	42	44





Shading Geometry
(Not to Scale)

Goodland, KS

WBAN NO. 23065

LATITUDE: 39.37° N
LONGITUDE: 101.70° W
ELEVATION: 3688 feet
MEAN PRESSURE: 12.9 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	790	1050	1420	1800	2000	2270	2250	1990	1610	1240	850	690	1500
	Std.Dev.	47	64	92	101	116	143	111	100	121	115	58	34	35
	Minimum	690	920	1190	1630	1790	1980	2020	1840	1280	980	740	640	1430
	Maximum	870	1140	1570	2010	2300	2570	2470	2240	1800	1400	970	750	1570
	Diffuse	290	390	550	630	710	660	630	570	490	360	310	260	490
	Clear-Day Global	960	1320	1820	2310	2610	2720	2640	2360	1930	1440	1030	860	1840
North	Global	210	270	360	450	560	640	600	480	370	290	220	190	390
	Diffuse	210	270	360	430	490	510	490	440	370	290	220	190	350
	Clear-Day Global	190	240	320	420	590	710	650	470	340	260	200	170	380
East	Global	560	710	900	1090	1130	1260	1250	1140	960	810	580	500	910
	Diffuse	260	340	450	530	570	600	580	530	450	350	270	230	430
	Clear-Day Global	750	950	1220	1420	1520	1540	1510	1420	1240	1000	760	670	1170
South	Global	1400	1400	1300	1110	890	830	880	1050	1270	1490	1360	1340	1190
	Diffuse	380	440	520	540	540	530	530	520	480	430	380	340	470
	Clear-Day Global	2030	2060	1870	1430	1060	900	950	1240	1640	1950	1990	1970	1590
West	Global	570	710	900	1070	1130	1240	1250	1170	1020	830	590	510	920
	Diffuse	270	340	460	540	590	610	590	540	460	360	280	230	440
	Clear-Day Global	750	950	1220	1420	1520	1540	1510	1420	1240	1000	760	670	1170

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	500	710	1000	1300	1460	1670	1650	1450	1160	860	550	430	1060
North	Unshaded	150	190	250	300	360	410	380	310	250	200	150	130	260
	Shaded	130	170	230	270	330	370	350	290	230	180	140	120	230
East	Unshaded	380	490	640	780	810	900	890	810	680	570	410	340	640
	Shaded	350	440	570	680	700	770	760	700	600	510	370	310	560
South	Unshaded	1060	1030	900	710	530	480	510	650	850	1070	1020	1020	820
	Shaded	1040	960	710	460	340	340	330	380	610	950	990	1000	670
West	Unshaded	390	500	640	760	810	890	890	840	730	590	410	350	650
	Shaded	360	450	570	670	700	760	760	730	650	530	370	320	570

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	28.4	32.2	39.1	49.5	59.0	69.3	75.6	73.2	64.0	52.1	38.7	29.5	50.9
Daily Minimum Temp	15.3	19.0	25.4	35.3	45.6	55.2	61.4	59.1	50.0	37.6	25.7	17.0	37.2
Daily Maximum Temp	41.5	45.3	52.7	63.6	72.3	83.4	89.8	87.3	78.0	66.5	51.6	42.0	64.5
Record Minimum Temp	-26.0	-22.0	-20.0	0.0	21.0	31.0	42.0	38.0	19.0	10.0	-12.0	-27.0	-27.0
Record Maximum Temp	79.0	81.0	89.0	96.0	99.0	109.0	111.0	110.0	105.0	96.0	87.0	83.0	111.0
HDD, Base 65°F	1135	918	803	465	211	33	0	11	108	400	789	1101	5974
CDD, Base 65°F	0	0	0	0	25	162	329	265	78	0	0	0	859
Humidity Ratio (#w/#da)	0.0022	0.0026	0.0032	0.0046	0.0072	0.0098	0.0114	0.0109	0.0080	0.0049	0.0033	0.0023	0.0059
Wind Speed (mph)	12.8	12.6	14.3	14.8	13.7	12.7	12.3	11.5	12.0	11.9	12.1	12.3	12.7
Clearness Index, Kt	0.56	0.56	0.57	0.58	0.57	0.61	0.62	0.61	0.59	0.59	0.55	0.55	0.59

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

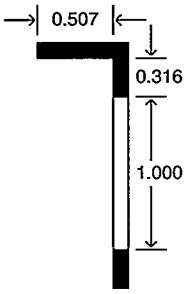
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	47/30	78/52	83/58	62/43	22/16	55/37	90/64	104/77	95/72	65/48	36/20	73/46	88/58	77/55	44/30	20/13	46/31	48/33	27/18	0/0
North	10/11	14/16	15/17	12/14	7/7	16/15	15/17	16/18	16/18	13/14	9/8	14/15	15/18	14/16	10/11	6/6	10/11	10/11	7/7	0/0
East	81/35	52/33	15/17	12/14	7/7	85/46	69/48	24/23	16/18	13/14	78/25	68/37	20/20	14/16	10/11	52/20	37/22	10/11	7/7	0/0
South	48/24	79/44	84/51	64/36	23/12	12/13	34/28	46/38	39/33	16/16	28/13	63/34	77/45	67/43	35/21	52/20	90/43	92/46	63/28	0/0
West	10/11	14/16	30/25	73/41	66/27	12/13	15/17	16/18	57/45	83/55	9/8	14/15	15/18	60/40	80/40	6/6	10/11	28/19	54/25	0/0
M. Clr (%hrs)	42	39	36	37	38	54	56	56	52	48	53	55	58	56	57	44	44	45	45	51

Topeka, KS

WBAN NO. 13996

LATITUDE: 39.07° N
LONGITUDE: 95.63° W
ELEVATION: 886 feet
MEAN PRESSURE: 14.3 psia

STATION TYPE: Secondary



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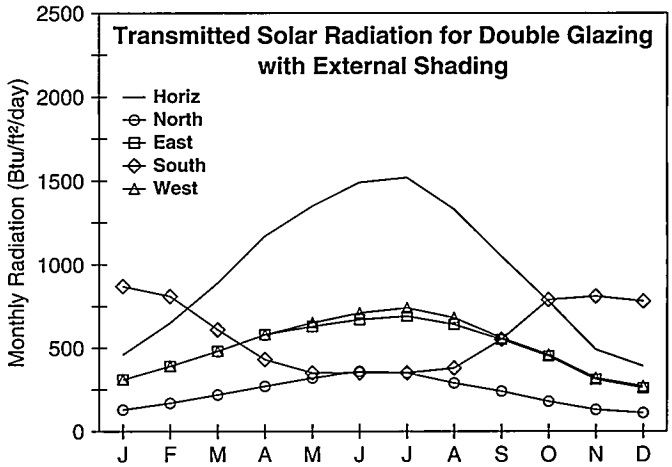


Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	720	950	1260	1620	1860	2050	2090	1840	1470	1120	750	610	1360
	Std.Dev.	61	82	117	110	117	127	140	132	133	113	73	50	41
	Minimum	570	820	960	1380	1600	1840	1800	1540	1060	930	580	540	1300
	Maximum	830	1140	1450	1890	2160	2330	2370	2050	1780	1290	880	710	1480
	Diffuse	310	420	570	680	800	810	770	680	580	420	330	280	550
	Clear-Day Global	950	1290	1770	2240	2540	2640	2560	2290	1880	1400	1000	830	1780
North	Global	200	270	350	440	550	630	600	480	380	290	220	180	380
	Diffuse	200	270	350	430	500	530	510	450	380	290	220	180	360
	Clear-Day Global	190	250	320	420	580	690	630	470	350	270	200	170	380
East	Global	490	620	770	940	1030	1090	1130	1030	870	720	500	410	800
	Diffuse	250	330	430	520	590	620	620	550	470	360	260	220	440
	Clear-Day Global	710	910	1140	1350	1450	1470	1440	1340	1180	950	740	640	1110
South	Global	1190	1190	1110	990	840	780	840	980	1130	1260	1120	1050	1040
	Diffuse	350	420	490	530	560	560	560	550	510	440	360	320	470
	Clear-Day Global	1940	1980	1790	1390	1050	900	950	1220	1600	1870	1900	1870	1540
West	Global	490	630	770	940	1060	1160	1200	1090	900	730	510	430	830
	Diffuse	250	330	430	530	610	640	630	570	480	360	270	230	440
	Clear-Day Global	710	910	1140	1350	1450	1470	1440	1340	1180	950	740	640	1110

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

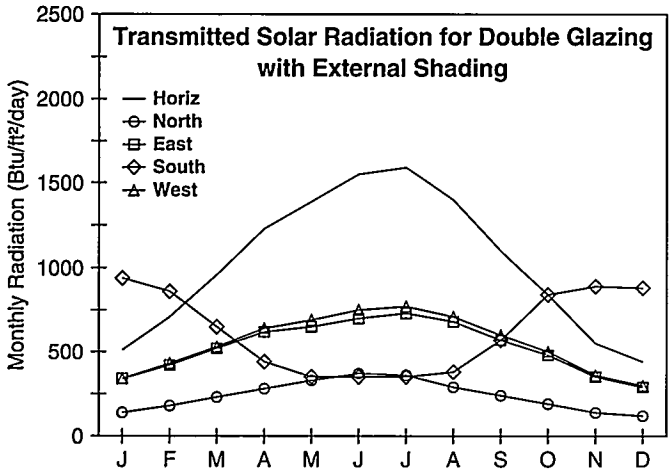
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	460	650	890	1170	1350	1490	1520	1330	1050	780	490	390	970
North	Unshaded	140	190	240	300	360	410	390	320	260	200	150	130	260
	Shaded	130	170	220	270	320	360	350	290	240	180	130	110	230
East	Unshaded	340	430	550	670	730	780	800	740	620	500	350	280	570
	Shaded	310	390	480	580	630	670	690	640	550	450	310	260	500
South	Unshaded	900	870	760	640	520	470	500	610	760	900	830	800	710
	Shaded	870	810	610	430	350	350	350	380	550	790	810	780	590
West	Unshaded	340	440	550	670	760	830	860	780	640	510	350	290	590
	Shaded	310	390	480	580	650	710	740	680	560	460	320	270	510

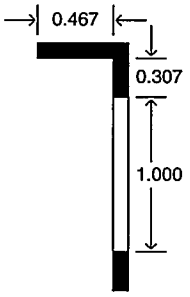
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	26.7	32.2	43.6	54.9	64.6	73.6	78.5	76.2	67.8	56.3	43.0	30.8	54.0
Daily Minimum Temp	16.3	21.7	32.1	42.8	53.3	62.9	67.6	64.9	55.7	43.6	32.0	21.0	42.8
Daily Maximum Temp	37.0	42.6	55.0	66.9	75.8	84.2	89.3	87.5	79.7	69.0	54.0	40.5	65.1
Record Minimum Temp	-20.0	-23.0	-7.0	10.0	26.0	43.0	43.0	41.0	29.0	19.0	2.0	-26.0	-26.0
Record Maximum Temp	73.0	84.0	89.0	95.0	97.0	107.0	110.0	110.0	109.0	96.0	85.0	73.0	110.0
HDD, Base 65°F	1187	918	663	312	121	5	0	0	56	283	660	1060	5265
CDD, Base 65°F	0	0	0	9	109	263	419	351	140	13	0	0	1304
Humidity Ratio (#w/#da)	0.0023	0.0028	0.0041	0.0062	0.0092	0.0130	0.0148	0.0138	0.0108	0.0068	0.0044	0.0028	0.0076
Wind Speed (mph)	9.9	10.1	11.8	11.7	10.4	9.3	8.5	8.1	8.3	8.8	9.7	9.5	9.7
Clearness Index, Kt	0.50	0.51	0.50	0.52	0.53	0.55	0.58	0.56	0.54	0.53	0.48	0.47	0.53

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	33/19	70/41	83/52	70/42	34/21	41/26	80/53	102/71	99/73	75/55	22/13	63/38	85/53	82/55	54/36	10/6	39/23	49/29	34/21	5/4
North	9/8	13/15	15/17	13/15	9/9	21/14	16/17	17/19	17/19	16/17	7/6	13/14	16/17	16/17	13/13	4/3	9/9	11/11	9/8	3/2
East	73/23	63/31	16/17	13/15	9/9	75/32	78/45	40/31	17/19	16/17	58/18	74/35	37/26	16/17	13/13	36/9	45/19	11/11	9/8	3/2
South	34/14	70/33	84/43	70/34	35/16	11/10	27/22	45/34	44/35	24/22	15/8	53/27	74/40	71/43	45/26	30/8	79/28	93/35	72/25	15/5
West	9/8	13/15	15/17	62/32	73/28	11/10	16/17	17/19	45/36	78/52	7/6	13/14	16/17	47/32	76/39	4/3	9/9	15/12	49/19	21/6
M. Clr (%hrs)	35	32	30	30	32	38	38	36	37	40	45	45	44	42	44	35	35	36	37	38





Shading Geometry
(Not to Scale)

Wichita, KS

WBAN NO. 03928

LATITUDE: 37.65° N
LONGITUDE: 97.42° W
ELEVATION: 1339 feet
MEAN PRESSURE: 14.0 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	780	1030	1350	1710	1920	2120	2170	1920	1540	1200	830	680	1440
	Std.Dev.	69	82	127	107	131	126	118	126	127	122	75	56	33
	Minimum	640	880	1020	1450	1710	1900	1940	1640	1200	990	700	580	1370
	Maximum	950	1200	1560	1970	2200	2400	2430	2150	1820	1380	990	830	1520
	Diffuse	320	430	560	680	780	780	730	650	570	430	340	290	550
	Clear-Day Global	1020	1360	1830	2280	2560	2660	2590	2330	1940	1470	1070	910	1840
North	Global	220	280	360	450	560	640	610	480	390	300	230	190	390
	Diffuse	220	280	360	440	500	520	510	450	380	300	230	190	370
	Clear-Day Global	200	260	330	430	580	690	630	470	360	280	210	180	390
East	Global	530	660	820	980	1040	1120	1170	1080	900	750	550	460	840
	Diffuse	270	350	440	530	590	620	610	550	470	370	280	230	440
	Clear-Day Global	750	950	1180	1360	1450	1470	1450	1360	1210	990	780	680	1140
South	Global	1270	1260	1170	1010	830	760	820	980	1150	1320	1220	1180	1080
	Diffuse	370	440	500	540	550	550	550	540	510	450	380	340	480
	Clear-Day Global	2000	2000	1780	1350	1000	850	900	1170	1570	1880	1950	1940	1530
West	Global	540	680	830	1010	1100	1190	1230	1120	950	790	560	480	870
	Diffuse	270	350	450	540	600	630	630	560	480	380	280	240	450
	Clear-Day Global	750	950	1180	1360	1450	1470	1450	1360	1210	990	780	680	1140

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	510	710	960	1230	1390	1550	1590	1400	1100	840	550	440	1030
North	Unshaded	150	200	250	310	360	410	390	320	270	210	160	130	260
	Shaded	140	180	230	280	330	370	360	290	240	190	140	120	240
East	Unshaded	370	460	580	700	740	800	830	770	640	530	380	320	590
	Shaded	340	420	520	620	650	700	730	680	570	480	350	290	530
South	Unshaded	960	920	810	650	500	450	480	600	770	940	910	890	740
	Shaded	940	860	650	440	350	350	350	380	570	840	890	880	620
West	Unshaded	370	480	590	720	790	850	880	800	680	560	390	330	620
	Shaded	340	430	530	640	690	750	770	710	600	500	360	300	550

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	29.5	34.8	45.4	56.4	65.6	75.7	81.4	79.3	70.3	58.6	44.7	33.0	56.2
Daily Minimum Temp	19.2	23.7	33.6	44.5	54.3	64.6	69.9	67.9	59.2	46.6	33.9	23.0	45.0
Daily Maximum Temp	39.8	45.9	57.2	68.3	76.9	86.8	92.8	90.7	81.4	70.6	55.3	43.0	67.4
Record Minimum Temp	-12.0	-21.0	-2.0	15.0	31.0	43.0	51.0	48.0	31.0	21.0	1.0	-16.0	-21.0
Record Maximum Temp	75.0	84.0	89.0	96.0	100.0	110.0	113.0	110.0	107.0	95.0	85.0	83.0	113.0
HDD, Base 65°F	1101	846	608	278	102	5	0	0	29	221	609	992	4791
CDD, Base 65°F	0	0	0	20	121	326	508	443	188	22	0	0	1628
Humidity Ratio (#w/#da)	0.0026	0.0030	0.0043	0.0065	0.0094	0.0124	0.0134	0.0130	0.0108	0.0071	0.0047	0.0030	0.0075
Wind Speed (mph)	12.0	12.4	13.8	13.7	12.1	11.6	11.3	10.9	11.3	11.6	12.0	12.0	12.0
Clearness Index, Kt	0.52	0.53	0.53	0.55	0.54	0.58	0.60	0.59	0.55	0.55	0.51	0.50	0.55

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

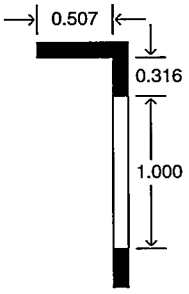
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	32/19	70/43	85/55	73/46	38/24	38/25	78/55	102/74	101/76	77/58	20/12	62/37	87/55	85/58	58/39	10/6	41/25	53/33	39/24	8/5
North	8/8	13/15	15/18	14/16	9/9	22/14	15/17	17/19	17/19	16/17	7/5	13/14	16/17	16/18	13/14	4/3	9/10	11/12	9/9	3/3
East	74/24	67/34	19/19	14/16	9/9	73/33	78/49	42/34	17/19	16/17	56/17	77/34	40/28	16/18	13/14	37/9	48/21	11/12	9/9	3/3
South	31/13	68/34	82/45	71/37	38/18	10/10	24/21	42/34	42/35	24/22	13/7	50/25	73/41	71/44	46/28	29/8	79/30	94/41	77/30	23/7
West	8/8	13/15	15/18	61/34	77/31	10/10	15/17	17/19	42/35	77/53	7/5	13/14	16/17	44/31	76/41	4/3	9/10	13/13	50/22	30/9
M. Clr (%hrs)	38	37	37	36	36	40	42	41	40	44	46	49	46	47	48	40	40	38	40	44

Covington, KY

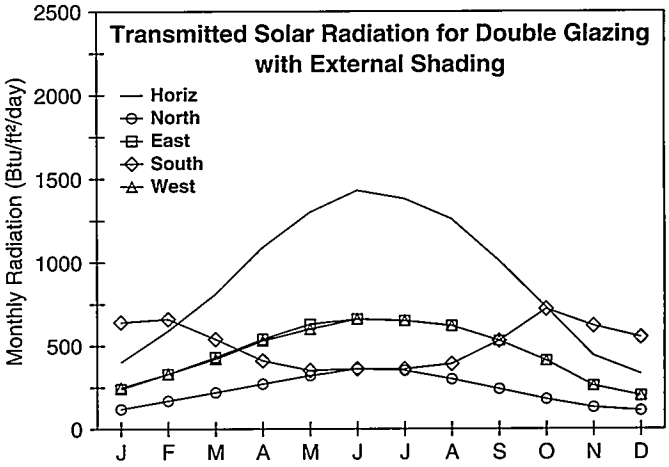
WBAN NO. 93814

LATITUDE: 39.07° N
LONGITUDE: 84.67° W
ELEVATION: 889 feet
MEAN PRESSURE: 14.3 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	610	860	1150	1510	1800	1970	1900	1740	1420	1050	660	510	1270
	Std.Dev.	48	66	85	150	137	114	112	92	92	73	60	47	38
	Minimum	520	740	980	1210	1520	1790	1680	1550	1270	880	530	430	1190
	Maximum	730	1040	1290	1830	2080	2390	2100	1900	1640	1260	810	610	1380
	Diffuse	350	460	600	730	830	880	860	770	620	460	360	310	600
	Clear-Day Global	930	1280	1750	2220	2520	2620	2540	2270	1860	1380	980	820	1770
North	Global	200	270	350	440	550	620	590	490	390	290	220	180	380
	Diffuse	200	270	350	430	500	540	520	470	380	290	220	180	360
	Clear-Day Global	190	250	330	430	580	680	620	480	360	280	200	170	380
East	Global	400	540	690	890	1020	1080	1070	1000	850	660	420	330	750
	Diffuse	250	330	430	520	600	640	630	580	480	360	260	210	440
	Clear-Day Global	690	890	1140	1330	1420	1450	1410	1330	1150	930	700	620	1090
South	Global	880	980	970	920	820	770	800	940	1080	1140	870	750	910
	Diffuse	350	420	490	540	570	580	580	570	530	450	350	310	480
	Clear-Day Global	1900	1950	1780	1400	1060	900	960	1220	1580	1830	1840	1820	1520
West	Global	400	540	690	860	980	1080	1050	1000	850	650	420	330	740
	Diffuse	250	330	430	530	600	650	640	580	480	360	260	210	450
	Clear-Day Global	690	890	1140	1330	1420	1450	1410	1330	1150	930	700	620	1090

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

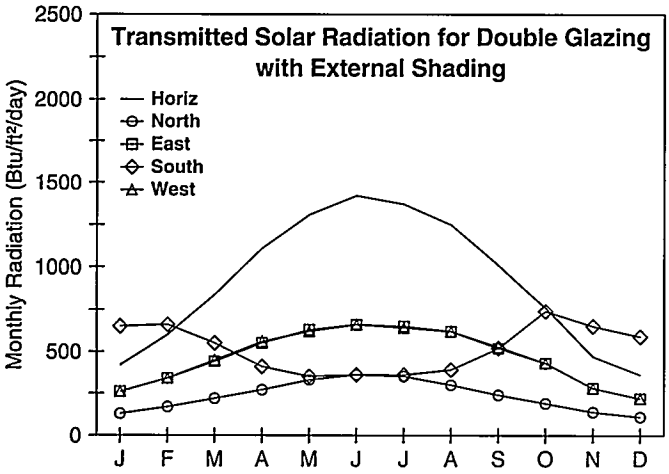
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	400	590	810	1090	1300	1430	1380	1260	1010	730	440	330	900
North	Unshaded	140	190	240	300	360	410	390	330	270	200	150	120	260
	Shaded	120	170	220	270	320	360	350	300	240	180	130	110	230
East	Unshaded	270	380	490	630	730	770	760	710	600	470	290	230	530
	Shaded	240	330	430	540	630	660	650	620	530	410	260	200	460
South	Unshaded	660	720	670	600	510	470	490	590	730	820	650	570	620
	Shaded	640	660	540	410	350	360	360	390	530	720	620	550	510
West	Unshaded	280	370	490	610	700	770	750	710	600	460	290	230	520
	Shaded	250	330	420	530	600	660	650	620	530	410	260	200	450

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	28.1	31.8	43.0	53.2	62.9	71.0	75.1	73.5	67.3	55.1	44.3	33.5	53.2
Daily Minimum Temp	19.5	22.7	33.1	42.2	51.8	60.0	64.8	62.9	56.6	44.2	35.3	25.3	43.2
Daily Maximum Temp	36.6	40.8	53.0	64.2	74.0	82.0	85.5	84.1	77.9	66.0	53.3	41.5	63.2
Record Minimum Temp	-25.1	-9.9	-9.9	19.0	27.0	41.0	48.0	44.1	35.1	17.1	1.9	-20.0	-25.1
Record Maximum Temp	68.0	73.0	82.9	88.0	91.0	100.9	102.0	100.9	97.0	87.1	80.1	75.0	102.0
HDD, Base 65°F	1144	930	682	354	151	11	0	0	51	327	621	977	5248
CDD, Base 65°F	0	0	0	0	86	191	313	266	120	20	0	0	996
Humidity Ratio (#w/#da)	0.0027	0.0029	0.0042	0.0057	0.0085	0.0116	0.0135	0.0129	0.0105	0.0067	0.0047	0.0033	0.0073
Wind Speed (mph)	10.5	10.1	10.9	10.3	8.5	7.9	7.0	6.9	7.2	8.1	9.5	10.1	8.9
Clearness Index, Kt	0.43	0.46	0.46	0.49	0.51	0.53	0.53	0.53	0.52	0.50	0.42	0.40	0.49

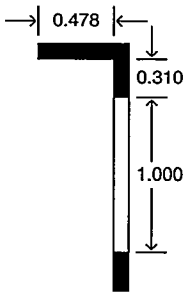
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	27/15	64/37	81/48	72/43	39/23	34/22	75/49	98/70	99/72	77/55	15/9	57/34	82/55	82/56	58/37	6/4	35/19	48/26	36/21	8/5
North	8/6	13/14	15/17	14/15	10/9	21/13	16/16	17/19	17/19	16/17	6/4	13/13	16/17	16/18	13/13	3/2	9/8	11/11	9/9	4/3
East	65/17	66/29	23/19	14/15	10/9	67/28	78/44	46/35	17/19	16/17	44/14	74/32	43/30	16/18	13/13	23/5	45/15	12/11	9/9	4/3
South	26/10	64/29	82/38	72/34	39/17	10/9	24/20	43/34	45/35	27/23	10/5	47/23	71/42	72/44	48/27	18/4	70/20	88/27	72/23	22/6
West	8/6	13/14	15/17	56/29	73/26	10/9	16/16	17/19	38/32	73/47	6/4	13/13	16/17	40/29	72/36	3/2	9/8	11/11	44/16	27/7
M. Clr (%hrs)	28	25	25	22	22	38	40	33	28	31	43	45	38	35	38	24	24	21	22	22



Lexington, KY

WBAN NO. 93820



Shading Geometry
(Not to Scale)

LATITUDE: 38.03° N
LONGITUDE: 84.60° W
ELEVATION: 988 feet
MEAN PRESSURE: 14.2 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	640	870	1190	1550	1810	1960	1890	1730	1410	1090	700	550	1280
	Std.Dev.	49	66	98	142	132	118	108	93	94	84	70	48	40
	Minimum	550	770	1010	1270	1500	1780	1570	1590	1260	890	560	490	1210
	Maximum	740	1020	1380	1870	2040	2390	2040	1930	1600	1330	830	660	1390
	Diffuse	360	470	610	720	830	890	880	770	640	460	370	320	610
	Clear-Day Global	980	1320	1790	2250	2520	2620	2540	2280	1880	1410	1020	860	1790
North	Global	210	280	360	440	550	620	590	490	390	300	220	190	390
	Diffuse	210	280	360	440	500	540	530	470	390	300	220	190	370
	Clear-Day Global	190	250	330	430	570	680	620	480	370	280	210	180	380
East	Global	420	540	710	890	1010	1070	1060	990	830	680	440	350	750
	Diffuse	260	330	430	530	600	640	630	580	480	370	270	220	440
	Clear-Day Global	720	920	1150	1340	1420	1440	1410	1320	1150	940	720	630	1100
South	Global	900	980	990	920	800	750	770	910	1040	1160	920	810	910
	Diffuse	350	420	490	540	560	580	580	570	530	450	360	320	480
	Clear-Day Global	1940	1950	1760	1360	1020	870	930	1180	1550	1810	1850	1850	1500
West	Global	420	550	710	890	990	1070	1040	990	840	680	450	360	750
	Diffuse	260	340	440	530	610	650	640	580	490	370	270	220	450
	Clear-Day Global	720	920	1150	1340	1420	1440	1410	1320	1150	940	720	630	1100

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	420	600	840	1110	1310	1420	1370	1250	1010	760	470	360	910
North	Unshaded	150	190	250	300	360	410	390	330	270	210	160	130	260
	Shaded	130	170	220	270	330	360	350	300	240	190	140	110	230
East	Unshaded	290	380	500	630	720	760	750	710	590	480	310	240	530
	Shaded	260	340	440	550	630	660	650	620	520	430	280	220	470
South	Unshaded	670	710	680	590	500	460	470	570	700	830	680	610	620
	Shaded	650	660	550	410	350	360	360	390	520	740	650	590	520
West	Unshaded	290	380	500	630	710	760	740	700	600	480	310	250	530
	Shaded	260	340	450	560	620	660	640	620	530	430	280	220	470

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	30.8	34.5	45.3	54.8	64.0	72.2	75.8	74.7	68.2	56.7	46.0	35.9	54.9
Daily Minimum Temp	22.4	25.3	35.3	44.2	53.5	61.5	65.7	64.4	58.0	46.0	37.0	27.6	45.1
Daily Maximum Temp	39.1	43.6	55.3	65.5	74.3	82.7	85.8	84.9	78.3	67.2	54.9	44.2	64.7
Record Minimum Temp	-21.0	-15.0	-2.0	18.0	26.0	39.0	47.0	42.0	35.0	20.0	-3.0	-19.0	-21.0
Record Maximum Temp	76.0	76.0	83.0	88.0	92.0	101.0	103.0	103.0	103.0	91.0	83.0	75.0	103.0
HDD, Base 65°F	1060	854	611	312	135	5	0	0	47	287	570	902	4783
CDD, Base 65°F	0	0	0	6	104	221	335	301	143	30	0	0	1140
Humidity Ratio (#w/#da)	0.0030	0.0033	0.0045	0.0060	0.0089	0.0119	0.0138	0.0132	0.0109	0.0070	0.0051	0.0037	0.0076
Wind Speed (mph)	9.9	9.9	10.5	9.9	8.2	7.5	6.8	6.7	7.0	7.7	9.2	9.8	8.6
Clearness Index, Kt	0.43	0.45	0.47	0.50	0.51	0.53	0.53	0.53	0.51	0.50	0.43	0.41	0.50

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

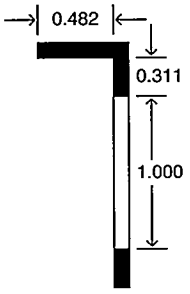
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	28/15	66/38	83/49	73/45	40/24	34/22	75/49	98/71	99/72	76/55	16/9	58/34	82/54	83/56	58/38	7/4	37/20	49/27	38/22	9/6
North	8/7	13/14	15/17	14/16	10/10	21/13	16/16	17/19	17/19	17/17	6/4	13/13	16/18	16/18	14/14	3/2	9/9	11/11	9/9	4/3
East	67/18	66/30	23/19	14/16	10/10	66/28	78/43	46/36	17/19	17/17	44/13	75/32	43/29	16/18	14/14	26/5	46/17	12/11	9/9	4/3
South	27/10	64/29	81/38	71/36	39/18	10/9	23/20	42/33	43/34	26/22	10/5	46/23	70/40	71/42	47/27	20/4	72/22	89/29	74/24	24/6
West	8/7	13/14	15/17	57/31	74/27	10/9	16/16	17/19	39/32	73/47	6/4	13/13	16/18	40/29	72/36	3/2	9/9	11/11	45/17	30/7
M. Clr (%hrs)	29	26	25	23	24	39	39	31	29	31	43	43	38	33	37	25	24	24	23	24

Louisville, KY

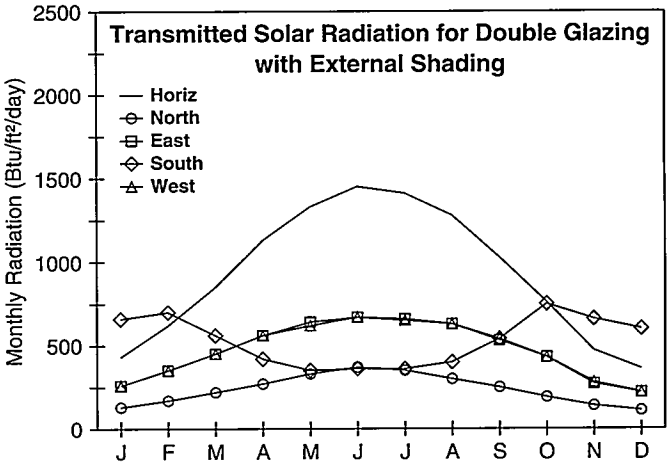
WBAN NO. 93821

LATITUDE: 38.18° N
LONGITUDE: 85.73° W
ELEVATION: 489 feet
MEAN PRESSURE: 14.5 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	640	900	1200	1570	1840	2000	1940	1770	1440	1090	700	550	1300
	Std.Dev.	49	72	105	138	133	125	110	95	87	76	68	52	41
	Minimum	550	790	980	1330	1610	1800	1610	1610	1270	900	570	460	1230
	Maximum	730	1080	1390	1820	2150	2460	2120	1940	1600	1280	840	670	1440
	Diffuse	360	460	600	720	830	880	870	780	630	460	370	320	610
	Clear-Day Global	970	1310	1780	2240	2520	2620	2530	2280	1870	1400	1010	850	1780
North	Global	210	280	360	440	550	630	590	490	390	300	220	190	390
	Diffuse	210	280	360	430	500	540	520	470	390	300	220	190	370
	Clear-Day Global	190	250	330	430	570	680	630	480	370	280	210	170	380
East	Global	410	560	710	910	1030	1090	1070	1010	850	680	440	360	760
	Diffuse	260	330	430	530	600	640	630	580	480	370	270	220	450
	Clear-Day Global	720	910	1150	1340	1420	1440	1410	1320	1150	930	710	630	1090
South	Global	910	1030	1010	940	820	760	790	930	1070	1180	930	820	930
	Diffuse	360	430	500	540	570	580	580	580	540	460	370	320	480
	Clear-Day Global	1930	1950	1760	1360	1020	870	930	1190	1550	1810	1850	1840	1500
West	Global	420	560	720	890	1000	1090	1060	1000	860	680	450	360	760
	Diffuse	260	340	440	530	610	660	640	590	490	380	270	220	450
	Clear-Day Global	720	910	1150	1340	1420	1440	1410	1320	1150	930	710	630	1090

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

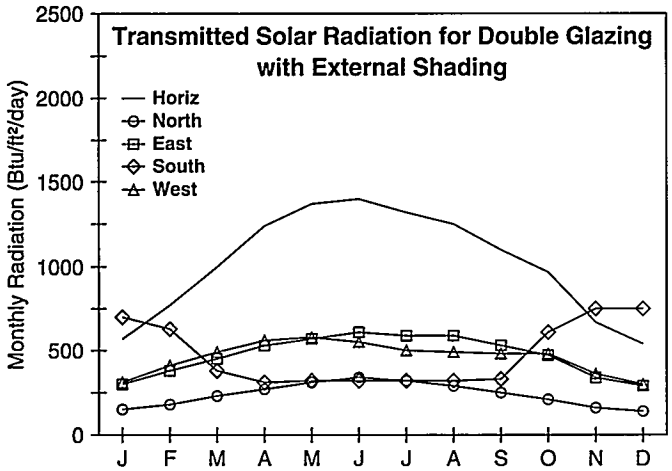
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	430	620	850	1130	1330	1450	1410	1280	1030	760	470	360	930
North	Unshaded	150	190	250	300	360	410	390	330	270	210	160	130	260
	Shaded	130	170	220	270	330	370	350	300	250	190	140	110	240
East	Unshaded	280	390	500	640	740	770	760	720	600	480	300	240	540
	Shaded	260	350	450	560	640	670	660	630	530	430	270	220	470
South	Unshaded	680	750	700	610	500	460	480	590	720	840	690	620	640
	Shaded	660	700	560	420	350	360	360	400	540	750	660	600	530
West	Unshaded	290	390	510	630	710	780	750	710	610	480	310	250	540
	Shaded	260	350	450	560	620	670	650	630	540	430	280	220	470

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	31.7	35.7	46.3	56.3	65.3	73.2	77.2	75.8	69.5	57.6	47.1	36.9	56.1
Daily Minimum Temp	23.2	26.5	36.2	45.4	54.7	62.9	67.3	65.8	58.7	45.8	37.3	28.6	46.0
Daily Maximum Temp	40.3	44.8	56.3	67.3	76.0	83.5	87.0	85.7	80.3	69.2	56.8	45.1	66.0
Record Minimum Temp	-20.0	-19.0	-1.0	22.0	31.0	42.0	50.0	46.0	33.0	23.0	-1.0	-15.0	-20.0
Record Maximum Temp	77.0	77.0	86.0	91.0	95.0	102.0	105.0	101.0	104.0	92.0	84.0	76.0	105.0
HDD, Base 65°F	1032	820	580	273	105	6	0	0	36	254	537	871	4514
CDD, Base 65°F	0	0	0	12	115	252	378	335	171	25	0	0	1288
Humidity Ratio (#w/#da)	0.0028	0.0031	0.0044	0.0060	0.0090	0.0121	0.0139	0.0134	0.0110	0.0070	0.0049	0.0035	0.0076
Wind Speed (mph)	9.5	9.5	10.1	9.6	8.0	7.5	6.8	6.6	6.8	7.3	8.7	9.3	8.3
Clearness Index, Kt	0.44	0.47	0.47	0.50	0.52	0.54	0.54	0.54	0.52	0.51	0.44	0.41	0.50

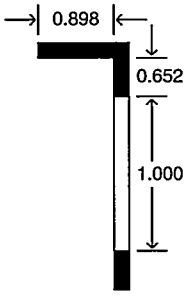
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	26/15	64/38	82/50	73/46	41/25	32/22	74/49	98/72	99/76	78/58	14/9	56/33	83/55	84/58	59/40	6/4	35/20	49/27	38/22	10/6
North	8/6	13/14	15/17	14/16	10/10	21/13	16/16	17/19	17/19	17/17	6/4	13/13	16/18	16/18	14/14	3/2	9/8	11/11	9/9	4/3
East	65/20	67/31	25/20	14/16	10/10	63/31	79/45	48/37	17/19	17/17	41/14	75/32	45/31	16/18	14/14	22/5	46/17	14/12	9/9	4/3
South	25/10	62/30	80/41	72/37	40/19	10/9	22/19	42/33	43/36	27/23	9/5	45/22	70/42	71/45	48/29	16/4	69/22	88/29	74/25	25/7
West	8/6	13/14	15/17	54/31	73/30	10/9	16/16	17/19	37/32	73/49	6/4	13/13	16/18	38/29	70/39	3/2	9/8	11/11	44/18	31/8
M. Clr (%hrs)	25	25	25	23	22	36	39	31	28	31	39	45	37	34	40	23	23	25	23	23



Baton Rouge, LA

WBAN NO. 13970



Shading Geometry
(Not to Scale)

LATITUDE: 30.53° N
LONGITUDE: 91.15° W
ELEVATION: 75 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	840	1100	1390	1700	1870	1920	1810	1720	1520	1350	960	800	1420
	Std.Dev.	68	103	108	137	126	150	127	125	107	110	80	66	36
	Minimum	700	940	1190	1450	1670	1600	1620	1530	1280	1090	750	680	1340
	Maximum	990	1280	1650	2100	2170	2150	2120	1990	1710	1570	1090	940	1470
	Diffuse	410	490	600	710	820	870	870	800	680	500	420	370	630
	Clear-Day Global	1280	1600	1990	2320	2500	2550	2490	2320	2020	1650	1310	1170	1930
North	Global	250	310	380	450	550	620	570	480	410	340	270	240	410
	Diffuse	250	310	380	440	490	520	510	460	410	340	270	240	380
	Clear-Day Global	230	290	350	430	580	690	630	490	400	320	250	230	410
East	Global	500	640	770	920	1000	1060	1020	1000	890	800	580	490	810
	Diffuse	300	360	450	530	600	630	620	580	510	420	330	280	470
	Clear-Day Global	860	1020	1200	1310	1340	1340	1310	1260	1170	1010	850	790	1120
South	Global	1010	1090	1010	840	660	590	610	750	960	1250	1140	1060	910
	Diffuse	390	440	490	520	520	520	520	530	530	500	420	370	480
	Clear-Day Global	2000	1900	1570	1090	750	630	680	930	1340	1710	1890	1960	1370
West	Global	530	680	830	960	1000	960	880	850	820	800	610	510	790
	Diffuse	300	370	460	540	600	620	600	570	510	420	330	280	470
	Clear-Day Global	860	1020	1200	1310	1340	1340	1310	1260	1170	1010	850	790	1120

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	570	770	1000	1240	1370	1400	1320	1250	1100	970	670	540	1020
North	Unshaded	180	210	260	310	360	400	370	330	280	230	190	160	270
	Shaded	150	180	230	270	310	340	320	290	250	210	160	140	240
East	Unshaded	350	450	550	650	700	750	720	710	630	560	400	340	570
	Shaded	300	380	450	530	570	610	590	590	530	470	340	290	470
South	Unshaded	750	780	670	510	400	370	380	450	620	870	830	790	620
	Shaded	700	630	380	310	320	320	320	320	330	610	750	750	480
West	Unshaded	370	480	590	680	710	680	620	600	580	570	420	350	550
	Shaded	310	410	490	560	580	550	500	490	480	480	360	300	460

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	49.8	53.1	61.3	68.9	75.3	80.5	82.3	81.9	78.1	68.6	60.0	52.9	67.7
Daily Minimum Temp	39.6	42.5	50.2	57.9	64.8	70.4	73.2	72.6	68.8	57.1	49.0	42.5	57.4
Daily Maximum Temp	59.8	63.6	72.3	79.8	85.7	90.5	91.4	91.1	87.4	80.0	70.9	63.3	78.0
Record Minimum Temp	9.0	20.0	20.0	32.0	44.0	53.0	58.0	59.0	43.0	32.0	21.0	8.0	8.0
Record Maximum Temp	82.0	85.0	91.0	92.0	98.0	103.0	101.0	102.0	99.0	94.0	87.0	85.0	103.0
HDD, Base 65°F	490	345	170	27	0	0	0	0	0	48	197	392	1669
CDD, Base 65°F	19	12	55	144	319	465	536	524	393	159	47	17	2690
Humidity Ratio (#w/#da)	0.0060	0.0064	0.0081	0.0104	0.0129	0.0157	0.0171	0.0169	0.0150	0.0105	0.0084	0.0068	0.0112
Wind Speed (mph)	8.6	9.0	9.2	8.7	7.5	6.5	5.8	5.4	6.5	6.5	7.6	8.1	7.4
Clearness Index, Kt	0.45	0.48	0.50	0.52	0.53	0.53	0.51	0.51	0.51	0.55	0.48	0.45	0.51

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

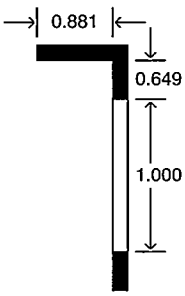
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	45/24	82/48	93/57	74/44	32/19	42/30	83/61	101/75	95/69	66/45	29/18	72/47	92/64	84/57	50/32	25/13	56/31	63/36	43/24	7/4
North	11/10	15/17	16/18	14/15	9/8	23/17	18/18	17/18	18/19	20/17	9/8	16/16	18/19	17/18	13/12	7/6	12/12	13/13	10/10	3/2
East	79/24	59/32	16/18	14/15	9/8	69/37	72/49	32/28	18/19	16/15	62/22	71/40	30/26	17/18	13/12	57/13	44/20	13/13	10/10	3/2
South	36/15	64/34	73/41	58/31	26/13	13/11	20/20	31/27	28/25	16/15	18/10	49/30	65/43	59/37	33/19	49/12	83/30	90/36	70/24	17/5
West	11/10	15/17	23/21	70/35	70/25	13/11	18/18	17/18	52/39	75/43	9/8	16/16	18/19	54/36	72/34	7/6	12/12	24/17	58/21	26/6
M. Clr (%hrs)	34	33	32	34	39	50	39	33	32	31	51	46	36	34	35	32	35	33	33	35

Lake Charles, LA

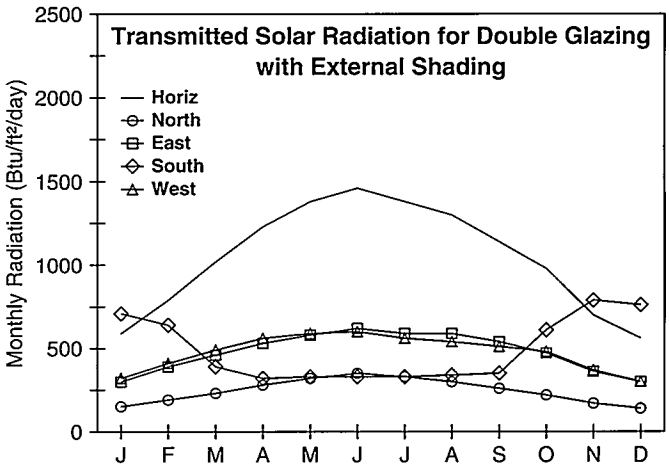
WBAN NO. 03937

LATITUDE: 30.12° N
LONGITUDE: 93.22° W
ELEVATION: 10 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Primary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	860	1130	1420	1700	1900	2000	1900	1790	1590	1370	1010	820	1460
	Std.Dev.	78	97	115	136	131	148	102	113	93	104	90	58	31
	Minimum	670	970	1120	1430	1660	1700	1670	1480	1370	1090	750	740	1410
	Maximum	1020	1300	1650	2090	2230	2260	2140	2010	1780	1570	1160	930	1520
	Diffuse	420	500	640	770	880	910	920	860	720	540	430	380	660
	Clear-Day Global	1300	1620	2010	2340	2520	2550	2490	2320	2030	1670	1330	1180	1950
North	Global	260	310	390	470	570	640	600	510	420	350	280	240	420
	Diffuse	260	310	390	460	520	540	530	490	420	350	280	240	400
	Clear-Day Global	240	290	350	430	590	690	630	490	390	320	250	230	410
East	Global	510	660	780	910	1000	1060	1020	1000	910	810	600	500	810
	Diffuse	310	370	470	560	620	650	640	610	540	440	330	290	490
	Clear-Day Global	870	1030	1200	1320	1350	1340	1310	1260	1170	1020	860	800	1130
South	Global	1030	1110	1010	830	670	600	630	760	990	1240	1190	1070	930
	Diffuse	400	450	510	540	550	540	540	560	560	520	430	380	500
	Clear-Day Global	2020	1910	1570	1080	740	620	660	920	1330	1710	1900	1970	1360
West	Global	540	690	830	950	1020	1040	970	930	870	810	630	510	810
	Diffuse	310	380	470	560	630	650	640	610	530	440	340	290	490
	Clear-Day Global	870	1030	1200	1320	1350	1340	1310	1260	1170	1020	860	800	1130

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

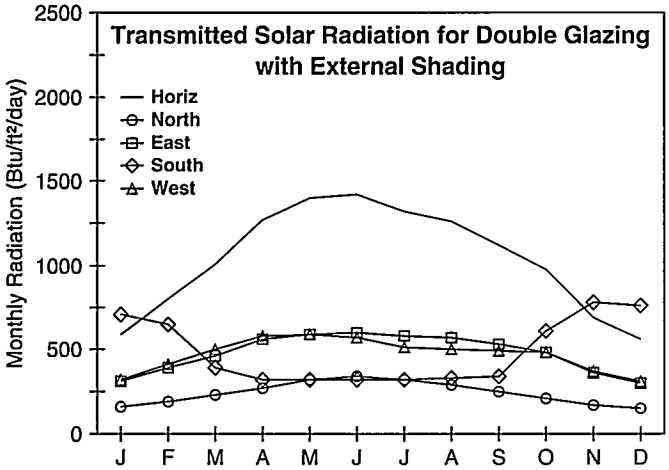
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	590	790	1020	1230	1380	1460	1380	1300	1140	980	700	560	1050
North	Unshaded	180	220	270	320	370	410	390	340	290	240	190	170	280
	Shaded	150	190	230	280	320	350	330	300	260	220	170	140	250
East	Unshaded	350	460	550	650	710	750	720	710	650	570	420	340	570
	Shaded	300	390	460	530	580	620	590	590	540	470	360	300	480
South	Unshaded	760	790	670	510	410	380	390	470	630	860	870	790	630
	Shaded	710	640	390	320	330	330	330	340	350	610	790	760	490
West	Unshaded	380	480	590	670	720	740	680	660	610	570	440	360	570
	Shaded	320	410	490	560	590	600	560	540	510	480	370	300	480

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	50.4	53.7	60.7	68.3	74.9	80.3	82.2	81.9	77.7	69.1	60.4	53.5	67.8
Daily Minimum Temp	41.1	44.0	50.7	58.7	65.7	71.6	73.6	73.0	68.6	57.9	50.0	43.6	58.2
Daily Maximum Temp	59.7	63.4	70.7	77.9	84.0	89.0	90.8	90.8	86.8	80.2	70.8	63.3	77.3
Record Minimum Temp	15.0	22.0	25.0	34.0	49.0	56.0	61.0	61.0	47.0	32.0	23.0	11.0	11.0
Record Maximum Temp	82.0	83.0	86.0	95.0	96.0	99.0	102.0	101.0	98.0	92.0	87.0	82.0	102.0
HDD, Base 65°F	467	328	178	40	0	0	0	0	0	35	193	375	1616
CDD, Base 65°F	15	12	45	139	307	459	533	524	381	162	55	18	2650
Humidity Ratio (#w/#da)	0.0065	0.0069	0.0088	0.0112	0.0139	0.0166	0.0179	0.0176	0.0155	0.0112	0.0089	0.0073	0.0118
Wind Speed (mph)	9.9	10.4	10.2	10.0	8.8	7.5	6.4	6.1	7.2	7.7	9.2	9.8	8.6
Clearness Index, Kt	0.45	0.49	0.50	0.52	0.54	0.55	0.53	0.53	0.53	0.55	0.50	0.46	0.52

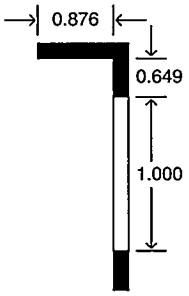
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	43/23	83/49	95/59	78/46	35/21	39/28	81/62	103/79	99/74	70/49	25/17	70/49	93/67	87/62	53/37	23/12	55/31	65/37	46/26	9/6
North	10/10	15/17	16/19	15/16	10/9	23/16	18/19	18/19	19/20	20/18	9/7	16/17	18/19	18/19	14/14	7/5	12/12	13/14	11/10	4/3
East	79/24	64/34	16/19	15/16	10/9	64/36	73/52	37/31	19/20	17/17	54/23	72/44	35/29	18/19	14/14	54/13	47/21	13/14	11/10	4/3
South	34/15	64/34	73/42	60/32	28/14	12/11	19/19	31/27	29/26	17/17	15/9	47/31	65/44	60/41	35/23	45/12	82/30	91/38	72/26	21/6
West	10/10	15/17	20/20	68/35	73/26	12/11	18/19	18/19	50/39	75/46	9/7	16/17	18/19	52/37	72/39	7/5	12/12	21/16	57/22	31/8
M. Clr (%hrs)	30	30	31	34	37	47	35	32	36	43	52	44	35	37	39	32	33	33	35	36



New Orleans, LA

WBAN NO. 12916



Shading Geometry
(Not to Scale)

LATITUDE: 29.98° N
LONGITUDE: 90.25° W
ELEVATION: 10 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	860	1130	1410	1750	1920	1940	1820	1730	1550	1370	990	820	1440
	Std.Dev.	70	96	112	123	118	164	98	123	90	108	90	63	35
	Minimum	720	930	1190	1490	1690	1570	1660	1470	1360	1160	730	730	1370
	Maximum	1020	1320	1650	2090	2220	2240	2090	1940	1750	1580	1130	950	1510
	Diffuse	420	490	620	710	800	860	890	820	690	510	430	390	640
	Clear-Day Global	1300	1610	1990	2320	2500	2540	2480	2320	2030	1660	1320	1180	1940
North	Global	260	310	380	450	560	620	570	490	410	340	280	240	410
	Diffuse	260	310	380	440	500	520	510	470	410	340	280	240	390
	Clear-Day Global	240	290	360	430	580	690	640	490	400	330	260	230	410
East	Global	510	660	790	950	1020	1040	1010	980	900	800	600	500	810
	Diffuse	310	370	460	550	600	630	630	590	520	430	340	290	480
	Clear-Day Global	860	1020	1200	1300	1340	1330	1300	1260	1170	1010	850	790	1120
South	Global	1030	1120	1010	850	660	580	600	740	970	1240	1170	1070	920
	Diffuse	400	450	510	530	520	520	520	540	540	500	440	390	490
	Clear-Day Global	1990	1880	1550	1080	730	610	670	910	1320	1690	1880	1950	1350
West	Global	540	690	830	980	1020	980	880	860	840	810	620	520	800
	Diffuse	310	380	470	550	600	620	610	580	510	430	340	290	480
	Clear-Day Global	860	1020	1200	1300	1340	1330	1300	1260	1170	1010	850	790	1120

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	590	800	1010	1270	1400	1420	1320	1260	1120	980	690	560	1040
North	Unshaded	180	220	260	310	360	400	370	330	290	240	190	170	280
	Shaded	160	190	230	270	320	340	320	290	250	210	170	150	240
East	Unshaded	360	460	560	670	720	740	710	700	640	570	420	340	570
	Shaded	310	390	460	560	590	600	580	570	530	480	360	300	480
South	Unshaded	760	800	670	520	400	370	380	450	620	860	860	800	620
	Shaded	710	650	390	320	320	320	320	330	340	610	780	760	490
West	Unshaded	370	490	590	690	720	690	620	610	590	570	430	360	560
	Shaded	320	410	500	580	590	570	510	500	490	480	370	310	470

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	51.3	54.3	61.6	68.5	74.8	80.0	81.9	81.5	78.1	69.1	61.1	54.5	68.1
Daily Minimum Temp	41.8	44.4	51.6	58.4	65.2	70.8	73.1	72.8	69.5	58.7	51.0	44.8	58.5
Daily Maximum Temp	60.8	64.1	71.6	78.5	84.4	89.2	90.6	90.2	86.6	79.4	71.1	64.3	77.6
Record Minimum Temp	14.0	19.0	25.0	32.0	41.0	50.0	60.0	60.0	42.0	35.0	24.0	11.0	11.0
Record Maximum Temp	83.0	85.0	89.0	92.0	96.0	100.0	101.0	102.0	101.0	92.0	87.0	84.0	102.0
HDD, Base 65°F	450	316	162	28	0	0	0	0	0	30	178	349	1513
CDD, Base 65°F	25	17	56	133	304	450	524	512	393	157	61	23	2655
Humidity Ratio (#w/#da)	0.0066	0.0070	0.0089	0.0112	0.0138	0.0165	0.0178	0.0177	0.0158	0.0114	0.0093	0.0076	0.0120
Wind Speed (mph)	9.0	9.7	9.4	9.2	8.0	6.6	5.9	5.8	7.0	7.3	8.5	9.0	7.9
Clearness Index, Kt	0.45	0.49	0.50	0.53	0.54	0.53	0.51	0.51	0.52	0.55	0.49	0.46	0.51

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

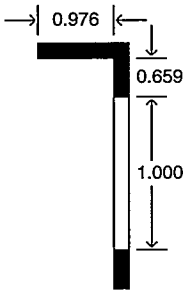
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	47/26	83/51	92/59	73/45	30/19	43/31	83/62	103/74	97/69	65/45	30/20	73/51	93/64	84/59	49/33	26/14	57/33	63/37	42/24	6/4
North	11/10	15/17	16/18	14/15	9/8	24/17	18/19	17/19	18/19	21/18	10/9	16/17	18/19	17/18	13/13	8/6	12/13	13/14	10/10	3/2
East	79/28	58/34	16/18	14/15	9/8	67/39	71/50	31/27	18/19	16/16	60/26	70/43	29/25	17/18	13/13	56/15	43/22	13/14	10/10	3/2
South	37/17	64/36	71/42	57/32	24/12	13/12	20/20	30/26	27/24	16/16	19/11	49/32	65/43	58/38	32/20	49/14	83/33	88/38	67/25	15/5
West	11/10	15/17	25/22	70/37	69/25	13/12	18/19	17/19	54/40	75/44	10/9	16/17	18/19	56/38	72/36	8/6	12/13	26/18	57/22	23/6
M. Clr (%hrs)	31	31	33	34	37	45	40	40	37	35	51	42	39	36	36	33	32	33	36	35

Shreveport, LA

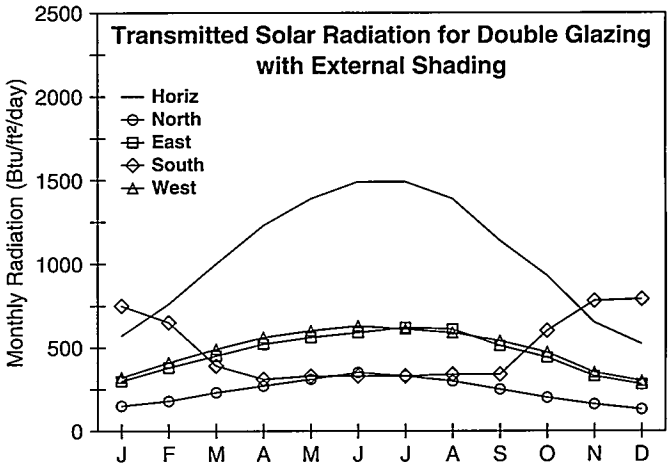
WBAN NO. 13957

LATITUDE: 32.47° N
LONGITUDE: 93.82° W
ELEVATION: 259 feet
MEAN PRESSURE: 14.6 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	840	1090	1400	1700	1910	2040	2040	1910	1580	1310	940	780	1460
	Std.Dev.	75	75	117	141	140	121	118	95	95	122	78	58	36
	Minimum	710	960	1200	1440	1660	1710	1850	1690	1270	1050	720	670	1400
	Maximum	980	1230	1710	2080	2230	2230	2340	2050	1740	1520	1070	880	1540
	Diffuse	400	480	610	730	840	870	850	780	670	500	400	360	620
	Clear-Day Global	1210	1530	1950	2320	2530	2590	2520	2330	2010	1610	1250	1090	1910
North	Global	250	300	380	460	560	640	610	500	410	330	260	230	410
	Diffuse	250	300	380	450	510	530	520	480	410	330	260	230	390
	Clear-Day Global	230	280	350	440	590	690	640	490	390	310	240	210	410
East	Global	510	640	790	910	990	1050	1090	1060	890	770	570	480	810
	Diffuse	300	360	460	540	610	640	630	600	520	410	320	270	470
	Clear-Day Global	820	990	1180	1330	1380	1380	1350	1290	1180	1010	830	760	1130
South	Global	1090	1140	1050	880	720	640	680	850	1040	1250	1170	1100	970
	Diffuse	390	450	500	540	550	540	550	560	550	490	420	370	490
	Clear-Day Global	2000	1920	1630	1170	820	690	740	1000	1410	1760	1910	1950	1410
West	Global	550	690	840	980	1070	1110	1080	1030	920	810	610	510	850
	Diffuse	300	370	460	560	620	650	640	610	520	420	320	280	480
	Clear-Day Global	820	990	1180	1330	1380	1380	1350	1290	1180	1010	830	760	1130

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

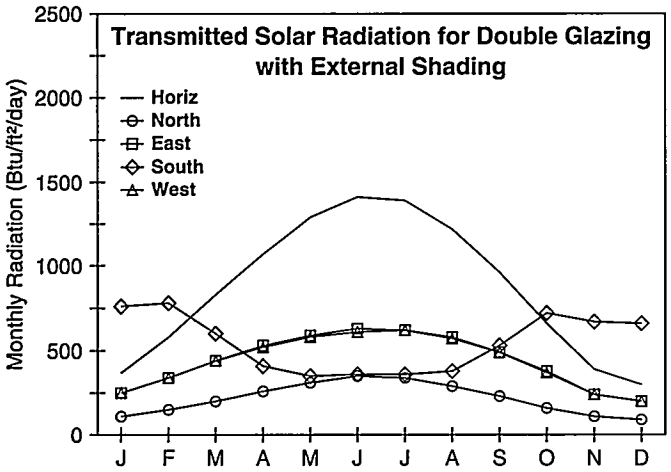
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	570	760	1000	1230	1390	1490	1490	1390	1140	930	650	520	1050
North	Unshaded	170	210	260	310	370	410	390	340	290	230	180	160	280
	Shaded	150	180	230	270	310	350	330	300	250	200	160	130	240
East	Unshaded	350	450	560	650	700	750	770	750	630	540	390	330	570
	Shaded	300	380	450	520	560	590	620	610	510	440	330	280	470
South	Unshaded	810	820	710	550	430	400	410	520	670	880	860	820	660
	Shaded	750	650	390	310	330	330	330	340	340	600	780	790	490
West	Unshaded	380	490	600	700	760	790	770	730	650	570	420	350	600
	Shaded	320	410	490	560	600	630	610	590	540	470	350	300	490

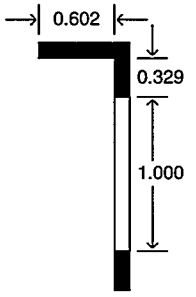
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	45.1	49.3	57.5	65.6	72.6	79.4	82.7	82.2	76.7	66.5	56.7	48.0	65.2
Daily Minimum Temp	34.8	38.0	45.8	54.1	62.0	69.0	72.3	71.3	66.0	54.3	45.3	37.3	54.2
Daily Maximum Temp	55.4	60.6	69.2	77.1	83.2	89.7	93.0	93.1	87.3	78.7	68.0	58.5	76.2
Record Minimum Temp	3.0	12.0	20.0	31.0	42.0	52.0	58.0	54.0	42.0	29.0	16.0	5.0	3.0
Record Maximum Temp	84.0	89.0	92.0	94.0	95.0	101.0	106.0	107.0	103.0	97.0	88.0	84.0	107.0
HDD, Base 65°F	623	448	262	69	0	0	0	0	0	63	264	535	2264
CDD, Base 65°F	6	8	30	87	239	432	549	533	351	110	15	8	2368
Humidity Ratio (#w/#da)	0.0049	0.0054	0.0070	0.0095	0.0123	0.0152	0.0164	0.0160	0.0139	0.0097	0.0073	0.0056	0.0103
Wind Speed (mph)	8.8	9.4	9.9	9.5	8.3	7.3	6.9	6.5	7.1	7.1	8.4	8.8	8.1
Clearness Index, Kt	0.47	0.50	0.51	0.52	0.54	0.56	0.57	0.57	0.54	0.54	0.49	0.47	0.53

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	40/21	78/46	91/56	75/45	36/22	40/26	81/58	103/78	99/77	71/53	25/16	69/45	91/64	85/63	54/38	19/10	52/29	61/36	43/24	8/5
North	10/9	14/17	16/19	14/16	9/9	23/15	17/18	17/19	18/19	17/17	8/7	15/16	17/19	17/19	14/14	6/5	11/11	12/13	10/10	4/3
East	78/23	63/32	16/19	14/16	9/9	70/32	75/49	37/32	18/19	16/17	58/20	74/40	35/28	17/19	14/14	50/12	47/20	12/13	10/10	4/3
South	34/14	66/32	76/41	63/33	30/15	12/11	21/20	34/30	32/29	17/17	16/9	49/29	67/44	62/43	38/24	42/10	83/29	92/37	72/25	20/6
West	10/9	14/17	18/20	66/34	75/28	12/11	17/18	17/19	49/40	76/51	8/7	15/16	17/19	50/37	74/41	6/5	11/11	20/15	55/21	29/8
M. Clr (%hrs)	34	35	35	37	38	39	37	32	37	45	44	42	38	40	47	35	34	35	39	40





Shading Geometry
(Not to Scale)

Boston, MA

WBAN NO. 14739

LATITUDE: 42.37° N
LONGITUDE: 71.03° W
ELEVATION: 16 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Primary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	590	850	1180	1490	1780	1940	1920	1700	1350	950	600	480	1240
	Std.Dev.	42	80	91	122	129	134	120	99	80	63	48	37	33
	Minimum	480	680	1000	1280	1530	1670	1660	1510	1230	850	480	390	1160
	Maximum	700	1060	1390	1710	2040	2230	2090	1890	1500	1100	690	560	1300
	Diffuse	280	400	550	700	830	900	870	760	590	420	300	240	570
	Clear-Day Global	770	1120	1610	2120	2460	2580	2490	2190	1740	1220	820	660	1650
North	Global	180	250	340	430	540	620	580	480	370	270	190	150	370
	Diffuse	180	250	340	420	500	540	530	460	370	270	190	150	350
	Clear-Day Global	170	240	320	430	570	670	620	470	350	260	180	150	370
East	Global	410	560	740	890	1000	1080	1060	990	830	620	400	340	740
	Diffuse	220	310	420	520	600	640	630	570	460	340	230	190	430
	Clear-Day Global	600	810	1070	1300	1410	1450	1410	1300	1100	850	610	520	1040
South	Global	1040	1150	1110	980	880	840	880	990	1120	1140	930	900	1000
	Diffuse	330	420	490	540	580	600	600	580	520	430	320	290	480
	Clear-Day Global	1740	1870	1790	1480	1170	1020	1070	1310	1620	1780	1710	1640	1510
West	Global	410	570	730	870	990	1050	1060	960	810	610	400	340	730
	Diffuse	220	310	420	520	600	650	640	580	460	340	230	190	430
	Clear-Day Global	600	810	1070	1300	1410	1450	1410	1300	1100	850	610	520	1040

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	370	580	830	1070	1290	1410	1390	1220	960	660	390	300	870
North	Unshaded	130	170	240	290	360	410	390	330	260	190	130	110	250
	Shaded	110	150	200	260	310	350	340	290	230	160	110	92	220
East	Unshaded	280	390	520	640	710	770	750	700	590	440	280	230	530
	Shaded	250	340	440	530	590	630	620	580	490	380	240	200	440
South	Unshaded	780	850	780	650	560	520	550	640	760	830	700	680	690
	Shaded	760	780	600	410	350	360	360	380	530	720	670	660	550
West	Unshaded	280	390	520	620	700	750	750	680	570	430	270	230	520
	Shaded	250	340	440	520	580	610	620	570	490	370	240	200	440

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	28.6	30.3	38.6	48.1	58.2	67.7	73.5	71.9	64.8	54.8	45.3	33.6	51.3
Daily Minimum Temp	21.6	23.0	31.3	40.2	49.8	59.1	65.1	64.0	56.8	46.9	38.3	26.7	43.6
Daily Maximum Temp	35.7	37.5	45.8	55.9	66.6	76.3	81.8	79.8	72.8	62.7	52.2	40.4	59.0
Record Minimum Temp	-12.0	-4.0	6.0	16.0	34.0	45.0	50.0	47.0	38.0	28.0	15.0	-7.0	-12.0
Record Maximum Temp	63.0	70.0	81.0	94.0	95.0	100.0	102.0	102.0	100.0	90.0	78.0	73.0	102.0
HDD, Base 65°F	1128	972	818	507	221	32	0	6	72	321	591	973	5641
CDD, Base 65°F	0	0	0	0	10	113	264	220	66	5	0	0	678
Humidity Ratio (#w/#da)	0.0022	0.0023	0.0031	0.0043	0.0067	0.0096	0.0117	0.0115	0.0092	0.0062	0.0044	0.0028	0.0062
Wind Speed (mph)	13.8	13.7	13.7	13.3	12.2	11.5	11.0	10.8	11.4	12.0	13.0	13.6	12.5
Clearness Index, Kt	0.47	0.50	0.50	0.49	0.51	0.52	0.53	0.53	0.51	0.49	0.43	0.43	0.50

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

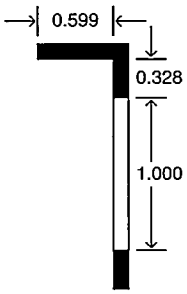
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	43/24	71/44	76/48	56/35	18/11	54/34	86/56	99/70	90/64	61/42	32/19	67/42	81/54	70/46	38/24	15/9	37/22	39/23	19/12	0/0
North	10/10	14/15	15/16	12/13	6/5	14/13	17/18	17/19	17/19	15/14	9/8	14/15	16/17	15/16	11/10	5/4	9/9	10/9	6/5	0/0
East	72/26	49/28	15/16	12/13	6/5	79/36	67/40	23/23	17/19	15/14	66/24	63/33	20/19	15/16	11/10	38/11	31/15	10/9	6/5	0/0
South	46/19	78/38	83/42	60/30	19/8	13/13	39/28	52/38	44/33	19/16	27/13	62/32	78/45	65/37	32/17	39/11	78/28	80/29	47/15	0/0
West	10/10	14/15	31/22	68/32	52/16	13/13	17/18	17/19	58/40	77/42	9/8	14/15	16/17	57/34	67/29	5/4	9/9	25/14	41/13	0/0
M. Clr (%hrs)	37	34	32	32	35	39	39	32	30	32	44	46	40	40	41	35	35	35	35	37

Worchester, MA

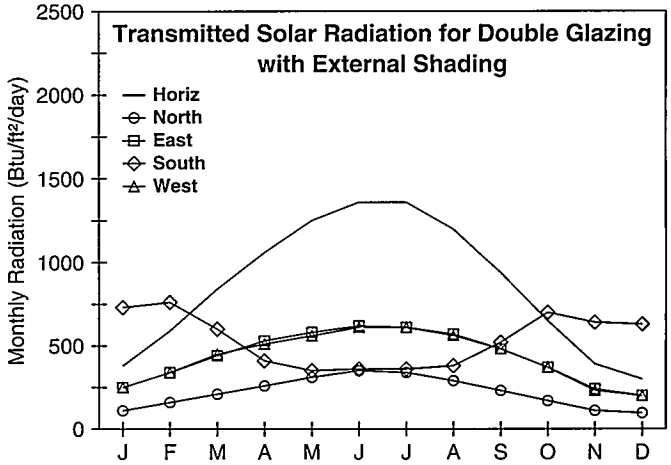
WBAN NO. 94746

LATITUDE: 42.27° N
LONGITUDE: 71.87° W
ELEVATION: 988 feet
MEAN PRESSURE: 14.2 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±11%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	600	870	1200	1480	1730	1890	1880	1660	1330	950	590	480	1220
	Std.Dev.	48	79	94	115	127	143	104	97	88	60	45	34	34
	Minimum	520	700	950	1260	1450	1600	1670	1460	1170	860	480	410	1170
	Maximum	690	1060	1370	1710	2030	2170	2080	1870	1500	1120	660	560	1280
	Diffuse	320	450	600	730	860	910	890	780	610	440	320	270	600
	Clear-Day Global	790	1150	1650	2150	2490	2610	2520	2210	1760	1240	830	680	1680
North	Global	190	270	360	440	540	620	590	480	380	280	190	160	370
	Diffuse	190	270	360	430	510	540	530	470	370	280	190	160	360
	Clear-Day Global	180	250	330	430	580	680	620	480	360	260	180	160	380
East	Global	410	570	740	880	990	1060	1040	960	810	610	390	340	730
	Diffuse	240	340	440	530	610	640	640	570	460	340	230	200	440
	Clear-Day Global	610	830	1100	1310	1430	1470	1430	1320	1120	860	620	530	1050
South	Global	1010	1130	1100	970	860	820	860	970	1080	1120	890	860	970
	Diffuse	370	450	520	550	590	600	600	580	530	440	340	310	490
	Clear-Day Global	1770	1900	1830	1490	1180	1030	1080	1320	1630	1790	1720	1660	1530
West	Global	410	570	740	860	960	1040	1040	950	800	610	390	330	730
	Diffuse	240	340	450	530	610	650	650	580	470	340	240	200	440
	Clear-Day Global	610	830	1100	1310	1430	1470	1430	1320	1120	860	620	530	1050

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±11%

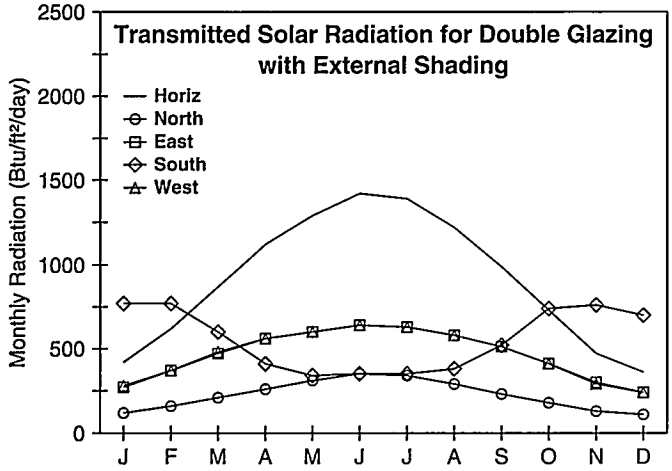
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	380	590	840	1060	1250	1360	1360	1200	940	650	390	300	860
North	Unshaded	130	190	250	300	360	410	390	330	260	190	130	110	250
	Shaded	110	160	210	260	310	350	340	290	230	170	110	96	220
East	Unshaded	280	400	520	630	700	750	740	680	570	430	270	230	520
	Shaded	250	340	440	530	580	620	610	570	480	370	240	200	440
South	Unshaded	760	830	770	640	550	510	540	630	740	810	670	650	670
	Shaded	730	760	600	410	350	360	360	380	520	700	640	630	540
West	Unshaded	280	400	520	610	680	740	740	670	570	430	270	230	510
	Shaded	250	340	450	510	560	610	610	560	480	370	230	200	430

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	22.8	24.8	33.7	44.4	55.5	64.2	69.7	68.0	60.2	50.0	39.4	27.4	46.7
Daily Minimum Temp	15.0	16.5	24.9	34.7	45.1	53.9	60.1	58.6	50.5	40.5	31.3	20.1	37.6
Daily Maximum Temp	30.7	33.0	42.4	54.0	65.9	74.5	79.3	77.3	69.7	59.5	47.4	34.7	55.7
Record Minimum Temp	-19.0	-12.0	-4.0	11.0	28.0	36.0	43.0	38.0	30.0	20.0	6.0	-13.0	-19.0
Record Maximum Temp	60.0	67.0	81.0	91.0	92.0	94.0	96.0	96.0	91.0	85.0	78.0	70.0	96.0
HDD, Base 65°F	1308	1126	970	618	301	69	6	25	157	465	768	1166	6979
CDD, Base 65°F	0	0	0	0	6	45	151	118	13	0	0	0	333
Humidity Ratio (#w/#da)	0.0018	0.0020	0.0027	0.0038	0.0062	0.0091	0.0112	0.0109	0.0086	0.0056	0.0039	0.0024	0.0057
Wind Speed (mph)	10.9	10.7	10.8	10.4	9.1	8.5	7.9	7.7	8.1	9.0	10.0	10.3	9.4
Clearness Index, Kt	0.48	0.51	0.50	0.49	0.50	0.51	0.52	0.52	0.50	0.48	0.43	0.43	0.50

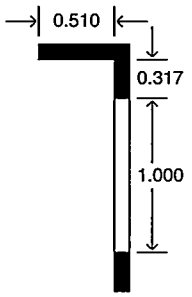
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±11%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	42/25	71/45	77/48	57/37	19/13	52/33	85/55	99/68	90/64	62/42	31/19	66/40	80/54	70/47	39/24	14/9	37/23	39/23	20/13	0/0
North	10/10	14/16	15/17	13/14	7/6	15/13	16/18	17/19	17/19	15/14	9/8	14/14	16/17	15/16	11/10	5/4	9/9	10/9	7/6	0/0
East	71/27	50/28	15/17	13/14	7/6	77/36	67/39	25/23	17/19	15/14	64/23	63/32	21/20	15/16	11/10	35/11	31/16	10/9	7/6	0/0
South	44/20	77/38	83/41	61/30	19/9	13/12	38/27	51/37	44/33	20/17	25/12	61/31	76/45	65/38	33/17	35/11	76/29	81/29	47/15	0/0
West	10/10	14/16	29/22	67/33	51/18	13/12	16/18	17/19	56/40	77/42	9/8	14/14	16/17	56/34	68/28	5/4	9/9	25/13	40/14	0/0
M. Clr (%hrs)	35	32	30	31	35	37	34	28	25	28	43	43	36	35	40	34	32	31	33	36



Baltimore, MD

WBAN NO. 93721



Shading Geometry
(Not to Scale)

LATITUDE: 39.18° N
LONGITUDE: 76.67° W
ELEVATION: 154 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	650	910	1230	1550	1780	1950	1910	1690	1390	1050	710	560	1280
	Std.Dev.	46	70	92	134	131	115	120	85	104	85	62	40	34
	Minimum	550	760	1070	1230	1570	1740	1680	1500	1170	910	560	480	1210
	Maximum	750	1020	1410	1830	2050	2180	2140	1810	1570	1240	830	620	1360
	Diffuse	300	410	530	680	800	850	820	750	600	440	320	270	560
	Clear-Day Global	930	1280	1740	2200	2490	2580	2500	2230	1820	1350	960	810	1740
North	Global	200	260	340	430	530	610	570	470	380	290	210	180	370
	Diffuse	200	260	340	420	490	530	510	450	380	290	210	180	350
	Clear-Day Global	190	240	320	430	570	670	620	480	370	280	200	160	380
East	Global	440	590	750	910	990	1070	1050	950	830	660	480	380	760
	Diffuse	240	320	410	510	580	630	610	560	470	360	260	210	430
	Clear-Day Global	700	900	1130	1320	1410	1420	1380	1290	1130	900	700	620	1080
South	Global	1050	1130	1090	950	810	770	800	920	1060	1170	1050	950	980
	Diffuse	340	410	470	520	550	570	560	560	520	440	350	310	470
	Clear-Day Global	1910	1950	1770	1390	1050	910	960	1210	1550	1790	1820	1820	1510
West	Global	450	590	760	900	980	1060	1040	950	830	660	470	390	760
	Diffuse	240	320	420	520	590	630	620	570	470	360	260	210	430
	Clear-Day Global	700	900	1130	1320	1410	1420	1380	1290	1130	900	700	620	1080

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	420	620	870	1120	1290	1420	1390	1220	990	730	470	360	910
North	Unshaded	140	180	230	290	350	400	380	320	260	200	150	120	250
	Shaded	120	160	210	260	310	350	340	290	230	180	130	110	220
East	Unshaded	300	410	530	650	700	760	740	680	590	470	330	260	530
	Shaded	270	370	470	560	600	640	630	580	510	410	300	240	470
South	Unshaded	790	820	760	620	500	470	490	580	720	840	780	720	670
	Shaded	770	770	600	410	340	350	350	380	520	740	760	700	560
West	Unshaded	310	410	540	640	700	750	740	680	590	470	320	260	530
	Shaded	280	370	480	560	600	640	630	580	510	410	290	240	470

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	31.8	34.8	44.1	53.4	63.4	72.5	77.0	75.6	68.5	56.6	46.8	36.7	55.1
Daily Minimum Temp	23.4	25.9	34.1	42.5	52.6	61.8	66.8	65.7	58.4	45.9	37.1	28.2	45.2
Daily Maximum Temp	40.2	43.7	54.0	64.3	74.2	83.2	87.2	85.4	78.5	67.3	56.5	45.2	65.0
Record Minimum Temp	-7.0	-3.0	6.0	20.0	32.0	40.0	50.0	45.0	35.0	25.0	13.0	0.0	-7.0
Record Maximum Temp	75.0	79.0	87.0	94.0	98.0	100.0	104.0	105.0	100.0	92.0	83.0	77.0	105.0
HDD, Base 65°F	1029	846	648	348	108	0	0	0	29	276	546	877	4707
CDD, Base 65°F	0	0	0	0	59	227	372	329	134	16	0	0	1137
Humidity Ratio (#w/#da)	0.0025	0.0027	0.0037	0.0052	0.0083	0.0115	0.0134	0.0131	0.0106	0.0070	0.0048	0.0032	0.0072
Wind Speed (mph)	9.5	9.8	10.4	10.2	8.8	8.1	7.7	7.5	7.8	8.2	9.0	9.1	8.8
Clearness Index, Kt	0.46	0.48	0.49	0.50	0.50	0.53	0.53	0.52	0.51	0.50	0.46	0.43	0.50

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

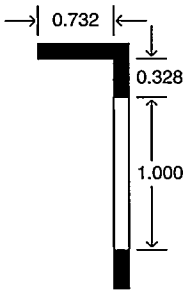
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	38/22	71/42	81/49	65/40	28/16	45/28	82/54	99/69	94/67	67/46	26/15	65/38	83/54	77/51	47/30	14/8	40/23	46/26	29/17	3/2
North	9/9	14/14	15/16	13/14	8/7	19/13	17/17	17/19	17/19	16/15	8/7	14/14	16/17	16/17	12/11	5/4	10/9	10/10	8/7	2/1
East	73/26	57/30	15/16	13/14	8/7	73/32	72/42	33/27	17/19	16/15	59/19	69/31	30/23	16/17	12/11	39/10	39/17	10/10	8/7	2/1
South	38/16	71/35	81/41	65/32	28/12	12/11	31/23	45/34	42/32	21/18	19/9	55/27	73/42	66/39	38/20	36/10	79/27	87/31	63/20	7/2
West	9/9	14/14	21/18	65/32	66/22	12/11	17/17	17/19	50/37	76/44	8/7	14/14	16/17	51/32	70/32	5/4	10/9	20/13	48/16	10/3
M. Clr (%hrs)	35	32	33	33	39	43	42	38	35	39	45	46	40	39	43	33	34	32	35	37

Caribou, ME

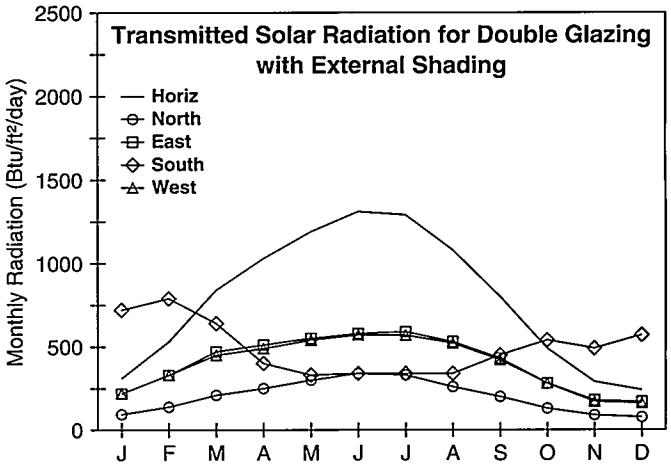
WBAN NO. 14607

LATITUDE: 46.87° N
LONGITUDE: 68.02° W
ELEVATION: 623 feet
MEAN PRESSURE: 14.4 psia

STATION TYPE: Primary



Shading Geometry (Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	510	810	1210	1450	1660	1820	1790	1520	1140	730	450	390	1120
	Std.Dev.	43	76	85	145	179	135	138	118	89	80	48	50	53
	Minimum	400	600	950	1110	1150	1470	1450	1250	970	550	360	280	990
	Maximum	570	910	1340	1700	1970	2010	2070	1800	1320	840	540	480	1180
	Diffuse	290	440	650	780	830	900	860	730	560	400	290	240	580
	Clear-Day Global	660	1030	1590	2150	2530	2690	2580	2210	1690	1130	700	550	1630
North	Global	170	260	370	450	550	620	590	470	340	240	160	140	360
	Diffuse	170	260	370	440	500	540	520	440	340	240	160	140	340
	Clear-Day Global	140	200	300	410	600	730	660	450	310	210	140	120	360
East	Global	380	570	800	890	990	1040	1050	930	740	490	320	290	710
	Diffuse	220	330	470	540	580	630	620	530	420	290	200	170	420
	Clear-Day Global	600	850	1170	1430	1570	1610	1570	1420	1190	880	620	510	1120
South	Global	990	1180	1230	1020	900	880	910	970	1000	880	690	780	950
	Diffuse	360	470	570	580	580	610	600	560	480	370	290	290	480
	Clear-Day Global	1880	2070	2030	1670	1320	1170	1210	1460	1790	1940	1830	1740	1670
West	Global	370	560	770	870	960	1030	1030	910	730	490	300	280	690
	Diffuse	220	330	470	550	590	640	630	550	420	290	200	180	420
	Clear-Day Global	600	850	1170	1430	1570	1610	1570	1420	1190	880	620	510	1120

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

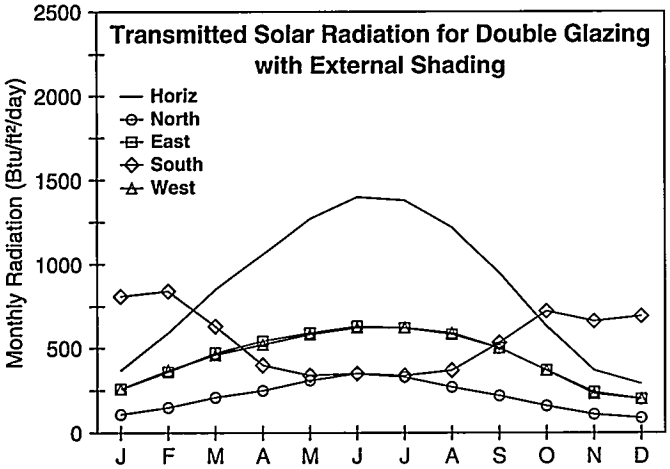
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	310	530	840	1030	1190	1310	1290	1080	800	490	290	240	780
North	Unshaded	120	180	260	310	360	410	390	310	240	170	110	96	250
	Shaded	95	140	210	250	300	340	330	260	200	130	89	77	200
East	Unshaded	260	400	570	640	710	750	750	670	530	340	220	200	500
	Shaded	220	330	470	510	550	580	590	530	430	280	180	170	400
South	Unshaded	750	870	870	690	590	560	580	640	690	640	520	590	670
	Shaded	720	790	640	400	330	340	340	340	450	540	490	570	490
West	Unshaded	260	390	550	620	690	740	730	650	520	340	210	190	490
	Shaded	220	330	450	490	540	570	570	520	420	280	170	160	390

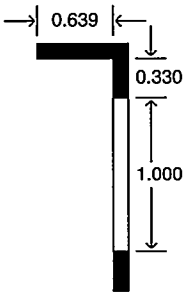
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	8.9	11.9	24.6	37.9	50.9	60.5	65.5	62.8	53.7	43.2	30.7	14.8	38.8
Daily Minimum Temp	-1.6	0.7	14.9	29.0	40.1	49.1	54.5	52.1	43.2	34.4	23.7	5.5	28.8
Daily Maximum Temp	19.4	23.0	34.3	46.7	61.7	71.9	76.5	73.6	64.0	52.0	37.6	24.0	48.7
Record Minimum Temp	-32.0	-41.0	-20.0	-2.0	18.0	30.0	36.0	34.0	23.0	14.0	-5.0	-31.0	-41.0
Record Maximum Temp	52.0	52.0	73.0	86.0	96.0	96.0	95.0	95.0	91.0	79.0	68.0	58.0	96.0
HDD, Base 65°F	1739	1487	1252	813	437	143	61	115	343	676	1029	1556	9651
CDD, Base 65°F	0	0	0	0	0	8	76	47	0	0	0	0	131
Humidity Ratio (#w/#da)	0.0013	0.0014	0.0021	0.0033	0.0053	0.0080	0.0101	0.0096	0.0070	0.0047	0.0031	0.0017	0.0048
Wind Speed (mph)	11.4	11.1	11.8	11.3	10.7	9.8	9.1	8.5	9.3	10.0	10.6	11.0	10.4
Clearness Index, Kt	0.51	0.55	0.56	0.50	0.48	0.49	0.50	0.49	0.46	0.42	0.39	0.45	0.49

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	45/31	71/50	74/49	52/35	15/10	58/36	87/55	98/66	89/60	59/38	35/20	64/38	76/47	64/39	33/20	13/9	32/21	32/20	12/8	0/0
North	11/12	14/18	14/18	12/14	5/5	13/13	16/17	17/19	16/18	13/13	9/8	13/13	14/16	13/14	9/8	5/4	8/9	9/9	5/4	0/0
East	76/32	45/30	14/18	12/14	5/5	82/37	63/38	18/19	16/18	13/13	72/25	58/29	15/16	13/14	9/8	36/10	26/13	9/9	5/4	0/0
South	56/26	88/46	91/45	64/30	17/7	18/15	47/31	59/40	48/34	19/16	34/15	67/32	82/42	68/33	31/14	41/11	79/27	80/26	38/11	0/0
West	11/12	14/18	36/26	74/33	51/16	13/13	16/17	17/19	62/40	80/41	9/8	13/13	16/16	60/30	69/25	5/4	8/9	28/13	35/10	0/0
M. Clr (%hrs)	32	29	28	27	28	25	23	18	16	19	31	25	22	23	28	28	25	24	27	31





Shading Geometry
(Not to Scale)

Portland, ME

WBAN NO. 14764

LATITUDE: 43.65° N
LONGITUDE: 70.32° W
ELEVATION: 62 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±11%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	590	880	1220	1490	1760	1930	1910	1700	1340	930	570	480	1230
	Std.Dev.	43	75	99	123	136	157	118	90	81	58	46	37	35
	Minimum	520	700	980	1290	1470	1630	1700	1530	1220	790	430	390	1180
	Maximum	690	1040	1420	1700	2080	2260	2120	1880	1520	1090	650	560	1320
	Diffuse	290	420	580	680	790	840	800	690	550	400	290	250	550
	Clear-Day Global	760	1120	1640	2160	2520	2650	2560	2240	1760	1220	800	640	1670
North	Global	180	260	350	430	540	620	580	470	360	260	180	150	370
	Diffuse	180	260	350	420	490	530	510	450	360	260	180	150	350
	Clear-Day Global	160	230	310	410	580	690	630	460	330	240	160	140	360
East	Global	430	600	780	910	1010	1090	1070	1000	830	620	390	340	760
	Diffuse	230	330	440	510	580	620	610	540	440	320	220	190	420
	Clear-Day Global	620	850	1130	1370	1500	1540	1500	1380	1160	880	620	530	1090
South	Global	1100	1240	1180	1000	900	850	890	1020	1140	1150	920	940	1030
	Diffuse	350	450	520	530	570	580	580	550	500	410	310	300	470
	Clear-Day Global	1830	1980	1900	1540	1210	1050	1100	1360	1700	1880	1790	1720	1580
West	Global	430	610	770	880	1000	1080	1070	1000	840	610	390	340	750
	Diffuse	230	330	440	510	590	630	620	550	450	330	220	190	430
	Clear-Day Global	620	850	1130	1370	1500	1540	1500	1380	1160	880	620	530	1090

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±11%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	370	590	850	1060	1270	1400	1380	1220	950	630	370	290	870
North	Unshaded	130	180	240	290	360	410	380	310	250	180	120	110	250
	Shaded	110	150	210	250	310	350	330	270	220	160	110	90	210
East	Unshaded	290	420	560	650	720	770	760	710	590	440	270	230	540
	Shaded	260	360	470	540	590	630	620	580	500	370	240	200	450
South	Unshaded	830	910	830	670	570	530	560	660	790	830	690	710	710
	Shaded	810	840	630	400	340	350	340	370	530	720	660	690	560
West	Unshaded	290	420	540	630	710	770	760	720	600	430	270	230	530
	Shaded	260	370	460	520	580	620	620	590	500	370	230	200	440

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	20.8	23.3	33.0	43.3	53.3	62.4	68.6	67.3	59.1	48.5	38.7	26.5	45.4
Daily Minimum Temp	11.4	13.5	24.5	34.1	43.4	52.1	58.3	57.1	48.9	38.3	30.4	17.8	35.8
Daily Maximum Temp	30.3	33.1	41.4	52.3	63.2	72.7	78.8	77.4	69.3	58.7	47.0	35.1	54.9
Record Minimum Temp	-26.0	-39.0	-21.0	8.0	23.0	33.0	40.0	33.0	23.0	15.0	3.0	-21.0	-39.0
Record Maximum Temp	64.0	64.0	86.0	85.0	94.0	98.0	99.0	103.0	95.0	88.0	74.0	69.0	103.0
HDD, Base 65°F	1370	1168	992	651	363	100	11	39	189	512	789	1194	7378
CDD, Base 65°F	0	0	0	0	0	22	123	111	12	0	0	0	268
Humidity Ratio (#w/#da)	0.0018	0.0019	0.0027	0.0038	0.0061	0.0089	0.0110	0.0107	0.0083	0.0055	0.0038	0.0023	0.0056
Wind Speed (mph)	9.1	9.2	9.8	9.9	9.2	8.4	7.6	7.6	7.9	8.3	8.9	8.8	8.7
Clearness Index, Kt	0.51	0.54	0.53	0.50	0.51	0.52	0.53	0.53	0.52	0.49	0.43	0.46	0.51

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±11%

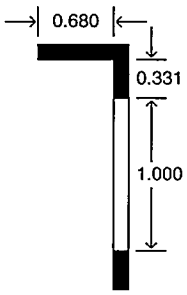
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	44/27	72/46	76/48	55/36	18/12	56/35	87/56	99/69	90/63	62/41	34/20	67/41	79/53	69/47	38/24	15/9	36/23	37/23	18/12	0/0
North	10/11	14/16	14/17	12/13	6/5	13/13	16/17	16/19	16/19	14/14	9/8	14/14	15/17	14/15	10/9	5/4	9/9	9/9	6/5	0/0
East	75/29	49/28	14/17	12/13	6/5	83/36	66/39	21/22	16/19	14/14	71/25	63/33	18/18	14/15	10/9	38/12	30/15	9/9	6/5	0/0
South	50/22	82/40	87/43	63/30	20/9	13/13	41/28	53/39	44/33	19/16	29/14	65/33	79/46	67/39	33/17	41/12	81/30	83/31	47/15	0/0
West	10/11	14/16	32/23	71/33	55/18	12/13	16/17	16/19	58/40	81/43	9/8	14/14	15/17	58/35	72/30	5/4	9/9	27/14	41/14	0/0
M. Clr (%hrs)	36	34	31	30	32	36	32	29	28	29	42	41	38	37	40	35	36	34	34	36

Alpena, MI

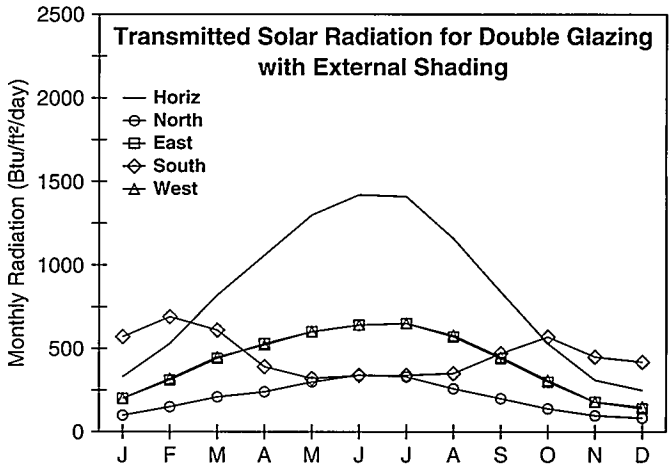
WBAN NO. 94849

LATITUDE: 45.07° N
LONGITUDE: 83.57° W
ELEVATION: 689 feet
MEAN PRESSURE: 14.4 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	510	800	1180	1480	1800	1960	1940	1620	1200	780	470	390	1180
	Std.Dev.	36	61	96	94	134	138	101	105	102	48	42	37	31
	Minimum	430	690	970	1260	1500	1710	1740	1420	940	690	380	280	1120
	Maximum	570	920	1350	1670	2080	2270	2140	1830	1400	870	580	450	1230
	Diffuse	340	480	610	650	720	780	740	660	550	410	310	290	540
	Clear-Day Global	720	1080	1610	2130	2510	2660	2550	2210	1720	1170	750	600	1650
North	Global	190	270	360	420	540	620	580	460	350	250	170	150	360
	Diffuse	190	270	360	410	480	520	500	430	340	250	170	150	340
	Clear-Day Global	150	220	300	410	580	700	640	450	320	230	160	130	360
East	Global	350	530	750	900	1050	1120	1130	970	740	510	300	250	720
	Diffuse	240	340	440	500	570	610	600	520	420	300	210	190	410
	Clear-Day Global	610	840	1140	1370	1510	1560	1520	1390	1160	880	620	520	1090
South	Global	810	1040	1160	1030	940	880	930	1000	1020	920	650	590	910
	Diffuse	370	470	530	520	550	570	570	530	480	380	290	300	460
	Clear-Day Global	1860	2020	1950	1580	1250	1100	1150	1400	1730	1890	1800	1740	1620
West	Global	350	540	770	890	1050	1130	1130	990	760	520	310	260	730
	Diffuse	240	340	450	500	570	610	600	530	430	300	210	190	410
	Clear-Day Global	610	840	1140	1370	1510	1560	1520	1390	1160	880	620	520	1090

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

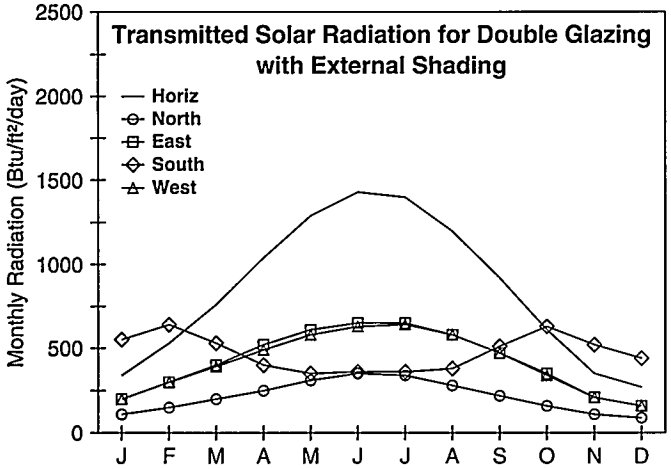
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	330	530	820	1060	1300	1420	1410	1160	840	530	310	250	830
North	Unshaded	130	190	250	290	350	400	380	310	240	170	120	110	240
	Shaded	100	150	210	240	300	340	330	260	200	140	97	84	210
East	Unshaded	240	370	530	640	750	800	810	700	530	360	210	170	510
	Shaded	200	310	440	530	600	640	650	570	440	300	180	140	420
South	Unshaded	610	770	820	690	590	540	580	650	710	670	490	450	630
	Shaded	570	690	610	390	320	340	340	350	470	570	450	420	460
West	Unshaded	240	380	540	640	750	810	810	710	540	370	220	180	520
	Shaded	200	320	450	520	600	640	650	580	450	310	180	150	420

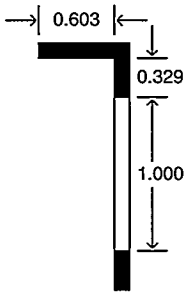
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	17.6	18.3	28.0	40.9	52.0	61.3	67.1	64.8	57.3	46.9	35.7	23.7	42.8
Daily Minimum Temp	8.8	8.3	18.0	30.1	39.2	48.0	54.0	52.6	46.3	37.0	28.4	16.5	32.3
Daily Maximum Temp	26.4	28.2	37.9	51.6	64.8	74.5	80.2	76.9	68.3	56.8	43.0	30.9	53.3
Record Minimum Temp	-28.0	-37.0	-27.0	0.0	20.0	28.0	34.0	30.0	25.0	16.0	-1.0	-18.0	-37.0
Record Maximum Temp	52.0	65.0	76.0	90.0	94.0	98.0	102.0	102.0	94.0	88.0	76.0	65.0	102.0
HDD, Base 65°F	1469	1308	1147	723	411	146	43	80	237	561	879	1280	8284
CDD, Base 65°F	0	0	0	0	8	35	108	74	6	0	0	0	231
Humidity Ratio (#w/#da)	0.0017	0.0017	0.0025	0.0037	0.0057	0.0083	0.0102	0.0101	0.0081	0.0053	0.0036	0.0023	0.0053
Wind Speed (mph)	9.2	8.7	9.4	9.5	8.4	7.9	7.3	6.9	7.4	8.0	8.9	8.8	8.4
Clearness Index, Kt	0.46	0.51	0.52	0.50	0.52	0.53	0.54	0.51	0.47	0.43	0.38	0.40	0.50

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	25/17	60/39	75/49	66/44	34/23	39/24	75/47	95/64	95/66	76/49	17/9	53/30	73/46	73/47	52/31	3/3	26/16	36/23	25/17	3/3
North	8/7	13/14	14/17	13/16	9/9	19/12	14/15	16/18	16/18	15/16	6/4	12/11	14/16	14/16	12/12	2/1	8/7	9/10	8/7	2/1
East	65/22	64/31	20/19	13/16	9/9	75/31	78/41	42/32	16/18	15/16	51/13	72/28	38/25	14/16	12/12	12/3	38/14	10/10	8/7	2/1
South	29/13	71/33	89/43	77/39	40/19	10/9	31/22	52/37	53/38	33/24	12/6	51/22	74/40	75/40	50/25	10/3	62/19	81/26	60/20	10/3
West	8/7	13/14	14/17	57/32	72/29	10/9	14/15	16/18	39/30	75/43	6/4	12/11	14/16	39/26	71/32	2/1	8/7	10/10	37/14	12/3
M. Clr (%hrs)	31	29	29	29	29	39	40	35	33	37	33	32	30	28	30	12	15	12	14	19





Shading Geometry
(Not to Scale)

Detroit, MI

WBAN NO. 94847

LATITUDE: 42.42° N
LONGITUDE: 83.02° W
ELEVATION: 627 feet
MEAN PRESSURE: 14.4 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	520	780	1090	1450	1790	1970	1930	1670	1300	890	540	410	1200
	Std.Dev.	34	67	70	119	131	125	83	119	84	74	52	38	28
	Minimum	420	670	980	1140	1460	1750	1800	1450	1120	700	420	340	1140
	Maximum	600	1000	1270	1650	2070	2310	2140	1920	1470	1070	670	490	1270
	Diffuse	320	440	590	710	830	870	850	750	610	450	330	280	590
	Clear-Day Global	770	1130	1620	2130	2470	2600	2520	2210	1750	1240	830	670	1660
North	Global	180	260	340	430	550	620	590	480	370	270	190	160	370
	Diffuse	180	260	340	420	500	540	530	460	370	270	190	160	350
	Clear-Day Global	170	240	330	430	580	680	630	470	360	260	180	160	370
East	Global	340	500	680	870	1030	1110	1110	980	790	580	350	270	720
	Diffuse	220	310	410	520	610	640	640	570	460	340	230	190	430
	Clear-Day Global	600	810	1070	1300	1420	1460	1420	1310	1110	860	620	530	1040
South	Global	770	960	980	950	890	840	880	980	1060	1020	730	610	890
	Diffuse	330	420	490	540	580	590	600	580	520	430	320	280	470
	Clear-Day Global	1740	1870	1800	1490	1180	1030	1080	1320	1630	1800	1720	1650	1520
West	Global	340	500	650	820	990	1080	1080	980	790	560	350	270	700
	Diffuse	220	320	410	520	610	650	640	570	460	340	230	190	430
	Clear-Day Global	600	810	1070	1300	1420	1460	1420	1310	1110	860	620	530	1040

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	340	530	760	1040	1290	1430	1400	1200	920	610	350	270	850
North	Unshaded	130	180	240	300	360	410	390	320	260	190	130	110	250
	Shaded	110	150	200	250	310	350	340	280	220	160	110	90	220
East	Unshaded	230	350	480	620	730	790	790	700	560	410	240	180	510
	Shaded	200	300	400	520	610	650	650	580	470	350	210	160	430
South	Unshaded	580	710	690	630	560	520	550	630	720	740	550	460	610
	Shaded	550	640	530	400	350	360	360	380	510	630	520	440	470
West	Unshaded	230	350	460	590	700	770	770	700	560	400	240	180	500
	Shaded	200	300	390	490	580	630	640	580	470	340	210	160	420

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	22.9	25.4	35.7	47.3	58.4	67.6	72.3	70.5	63.2	51.2	40.2	28.3	48.6
Daily Minimum Temp	15.6	17.6	27.0	36.8	47.1	56.3	61.3	59.6	52.5	40.9	32.2	21.4	39.0
Daily Maximum Temp	30.3	33.3	44.4	57.7	69.6	78.9	83.3	81.3	73.9	61.5	48.1	35.2	58.1
Record Minimum Temp	-21.0	-15.0	-4.0	10.0	25.0	36.0	41.0	38.0	29.0	17.0	9.0	-10.0	-21.0
Record Maximum Temp	62.0	65.0	81.0	89.0	93.0	104.0	102.0	100.0	98.0	91.0	77.0	68.0	104.0
HDD, Base 65°F	1305	1109	908	531	243	38	0	16	102	435	744	1138	6569
CDD, Base 65°F	0	0	0	0	38	116	231	186	48	7	0	0	626
Humidity Ratio (#w/#da)	0.0021	0.0022	0.0032	0.0047	0.0071	0.0100	0.0118	0.0115	0.0093	0.0060	0.0042	0.0027	0.0062
Wind Speed (mph)	12.0	11.5	11.9	11.7	10.2	9.3	8.5	8.3	8.8	9.9	11.2	11.5	10.4
Clearness Index, Kt	0.42	0.46	0.46	0.48	0.51	0.53	0.54	0.52	0.50	0.46	0.39	0.37	0.49

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

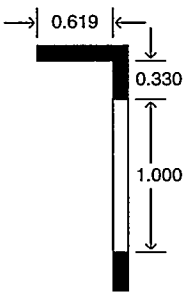
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	26/15	62/36	76/45	66/40	33/20	37/23	76/49	96/67	97/67	74/52	17/10	55/33	78/50	76/50	52/34	5/3	29/17	40/23	29/17	4/3
North	8/7	13/14	15/16	14/15	9/8	20/12	16/16	17/19	17/19	16/16	6/5	13/12	16/17	16/17	13/12	2/2	8/7	10/10	8/7	2/1
East	62/18	63/28	20/18	14/15	9/8	69/28	77/42	43/32	17/19	16/16	45/13	71/31	39/27	16/17	13/12	16/4	39/13	10/10	8/7	2/1
South	28/11	67/29	84/37	72/32	36/15	11/9	29/22	49/36	49/36	30/23	12/6	49/24	74/41	73/41	47/25	13/3	64/18	81/24	63/17	11/3
West	8/7	13/14	15/16	56/28	67/23	11/9	16/16	17/19	41/31	74/45	6/5	13/12	16/17	41/28	69/34	2/2	8/7	11/10	39/13	13/3
M. Clr (%hrs)	31	27	27	24	24	44	44	38	33	33	43	40	35	34	36	18	19	18.	18	19

Flint, MI

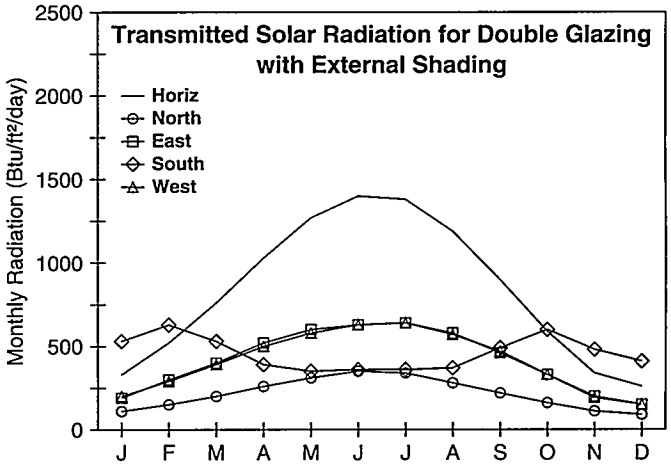
WBAN NO. 14826

LATITUDE: 42.97° N
LONGITUDE: 83.73° W
ELEVATION: 764 feet
MEAN PRESSURE: 14.3 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	510	780	1090	1440	1770	1930	1910	1650	1270	860	520	400	1180
	Std.Dev.	30	71	68	97	146	128	89	122	97	61	48	35	31
	Minimum	430	660	980	1120	1460	1660	1730	1440	1050	750	410	340	1120
	Maximum	580	950	1250	1620	2100	2190	2110	1980	1450	1030	640	490	1230
	Diffuse	330	460	600	730	840	890	850	750	610	450	340	290	590
	Clear-Day Global	770	1130	1620	2140	2490	2620	2530	2220	1750	1230	820	660	1670
North	Global	190	260	350	440	550	620	600	480	370	270	190	160	370
	Diffuse	190	260	350	430	500	540	530	460	370	270	190	160	350
	Clear-Day Global	170	230	320	430	580	680	630	470	350	250	180	150	370
East	Global	330	500	680	870	1020	1090	1100	980	780	560	330	260	710
	Diffuse	230	320	420	520	600	640	630	560	450	330	220	190	430
	Clear-Day Global	610	830	1090	1330	1440	1480	1450	1340	1130	870	630	540	1060
South	Global	750	950	990	950	890	840	880	980	1040	970	680	580	870
	Diffuse	340	430	500	540	590	600	600	570	510	420	310	280	470
	Clear-Day Global	1800	1930	1840	1520	1200	1050	1100	1340	1660	1830	1760	1710	1560
West	Global	340	490	660	840	990	1070	1090	960	780	540	330	260	700
	Diffuse	230	320	420	520	610	650	640	570	460	330	230	190	430
	Clear-Day Global	610	830	1090	1330	1440	1480	1450	1340	1130	870	630	540	1060

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

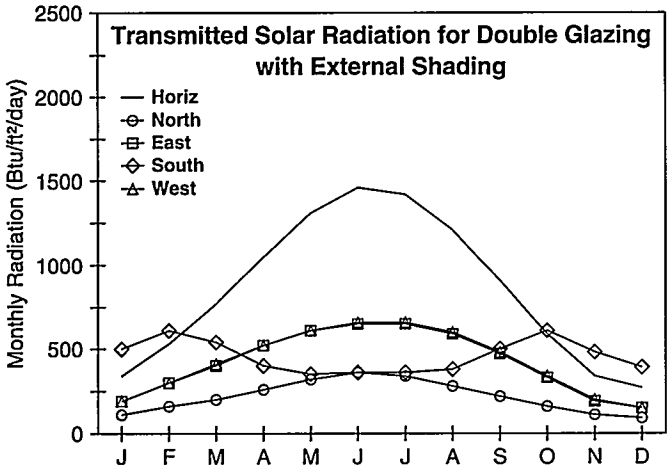
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	330	520	760	1030	1270	1400	1380	1190	900	590	340	260	830
North	Unshaded	130	180	240	300	360	410	390	320	260	190	130	110	250
	Shaded	110	150	200	260	310	350	340	280	220	160	110	90	220
East	Unshaded	230	350	480	620	730	770	780	700	550	390	230	180	500
	Shaded	190	300	400	520	600	630	640	580	460	330	200	150	420
South	Unshaded	560	700	690	630	560	520	550	630	710	700	510	440	600
	Shaded	530	630	530	390	350	360	360	370	490	600	480	410	460
West	Unshaded	240	340	470	600	710	760	780	690	550	380	230	180	490
	Shaded	200	290	390	500	580	630	640	570	470	330	190	150	410

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	21.5	23.5	34.0	46.0	56.8	65.9	70.6	68.6	61.4	50.1	39.4	27.2	47.1
Daily Minimum Temp	14.2	15.6	25.6	36.0	45.7	54.7	59.7	57.9	51.1	40.5	32.1	20.6	37.8
Daily Maximum Temp	28.7	31.3	42.3	55.9	68.0	76.9	81.5	79.2	71.6	59.7	46.6	33.8	56.3
Record Minimum Temp	-25.0	-22.0	-12.0	6.0	22.0	33.0	40.0	37.0	26.0	19.0	6.0	-12.0	-25.0
Record Maximum Temp	60.0	63.0	78.0	87.0	93.0	101.0	101.0	98.0	93.0	89.0	76.0	67.0	101.0
HDD, Base 65°F	1349	1162	961	570	292	64	11	25	137	468	768	1172	6979
CDD, Base 65°F	0	0	0	0	37	91	184	136	29	6	0	0	483
Humidity Ratio (#w/#da)	0.0020	0.0021	0.0031	0.0045	0.0068	0.0097	0.0114	0.0112	0.0091	0.0059	0.0041	0.0026	0.0061
Wind Speed (mph)	11.5	10.7	11.3	11.0	9.8	8.9	8.0	7.7	8.4	9.3	10.7	11.0	9.8
Clearness Index, Kt	0.42	0.46	0.46	0.48	0.51	0.52	0.53	0.52	0.49	0.44	0.38	0.38	0.48

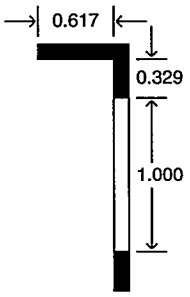
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	26/15	61/36	76/46	66/40	34/21	37/23	75/48	96/67	96/67	75/52	16/10	54/32	77/49	77/50	53/34	4/3	29/17	40/22	29/17	4/3
North	8/7	13/14	15/17	14/15	9/9	20/12	15/16	17/19	17/19	16/17	6/4	13/12	15/17	15/16	13/12	2/1	8/7	10/10	8/8	2/2
East	63/17	63/28	21/18	14/15	9/9	69/30	78/42	44/33	17/19	16/17	46/13	72/31	40/27	15/16	13/12	16/3	40/13	11/10	8/8	2/2
South	28/10	67/30	85/38	73/33	38/16	10/9	29/22	50/36	50/37	31/24	11/6	49/24	74/41	74/41	48/25	12/3	66/18	83/23	64/18	12/3
West	8/7	13/14	15/17	55/28	68/24	10/9	15/16	17/19	39/31	74/44	6/4	13/12	15/17	40/27	70/33	2/1	8/7	10/10	39/13	15/4
M. Clr (%hrs)	28	25	24	23	23	39	38	30	28	31	38	37	31	28	32	16	17	15	15	17



Grand Rapids, MI

WBAN NO. 94860



Shading Geometry
(Not to Scale)

LATITUDE: 42.88° N
LONGITUDE: 85.52° W
ELEVATION: 804 feet
MEAN PRESSURE: 14.3 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	510	780	1100	1480	1810	2010	1960	1690	1290	860	520	410	1200
	Std.Dev.	36	47	65	96	150	142	95	121	107	59	43	30	35
	Minimum	430	690	980	1270	1410	1740	1770	1500	1050	750	430	350	1140
	Maximum	580	910	1220	1660	2140	2340	2130	1940	1520	1010	640	470	1260
	Diffuse	370	490	610	720	810	840	840	740	600	450	340	310	590
	Clear-Day Global	770	1130	1630	2140	2490	2620	2530	2220	1750	1230	820	660	1670
North	Global	200	270	350	440	550	630	600	480	370	270	190	160	380
	Diffuse	200	270	350	430	500	540	530	460	370	270	190	160	360
	Clear-Day Global	170	240	320	420	580	680	630	470	350	250	180	150	370
East	Global	330	500	680	880	1040	1120	1110	1000	790	550	330	260	720
	Diffuse	240	330	430	520	600	640	630	560	450	330	230	190	430
	Clear-Day Global	610	830	1100	1330	1450	1490	1460	1340	1140	870	620	530	1060
South	Global	710	930	1000	970	900	860	890	990	1050	980	680	560	880
	Diffuse	360	450	500	550	580	590	600	570	510	420	320	290	480
	Clear-Day Global	1790	1920	1840	1510	1200	1040	1090	1340	1660	1830	1750	1690	1550
West	Global	330	500	680	870	1030	1130	1130	1010	800	560	340	260	720
	Diffuse	240	330	430	530	610	650	650	570	460	340	230	200	440
	Clear-Day Global	610	830	1100	1330	1450	1490	1460	1340	1140	870	620	530	1060

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	340	530	770	1050	1310	1460	1420	1210	910	590	340	270	850
North	Unshaded	140	190	240	300	360	410	390	320	260	190	130	110	250
	Shaded	110	160	200	260	320	360	340	280	220	160	110	92	220
East	Unshaded	230	350	480	630	740	800	790	710	560	390	230	180	510
	Shaded	190	300	400	520	610	650	650	590	470	330	190	150	420
South	Unshaded	530	680	700	640	570	530	550	640	720	710	510	420	600
	Shaded	500	610	540	400	350	360	360	380	500	610	480	390	450
West	Unshaded	220	350	480	620	740	810	800	720	570	400	230	180	510
	Shaded	190	300	410	520	610	660	660	600	480	340	200	150	430

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	21.8	23.7	34.1	46.0	57.5	67.0	71.6	69.5	61.0	49.5	38.0	27.1	47.2
Daily Minimum Temp	14.7	15.8	25.4	35.4	45.6	55.3	60.4	58.4	49.9	39.1	30.2	20.7	37.6
Daily Maximum Temp	29.0	31.6	42.8	56.6	69.3	78.7	82.8	80.5	72.0	59.8	45.8	33.5	56.9
Record Minimum Temp	-21.0	-19.0	-8.0	3.0	22.0	33.0	41.0	39.0	27.0	18.0	5.0	-18.0	-21.0
Record Maximum Temp	62.0	67.0	78.0	88.0	92.0	98.0	100.0	100.0	93.0	87.0	77.0	67.0	100.0
HDD, Base 65°F	1339	1156	958	570	273	50	0	18	139	485	810	1175	6973
CDD, Base 65°F	0	0	0	0	40	110	208	157	19	0	0	0	534
Humidity Ratio (#w/#da)	0.0021	0.0022	0.0031	0.0046	0.0069	0.0098	0.0117	0.0114	0.0092	0.0060	0.0041	0.0027	0.0061
Wind Speed (mph)	11.4	10.5	11.3	11.0	9.7	8.9	8.2	7.8	8.3	9.0	10.3	10.7	9.8
Clearness Index, Kt	0.42	0.46	0.47	0.49	0.52	0.54	0.54	0.53	0.49	0.45	0.38	0.38	0.49

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

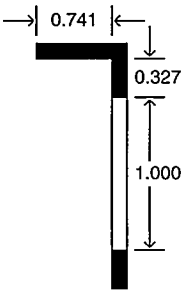
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	24/14	59/36	76/46	68/43	37/23	35/23	73/48	96/66	98/71	78/54	14/8	52/30	77/49	77/52	56/36	3/2	27/16	40/23	30/18	5/4
North	7/6	13/14	15/17	14/15	10/9	20/13	15/16	17/19	17/19	16/17	6/4	12/12	15/16	15/17	13/13	2/1	8/7	10/10	8/8	3/2
East	60/18	65/29	24/20	14/15	10/9	69/30	79/44	47/34	17/19	16/17	41/12	72/29	43/28	15/17	13/13	11/3	40/13	12/10	8/8	3/2
South	25/10	65/29	85/39	75/36	40/18	10/9	27/21	49/36	51/38	33/25	10/5	47/21	73/40	74/43	51/27	9/2	61/17	82/24	66/20	15/4
West	7/6	13/14	15/17	54/29	69/27	10/9	15/16	17/19	37/30	74/46	6/4	12/12	15/16	37/26	70/34	2/1	8/7	10/10	39/14	18/5
M. Clr (%hrs)	23	22	22	22	23	39	39	36	33	35	40	38	30	30	34	13	13	12	12	14

Houghton, MI

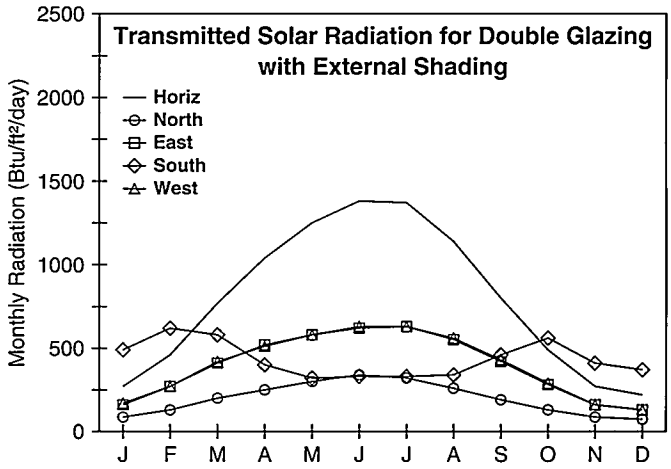
WBAN NO. 94814

LATITUDE: 47.17° N
LONGITUDE: 88.50° W
ELEVATION: 1079 feet
MEAN PRESSURE: 14.1 psia

STATION TYPE: Secondary



Shading Geometry (Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	420	700	1120	1460	1740	1910	1900	1590	1140	730	420	340	1130
	Std.Dev.	53	81	106	104	153	144	91	115	98	51	40	46	42
	Minimum	320	550	890	1250	1460	1640	1740	1380	930	640	340	230	1040
	Maximum	490	820	1300	1670	2090	2220	2130	1800	1360	840	500	390	1190
	Diffuse	300	430	630	710	730	770	740	650	530	390	290	260	540
	Clear-Day Global	620	990	1540	2110	2490	2650	2550	2180	1650	1090	680	520	1590
North	Global	160	240	350	440	540	620	580	460	330	230	160	140	360
	Diffuse	160	240	350	430	480	520	500	430	330	230	160	140	330
	Clear-Day Global	130	200	290	410	580	710	640	460	310	210	140	120	350
East	Global	290	470	720	920	1040	1120	1130	970	730	490	280	220	700
	Diffuse	200	300	440	520	560	600	590	520	410	280	190	170	400
	Clear-Day Global	550	800	1130	1410	1540	1600	1550	1410	1160	850	580	470	1090
South	Global	690	940	1120	1050	950	900	950	1030	1020	910	600	530	890
	Diffuse	320	430	540	560	550	570	570	530	460	370	280	280	460
	Clear-Day Global	1770	1990	2000	1660	1320	1170	1210	1470	1760	1890	1760	1640	1630
West	Global	300	470	730	900	1040	1130	1130	990	750	500	280	230	710
	Diffuse	200	300	450	520	570	610	600	530	410	290	190	170	410
	Clear-Day Global	550	800	1130	1410	1540	1600	1550	1410	1160	850	580	470	1090

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

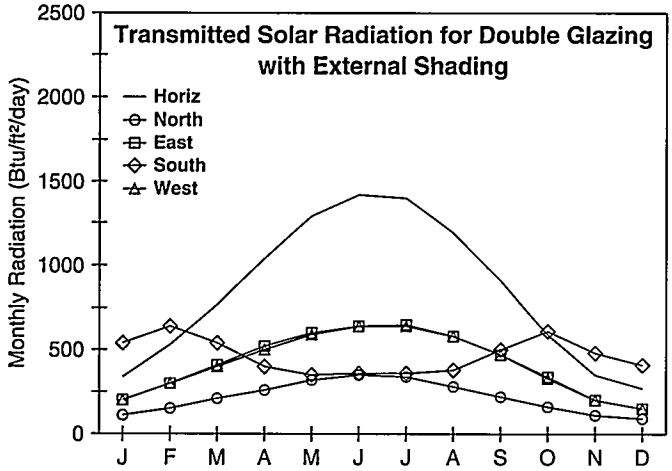
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	270	460	770	1040	1250	1380	1370	1140	800	490	270	220	790
North	Unshaded	110	170	250	300	350	410	380	300	230	160	110	95	240
	Shaded	87	130	200	250	300	340	320	260	190	130	87	73	200
East	Unshaded	200	330	510	660	740	800	800	700	520	340	190	150	490
	Shaded	160	270	410	520	580	620	630	550	420	280	160	130	390
South	Unshaded	520	700	800	710	620	570	600	680	710	670	450	400	620
	Shaded	490	620	580	400	320	330	330	340	460	560	410	370	430
West	Unshaded	200	330	520	640	740	810	800	710	530	350	200	160	500
	Shaded	170	270	420	510	580	630	630	560	430	290	160	130	400

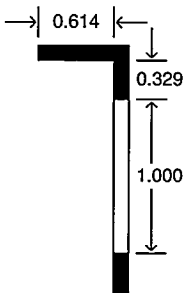
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	16.9	18.2	28.2	42.2	54.1	62.7	67.5	65.1	57.3	46.7	35.2	22.6	43.1
Daily Minimum Temp	8.4	8.2	18.2	31.6	42.0	50.6	55.4	53.8	46.9	37.5	28.4	15.7	33.1
Daily Maximum Temp	25.3	28.1	38.2	52.7	66.1	74.8	79.6	76.4	67.8	55.8	42.0	29.5	53.0
Record Minimum Temp	-26.0	-34.0	-23.0	3.0	21.0	29.0	33.0	29.0	21.0	16.0	-2.0	-21.0	-34.0
Record Maximum Temp	53.0	59.0	76.0	86.0	90.0	95.0	98.0	94.0	92.0	85.0	70.0	63.0	98.0
HDD, Base 65°F	1491	1310	1141	684	358	120	35	70	234	567	894	1314	8218
CDD, Base 65°F	0	0	0	0	20	51	112	73	0	0	0	0	256
Humidity Ratio (#w/#da)	0.0018	0.0018	0.0026	0.0039	0.0060	0.0088	0.0107	0.0105	0.0084	0.0055	0.0037	0.0023	0.0055
Wind Speed (mph)	10.0	9.2	9.8	10.1	9.2	8.4	7.5	7.3	7.9	8.7	9.7	9.6	8.9
Clearness Index, Kt	0.43	0.48	0.52	0.51	0.51	0.52	0.53	0.51	0.47	0.43	0.37	0.40	0.49

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	19/12	53/35	71/47	66/44	39/26	33/20	69/41	90/60	94/64	79/50	11/6	46/25	69/42	73/45	55/32	0/0	19/13	32/20	25/17	4/3
North	6/6	12/14	14/17	13/16	10/11	20/11	14/14	16/18	16/18	15/16	4/3	11/10	14/15	14/15	12/12	0/0	7/6	9/9	8/7	2/2
East	56/17	68/31	28/22	13/16	10/11	72/26	80/38	49/34	16/18	15/16	38/9	73/26	46/26	14/15	12/12	0/0	36/11	15/10	8/7	2/2
South	22/9	66/30	89/41	83/39	48/22	9/8	28/20	52/35	57/39	40/27	7/4	46/19	75/36	79/39	57/26	0/0	53/15	77/23	63/19	15/4
West	6/6	12/14	14/17	50/28	72/29	9/8	14/14	16/18	30/26	71/40	4/3	11/10	14/15	31/22	68/29	0/0	7/6	9/9	32/13	17/4
M. Clr (%hrs)	26	26	27	25	27	39	38	34	31	36	33	33	31	29	32	12	13	13	12	15





Shading Geometry
(Not to Scale)

Lansing, MI

WBAN NO. 14836

LATITUDE: 42.78° N
LONGITUDE: 84.60° W
ELEVATION: 840 feet
MEAN PRESSURE: 14.3 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	520	780	1100	1460	1780	1960	1930	1660	1280	860	520	410	1190
	Std.Dev.	33	64	67	98	141	134	90	112	97	67	42	29	31
	Minimum	430	660	1000	1190	1460	1720	1770	1470	1020	740	430	350	1140
	Maximum	580	950	1220	1620	2130	2300	2070	1900	1510	1030	620	490	1260
	Diffuse	340	470	610	730	830	870	850	750	610	450	340	300	600
	Clear-Day Global	780	1140	1630	2140	2490	2620	2530	2220	1750	1240	830	670	1670
North	Global	190	260	350	440	550	620	600	480	370	270	190	160	370
	Diffuse	190	260	350	430	500	540	530	460	370	270	190	160	360
	Clear-Day Global	170	230	320	430	580	680	630	470	350	250	180	150	370
East	Global	340	510	680	870	1030	1100	1100	980	780	560	330	260	710
	Diffuse	230	320	430	520	600	640	630	560	450	330	230	190	430
	Clear-Day Global	620	830	1100	1330	1440	1480	1450	1340	1130	870	630	540	1060
South	Global	750	960	1000	950	890	850	880	970	1040	980	690	580	880
	Diffuse	350	440	500	540	580	600	600	570	520	420	320	290	480
	Clear-Day Global	1800	1930	1840	1510	1190	1040	1090	1340	1660	1830	1770	1710	1560
West	Global	340	500	670	840	1000	1090	1090	980	790	550	340	260	710
	Diffuse	230	330	430	520	610	650	650	570	460	330	230	190	430
	Clear-Day Global	620	830	1100	1330	1440	1480	1450	1340	1130	870	630	540	1060

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	340	530	770	1040	1290	1420	1400	1190	910	590	350	270	840
North	Unshaded	130	180	240	300	360	410	390	320	260	190	130	110	250
	Shaded	110	150	210	260	320	350	340	280	220	160	110	92	220
East	Unshaded	230	350	480	620	730	780	780	700	550	390	230	180	500
	Shaded	200	300	410	520	600	640	650	580	470	340	200	150	420
South	Unshaded	560	700	700	630	560	520	550	630	710	710	520	440	600
	Shaded	540	640	540	400	350	360	360	380	500	610	480	410	460
West	Unshaded	230	350	470	600	710	780	780	700	560	390	230	180	500
	Shaded	200	300	400	500	590	640	640	580	470	330	200	150	420

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	20.9	22.9	33.6	45.9	57.0	66.4	70.8	68.7	60.9	49.3	38.3	26.4	46.8
Daily Minimum Temp	13.3	14.2	24.5	35.1	44.9	54.5	59.0	56.9	49.9	39.2	30.8	19.3	36.8
Daily Maximum Temp	28.5	31.6	42.7	56.7	69.1	78.2	82.6	80.4	71.9	59.4	45.8	33.5	56.7
Record Minimum Temp	-29.0	-24.0	-15.0	-2.0	19.0	30.0	37.0	35.0	22.0	15.0	4.0	-17.0	-29.0
Record Maximum Temp	66.0	64.0	78.0	86.0	94.0	99.0	100.0	100.0	97.0	89.0	77.0	66.0	100.0
HDD, Base 65°F	1367	1179	973	573	283	60	8	26	147	487	801	1197	7101
CDD, Base 65°F	0	0	0	0	35	102	188	141	24	0	0	0	490
Humidity Ratio (#w/#da)	0.0021	0.0022	0.0032	0.0047	0.0070	0.0100	0.0119	0.0116	0.0094	0.0061	0.0042	0.0027	0.0063
Wind Speed (mph)	12.0	11.0	11.6	11.3	10.0	9.1	8.1	7.5	8.3	9.2	10.8	11.2	10.0
Clearness Index, Kt	0.43	0.46	0.47	0.48	0.51	0.53	0.54	0.52	0.49	0.45	0.38	0.38	0.49

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

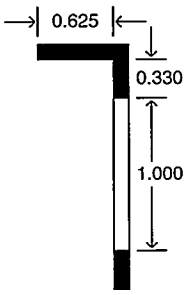
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	25/15	60/36	76/46	67/42	36/22	36/23	74/48	95/66	96/69	77/53	15/9	53/31	77/50	77/51	54/35	4/3	28/17	40/23	30/18	5/4
North	7/7	13/14	15/17	14/16	9/9	20/12	15/16	17/19	17/19	16/17	6/4	12/12	15/17	16/17	13/13	2/1	8/8	10/10	8/8	3/2
East	61/18	64/29	22/19	14/16	9/9	69/29	78/42	45/33	17/19	16/17	43/13	72/30	41/28	16/17	13/13	14/3	39/14	11/10	8/8	3/2
South	26/10	66/30	84/39	74/35	39/17	10/9	28/21	49/35	50/38	32/25	10/5	48/22	74/41	74/42	49/27	11/3	62/18	81/25	65/19	14/4
West	7/7	13/14	15/17	55/29	69/25	10/9	15/16	17/19	38/31	74/45	6/4	12/12	15/17	39/27	70/35	2/1	8/8	10/10	39/14	17/4
M. Clr (%hrs)	28	26	24	23	22	38	39	35	29	30	38	38	31	30	30	15	15	13	13	15

Muskegon, MI

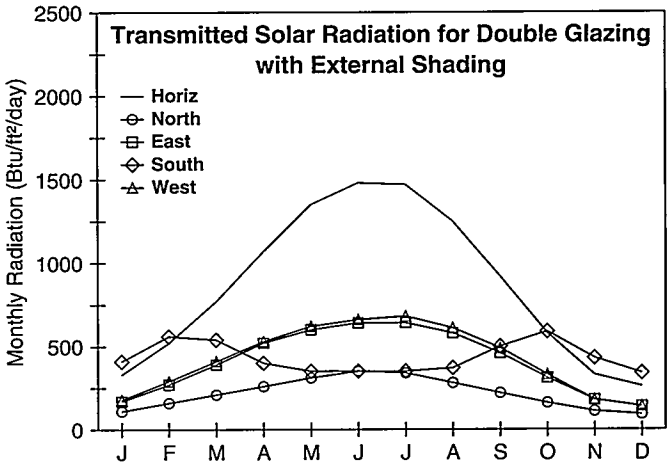
WBAN NO. 14840

LATITUDE: 43.17° N
LONGITUDE: 86.25° W
ELEVATION: 627 feet
MEAN PRESSURE: 14.4 psia

STATION TYPE: Secondary



Shading Geometry (Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	490	760	1100	1500	1860	2040	2030	1730	1300	850	500	390	1210
	Std.Dev.	37	57	74	91	156	132	90	125	106	56	41	27	36
	Minimum	400	650	990	1270	1540	1790	1840	1540	1090	750	420	330	1150
	Maximum	560	900	1260	1700	2170	2340	2190	2030	1510	950	590	450	1270
	Diffuse	390	510	610	700	780	830	790	710	590	450	340	320	580
	Clear-Day Global	770	1130	1620	2130	2490	2620	2520	2210	1740	1220	810	650	1660
North	Global	200	270	350	430	550	620	590	480	370	270	190	160	370
	Diffuse	200	270	350	430	500	540	520	450	360	270	190	160	350
	Clear-Day Global	170	240	320	420	580	680	630	470	350	250	170	150	370
East	Global	300	470	670	880	1040	1100	1110	990	780	520	310	240	700
	Diffuse	240	340	430	520	600	630	620	560	450	320	220	190	430
	Clear-Day Global	610	830	1100	1330	1450	1490	1460	1340	1130	860	620	530	1060
South	Global	590	860	1000	1000	930	880	930	1020	1070	960	620	490	860
	Diffuse	370	460	500	540	570	590	580	560	500	410	310	290	470
	Clear-Day Global	1800	1930	1850	1520	1210	1050	1100	1350	1660	1820	1760	1690	1560
West	Global	300	480	690	900	1070	1150	1170	1040	820	560	310	250	730
	Diffuse	240	340	430	520	600	640	630	560	460	330	220	200	430
	Clear-Day Global	610	830	1100	1330	1450	1490	1460	1340	1130	860	620	530	1060

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

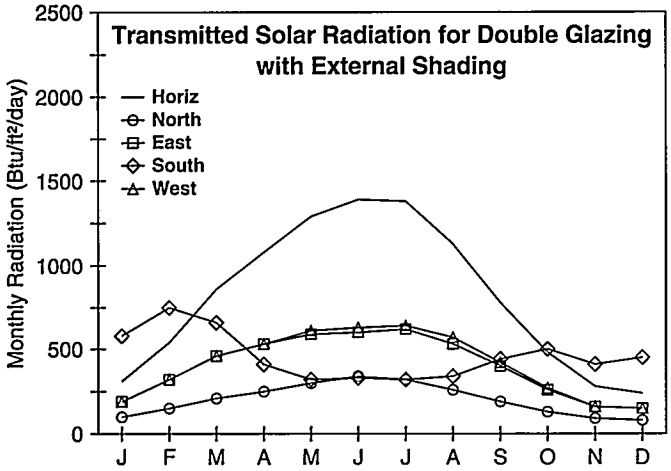
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	330	520	770	1070	1350	1480	1470	1250	920	580	330	260	860
North	Unshaded	140	190	240	300	360	410	390	320	250	190	130	110	250
	Shaded	110	160	210	260	310	350	340	280	220	160	110	91	220
East	Unshaded	210	330	470	620	740	780	790	700	550	370	210	160	500
	Shaded	170	270	390	520	600	640	640	580	460	310	180	140	410
South	Unshaded	440	630	710	660	590	540	570	660	740	690	460	360	590
	Shaded	410	560	540	400	350	350	350	370	500	590	430	340	430
West	Unshaded	210	340	480	640	760	820	830	740	580	390	220	170	520
	Shaded	180	290	410	530	620	660	680	610	490	330	180	140	430

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	23.3	24.4	33.3	45.0	55.9	65.0	70.3	68.5	61.2	50.3	39.4	28.5	47.1
Daily Minimum Temp	17.7	18.0	25.4	35.4	45.1	54.4	60.2	58.8	51.5	41.5	32.7	23.3	38.7
Daily Maximum Temp	28.8	30.8	41.2	54.5	66.6	75.6	80.3	78.1	70.8	59.0	46.0	33.7	55.5
Record Minimum Temp	-13.0	-14.0	-10.0	1.0	22.0	31.0	40.0	36.0	27.0	21.0	-14.0	-15.0	-15.0
Record Maximum Temp	63.0	62.0	80.0	86.0	93.0	97.0	96.0	99.0	95.0	83.0	76.0	64.0	99.0
HDD, Base 65°F	1293	1137	983	600	309	78	10	25	133	456	768	1132	6924
CDD, Base 65°F	0	0	0	0	27	78	174	133	19	0	0	0	431
Humidity Ratio (#w/#da)	0.0021	0.0022	0.0030	0.0043	0.0064	0.0093	0.0114	0.0115	0.0092	0.0061	0.0041	0.0027	0.0060
Wind Speed (mph)	12.6	11.5	12.1	11.8	10.0	9.5	8.9	8.7	9.5	10.6	11.9	12.1	10.8
Clearness Index, Kt	0.41	0.46	0.47	0.50	0.53	0.55	0.56	0.54	0.50	0.44	0.37	0.37	0.50

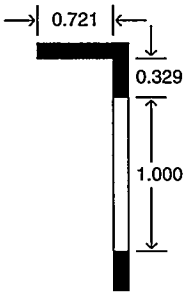
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	22/13	58/36	76/45	68/43	38/24	34/21	72/44	96/66	99/69	80/55	13/8	51/30	76/49	78/50	57/35	3/2	27/16	40/23	30/18	6/4
North	7/6	12/14	15/17	14/16	10/10	20/12	15/15	17/19	17/19	16/17	5/4	12/12	15/16	15/17	13/13	2/1	8/7	10/10	9/8	3/2
East	59/17	66/29	25/20	14/16	10/10	67/26	79/39	48/35	17/19	16/17	39/12	73/29	44/28	15/17	13/13	10/2	40/12	13/11	9/8	3/2
South	24/9	65/29	85/37	76/36	41/18	10/8	27/20	49/35	52/38	34/26	9/5	46/21	73/40	76/41	53/26	8/2	61/16	83/22	66/18	17/4
West	7/6	12/14	15/17	53/28	70/26	10/8	15/15	17/19	36/29	74/45	5/4	12/12	15/16	36/25	71/32	2/1	8/7	10/10	37/13	20/5
M. Clr (%hrs)	24	24	26	24	26	40	42	42	43	43	35	38	35	37	39	8	9	9	10	11



Sault Ste. Marie, MI

WBAN NO. 14847



Shading Geometry
(Not to Scale)

LATITUDE: 46.47° N
LONGITUDE: 84.37° W
ELEVATION: 725 feet
MEAN PRESSURE: 14.3 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	490	820	1240	1510	1790	1920	1910	1580	1120	710	430	380	1160
	Std.Dev.	27	53	91	127	143	140	110	110	101	47	34	31	32
	Minimum	430	710	990	1310	1500	1620	1740	1340	920	620	340	280	1100
	Maximum	530	900	1410	1790	2130	2130	2160	1800	1360	850	500	450	1220
	Diffuse	340	480	660	680	710	760	720	650	550	410	310	280	550
	Clear-Day Global	670	1050	1600	2130	2500	2660	2560	2200	1680	1130	710	560	1620
North	Global	180	270	380	430	540	610	580	450	340	240	170	150	360
	Diffuse	180	270	380	420	470	510	490	420	340	240	170	150	340
	Clear-Day Global	150	210	300	410	590	710	650	450	310	220	150	120	360
East	Global	340	550	800	930	1050	1080	1100	930	690	460	280	260	710
	Diffuse	230	340	480	510	560	590	580	510	410	290	200	180	410
	Clear-Day Global	590	840	1160	1400	1540	1590	1550	1410	1160	870	610	500	1100
South	Global	810	1130	1250	1080	960	890	940	1000	960	830	590	640	920
	Diffuse	380	490	580	540	550	560	560	530	470	370	290	310	470
	Clear-Day Global	1850	2050	2020	1640	1300	1150	1200	1440	1760	1900	1800	1730	1650
West	Global	330	550	800	930	1070	1120	1140	990	720	470	280	260	720
	Diffuse	230	350	480	520	570	600	590	520	410	290	200	190	410
	Clear-Day Global	590	840	1160	1400	1540	1590	1550	1410	1160	870	610	500	1100

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	310	540	860	1080	1290	1390	1380	1130	780	480	280	240	820
North	Unshaded	130	190	260	290	350	400	380	300	230	170	120	100	240
	Shaded	99	150	210	250	300	340	320	260	190	130	91	80	200
East	Unshaded	230	380	560	660	750	770	780	660	490	320	190	180	500
	Shaded	190	320	460	530	590	600	620	530	400	260	160	150	400
South	Unshaded	610	830	890	730	620	560	590	660	670	600	440	480	640
	Shaded	580	750	660	410	320	330	320	340	440	500	410	450	460
West	Unshaded	230	380	560	670	770	800	820	710	510	330	200	180	510
	Shaded	190	320	460	530	610	630	640	570	420	270	160	150	410

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	12.9	14.0	24.0	38.2	50.5	58.0	63.8	62.6	55.1	45.3	33.0	19.0	39.7
Daily Minimum Temp	4.6	4.8	15.3	28.4	38.4	45.5	51.3	51.3	44.3	36.2	25.9	11.8	29.8
Daily Maximum Temp	21.1	23.2	32.8	48.0	62.6	70.5	76.3	73.8	65.9	54.3	40.0	26.2	49.6
Record Minimum Temp	-36.0	-35.0	-24.0	-2.0	18.0	26.0	36.0	29.0	25.0	16.0	-10.0	-25.0	-36.0
Record Maximum Temp	45.0	47.0	75.0	85.0	89.0	93.0	97.0	98.0	95.0	80.0	67.0	60.0	98.0
HDD, Base 65°F	1615	1428	1271	804	457	224	92	128	300	611	960	1426	9316
CDD, Base 65°F	0	0	0	0	8	14	55	54	0	0	0	0	131
Humidity Ratio (#w/#da)	0.0015	0.0015	0.0022	0.0035	0.0054	0.0079	0.0099	0.0099	0.0078	0.0053	0.0034	0.0020	0.0050
Wind Speed (mph)	9.3	8.8	9.7	9.9	9.1	8.2	7.5	7.3	8.1	8.6	9.5	9.2	8.8
Clearness Index, Kt	0.48	0.54	0.56	0.52	0.52	0.52	0.53	0.50	0.45	0.40	0.37	0.43	0.50

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

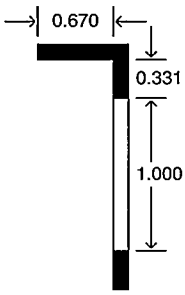
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	25/17	60/41	75/52	66/47	35/25	39/23	74/45	94/62	96/63	77/48	15/9	51/28	72/44	73/44	53/31	2/2	24/16	35/22	25/16	3/3
North	7/7	13/15	14/18	14/17	9/10	19/12	14/15	16/18	16/18	14/15	6/4	11/11	14/15	14/15	12/11	1/1	7/7	9/10	8/7	2/1
East	67/23	67/35	22/21	14/17	9/10	78/28	79/39	43/31	16/18	14/15	48/14	72/28	40/25	14/15	12/11	7/2	38/14	10/10	8/7	2/1
South	30/13	73/37	93/48	81/44	42/21	10/9	32/22	54/36	55/37	36/24	11/6	51/22	76/39	77/39	52/24	5/2	62/19	83/26	65/19	10/3
West	7/7	13/15	14/18	57/34	73/31	10/9	14/15	16/18	37/29	75/40	6/4	11/11	14/15	38/24	71/30	1/1	7/7	9/10	38/14	12/3
M. Clr (%hrs)	28	29	29	28	28	34	35	34	34	36	25	25	23	23	26	16	18	18	15	17

Traverse City, MI

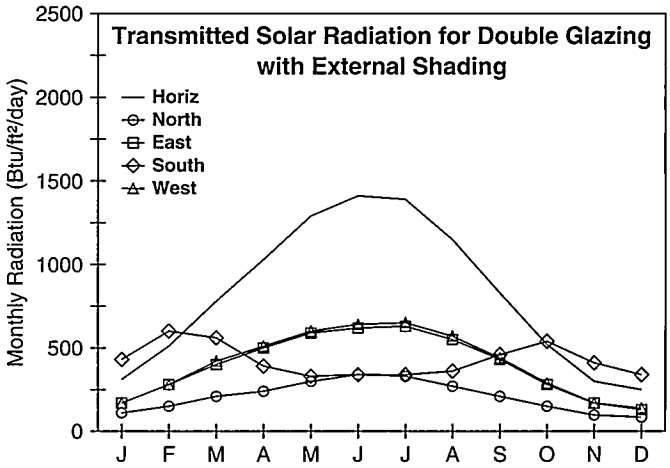
WBAN NO. 14850

LATITUDE: 44.73° N
LONGITUDE: 85.58° W
ELEVATION: 630 feet
MEAN PRESSURE: 14.4 psia

STATION TYPE: Secondary



Shading Geometry (Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	470	760	1120	1440	1780	1950	1920	1600	1180	770	460	370	1150
	Std.Dev.	31	62	95	75	127	136	77	95	93	52	40	28	29
	Minimum	390	600	900	1280	1530	1710	1800	1450	990	650	380	280	1100
	Maximum	530	880	1270	1600	2080	2290	2080	1860	1390	900	540	430	1220
	Diffuse	380	510	620	680	760	810	780	710	580	430	320	300	570
	Clear-Day Global	730	1090	1610	2120	2500	2640	2540	2210	1710	1170	760	610	1640
North	Global	190	270	360	420	540	610	580	470	350	250	180	160	370
	Diffuse	190	270	360	410	490	520	510	440	350	250	180	160	340
	Clear-Day Global	160	220	300	410	580	690	630	460	320	230	160	130	360
East	Global	300	480	690	860	1020	1090	1100	950	730	490	290	230	690
	Diffuse	240	340	440	500	580	620	610	540	430	310	210	190	420
	Clear-Day Global	610	840	1130	1360	1500	1540	1500	1370	1150	870	620	520	1080
South	Global	620	910	1060	990	930	880	920	980	1000	880	590	490	850
	Diffuse	370	470	530	530	570	580	580	550	490	390	290	300	470
	Clear-Day Global	1840	2000	1930	1560	1240	1090	1140	1390	1710	1870	1800	1730	1610
West	Global	300	490	710	880	1050	1130	1120	980	740	500	290	240	700
	Diffuse	240	340	450	510	590	630	620	550	440	310	210	190	420
	Clear-Day Global	610	840	1130	1360	1500	1540	1500	1370	1150	870	620	520	1080

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

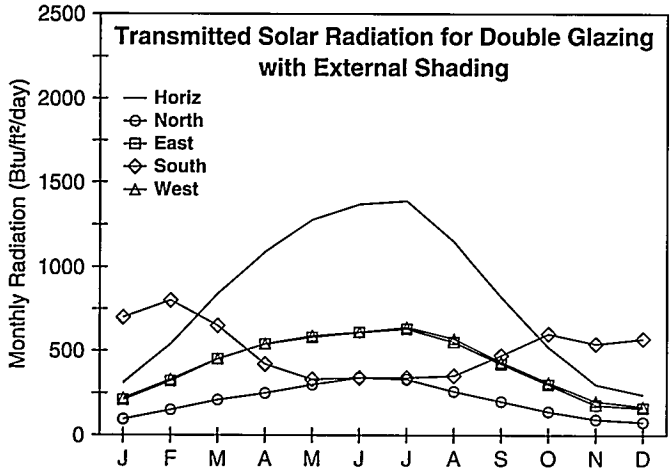
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	310	510	780	1030	1290	1410	1390	1150	830	520	300	250	820
North	Unshaded	130	190	250	290	360	400	380	310	240	170	120	110	250
	Shaded	110	150	210	240	300	340	330	270	210	150	98	85	210
East	Unshaded	200	330	490	620	730	770	780	680	520	340	200	160	490
	Shaded	170	280	400	500	590	620	630	550	430	280	170	130	400
South	Unshaded	460	670	750	660	590	550	570	640	690	640	440	370	590
	Shaded	430	600	560	390	330	340	340	360	460	540	410	340	420
West	Unshaded	210	340	500	630	750	800	800	700	530	350	200	160	500
	Shaded	170	280	420	510	600	640	650	570	440	290	170	140	410

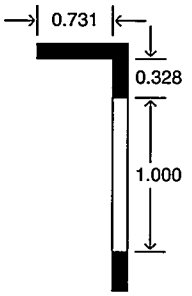
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	19.8	19.8	29.4	42.5	53.7	63.5	69.3	67.1	59.5	48.8	37.2	25.4	44.7
Daily Minimum Temp	13.3	11.2	20.2	31.8	41.0	51.0	57.3	56.0	49.3	39.5	30.5	19.6	35.1
Daily Maximum Temp	26.2	28.2	38.5	53.2	66.4	76.0	81.4	78.2	69.7	57.9	43.9	31.2	54.2
Record Minimum Temp	-20.0	-36.0	-25.1	5.0	21.0	28.9	32.0	32.0	28.0	21.9	5.0	-15.0	-36.0
Record Maximum Temp	53.1	57.9	78.1	90.0	91.9	99.0	99.0	98.1	91.9	88.0	73.9	63.0	99.0
HDD, Base 65°F	1401	1266	1104	675	370	115	25	57	172	502	834	1228	7749
CDD, Base 65°F	0	0	0	0	19	70	159	122	7	0	0	0	377
Humidity Ratio (#w/#da)	0.0019	0.0018	0.0026	0.0039	0.0059	0.0087	0.0106	0.0105	0.0085	0.0057	0.0038	0.0024	0.0055
Wind Speed (mph)	10.3	9.4	9.3	9.6	8.5	8.2	7.5	7.5	8.0	8.6	9.5	9.7	8.8
Clearness Index, Kt	0.43	0.48	0.49	0.49	0.51	0.53	0.54	0.51	0.46	0.42	0.36	0.38	0.49

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	23/15	58/37	74/48	66/44	36/24	35/22	72/46	93/67	95/68	77/53	14/9	50/30	73/48	75/49	54/33	3/2	24/15	37/23	27/18	4/3
North	7/6	12/14	14/17	13/16	9/10	19/12	14/15	16/18	16/18	15/16	5/4	12/11	14/16	15/16	12/12	2/1	8/7	10/10	8/8	2/2
East	60/20	66/31	24/20	13/16	9/10	71/30	78/42	45/35	16/18	15/16	43/14	72/32	42/27	15/16	12/12	9/2	37/13	12/10	8/8	2/2
South	25/11	67/32	87/42	76/39	41/20	10/9	29/21	50/38	52/39	34/26	10/5	48/24	74/41	76/43	51/27	7/2	57/17	80/25	62/20	13/4
West	7/6	12/14	14/17	53/31	71/29	10/9	14/15	16/18	35/29	73/46	5/4	12/11	14/16	36/26	69/33	2/1	8/7	10/10	35/14	16/4
M. Clr (%hrs)	23	22	23	22	23	33	35	30	31	34	29	27	21	21	25	6	6	6	6	8





Shading Geometry
(Not to Scale)

Duluth, MN

WBAN NO. 14913

LATITUDE: 46.83° N
LONGITUDE: 92.18° W
ELEVATION: 1417 feet
MEAN PRESSURE: 14.0 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	500	820	1210	1530	1770	1890	1920	1610	1170	780	470	390	1170
	Std.Dev.	27	55	86	110	152	140	144	128	100	66	36	32	41
	Minimum	460	670	1050	1330	1450	1610	1610	1330	960	660	400	300	1100
	Maximum	560	900	1390	1750	2070	2160	2170	1870	1390	900	550	460	1270
	Diffuse	290	440	650	710	770	840	790	690	550	390	290	240	550
	Clear-Day Global	650	1020	1580	2120	2510	2670	2560	2200	1670	1110	690	540	1610
North	Global	170	260	370	440	540	630	600	470	340	240	170	140	360
	Diffuse	170	260	370	430	490	530	510	440	340	240	170	140	340
	Clear-Day Global	140	210	300	410	590	710	650	460	310	220	150	120	360
East	Global	370	560	770	950	1050	1090	1120	970	740	520	320	280	730
	Diffuse	210	330	470	530	580	630	610	530	420	300	200	170	420
	Clear-Day Global	570	820	1140	1410	1540	1600	1550	1410	1160	860	590	490	1100
South	Global	970	1200	1230	1110	970	900	970	1030	1040	980	760	780	990
	Diffuse	350	470	580	570	570	600	590	550	480	380	300	290	480
	Clear-Day Global	1810	2020	2000	1660	1330	1170	1220	1460	1770	1900	1780	1690	1650
West	Global	370	570	790	940	1050	1100	1140	1000	760	530	340	290	740
	Diffuse	220	330	470	540	590	640	630	550	420	300	210	180	420
	Clear-Day Global	570	820	1140	1410	1540	1600	1550	1410	1160	860	590	490	1100

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	310	540	840	1090	1280	1370	1390	1150	820	520	300	240	820
North	Unshaded	120	180	260	300	360	410	390	310	240	170	120	96	250
	Shaded	95	150	210	250	300	340	330	260	200	140	93	77	200
East	Unshaded	250	390	550	670	750	780	800	690	530	370	220	190	520
	Shaded	210	320	450	540	580	610	630	550	420	300	180	160	410
South	Unshaded	730	890	880	750	620	570	610	680	720	720	570	600	690
	Shaded	700	800	650	420	330	340	340	350	470	600	540	570	510
West	Unshaded	250	400	560	670	750	780	810	720	540	370	230	200	520
	Shaded	220	330	450	540	590	610	640	570	430	310	200	170	420

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	7.0	12.3	24.4	38.6	50.8	59.8	66.1	63.7	54.2	43.7	28.4	12.8	38.5
Daily Minimum Temp	-2.2	2.8	15.7	28.9	39.6	48.5	55.1	53.3	44.5	35.1	21.5	4.9	29.0
Daily Maximum Temp	16.2	21.7	32.9	48.2	61.9	71.0	77.1	73.9	63.8	52.3	35.2	20.7	47.9
Record Minimum Temp	-39.0	-33.0	-29.0	-5.0	17.0	27.0	35.0	32.0	22.0	8.0	-23.0	-34.0	-39.0
Record Maximum Temp	52.0	55.0	78.0	88.0	90.0	93.0	97.0	97.0	95.0	86.0	70.0	55.0	97.0
HDD, Base 65°F	1798	1476	1259	792	445	170	60	113	329	660	1098	1618	9818
CDD, Base 65°F	0	0	0	0	0	14	94	72	0	0	0	0	180
Humidity Ratio (#w/#da)	0.0012	0.0014	0.0021	0.0032	0.0051	0.0078	0.0100	0.0096	0.0072	0.0045	0.0027	0.0015	0.0047
Wind Speed (mph)	11.3	10.8	11.8	11.7	10.9	10.0	8.9	9.0	9.8	10.4	10.9	10.8	10.5
Clearness Index, Kt	0.50	0.55	0.56	0.53	0.51	0.51	0.54	0.52	0.47	0.45	0.42	0.45	0.51

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

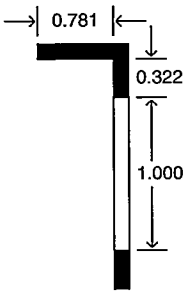
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	33/22	63/45	73/53	59/42	25/18	48/29	80/52	95/64	91/65	68/47	24/14	57/34	75/44	70/44	44/27	6/4	28/18	34/22	20/13	0/0
North	9/9	13/16	14/18	13/15	8/8	14/12	15/17	16/18	16/18	14/15	7/6	12/13	14/15	14/15	11/10	3/2	8/8	9/9	6/6	0/0
East	72/26	57/33	14/18	13/15	8/8	81/34	72/41	32/26	16/18	14/15	63/18	67/30	29/20	14/15	11/10	23/6	35/14	9/9	6/6	0/0
South	41/18	79/41	92/50	74/38	30/15	11/11	39/27	57/39	53/38	29/22	21/9	59/27	81/38	74/38	43/21	21/5	73/23	84/29	56/17	0/0
West	9/9	13/16	20/21	64/35	65/26	11/11	15/17	16/18	48/36	77/45	7/6	12/13	14/15	49/28	72/31	3/2	8/8	17/11	40/13	0/0
M. Clr (%hrs)	30	28	28	29	29	32	29	27	24	26	33	31	30	29	30	26	26	27	28	30

International Falls, MN

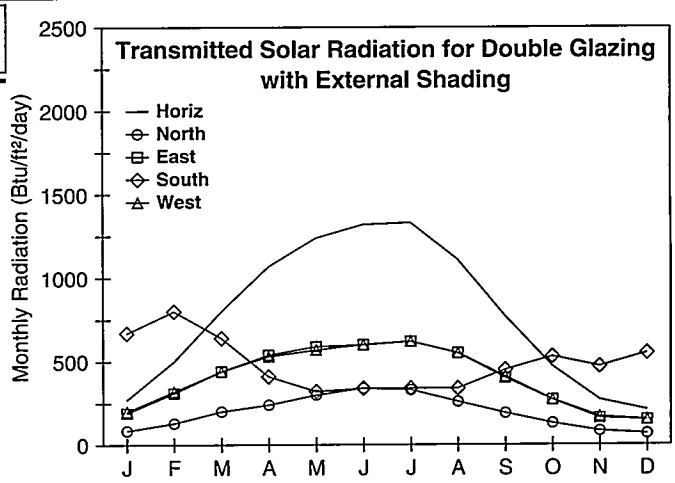
WBAN NO. 14918

LATITUDE: 48.57° N
LONGITUDE: 93.38° W
ELEVATION: 1184 feet
MEAN PRESSURE: 14.1 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	450	770	1170	1510	1740	1840	1850	1560	1110	700	430	350	1120
	Std.Dev.	32	55	97	126	156	145	96	123	100	62	30	26	36
	Minimum	370	600	940	1300	1360	1580	1670	1350	900	580	370	260	1060
	Maximum	510	840	1370	1780	2000	2110	2040	1770	1300	840	490	400	1200
	Diffuse	270	410	620	680	770	850	800	680	540	390	280	220	540
	Clear-Day Global	580	950	1510	2080	2490	2660	2550	2170	1620	1050	630	470	1570
North	Global	150	240	360	440	550	630	610	470	330	230	160	130	360
	Diffuse	150	240	360	430	490	540	510	440	330	230	160	130	330
	Clear-Day Global	130	200	290	400	590	730	660	450	300	210	130	110	350
East	Global	340	540	770	970	1070	1090	1130	980	720	470	290	260	720
	Diffuse	200	310	450	520	580	620	610	530	410	280	190	160	410
	Clear-Day Global	540	770	1120	1410	1570	1630	1570	1420	1160	840	560	450	1090
South	Global	920	1190	1240	1140	980	910	960	1030	1010	880	670	750	970
	Diffuse	330	450	560	560	570	600	600	550	470	360	290	280	470
	Clear-Day Global	1780	2000	2030	1700	1380	1230	1280	1510	1800	1900	1740	1630	1660
West	Global	340	550	780	940	1040	1100	1120	980	730	480	300	270	720
	Diffuse	200	310	460	530	590	640	630	540	410	280	190	160	410
	Clear-Day Global	540	770	1120	1410	1570	1630	1570	1420	1160	840	560	450	1090

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

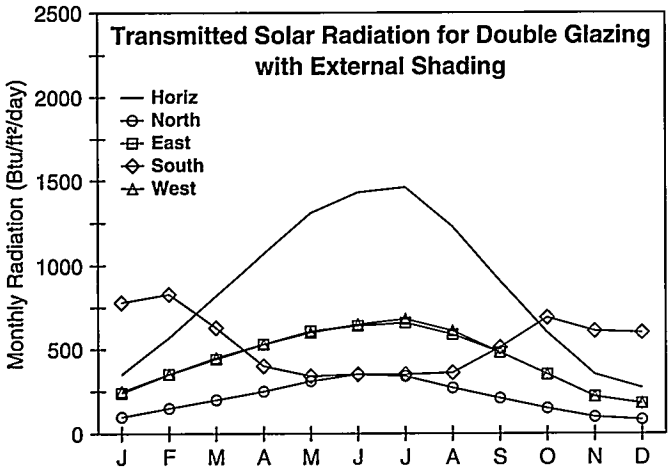
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	270	500	800	1070	1240	1320	1330	1110	770	470	270	210	780
North	Unshaded	110	170	250	300	360	420	400	310	230	160	110	87	240
	Shaded	85	130	200	240	300	340	330	260	190	130	84	68	200
East	Unshaded	230	380	540	700	770	780	810	700	510	330	200	180	510
	Shaded	190	310	440	540	590	600	620	550	400	270	160	150	400
South	Unshaded	700	890	890	770	630	580	620	690	700	640	510	570	680
	Shaded	670	800	640	410	320	340	340	340	450	530	470	550	490
West	Unshaded	230	380	550	670	740	780	800	710	520	340	210	180	510
	Shaded	200	320	440	530	570	600	620	550	410	270	170	150	400

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	1.0	7.7	22.1	39.0	52.1	61.4	66.7	63.7	53.4	42.4	24.9	7.2	36.8
Daily Minimum Temp	-10.0	-4.0	11.4	27.8	39.6	49.5	54.6	51.7	42.5	32.9	17.0	-2.2	25.9
Daily Maximum Temp	11.9	19.3	32.8	50.1	64.6	73.4	78.8	75.6	64.3	51.8	32.8	16.6	47.7
Record Minimum Temp	-46.0	-44.0	-38.0	-14.0	11.0	23.0	35.0	30.0	20.0	2.0	-32.0	-41.0	-46.0
Record Maximum Temp	48.0	55.0	76.0	93.0	95.0	98.0	98.0	95.0	95.0	88.0	73.0	57.0	98.0
HDD, Base 65°F	1984	1604	1330	780	418	156	55	116	348	701	1203	1792	10487
CDD, Base 65°F	0	0	0	0	18	48	107	76	0	0	0	0	249
Humidity Ratio (#w/#da)	0.0009	0.0012	0.0019	0.0031	0.0053	0.0083	0.0103	0.0097	0.0070	0.0045	0.0025	0.0013	0.0047
Wind Speed (mph)	8.8	8.6	9.5	9.6	9.2	8.3	7.4	7.5	8.3	9.0	9.1	8.7	8.7
Clearness Index, Kt	0.50	0.55	0.56	0.53	0.51	0.50	0.52	0.51	0.46	0.42	0.41	0.45	0.50

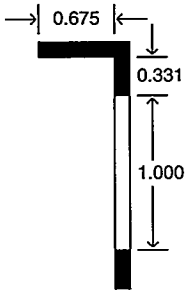
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	31/20	61/42	72/50	58/41	25/18	47/28	78/49	94/60	90/61	69/46	22/12	55/32	73/42	68/43	43/27	4/3	24/16	31/20	18/12	0/0
North	8/9	13/16	14/18	12/15	8/8	14/12	15/16	16/18	16/18	14/15	7/5	12/12	14/15	13/15	10/10	2/2	7/7	8/9	6/6	0/0
East	71/25	59/31	14/18	12/15	8/8	81/33	73/39	34/26	16/18	14/15	61/16	68/29	30/20	13/15	10/10	16/4	34/13	8/9	6/6	0/0
South	39/16	80/38	94/48	76/38	33/15	11/11	40/26	59/38	55/37	32/23	20/8	59/26	82/37	76/38	45/21	14/4	68/21	82/26	55/16	0/0
West	8/9	13/16	17/19	63/33	66/25	11/11	15/16	16/18	46/33	77/43	7/5	12/12	14/15	46/27	71/29	2/2	7/7	15/10	37/12	0/0
M. Clr (%hrs)	31	31	29	30	32	32	30	23	22	27	32	29	26	24	28	27	27	27	29	31



Minneapolis, MN

WBAN NO. 14922



Shading Geometry
(Not to Scale)

LATITUDE: 44.88° N
LONGITUDE: 93.22° W
ELEVATION: 837 feet
MEAN PRESSURE: 14.3 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	560	860	1190	1490	1810	1980	2010	1710	1290	880	540	430	1230
	Std.Dev.	36	53	90	116	136	133	117	115	104	73	47	35	38
	Minimum	490	750	990	1280	1540	1750	1770	1520	1030	770	420	360	1160
	Maximum	640	970	1370	1740	2050	2340	2200	2010	1510	1020	630	530	1340
	Diffuse	290	420	580	670	770	820	760	670	540	390	300	250	540
	Clear-Day Global	720	1090	1600	2130	2500	2650	2550	2220	1720	1180	770	610	1650
North	Global	180	260	350	430	540	630	600	470	350	260	180	150	370
	Diffuse	180	260	350	420	490	530	510	440	350	260	180	150	340
	Clear-Day Global	160	220	300	410	580	690	640	460	320	230	160	130	360
East	Global	400	580	750	910	1060	1130	1150	1020	820	590	370	310	760
	Diffuse	220	330	430	510	590	630	620	540	430	310	220	180	420
	Clear-Day Global	600	830	1110	1360	1500	1540	1510	1380	1160	870	630	520	1090
South	Global	1060	1230	1180	1040	940	890	960	1050	1120	1110	860	820	1020
	Diffuse	350	450	520	530	570	590	590	550	490	400	310	290	470
	Clear-Day Global	1850	2010	1930	1570	1250	1100	1160	1410	1730	1890	1810	1730	1620
West	Global	410	590	760	900	1050	1140	1180	1050	820	590	380	310	770
	Diffuse	230	330	430	510	590	640	630	550	440	320	220	180	420
	Clear-Day Global	600	830	1110	1360	1500	1540	1510	1380	1160	870	630	520	1090

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	350	570	820	1070	1310	1430	1460	1230	910	600	350	270	860
North	Unshaded	120	180	240	290	360	410	390	310	240	180	120	100	250
	Shaded	100	150	200	250	310	350	340	270	210	150	100	84	210
East	Unshaded	270	410	530	650	760	810	820	730	580	420	250	210	540
	Shaded	240	350	440	530	610	640	660	590	480	350	220	180	440
South	Unshaded	810	910	830	700	600	550	600	680	770	810	640	630	710
	Shaded	780	830	630	400	340	350	350	360	510	690	610	600	540
West	Unshaded	280	410	540	640	750	810	840	750	580	420	260	210	540
	Shaded	250	350	450	530	600	650	680	610	480	350	220	180	450

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	11.8	17.9	31.0	46.4	58.5	68.2	73.6	70.5	60.5	48.8	33.2	17.9	44.9
Daily Minimum Temp	2.8	9.2	22.7	36.2	47.6	57.6	63.1	60.3	50.3	38.8	25.2	10.2	35.3
Daily Maximum Temp	20.7	26.6	39.2	56.5	69.4	78.8	84.0	80.7	70.7	58.8	41.0	25.5	54.3
Record Minimum Temp	-34.0	-28.0	-32.0	2.0	18.0	34.0	43.0	39.0	26.0	15.0	-17.0	-29.0	-34.0
Record Maximum Temp	58.0	60.0	83.0	95.0	96.0	102.0	105.0	102.0	98.0	89.0	75.0	63.0	105.0
HDD, Base 65°F	1649	1319	1054	558	244	41	11	22	167	502	954	1460	7981
CDD, Base 65°F	0	0	0	0	43	137	278	192	32	0	0	0	682
Humidity Ratio (#w/#da)	0.0014	0.0017	0.0026	0.0041	0.0066	0.0097	0.0117	0.0110	0.0083	0.0053	0.0031	0.0018	0.0056
Wind Speed (mph)	10.5	10.2	11.4	12.0	10.8	10.2	9.3	9.2	9.6	10.2	10.5	10.2	10.4
Clearness Index, Kt	0.51	0.54	0.52	0.50	0.52	0.54	0.56	0.54	0.51	0.48	0.43	0.45	0.52

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

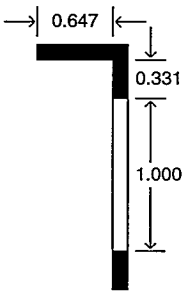
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	33/20	65/42	76/50	62/40	27/18	46/29	80/53	97/67	94/66	70/48	23/14	59/35	78/48	73/47	46/29	7/5	30/19	38/24	23/15	0/0
North	9/8	13/15	14/17	13/14	8/8	16/13	15/17	16/18	17/18	15/16	7/6	13/13	15/16	14/16	11/11	3/2	8/8	9/10	7/6	0/0
East	72/25	59/31	14/17	13/14	8/8	79/35	74/43	35/28	17/18	15/16	61/19	70/31	31/22	14/16	11/11	25/7	37/16	9/10	7/6	0/0
South	38/16	77/37	90/45	73/35	32/14	11/11	36/26	54/39	51/37	28/22	19/9	58/27	80/41	74/40	44/22	22/6	73/25	87/30	60/18	0/0
West	9/8	13/15	18/19	64/32	67/24	11/11	15/17	16/18	48/36	78/46	7/6	13/13	15/16	48/29	73/32	3/2	8/8	16/12	42/14	0/0
M. Clr (%hrs)	31	32	32	30	32	39	38	33	31	34	42	42	38	37	39	26	27	27	29	33

Rochester, MN

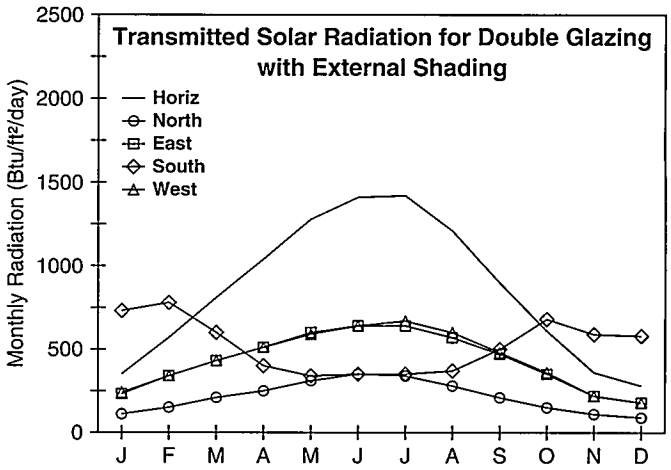
WBAN NO. 14925

LATITUDE: 43.92° N
LONGITUDE: 92.50° W
ELEVATION: 1319 feet
MEAN PRESSURE: 14.0 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	560	850	1160	1460	1770	1950	1950	1680	1280	890	550	450	1210
	Std.Dev.	41	62	105	121	134	124	124	110	117	80	43	37	37
	Minimum	480	720	940	1220	1520	1730	1660	1420	1030	730	450	370	1160
	Maximum	650	960	1370	1750	2050	2300	2220	1900	1500	1050	630	530	1310
	Diffuse	300	440	600	700	790	850	800	700	560	410	310	270	560
	Clear-Day Global	750	1110	1620	2140	2500	2650	2550	2230	1740	1210	800	640	1670
North	Global	180	260	350	430	540	630	600	470	360	260	190	160	370
	Diffuse	180	260	350	420	490	530	520	450	350	260	190	160	350
	Clear-Day Global	160	230	310	410	570	690	640	460	330	240	170	140	360
East	Global	400	570	730	880	1030	1110	1110	980	790	590	370	310	740
	Diffuse	230	330	440	510	590	630	620	550	440	320	220	190	420
	Clear-Day Global	610	830	1120	1350	1490	1530	1490	1370	1160	870	640	530	1080
South	Global	1000	1150	1110	980	900	860	910	1010	1080	1090	830	800	980
	Diffuse	350	450	520	540	570	590	590	560	490	410	320	300	470
	Clear-Day Global	1840	1980	1900	1540	1220	1080	1130	1380	1700	1870	1800	1720	1590
West	Global	400	560	720	870	1020	1110	1140	1020	810	590	370	310	750
	Diffuse	230	330	440	520	600	640	630	560	450	320	230	190	430
	Clear-Day Global	610	830	1120	1350	1490	1530	1490	1370	1160	870	640	530	1080

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

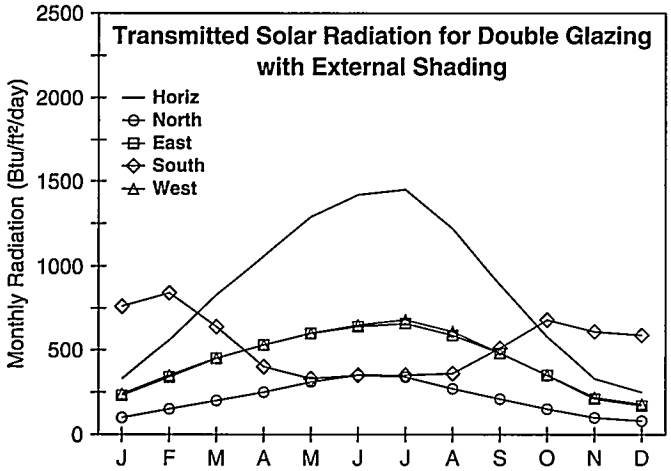
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	350	570	810	1040	1280	1410	1420	1210	900	610	360	280	850
North	Unshaded	130	180	240	300	360	410	390	320	250	180	130	110	250
	Shaded	110	150	210	250	310	350	340	280	210	150	110	89	210
East	Unshaded	270	400	510	630	740	790	790	700	560	410	250	210	520
	Shaded	230	340	430	510	600	640	640	570	470	350	220	180	430
South	Unshaded	760	850	780	660	570	540	570	650	740	790	620	610	680
	Shaded	730	780	600	400	340	350	350	370	500	680	590	580	520
West	Unshaded	280	390	510	620	720	790	820	730	580	420	260	210	530
	Shaded	240	340	430	510	590	640	670	600	480	360	220	180	440

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	11.5	17.1	29.8	44.9	56.8	66.5	70.9	68.2	59.2	47.9	32.6	17.2	43.6
Daily Minimum Temp	2.6	8.1	21.3	34.6	45.5	55.2	60.1	57.5	48.5	37.6	24.4	9.4	33.7
Daily Maximum Temp	20.2	26.0	38.2	55.2	68.1	77.7	81.8	78.8	69.8	58.2	40.9	25.0	53.3
Record Minimum Temp	-32.0	-29.0	-31.0	5.0	21.0	35.0	42.0	37.0	23.0	11.0	-20.0	-33.0	-33.0
Record Maximum Temp	55.0	63.0	79.0	91.0	92.0	101.0	102.0	99.0	95.0	88.0	73.0	62.0	102.0
HDD, Base 65°F	1659	1341	1091	603	282	56	16	33	185	530	972	1482	8250
CDD, Base 65°F	0	0	0	0	28	101	199	133	11	0	0	0	472
Humidity Ratio (#w/#da)	0.0015	0.0018	0.0029	0.0045	0.0070	0.0100	0.0121	0.0113	0.0085	0.0054	0.0033	0.0019	0.0058
Wind Speed (mph)	14.7	14.0	14.7	14.7	13.4	12.7	11.0	10.9	12.1	13.1	13.9	14.0	13.2
Clearness Index, Kt	0.49	0.52	0.50	0.49	0.51	0.53	0.54	0.53	0.50	0.48	0.42	0.44	0.51

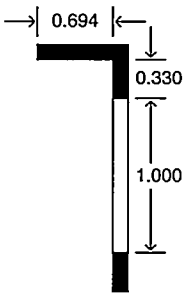
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	34/21	65/41	76/50	61/39	26/17	46/30	80/54	97/67	94/66	70/48	24/14	60/35	78/47	73/47	46/28	8/6	32/20	39/24	24/15	0/0
North	9/9	13/15	14/17	13/14	8/7	16/13	16/17	17/19	17/19	15/16	8/6	13/13	15/16	15/16	11/11	4/3	9/9	10/10	7/7	0/0
East	71/24	57/29	14/17	13/14	8/7	79/36	73/43	33/28	17/19	15/16	62/18	69/30	30/22	15/16	11/11	28/7	37/15	10/10	7/7	0/0
South	39/16	75/35	88/43	71/33	30/13	11/11	36/26	53/38	49/36	26/21	20/9	58/27	79/38	73/39	42/21	25/6	74/24	85/29	59/17	1/0
West	9/9	13/15	19/19	64/31	65/22	11/11	16/17	17/19	49/36	78/47	8/6	13/13	15/16	49/30	72/31	4/3	9/9	18/12	42/14	1/0
M. Clr (%hrs)	29	30	29	28	28	36	35	32	29	31	38	38	37	36	40	28	28	27	27	29



Saint Cloud, MN

WBAN NO. 14926



Shading Geometry
(Not to Scale)

LATITUDE: 45.55° N
LONGITUDE: 94.07° W
ELEVATION: 1027 feet
MEAN PRESSURE: 14.2 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	540	840	1190	1490	1790	1960	2000	1700	1270	870	520	410	1220
	Std.Dev.	35	59	97	117	154	127	128	125	108	79	41	33	42
	Minimum	450	700	970	1270	1490	1770	1790	1530	1000	700	410	350	1140
	Maximum	580	940	1390	1760	2020	2290	2240	2050	1430	1020	590	490	1320
	Diffuse	280	410	580	680	780	830	760	670	540	390	290	240	540
	Clear-Day Global	690	1060	1580	2120	2500	2650	2550	2210	1700	1160	740	580	1630
North	Global	170	250	350	430	550	640	610	470	350	250	170	140	370
	Diffuse	170	250	350	420	490	540	520	440	350	250	170	140	340
	Clear-Day Global	150	220	300	410	580	700	650	460	320	230	160	130	360
East	Global	390	570	760	910	1060	1140	1160	1030	810	590	360	300	760
	Diffuse	220	320	430	510	590	630	620	540	430	310	210	180	420
	Clear-Day Global	590	820	1110	1370	1520	1560	1520	1390	1160	870	610	510	1090
South	Global	1040	1240	1210	1050	950	900	970	1050	1110	1100	860	810	1020
	Diffuse	340	440	520	540	570	590	590	550	480	400	310	280	470
	Clear-Day Global	1820	2010	1940	1590	1270	1120	1170	1420	1740	1900	1800	1700	1620
West	Global	400	580	770	910	1050	1140	1180	1050	820	590	380	300	770
	Diffuse	220	320	440	520	590	640	630	550	440	310	210	170	420
	Clear-Day Global	590	820	1110	1370	1520	1560	1520	1390	1160	870	610	510	1090

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	330	560	830	1060	1290	1420	1450	1220	890	580	330	250	850
North	Unshaded	120	170	240	290	360	420	390	320	240	170	120	99	250
	Shaded	99	150	200	250	310	350	340	270	210	150	99	80	210
East	Unshaded	270	400	540	650	760	810	830	730	580	410	250	200	540
	Shaded	230	340	450	530	600	640	660	590	480	350	210	170	440
South	Unshaded	790	920	860	700	610	560	600	690	770	800	640	610	710
	Shaded	760	840	640	400	330	350	350	360	510	680	610	590	530
West	Unshaded	270	410	550	650	750	810	850	750	580	420	260	210	540
	Shaded	240	350	450	530	600	650	680	610	480	350	220	180	450

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	8.1	14.3	27.6	43.5	55.9	64.8	70.1	67.1	57.3	45.9	29.7	14.1	41.5
Daily Minimum Temp	-2.4	3.8	17.6	32.0	43.4	52.2	57.6	54.8	45.4	34.4	20.3	5.0	30.3
Daily Maximum Temp	18.5	24.8	37.6	55.0	68.4	77.4	82.6	79.4	69.1	57.4	39.0	23.1	52.7
Record Minimum Temp	-43.0	-35.0	-32.0	-3.0	19.0	33.0	40.0	33.0	18.0	5.0	-20.0	-41.0	-43.0
Record Maximum Temp	55.0	55.0	79.0	96.0	97.0	102.0	103.0	103.0	98.0	90.0	74.0	60.0	103.0
HDD, Base 65°F	1764	1420	1159	645	307	87	23	54	240	592	1059	1578	8928
CDD, Base 65°F	0	0	0	0	25	81	181	119	9	0	0	0	415
Humidity Ratio (#w/#da)	0.0012	0.0015	0.0025	0.0039	0.0063	0.0094	0.0114	0.0107	0.0078	0.0049	0.0029	0.0016	0.0053
Wind Speed (mph)	10.5	8.2	11.1	10.6	9.9	8.2	7.2	7.4	7.7	8.8	9.3	9.8	9.1
Clearness Index, Kt	0.50	0.55	0.53	0.51	0.52	0.53	0.56	0.54	0.50	0.48	0.43	0.44	0.52

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

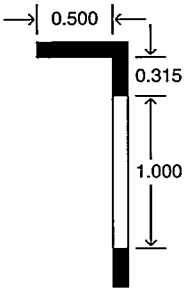
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	31/20	64/42	75/50	62/40	28/19	45/29	79/53	97/64	93/65	71/49	22/13	58/34	77/45	73/46	47/29	6/4	29/18	37/23	23/14	0/0
North	8/8	13/15	14/17	13/15	8/8	16/13	15/17	16/18	16/19	15/16	7/6	12/13	15/16	14/16	11/11	3/2	8/8	9/9	7/6	0/0
East	72/24	60/32	14/17	13/15	8/8	79/35	75/44	36/28	16/19	15/16	61/17	70/30	32/22	14/16	11/11	23/5	38/15	9/9	7/6	0/0
South	37/15	77/37	91/46	76/35	34/15	11/11	36/26	55/37	52/38	30/23	18/8	58/26	80/38	76/39	45/23	20/5	73/23	86/29	61/17	0/0
West	8/8	13/15	16/18	63/32	69/26	11/11	15/17	16/18	46/34	78/46	7/6	12/13	15/16	47/28	73/32	3/2	8/8	15/11	42/13	0/0
M. Clr (%hrs)	34	31	31	32	31	39	36	32	30	34	43	41	37	35	39	27	26	28	30	34

Columbia, MO

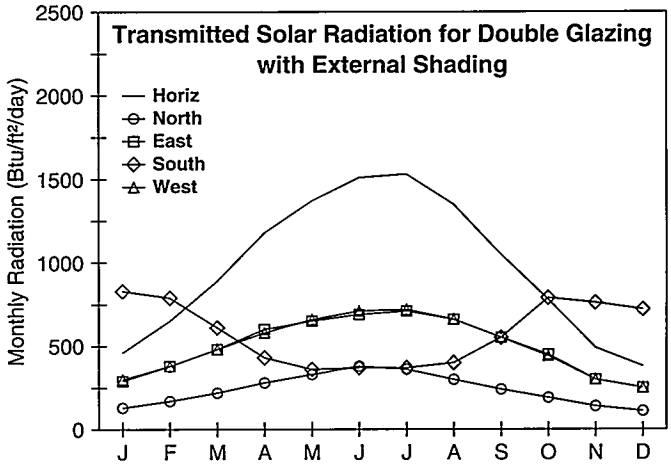
WBAN NO. 03945

LATITUDE: 38.82° N
LONGITUDE: 92.22° W
ELEVATION: 886 feet
MEAN PRESSURE: 14.3 psia

STATION TYPE: Primary



Shading Geometry (Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	710	960	1260	1640	1900	2080	2100	1860	1470	1120	730	590	1370
	Std.Dev.	58	69	116	127	132	137	143	129	107	100	67	55	39
	Minimum	570	830	1000	1380	1650	1840	1750	1570	1180	910	630	490	1310
	Maximum	810	1080	1470	1870	2150	2370	2370	2050	1700	1290	900	720	1450
	Diffuse	320	440	580	710	830	870	830	750	610	440	350	290	590
	Clear-Day Global	950	1300	1780	2240	2540	2640	2560	2300	1890	1410	1010	840	1790
North	Global	210	280	360	450	570	650	610	500	390	300	220	180	390
	Diffuse	210	280	360	440	510	550	530	470	390	300	220	180	370
	Clear-Day Global	190	250	330	420	580	680	630	470	350	270	200	170	380
East	Global	470	610	770	970	1060	1140	1150	1060	880	720	490	400	810
	Diffuse	250	340	440	540	610	650	640	590	480	370	270	220	450
	Clear-Day Global	720	910	1150	1350	1460	1470	1440	1360	1190	950	740	650	1120
South	Global	1130	1160	1100	1000	850	800	850	990	1120	1240	1050	990	1020
	Diffuse	360	430	500	550	570	590	580	580	530	450	360	320	490
	Clear-Day Global	1940	1980	1790	1380	1040	890	950	1210	1590	1870	1910	1870	1530
West	Global	480	610	760	940	1070	1160	1170	1070	890	710	490	410	810
	Diffuse	250	340	440	540	620	660	650	600	490	370	270	220	450
	Clear-Day Global	720	910	1150	1350	1460	1470	1440	1360	1190	950	740	650	1120

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

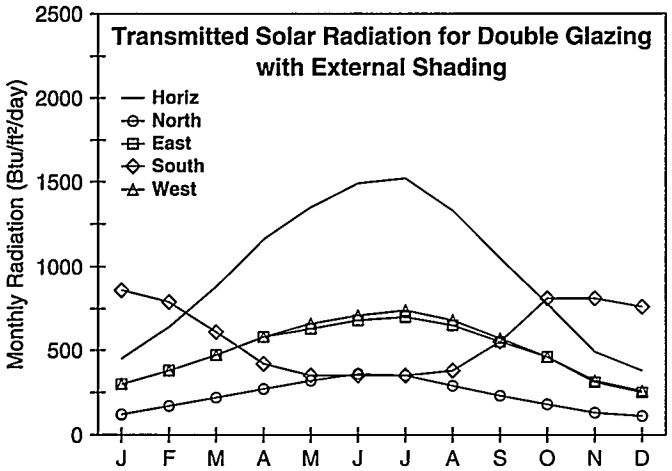
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	460	650	890	1180	1370	1510	1530	1350	1050	780	490	380	970
North	Unshaded	140	190	250	310	370	420	400	330	270	210	150	130	260
	Shaded	130	170	220	280	330	380	360	300	240	190	140	110	240
East	Unshaded	320	430	540	690	750	810	820	750	630	510	340	280	570
	Shaded	290	380	480	600	650	690	710	660	550	450	300	250	500
South	Unshaded	850	850	760	640	520	480	510	620	750	890	790	740	700
	Shaded	830	790	610	430	360	370	370	400	550	790	760	720	580
West	Unshaded	330	430	540	670	760	820	830	760	630	500	340	280	570
	Shaded	300	380	480	580	660	710	720	660	550	440	300	250	500

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	27.6	32.1	43.2	54.7	63.6	72.1	77.4	75.2	67.9	56.5	44.1	31.8	53.9
Daily Minimum Temp	18.5	22.8	33.0	43.7	53.1	61.2	66.2	63.8	57.0	45.5	34.6	23.2	43.6
Daily Maximum Temp	36.6	41.4	53.3	65.7	74.1	82.8	88.6	86.7	78.8	67.6	53.6	40.3	64.1
Record Minimum Temp	-19.0	-15.0	-5.0	19.0	29.0	43.0	48.0	42.0	32.0	22.0	0.0	-20.0	-20.0
Record Maximum Temp	74.0	82.0	85.0	90.0	90.0	103.0	111.0	110.0	101.0	93.0	83.0	76.0	111.0
HDD, Base 65°F	1159	921	676	316	137	10	0	0	52	285	627	1029	5212
CDD, Base 65°F	0	0	0	7	94	223	384	321	139	21	0	0	1189
Humidity Ratio (#w/#da)	0.0025	0.0029	0.0042	0.0060	0.0090	0.0124	0.0142	0.0131	0.0106	0.0068	0.0046	0.0030	0.0074
Wind Speed (mph)	11.2	11.1	12.2	11.8	9.7	8.7	8.2	8.1	8.8	9.8	10.8	11.0	10.1
Clearness Index, Kt	0.49	0.51	0.50	0.53	0.54	0.56	0.58	0.57	0.54	0.53	0.47	0.45	0.53

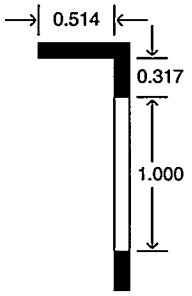
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	39/22	74/45	84/53	68/41	29/18	46/31	84/59	104/75	99/74	72/52	26/16	67/42	87/58	80/54	50/33	14/8	42/25	49/29	31/18	3/2
North	10/9	14/15	15/17	13/14	8/8	20/15	17/18	17/20	17/19	16/16	8/7	14/15	16/18	16/17	12/12	5/4	10/10	11/11	8/8	2/1
East	76/26	60/32	15/17	13/14	8/8	77/39	75/48	35/30	17/19	16/16	62/21	72/36	31/25	16/17	12/12	42/10	42/18	11/11	8/8	2/1
South	39/16	74/37	84/44	68/33	29/13	12/12	30/25	46/36	42/35	22/19	19/9	56/30	76/45	69/42	40/23	38/9	83/29	91/33	65/21	9/2
West	10/9	14/15	20/19	67/33	69/24	12/12	17/18	17/20	51/40	80/51	8/7	14/15	16/18	52/34	75/38	5/4	10/10	20/14	49/17	13/3
M. Clr (%hrs)	31	28	29	28	30	38	38	31	31	35	47	46	38	39	42	34	30	31	33	35



Kansas City, MO

WBAN NO. 03947



Shading Geometry
(Not to Scale)

LATITUDE: 39.30° N
LONGITUDE: 94.72° W
ELEVATION: 1034 feet
MEAN PRESSURE: 14.3 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	700	940	1240	1610	1870	2050	2080	1830	1460	1120	740	590	1360
	Std.Dev.	57	71	114	112	128	127	144	129	130	107	73	53	42
	Minimum	560	790	980	1330	1560	1750	1800	1550	1060	930	590	490	1280
	Maximum	820	1100	1410	1870	2130	2360	2350	2040	1760	1390	890	700	1490
	Diffuse	300	420	560	680	790	810	760	680	560	410	320	280	550
	Clear-Day Global	940	1280	1760	2230	2530	2640	2560	2290	1870	1390	990	820	1780
North	Global	200	270	350	440	550	630	600	480	380	290	210	180	380
	Diffuse	200	270	350	430	500	530	510	450	370	290	210	180	360
	Clear-Day Global	190	240	320	420	580	680	630	460	350	270	200	160	380
East	Global	480	610	760	940	1040	1110	1130	1040	880	730	500	400	800
	Diffuse	240	330	430	520	590	630	620	550	460	350	260	220	430
	Clear-Day Global	700	900	1140	1350	1450	1470	1440	1350	1180	950	740	630	1110
South	Global	1170	1170	1100	990	850	780	840	980	1130	1280	1120	1030	1040
	Diffuse	350	420	490	530	560	560	560	550	500	430	350	320	470
	Clear-Day Global	1940	1980	1800	1400	1060	910	960	1220	1610	1870	1900	1870	1540
West	Global	480	610	760	940	1070	1160	1190	1080	910	730	500	420	820
	Diffuse	250	330	430	530	600	640	630	570	470	360	260	220	440
	Clear-Day Global	700	900	1140	1350	1450	1470	1440	1350	1180	950	740	630	1110

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	450	640	880	1160	1350	1490	1520	1330	1050	780	490	380	960
North	Unshaded	140	190	240	300	360	410	390	320	260	200	150	120	260
	Shaded	120	170	220	270	320	360	350	290	230	180	130	110	230
East	Unshaded	330	430	540	670	740	790	810	740	620	510	350	280	570
	Shaded	300	380	470	580	630	680	700	650	550	460	310	250	500
South	Unshaded	880	850	760	640	520	470	500	610	760	920	840	780	710
	Shaded	860	790	610	420	350	350	350	380	550	810	810	760	590
West	Unshaded	330	430	540	670	760	830	850	780	650	510	350	280	580
	Shaded	300	380	470	580	660	710	740	680	570	460	320	260	510

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	25.7	31.2	42.7	54.5	64.1	73.2	78.5	76.1	67.5	56.6	43.1	30.4	53.6
Daily Minimum Temp	16.7	21.8	32.6	43.8	53.9	63.1	68.2	65.7	56.9	45.7	33.6	21.9	43.7
Daily Maximum Temp	34.7	40.6	52.8	65.1	74.3	83.3	88.7	86.4	78.1	67.5	52.6	38.8	63.6
Record Minimum Temp	-17.0	-19.0	-10.0	12.0	30.0	42.0	52.0	43.0	33.0	21.0	1.0	-23.0	-23.0
Record Maximum Temp	69.0	76.0	86.0	93.0	92.0	105.0	107.0	109.0	102.0	92.0	82.0	70.0	109.0
HDD, Base 65°F	1218	946	691	325	135	7	0	6	56	279	657	1073	5393
CDD, Base 65°F	0	0	0	10	107	253	419	350	131	18	0	0	1288
Humidity Ratio (#w/#da)	0.0023	0.0027	0.0040	0.0060	0.0090	0.0125	0.0143	0.0135	0.0107	0.0068	0.0045	0.0029	0.0074
Wind Speed (mph)	10.9	10.9	12.2	12.0	10.3	9.7	9.2	9.0	9.2	10.0	10.7	10.8	10.4
Clearness Index, Kt	0.50	0.50	0.50	0.52	0.53	0.55	0.58	0.56	0.54	0.54	0.48	0.46	0.53

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

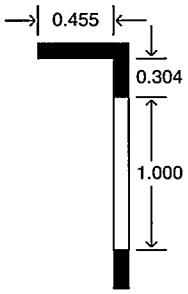
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	34/20	69/42	82/51	68/42	32/20	42/27	81/55	101/70	98/72	73/53	23/13	63/37	85/53	81/53	53/34	11/7	39/23	48/29	33/20	4/3
North	9/8	13/15	15/17	13/15	9/8	20/14	16/17	17/19	17/19	16/16	7/6	13/14	16/17	15/17	12/13	4/3	9/9	10/11	8/8	2/2
East	73/24	62/31	15/17	13/15	9/8	75/35	76/46	38/30	17/19	16/16	61/18	73/34	35/25	15/17	12/13	36/9	43/18	10/11	8/8	2/2
South	35/15	70/34	83/43	69/34	33/15	11/10	28/23	45/35	43/35	24/21	17/8	53/27	75/41	71/41	43/25	30/8	79/27	92/34	70/24	13/4
West	9/8	13/15	16/17	63/32	71/26	11/10	16/17	17/19	46/37	78/50	7/6	13/14	16/17	48/31	75/37	4/3	9/9	16/13	49/18	18/5
M. Clr (%hrs)	34	32	31	30	32	39	40	39	38	41	46	47	47	46	47	35	36	35	36	37

Springfield, MO

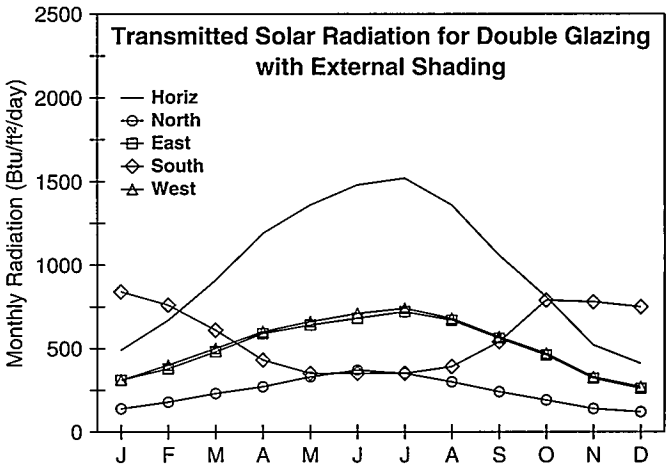
WBAN NO. 13995

LATITUDE: 37.23° N
LONGITUDE: 93.38° W
ELEVATION: 1270 feet
MEAN PRESSURE: 14.1 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	750	970	1290	1640	1870	2030	2080	1870	1480	1160	780	640	1380
	Std.Dev.	62	56	110	113	125	131	131	111	115	126	79	52	39
	Minimum	620	880	1080	1320	1580	1800	1870	1670	1200	870	630	560	1330
	Maximum	850	1080	1490	1830	2120	2330	2380	2100	1720	1360	950	770	1460
	Diffuse	330	450	580	690	790	820	770	700	600	440	350	310	570
	Clear-Day Global	1020	1360	1820	2260	2540	2630	2560	2320	1930	1460	1070	900	1820
North	Global	220	280	360	440	550	630	610	490	390	300	230	190	390
	Diffuse	220	280	360	430	500	530	510	460	380	300	230	190	370
	Clear-Day Global	200	260	340	430	580	680	630	470	360	280	210	180	390
East	Global	490	600	770	940	1030	1090	1140	1060	890	730	510	420	810
	Diffuse	260	340	440	530	600	620	620	560	480	370	280	230	440
	Clear-Day Global	730	930	1150	1340	1440	1450	1420	1340	1190	970	770	670	1120
South	Global	1140	1130	1090	960	800	730	790	950	1090	1240	1090	1020	1000
	Diffuse	370	430	490	530	550	550	550	550	520	440	370	330	470
	Clear-Day Global	1960	1970	1750	1330	990	840	890	1160	1550	1850	1910	1900	1500
West	Global	500	620	780	950	1060	1140	1180	1080	890	740	520	430	820
	Diffuse	260	350	440	530	600	630	630	570	480	370	280	240	450
	Clear-Day Global	730	930	1150	1340	1440	1450	1420	1340	1190	970	770	670	1120

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

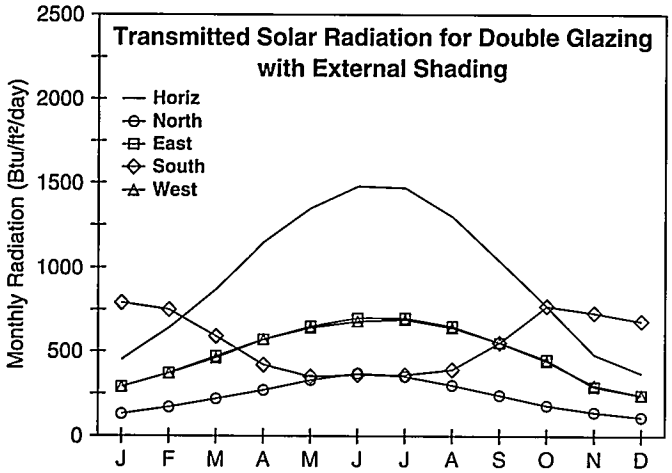
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	490	670	910	1190	1360	1480	1520	1360	1060	810	520	410	980
North	Unshaded	150	200	250	300	360	400	390	320	270	210	160	140	260
	Shaded	140	180	230	270	330	370	350	300	240	190	140	120	240
East	Unshaded	340	420	540	670	730	780	820	750	630	510	350	290	570
	Shaded	310	380	480	590	640	680	720	670	560	460	320	260	510
South	Unshaded	860	820	750	620	490	440	470	580	720	890	810	770	680
	Shaded	840	760	610	430	350	350	350	390	540	790	780	750	580
West	Unshaded	340	440	560	680	750	810	840	770	640	520	360	300	580
	Shaded	310	400	500	600	660	710	740	680	570	470	330	270	520

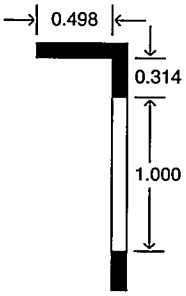
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	31.1	35.7	46.0	56.0	64.6	73.2	78.1	76.8	69.0	57.8	46.0	35.3	55.8
Daily Minimum Temp	20.4	25.0	34.4	44.1	53.2	61.9	66.6	65.0	57.7	45.9	35.5	25.3	44.6
Daily Maximum Temp	41.8	46.3	57.4	67.9	76.0	84.4	89.6	88.6	80.3	69.8	56.6	45.3	67.0
Record Minimum Temp	-13.0	-17.0	-3.0	18.0	30.0	42.0	44.0	44.0	31.0	21.0	4.0	-16.0	-17.0
Record Maximum Temp	76.0	81.0	87.0	93.0	93.0	101.0	113.0	106.0	104.0	93.0	80.0	77.0	113.0
HDD, Base 65°F	1051	820	589	280	110	5	0	0	43	249	570	921	4638
CDD, Base 65°F	0	0	0	10	98	251	406	366	163	26	0	0	1320
Humidity Ratio (#w/#da)	0.0027	0.0032	0.0045	0.0066	0.0096	0.0129	0.0145	0.0135	0.0112	0.0072	0.0049	0.0033	0.0079
Wind Speed (mph)	10.9	11.0	12.0	11.1	9.5	8.5	7.7	7.9	8.5	9.4	10.3	10.7	9.8
Clearness Index, Kt	0.49	0.49	0.50	0.52	0.53	0.55	0.58	0.57	0.53	0.53	0.47	0.46	0.53

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	38/21	73/44	85/52	70/43	32/19	44/27	83/56	102/71	98/72	71/50	25/15	66/41	87/57	82/54	52/34	14/8	44/24	52/30	35/20	4/3
North	9/9	14/15	15/17	14/15	9/8	21/14	16/17	17/19	17/19	16/16	8/6	14/15	16/18	16/17	12/12	5/4	10/10	11/12	9/8	2/2
East	75/23	61/31	15/17	14/15	9/8	76/33	75/46	36/29	17/19	16/16	62/21	73/36	33/25	16/17	12/12	42/10	44/18	11/12	9/8	2/2
South	36/14	70/34	81/42	67/33	31/14	11/11	27/23	42/33	39/33	20/19	18/9	53/28	73/42	68/40	41/23	36/9	81/27	91/33	70/23	12/4
West	9/9	14/15	19/19	65/33	71/25	11/11	16/17	17/19	48/38	78/48	8/6	14/15	16/18	50/32	75/36	5/4	10/10	19/14	51/18	17/5
M. Clr (%hrs)	35	33	32	32	35	41	39	37	38	46	45	45	40	41	45	34	34	35	35	38





Shading Geometry
(Not to Scale)

St. Louis, MO

WBAN NO. 13994

LATITUDE: 38.75° N
LONGITUDE: 90.38° W
ELEVATION: 564 feet
MEAN PRESSURE: 14.5 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	690	930	1230	1590	1860	2030	2020	1800	1460	1100	720	580	1340
	Std.Dev.	56	69	98	135	138	114	120	110	112	98	69	57	42
	Minimum	550	800	1060	1370	1550	1830	1750	1570	1190	870	590	490	1280
	Maximum	780	1070	1430	1930	2180	2350	2240	1960	1690	1250	870	710	1480
	Diffuse	340	460	590	710	810	840	810	730	600	430	350	300	580
	Clear-Day Global	950	1300	1760	2230	2520	2630	2550	2290	1870	1400	1000	840	1780
North	Global	210	280	360	440	550	630	600	490	380	290	220	190	390
	Diffuse	210	280	360	430	500	530	520	460	380	290	220	190	370
	Clear-Day Global	190	250	330	430	580	680	630	470	360	270	200	170	380
East	Global	460	590	750	920	1060	1140	1130	1050	880	710	470	390	800
	Diffuse	260	340	440	530	600	640	620	570	470	360	270	230	440
	Clear-Day Global	710	910	1150	1340	1440	1460	1430	1340	1170	940	730	640	1110
South	Global	1080	1110	1060	970	830	780	820	950	1110	1220	1020	940	990
	Diffuse	370	440	500	540	560	570	570	560	520	440	360	330	480
	Clear-Day Global	1930	1970	1770	1380	1040	890	950	1210	1580	1840	1870	1860	1520
West	Global	470	600	740	920	1040	1110	1120	1030	880	700	480	390	790
	Diffuse	260	340	440	530	610	650	630	580	480	360	270	230	450
	Clear-Day Global	710	910	1150	1340	1440	1460	1430	1340	1170	940	730	640	1110

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	450	640	870	1150	1350	1480	1470	1300	1040	770	480	370	950
North	Unshaded	150	190	250	300	370	410	390	330	260	200	150	130	260
	Shaded	130	170	220	270	330	370	350	300	240	180	140	110	230
East	Unshaded	320	410	530	660	750	810	810	750	620	500	320	270	560
	Shaded	290	370	470	570	650	700	700	650	550	450	290	240	490
South	Unshaded	810	810	740	630	510	470	490	600	750	870	760	700	680
	Shaded	790	750	590	420	350	360	360	390	550	770	730	680	560
West	Unshaded	320	420	520	650	740	790	800	740	620	490	330	270	560
	Shaded	290	370	460	570	640	680	690	640	550	440	300	240	490

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	29.3	33.9	45.1	56.7	66.1	75.4	79.8	77.6	70.2	58.4	46.2	33.9	56.1
Daily Minimum Temp	20.8	25.1	35.5	46.4	56.0	65.7	70.4	67.9	60.5	48.3	37.7	26.0	46.7
Daily Maximum Temp	37.7	42.6	54.6	66.9	76.1	85.2	89.3	87.3	79.9	68.5	54.7	41.7	65.4
Record Minimum Temp	-18.0	-10.0	-5.0	22.0	31.0	43.0	51.0	47.0	36.0	23.0	1.0	-16.0	-18.0
Record Maximum Temp	76.0	85.0	89.0	93.0	93.0	102.0	107.0	107.0	104.0	94.0	85.0	76.0	107.0
HDD, Base 65°F	1107	871	617	266	111	0	0	0	21	237	564	964	4758
CDD, Base 65°F	0	0	0	17	145	312	459	391	177	33	0	0	1534
Humidity Ratio (#w/#da)	0.0026	0.0030	0.0044	0.0063	0.0091	0.0125	0.0145	0.0138	0.0112	0.0072	0.0049	0.0033	0.0077
Wind Speed (mph)	10.9	10.8	11.9	11.6	9.6	9.1	8.4	8.0	8.4	9.1	10.2	10.7	9.9
Clearness Index, Kt	0.48	0.49	0.49	0.51	0.53	0.55	0.56	0.55	0.53	0.52	0.46	0.44	0.52

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

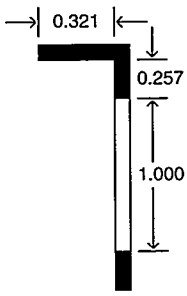
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	40/23	73/45	82/52	64/40	26/16	48/32	84/61	101/76	96/71	67/49	29/17	68/42	86/58	78/53	47/31	16/9	42/25	48/28	30/17	2/2
North	10/9	14/16	15/17	13/14	8/7	19/15	16/18	17/19	17/19	15/16	9/7	14/15	16/18	15/17	12/12	6/4	10/10	11/11	8/7	1/1
East	75/25	56/30	15/17	13/14	8/7	78/40	72/49	31/27	17/19	15/16	65/23	70/36	28/23	15/17	12/12	42/11	39/18	11/11	8/7	1/1
South	40/17	73/36	82/43	64/32	26/12	12/12	31/26	45/37	41/33	19/18	21/11	57/31	75/45	67/41	37/21	39/10	82/29	88/32	63/20	6/2
West	10/9	14/16	24/21	67/33	64/22	12/12	16/18	17/19	53/41	78/50	9/7	14/15	16/18	54/35	74/35	6/4	10/10	22/14	50/17	9/2
M. Clr (%hrs)	32	28	27	28	29	43	39	32	29	34	47	47	41	41	43	31	30	30	30	32

Jackson, MS

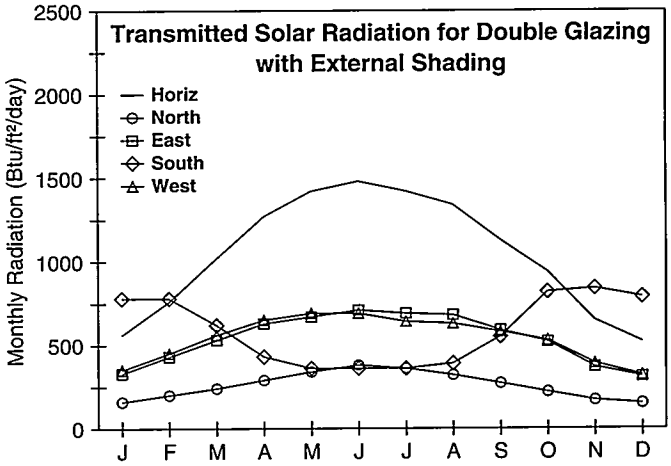
WBAN NO. 03940

LATITUDE: 32.32° N
LONGITUDE: 90.08° W
ELEVATION: 331 feet
MEAN PRESSURE: 14.6 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	830	1090	1420	1750	1950	2030	1950	1840	1560	1330	940	770	1460
	Std.Dev.	64	90	110	135	128	116	123	110	90	119	72	62	32
	Minimum	690	920	1200	1500	1760	1750	1720	1630	1370	1060	730	670	1370
	Maximum	980	1260	1700	2130	2240	2270	2200	2060	1700	1550	1060	890	1500
	Diffuse	390	470	590	710	820	880	880	800	680	490	400	360	620
	Clear-Day Global	1220	1550	1960	2330	2530	2580	2510	2320	2000	1600	1250	1100	1910
North	Global	240	300	380	460	560	640	590	500	410	330	260	230	410
	Diffuse	240	300	380	440	500	540	520	480	410	330	260	230	390
	Clear-Day Global	230	280	350	440	590	690	630	490	390	320	240	220	410
East	Global	510	650	810	960	1030	1090	1060	1040	900	790	570	480	830
	Diffuse	290	360	450	540	610	640	640	600	510	410	320	270	470
	Clear-Day Global	840	1020	1210	1330	1370	1370	1340	1280	1170	1000	830	770	1130
South	Global	1070	1140	1080	910	720	650	670	830	1030	1270	1170	1080	970
	Diffuse	380	440	500	530	540	540	550	560	550	490	420	370	490
	Clear-Day Global	2020	1940	1640	1170	820	690	740	1000	1400	1740	1910	1960	1410
West	Global	540	680	850	990	1060	1060	1000	970	880	810	600	500	830
	Diffuse	290	370	460	550	620	650	630	600	520	420	330	280	480
	Clear-Day Global	840	1020	1210	1330	1370	1370	1340	1280	1170	1000	830	770	1130

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

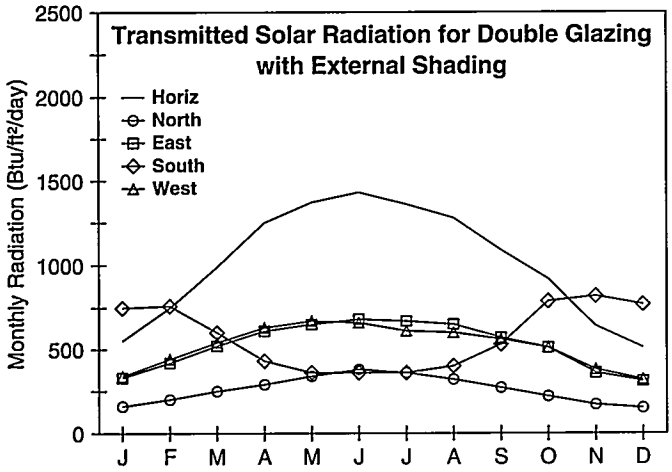
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	560	760	1020	1270	1420	1480	1420	1340	1130	940	650	520	1040
North	Unshaded	170	210	260	310	370	410	380	330	290	230	180	160	280
	Shaded	160	200	240	290	340	380	360	320	270	220	170	150	260
East	Unshaded	350	460	580	680	730	770	750	740	630	550	400	330	580
	Shaded	330	430	530	630	670	710	690	680	590	520	370	310	540
South	Unshaded	790	820	720	560	430	400	410	500	670	890	860	810	650
	Shaded	780	780	620	430	360	360	360	390	550	820	840	790	590
West	Unshaded	370	480	600	700	750	750	700	680	620	570	420	350	580
	Shaded	350	450	560	650	690	690	640	630	580	530	390	320	540

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	44.1	47.9	56.7	64.6	72.0	78.8	81.5	80.9	75.9	64.7	55.8	47.8	64.2
Daily Minimum Temp	32.7	35.7	44.1	51.9	60.0	67.1	70.5	69.7	63.7	50.3	42.3	36.1	52.0
Daily Maximum Temp	55.6	60.1	69.3	77.4	84.0	90.6	92.4	92.0	88.0	79.1	69.2	59.5	76.4
Record Minimum Temp	2.0	11.0	15.0	27.0	38.0	47.0	51.0	55.0	35.0	29.0	17.0	4.0	2.0
Record Maximum Temp	82.0	85.0	89.0	94.0	99.0	105.0	106.0	102.0	104.0	95.0	88.0	84.0	106.0
HDD, Base 65°F	656	485	285	87	7	0	0	0	6	104	295	542	2467
CDD, Base 65°F	8	6	28	75	224	414	512	493	333	94	19	9	2215
Humidity Ratio (#w/#da)	0.0051	0.0055	0.0072	0.0094	0.0121	0.0150	0.0168	0.0164	0.0142	0.0096	0.0074	0.0059	0.0104
Wind Speed (mph)	8.3	8.5	8.9	8.2	7.2	6.3	5.8	5.6	6.4	6.4	7.7	8.4	7.3
Clearness Index, Kt	0.47	0.49	0.52	0.54	0.55	0.56	0.54	0.55	0.53	0.55	0.49	0.47	0.53

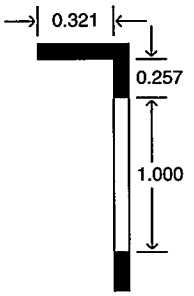
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	46/26	81/50	91/56	72/44	30/18	46/30	85/62	103/79	96/75	66/47	31/18	73/48	91/64	82/59	48/33	25/13	54/30	60/34	39/22	5/4
North	11/10	15/17	16/18	14/15	8/8	23/16	17/19	17/19	18/19	19/17	10/8	16/17	18/19	17/18	13/12	7/6	11/12	12/13	9/9	3/2
East	80/27	58/32	16/18	14/15	8/8	73/35	72/48	31/28	18/19	16/16	64/22	71/39	29/25	17/18	13/12	55/13	43/20	12/13	9/9	3/2
South	39/17	67/36	75/41	60/32	25/12	13/12	23/22	34/31	31/28	16/16	20/10	52/31	67/44	60/40	33/20	50/13	85/30	91/35	69/23	13/4
West	11/10	15/17	25/22	71/36	70/25	13/12	17/19	17/19	54/43	76/47	10/8	16/17	18/19	56/38	72/36	7/6	11/12	25/17	57/20	20/5
M. Clr (%hrs)	35	39	37	34	39	47	45	36	36	40	49	48	40	41	44	34	35	36	37	37



Meridian, MS

WBAN NO. 13865



Shading Geometry
(Not to Scale)

LATITUDE: 32.33° N
LONGITUDE: 88.75° W
ELEVATION: 308 feet
MEAN PRESSURE: 14.6 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	820	1070	1380	1720	1880	1960	1870	1770	1510	1290	930	760	1420
	Std.Dev.	63	86	103	119	111	118	119	105	107	114	80	62	31
	Minimum	700	930	1180	1510	1710	1700	1640	1530	1300	1020	710	650	1340
	Maximum	950	1220	1620	2040	2150	2190	2070	1990	1730	1520	1070	880	1480
	Diffuse	400	490	620	730	860	920	920	860	710	510	420	370	650
	Clear-Day Global	1220	1540	1960	2320	2520	2570	2510	2310	2000	1600	1250	1100	1910
North	Global	250	310	380	460	560	630	590	510	420	340	270	230	410
	Diffuse	250	310	380	450	510	540	530	490	420	340	270	230	390
	Clear-Day Global	230	280	350	440	590	690	630	490	400	320	250	210	410
East	Global	500	650	790	940	1000	1050	1030	1000	870	770	560	470	800
	Diffuse	290	360	460	540	610	650	640	610	520	420	320	270	480
	Clear-Day Global	840	1010	1210	1330	1360	1360	1340	1270	1160	990	830	770	1120
South	Global	1040	1120	1040	890	710	640	660	810	990	1230	1140	1050	940
	Diffuse	390	450	510	540	550	550	550	580	560	500	430	370	500
	Clear-Day Global	2020	1940	1630	1170	820	690	740	1000	1390	1740	1910	1970	1420
West	Global	520	670	820	970	1020	1020	950	930	850	780	590	490	800
	Diffuse	300	370	470	550	620	650	630	610	530	420	330	280	480
	Clear-Day Global	840	1010	1210	1330	1360	1360	1340	1270	1160	990	830	770	1120

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	550	750	990	1250	1370	1430	1360	1280	1090	920	640	510	1010
North	Unshaded	170	210	260	310	370	410	380	340	290	230	180	160	280
	Shaded	160	200	250	290	340	380	360	320	270	220	170	150	260
East	Unshaded	350	450	560	660	710	740	730	710	620	540	390	330	570
	Shaded	330	420	520	610	650	680	670	650	570	510	360	310	520
South	Unshaded	770	800	700	550	430	400	410	500	640	860	840	780	640
	Shaded	750	760	600	430	360	360	360	400	530	790	820	770	580
West	Unshaded	360	470	580	690	730	720	670	650	600	550	410	340	570
	Shaded	340	440	540	630	670	660	610	600	560	510	380	320	520

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	45.0	48.9	56.6	64.1	71.3	78.1	81.0	80.6	75.4	64.1	55.5	48.4	64.1
Daily Minimum Temp	33.4	36.6	43.5	50.9	58.9	66.1	69.9	69.2	63.9	50.5	42.4	36.6	51.8
Daily Maximum Temp	56.4	61.2	69.6	77.4	83.6	90.0	92.1	91.8	86.9	77.7	68.6	60.1	76.3
Record Minimum Temp	0.0	8.0	15.0	28.0	38.0	42.0	55.0	53.0	34.0	24.0	16.0	2.0	0.0
Record Maximum Temp	83.0	85.0	90.0	95.0	99.0	104.0	107.0	104.0	105.0	97.0	87.0	82.0	107.0
HDD, Base 65°F	628	456	292	99	14	0	0	0	6	123	301	525	2444
CDD, Base 65°F	8	5	31	72	210	393	496	484	318	95	16	10	2138
Humidity Ratio (#w/#da)	0.0049	0.0053	0.0068	0.0090	0.0117	0.0145	0.0163	0.0160	0.0137	0.0092	0.0071	0.0057	0.0100
Wind Speed (mph)	7.1	7.6	7.8	7.1	5.9	5.1	4.7	4.6	5.3	5.2	6.3	7.1	6.1
Clearness Index, Kt	0.46	0.49	0.50	0.53	0.53	0.54	0.52	0.53	0.52	0.54	0.49	0.46	0.51

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

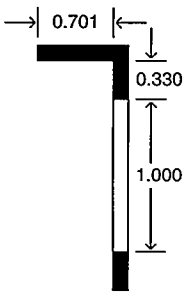
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	48/26	82/50	90/55	70/42	27/17	48/31	86/61	102/77	95/73	63/46	32/20	74/48	91/63	80/56	46/32	26/14	55/30	59/35	37/21	4/3
North	11/11	15/17	16/18	14/15	8/7	23/16	18/19	17/20	18/20	19/17	10/9	16/17	18/19	17/18	13/12	7/6	12/12	12/13	9/9	2/2
East	78/27	55/32	16/18	14/15	8/7	74/34	70/46	28/26	18/20	16/16	64/24	69/38	26/24	17/18	13/12	55/14	41/19	12/13	9/9	2/2
South	40/17	67/36	74/41	58/31	23/11	13/12	24/22	34/30	30/27	16/16	21/11	52/31	68/43	59/38	31/19	51/13	85/30	90/35	65/21	10/3
West	11/11	15/17	27/23	71/35	66/23	13/12	18/19	17/20	55/44	74/46	10/9	16/17	18/19	57/37	70/35	7/6	12/12	27/17	56/19	15/4
M. Clr (%hrs)	33	34	33	32	37	44	40	28	28	33	45	45	35	34	38	33	34	33	35	37

Billings, MT

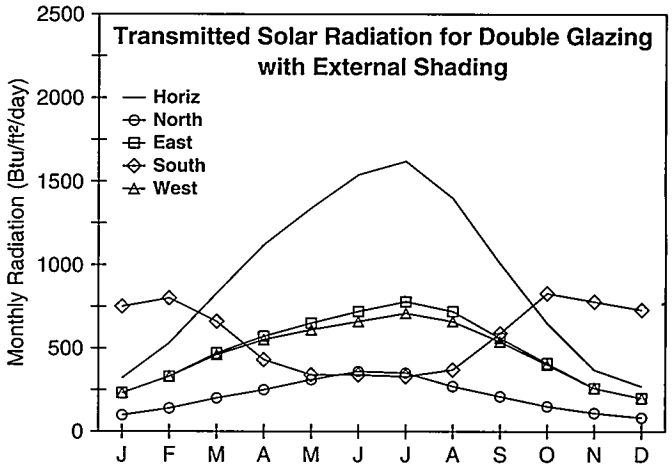
WBAN NO. 24033

LATITUDE: 45.80° N
LONGITUDE: 108.53° W
ELEVATION: 3570 feet
MEAN PRESSURE: 12.9 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	530	800	1200	1570	1860	2120	2220	1930	1430	970	590	450	1310
	Std.Dev.	40	48	78	114	124	133	113	91	128	61	36	24	32
	Minimum	460	720	1020	1420	1630	1830	1930	1760	1130	850	530	400	1230
	Maximum	640	900	1340	1810	2050	2390	2410	2130	1660	1070	660	510	1370
	Diffuse	280	390	550	680	740	710	600	530	460	360	290	230	490
	Clear-Day Global	700	1070	1610	2180	2590	2740	2650	2290	1770	1200	770	590	1680
North	Global	170	240	340	440	560	640	620	470	340	250	180	140	370
	Diffuse	170	240	340	430	490	510	490	420	340	250	180	140	330
	Clear-Day Global	140	200	290	400	590	730	670	460	310	220	150	120	360
East	Global	390	550	790	990	1130	1280	1360	1230	950	680	430	340	850
	Diffuse	220	310	430	530	580	600	580	520	420	320	230	190	410
	Clear-Day Global	620	850	1160	1440	1600	1650	1610	1470	1240	920	660	540	1150
South	Global	1020	1190	1250	1120	990	960	1050	1220	1320	1330	1080	980	1130
	Diffuse	350	430	520	560	570	570	540	520	470	410	350	310	470
	Clear-Day Global	1910	2070	2000	1640	1290	1130	1190	1460	1810	2000	1910	1810	1680
West	Global	390	560	780	950	1070	1170	1240	1140	930	680	440	340	810
	Diffuse	220	310	430	530	600	620	590	520	430	320	230	180	420
	Clear-Day Global	620	850	1160	1440	1600	1650	1610	1470	1240	920	660	540	1150

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

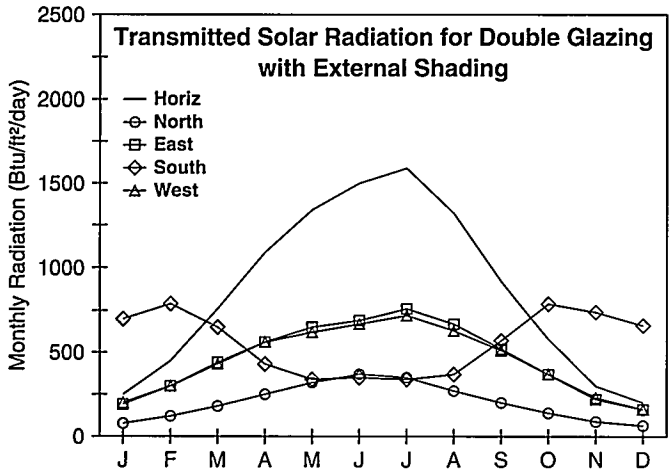
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	320	530	830	1120	1340	1540	1620	1400	1010	650	370	270	920
North	Unshaded	120	170	240	300	370	420	390	310	240	180	130	100	250
	Shaded	98	140	200	250	310	360	350	270	210	150	110	83	210
East	Unshaded	260	390	560	710	810	910	980	890	680	480	300	230	600
	Shaded	230	330	470	570	650	720	780	720	560	410	260	200	490
South	Unshaded	770	880	890	760	630	590	640	790	910	970	810	750	780
	Shaded	750	800	660	430	340	340	330	370	590	830	780	730	580
West	Unshaded	270	390	550	680	760	830	890	820	660	480	300	230	570
	Shaded	230	330	460	550	610	660	710	660	540	400	260	200	470

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	22.8	29.0	35.5	45.6	55.0	64.8	72.5	70.7	59.1	49.1	35.1	25.5	47.1
Daily Minimum Temp	13.7	19.4	25.2	34.0	43.3	52.0	58.3	56.7	46.5	37.5	25.6	16.5	35.7
Daily Maximum Temp	31.8	38.6	45.8	57.1	66.7	77.6	86.7	84.7	71.6	60.6	44.5	34.4	58.3
Record Minimum Temp	-30.0	-38.0	-19.0	-5.0	14.0	32.0	41.0	40.0	22.0	-7.0	-22.0	-32.0	-38.0
Record Maximum Temp	68.0	72.0	79.0	92.0	96.0	105.0	106.0	105.0	103.0	90.0	77.0	69.0	106.0
HDD, Base 65°F	1308	1008	915	582	316	119	12	42	242	498	897	1225	7164
CDD, Base 65°F	0	0	0	0	6	113	244	219	65	5	0	0	652
Humidity Ratio (#w/#da)	0.0018	0.0021	0.0026	0.0035	0.0053	0.0073	0.0080	0.0073	0.0057	0.0040	0.0027	0.0019	0.0044
Wind Speed (mph)	14.0	12.3	11.1	11.3	10.5	9.7	9.3	9.3	9.8	10.9	11.7	13.3	11.1
Clearness Index, Kt	0.50	0.52	0.54	0.53	0.54	0.57	0.62	0.61	0.57	0.54	0.50	0.49	0.56

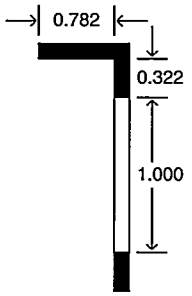
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	32/22	63/44	73/55	60/44	27/19	47/30	80/58	97/73	94/67	72/52	24/15	60/39	78/54	74/50	48/32	6/5	29/20	36/26	22/16	0/0
North	8/9	12/15	14/16	12/14	8/8	16/13	14/16	16/18	15/17	14/15	7/6	12/13	14/16	14/15	11/11	3/2	8/8	9/10	7/7	0/0
East	74/33	59/35	14/16	12/14	8/8	84/42	75/51	34/30	15/17	14/15	69/25	73/39	31/25	14/15	11/11	26/9	38/19	9/10	7/7	0/0
South	39/20	77/43	90/56	74/43	34/17	10/10	36/29	55/43	52/39	29/24	20/10	60/34	82/51	77/47	47/27	23/8	75/32	87/42	61/26	0/0
West	8/9	12/15	16/18	62/38	70/30	10/10	14/16	16/18	46/36	80/51	7/6	12/13	14/16	48/32	77/41	3/2	8/8	16/13	42/19	0/0
M. Clr (%hrs)	26	26	21	22	24	46	44	41	37	30	50	47	47	46	42	26	29	28	28	30



Cut Bank, MT

WBAN NO. 24137



Shading Geometry
(Not to Scale)

LATITUDE: 48.60° N
LONGITUDE: 112.37° W
ELEVATION: 3839 feet
MEAN PRESSURE: 12.8 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	430	710	1100	1540	1870	2070	2190	1830	1320	880	500	350	1240
	Std.Dev.	29	41	77	112	105	161	106	125	138	53	33	22	32
	Minimum	380	590	890	1340	1690	1800	1980	1610	1030	770	440	300	1180
	Maximum	490	780	1240	1780	2160	2410	2340	2090	1540	960	570	390	1310
	Diffuse	220	330	500	670	780	810	670	590	490	350	240	180	490
	Clear-Day Global	580	940	1490	2110	2550	2730	2630	2240	1680	1080	650	480	1600
North	Global	140	210	310	440	580	680	640	480	340	240	150	110	360
	Diffuse	140	210	310	420	510	540	510	430	340	240	150	110	330
	Clear-Day Global	110	170	260	400	610	750	680	460	300	200	130	98	350
East	Global	330	510	760	1000	1180	1260	1370	1190	900	640	390	280	820
	Diffuse	180	270	400	530	610	650	610	540	430	300	200	150	410
	Clear-Day Global	560	810	1130	1430	1620	1670	1640	1470	1210	880	600	470	1130
South	Global	950	1170	1250	1190	1060	1020	1130	1240	1300	1280	1020	890	1120
	Diffuse	290	390	490	570	610	620	590	550	490	410	310	250	460
	Clear-Day Global	1840	2040	2020	1720	1410	1250	1300	1550	1870	1990	1850	1720	1710
West	Global	340	520	740	980	1120	1220	1300	1130	880	640	390	290	800
	Diffuse	180	270	400	530	620	660	620	550	430	310	200	150	410
	Clear-Day Global	560	810	1130	1430	1620	1670	1640	1470	1210	880	600	470	1130

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	250	450	760	1090	1340	1500	1590	1320	920	580	300	200	860
North	Unshaded	96	150	220	300	380	440	410	310	240	170	110	79	240
	Shaded	77	120	180	250	320	370	350	270	200	140	88	64	200
East	Unshaded	230	360	540	720	850	910	990	850	640	450	260	190	580
	Shaded	190	300	440	560	650	690	760	670	520	370	220	160	460
South	Unshaded	720	870	890	810	690	640	710	820	910	950	780	680	790
	Shaded	700	790	650	430	340	350	340	370	570	790	740	660	560
West	Unshaded	230	360	530	710	800	880	930	810	630	450	270	190	570
	Shaded	200	300	430	560	620	670	720	630	510	370	230	160	450

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	17.5	23.2	29.5	40.3	49.9	58.3	64.3	63.3	53.2	44.0	29.4	19.9	41.1
Daily Minimum Temp	7.4	12.5	18.9	28.3	37.5	45.5	49.4	48.5	39.4	31.2	19.0	10.1	29.0
Daily Maximum Temp	27.5	33.8	40.2	52.2	62.3	71.1	79.0	78.1	66.9	56.7	39.8	29.8	53.1
Record Minimum Temp	-35.0	-29.9	-24.0	-2.0	12.9	30.0	35.1	30.9	21.0	-6.0	-23.1	-38.9	-38.9
Record Maximum Temp	66.9	66.0	72.0	84.9	89.1	93.9	98.1	106.0	95.0	86.0	77.0	61.0	106.0
HDD, Base 65°F	1473	1170	1101	741	468	225	77	155	377	651	1068	1398	8904
CDD, Base 65°F	0	0	0	0	0	24	56	103	23	0	0	0	206
Humidity Ratio (#w/#da)	0.0017	0.0021	0.0024	0.0031	0.0045	0.0063	0.0069	0.0066	0.0050	0.0037	0.0025	0.0019	0.0039
Wind Speed (mph)	14.6	13.4	12.5	13.5	12.4	11.5	10.7	10.4	10.9	12.3	12.4	13.3	12.3
Clearness Index, Kt	0.48	0.51	0.53	0.54	0.55	0.56	0.62	0.60	0.55	0.53	0.48	0.46	0.55

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

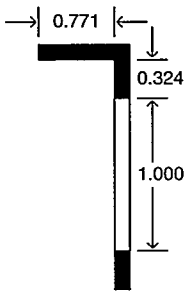
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	25/17	55/39	67/50	57/42	29/21	42/28	75/55	93/69	93/68	74/55	18/11	53/36	72/51	71/49	49/35	1/1	22/15	30/21	20/14	0/0
North	7/7	11/13	13/15	12/13	8/8	16/13	14/16	16/18	16/18	14/16	6/5	11/12	14/15	13/15	11/12	1/1	7/6	8/8	6/6	0/0
East	67/29	61/36	17/17	12/13	8/8	80/40	77/50	40/33	16/18	14/16	59/20	73/40	37/27	13/15	11/12	6/2	36/16	8/8	6/6	0/0
South	32/16	73/42	89/55	77/46	38/20	10/10	36/28	58/44	58/43	36/28	15/8	56/32	81/51	80/48	53/32	5/2	64/25	82/37	60/26	0/0
West	7/7	11/13	13/15	55/36	67/33	10/10	14/16	16/18	40/32	76/51	6/5	11/12	14/15	41/28	74/42	1/1	7/6	10/9	37/17	0/0
M. Clr (%hrs)	26	26	22	20	22	42	36	32	27	29	44	40	39	37	35	28	29	28	28	29

Glasgow, MT

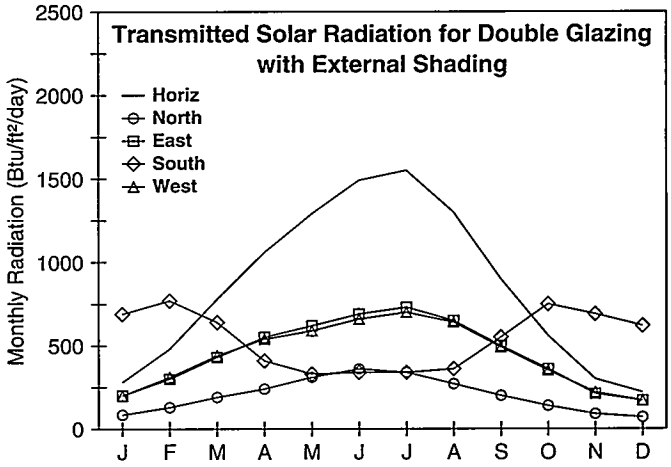
WBAN NO. 94008

LATITUDE: 48.22° N
LONGITUDE: 106.62° W
ELEVATION: 2297 feet
MEAN PRESSURE: 13.5 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	460	740	1130	1500	1800	2050	2130	1810	1290	840	490	370	1220
	Std.Dev.	30	66	103	120	149	140	110	110	121	46	32	23	31
	Minimum	410	590	880	1310	1510	1760	1880	1570	1030	730	440	330	1180
	Maximum	540	840	1320	1720	2110	2340	2350	2020	1490	920	550	420	1300
	Diffuse	260	380	540	660	760	770	660	580	490	350	250	210	490
	Clear-Day Global	600	960	1520	2100	2520	2700	2590	2210	1670	1090	660	500	1600
North	Global	150	230	330	430	560	650	620	470	340	240	160	130	360
	Diffuse	150	230	330	420	490	530	500	430	330	240	160	130	330
	Clear-Day Global	130	190	280	390	590	740	660	460	300	210	130	110	350
East	Global	350	520	760	980	1120	1250	1310	1160	880	610	370	290	800
	Diffuse	200	290	420	510	590	630	600	530	420	300	200	160	410
	Clear-Day Global	570	810	1140	1430	1590	1660	1610	1460	1200	870	600	490	1120
South	Global	950	1150	1240	1130	1010	990	1090	1210	1250	1210	960	840	1080
	Diffuse	330	430	520	550	580	600	580	540	480	400	310	290	470
	Clear-Day Global	1840	2030	2020	1690	1380	1220	1270	1520	1840	1960	1830	1710	1690
West	Global	350	530	770	940	1060	1190	1270	1130	860	600	380	290	780
	Diffuse	200	300	420	520	600	640	620	540	420	300	200	170	410
	Clear-Day Global	570	810	1140	1430	1590	1660	1610	1460	1200	870	600	490	1120

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

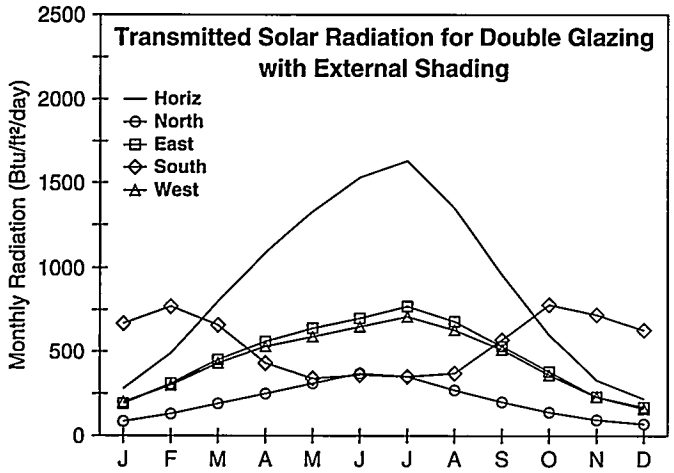
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	280	480	780	1060	1290	1490	1550	1300	900	560	300	220	850
North	Unshaded	110	160	230	290	370	430	400	310	230	160	110	88	240
	Shaded	85	130	190	240	310	360	340	270	200	140	89	70	200
East	Unshaded	240	360	540	700	800	900	940	830	630	430	250	190	570
	Shaded	200	300	430	550	620	690	730	650	500	360	210	170	450
South	Unshaded	720	860	880	770	650	630	690	800	870	890	720	640	760
	Shaded	690	770	640	410	330	340	340	360	550	750	690	620	540
West	Unshaded	240	370	540	670	760	850	910	810	610	420	260	200	550
	Shaded	200	310	440	540	590	660	700	640	490	350	220	170	440

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	10.6	17.5	29.4	44.3	55.0	64.4	70.8	69.4	57.3	46.1	29.2	15.2	42.4
Daily Minimum Temp	1.2	7.9	19.0	32.0	42.5	51.3	56.7	55.3	44.1	33.3	18.8	5.5	30.6
Daily Maximum Temp	19.9	27.1	39.8	56.5	67.3	77.5	84.7	83.5	70.4	58.7	39.6	24.9	54.2
Record Minimum Temp	-47.0	-37.0	-27.0	-3.0	20.0	33.0	41.0	37.0	20.0	-6.0	-26.0	-38.0	-47.0
Record Maximum Temp	55.0	66.0	77.0	91.0	102.0	108.0	104.0	108.0	103.0	90.0	75.0	59.0	108.0
HDD, Base 65°F	1686	1330	1104	621	322	121	19	71	267	586	1074	1544	8745
CDD, Base 65°F	0	0	0	0	12	103	199	208	36	0	0	0	558
Humidity Ratio (#w/#da)	0.0015	0.0019	0.0026	0.0035	0.0053	0.0074	0.0083	0.0073	0.0055	0.0039	0.0025	0.0017	0.0043
Wind Speed (mph)	9.9	10.2	11.4	12.1	12.4	10.9	10.9	10.9	11.1	10.5	9.7	10.0	10.8
Clearness Index, Kt	0.50	0.53	0.53	0.52	0.52	0.56	0.60	0.59	0.54	0.51	0.46	0.47	0.54

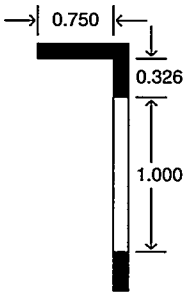
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	32/22	60/42	69/50	55/40	23/17	49/32	79/56	94/70	91/65	68/49	25/15	58/37	74/49	69/44	43/28	5/4	26/18	31/22	17/12	0/0
North	8/9	12/14	13/16	12/13	7/7	13/12	15/16	16/18	16/17	14/15	7/6	12/13	14/15	13/14	10/10	3/2	7/7	8/9	6/6	0/0
East	71/30	55/32	13/16	12/13	7/7	84/41	71/47	31/27	16/17	14/15	66/25	68/36	27/22	13/14	10/10	22/7	33/15	8/9	6/6	0/0
South	41/20	79/41	91/52	72/41	30/15	11/11	41/31	59/44	54/40	29/23	23/11	62/34	83/47	76/42	44/24	20/7	72/27	82/35	52/20	0/0
West	8/9	12/14	19/19	63/37	65/27	11/11	15/16	16/18	49/37	79/50	7/6	12/13	14/15	49/30	74/36	3/2	7/7	17/12	38/16	0/0
M. Clr (%hrs)	27	29	24	25	26	44	42	37	33	33	44	42	41	39	38	25	26	23	23	30



Great Falls, MT

WBAN NO. 24143



Shading Geometry
(Not to Scale)

LATITUDE: 47.48° N
LONGITUDE: 111.37° W
ELEVATION: 3662 feet
MEAN PRESSURE: 12.9 psia

STATION TYPE: Primary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	460	750	1150	1530	1850	2110	2240	1870	1360	900	530	380	1260
	Std.Dev.	34	49	85	115	130	154	112	121	138	60	37	29	38
	Minimum	360	680	900	1340	1550	1810	2000	1660	1060	750	400	290	1160
	Maximum	540	870	1300	1780	2040	2500	2400	2120	1620	1000	580	430	1320
	Diffuse	250	380	550	710	800	820	680	600	500	370	260	210	510
	Clear-Day Global	620	990	1540	2140	2570	2750	2640	2250	1710	1130	690	520	1630
North	Global	150	230	340	450	570	670	640	480	350	250	160	130	370
	Diffuse	150	230	340	430	510	550	510	440	340	250	160	130	340
	Clear-Day Global	120	180	270	400	610	750	680	450	300	210	140	110	350
East	Global	340	530	770	980	1140	1270	1370	1190	910	640	390	290	820
	Diffuse	190	290	420	540	610	650	610	540	430	310	210	160	410
	Clear-Day Global	570	820	1140	1440	1620	1670	1620	1460	1210	900	620	490	1130
South	Global	920	1150	1250	1140	1020	1010	1120	1230	1290	1260	1000	850	1100
	Diffuse	320	420	520	580	600	620	590	550	490	410	320	270	480
	Clear-Day Global	1860	2050	2010	1690	1360	1210	1260	1510	1840	2000	1870	1750	1700
West	Global	340	520	740	940	1050	1190	1280	1110	880	620	390	290	780
	Diffuse	190	300	430	540	620	660	620	550	430	310	210	160	420
	Clear-Day Global	570	820	1140	1440	1620	1670	1620	1460	1210	900	620	490	1130

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	280	490	800	1090	1330	1530	1630	1350	960	600	330	220	880
North	Unshaded	110	160	230	300	380	440	410	320	240	170	110	87	250
	Shaded	85	130	190	250	310	370	350	270	200	140	94	70	210
East	Unshaded	230	370	550	700	820	910	990	860	650	450	270	190	580
	Shaded	190	310	450	560	640	700	770	680	530	380	230	170	470
South	Unshaded	700	850	890	770	660	630	700	810	900	930	750	650	770
	Shaded	670	770	660	430	340	360	350	370	570	780	720	630	550
West	Unshaded	230	360	530	670	750	850	920	800	630	440	270	190	550
	Shaded	200	300	430	530	590	650	710	630	510	360	230	160	440

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	21.2	27.4	33.3	43.6	53.1	61.6	68.2	66.9	56.6	47.5	33.9	23.9	44.8
Daily Minimum Temp	11.6	17.2	22.8	31.9	40.9	48.6	53.2	52.2	43.5	35.8	24.3	14.6	33.1
Daily Maximum Temp	30.6	37.5	43.7	55.3	65.2	74.6	83.3	81.6	69.6	59.3	43.5	33.1	56.4
Record Minimum Temp	-37.0	-35.0	-29.0	-6.0	15.0	31.0	40.0	35.0	21.0	-11.0	-25.0	-43.0	-43.0
Record Maximum Temp	62.0	68.0	78.0	89.0	93.0	101.0	105.0	106.0	98.0	91.0	76.0	69.0	106.0
HDD, Base 65°F	1358	1053	983	642	372	156	37	91	299	543	933	1274	7741
CDD, Base 65°F	0	0	0	0	0	54	137	150	47	0	0	0	388
Humidity Ratio (#w/#da)	0.0018	0.0021	0.0025	0.0033	0.0048	0.0065	0.0069	0.0065	0.0051	0.0037	0.0025	0.0020	0.0040
Wind Speed (mph)	14.3	13.3	12.1	12.3	11.0	10.4	9.7	9.6	10.6	12.4	13.8	14.4	12.0
Clearness Index, Kt	0.47	0.52	0.54	0.53	0.54	0.57	0.63	0.60	0.56	0.53	0.48	0.46	0.55

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

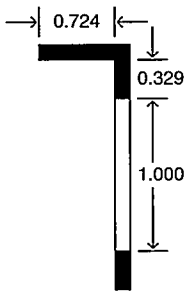
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	27/19	58/43	71/53	61/44	29/21	44/30	77/58	97/73	95/70	75/55	20/12	55/37	76/53	74/51	50/34	3/2	24/16	33/23	22/15	0/0
North	8/7	12/14	14/16	12/14	8/8	17/13	15/16	16/18	16/18	14/16	6/5	12/12	14/16	14/15	11/11	2/1	7/7	9/9	7/6	0/0
East	68/30	61/38	16/17	12/14	8/8	81/43	76/52	40/33	16/18	14/16	62/22	73/39	36/27	14/15	11/11	14/4	36/17	9/9	7/6	0/0
South	34/17	74/44	92/57	78/46	37/19	10/10	36/29	57/45	57/43	34/27	17/8	57/32	83/51	80/48	51/29	12/4	66/27	85/38	62/25	0/0
West	8/7	12/14	14/16	59/37	69/32	10/10	15/16	16/18	43/34	79/52	6/5	12/12	14/16	43/30	75/40	2/1	7/7	12/10	39/17	0/0
M. Clr (%hrs)	25	22	18	16	18	38	37	32	28	24	44	43	39	37	37	22	25	23	23	24

Helena, MT

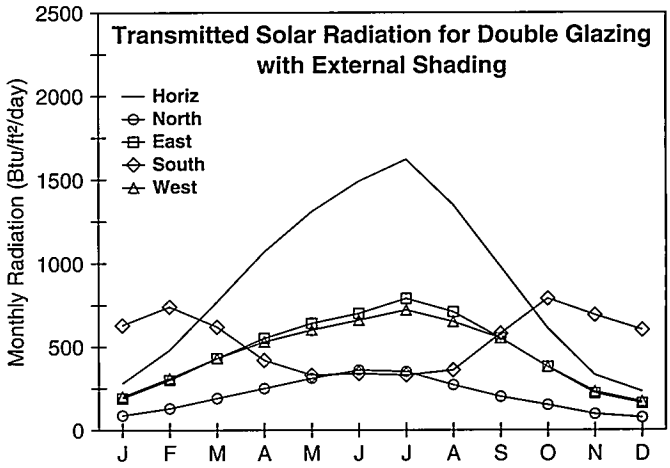
WBAN NO. 24144

LATITUDE: 46.60° N
LONGITUDE: 112.00° W
ELEVATION: 3898 feet
MEAN PRESSURE: 12.8 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	460	730	1110	1510	1820	2050	2220	1870	1390	920	530	390	1250
	Std.Dev.	36	48	83	118	128	154	111	125	133	69	34	26	29
	Minimum	390	660	920	1330	1610	1790	1980	1620	1130	800	460	340	1210
	Maximum	530	870	1310	1780	2060	2390	2410	2140	1650	1060	580	440	1320
	Diffuse	260	370	530	670	760	750	600	540	460	350	270	220	480
	Clear-Day Global	660	1020	1570	2160	2580	2750	2650	2280	1750	1160	730	560	1660
North	Global	160	230	320	430	560	650	630	470	340	240	170	130	360
	Diffuse	160	230	320	420	490	520	490	420	340	240	170	130	330
	Clear-Day Global	130	190	270	400	600	740	680	450	300	210	140	110	350
East	Global	330	510	730	940	1130	1240	1380	1210	930	650	380	290	810
	Diffuse	200	280	410	520	590	610	580	510	420	310	210	170	400
	Clear-Day Global	590	830	1140	1440	1610	1660	1620	1460	1230	910	630	510	1140
South	Global	870	1100	1180	1100	980	950	1080	1200	1310	1270	950	810	1070
	Diffuse	310	400	490	550	580	580	550	520	470	400	320	280	450
	Clear-Day Global	1870	2030	1990	1670	1330	1170	1220	1480	1830	2000	1880	1760	1680
West	Global	340	520	730	930	1060	1170	1270	1120	920	650	390	290	780
	Diffuse	200	290	410	520	590	620	590	520	420	310	220	170	410
	Clear-Day Global	590	830	1140	1440	1610	1660	1620	1460	1230	910	630	510	1140

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

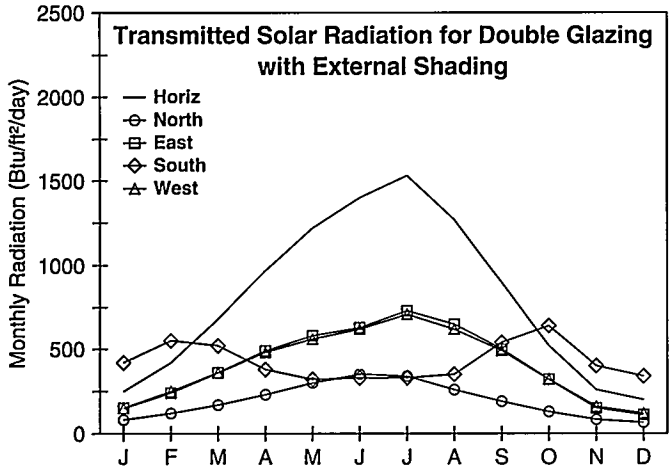
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	280	480	770	1070	1310	1490	1620	1350	980	610	330	230	880
North	Unshaded	110	160	220	290	370	420	400	310	230	170	120	92	240
	Shaded	88	130	190	250	310	360	350	270	200	150	96	75	210
East	Unshaded	230	350	520	680	810	890	990	880	660	460	260	190	580
	Shaded	190	300	430	550	640	700	790	710	550	380	220	160	470
South	Unshaded	660	820	840	740	630	590	660	780	910	930	720	620	740
	Shaded	630	740	620	420	330	340	330	360	580	790	690	600	530
West	Unshaded	230	360	520	660	760	840	910	810	660	460	270	200	560
	Shaded	200	310	430	530	600	660	720	650	550	380	230	170	450

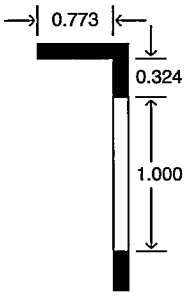
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	19.6	26.4	33.6	43.4	52.5	62.1	69.2	67.4	55.4	45.1	31.6	21.2	44.0
Daily Minimum Temp	9.6	15.9	22.3	30.6	39.6	48.3	53.4	51.7	41.0	31.6	20.7	11.2	31.3
Daily Maximum Temp	29.6	36.9	44.8	56.1	65.4	75.8	85.0	83.2	69.8	58.5	42.4	31.3	56.6
Record Minimum Temp	-42.0	-33.0	-30.0	1.0	17.0	30.0	36.0	32.0	18.0	-8.0	-39.0	-38.0	-42.0
Record Maximum Temp	62.0	68.0	77.0	85.0	92.0	100.0	102.0	105.0	99.0	85.0	72.0	64.0	105.0
HDD, Base 65°F	1407	1081	973	648	388	137	34	65	321	617	1002	1358	8031
CDD, Base 65°F	0	0	0	0	0	50	164	139	33	0	0	0	386
Humidity Ratio (#w/#da)	0.0019	0.0023	0.0026	0.0034	0.0048	0.0064	0.0071	0.0068	0.0054	0.0039	0.0027	0.0020	0.0041
Wind Speed (mph)	7.0	7.5	8.2	9.1	8.8	8.3	7.9	7.2	7.2	7.0	7.0	6.3	7.6
Clearness Index, Kt	0.46	0.49	0.51	0.52	0.53	0.56	0.62	0.60	0.56	0.53	0.46	0.44	0.54

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	27/18	58/40	71/50	60/43	30/21	43/28	77/53	96/69	95/66	75/53	20/12	56/36	76/52	75/50	52/35	3/3	25/16	35/23	23/16	1/1
North	7/7	12/13	13/15	12/14	8/8	18/13	14/16	15/18	16/17	14/15	6/5	11/12	14/16	14/15	11/12	2/1	7/7	9/9	7/7	1/1
East	69/28	61/35	17/17	12/14	8/8	83/39	78/48	40/32	16/17	14/15	63/21	75/39	37/27	14/15	11/12	16/5	38/16	9/9	7/7	1/1
South	33/16	73/40	90/52	76/43	39/19	10/10	34/26	55/41	55/40	33/26	16/8	57/32	81/49	80/47	52/30	13/4	68/25	85/36	63/25	5/2
West	7/7	12/13	13/15	57/35	71/32	10/10	14/16	15/18	41/32	77/49	6/5	11/12	14/16	43/29	76/40	2/1	7/7	11/10	39/17	6/2
M. Clr (%hrs)	21	21	19	19	19	40	38	34	31	27	46	44	43	42	43	18	21	20	21	22





Shading Geometry
(Not to Scale)

Kalispell, MT

WBAN NO. 24146

LATITUDE: 48.30° N
LONGITUDE: 114.27° W
ELEVATION: 2966 feet
MEAN PRESSURE: 13.2 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	390	640	980	1370	1710	1940	2110	1770	1280	790	400	310	1140
	Std.Dev.	37	62	111	106	131	168	147	165	159	87	27	21	39
	Minimum	290	480	800	1180	1430	1720	1760	1540	1000	640	360	260	1070
	Maximum	470	730	1270	1620	1930	2360	2460	2060	1610	1000	460	350	1210
	Diffuse	300	420	540	680	780	790	640	570	470	360	290	240	510
	Clear-Day Global	600	960	1500	2100	2530	2720	2610	2220	1670	1090	660	490	1600
North	Global	160	230	320	420	550	640	620	470	330	230	160	130	360
	Diffuse	160	230	320	410	490	530	490	420	330	230	160	130	320
	Clear-Day Global	120	180	270	390	610	740	670	450	300	200	130	98	350
East	Global	260	420	640	870	1050	1160	1310	1140	870	550	270	200	730
	Diffuse	190	290	390	500	580	610	590	520	400	290	190	160	390
	Clear-Day Global	560	820	1130	1420	1610	1660	1620	1460	1200	880	600	470	1120
South	Global	600	850	1010	1020	960	940	1080	1180	1230	1050	580	490	920
	Diffuse	320	410	470	530	580	590	560	530	460	370	280	260	450
	Clear-Day Global	1840	2040	2000	1700	1380	1230	1280	1530	1850	1980	1850	1720	1700
West	Global	270	450	640	860	1020	1140	1270	1110	850	550	280	210	720
	Diffuse	200	290	400	510	590	620	590	520	410	290	190	160	400
	Clear-Day Global	560	820	1130	1420	1610	1660	1620	1460	1200	880	600	470	1120

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	250	420	680	970	1220	1400	1530	1270	900	520	260	200	800
North	Unshaded	110	160	220	290	370	420	400	310	230	160	110	88	240
	Shaded	81	120	170	230	300	350	340	260	190	130	83	66	200
East	Unshaded	180	290	450	620	750	830	940	820	620	390	190	140	520
	Shaded	150	240	360	490	580	630	730	650	500	320	150	110	410
South	Unshaded	450	630	720	690	620	600	680	780	860	770	440	370	630
	Shaded	420	550	520	380	320	330	330	350	540	640	400	340	430
West	Unshaded	190	310	460	620	730	810	910	790	610	390	190	140	510
	Shaded	150	250	360	480	560	620	710	620	490	320	160	120	410

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	20.5	26.6	33.7	43.2	51.3	57.8	63.6	62.9	53.2	41.9	31.0	22.7	42.4
Daily Minimum Temp	12.7	18.1	23.9	31.1	38.4	44.1	47.1	46.3	38.6	29.4	23.7	15.5	30.7
Daily Maximum Temp	28.2	35.0	43.4	55.2	64.2	71.4	80.1	79.4	67.7	54.4	38.3	29.9	53.9
Record Minimum Temp	-38.0	-36.0	-29.0	10.0	19.0	28.0	31.0	31.0	16.0	-3.0	-28.0	-35.0	-38.0
Record Maximum Temp	53.0	57.0	72.0	84.0	94.0	96.0	104.0	105.0	99.0	82.0	65.0	57.0	105.0
HDD, Base 65°F	1380	1075	970	654	425	235	97	128	367	716	1020	1311	8378
CDD, Base 65°F	0	0	0	0	0	19	54	63	13	0	0	0	149
Humidity Ratio (#w/#da)	0.0023	0.0027	0.0031	0.0038	0.0052	0.0070	0.0078	0.0074	0.0058	0.0043	0.0033	0.0025	0.0046
Wind Speed (mph)	5.8	5.8	7.0	8.0	7.5	7.0	6.6	6.4	6.4	5.1	5.8	5.1	6.4
Clearness Index, Kt	0.43	0.46	0.46	0.48	0.50	0.53	0.59	0.57	0.53	0.47	0.38	0.39	0.51

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

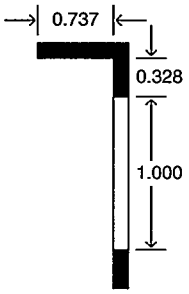
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	23/14	55/33	68/44	59/39	31/20	40/23	73/48	93/63	94/62	75/52	16/9	51/31	72/46	73/45	52/34	1/1	20/13	31/19	22/14	1/1
North	7/6	11/12	13/15	12/14	8/8	18/11	14/15	16/18	16/17	14/16	6/4	11/11	13/15	13/15	11/12	0/0	6/6	8/9	7/6	1/1
East	64/20	64/28	20/18	12/14	8/8	80/30	78/43	43/32	16/17	14/16	57/15	75/34	40/26	13/15	11/12	3/1	36/11	10/9	7/6	1/1
South	29/11	72/30	90/43	78/38	40/18	10/9	34/24	56/38	58/38	37/27	13/6	54/27	81/43	82/42	55/30	2/1	60/15	81/24	62/17	5/1
West	7/6	11/12	13/15	53/29	68/27	10/9	14/15	16/18	37/28	74/46	6/4	11/11	13/15	38/25	73/37	0/0	6/6	8/9	36/12	6/2
M. Clr (%hrs)	19	20	16	15	16	38	36	32	28	28	43	43	42	40	35	9	10	8	9	12

Lewistown, MT

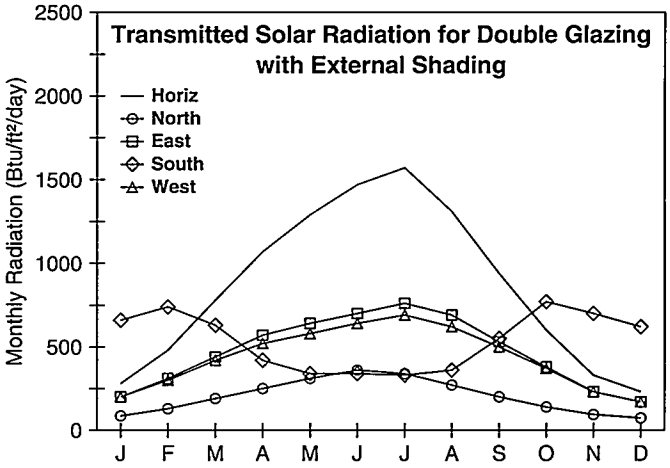
WBAN NO. 24036

LATITUDE: 47.05° N
LONGITUDE: 109.45° W
ELEVATION: 4147 feet
MEAN PRESSURE: 12.6 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	460	740	1120	1510	1790	2030	2160	1830	1330	900	520	380	1230
	Std.Dev.	33	52	97	137	127	145	109	120	128	58	30	23	29
	Minimum	420	650	940	1220	1520	1730	1930	1620	1060	780	470	350	1180
	Maximum	560	840	1320	1880	2070	2310	2360	2070	1540	1010	580	430	1300
	Diffuse	260	380	550	690	780	770	640	570	480	360	260	210	500
	Clear-Day Global	650	1010	1560	2140	2570	2730	2630	2270	1730	1150	710	540	1640
North	Global	160	230	330	440	560	650	620	470	340	240	170	130	360
	Diffuse	160	230	330	420	500	520	500	430	340	240	170	130	330
	Clear-Day Global	130	190	280	400	600	740	680	450	300	210	140	110	350
East	Global	350	520	760	980	1130	1240	1340	1190	910	650	400	300	810
	Diffuse	200	290	420	520	600	620	590	520	420	310	210	170	410
	Clear-Day Global	590	820	1150	1440	1610	1660	1620	1470	1220	900	630	510	1140
South	Global	910	1110	1190	1110	980	960	1070	1180	1250	1250	970	840	1070
	Diffuse	320	410	510	560	590	590	560	530	480	400	320	280	460
	Clear-Day Global	1880	2040	2010	1670	1340	1180	1240	1500	1830	2000	1880	1760	1690
West	Global	340	510	720	910	1030	1140	1230	1090	860	630	390	290	760
	Diffuse	200	290	420	530	600	630	600	530	430	310	210	170	410
	Clear-Day Global	590	820	1150	1440	1610	1660	1620	1470	1220	900	630	510	1140

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

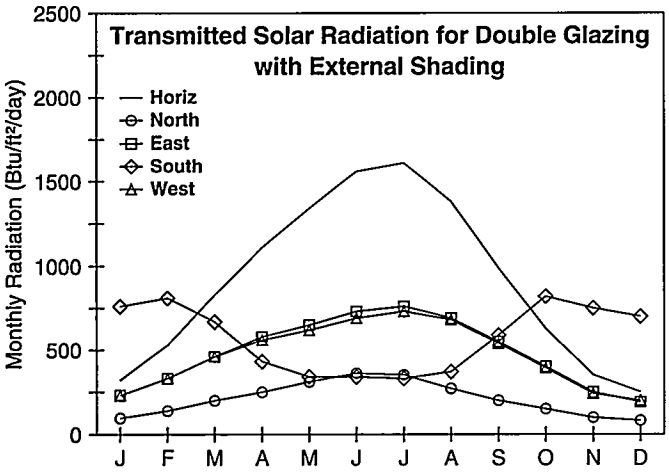
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	280	480	780	1070	1290	1470	1570	1310	940	600	330	230	860
North	Unshaded	110	160	230	300	370	420	400	310	230	170	120	91	240
	Shaded	87	130	190	250	310	360	340	270	200	140	94	73	200
East	Unshaded	240	360	540	700	810	890	970	860	650	450	270	200	580
	Shaded	200	310	440	570	640	700	760	690	530	380	230	170	470
South	Unshaded	690	820	850	750	630	600	660	780	870	920	740	640	740
	Shaded	660	740	630	420	340	340	330	360	550	770	700	620	540
West	Unshaded	230	360	510	650	730	820	880	780	620	440	270	200	540
	Shaded	200	300	420	520	580	640	690	620	500	370	230	170	440

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	20.1	25.0	30.5	40.8	49.9	58.5	65.3	64.7	54.1	45.0	32.1	22.6	42.4
Daily Minimum Temp	9.2	14.1	19.6	28.8	37.3	45.1	49.8	49.1	39.9	31.7	20.5	11.6	29.7
Daily Maximum Temp	30.9	35.9	41.4	52.9	62.5	71.9	80.8	80.3	68.2	58.3	43.5	33.6	55.0
Record Minimum Temp	-35.0	-33.0	-24.0	-5.1	16.0	24.1	35.1	33.1	17.1	-5.1	-27.9	-42.0	-42.0
Record Maximum Temp	73.0	66.0	72.0	82.4	87.8	98.1	98.1	102.9	97.0	84.9	75.0	75.0	102.9
HDD, Base 65°F	1392	1120	1070	726	468	221	75	131	355	620	987	1314	8479
CDD, Base 65°F	0	0	0	0	0	26	85	121	28	0	0	0	260
Humidity Ratio (#w/#da)	0.0018	0.0021	0.0025	0.0033	0.0049	0.0068	0.0073	0.0066	0.0050	0.0036	0.0025	0.0019	0.0040
Wind Speed (mph)	11.1	10.3	9.7	10.2	9.7	8.6	8.4	8.2	8.6	9.0	9.6	10.3	9.5
Clearness Index, Kt	0.47	0.50	0.52	0.52	0.52	0.55	0.60	0.59	0.54	0.52	0.47	0.45	0.54

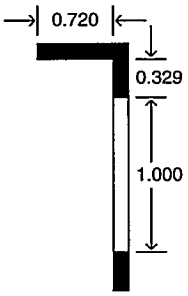
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	29/20	60/42	70/50	58/41	27/19	46/30	78/57	95/71	93/67	71/51	22/13	57/38	75/51	73/48	48/32	4/3	26/18	34/23	21/14	0/0
North	8/8	12/14	13/16	12/14	8/8	15/13	14/16	16/18	16/17	14/15	7/6	12/12	14/15	13/15	10/11	2/2	7/7	9/9	6/6	0/0
East	70/29	59/34	13/16	12/14	8/8	83/42	75/50	36/30	16/17	14/15	66/23	72/38	32/24	13/15	10/11	20/6	37/17	9/9	6/6	0/0
South	37/18	76/41	90/52	75/41	35/16	10/10	37/29	56/43	54/40	31/25	19/9	59/33	82/48	78/45	49/27	18/6	71/28	84/36	60/22	0/0
West	8/8	12/14	14/16	60/35	69/28	10/10	14/16	16/18	44/35	77/50	7/6	12/12	14/15	46/30	77/38	2/2	7/7	14/11	40/16	0/0
M. Clr (%hrs)	26	25	21	19	19	41	36	31	27	25	45	42	40	35	34	24	23	22	23	24



Miles City, MT

WBAN NO. 24037



Shading Geometry
(Not to Scale)

LATITUDE: 46.43° N
LONGITUDE: 105.87° W
ELEVATION: 2635 feet
MEAN PRESSURE: 13.4 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	520	810	1190	1560	1860	2150	2210	1920	1400	940	560	430	1300
	Std.Dev.	36	50	80	138	145	149	91	101	121	55	33	28	32
	Minimum	440	730	1040	1310	1560	1730	1970	1740	1120	810	470	380	1210
	Maximum	610	890	1320	1820	2130	2420	2390	2100	1590	1030	620	480	1380
	Diffuse	280	400	550	660	740	720	620	540	460	350	270	230	490
	Clear-Day Global	670	1040	1580	2150	2560	2720	2620	2260	1740	1160	730	570	1650
North	Global	170	240	340	440	560	650	620	470	340	250	170	140	370
	Diffuse	170	240	340	420	490	520	490	430	340	250	170	140	330
	Clear-Day Global	140	200	290	400	590	730	660	460	310	220	150	120	360
East	Global	390	560	790	1010	1140	1290	1340	1200	940	670	420	330	840
	Diffuse	220	310	430	520	590	620	590	530	420	310	220	180	410
	Clear-Day Global	600	840	1160	1440	1590	1650	1600	1470	1220	910	630	530	1140
South	Global	1040	1210	1270	1140	1000	980	1070	1230	1320	1310	1040	950	1130
	Diffuse	360	450	520	550	580	580	550	530	480	410	340	310	470
	Clear-Day Global	1880	2050	2000	1650	1310	1150	1210	1470	1810	1970	1870	1770	1680
West	Global	390	570	790	970	1090	1230	1290	1180	930	660	410	330	820
	Diffuse	220	320	430	530	600	630	600	530	430	320	220	180	420
	Clear-Day Global	600	840	1160	1440	1590	1650	1600	1470	1220	910	630	530	1140

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	320	530	830	1110	1340	1560	1610	1380	990	630	350	250	910
North	Unshaded	120	170	230	300	370	420	400	310	230	170	120	98	240
	Shaded	96	140	200	250	310	360	350	270	200	150	100	81	210
East	Unshaded	260	390	560	720	820	930	960	860	670	470	290	220	600
	Shaded	230	330	460	580	650	730	760	690	550	400	250	190	490
South	Unshaded	790	900	900	770	640	610	660	800	910	960	790	720	790
	Shaded	760	810	670	430	340	340	330	370	590	820	750	700	570
West	Unshaded	270	400	560	690	780	880	930	850	660	460	280	230	580
	Shaded	230	330	460	560	620	690	730	680	540	390	240	200	470

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	16.0	23.3	33.3	46.0	56.9	67.0	74.7	72.5	59.8	48.0	32.1	19.2	45.7
Daily Minimum Temp	6.3	13.0	22.2	33.8	44.6	54.1	60.7	58.5	46.5	35.5	21.7	9.4	33.9
Daily Maximum Temp	25.7	33.4	44.3	58.1	69.1	79.9	88.8	86.5	73.0	60.4	42.4	29.0	57.6
Record Minimum Temp	-35.0	-36.0	-23.1	5.0	21.9	35.1	44.1	36.0	23.0	1.0	-25.1	-40.0	-40.0
Record Maximum Temp	57.9	66.9	80.1	91.0	100.0	106.0	108.0	105.1	104.0	93.0	72.0	66.0	108.0
HDD, Base 65°F	1519	1168	983	570	266	84	5	39	228	527	987	1420	7796
CDD, Base 65°F	0	0	0	0	15	144	306	271	72	0	0	0	808
Humidity Ratio (#w/#da)	0.0017	0.0022	0.0029	0.0039	0.0058	0.0080	0.0087	0.0078	0.0059	0.0043	0.0028	0.0019	0.0047
Wind Speed (mph)	10.2	10.1	10.9	11.7	11.4	10.3	9.8	9.9	10.1	10.0	9.5	9.9	10.3
Clearness Index, Kt	0.51	0.54	0.54	0.54	0.54	0.58	0.62	0.61	0.57	0.53	0.48	0.49	0.56

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

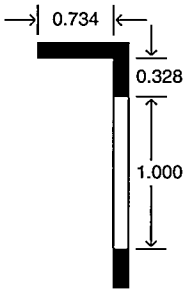
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	34/24	64/46	71/53	56/42	24/17	50/34	82/61	97/73	92/69	68/52	27/16	61/41	77/55	72/49	45/30	7/6	29/21	35/25	19/14	0/0
North	9/9	13/15	14/16	12/14	7/7	13/12	15/17	16/18	15/17	13/15	8/7	12/13	14/16	13/15	10/11	3/3	8/8	9/9	6/6	0/0
East	73/33	55/34	14/16	12/14	7/7	84/45	72/50	30/27	15/17	13/15	70/26	69/39	27/22	13/15	10/11	29/10	35/18	9/9	6/6	0/0
South	42/21	79/46	89/54	71/42	29/15	11/11	40/32	57/45	51/41	27/23	24/12	63/37	82/52	75/46	43/26	27/9	76/33	85/40	56/23	0/0
West	9/9	13/15	21/20	64/39	65/28	11/11	15/17	16/18	50/40	80/55	8/7	12/13	14/16	52/34	77/41	3/3	8/8	19/13	41/18	0/0
M. Clr (%hrs)	27	27	25	25	28	48	45	42	35	32	49	47	45	43	43	27	28	26	26	29

Missoula, MT

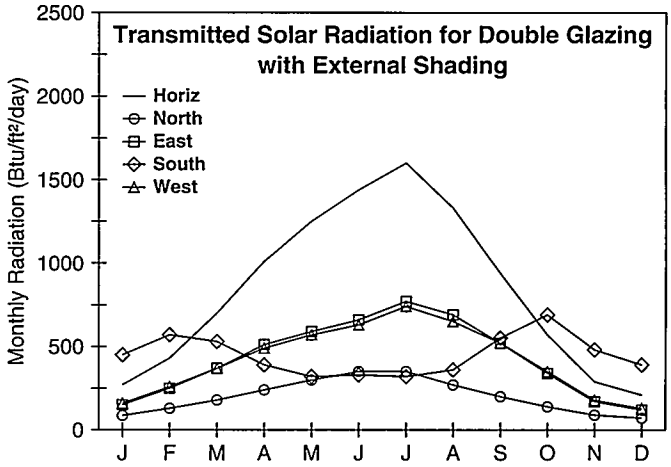
WBAN NO. 24153

LATITUDE: 46.92° N
LONGITUDE: 114.08° W
ELEVATION: 3189 feet
MEAN PRESSURE: 13.1 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	410	660	1010	1420	1740	1980	2200	1840	1340	850	450	340	1190
	Std.Dev.	36	54	103	113	152	166	131	151	153	94	32	23	35
	Minimum	350	520	860	1190	1410	1650	1880	1620	1090	710	400	300	1120
	Maximum	510	790	1250	1690	2010	2400	2390	2150	1640	1060	510	390	1250
	Diffuse	300	410	540	670	770	760	590	540	460	360	290	250	500
	Clear-Day Global	640	1000	1540	2140	2570	2740	2640	2270	1730	1140	710	540	1640
North	Global	160	230	320	420	550	640	630	470	340	240	160	130	360
	Diffuse	160	230	320	410	490	520	480	420	330	240	160	130	330
	Clear-Day Global	130	190	270	390	600	740	680	450	300	210	140	110	350
East	Global	270	430	650	890	1050	1180	1350	1190	880	580	300	220	750
	Diffuse	200	280	390	500	580	600	570	510	410	290	200	160	390
	Clear-Day Global	580	820	1140	1430	1610	1660	1620	1470	1220	900	620	500	1130
South	Global	640	860	1010	1030	940	930	1070	1180	1250	1130	680	560	940
	Diffuse	310	390	470	530	570	570	540	510	460	380	290	260	440
	Clear-Day Global	1840	2020	1980	1660	1340	1180	1230	1490	1830	1980	1860	1730	1680
West	Global	290	450	650	870	1020	1140	1300	1130	890	600	310	240	740
	Diffuse	200	290	400	500	590	610	580	520	410	300	200	160	400
	Clear-Day Global	580	820	1140	1430	1610	1660	1620	1470	1220	900	620	500	1130

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

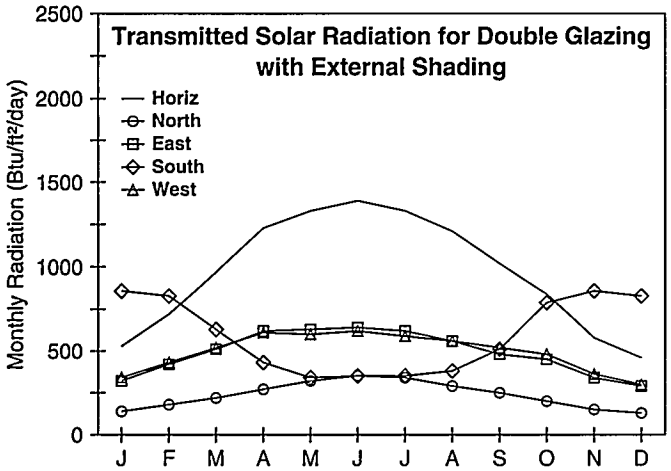
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	270	430	700	1010	1250	1440	1600	1330	940	570	290	210	840
North	Unshaded	110	160	220	290	360	420	400	310	230	170	110	92	240
	Shaded	86	130	180	240	300	350	350	270	200	140	90	72	200
East	Unshaded	190	300	460	640	750	850	970	850	630	410	210	150	540
	Shaded	150	250	370	510	590	660	770	690	520	340	170	120	430
South	Unshaded	480	640	720	700	610	580	660	770	870	820	510	420	650
	Shaded	450	570	530	390	320	330	320	360	550	690	480	390	450
West	Unshaded	200	310	460	620	730	810	940	810	630	420	220	160	530
	Shaded	160	260	370	490	570	630	740	650	520	350	180	130	420

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	22.7	29.2	35.8	44.2	51.8	60.0	66.8	65.8	55.7	44.2	32.4	23.4	44.3
Daily Minimum Temp	15.4	20.9	24.9	30.9	37.9	46.1	50.1	49.2	40.4	31.3	24.2	16.4	32.3
Daily Maximum Temp	30.0	37.4	46.6	57.5	65.7	73.9	83.4	82.2	70.9	57.0	40.6	30.2	56.3
Record Minimum Temp	-33.0	-27.0	-13.0	14.0	21.0	31.0	31.0	32.0	20.0	0.0	-23.0	-30.0	-33.0
Record Maximum Temp	59.0	60.0	75.0	87.0	95.0	98.0	105.0	105.0	99.0	85.0	66.0	60.0	105.0
HDD, Base 65°F	1311	1002	905	624	409	179	65	81	303	645	978	1290	7792
CDD, Base 65°F	0	0	0	0	0	29	121	106	24	0	0	0	280
Humidity Ratio (#w/#da)	0.0025	0.0029	0.0033	0.0039	0.0054	0.0071	0.0074	0.0071	0.0059	0.0044	0.0034	0.0026	0.0047
Wind Speed (mph)	5.4	5.9	6.8	7.9	7.6	7.3	7.4	6.8	6.2	5.2	5.6	5.0	6.4
Clearness Index, Kt	0.42	0.44	0.46	0.49	0.50	0.54	0.62	0.59	0.55	0.49	0.40	0.39	0.52

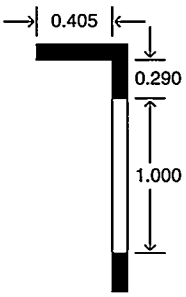
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	24/15	56/35	70/45	61/39	33/21	40/24	75/49	94/64	95/64	77/52	17/10	53/33	75/47	75/47	54/34	1/1	23/14	34/20	24/15	3/2
North	7/6	11/13	13/15	12/14	8/8	19/12	14/16	15/18	15/17	14/16	6/4	11/12	14/15	14/15	11/12	1/1	7/6	9/9	7/7	2/1
East	68/21	64/30	20/18	12/14	8/8	81/31	79/44	43/32	15/17	14/16	59/17	76/36	41/26	14/15	11/12	6/2	39/12	10/9	7/7	2/1
South	30/12	71/32	88/44	77/37	42/18	10/9	32/24	54/38	56/38	36/27	13/6	54/27	81/43	81/44	55/29	5/1	65/16	84/25	64/19	10/3
West	7/6	11/13	13/15	54/29	72/27	10/9	14/16	15/18	37/29	76/46	6/4	11/12	14/15	39/26	75/37	1/1	7/6	9/9	37/13	12/3
M. Clr (%hrs)	18	19	17	17	15	40	38	37	33	26	42	42	45	44	41	9	11	11	12	14



Asheville, NC

WBAN NO. 03812



Shading Geometry
(Not to Scale)

LATITUDE: 35.43° N
LONGITUDE: 82.53° W
ELEVATION: 2169 feet
MEAN PRESSURE: 13.7 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	790	1040	1360	1700	1830	1910	1830	1670	1410	1200	860	700	1360
	Std.Dev.	62	83	113	137	92	147	152	112	110	109	76	54	37
	Minimum	630	910	1110	1370	1710	1660	1580	1490	1170	1020	690	560	1290
	Maximum	900	1240	1550	2040	2080	2200	2150	1880	1630	1420	990	780	1450
	Diffuse	320	410	530	650	780	850	850	780	640	440	340	290	580
	Clear-Day Global	1110	1440	1880	2290	2530	2600	2520	2300	1930	1500	1130	980	1850
North	Global	220	280	350	440	530	590	560	470	390	310	230	200	380
	Diffuse	220	280	350	420	480	520	500	450	390	310	230	200	360
	Clear-Day Global	210	260	330	430	570	680	620	490	380	300	220	190	390
East	Global	510	650	800	970	1000	1020	990	900	770	710	540	450	780
	Diffuse	260	340	430	520	580	610	610	560	470	370	290	240	440
	Clear-Day Global	790	980	1180	1340	1390	1400	1360	1290	1150	960	780	700	1110
South	Global	1180	1210	1120	950	750	680	700	830	990	1230	1180	1120	1000
	Diffuse	360	420	480	520	530	540	550	550	520	450	380	330	470
	Clear-Day Global	2020	1980	1720	1270	920	790	840	1100	1480	1790	1900	1930	1470
West	Global	530	660	810	960	960	990	940	890	810	740	560	470	780
	Diffuse	270	340	430	520	580	620	610	560	480	380	290	240	440
	Clear-Day Global	790	980	1180	1340	1390	1400	1360	1290	1150	960	780	700	1110

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	530	720	970	1230	1330	1390	1330	1210	1020	840	580	460	970
North	Unshaded	150	190	240	300	350	390	370	320	270	210	160	140	260
	Shaded	140	180	220	270	320	350	340	290	250	200	150	130	240
East	Unshaded	350	460	560	690	710	730	700	640	540	490	370	310	550
	Shaded	320	420	510	620	630	640	620	560	480	450	340	290	.490
South	Unshaded	880	880	760	600	450	410	430	520	660	880	880	840	680
	Shaded	860	830	630	430	340	350	350	380	510	790	860	830	590
West	Unshaded	360	460	570	680	680	700	660	630	580	520	390	320	550
	Shaded	340	430	520	610	600	620	590	560	520	480	360	300	490

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	35.7	38.7	47.4	55.2	63.0	69.4	72.8	72.0	66.2	55.9	47.5	39.5	55.3
Daily Minimum Temp	24.8	27.4	35.4	42.6	50.9	58.3	62.7	61.9	55.5	43.5	35.7	28.6	43.9
Daily Maximum Temp	46.5	50.0	59.2	67.8	75.0	80.4	83.0	82.1	76.9	68.3	59.3	50.3	66.6
Record Minimum Temp	-16.0	-2.0	9.0	22.0	28.0	35.0	44.0	42.0	30.0	21.0	8.0	-7.0	-16.0
Record Maximum Temp	78.0	77.0	83.0	89.0	91.0	96.0	96.0	100.0	92.0	86.0	81.0	78.0	100.0
HDD, Base 65°F	908	736	546	298	117	18	5	5	64	295	525	791	4308
CDD, Base 65°F	0	0	0	0	55	150	247	222	100	13	0	0	787
Humidity Ratio (#w/#da)	0.0035	0.0037	0.0050	0.0064	0.0095	0.0125	0.0144	0.0142	0.0118	0.0077	0.0055	0.0042	0.0082
Wind Speed (mph)	9.7	9.6	9.5	9.1	7.2	5.8	5.6	5.3	5.6	6.7	8.2	9.0	7.6
Clearness Index, Kt	0.49	0.50	0.51	0.53	0.52	0.52	0.51	0.50	0.50	0.53	0.49	0.47	0.51

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

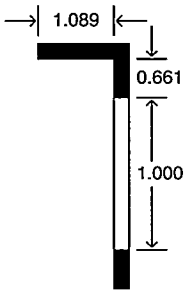
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	32/18	71/42	87/53	75/47	39/24	35/21	77/51	100/71	98/71	74/50	18/10	61/35	86/55	84/56	57/35	12/7	43/24	56/31	41/24	9/6
North	9/8	14/14	15/16	14/15	10/9	22/12	16/16	17/19	17/19	16/16	7/5	14/13	17/18	16/18	14/13	5/3	10/10	11/11	10/9	4/3
East	73/24	66/33	19/18	14/15	10/9	65/25	77/44	42/33	17/19	16/16	46/13	74/32	40/28	16/18	14/13	38/10	48/20	11/11	10/9	4/3
South	30/13	65/32	79/42	68/37	36/18	10/9	21/19	38/31	38/31	21/19	12/6	46/23	68/39	67/41	43/24	30/8	78/28	93/35	76/28	26/7
West	9/8	14/14	15/16	61/34	76/31	10/9	16/16	17/19	42/33	74/44	7/5	14/13	17/18	44/30	73/35	5/3	10/10	13/12	50/21	34/9
M. Clr (%hrs)	35	39	38	36	35	38	43	36	29	29	25	41	39	37	37	38	38	38	40	40

Cape Hatteras, NC

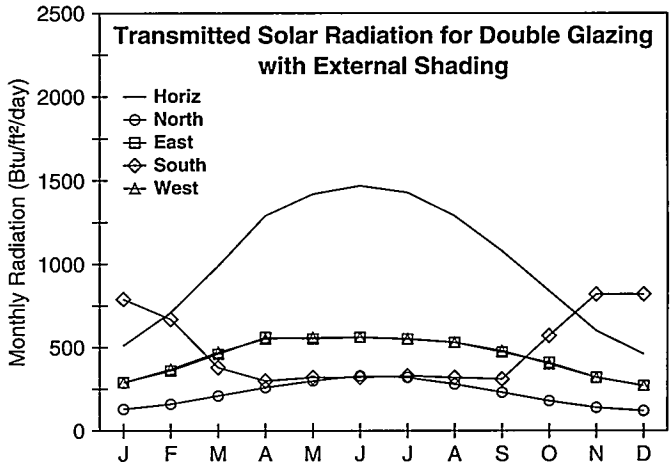
WBAN NO. 93729

LATITUDE: 35.27° N
LONGITUDE: 75.55° W
ELEVATION: 7 feet
MEAN PRESSURE: 14.8 psia

STATION TYPE: Primary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	770	1030	1390	1780	1940	2010	1960	1780	1500	1180	880	710	1410
	Std.Dev.	57	85	108	111	129	131	115	112	111	78	64	49	32
	Minimum	660	880	1200	1600	1670	1700	1770	1580	1260	1030	700	620	1340
	Maximum	880	1220	1550	2010	2190	2210	2180	2030	1730	1360	1000	800	1480
	Diffuse	320	420	530	630	770	840	850	770	630	470	350	300	570
	Clear-Day Global	1080	1410	1850	2260	2490	2570	2490	2260	1910	1470	1110	960	1820
North	Global	220	280	350	440	540	610	580	480	390	310	240	200	390
	Diffuse	220	280	350	430	490	530	520	470	390	310	240	200	370
	Clear-Day Global	210	260	330	430	580	670	620	470	370	290	220	190	390
East	Global	500	640	830	1010	1030	1050	1030	970	860	720	570	470	810
	Diffuse	260	330	430	520	590	630	630	580	490	390	290	250	450
	Clear-Day Global	770	950	1160	1320	1390	1390	1340	1280	1150	950	770	700	1100
South	Global	1130	1180	1140	990	780	700	730	870	1060	1200	1220	1130	1010
	Diffuse	350	410	480	520	540	550	560	560	530	470	400	340	480
	Clear-Day Global	1950	1930	1680	1240	910	760	820	1080	1450	1750	1860	1890	1440
West	Global	510	640	830	1000	1050	1060	1040	970	860	720	560	470	810
	Diffuse	260	340	430	530	600	630	630	580	500	390	300	250	450
	Clear-Day Global	770	950	1160	1320	1390	1390	1340	1280	1150	950	770	700	1100

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

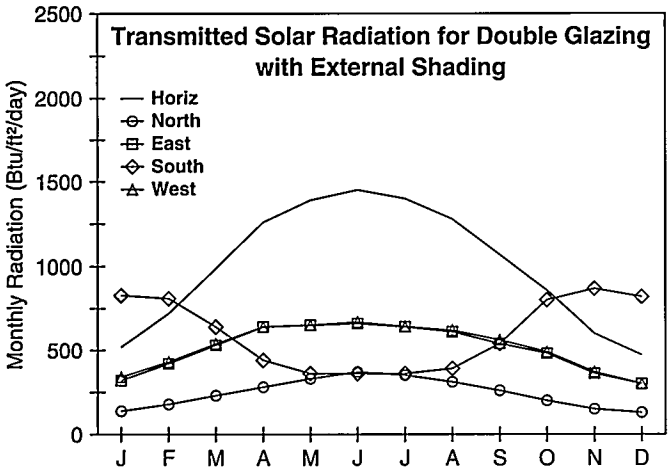
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	510	710	990	1290	1420	1470	1430	1290	1080	840	600	460	1010
North	Unshaded	150	190	240	300	360	390	380	330	270	220	160	140	260
	Shaded	130	160	210	260	300	330	320	280	230	180	140	120	220
East	Unshaded	350	450	580	720	730	740	730	680	600	500	390	320	570
	Shaded	290	360	460	560	550	560	550	530	470	410	320	270	440
South	Unshaded	840	860	780	620	470	420	440	540	700	850	910	850	690
	Shaded	790	670	380	300	320	320	330	320	310	570	820	820	490
West	Unshaded	350	450	590	710	750	750	730	690	610	510	390	320	570
	Shaded	290	370	470	550	560	560	550	530	480	400	320	270	450

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	44.6	45.5	51.6	58.9	67.0	74.2	78.3	78.4	74.2	65.4	57.0	49.0	62.0
Daily Minimum Temp	36.7	37.6	43.6	50.8	59.6	67.5	71.8	72.0	67.6	58.3	49.3	41.1	54.7
Daily Maximum Temp	52.4	53.4	59.6	67.0	74.4	80.8	84.6	84.7	80.7	72.4	64.7	56.8	69.3
Record Minimum Temp	6.0	14.0	19.0	26.0	39.0	44.0	54.0	56.0	45.0	32.0	22.0	12.0	6.0
Record Maximum Temp	75.0	76.0	81.0	89.0	91.0	95.0	95.0	94.0	92.0	89.0	81.0	78.0	95.0
HDD, Base 65°F	639	546	421	196	38	0	0	0	0	90	265	503	2698
CDD, Base 65°F	6	0	6	13	100	276	412	415	276	102	25	7	1638
Humidity Ratio (#w/#da)	0.0051	0.0052	0.0063	0.0079	0.0111	0.0144	0.0169	0.0167	0.0143	0.0104	0.0079	0.0060	0.0102
Wind Speed (mph)	11.6	11.9	11.8	11.6	10.5	10.6	9.9	9.4	10.5	11.0	10.9	11.1	10.9
Clearness Index, Kt	0.47	0.50	0.52	0.56	0.55	0.55	0.54	0.54	0.53	0.52	0.50	0.47	0.53

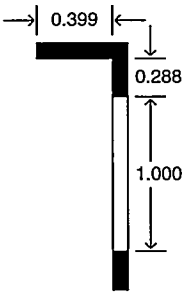
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	43/25	77/48	87/52	69/43	29/18	45/31	85/59	104/77	98/72	69/48	28/19	69/46	89/63	81/57	48/32	19/11	48/29	54/31	35/21	4/3
North	10/10	14/16	15/16	13/14	8/7	21/15	17/18	17/19	17/19	16/16	9/8	15/15	17/19	17/18	13/12	6/5	11/11	11/11	9/8	2/1
East	77/30	57/33	15/16	13/14	8/7	73/38	72/46	31/28	17/19	16/16	58/27	69/40	29/25	17/18	13/12	48/15	41/21	11/11	9/8	2/1
South	39/19	69/38	78/42	62/33	27/13	12/12	27/23	40/33	36/30	16/16	19/12	53/32	70/47	63/42	35/21	43/14	83/35	90/37	66/25	10/3
West	10/10	14/16	24/20	69/35	70/25	12/12	17/18	17/19	53/41	80/48	9/8	15/15	17/19	54/38	72/36	6/5	11/11	24/15	53/21	15/4
M. Clr (%hrs)	40	40	41	40	38	35	38	36	36	36	40	41	40	41	44	41	39	38	38	38



Charlotte, NC

WBAN NO. 13881



Shading Geometry
(Not to Scale)

LATITUDE: 35.22° N
LONGITUDE: 80.93° W
ELEVATION: 768 feet
MEAN PRESSURE: 14.4 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	790	1040	1380	1740	1900	1990	1930	1760	1490	1230	880	710	1410
	Std.Dev.	62	95	120	117	93	128	143	116	116	104	88	51	34
	Minimum	630	880	1150	1490	1740	1740	1670	1540	1260	1050	620	620	1340
	Maximum	890	1210	1630	2020	2080	2260	2190	2020	1710	1430	1040	830	1460
	Diffuse	340	440	560	680	820	880	880	790	660	470	360	310	600
	Clear-Day Global	1110	1440	1880	2290	2530	2610	2530	2300	1940	1510	1140	990	1860
North	Global	230	290	360	450	550	620	580	490	400	320	240	200	400
	Diffuse	230	290	360	440	500	540	520	470	400	320	240	200	380
	Clear-Day Global	210	260	340	430	580	690	630	490	380	300	230	200	400
East	Global	510	650	820	990	1020	1040	1020	950	850	740	560	470	800
	Diffuse	270	350	440	530	600	630	630	580	500	390	300	250	460
	Clear-Day Global	780	970	1180	1340	1400	1400	1360	1280	1160	960	790	710	1110
South	Global	1140	1190	1130	970	780	700	730	860	1040	1260	1200	1120	1010
	Diffuse	370	430	490	530	560	560	560	560	540	480	390	340	490
	Clear-Day Global	2000	1970	1710	1260	920	780	830	1090	1470	1780	1900	1930	1470
West	Global	520	660	830	990	1030	1060	1010	980	870	760	580	470	810
	Diffuse	270	350	450	540	610	640	630	590	510	400	300	250	460
	Clear-Day Global	780	970	1180	1340	1400	1400	1360	1280	1160	960	790	710	1110

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	520	720	990	1260	1390	1450	1400	1280	1070	860	600	470	1000
North	Unshaded	160	200	250	300	360	400	380	330	280	220	170	140	270
	Shaded	140	180	230	280	330	370	350	310	260	200	150	130	250
East	Unshaded	350	460	580	710	730	740	720	680	600	520	390	320	570
	Shaded	320	420	530	640	650	660	640	610	540	480	360	300	510
South	Unshaded	850	860	770	610	470	430	440	540	690	890	890	840	690
	Shaded	830	810	640	440	360	360	360	390	540	800	870	820	600
West	Unshaded	360	470	590	710	730	750	720	690	620	540	400	320	580
	Shaded	340	430	540	640	650	670	640	620	560	490	370	300	520

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	39.3	42.5	50.9	59.4	67.4	75.7	79.3	78.3	72.4	61.3	52.1	42.6	60.1
Daily Minimum Temp	29.6	31.9	39.4	47.5	56.4	65.6	69.6	68.9	62.9	50.6	41.5	32.8	49.7
Daily Maximum Temp	49.0	53.0	62.3	71.2	78.3	85.8	88.9	87.7	81.9	72.0	62.6	52.3	70.4
Record Minimum Temp	-5.0	5.0	4.0	24.0	32.0	45.0	53.0	53.0	39.0	24.0	11.0	2.0	-5.0
Record Maximum Temp	78.0	81.0	90.0	93.0	100.0	103.0	103.0	103.0	104.0	98.0	85.0	77.0	104.0
HDD, Base 65°F	797	630	437	183	42	0	0	0	6	161	391	694	3341
CDD, Base 65°F	0	0	0	15	116	321	443	412	228	47	0	0	1582
Humidity Ratio (#w/#da)	0.0036	0.0038	0.0052	0.0067	0.0098	0.0128	0.0147	0.0146	0.0121	0.0081	0.0058	0.0043	0.0085
Wind Speed (mph)	7.6	8.1	8.7	8.6	7.5	7.0	6.5	6.2	6.5	6.5	7.0	7.3	7.3
Clearness Index, Kt	0.48	0.50	0.52	0.55	0.54	0.54	0.53	0.53	0.52	0.54	0.50	0.47	0.52

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

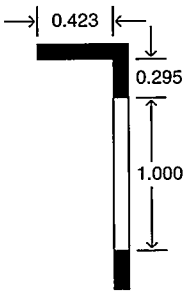
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	35/20	73/44	88/55	75/47	37/23	38/24	80/52	101/72	98/73	73/51	21/12	64/39	87/57	84/59	55/37	14/8	45/26	56/31	41/24	8/5
North	9/8	14/15	15/17	14/15	9/9	22/13	16/17	17/20	18/19	16/17	8/6	14/15	17/18	17/18	14/13	5/4	10/10	11/12	10/9	4/3
East	74/25	65/33	17/18	14/15	9/9	69/29	77/43	40/32	18/19	16/17	53/15	74/35	38/28	17/18	14/13	42/11	47/20	11/12	10/9	4/3
South	32/14	66/33	79/43	67/37	34/17	11/10	23/20	38/31	37/31	20/19	14/7	48/26	69/41	66/43	41/24	34/9	80/29	92/34	74/27	22/6
West	9/8	14/15	15/17	63/35	75/30	11/10	16/17	17/20	45/36	75/47	8/6	14/15	17/18	46/33	72/37	5/4	10/10	16/13	52/21	30/8
M. Clr (%hrs)	39	39	36	37	37	39	40	37	35	39	41	42	39	38	45	40	39	39	38	40

Greensboro, NC

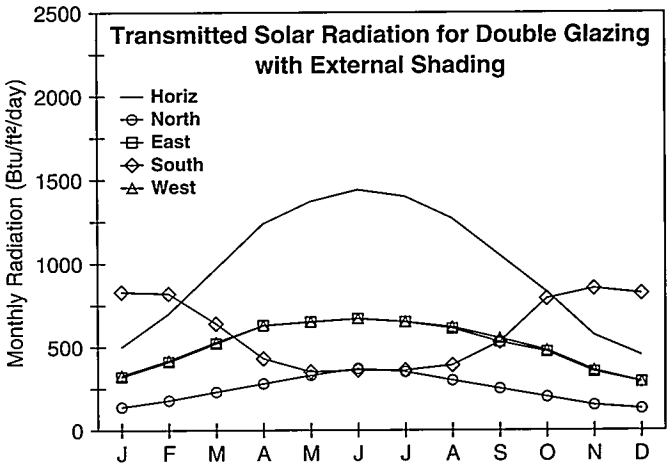
WBAN NO. 13723

LATITUDE: 36.08° N
LONGITUDE: 79.95° W
ELEVATION: 886 feet
MEAN PRESSURE: 14.3 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	760	1020	1370	1710	1890	1980	1920	1750	1460	1190	840	680	1380
	Std.Dev.	58	92	113	134	99	109	134	113	100	108	83	47	34
	Minimum	620	830	1100	1460	1690	1820	1680	1500	1260	970	620	600	1310
	Maximum	880	1200	1590	2060	2120	2230	2160	1960	1630	1400	990	770	1430
	Diffuse	330	420	540	680	820	890	880	790	650	460	350	300	590
	Clear-Day Global	1070	1410	1860	2280	2530	2610	2530	2290	1920	1480	1100	950	1840
North	Global	220	280	360	450	550	620	590	490	400	310	240	200	390
	Diffuse	220	280	360	430	500	540	520	470	400	310	240	200	370
	Clear-Day Global	200	260	340	430	580	680	630	490	380	300	220	190	390
East	Global	500	640	810	980	1030	1060	1040	960	840	730	540	460	800
	Diffuse	260	340	430	530	600	640	630	580	490	380	290	240	450
	Clear-Day Global	750	960	1160	1340	1410	1410	1370	1290	1160	960	770	690	1110
South	Global	1140	1200	1150	970	790	720	740	880	1040	1240	1180	1110	1010
	Diffuse	360	420	490	530	560	570	570	570	540	470	390	340	480
	Clear-Day Global	1980	1980	1730	1290	950	810	860	1120	1500	1790	1890	1910	1480
West	Global	510	660	830	990	1030	1060	1030	980	860	750	560	460	810
	Diffuse	270	340	440	540	610	650	640	590	500	390	290	240	460
	Clear-Day Global	750	960	1160	1340	1410	1410	1370	1290	1160	960	770	690	1110

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

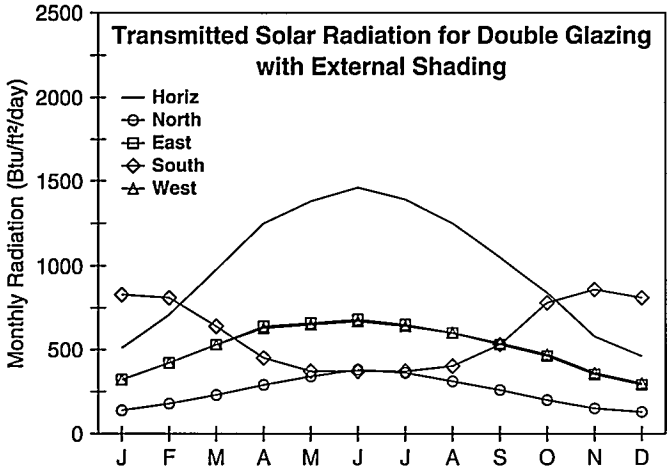
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	500	700	970	1240	1370	1440	1400	1270	1050	830	570	450	980
North	Unshaded	150	190	250	300	360	400	390	330	280	210	160	140	260
	Shaded	140	180	230	280	330	370	350	300	250	200	150	130	240
East	Unshaded	340	450	580	700	730	750	740	680	600	510	380	310	560
	Shaded	320	410	520	630	650	670	650	610	530	470	350	290	510
South	Unshaded	850	870	780	610	480	440	450	550	690	880	880	830	690
	Shaded	830	820	640	430	350	360	360	390	530	790	850	820	600
West	Unshaded	350	460	590	710	730	750	730	700	610	530	390	320	570
	Shaded	330	420	530	630	650	670	650	620	550	480	360	290	520

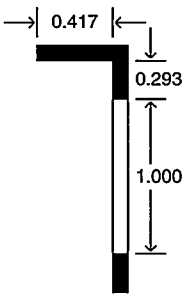
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	36.7	40.0	48.8	57.6	65.9	73.1	76.9	75.7	69.7	58.6	49.5	40.5	57.8
Daily Minimum Temp	26.6	29.3	37.4	45.6	54.7	62.6	66.9	65.9	59.5	47.2	38.5	30.5	47.1
Daily Maximum Temp	46.7	50.7	60.2	69.6	77.0	83.6	86.9	85.5	79.9	69.9	60.5	50.5	68.4
Record Minimum Temp	-8.0	-4.0	5.0	21.0	32.0	42.0	48.0	45.0	35.0	20.0	10.0	0.0	-8.0
Record Maximum Temp	78.0	81.0	90.0	94.0	98.0	102.0	102.0	103.0	100.0	95.0	85.0	78.0	103.0
HDD, Base 65°F	877	700	502	235	78	6	0	0	16	226	465	760	3865
CDD, Base 65°F	0	0	0	13	106	249	369	332	157	27	0	0	1253
Humidity Ratio (#w/#da)	0.0033	0.0035	0.0048	0.0064	0.0097	0.0129	0.0148	0.0145	0.0117	0.0077	0.0055	0.0040	0.0082
Wind Speed (mph)	7.7	8.1	8.6	8.3	7.2	6.7	6.2	6.0	6.3	6.5	7.2	7.5	7.2
Clearness Index, Kt	0.48	0.50	0.52	0.54	0.53	0.54	0.53	0.53	0.52	0.53	0.49	0.47	0.52

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	36/21	73/45	87/54	72/47	35/22	40/26	80/53	101/74	97/74	72/51	22/13	65/39	87/58	82/57	54/36	14/8	44/25	54/31	38/22	6/4
North	9/8	14/15	15/17	14/15	9/9	22/14	17/17	17/19	18/19	16/16	8/6	14/14	17/18	17/18	13/13	5/4	10/10	11/11	9/9	3/2
East	75/27	63/34	15/17	14/15	9/9	70/31	76/44	39/32	18/19	16/16	55/17	73/34	36/27	17/18	13/13	41/12	45/20	11/11	9/9	3/2
South	34/15	68/35	80/43	67/38	33/16	11/10	25/21	40/33	38/32	21/19	15/7	50/26	70/43	66/42	41/25	34/10	80/29	91/35	72/27	17/5
West	9/8	14/15	16/17	64/36	74/29	11/10	17/17	17/19	46/37	75/47	8/6	14/14	17/18	48/33	73/39	5/4	10/10	17/13	51/21	24/7
M. Clr (%hrs)	38	37	36	36	38	39	40	33	29	36	41	42	37	36	41	39	39	39	38	39





Shading Geometry
(Not to Scale)

Raleigh, NC

WBAN NO. 13722

LATITUDE: 35.87° N
LONGITUDE: 78.78° W
ELEVATION: 440 feet
MEAN PRESSURE: 14.5 psia

STATION TYPE: Primary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	770	1030	1380	1730	1900	2000	1920	1740	1470	1190	860	700	1390
	Std.Dev.	62	93	111	125	103	120	129	128	116	96	82	58	38
	Minimum	640	800	1150	1530	1620	1790	1640	1380	1220	1020	650	520	1280
	Maximum	890	1200	1600	2020	2080	2250	2140	1920	1690	1390	960	830	1450
	Diffuse	340	440	570	720	870	940	950	860	690	490	360	310	630
	Clear-Day Global	1080	1410	1860	2280	2520	2600	2520	2290	1920	1480	1110	950	1840
North	Global	220	290	370	460	570	640	600	510	410	320	240	200	400
	Diffuse	220	290	370	450	520	560	540	490	410	320	240	200	380
	Clear-Day Global	210	260	340	430	580	680	620	490	380	300	220	190	390
East	Global	500	650	820	1000	1040	1080	1040	950	840	720	550	460	810
	Diffuse	270	350	450	550	620	660	650	600	500	390	290	250	470
	Clear-Day Global	770	960	1170	1340	1410	1410	1370	1290	1160	960	770	690	1110
South	Global	1130	1190	1140	980	800	730	750	870	1030	1220	1190	1100	1010
	Diffuse	370	430	500	550	580	580	590	590	550	480	400	350	500
	Clear-Day Global	1980	1970	1720	1280	950	800	850	1110	1490	1790	1880	1910	1470
West	Global	510	650	830	990	1030	1070	1010	950	850	740	560	470	800
	Diffuse	270	350	450	560	630	670	660	610	510	400	300	250	470
	Clear-Day Global	770	960	1170	1340	1410	1410	1370	1290	1160	960	770	690	1110

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	510	710	980	1250	1380	1460	1390	1250	1050	840	580	460	990
North	Unshaded	150	200	250	310	370	410	400	340	280	220	170	140	270
	Shaded	140	180	230	290	340	380	360	310	260	200	150	130	250
East	Unshaded	350	460	580	710	740	760	740	680	590	510	380	320	570
	Shaded	320	420	530	640	660	680	650	600	530	460	350	290	510
South	Unshaded	850	860	780	620	490	450	460	550	690	870	880	830	690
	Shaded	830	810	640	450	370	370	370	400	530	780	860	810	600
West	Unshaded	350	460	590	700	730	750	720	670	600	520	390	320	570
	Shaded	320	420	530	630	650	670	640	600	540	470	360	300	510

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	38.9	42.0	50.4	59.0	67.0	74.3	78.1	77.1	71.1	60.1	51.2	42.6	59.3
Daily Minimum Temp	28.8	31.3	38.7	46.2	55.3	63.6	68.1	67.5	61.1	48.4	39.7	32.4	48.4
Daily Maximum Temp	48.9	52.6	62.1	71.7	78.6	85.0	88.0	86.8	81.1	71.6	62.6	52.7	70.1
Record Minimum Temp	-9.0	5.0	11.0	23.0	31.0	38.0	48.0	46.0	37.0	19.0	11.0	4.0	-9.0
Record Maximum Temp	79.0	84.0	92.0	95.0	97.0	104.0	105.0	105.0	104.0	98.0	88.0	79.0	105.0
HDD, Base 65°F	809	644	458	193	47	0	0	0	9	189	414	694	3457
CDD, Base 65°F	0	0	6	13	109	279	406	375	192	37	0	0	1417
Humidity Ratio (#w/#da)	0.0035	0.0038	0.0050	0.0065	0.0099	0.0130	0.0149	0.0148	0.0122	0.0081	0.0057	0.0042	0.0085
Wind Speed (mph)	8.4	8.8	9.2	8.7	7.6	7.0	6.5	6.2	6.6	6.9	7.6	8.0	7.6
Clearness Index, Kt	0.48	0.50	0.53	0.55	0.54	0.54	0.53	0.52	0.52	0.53	0.50	0.47	0.52

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

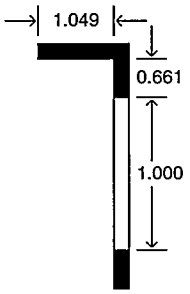
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	38/21	75/45	87/54	71/46	33/21	41/27	82/56	102/75	98/73	71/52	24/14	66/39	86/60	81/57	51/35	16/9	45/27	54/32	37/22	5/4
North	10/9	14/16	15/17	14/15	9/8	21/14	17/18	18/20	18/20	17/17	8/6	15/15	17/19	17/18	13/13	6/4	10/10	11/12	9/9	3/2
East	75/25	62/32	15/17	14/15	9/8	70/32	75/45	37/31	18/20	17/17	54/17	72/33	34/27	17/18	13/13	44/12	44/20	11/12	9/9	3/2
South	35/15	68/35	80/42	65/36	31/16	12/11	25/22	40/33	38/32	20/19	16/8	51/26	70/43	65/41	39/23	37/11	80/31	90/37	69/26	15/4
West	10/9	14/16	18/18	65/35	72/29	12/11	17/18	18/20	49/38	76/48	8/6	15/15	17/19	49/34	71/37	6/4	10/10	19/14	51/21	21/6
M. Clr (%hrs)	41	39	38	36	37	40	41	34	29	35	42	44	39	36	40	38	38	37	38	40

Wilmington, NC

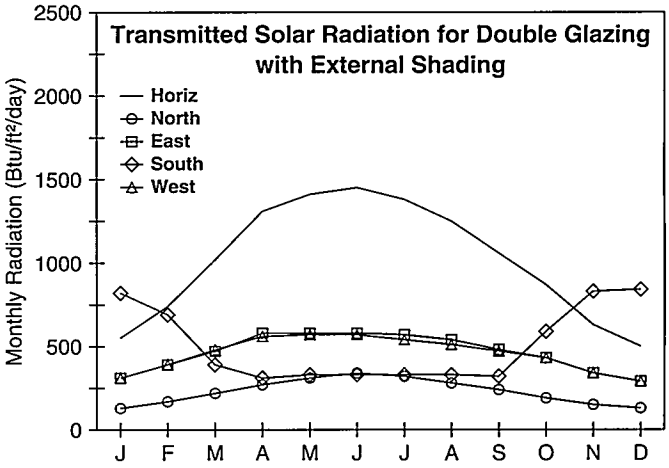
WBAN NO. 13748

LATITUDE: 34.27° N
LONGITUDE: 77.90° W
ELEVATION: 30 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	820	1070	1430	1800	1930	1990	1900	1720	1470	1240	930	750	1420
	Std.Dev.	57	89	102	112	121	138	112	103	120	101	77	49	32
	Minimum	690	890	1280	1640	1630	1710	1570	1490	1190	1040	670	670	1340
	Maximum	950	1260	1640	2070	2100	2260	2070	1930	1700	1420	1030	870	1490
	Diffuse	350	440	560	680	820	890	900	830	690	500	370	320	610
	Clear-Day Global	1130	1460	1890	2290	2520	2590	2510	2290	1950	1530	1160	1010	1860
North	Global	230	290	370	450	560	620	590	500	410	330	250	220	400
	Diffuse	230	290	370	440	510	540	530	480	410	330	250	220	380
	Clear-Day Global	220	270	340	430	590	680	630	490	390	310	230	200	400
East	Global	530	670	840	1030	1050	1060	1030	970	860	750	590	490	820
	Diffuse	280	350	450	550	610	640	640	590	510	410	310	260	470
	Clear-Day Global	790	970	1170	1330	1390	1390	1350	1280	1160	970	790	720	1110
South	Global	1170	1200	1150	980	770	680	700	830	1010	1230	1250	1170	1010
	Diffuse	370	440	500	540	550	560	560	570	550	490	410	370	490
	Clear-Day Global	1970	1930	1670	1230	890	750	800	1060	1440	1750	1870	1910	1440
West	Global	540	670	850	1010	1040	1050	1000	930	840	750	600	500	820
	Diffuse	280	360	460	550	620	650	640	590	510	410	310	270	470
	Clear-Day Global	790	970	1170	1330	1390	1390	1350	1280	1160	970	790	720	1110

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

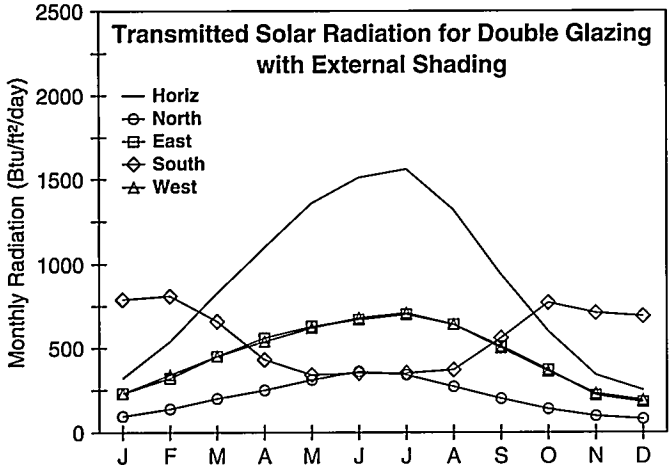
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	550	740	1020	1310	1410	1450	1380	1250	1060	870	630	500	1020
North	Unshaded	160	200	260	310	370	400	380	330	280	230	170	150	270
	Shaded	130	170	220	270	310	340	320	280	240	190	150	130	230
East	Unshaded	370	470	600	730	740	750	730	690	610	530	410	340	580
	Shaded	310	390	470	580	580	580	570	540	480	430	340	290	460
South	Unshaded	870	870	780	610	460	420	430	510	660	870	930	880	690
	Shaded	820	690	390	310	330	330	330	330	320	590	830	840	510
West	Unshaded	370	470	600	720	740	740	710	660	590	530	410	340	570
	Shaded	310	390	480	560	570	570	540	510	470	430	340	290	460

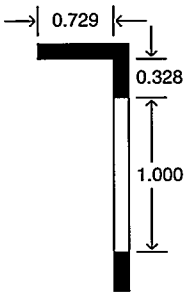
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	44.9	47.3	54.4	62.3	70.1	76.5	80.1	79.4	75.3	65.3	57.0	48.5	63.4
Daily Minimum Temp	34.4	36.4	43.1	50.5	59.3	67.5	71.7	71.0	65.3	53.7	44.8	37.5	52.9
Daily Maximum Temp	55.3	58.1	65.7	74.0	80.8	85.4	88.5	87.6	85.2	76.9	69.1	59.4	73.8
Record Minimum Temp	5.0	11.0	9.0	30.0	38.0	48.0	55.0	55.0	44.0	27.0	20.0	0.0	0.0
Record Maximum Temp	82.0	85.0	89.0	95.0	98.0	104.0	102.0	102.0	98.0	95.0	87.0	81.0	104.0
HDD, Base 65°F	631	496	338	115	10	0	0	0	0	102	259	519	2470
CDD, Base 65°F	8	0	10	34	168	345	468	446	309	111	19	8	1926
Humidity Ratio (#w/#da)	0.0048	0.0050	0.0064	0.0080	0.0114	0.0147	0.0168	0.0167	0.0142	0.0099	0.0073	0.0056	0.0101
Wind Speed (mph)	8.8	9.4	9.7	9.8	8.7	8.3	7.6	6.9	7.5	7.7	7.9	8.2	8.4
Clearness Index, Kt	0.49	0.51	0.53	0.56	0.55	0.54	0.53	0.52	0.51	0.53	0.51	0.49	0.53

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	40/24	77/48	89/56	72/47	32/21	42/29	82/58	102/77	97/74	70/50	25/16	67/45	88/62	82/58	52/34	18/11	49/29	57/34	38/24	6/4
North	10/9	15/16	16/17	14/15	9/8	22/16	17/18	17/20	18/20	16/17	9/7	15/16	17/19	17/18	14/13	6/5	11/11	12/12	9/9	3/2
East	76/28	61/35	16/17	14/15	9/8	70/37	74/48	35/31	18/20	16/17	56/23	71/39	33/27	17/18	14/13	46/15	44/22	12/12	9/9	3/2
South	35/17	67/37	77/43	63/36	29/15	12/11	24/22	37/32	35/30	17/17	17/10	51/30	69/44	63/42	37/22	40/13	82/33	91/38	69/29	15/5
West	10/9	15/16	20/19	66/38	71/28	12/11	17/18	17/20	50/39	77/47	9/7	15/16	17/19	51/36	72/36	6/5	11/11	21/15	53/24	22/7
M. Clr (%hrs)	41	40	40	39	39	36	36	31	31	34	39	39	33	32	36	41	39	40	39	39





Shading Geometry
(Not to Scale)

Bismarck, ND

WBAN NO. 24011

LATITUDE: 46.77° N
LONGITUDE: 100.75° W
ELEVATION: 1647 feet
MEAN PRESSURE: 13.9 psia

STATION TYPE: Primary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	530	820	1200	1550	1880	2090	2140	1830	1340	900	540	430	1270
	Std.Dev.	40	71	98	179	157	148	95	122	119	75	43	31	29
	Minimum	430	640	940	1130	1480	1820	1950	1530	1050	750	440	380	1220
	Maximum	600	950	1390	1930	2170	2380	2390	2010	1540	1060	640	480	1340
	Diffuse	280	430	580	680	770	780	710	620	480	360	270	240	520
	Clear-Day Global	650	1020	1560	2120	2520	2680	2580	2220	1700	1130	710	550	1620
North	Global	170	250	350	440	560	650	610	470	340	250	170	140	370
	Diffuse	170	250	350	420	500	530	510	440	340	250	170	140	340
	Clear-Day Global	140	200	290	400	600	720	650	460	310	220	150	120	360
East	Global	390	560	790	980	1130	1200	1250	1110	870	630	380	310	800
	Diffuse	220	320	440	520	600	630	620	550	420	310	210	180	420
	Clear-Day Global	580	830	1150	1410	1560	1610	1570	1430	1180	870	610	490	1110
South	Global	1070	1210	1260	1140	1030	980	1060	1180	1250	1230	980	930	1110
	Diffuse	360	460	540	560	590	600	590	550	480	400	330	310	480
	Clear-Day Global	1830	2040	1990	1650	1320	1170	1210	1460	1790	1930	1820	1710	1660
West	Global	400	570	780	950	1100	1210	1260	1120	870	620	400	330	800
	Diffuse	220	320	440	530	610	640	620	550	430	310	220	180	420
	Clear-Day Global	580	830	1150	1410	1560	1610	1570	1430	1180	870	610	490	1110

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	320	540	830	1100	1360	1510	1560	1320	940	600	340	250	890
North	Unshaded	120	170	240	300	370	420	400	310	230	170	120	98	250
	Shaded	96	140	200	250	310	360	340	270	200	140	97	80	210
East	Unshaded	260	390	560	700	810	860	890	800	620	440	260	210	570
	Shaded	230	320	450	560	630	670	700	640	510	370	220	180	460
South	Unshaded	820	900	900	770	660	610	660	780	870	910	740	710	780
	Shaded	790	810	660	430	340	350	350	370	560	770	710	690	570
West	Unshaded	270	400	550	680	790	860	900	800	620	440	280	230	570
	Shaded	230	340	450	540	620	680	710	640	500	360	230	190	460

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	9.2	15.7	28.2	43.0	55.0	64.4	70.4	68.3	57.0	45.7	28.6	14.0	41.6
Daily Minimum Temp	-1.7	5.1	17.8	31.0	42.2	51.6	56.4	53.9	43.1	32.5	17.8	3.3	29.4
Daily Maximum Temp	20.2	26.4	38.5	54.9	67.8	77.1	84.4	82.7	70.8	58.7	39.3	24.5	53.8
Record Minimum Temp	-44.0	-39.0	-31.0	-12.0	15.0	30.0	35.0	33.0	11.0	-10.0	-30.0	-43.0	-44.0
Record Maximum Temp	62.0	68.0	81.0	93.0	98.0	107.0	109.0	109.0	105.0	95.0	75.0	65.0	109.0
HDD, Base 65°F	1730	1380	1141	660	324	116	15	69	262	598	1092	1581	8968
CDD, Base 65°F	0	0	0	0	14	98	183	171	22	0	0	0	488
Humidity Ratio (#w/#da)	0.0013	0.0017	0.0025	0.0036	0.0058	0.0087	0.0101	0.0090	0.0064	0.0042	0.0025	0.0016	0.0048
Wind Speed (mph)	9.8	9.5	10.3	11.1	10.8	9.3	8.6	8.8	9.2	9.6	8.9	9.2	9.6
Clearness Index, Kt	0.53	0.55	0.55	0.53	0.55	0.57	0.60	0.59	0.54	0.52	0.47	0.49	0.55

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

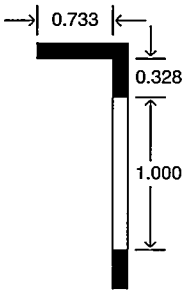
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	23/15	58/40	74/53	66/47	36/25	38/24	74/50	95/67	97/71	79/57	14/8	51/31	75/48	76/49	54/36	1/1	23/16	35/25	26/18	3/3
North	7/6	12/14	14/17	13/15	9/10	20/13	14/16	16/18	16/18	15/17	5/4	11/11	14/15	14/15	12/12	1/0	7/7	9/10	8/8	2/2
East	64/23	68/36	24/21	13/15	9/10	76/33	81/47	47/35	16/18	15/17	48/15	75/35	43/28	14/15	12/12	4/1	40/16	12/11	8/8	2/2
South	27/12	71/38	92/53	82/46	45/22	10/9	31/24	55/40	57/43	38/29	10/5	51/26	79/44	81/46	55/31	3/1	63/23	87/36	69/28	13/4
West	7/6	12/14	14/17	55/34	73/33	10/9	14/16	16/18	36/30	75/50	5/4	11/11	14/15	36/25	72/38	1/0	7/7	9/10	38/18	15/5
M. Clr (%hrs)	30	28	25	25	27	40	39	38	34	35	45	44	43	43	42	29	30	29	32	34

Fargo, ND

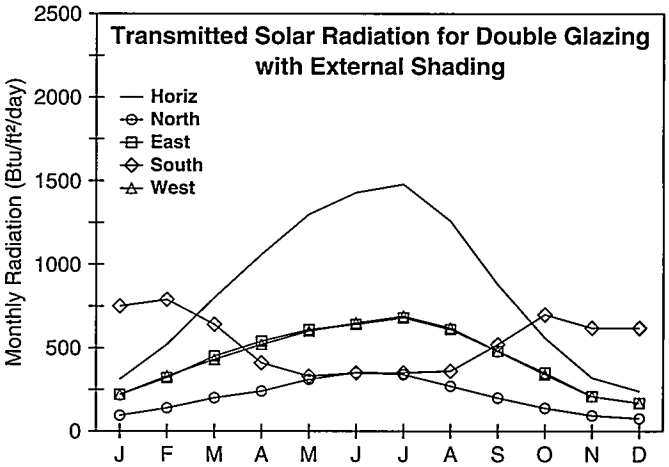
WBAN NO. 14914

LATITUDE: 46.90° N
LONGITUDE: 96.80° W
ELEVATION: 899 feet
MEAN PRESSURE: 14.3 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	510	800	1160	1490	1810	1970	2040	1750	1260	840	500	400	1210
	Std.Dev.	37	72	110	159	184	139	102	115	109	69	43	31	37
	Minimum	420	600	930	1210	1280	1790	1840	1540	1020	700	410	320	1160
	Maximum	570	930	1410	1800	2080	2260	2250	1970	1470	990	570	460	1310
	Diffuse	280	420	590	670	760	810	730	630	520	370	280	230	520
	Clear-Day Global	650	1020	1540	2100	2510	2660	2560	2200	1680	1110	690	540	1610
North	Global	170	250	350	430	550	640	610	470	340	240	170	140	360
	Diffuse	170	250	350	420	490	530	510	430	340	240	170	140	340
	Clear-Day Global	140	210	290	410	590	710	650	450	310	220	150	120	350
East	Global	380	560	770	940	1090	1150	1210	1070	820	590	360	290	770
	Diffuse	220	320	440	510	590	630	620	540	420	300	210	170	410
	Clear-Day Global	570	820	1120	1380	1540	1590	1540	1390	1170	860	600	490	1090
South	Global	1030	1180	1210	1090	990	930	1020	1130	1150	1130	870	840	1050
	Diffuse	350	460	540	550	580	600	590	550	480	390	310	290	470
	Clear-Day Global	1820	2020	1970	1640	1330	1170	1220	1460	1780	1900	1790	1700	1650
West	Global	380	560	750	910	1070	1160	1220	1080	820	580	360	300	770
	Diffuse	220	320	440	520	600	640	630	550	430	300	210	170	420
	Clear-Day Global	570	820	1120	1380	1540	1590	1540	1390	1170	860	600	490	1090

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

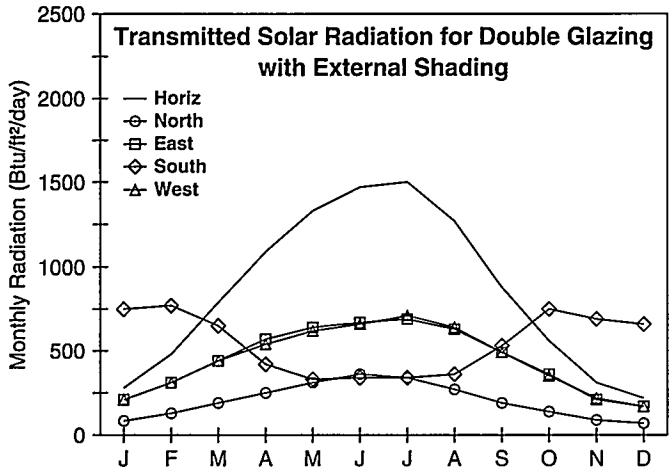
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	310	520	800	1060	1300	1430	1480	1260	880	560	320	240	850
North	Unshaded	120	170	240	290	360	420	400	310	240	170	120	95	240
	Shaded	95	140	200	240	310	350	340	270	200	140	95	77	210
East	Unshaded	260	390	550	670	780	830	860	770	590	410	250	200	550
	Shaded	220	320	450	540	610	640	680	610	480	350	210	170	440
South	Unshaded	780	880	860	730	640	580	640	740	800	820	660	640	730
	Shaded	750	790	640	410	330	350	350	360	520	700	620	620	530
West	Unshaded	260	390	530	650	760	840	880	780	590	410	250	200	550
	Shaded	220	330	430	520	600	650	690	620	480	340	210	170	440

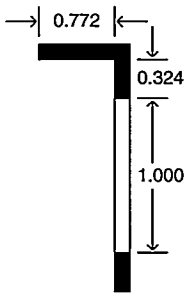
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	5.9	12.0	25.9	43.0	56.2	65.5	71.1	68.8	57.7	45.7	28.1	11.6	41.0
Daily Minimum Temp	-3.6	2.7	17.3	32.1	43.8	53.6	58.8	56.4	45.9	34.6	19.4	3.1	30.3
Daily Maximum Temp	15.4	21.1	34.6	53.8	68.5	77.4	83.4	81.3	69.4	56.7	36.8	20.1	51.5
Record Minimum Temp	-35.0	-34.0	-23.0	-7.0	20.0	30.0	36.0	33.0	19.0	7.0	-24.0	-32.0	-35.0
Record Maximum Temp	52.0	66.0	78.0	100.0	98.0	99.0	106.0	106.0	102.0	93.0	74.0	57.0	106.0
HDD, Base 65°F	1832	1484	1212	660	307	93	19	48	239	598	1107	1655	9254
CDD, Base 65°F	0	0	0	0	35	108	209	165	20	0	0	0	537
Humidity Ratio (#w/#da)	0.0011	0.0015	0.0025	0.0039	0.0060	0.0092	0.0112	0.0102	0.0072	0.0046	0.0026	0.0014	0.0051
Wind Speed (mph)	12.3	12.0	12.6	13.0	12.0	11.0	10.0	10.4	11.0	11.8	11.6	11.5	11.6
Clearness Index, Kt	0.52	0.54	0.53	0.51	0.53	0.53	0.57	0.56	0.51	0.48	0.44	0.47	0.53

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	27/18	59/41	72/51	61/42	30/21	42/27	76/51	95/64	93/66	72/52	19/11	54/32	74/47	72/47	49/32	3/3	25/17	34/23	23/15	1/0
North	8/7	12/14	14/17	13/15	8/9	17/13	15/16	16/18	16/18	15/16	6/5	12/12	14/15	14/15	11/12	2/1	7/7	9/9	7/7	0/0
East	67/26	62/35	17/18	13/15	8/9	78/36	77/45	40/30	16/18	15/16	56/18	72/32	36/24	14/15	11/12	14/4	37/15	9/9	7/7	0/0
South	33/15	74/39	91/50	76/40	37/18	10/10	35/26	56/39	55/40	33/26	15/7	55/26	79/42	77/43	50/26	12/3	66/23	84/33	61/22	2/1
West	8/7	12/14	14/17	58/33	67/29	10/10	15/16	16/18	42/32	75/48	6/5	12/12	14/15	42/27	72/35	2/1	7/7	11/10	39/16	2/1
M. Clr (%hrs)	30	28	26	25	27	38	36	32	30	34	41	41	36	35	38	28	29	27	28	34





Shading Geometry
(Not to Scale)

Minot, ND

WBAN NO. 24013

LATITUDE: 48.27° N
LONGITUDE: 101.28° W
ELEVATION: 1713 feet
MEAN PRESSURE: 13.8 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	470	750	1140	1540	1850	2030	2080	1770	1260	850	500	380	1220
	Std.Dev.	35	62	88	156	169	168	108	118	119	68	43	25	37
	Minimum	360	570	930	1220	1480	1720	1860	1530	1040	700	410	310	1160
	Maximum	530	840	1310	1850	2150	2330	2230	1960	1480	990	590	430	1310
	Diffuse	250	400	550	670	750	770	690	600	490	350	260	200	500
	Clear-Day Global	590	960	1500	2100	2520	2690	2580	2200	1660	1080	650	490	1590
North	Global	150	230	340	440	570	650	620	470	340	240	160	130	360
	Diffuse	150	230	340	420	500	530	500	430	330	240	160	130	330
	Clear-Day Global	130	190	280	400	600	740	660	460	300	210	140	110	350
East	Global	370	530	770	1000	1140	1210	1250	1120	840	610	370	290	790
	Diffuse	200	300	420	520	590	620	610	530	410	300	200	160	410
	Clear-Day Global	560	810	1130	1420	1590	1650	1590	1450	1190	860	580	470	1110
South	Global	1020	1150	1250	1160	1040	990	1070	1190	1200	1210	950	890	1090
	Diffuse	330	440	520	560	590	590	580	550	470	390	310	280	470
	Clear-Day Global	1800	2020	2000	1700	1380	1220	1270	1520	1820	1950	1800	1680	1680
West	Global	370	540	770	950	1110	1200	1280	1130	840	600	380	300	790
	Diffuse	200	310	430	530	600	630	620	540	420	300	200	160	410
	Clear-Day Global	560	810	1130	1420	1590	1650	1590	1450	1190	860	580	470	1110

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	280	480	790	1090	1330	1470	1500	1270	880	560	310	220	850
North	Unshaded	110	160	230	300	370	430	400	310	230	160	110	87	240
	Shaded	85	130	190	250	310	360	340	270	190	140	89	70	200
East	Unshaded	250	370	540	720	820	870	890	800	600	430	250	200	560
	Shaded	210	310	440	570	640	670	690	630	490	360	210	170	450
South	Unshaded	770	860	890	790	670	620	670	780	840	890	720	680	770
	Shaded	750	770	650	420	330	340	340	360	530	750	690	660	550
West	Unshaded	250	380	550	680	800	860	920	810	600	420	260	200	560
	Shaded	210	310	440	540	620	660	710	640	490	350	220	170	450

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	9.0	14.8	26.8	42.2	54.4	64.2	69.9	67.9	56.3	45.2	27.9	13.6	41.0
Daily Minimum Temp	0.4	6.2	17.9	31.5	42.8	52.8	57.8	55.2	45.0	34.6	19.5	5.3	30.8
Daily Maximum Temp	17.6	23.4	35.5	52.8	65.9	75.6	82.0	80.5	67.6	55.7	36.2	21.8	51.2
Record Minimum Temp	-33.0	-31.0	-29.0	-5.1	19.0	33.1	42.1	34.0	21.0	6.1	-18.9	-36.0	-36.0
Record Maximum Temp	55.9	64.0	77.0	90.0	99.0	100.9	105.1	102.9	102.9	93.9	73.9	55.9	105.1
HDD, Base 65°F	1736	1406	1184	684	349	125	19	84	286	614	1113	1593	9193
CDD, Base 65°F	0	0	0	0	21	101	171	174	25	0	0	0	492
Humidity Ratio (#w/#da)	0.0012	0.0016	0.0024	0.0035	0.0054	0.0081	0.0096	0.0087	0.0062	0.0041	0.0024	0.0015	0.0046
Wind Speed (mph)	13.6	12.5	12.7	12.9	12.5	11.3	10.6	10.9	11.9	12.5	11.8	12.6	12.1
Clearness Index, Kt	0.51	0.53	0.54	0.54	0.54	0.55	0.58	0.57	0.52	0.51	0.47	0.48	0.54

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

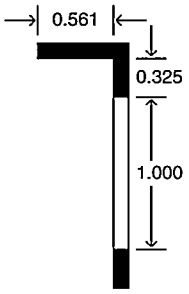
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	21/14	54/37	69/50	62/45	35/25	37/24	71/48	92/63	95/69	77/56	13/8	48/30	71/44	73/46	54/35	0/0	20/14	32/22	23/16	3/3
North	7/6	11/13	13/16	12/15	9/10	19/13	14/15	16/18	16/18	15/16	5/4	11/11	13/15	14/15	11/12	0/0	6/6	8/9	7/7	2/1
East	63/21	67/35	24/21	12/15	9/10	77/34	80/46	46/34	16/18	15/16	48/14	75/33	43/26	14/15	11/12	1/0	38/15	12/10	7/7	2/1
South	27/12	70/36	91/51	82/44	45/23	9/9	32/24	56/39	59/43	39/30	10/5	51/25	80/40	81/43	57/30	1/0	60/21	85/34	67/25	11/4
West	7/6	11/13	13/16	52/32	72/33	9/9	14/15	16/18	34/29	73/49	5/4	11/11	13/15	35/24	71/36	0/0	6/6	8/9	36/16	13/4
M. Clr (%hrs)	30	29	28	26	28	41	40	36	31	29	44	41	39	38	36	33	31	31	32	36

Grand Island, NE

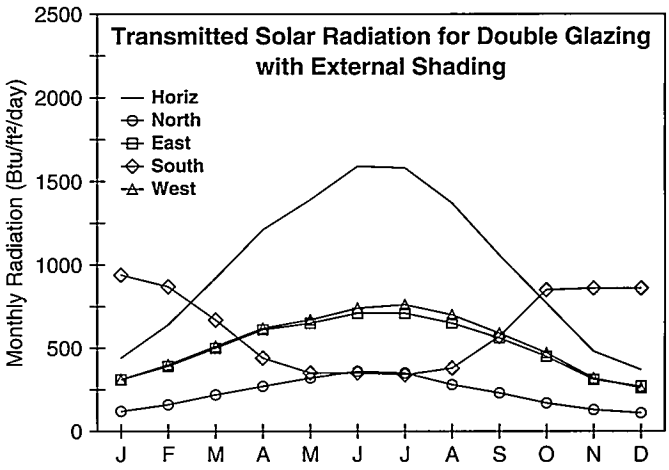
WBAN NO. 14935

LATITUDE: 40.97° N
LONGITUDE: 98.32° W
ELEVATION: 1857 feet
MEAN PRESSURE: 13.8 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	700	950	1300	1680	1920	2180	2160	1890	1490	1110	740	600	1400
	Std.Dev.	51	64	117	139	146	139	129	124	140	106	55	32	44
	Minimum	550	810	1050	1390	1520	1860	1890	1610	1170	910	610	550	1290
	Maximum	800	1040	1590	1890	2200	2360	2380	2080	1750	1290	850	670	1460
	Diffuse	280	410	550	650	760	740	690	620	520	390	310	260	520
	Clear-Day Global	880	1240	1740	2230	2560	2670	2590	2300	1860	1350	950	780	1770
North	Global	190	270	350	440	560	640	600	480	370	280	210	170	380
	Diffuse	190	270	350	430	490	520	500	440	360	280	210	170	350
	Clear-Day Global	180	230	320	420	590	690	640	460	340	260	190	160	370
East	Global	490	630	820	1000	1070	1190	1180	1070	900	730	510	430	840
	Diffuse	240	330	430	520	590	620	600	540	450	350	260	220	430
	Clear-Day Global	690	900	1170	1380	1490	1520	1490	1380	1200	950	720	620	1130
South	Global	1270	1270	1220	1080	900	850	900	1050	1210	1340	1190	1160	1120
	Diffuse	350	430	500	540	560	560	550	530	490	430	360	330	470
	Clear-Day Global	1960	2020	1870	1460	1120	950	1020	1280	1660	1920	1930	1890	1590
West	Global	500	650	820	1010	1110	1230	1260	1150	950	750	520	430	870
	Diffuse	240	330	440	530	600	630	610	550	460	350	260	220	440
	Clear-Day Global	690	900	1170	1380	1490	1520	1490	1380	1200	950	720	620	1130

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

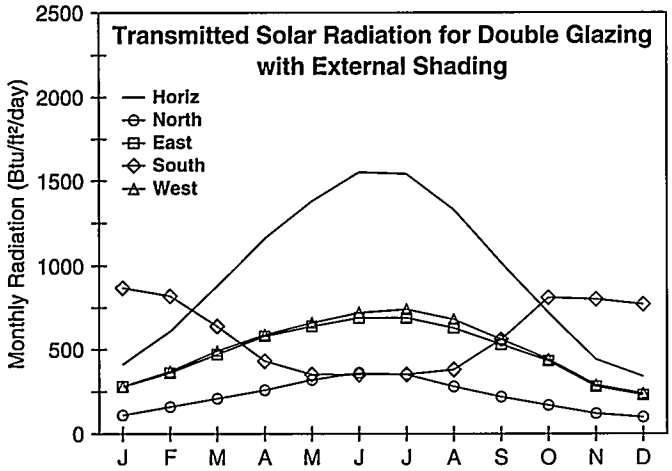
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	440	640	920	1210	1390	1590	1580	1370	1060	770	480	370	990
North	Unshaded	140	190	240	300	360	410	390	310	250	190	150	120	250
	Shaded	120	160	220	270	320	360	350	280	230	170	130	110	230
East	Unshaded	340	440	580	710	770	850	840	770	640	510	350	300	590
	Shaded	310	390	500	610	650	710	710	650	560	450	310	270	510
South	Unshaded	960	940	850	700	560	510	540	660	820	970	890	880	770
	Shaded	940	870	670	440	350	350	340	380	570	850	860	860	620
West	Unshaded	350	450	590	720	790	880	900	820	680	530	360	290	610
	Shaded	310	400	510	620	670	740	760	700	590	470	320	260	530

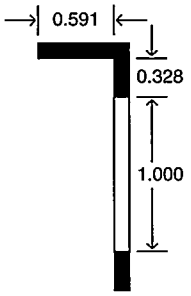
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	21.9	27.3	37.7	50.8	61.4	71.5	76.7	73.9	63.9	52.4	37.6	25.4	50.0
Daily Minimum Temp	11.1	16.4	26.3	38.1	49.4	59.3	64.8	62.0	51.6	39.2	26.2	14.9	38.3
Daily Maximum Temp	32.6	38.1	49.2	63.5	73.3	83.7	88.5	85.9	76.2	65.5	48.8	35.8	61.8
Record Minimum Temp	-28.0	-19.0	-21.0	7.0	23.0	38.0	42.0	40.0	23.0	16.0	-11.0	-26.0	-28.0
Record Maximum Temp	76.0	77.0	90.0	96.0	101.0	107.0	109.0	110.0	104.0	96.0	82.0	76.0	110.0
HDD, Base 65°F	1336	1056	846	430	171	18	0	12	107	395	822	1228	6421
CDD, Base 65°F	0	0	0	0	59	213	363	288	74	0	0	0	997
Humidity Ratio (#w/#da)	0.0019	0.0023	0.0033	0.0050	0.0078	0.0107	0.0129	0.0121	0.0089	0.0054	0.0034	0.0022	0.0063
Wind Speed (mph)	12.0	11.8	13.4	13.8	12.5	11.6	10.4	10.1	10.7	11.0	11.6	11.7	11.7
Clearness Index, Kt	0.53	0.53	0.54	0.55	0.55	0.59	0.60	0.58	0.56	0.55	0.51	0.51	0.56

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	29/18	65/43	81/55	71/47	37/25	38/26	77/55	100/71	100/75	78/58	18/11	59/34	83/49	82/53	57/37	6/4	35/23	46/31	34/22	6/4
North	8/7	13/14	14/17	13/15	9/9	21/14	15/16	16/18	16/18	15/17	6/5	12/13	15/17	15/17	12/13	3/2	9/9	10/11	9/9	3/2
East	72/25	67/35	20/20	13/15	9/9	74/36	79/50	44/34	16/18	15/17	56/16	77/33	41/26	15/17	12/13	27/7	46/22	11/11	9/9	3/2
South	31/14	70/36	86/49	75/41	40/20	10/10	27/23	47/36	47/38	28/24	13/6	51/25	76/38	75/42	50/28	21/6	76/32	93/42	76/32	19/6
West	8/7	13/14	14/17	59/34	75/34	10/10	15/16	16/18	40/34	77/53	6/5	12/13	15/17	42/28	76/38	3/2	9/9	11/11	47/22	25/8
M. Clr (%hrs)	35	35	33	32	33	44	46	47	45	48	48	49	51	51	51	39	38	38	36	37





Shading Geometry
(Not to Scale)

Norfolk, NE

WBAN NO. 14941

LATITUDE: 41.98° N
LONGITUDE: 97.43° W
ELEVATION: 1545 feet
MEAN PRESSURE: 13.9 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	650	900	1250	1620	1900	2130	2120	1840	1440	1050	680	540	1350
	Std.Dev.	43	60	103	148	141	140	107	115	140	84	49	31	41
	Minimum	540	790	1030	1340	1540	1840	1900	1600	1140	900	560	500	1270
	Maximum	730	1030	1430	1840	2170	2370	2320	2010	1740	1230	780	620	1430
	Diffuse	290	420	570	680	780	770	720	650	540	400	310	270	530
	Clear-Day Global	840	1200	1700	2210	2550	2670	2580	2270	1820	1310	890	730	1730
North	Global	190	260	350	440	560	640	600	480	370	280	200	170	380
	Diffuse	190	260	350	430	500	530	510	450	360	280	200	170	350
	Clear-Day Global	170	230	310	420	590	700	640	460	340	250	180	150	370
East	Global	460	600	780	950	1080	1170	1170	1040	870	690	470	390	810
	Diffuse	240	330	430	520	600	630	610	550	450	340	250	210	430
	Clear-Day Global	660	880	1150	1370	1490	1520	1490	1370	1190	930	690	590	1110
South	Global	1180	1210	1190	1060	920	870	920	1050	1190	1280	1100	1040	1080
	Diffuse	360	440	510	550	570	570	570	550	500	430	360	330	480
	Clear-Day Global	1920	2010	1880	1490	1160	1000	1050	1310	1670	1910	1890	1850	1590
West	Global	470	610	800	980	1100	1210	1230	1120	920	710	480	390	830
	Diffuse	240	330	440	530	610	640	620	560	460	350	250	210	440
	Clear-Day Global	660	880	1150	1370	1490	1520	1490	1370	1190	930	690	590	1110

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	410	610	880	1160	1380	1550	1540	1330	1020	720	440	340	950
North	Unshaded	130	180	250	300	370	410	390	320	250	190	140	120	250
	Shaded	110	160	210	260	320	360	350	280	220	170	120	100	220
East	Unshaded	310	420	550	680	770	830	830	750	620	490	320	260	570
	Shaded	280	360	470	580	640	690	690	630	530	430	280	230	490
South	Unshaded	890	890	830	700	570	520	550	670	810	930	830	790	750
	Shaded	870	820	640	430	350	350	350	380	560	810	800	770	590
West	Unshaded	320	430	570	700	790	870	880	800	660	500	330	270	590
	Shaded	280	370	490	590	660	720	740	680	560	440	290	240	510

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	19.0	24.4	35.7	49.7	60.9	70.3	75.4	72.6	63.1	51.4	36.2	22.8	48.5
Daily Minimum Temp	8.4	14.1	25.0	37.6	49.2	58.6	64.0	61.2	51.1	38.6	25.5	12.8	37.2
Daily Maximum Temp	29.6	34.7	46.3	61.6	72.6	82.1	86.8	83.8	75.1	64.1	46.9	32.7	59.7
Record Minimum Temp	-27.0	-26.0	-20.0	2.0	24.0	38.0	42.0	40.0	26.0	13.0	-15.0	-30.0	-30.0
Record Maximum Temp	71.0	73.0	88.0	95.0	103.0	106.0	113.0	107.0	101.0	95.0	82.0	71.0	113.0
HDD, Base 65°F	1426	1137	908	459	183	22	0	16	124	426	864	1308	6873
CDD, Base 65°F	0	0	0	0	56	181	322	251	67	0	0	0	877
Humidity Ratio (#w/#da)	0.0017	0.0021	0.0031	0.0047	0.0073	0.0104	0.0126	0.0121	0.0086	0.0053	0.0033	0.0021	0.0061
Wind Speed (mph)	12.5	11.9	13.4	13.6	12.2	10.9	9.9	9.8	10.7	11.1	12.0	12.1	11.7
Clearness Index, Kt	0.51	0.52	0.53	0.53	0.54	0.58	0.59	0.57	0.54	0.53	0.49	0.48	0.55

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	29/18	64/41	79/53	68/44	35/23	39/26	77/54	99/70	99/74	76/56	19/11	58/34	82/48	80/51	55/35	6/4	33/21	44/29	31/20	4/3
North	8/7	13/14	14/17	13/15	9/9	20/14	15/17	16/18	16/19	15/17	6/5	12/13	15/16	15/17	12/13	3/2	9/9	10/11	8/8	2/2
East	70/24	64/33	18/19	13/15	9/9	75/36	78/49	42/33	16/19	15/17	55/15	75/32	39/25	15/17	12/13	25/6	44/19	10/11	8/8	2/2
South	32/13	70/35	86/47	74/39	38/19	10/10	29/24	49/37	48/39	29/24	14/7	52/25	77/38	75/41	49/26	20/5	74/28	90/38	71/27	14/5
West	8/7	13/14	14/17	59/33	73/31	10/10	15/17	16/18	42/35	77/52	6/5	12/13	15/16	43/28	75/36	3/2	9/9	12/11	45/19	18/6
M. Clr (%hrs)	33	33	31	32	31	41	45	45	40	43	48	47	49	47	51	35	35	33	35	35

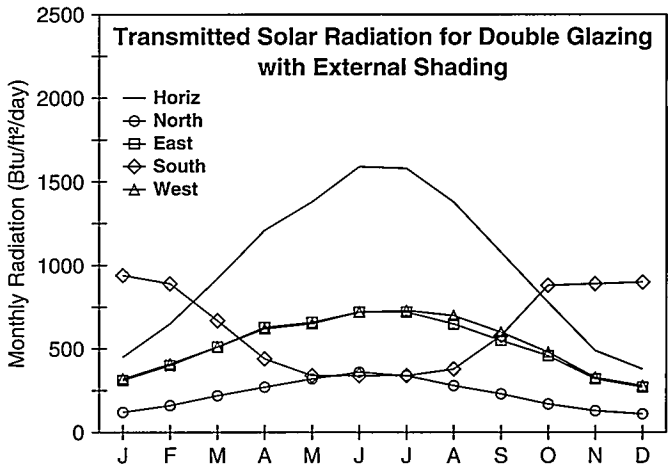
North Platte, NE

WBAN NO. 24023

LATITUDE: 41.13° N
LONGITUDE: 100.68° W
ELEVATION: 2786 feet
MEAN PRESSURE: 13.3 psia

STATION TYPE: Secondary

Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	700	960	1310	1680	1900	2170	2160	1890	1510	1130	750	610	1400
	Std.Dev.	50	56	101	112	124	134	100	96	135	101	47	33	35
	Minimum	580	820	1100	1480	1670	1880	1970	1690	1220	860	640	550	1320
	Maximum	800	1040	1520	1870	2210	2370	2330	2130	1740	1270	830	680	1470
	Diffuse	300	410	560	660	750	720	670	610	500	380	310	260	510
	Clear-Day Global	890	1250	1760	2270	2590	2710	2620	2320	1880	1360	950	780	1790
North	Global	200	270	360	440	550	630	590	470	360	280	210	180	380
	Diffuse	200	270	360	430	490	520	500	440	360	280	210	180	350
	Clear-Day Global	180	230	310	420	590	710	640	470	330	250	180	160	370
East	Global	500	650	830	1020	1090	1200	1200	1080	900	740	510	440	850
	Diffuse	250	330	440	530	590	610	590	540	440	350	260	220	430
	Clear-Day Global	710	920	1200	1420	1530	1550	1520	1420	1230	970	730	630	1150
South	Global	1280	1300	1230	1080	900	850	910	1060	1240	1390	1220	1210	1140
	Diffuse	370	440	520	540	560	550	540	530	490	430	370	340	470
	Clear-Day Global	1990	2060	1900	1480	1130	960	1020	1290	1680	1950	1970	1930	1610
West	Global	510	660	830	1010	1070	1210	1230	1140	970	770	530	450	870
	Diffuse	250	340	450	530	600	620	600	550	450	350	260	220	440
	Clear-Day Global	710	920	1200	1420	1530	1550	1520	1420	1230	970	730	630	1150

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

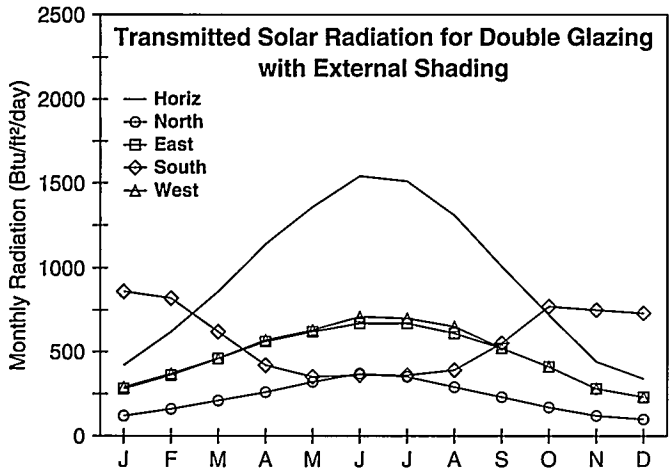
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	450	650	920	1210	1380	1590	1580	1380	1080	780	490	380	990
North	Unshaded	140	190	250	300	360	410	380	310	250	190	150	120	250
	Shaded	120	160	220	270	320	360	340	280	230	170	130	110	230
East	Unshaded	340	450	590	730	780	860	850	770	640	530	360	300	600
	Shaded	310	400	510	630	660	720	720	650	550	460	320	270	520
South	Unshaded	960	960	860	710	560	500	540	670	840	1000	920	920	790
	Shaded	940	890	670	440	340	340	340	380	580	880	890	900	630
West	Unshaded	350	460	590	720	770	860	870	820	690	540	370	310	610
	Shaded	320	410	510	620	650	720	730	700	600	480	330	280	530

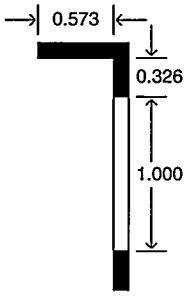
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	21.6	27.6	36.5	48.2	58.2	67.9	74.0	71.8	61.4	49.7	35.4	24.2	48.0
Daily Minimum Temp	8.6	14.3	23.0	33.9	44.6	54.1	60.1	57.6	46.2	33.5	21.3	11.2	34.0
Daily Maximum Temp	34.6	40.9	49.9	62.5	71.8	81.7	87.8	86.0	76.6	65.7	49.5	37.2	62.0
Record Minimum Temp	-23.0	-22.0	-22.0	7.0	19.0	29.0	40.0	35.0	17.0	10.0	-13.0	-34.0	-34.0
Record Maximum Temp	73.0	79.0	86.0	94.0	97.0	107.0	112.0	105.0	102.0	94.0	82.0	75.0	112.0
HDD, Base 65°F	1345	1047	884	504	234	49	0	11	158	474	888	1265	6859
CDD, Base 65°F	0	0	0	0	23	136	282	222	50	0	0	0	713
Humidity Ratio (#w/#da)	0.0019	0.0023	0.0030	0.0044	0.0071	0.0101	0.0119	0.0112	0.0079	0.0048	0.0030	0.0020	0.0058
Wind Speed (mph)	9.4	9.7	11.7	12.6	11.4	10.1	9.6	9.2	9.6	9.4	9.4	9.1	10.1
Clearness Index, Kt	0.54	0.54	0.54	0.55	0.54	0.59	0.60	0.59	0.57	0.56	0.52	0.52	0.56

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	26/16	64/42	81/56	72/50	40/28	35/24	75/52	99/71	100/74	80/60	15/9	56/34	82/52	83/56	60/40	5/4	33/22	46/32	36/24	8/6
North	7/7	12/14	14/17	14/16	10/10	22/14	14/16	16/18	16/18	15/17	6/4	12/12	15/16	15/17	12/13	2/2	8/8	10/11	9/9	4/3
East	70/25	70/37	25/22	14/16	10/10	74/34	81/50	47/36	16/18	15/17	51/16	78/35	45/29	15/17	12/13	21/6	48/23	13/12	9/9	4/3
South	28/13	68/36	86/50	77/44	44/23	9/9	25/21	46/36	48/38	30/26	10/5	49/24	75/42	76/47	52/31	16/5	73/32	94/45	79/35	26/9
West	7/7	12/14	14/17	55/35	76/37	9/9	14/16	16/18	36/31	75/53	6/4	12/12	15/16	38/28	75/40	2/2	8/8	10/11	45/23	32/11
M. Clr (%hrs)	32	32	31	29	29	44	46	46	46	43	44	47	50	50	52	38	38	37	39	40





Shading Geometry
(Not to Scale)

Omaha, NE

WBAN NO. 94918

LATITUDE: 41.37° N
LONGITUDE: 96.52° W
ELEVATION: 1326 feet
MEAN PRESSURE: 14.2 psia

STATION TYPE: Primary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	660	910	1230	1590	1870	2110	2070	1810	1410	1040	670	540	1330
	Std.Dev.	55	76	140	143	132	127	122	118	136	115	60	41	55
	Minimum	490	730	870	1230	1590	1800	1810	1610	1130	740	490	460	1180
	Maximum	740	1050	1430	1810	2110	2330	2330	2030	1710	1230	810	600	1410
	Diffuse	300	420	560	690	820	850	820	720	570	410	320	270	560
	Clear-Day Global	850	1210	1700	2200	2520	2650	2560	2260	1820	1310	910	740	1730
North	Global	190	260	340	440	560	640	600	490	370	280	200	170	380
	Diffuse	190	260	340	430	500	550	530	460	370	280	200	170	360
	Clear-Day Global	170	230	320	420	580	690	640	460	340	260	180	150	370
East	Global	450	590	760	920	1050	1140	1120	1010	850	670	460	380	780
	Diffuse	240	330	420	520	600	650	640	560	450	340	250	210	430
	Clear-Day Global	670	880	1140	1350	1470	1500	1470	1350	1170	920	690	590	1100
South	Global	1170	1200	1140	1020	900	860	900	1020	1140	1230	1040	990	1050
	Diffuse	360	430	490	540	580	590	590	570	500	430	350	320	480
	Clear-Day Global	1920	1990	1850	1470	1140	980	1040	1290	1660	1880	1880	1830	1570
West	Global	470	610	760	930	1060	1190	1170	1070	860	670	450	380	800
	Diffuse	240	330	430	530	620	660	650	580	460	350	250	210	440
	Clear-Day Global	670	880	1140	1350	1470	1500	1470	1350	1170	920	690	590	1100

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	420	620	860	1140	1360	1540	1510	1310	1010	720	440	340	940
North	Unshaded	140	180	240	300	370	420	390	320	260	190	140	120	260
	Shaded	120	160	210	260	320	370	350	290	230	170	120	100	230
East	Unshaded	310	410	540	650	750	810	800	720	600	470	310	260	550
	Shaded	280	360	460	560	620	670	670	610	520	410	280	230	470
South	Unshaded	880	880	800	670	560	520	550	650	780	890	780	750	730
	Shaded	860	820	620	420	350	360	360	390	550	770	750	730	580
West	Unshaded	320	420	540	670	750	850	840	770	610	470	310	260	570
	Shaded	290	370	460	570	630	710	700	650	520	410	280	230	490

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	20.5	25.9	37.7	51.4	62.4	71.9	76.5	73.9	64.8	53.6	38.7	24.4	50.1
Daily Minimum Temp	11.2	16.6	27.8	40.3	51.8	61.4	66.5	63.8	54.7	43.0	29.7	15.9	40.2
Daily Maximum Temp	29.7	35.0	47.6	62.4	72.8	82.4	86.5	84.0	74.9	64.0	47.7	32.9	60.0
Record Minimum Temp	-23.0	-21.0	-16.0	5.0	27.0	38.0	44.0	43.0	25.0	13.0	-9.0	-23.0	-23.0
Record Maximum Temp	69.0	78.0	89.0	97.0	99.0	105.0	114.0	110.0	104.0	96.0	80.0	72.0	114.0
HDD, Base 65°F	1380	1095	846	414	155	11	0	11	90	363	789	1259	6413
CDD, Base 65°F	0	0	0	6	75	218	357	287	84	10	0	0	1037
Humidity Ratio (#w/#da)	0.0019	0.0023	0.0034	0.0052	0.0081	0.0115	0.0138	0.0130	0.0098	0.0061	0.0038	0.0023	0.0068
Wind Speed (mph)	10.3	10.3	11.4	11.6	9.9	9.0	8.2	8.1	8.7	9.1	10.0	10.0	9.7
Clearness Index, Kt	0.51	0.52	0.51	0.52	0.54	0.57	0.58	0.56	0.53	0.52	0.47	0.47	0.53

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

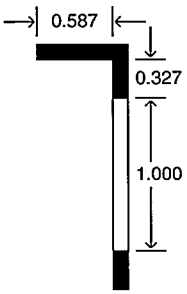
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	31/17	67/40	81/51	69/43	34/21	40/26	79/54	101/75	99/75	76/57	19/11	58/35	83/51	80/51	54/34	7/5	34/21	45/28	31/19	4/3
North	8/7	13/14	15/17	14/15	9/8	20/14	16/17	17/19	17/19	16/17	7/5	13/13	16/17	16/17	13/12	3/2	9/8	10/11	8/8	2/2
East	70/22	64/32	17/17	14/15	9/8	73/33	77/47	41/34	17/19	16/17	51/15	72/32	38/25	16/17	13/12	27/7	43/18	10/11	8/8	2/2
South	32/13	71/34	87/44	74/37	36/16	11/10	30/24	49/39	48/39	28/24	14/6	51/25	76/40	74/40	47/25	22/6	74/27	89/37	70/26	13/4
West	8/7	13/14	15/17	61/33	72/27	11/10	16/17	17/19	44/36	77/52	7/5	13/13	16/17	45/29	74/35	3/2	9/8	13/12	46/19	16/5
M. Clr (%hrs)	35	32	32	29	30	39	42	40	38	40	48	47	45	45	46	35	33	32	30	34

Scottsbluff, NE

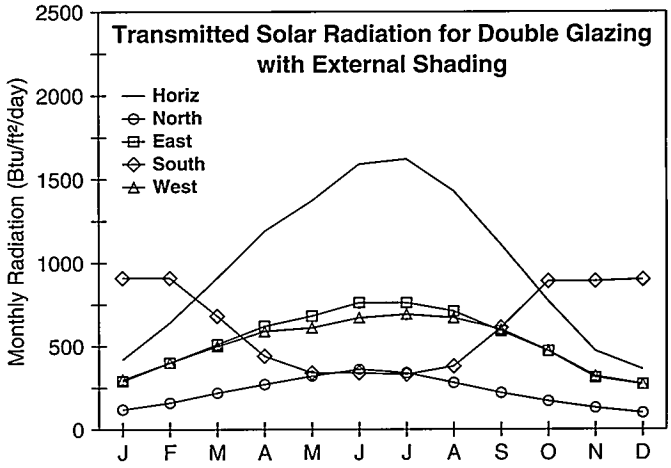
WBAN NO. 24028

LATITUDE: 41.87° N
LONGITUDE: 103.60° W
ELEVATION: 3957 feet
MEAN PRESSURE: 12.7 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	670	950	1300	1660	1890	2180	2210	1960	1550	1120	730	590	1400
	Std.Dev.	40	47	72	117	123	123	68	77	107	72	32	36	28
	Minimum	590	850	1150	1500	1720	1930	2070	1790	1350	960	660	520	1350
	Maximum	730	1050	1430	1880	2110	2350	2300	2120	1730	1230	800	670	1450
	Diffuse	290	390	560	670	740	690	620	560	470	370	300	250	490
	Clear-Day Global	870	1220	1740	2270	2610	2740	2640	2330	1880	1350	930	760	1780
North	Global	190	260	360	440	550	630	590	470	350	270	210	170	380
	Diffuse	190	260	350	430	490	510	480	430	350	270	210	170	350
	Clear-Day Global	170	230	300	410	590	720	650	470	330	250	180	150	370
East	Global	480	650	840	1030	1130	1280	1280	1190	970	760	510	440	880
	Diffuse	240	330	440	530	580	600	580	530	430	340	250	220	420
	Clear-Day Global	700	910	1200	1440	1560	1590	1550	1440	1250	980	720	620	1160
South	Global	1240	1330	1240	1090	910	870	940	1120	1310	1400	1230	1210	1150
	Diffuse	360	430	520	550	550	540	530	520	480	420	360	330	470
	Clear-Day Global	2000	2060	1920	1520	1150	990	1040	1320	1720	1980	1970	1930	1630
West	Global	490	650	820	980	1030	1150	1180	1120	980	760	520	440	840
	Diffuse	250	330	450	530	590	600	580	540	440	340	260	210	430
	Clear-Day Global	700	910	1200	1440	1560	1590	1550	1440	1250	980	720	620	1160

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	420	640	910	1190	1370	1590	1620	1430	1110	770	470	360	990
North	Unshaded	130	180	250	300	360	410	380	310	240	190	140	120	250
	Shaded	120	160	220	270	320	360	340	280	220	170	130	100	220
East	Unshaded	330	450	590	740	810	910	920	850	690	530	350	300	620
	Shaded	290	400	510	620	680	760	760	710	590	470	310	270	530
South	Unshaded	940	980	870	720	560	520	560	710	890	1010	920	920	800
	Shaded	910	910	680	440	340	340	330	380	610	890	890	900	630
West	Unshaded	340	460	580	690	730	810	830	790	700	530	360	300	590
	Shaded	300	400	500	590	610	670	690	670	600	470	320	270	510

Average Climatic Conditions

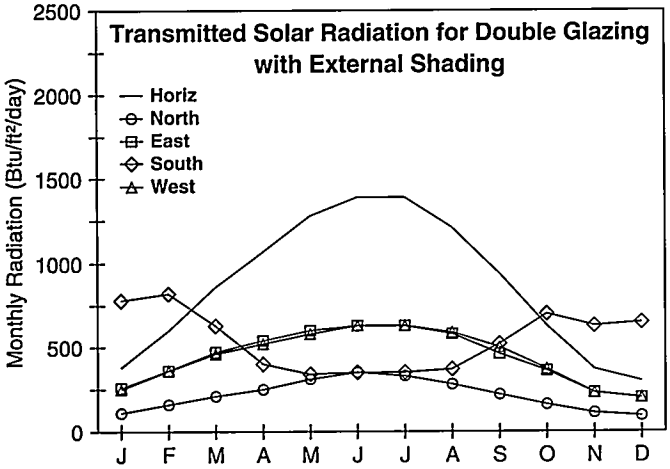
Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	24.9	30.2	36.2	46.5	56.4	67.3	74.2	71.6	61.4	49.6	36.3	26.2	48.4
Daily Minimum Temp	11.8	16.8	22.1	31.5	41.8	52.7	58.7	56.0	45.6	33.7	22.4	12.9	33.8
Daily Maximum Temp	37.9	43.6	50.3	61.4	70.9	82.0	89.7	87.2	77.2	65.5	50.2	39.5	63.0
Record Minimum Temp	-32.0	-28.0	-27.0	-8.0	15.0	30.0	40.0	39.0	19.0	-6.0	-13.0	-42.0	-42.0
Record Maximum Temp	74.0	77.0	87.0	92.0	95.0	106.0	109.0	104.0	101.0	92.0	80.0	77.0	109.0
HDD, Base 65°F	1243	974	893	555	278	61	0	9	175	477	861	1203	6729
CDD, Base 65°F	0	0	0	0	12	130	290	214	67	0	0	0	713
Humidity Ratio (#w/#da)	0.0020	0.0023	0.0029	0.0040	0.0061	0.0086	0.0105	0.0099	0.0068	0.0042	0.0029	0.0021	0.0052
Wind Speed (mph)	11.4	11.3	12.4	12.8	11.8	10.5	9.3	8.9	9.4	9.6	10.0	10.5	10.6
Clearness Index, Kt	0.53	0.55	0.54	0.55	0.54	0.59	0.61	0.61	0.59	0.57	0.52	0.52	0.57

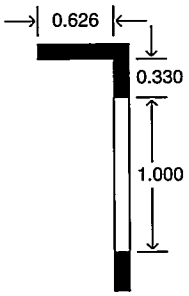
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	42/27	73/48	79/56	61/42	24/16	53/35	86/62	101/75	95/68	67/46	32/18	68/44	85/57	76/51	45/29	15/10	40/27	44/30	25/17	0/0
North	10/10	13/16	14/17	12/14	7/7	15/14	15/17	16/18	16/17	13/14	8/8	13/15	15/17	14/15	10/11	5/5	9/10	10/11	7/7	0/0
East	79/34	54/33	14/17	12/14	7/7	86/42	70/48	27/25	16/17	13/14	76/25	69/38	24/21	14/15	10/11	44/17	37/21	10/11	7/7	0/0
South	46/23	80/43	87/52	67/38	26/12	11/12	36/29	50/40	44/34	20/18	26/12	62/35	79/49	70/43	39/22	43/16	86/39	91/45	62/26	0/0
West	10/10	13/16	26/23	70/39	66/24	11/12	15/17	16/18	54/41	82/48	8/8	13/15	15/17	56/36	80/38	5/5	9/10	24/17	49/22	0/0
M. Clr (%hrs)	33	32	27	25	31	54	54	51	43	35	53	56	54	54	52	37	38	38	39	40

Concord, NH

WBAN NO. 14745





Shading Geometry
(Not to Scale)

LATITUDE: 43.20° N
LONGITUDE: 71.50° W
ELEVATION: 345 feet
MEAN PRESSURE: 14.5 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±11%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	600	890	1230	1490	1780	1920	1920	1680	1320	920	570	480	1240
	Std.Dev.	47	75	98	119	154	143	106	77	91	62	40	36	39
	Minimum	510	720	1000	1260	1480	1610	1740	1550	1170	810	450	400	1170
	Maximum	690	1080	1430	1680	2080	2170	2100	1870	1490	1140	630	550	1290
	Diffuse	310	450	600	690	800	850	820	720	570	420	310	260	570
	Clear-Day Global	770	1140	1650	2160	2520	2650	2560	2240	1760	1230	820	660	1680
North	Global	190	270	360	430	550	620	580	470	360	270	190	160	370
	Diffuse	190	270	360	420	500	530	510	450	360	270	190	160	350
	Clear-Day Global	170	240	320	410	580	690	630	470	340	250	170	150	370
East	Global	430	600	780	910	1030	1090	1080	980	790	590	380	340	750
	Diffuse	240	340	450	510	590	630	620	550	440	330	230	200	430
	Clear-Day Global	610	850	1130	1350	1490	1530	1490	1380	1160	880	630	540	1090
South	Global	1060	1210	1170	1000	890	840	890	1000	1110	1110	880	880	1000
	Diffuse	370	470	530	540	570	580	590	560	510	420	330	310	480
	Clear-Day Global	1800	1960	1880	1520	1200	1040	1090	1350	1690	1860	1780	1700	1570
West	Global	420	600	770	890	1000	1090	1080	1000	820	610	380	330	750
	Diffuse	240	340	450	520	600	640	630	560	460	330	230	200	430
	Clear-Day Global	610	850	1130	1350	1490	1530	1490	1380	1160	880	630	540	1090

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±11%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	380	600	860	1070	1280	1390	1390	1210	940	630	370	300	870
North	Unshaded	130	190	250	290	360	410	380	320	250	190	130	110	250
	Shaded	110	160	210	250	310	350	330	280	220	160	110	93	220
East	Unshaded	290	420	550	650	730	770	770	700	560	420	270	230	530
	Shaded	260	360	470	540	600	630	630	580	460	360	230	200	440
South	Unshaded	800	890	820	660	570	520	550	650	760	810	660	670	700
	Shaded	780	820	630	400	340	350	350	370	520	700	630	650	540
West	Unshaded	290	420	550	630	710	770	770	710	590	430	270	230	530
	Shaded	250	360	460	520	580	630	630	590	500	370	230	200	440

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	18.6	21.8	32.4	43.9	55.2	64.2	69.5	67.3	58.8	47.8	37.1	24.3	45.1
Daily Minimum Temp	7.4	10.4	22.1	31.5	41.4	51.2	56.5	54.7	46.0	34.9	27.0	14.4	33.1
Daily Maximum Temp	29.8	33.0	42.8	56.3	68.9	77.3	82.4	79.8	71.6	60.7	47.1	34.2	57.0
Record Minimum Temp	-33.0	-37.0	-16.0	8.0	21.0	30.0	35.0	29.0	21.0	10.0	-5.0	-22.0	-37.0
Record Maximum Temp	68.0	66.0	85.0	95.0	97.0	98.0	102.0	101.0	98.0	90.0	80.0	68.0	102.0
HDD, Base 65°F	1438	1210	1011	633	312	70	13	39	196	533	837	1262	7554
CDD, Base 65°F	0	0	0	0	8	46	153	111	10	0	0	0	328
Humidity Ratio (#w/#da)	0.0017	0.0018	0.0026	0.0038	0.0062	0.0092	0.0111	0.0107	0.0083	0.0053	0.0037	0.0022	0.0056
Wind Speed (mph)	6.8	7.2	7.8	7.8	6.8	6.5	5.7	5.3	5.4	5.7	6.8	6.8	6.6
Clearness Index, Kt	0.50	0.53	0.52	0.50	0.51	0.52	0.53	0.53	0.51	0.48	0.43	0.45	0.51

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±11%

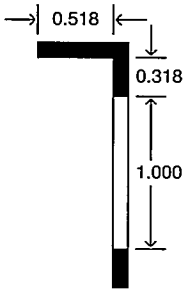
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	42/27	71/47	77/49	57/37	19/13	54/34	86/55	98/70	91/64	63/41	32/19	67/40	80/54	70/47	39/24	14/9	36/23	39/23	19/12	0/0
North	10/11	14/16	15/17	12/14	7/6	13/13	16/17	16/19	16/18	14/14	9/8	14/14	15/17	14/16	10/9	5/4	9/9	10/10	6/6	0/0
East	73/31	50/30	15/17	12/14	7/6	82/37	67/39	23/23	16/18	14/14	68/23	64/31	20/19	14/16	10/9	35/11	31/16	10/10	6/6	0/0
South	47/22	80/40	86/43	63/31	21/9	12/13	39/27	52/39	45/34	20/16	27/13	63/31	78/46	67/39	34/17	36/12	78/30	82/29	47/16	0/0
West	10/11	14/16	30/23	69/33	55/19	12/13	16/17	16/19	57/40	80/42	9/8	14/14	15/17	57/34	71/30	5/4	9/9	25/14	40/14	0/0
M. Clr (%hrs)	33	32	32	32	34	37	36	25	24	30	34	43	37	34	38	34	31	30	31	35

Atlantic City, NJ

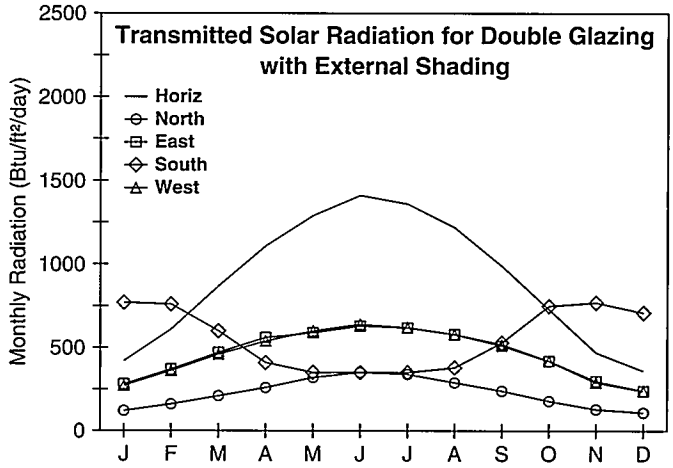
WBAN NO. 93730

LATITUDE: 39.45° N
LONGITUDE: 74.57° W
ELEVATION: 66 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	650	900	1230	1540	1780	1930	1870	1690	1390	1050	710	560	1280
	Std.Dev.	45	79	94	119	112	118	116	94	88	86	57	43	31
	Minimum	550	760	1040	1300	1620	1700	1620	1470	1240	870	590	470	1220
	Maximum	730	1070	1410	1770	2040	2140	2160	1890	1560	1210	830	640	1350
	Diffuse	300	410	540	690	820	860	850	750	610	430	320	270	570
	Clear-Day Global	920	1260	1730	2200	2490	2590	2510	2240	1830	1360	970	810	1740
North	Global	190	260	340	430	540	600	570	470	380	290	210	170	370
	Diffuse	190	260	340	430	500	530	510	460	380	290	210	170	360
	Clear-Day Global	180	240	320	430	570	670	620	470	360	270	190	160	370
East	Global	450	590	760	910	980	1050	1020	960	830	670	480	390	760
	Diffuse	240	320	420	520	590	630	620	560	470	360	260	210	430
	Clear-Day Global	700	900	1130	1320	1410	1430	1400	1300	1150	920	720	630	1080
South	Global	1050	1120	1090	960	830	770	800	920	1070	1190	1060	970	980
	Diffuse	340	410	480	530	570	570	570	560	520	440	360	310	470
	Clear-Day Global	1930	1950	1770	1400	1070	920	970	1220	1570	1830	1870	1850	1530
West	Global	440	580	750	890	990	1060	1030	960	830	670	470	390	760
	Diffuse	240	320	420	520	600	630	630	570	480	360	260	210	440
	Clear-Day Global	700	900	1130	1320	1410	1430	1400	1300	1150	920	720	630	1080

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

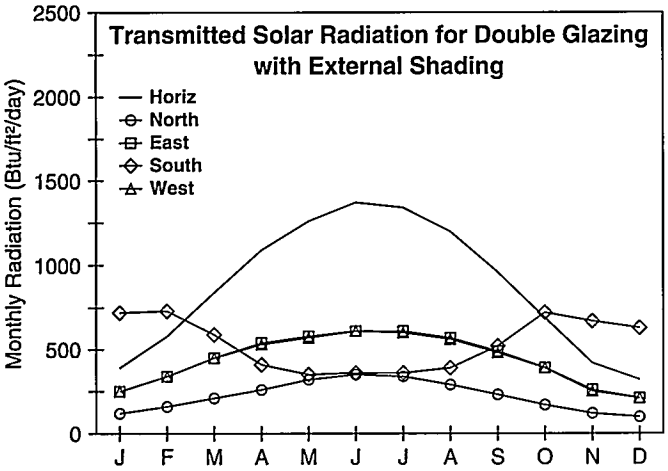
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	420	610	870	1110	1290	1410	1360	1220	990	730	470	360	900
North	Unshaded	140	180	240	300	360	390	380	320	260	200	150	120	250
	Shaded	120	160	210	260	320	350	340	290	240	180	130	110	220
East	Unshaded	310	410	540	650	690	740	720	680	590	470	330	270	530
	Shaded	280	370	470	560	590	630	620	580	510	420	300	240	470
South	Unshaded	790	820	760	620	510	470	490	590	720	850	790	730	680
	Shaded	770	760	600	410	350	350	350	380	530	750	770	710	560
West	Unshaded	300	400	530	630	700	750	730	680	590	470	320	260	530
	Shaded	270	360	460	540	600	640	620	580	520	420	290	240	460

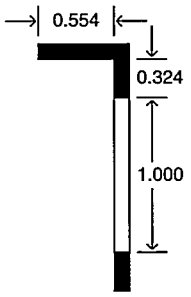
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	30.9	33.0	41.5	50.0	60.4	69.4	74.7	73.4	66.1	54.9	45.8	35.8	53.0
Daily Minimum Temp	21.4	23.5	31.3	39.3	49.6	58.7	64.8	63.5	55.5	43.7	35.8	26.3	42.8
Daily Maximum Temp	40.4	42.5	51.6	60.7	71.2	80.0	84.5	83.3	76.6	66.0	55.7	45.3	63.2
Record Minimum Temp	-10.0	-11.0	5.0	12.0	25.0	37.0	42.0	40.0	32.0	20.0	10.0	-7.0	-11.0
Record Maximum Temp	78.0	75.0	87.0	94.0	99.0	106.0	104.0	102.0	99.0	90.0	84.0	75.0	106.0
HDD, Base 65°F	1057	896	729	450	167	12	0	0	53	324	576	905	5169
CDD, Base 65°F	0	0	0	0	25	144	301	260	86	10	0	0	826
Humidity Ratio (#w/#da)	0.0027	0.0029	0.0038	0.0052	0.0079	0.0112	0.0134	0.0132	0.0106	0.0072	0.0051	0.0034	0.0072
Wind Speed (mph)	10.4	10.7	11.5	11.7	10.0	8.9	8.2	7.8	8.2	8.7	10.2	10.3	9.7
Clearness Index, Kt	0.46	0.48	0.49	0.50	0.51	0.52	0.52	0.52	0.51	0.50	0.46	0.44	0.50

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	41/23	72/45	80/49	62/39	25/15	47/31	83/56	99/71	93/68	65/45	29/18	66/42	83/57	74/51	44/29	16/10	41/24	46/27	27/17	1/1
North	10/9	14/15	15/16	13/14	7/6	18/14	16/17	17/19	17/19	15/15	9/8	14/15	16/17	15/16	12/11	6/4	10/9	10/10	8/7	1/1
East	74/28	54/30	15/16	13/14	7/6	75/35	70/43	29/26	17/19	15/15	63/24	67/35	26/22	15/16	12/11	43/13	37/17	10/10	8/7	1/1
South	41/18	73/38	81/42	62/32	24/11	12/12	32/25	46/36	41/32	19/17	22/11	57/31	74/45	65/40	36/20	40/12	80/30	87/33	59/21	4/1
West	10/9	14/15	25/20	67/33	62/21	12/12	16/17	17/19	53/39	77/44	9/8	14/15	16/17	53/34	71/34	6/4	10/9	23/14	47/18	6/2
M. Clr (%hrs)	36	33	31	31	33	39	36	33	31	35	42	42	37	37	40	33	33	31	32	37





Shading Geometry
(Not to Scale)

Newark, NJ

WBAN NO. 14734

LATITUDE: 40.70° N
LONGITUDE: 74.17° W
ELEVATION: 30 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±11%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	610	860	1190	1520	1740	1880	1850	1660	1350	1000	640	500	1230
	Std.Dev.	39	72	82	113	139	127	108	74	89	71	51	39	31
	Minimum	550	720	1040	1300	1520	1600	1690	1510	1170	880	530	410	1170
	Maximum	700	1020	1400	1740	2000	2080	2110	1820	1500	1150	750	560	1290
	Diffuse	310	420	560	710	860	910	900	800	630	450	330	270	600
	Clear-Day Global	850	1190	1670	2160	2470	2580	2500	2220	1790	1290	890	740	1700
North	Global	190	260	340	440	540	610	580	490	380	290	200	170	370
	Diffuse	190	260	340	430	500	540	530	470	380	290	200	170	360
	Clear-Day Global	180	250	330	430	580	670	620	480	360	270	200	160	380
East	Global	410	560	730	890	970	1030	1030	950	810	640	420	350	730
	Diffuse	240	320	420	520	600	640	640	580	470	360	250	200	440
	Clear-Day Global	640	840	1090	1300	1410	1420	1390	1300	1120	880	660	560	1050
South	Global	990	1080	1070	960	840	790	820	940	1060	1140	930	860	960
	Diffuse	340	420	490	540	580	590	600	580	530	450	350	300	480
	Clear-Day Global	1810	1890	1770	1440	1110	970	1020	1270	1590	1790	1760	1720	1510
West	Global	420	550	730	870	950	1020	1010	930	790	640	420	340	720
	Diffuse	240	320	420	530	610	650	640	580	480	360	250	200	440
	Clear-Day Global	640	840	1090	1300	1410	1420	1390	1300	1120	880	660	560	1050

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±11%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	390	580	840	1090	1260	1370	1340	1200	960	690	420	320	870
North	Unshaded	130	180	240	300	360	400	390	330	260	200	140	110	250
	Shaded	120	160	210	260	320	350	340	290	230	170	120	99	220
East	Unshaded	280	390	520	630	690	730	730	670	570	450	290	230	520
	Shaded	250	340	450	540	580	610	610	570	490	390	260	210	440
South	Unshaded	740	790	750	630	530	490	510	600	720	830	700	650	660
	Shaded	720	730	590	410	350	360	360	390	520	720	670	630	540
West	Unshaded	280	390	520	620	680	720	720	660	560	450	290	230	510
	Shaded	250	340	450	530	570	610	600	560	480	390	250	210	440

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	30.6	33.0	42.1	52.3	62.8	72.6	77.8	76.4	68.8	57.5	47.3	36.0	54.8
Daily Minimum Temp	23.4	25.4	33.4	42.7	53.2	62.8	68.6	67.4	59.9	48.2	39.2	29.1	46.1
Daily Maximum Temp	37.7	40.5	50.8	61.9	72.4	82.3	87.0	85.4	77.6	66.7	55.4	42.9	63.4
Record Minimum Temp	-8.0	-7.0	6.0	16.0	33.0	43.0	52.0	45.0	35.0	28.0	15.0	-1.0	-8.0
Record Maximum Temp	74.0	76.0	89.0	94.0	98.0	102.0	105.0	103.0	105.0	92.0	85.0	72.0	105.0
HDD, Base 65°F	1066	896	710	381	127	0	0	0	26	252	531	899	4888
CDD, Base 65°F	0	0	0	0	59	232	397	353	140	20	0	0	1201
Humidity Ratio (#w/#da)	0.0025	0.0026	0.0034	0.0047	0.0074	0.0103	0.0124	0.0124	0.0100	0.0067	0.0047	0.0031	0.0067
Wind Speed (mph)	11.0	11.4	12.0	11.6	10.2	9.7	9.0	9.0	9.3	9.5	10.5	10.7	10.3
Clearness Index, Kt	0.45	0.48	0.49	0.49	0.50	0.51	0.51	0.51	0.50	0.49	0.43	0.42	0.49

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±11%

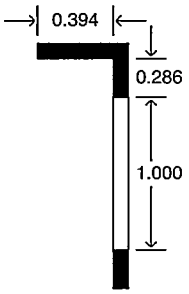
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	39/22	71/43	78/46	60/36	23/14	48/29	84/53	99/67	93/64	64/43	28/17	65/40	82/54	73/49	42/27	14/8	38/22	42/25	24/15	0/0
North	10/9	14/15	15/16	13/13	7/6	17/13	17/18	17/20	18/19	15/15	9/7	15/15	16/18	16/16	12/11	5/4	10/9	10/10	7/6	0/0
East	70/24	53/28	15/16	13/13	7/6	74/30	70/39	29/25	18/19	15/15	61/20	66/32	26/22	16/16	12/11	35/10	35/15	10/10	7/6	0/0
South	40/17	73/35	81/39	62/30	23/10	13/12	35/25	49/35	43/32	20/17	22/10	58/29	75/43	66/38	35/18	34/10	76/26	82/29	53/17	0/0
West	10/9	14/15	25/19	65/31	57/19	13/12	17/18	17/20	54/38	75/42	9/7	15/15	16/18	54/33	67/29	5/4	10/9	22/13	42/15	1/0
M. Clr (%hrs)	38	34	34	35	35	39	37	33	29	32	43	44	39	37	39	33	33	32	32	35

Albuquerque, NM

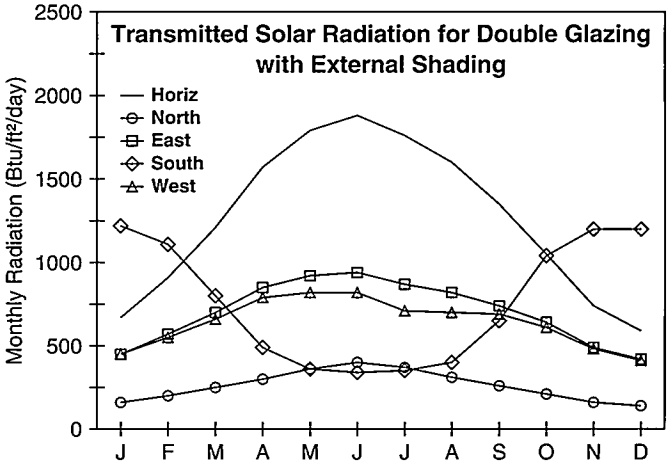
WBAN NO. 23050

LATITUDE: 35.05° N
LONGITUDE: 106.62° W
ELEVATION: 5312 feet
MEAN PRESSURE: 12.2 psia

STATION TYPE: Primary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	1010	1320	1700	2160	2430	2560	2380	2180	1860	1500	1100	910	1760
	Std.Dev.	79	96	121	91	119	105	81	93	95	101	79	74	56
	Minimum	830	1100	1410	1950	2170	2350	2160	1870	1700	1270	890	710	1630
	Maximum	1140	1470	1930	2310	2630	2720	2510	2350	2070	1680	1220	1030	1850
	Diffuse	310	400	540	600	650	640	700	640	520	390	310	280	500
	Clear-Day Global	1200	1550	2020	2490	2740	2830	2730	2490	2120	1660	1250	1080	2020
North	Global	240	300	390	480	620	700	630	500	400	320	250	220	420
	Diffuse	240	300	390	450	510	520	520	470	400	320	250	220	380
	Clear-Day Global	210	260	330	430	620	750	680	480	350	280	220	190	400
East	Global	700	870	1070	1310	1430	1460	1360	1270	1130	970	750	650	1080
	Diffuse	300	380	480	560	610	610	620	570	490	400	310	270	470
	Clear-Day Global	870	1070	1300	1490	1580	1580	1540	1470	1320	1110	900	810	1250
South	Global	1640	1620	1430	1170	900	760	810	1020	1320	1620	1640	1610	1290
	Diffuse	410	470	540	550	540	530	540	540	520	470	410	380	490
	Clear-Day Global	2190	2130	1830	1330	930	760	820	1110	1580	1990	2130	2160	1580
West	Global	690	850	1010	1220	1290	1290	1140	1120	1060	940	740	630	1000
	Diffuse	300	380	480	570	620	620	620	580	500	400	320	270	470
	Clear-Day Global	870	1070	1300	1490	1580	1580	1540	1470	1320	1110	900	810	1250

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	670	910	1210	1570	1790	1880	1760	1600	1350	1050	740	590	1260
North	Unshaded	170	210	270	320	390	440	400	330	270	220	170	150	280
	Shaded	160	200	250	300	360	400	370	310	260	210	160	140	260
East	Unshaded	490	610	770	940	1020	1050	970	910	810	690	520	450	770
	Shaded	450	570	700	850	920	940	870	820	740	640	490	420	700
South	Unshaded	1230	1170	970	720	510	430	460	600	860	1140	1220	1210	880
	Shaded	1220	1110	800	490	360	340	350	400	650	1040	1200	1200	760
West	Unshaded	480	600	720	870	920	920	800	790	750	660	510	440	700
	Shaded	450	550	660	790	820	820	710	700	690	610	480	410	640

Average Climatic Conditions

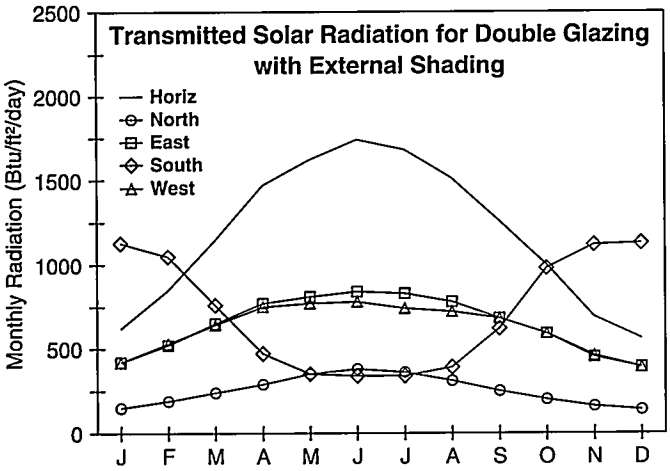
Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	34.2	40.0	46.9	55.2	64.2	74.2	78.5	75.9	68.6	57.0	44.3	35.3	56.2
Daily Minimum Temp	21.7	26.4	32.2	39.6	48.6	58.3	64.4	62.6	55.2	43.0	31.2	23.1	42.2
Daily Maximum Temp	46.8	53.5	61.4	70.8	79.7	90.0	92.5	89.0	81.9	71.0	57.3	47.5	70.1
Record Minimum Temp	-17.0	-5.0	8.0	19.0	28.0	40.0	52.0	52.0	37.0	21.0	-7.0	-7.0	-17.0
Record Maximum Temp	69.0	76.0	85.0	89.0	98.0	105.0	105.0	101.0	100.0	91.0	77.0	72.0	105.0
HDD, Base 65°F	955	700	561	301	89	0	0	0	18	259	621	921	4425
CDD, Base 65°F	0	0	0	7	64	279	419	338	126	11	0	0	1244
Humidity Ratio (#w/#da)	0.0025	0.0027	0.0028	0.0031	0.0042	0.0058	0.0092	0.0097	0.0077	0.0049	0.0033	0.0027	0.0049
Wind Speed (mph)	8.3	8.8	10.1	11.0	10.7	10.0	9.0	8.4	8.6	8.1	8.1	7.9	9.1
Clearness Index, Kt	0.62	0.63	0.64	0.68	0.69	0.70	0.66	0.66	0.65	0.65	0.62	0.61	0.66

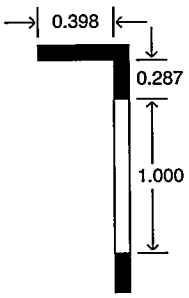
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	45/31	82/61	93/71	76/55	34/23	49/39	88/73	109/91	104/83	75/57	31/20	74/54	94/75	87/67	54/40	22/15	52/36	60/43	40/28	5/4
North	10/11	14/17	15/18	14/16	9/9	23/19	15/18	16/19	16/19	14/16	8/8	14/16	16/19	15/18	12/13	7/6	11/12	12/13	9/10	2/2
East	85/44	63/44	15/18	14/16	9/9	85/56	75/60	33/32	16/19	14/16	75/32	76/49	31/29	15/18	12/13	58/25	47/28	12/13	9/10	2/2
South	41/25	74/50	83/60	67/45	31/17	11/12	24/25	39/37	35/33	15/17	21/13	55/38	73/56	67/49	40/26	51/22	91/48	99/57	77/39	17/7
West	10/11	14/17	23/23	73/48	81/36	11/12	15/18	16/19	53/45	85/58	8/8	14/16	16/19	55/42	83/48	7/6	11/12	23/19	60/32	25/9
M. Clr (%hrs)	53	47	42	40	42	76	77	75	60	49	64	65	64	59	50	54	54	49	50	51

Tucumcari, NM

WBAN NO. 23048





Shading Geometry
(Not to Scale)

LATITUDE: 35.18° N
LONGITUDE: 103.60° W
ELEVATION: 4039 feet
MEAN PRESSURE: 12.7 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	940	1240	1600	2020	2220	2360	2280	2070	1740	1420	1030	860	1650
	Std.Dev.	63	73	91	86	95	105	76	97	82	102	72	61	31
	Minimum	800	1110	1420	1880	2050	2150	2140	1940	1610	1220	840	710	1590
	Maximum	1060	1370	1770	2180	2380	2580	2430	2290	1960	1610	1140	990	1710
	Diffuse	300	390	510	580	670	660	680	640	520	380	320	270	490
	Clear-Day Global	1150	1500	1970	2410	2660	2750	2670	2440	2060	1610	1210	1040	1960
North	Global	230	290	370	450	580	660	620	490	390	310	250	210	400
	Diffuse	230	290	370	430	490	510	500	460	390	310	250	210	370
	Clear-Day Global	210	260	330	430	610	720	660	480	350	280	220	190	400
East	Global	650	800	1000	1190	1260	1320	1300	1210	1040	900	690	600	1000
	Diffuse	290	360	460	540	590	600	610	570	480	390	300	260	450
	Clear-Day Global	840	1030	1260	1430	1520	1520	1500	1430	1280	1070	860	770	1210
South	Global	1530	1520	1360	1110	850	730	770	970	1240	1530	1530	1520	1220
	Diffuse	400	450	510	530	530	520	530	540	510	460	410	370	480
	Clear-Day Global	2110	2060	1780	1300	920	750	810	1090	1540	1930	2060	2080	1530
West	Global	650	810	980	1160	1200	1230	1180	1120	1040	910	700	610	970
	Diffuse	290	370	470	550	610	620	620	580	490	390	310	270	460
	Clear-Day Global	840	1030	1260	1430	1520	1520	1500	1430	1280	1070	860	770	1210

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	620	850	1150	1470	1620	1740	1680	1510	1260	1000	690	560	1180
North	Unshaded	160	200	260	300	370	420	390	330	270	210	170	150	270
	Shaded	150	190	240	290	350	380	360	310	250	200	160	140	250
East	Unshaded	450	560	710	850	900	940	920	860	740	640	480	410	710
	Shaded	420	520	650	770	810	840	830	780	680	590	450	390	640
South	Unshaded	1140	1100	920	680	490	420	440	580	810	1080	1140	1150	830
	Shaded	1130	1050	760	470	350	340	340	390	620	980	1120	1130	720
West	Unshaded	450	570	700	830	860	870	830	800	740	650	490	420	680
	Shaded	420	530	640	750	770	780	740	720	680	590	460	390	620

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	37.3	41.0	48.4	57.4	65.8	74.5	78.4	76.2	69.1	59.2	47.8	38.2	57.8
Daily Minimum Temp	21.7	25.5	32.6	41.7	50.6	59.5	64.2	62.1	55.0	43.6	33.0	23.3	42.7
Daily Maximum Temp	52.8	56.5	64.2	73.0	81.0	89.4	92.6	90.2	83.0	74.7	62.5	53.0	72.7
Record Minimum Temp	-18.0	-2.2	9.0	15.1	32.0	43.0	53.1	51.1	35.1	25.0	3.0	-11.0	-18.0
Record Maximum Temp	78.1	81.0	98.1	93.9	98.1	109.0	104.0	102.0	100.9	97.0	86.0	78.1	109.0
HDD, Base 65°F	859	672	515	244	56	7	0	0	14	198	516	831	3912
CDD, Base 65°F	0	0	0	16	81	292	415	347	137	18	0	0	1306
Humidity Ratio (#w/#da)	0.0027	0.0030	0.0034	0.0044	0.0066	0.0091	0.0114	0.0115	0.0093	0.0058	0.0039	0.0029	0.0062
Wind Speed (mph)	9.7	9.9	10.9	11.3	10.8	10.2	9.6	8.7	9.1	8.9	9.7	9.4	9.9
Clearness Index, Kt	0.58	0.60	0.61	0.63	0.63	0.64	0.63	0.62	0.61	0.62	0.58	0.57	0.62

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

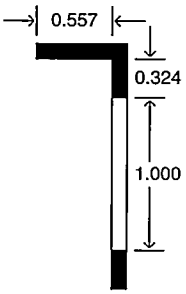
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	48/32	82/57	89/65	69/50	28/19	52/37	89/70	106/85	98/79	68/52	35/22	75/53	92/68	83/60	49/36	24/16	52/36	56/40	35/25	3/3
North	10/11	14/16	15/17	13/15	8/7	21/17	16/18	16/18	16/18	14/16	9/9	14/16	16/18	15/17	11/12	7/6	11/12	11/12	9/9	2/2
East	83/43	56/39	15/17	13/15	8/7	84/49	72/55	27/26	16/18	14/15	78/32	71/45	25/24	15/17	11/12	57/24	41/26	11/12	9/9	2/2
South	44/26	73/48	79/55	62/42	26/15	12/12	27/25	39/35	33/31	14/15	24/14	57/37	72/51	64/44	36/24	54/23	90/48	94/54	69/37	10/4
West	10/11	14/16	27/24	72/48	72/34	12/12	16/18	16/18	55/47	82/58	9/9	14/16	16/18	58/41	81/47	7/6	11/12	27/20	58/32	15/6
M. Clr (%hrs)	50	49	45	42	42	61	62	63	54	45	56	58	57	55	51	49	50	51	51	53

Elko, NV

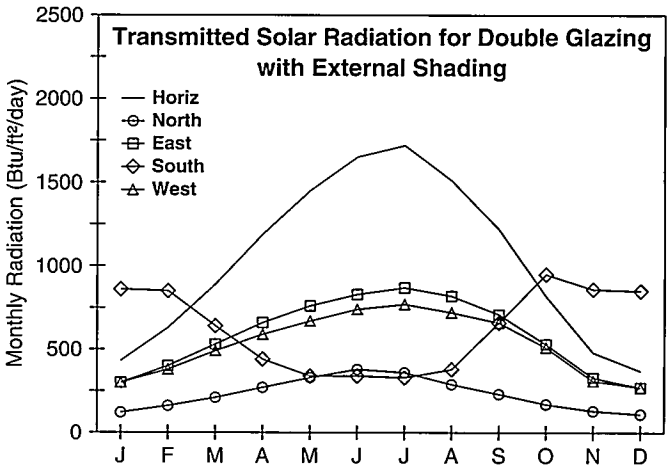
WBAN NO. 24121

LATITUDE: 40.83° N
LONGITUDE: 115.78° W
ELEVATION: 5076 feet
MEAN PRESSURE: 12.3 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	670	930	1270	1660	2000	2260	2350	2080	1700	1200	730	590	1460
	Std.Dev.	56	86	94	148	180	172	111	124	124	80	69	59	39
	Minimum	580	790	1080	1370	1590	1830	2140	1740	1370	1040	610	460	1380
	Maximum	760	1150	1440	1920	2330	2580	2690	2280	1970	1330	880	720	1530
	Diffuse	300	390	530	660	710	670	570	520	410	330	310	260	470
	Clear-Day Global	930	1280	1790	2310	2660	2790	2710	2410	1950	1420	990	820	1840
North	Global	200	260	340	440	570	670	630	480	360	270	210	170	380
	Diffuse	200	260	340	430	490	510	490	430	350	270	210	170	350
	Clear-Day Global	160	220	290	410	600	730	660	470	330	240	170	150	370
East	Global	480	640	850	1070	1230	1370	1430	1320	1130	830	520	440	940
	Diffuse	240	320	420	530	580	600	570	530	440	330	250	210	420
	Clear-Day Global	750	960	1230	1450	1570	1610	1580	1480	1280	1020	760	670	1200
South	Global	1170	1240	1190	1060	920	860	940	1140	1420	1500	1180	1150	1150
	Diffuse	360	420	490	540	550	540	520	510	470	410	350	320	460
	Clear-Day Global	2100	2110	1930	1490	1130	960	1020	1310	1730	2020	2060	2040	1660
West	Global	480	620	790	960	1100	1230	1280	1180	1050	800	500	430	870
	Diffuse	250	320	430	530	590	610	580	540	440	340	250	210	430
	Clear-Day Global	750	960	1230	1450	1570	1610	1580	1480	1280	1020	760	670	1200

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

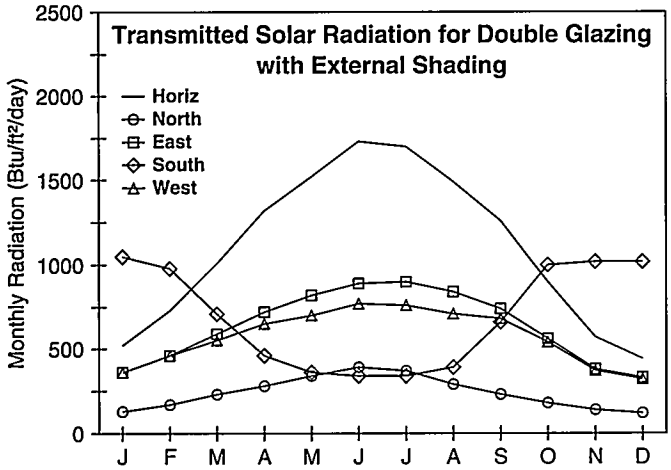
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	430	630	890	1190	1450	1650	1720	1510	1220	820	480	370	1030
North	Unshaded	140	180	240	300	370	420	400	310	240	190	140	120	250
	Shaded	120	160	210	270	330	380	360	290	230	170	130	110	230
East	Unshaded	330	450	610	770	890	980	1030	950	810	590	360	300	670
	Shaded	300	400	530	660	760	830	870	820	710	530	330	270	580
South	Unshaded	880	910	820	690	560	500	540	710	950	1080	890	870	780
	Shaded	860	850	640	440	340	340	330	380	660	950	860	850	620
West	Unshaded	330	430	560	680	780	880	910	840	750	570	350	300	620
	Shaded	300	380	490	590	670	740	770	720	660	510	310	270	540

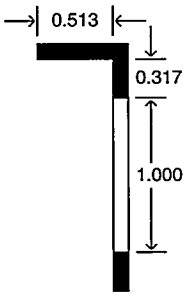
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	25.1	31.5	37.6	44.3	53.1	62.4	70.7	68.7	58.7	47.7	35.8	25.7	46.8
Daily Minimum Temp	13.4	19.9	25.0	29.5	36.8	44.6	50.3	48.6	38.9	29.6	22.5	14.0	31.1
Daily Maximum Temp	36.7	43.0	50.2	59.1	69.4	80.2	91.0	88.6	78.3	65.9	49.1	37.4	62.4
Record Minimum Temp	-43.0	-37.0	-9.0	-2.0	10.0	23.0	30.0	24.0	9.0	3.0	-12.0	-38.0	-43.0
Record Maximum Temp	64.0	70.0	77.0	86.0	92.0	104.0	107.0	107.0	99.0	88.0	78.0	64.0	107.0
HDD, Base 65°F	1237	938	849	621	369	138	18	42	235	536	876	1218	7077
CDD, Base 65°F	0	0	0	0	0	60	194	157	46	0	0	0	457
Humidity Ratio (#w/#da)	0.0024	0.0030	0.0032	0.0035	0.0045	0.0057	0.0059	0.0056	0.0045	0.0035	0.0032	0.0024	0.0040
Wind Speed (mph)	5.1	5.8	6.6	7.2	6.9	6.5	6.3	6.1	5.7	5.2	5.4	5.0	6.0
Clearness Index, Kt	0.51	0.52	0.52	0.54	0.57	0.61	0.65	0.64	0.64	0.59	0.50	0.50	0.58

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	47/30	76/50	81/52	59/38	21/14	57/39	90/64	103/77	94/68	65/43	38/25	73/51	87/63	76/53	43/28	20/13	43/28	45/29	24/16	0/0
North	10/11	13/15	14/16	12/13	6/6	14/14	15/17	16/18	15/17	13/14	9/9	13/14	15/17	14/15	10/10	6/6	10/10	10/10	7/6	0/0
East	80/39	50/32	14/16	12/13	6/6	87/49	68/47	22/21	15/17	13/14	82/41	67/43	18/19	14/15	10/10	52/18	35/19	10/10	7/6	0/0
South	50/26	80/46	84/47	62/33	22/11	12/13	36/29	49/39	41/33	16/15	30/18	65/43	79/55	68/45	36/21	54/18	91/39	94/39	61/23	0/0
West	10/11	13/15	31/24	73/37	64/24	12/13	15/17	16/18	58/43	84/48	9/9	13/14	15/17	61/41	82/40	6/6	10/10	29/17	53/21	0/0
M. Clr (%hrs)	32	27	24	23	26	62	57	49	41	40	69	70	64	58	57	34	33	34	32	34





Shading Geometry
(Not to Scale)

Ely, NV

WBAN NO. 23154

LATITUDE: 39.28° N
LONGITUDE: 114.85° W
ELEVATION: 6254 feet
MEAN PRESSURE: 11.7 psia

STATION TYPE: Primary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	810	1080	1430	1830	2090	2360	2320	2060	1760	1300	870	710	1550
	Std.Dev.	54	89	111	141	154	163	125	149	128	82	62	69	46
	Minimum	700	870	1200	1580	1730	2050	2010	1730	1340	1140	710	490	1440
	Maximum	920	1280	1690	2090	2320	2620	2630	2370	1950	1440	970	820	1630
	Diffuse	310	410	550	660	740	660	620	570	430	350	310	260	490
	Clear-Day Global	1020	1380	1890	2390	2710	2840	2740	2450	2020	1510	1080	910	1910
North	Global	210	280	360	460	590	690	640	490	360	280	220	190	400
	Diffuse	210	280	360	440	500	520	490	440	360	280	220	190	360
	Clear-Day Global	170	220	290	410	610	740	670	470	320	240	180	150	370
East	Global	570	730	940	1150	1310	1430	1440	1330	1160	880	610	520	1010
	Diffuse	270	350	450	540	600	600	580	530	440	350	270	230	430
	Clear-Day Global	810	1020	1280	1500	1600	1630	1590	1490	1320	1070	830	740	1240
South	Global	1420	1430	1300	1120	910	830	880	1070	1410	1560	1400	1360	1220
	Diffuse	380	460	520	550	560	540	530	520	480	430	380	340	470
	Clear-Day Global	2210	2190	1940	1460	1070	900	960	1260	1710	2060	2160	2160	1670
West	Global	580	720	880	1040	1130	1250	1230	1140	1070	850	590	500	910
	Diffuse	270	350	460	550	610	620	600	550	450	360	270	230	440
	Clear-Day Global	810	1020	1280	1500	1600	1630	1590	1490	1320	1070	830	740	1240

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	520	730	1010	1320	1520	1730	1700	1490	1260	900	570	440	1100
North	Unshaded	150	190	250	310	380	430	400	320	250	200	150	130	260
	Shaded	130	170	230	280	340	390	370	290	230	180	140	120	240
East	Unshaded	390	510	670	830	940	1030	1030	960	830	620	420	360	720
	Shaded	360	460	590	720	820	890	900	840	740	560	380	330	630
South	Unshaded	1070	1050	900	720	550	480	510	660	940	1120	1050	1030	840
	Shaded	1050	980	710	460	360	340	340	390	660	1000	1020	1020	690
West	Unshaded	400	510	620	740	800	890	880	820	770	600	410	350	650
	Shaded	360	460	550	650	700	770	760	710	680	540	370	320	570

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	24.6	29.5	34.6	41.5	50.5	59.6	67.5	65.5	56.3	45.8	34.2	25.6	44.6
Daily Minimum Temp	9.4	15.4	20.7	26.0	33.7	40.7	48.0	46.5	37.3	28.2	19.0	10.6	28.0
Daily Maximum Temp	39.7	43.6	48.4	57.0	67.3	78.3	87.0	84.4	75.2	63.5	49.2	40.6	61.2
Record Minimum Temp	-27.0	-30.0	-13.0	-5.0	7.0	18.0	30.0	24.0	15.0	-3.0	-15.0	-29.0	-30.0
Record Maximum Temp	68.0	67.0	73.0	81.0	89.0	99.0	100.0	97.0	93.0	84.0	75.0	67.0	100.0
HDD, Base 65°F	1252	994	942	705	450	188	14	62	274	595	924	1221	7621
CDD, Base 65°F	0	0	0	0	0	26	92	77	13	0	0	0	208
Humidity Ratio (#w/#da)	0.0021	0.0025	0.0027	0.0030	0.0039	0.0046	0.0056	0.0058	0.0044	0.0034	0.0026	0.0021	0.0036
Wind Speed (mph)	9.2	9.4	10.1	10.4	10.2	10.1	10.1	10.0	9.7	9.2	9.2	9.1	9.7
Clearness Index, Kt	0.57	0.58	0.58	0.59	0.60	0.64	0.64	0.63	0.65	0.62	0.56	0.56	0.61

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

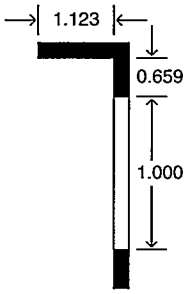
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	52/35	82/57	85/59	64/42	21/14	60/45	92/71	106/82	95/70	65/45	41/27	76/56	89/67	78/56	43/29	24/16	48/33	50/34	27/18	0/0
North	11/12	14/16	15/17	12/14	7/6	15/15	15/17	16/18	16/17	13/14	9/9	13/15	15/17	14/16	10/10	7/6	10/11	10/11	7/7	0/0
East	83/44	51/35	15/17	12/14	7/6	89/57	67/51	20/21	16/17	13/14	85/43	66/46	17/18	14/16	10/10	56/25	36/22	10/11	7/7	0/0
South	52/30	82/52	85/53	64/36	22/11	12/13	35/30	47/40	38/32	14/14	32/19	65/45	78/56	67/45	34/20	59/26	95/47	98/48	65/28	0/0
West	11/12	14/16	34/27	79/42	69/26	12/13	15/17	16/18	60/46	86/50	9/9	13/15	15/17	64/44	83/41	7/6	10/11	32/21	58/25	0/0
M. Clr (%hrs)	35	30	28	25	27	64	57	46	43	40	71	67	61	54	54	39	40	37	36	40

Las Vegas, NV

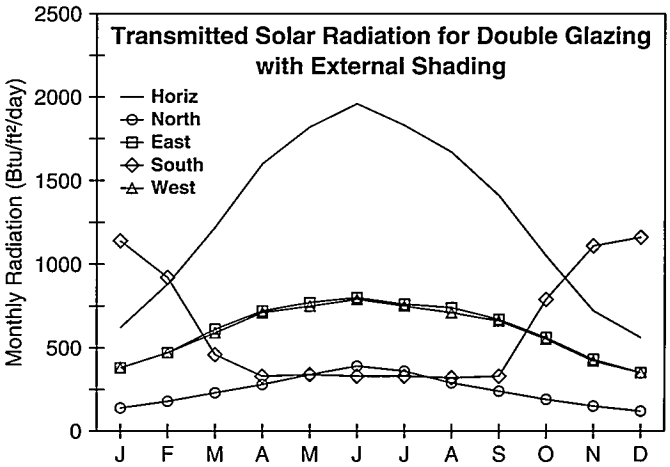
WBAN NO. 23169

LATITUDE: 36.08° N
LONGITUDE: 115.17° W
ELEVATION: 2179 feet
MEAN PRESSURE: 13.6 psia

STATION TYPE: Primary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	950	1270	1710	2190	2480	2650	2490	2280	1950	1500	1070	870	1790
	Std.Dev.	79	88	103	109	82	83	118	131	102	68	58	61	48
	Minimum	730	1090	1510	1920	2280	2490	2090	1900	1700	1280	950	690	1660
	Maximum	1080	1420	1910	2340	2630	2820	2650	2480	2110	1620	1170	960	1840
	Diffuse	300	400	520	590	640	610	650	570	450	360	310	260	470
	Clear-Day Global	1100	1470	1950	2420	2700	2800	2710	2460	2070	1590	1180	1000	1960
North	Global	230	300	380	480	620	740	670	510	390	310	250	210	420
	Diffuse	230	300	380	450	510	530	520	460	390	310	250	210	380
	Clear-Day Global	210	260	340	440	610	740	670	480	360	290	220	190	400
East	Global	660	830	1080	1310	1420	1480	1400	1340	1200	970	730	610	1090
	Diffuse	280	370	470	570	610	620	610	570	480	380	310	260	460
	Clear-Day Global	810	1010	1260	1450	1540	1560	1530	1440	1290	1060	840	730	1210
South	Global	1600	1610	1490	1230	940	810	840	1070	1430	1690	1650	1580	1330
	Diffuse	400	470	540	560	550	540	540	530	510	460	420	370	490
	Clear-Day Global	2070	2060	1810	1340	960	810	860	1150	1600	1950	2060	2030	1550
West	Global	660	830	1040	1260	1370	1450	1370	1280	1170	960	710	600	1060
	Diffuse	290	370	490	580	630	630	630	570	490	390	310	260	470
	Clear-Day Global	810	1010	1260	1450	1540	1560	1530	1440	1290	1060	840	730	1210

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

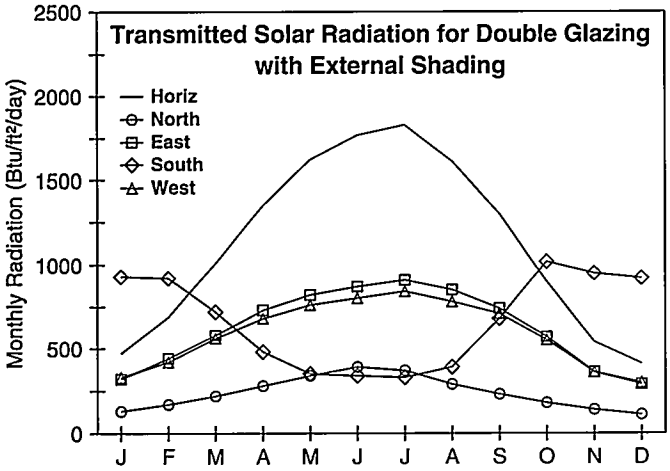
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	620	880	1220	1600	1820	1960	1830	1670	1410	1050	720	560	1280
North	Unshaded	160	210	260	320	390	450	420	330	270	220	170	140	280
	Shaded	140	180	230	280	340	390	360	290	240	190	150	120	240
East	Unshaded	460	580	770	940	1020	1060	1000	960	860	690	510	420	770
	Shaded	380	470	610	720	770	800	760	740	670	560	430	350	610
South	Unshaded	1200	1170	1010	760	540	450	480	640	930	1200	1230	1190	900
	Shaded	1140	920	460	330	340	330	330	320	330	790	1110	1160	630
West	Unshaded	450	580	740	910	980	1040	980	920	840	680	500	410	750
	Shaded	380	470	590	710	750	790	750	710	660	550	420	350	590

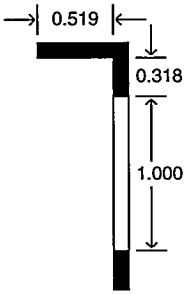
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	45.5	51.1	56.3	64.1	74.0	84.9	91.1	88.7	80.5	68.3	55.0	45.7	67.1
Daily Minimum Temp	33.6	38.8	43.8	50.7	60.2	69.4	76.2	74.2	66.2	54.3	42.6	33.9	53.7
Daily Maximum Temp	57.3	63.3	68.8	77.5	87.8	100.3	105.9	103.2	94.7	82.1	67.4	57.5	80.5
Record Minimum Temp	8.0	16.0	23.0	31.0	40.0	49.0	60.0	56.0	46.0	26.0	21.0	11.0	8.0
Record Maximum Temp	77.0	87.0	91.0	99.0	109.0	115.0	116.0	116.0	113.0	103.0	87.0	77.0	116.0
HDD, Base 65°F	605	389	292	143	14	0	0	0	0	62	304	598	2407
CDD, Base 65°F	0	0	22	116	293	597	809	735	465	164	0	0	3201
Humidity Ratio (#w/#da)	0.0028	0.0031	0.0031	0.0031	0.0037	0.0042	0.0066	0.0073	0.0055	0.0041	0.0033	0.0029	0.0041
Wind Speed (mph)	8.0	9.2	10.9	11.5	11.7	11.5	10.9	10.0	9.6	8.5	8.6	7.7	9.8
Clearness Index, Kt	0.60	0.63	0.65	0.69	0.70	0.72	0.69	0.69	0.69	0.67	0.62	0.60	0.67

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	53/40	83/67	90/70	67/51	22/16	58/46	94/81	110/97	100/84	67/52	40/29	79/62	94/76	82/63	45/32	26/19	52/39	54/41	30/23	0/0
North	11/12	15/17	15/18	13/15	7/7	18/18	16/18	16/19	16/19	16/16	10/10	14/17	16/19	15/17	10/11	7/7	11/12	11/13	8/8	0/0
East	82/51	51/41	15/18	13/15	7/7	87/59	68/59	21/23	16/19	13/15	81/44	68/51	19/21	15/17	10/11	56/29	36/26	11/13	8/8	0/0
South	49/33	76/57	82/60	61/42	21/12	12/14	30/30	42/41	34/33	13/15	29/20	61/47	75/59	64/47	32/22	58/30	91/55	94/57	64/34	0/0
West	11/12	15/17	35/30	78/52	65/31	12/14	16/18	16/19	63/54	87/60	10/10	14/17	16/19	64/47	82/44	7/7	11/12	32/24	58/31	1/0
M. Clr (%hrs)	55	54	49	45	48	80	78	76	72	72	79	80	78	74	73	55	55	53	52	54





Shading Geometry
(Not to Scale)

Reno, NV

WBAN NO. 23185

LATITUDE: 39.50° N
LONGITUDE: 119.78° W
ELEVATION: 4400 feet
MEAN PRESSURE: 12.6 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	730	1020	1430	1870	2210	2420	2480	2200	1810	1310	820	650	1580
	Std.Dev.	61	102	123	151	147	140	92	132	121	63	75	64	43
	Minimum	630	830	1130	1550	1900	2130	2290	1900	1480	1190	670	500	1460
	Maximum	860	1260	1710	2180	2410	2650	2680	2380	2030	1410	970	790	1670
	Diffuse	300	390	510	630	670	640	530	500	400	340	310	260	460
	Clear-Day Global	960	1330	1830	2330	2670	2790	2710	2420	1980	1460	1030	860	1870
North	Global	200	270	350	450	590	690	650	490	360	290	220	180	400
	Diffuse	200	270	350	440	500	510	490	440	360	290	220	180	350
	Clear-Day Global	180	230	310	420	600	730	670	480	340	260	190	160	380
East	Global	510	690	920	1160	1330	1420	1470	1360	1170	900	570	470	1000
	Diffuse	250	330	440	540	600	600	580	540	450	360	270	230	430
	Clear-Day Global	750	960	1230	1450	1560	1590	1560	1470	1280	1020	790	690	1200
South	Global	1260	1350	1320	1170	960	860	930	1150	1460	1600	1310	1240	1220
	Diffuse	370	440	510	550	560	540	520	510	480	440	380	340	470
	Clear-Day Global	2060	2080	1890	1450	1080	920	980	1270	1690	1990	2040	2010	1620
West	Global	520	670	890	1100	1230	1300	1370	1260	1130	870	570	480	950
	Diffuse	260	340	450	550	610	610	580	540	450	360	280	230	440
	Clear-Day Global	750	960	1230	1450	1560	1590	1560	1470	1280	1020	790	690	1200

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	470	690	1010	1350	1620	1770	1830	1610	1300	900	540	410	1130
North	Unshaded	140	190	240	310	380	430	400	320	250	200	150	130	260
	Shaded	130	170	220	280	340	390	370	290	230	180	140	110	240
East	Unshaded	350	490	660	830	950	1020	1050	980	840	640	400	320	710
	Shaded	320	440	580	730	820	870	910	850	740	570	360	290	620
South	Unshaded	950	990	910	750	570	490	530	700	970	1150	980	940	830
	Shaded	930	920	720	480	350	340	330	390	680	1020	950	920	670
West	Unshaded	360	470	630	780	880	930	980	900	800	610	400	330	670
	Shaded	330	420	560	680	760	800	840	780	710	550	360	300	590

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	32.9	38.0	42.8	48.6	56.5	65.1	71.6	69.6	60.4	50.8	40.3	32.7	50.8
Daily Minimum Temp	20.7	24.2	29.2	33.3	40.1	46.9	51.3	49.6	41.3	32.9	26.7	19.9	34.7
Daily Maximum Temp	45.1	51.7	56.3	63.7	72.9	83.1	91.9	89.6	79.5	68.6	53.8	45.5	66.8
Record Minimum Temp	-16.0	-16.0	-2.0	13.0	18.0	25.0	33.0	24.0	20.0	8.0	1.0	-16.0	-16.0
Record Maximum Temp	70.0	75.0	83.0	89.0	96.0	103.0	104.0	105.0	101.0	91.0	77.0	70.0	105.0
HDD, Base 65°F	995	756	688	492	274	76	13	20	178	440	741	1001	5674
CDD, Base 65°F	0	0	0	0	10	79	217	162	40	0	0	0	508
Humidity Ratio (#w/#da)	0.0029	0.0031	0.0031	0.0034	0.0044	0.0055	0.0062	0.0061	0.0051	0.0041	0.0034	0.0029	0.0042
Wind Speed (mph)	5.1	6.3	8.2	8.4	8.5	7.9	7.6	6.9	6.2	5.6	6.1	5.6	6.9
Clearness Index, Kt	0.52	0.55	0.57	0.60	0.63	0.65	0.69	0.68	0.66	0.63	0.53	0.52	0.62

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

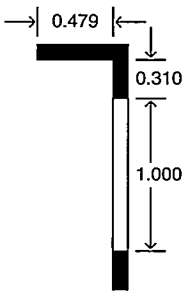
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	44/29	75/53	83/60	66/46	28/18	52/39	88/67	104/82	98/76	71/50	32/22	71/50	89/68	81/60	50/33	17/11	43/29	48/32	30/20	2/2
North	10/10	14/15	15/16	13/14	8/7	18/16	15/17	16/18	16/18	14/15	8/8	13/14	15/17	14/16	11/11	6/5	10/10	10/11	8/8	1/1
East	81/41	56/38	15/16	13/14	8/7	86/54	73/54	29/27	16/18	14/15	78/38	73/47	26/24	14/16	11/11	49/18	40/22	10/11	8/8	1/1
South	44/25	75/48	83/56	66/42	27/15	11/12	32/28	46/40	41/35	19/17	24/15	61/41	78/59	70/50	40/25	46/17	87/41	94/45	67/30	7/3
West	10/10	14/15	25/22	70/44	72/33	11/12	15/17	16/18	54/44	84/53	8/8	13/14	15/17	56/41	83/44	6/5	10/10	24/17	53/25	10/4
M. Clr (%hrs)	38	36	34	31	31	67	66	61	54	51	75	74	71	69	67	34	36	37	35	38

Tonopah, NV

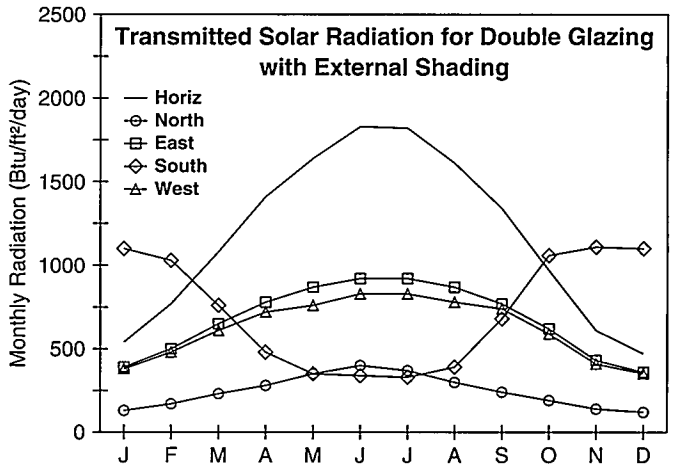
WBAN NO. 23153

LATITUDE: 38.07° N
LONGITUDE: 117.13° W
ELEVATION: 5423 feet
MEAN PRESSURE: 12.1 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	840	1130	1520	1950	2240	2490	2470	2200	1870	1390	930	760	1650
	Std.Dev.	65	87	107	139	134	125	115	119	119	69	68	61	39
	Minimum	710	920	1280	1650	2000	2250	2200	1930	1500	1230	820	630	1530
	Maximum	950	1330	1730	2160	2460	2730	2740	2410	2060	1490	1070	880	1700
	Diffuse	270	370	490	590	660	610	560	520	400	330	290	240	440
	Clear-Day Global	1040	1400	1890	2390	2700	2820	2740	2460	2040	1530	1110	930	1920
North	Global	210	270	350	450	590	700	650	500	370	290	230	190	400
	Diffuse	210	270	350	430	490	510	490	440	360	290	230	190	360
	Clear-Day Global	180	240	310	420	610	740	680	480	340	270	200	160	390
East	Global	610	770	1010	1230	1370	1470	1470	1370	1200	950	670	560	1060
	Diffuse	260	340	440	540	590	600	580	540	450	360	280	230	440
	Clear-Day Global	800	1000	1260	1460	1570	1600	1570	1480	1300	1050	820	730	1220
South	Global	1490	1500	1380	1170	930	830	880	1100	1450	1660	1520	1460	1280
	Diffuse	370	440	510	540	550	530	520	510	480	430	380	330	470
	Clear-Day Global	2130	2100	1870	1410	1030	870	930	1220	1670	2000	2090	2080	1620
West	Global	600	750	950	1130	1220	1330	1330	1240	1150	910	640	550	980
	Diffuse	260	340	450	540	610	610	590	540	460	360	280	230	440
	Clear-Day Global	800	1000	1260	1460	1570	1600	1570	1480	1300	1050	820	730	1220

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

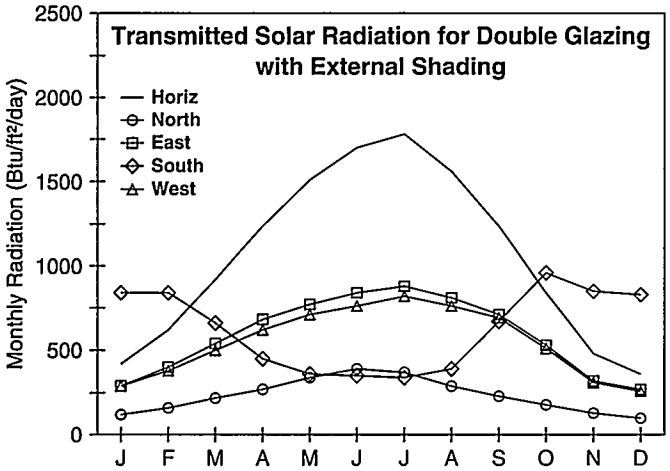
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	540	770	1080	1410	1640	1830	1820	1610	1340	970	610	470	1180
North	Unshaded	150	190	250	300	380	430	400	320	250	200	160	130	260
	Shaded	130	170	230	280	350	400	370	300	240	190	140	120	240
East	Unshaded	420	540	720	880	990	1060	1050	990	860	680	470	380	750
	Shaded	390	500	650	780	870	920	920	870	770	620	430	360	670
South	Unshaded	1120	1090	950	740	550	470	500	660	960	1190	1130	1110	870
	Shaded	1100	1030	760	480	350	340	330	390	680	1060	1110	1100	730
West	Unshaded	420	530	670	810	870	950	950	890	820	650	450	380	700
	Shaded	380	480	610	720	760	830	830	780	740	590	410	350	620

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	31.1	36.4	41.0	48.0	57.4	67.1	73.7	71.5	63.2	52.6	39.8	31.8	51.1
Daily Minimum Temp	18.2	23.5	27.4	33.0	41.8	50.6	56.4	54.6	46.8	36.9	26.2	19.1	36.2
Daily Maximum Temp	43.9	49.3	54.5	62.9	73.0	83.5	91.0	88.3	79.6	68.2	53.3	44.5	66.0
Record Minimum Temp	-13.0	-8.0	5.0	18.0	19.9	30.0	39.9	41.0	25.0	15.1	5.0	-9.9	-13.0
Record Maximum Temp	64.0	73.9	78.1	84.0	93.0	100.0	100.9	100.0	93.9	89.1	75.9	63.0	100.9
HDD, Base 65°F	1051	801	744	518	255	60	0	10	117	392	756	1029	5733
CDD, Base 65°F	0	0	0	8	19	123	273	212	63	8	0	0	706
Humidity Ratio (#w/#da)	0.0025	0.0028	0.0028	0.0029	0.0036	0.0042	0.0052	0.0055	0.0044	0.0034	0.0029	0.0025	0.0036
Wind Speed (mph)	8.2	9.2	10.7	11.0	10.4	9.6	9.0	8.6	8.7	8.5	8.5	8.3	9.2
Clearness Index, Kt	0.57	0.58	0.60	0.62	0.64	0.67	0.69	0.67	0.67	0.65	0.58	0.56	0.64

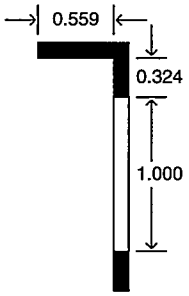
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	48/34	79/58	86/62	65/46	24/17	56/43	91/71	107/85	98/74	68/49	37/25	75/54	91/69	81/60	47/32	22/15	48/33	51/35	30/20	0/0
North	10/11	14/16	15/17	12/14	7/7	18/16	15/17	16/17	16/17	13/14	9/9	14/15	15/17	14/16	10/11	7/6	10/11	11/11	8/8	0/0
East	82/46	53/38	15/17	12/14	7/7	88/58	70/55	24/24	16/17	13/14	81/39	70/47	22/21	14/16	10/11	55/24	38/23	11/11	8/8	0/0
South	47/29	76/52	83/56	63/40	24/13	12/13	32/29	44/39	38/32	14/15	28/17	62/43	76/57	67/48	36/23	55/24	91/47	95/49	66/31	1/1
West	10/11	14/16	30/25	74/46	69/31	12/13	15/17	16/17	58/46	85/54	9/9	14/15	15/17	61/44	83/45	7/6	10/11	28/19	57/27	2/1
M. Clr (%hrs)	49	44	38	36	41	76	73	61	57	56	81	79	73	70	68	51	51	48	48	50



Winnemucca, NV

WBAN NO. 24128



Shading Geometry
(Not to Scale)

LATITUDE: 40.90° N
LONGITUDE: 117.80° W
ELEVATION: 4341 feet
MEAN PRESSURE: 12.6 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	660	920	1300	1730	2080	2330	2430	2140	1740	1220	730	590	1490
	Std.Dev.	62	97	104	153	164	166	97	138	114	75	75	63	42
	Minimum	520	770	1080	1360	1720	1920	2240	1780	1540	1080	600	430	1420
	Maximum	770	1140	1530	1940	2350	2610	2660	2340	2000	1380	880	730	1570
	Diffuse	300	400	540	670	730	680	570	520	420	350	320	260	480
	Clear-Day Global	910	1280	1800	2320	2660	2790	2710	2400	1940	1410	980	800	1840
North	Global	200	260	350	450	580	680	640	490	360	280	210	170	390
	Diffuse	200	260	350	440	500	520	490	440	360	280	210	170	350
	Clear-Day Global	170	220	300	410	600	730	670	480	330	250	180	150	380
East	Global	470	640	870	1100	1260	1380	1450	1330	1140	840	520	430	950
	Diffuse	240	320	440	540	610	620	580	540	440	350	260	210	430
	Clear-Day Global	740	950	1230	1460	1580	1610	1580	1470	1280	1010	760	660	1190
South	Global	1140	1230	1220	1110	960	880	960	1170	1450	1520	1170	1120	1160
	Diffuse	350	430	510	560	570	550	530	520	480	430	360	320	470
	Clear-Day Global	2060	2100	1930	1500	1130	970	1030	1320	1720	2010	2040	1990	1650
West	Global	470	610	810	1010	1160	1270	1360	1240	1090	820	500	420	900
	Diffuse	240	330	440	540	620	620	590	540	450	350	260	210	430
	Clear-Day Global	740	950	1230	1460	1580	1610	1580	1470	1280	1010	760	660	1190

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	420	620	920	1240	1510	1700	1780	1560	1240	840	480	360	1060
North	Unshaded	140	180	240	310	380	430	400	320	250	190	150	120	260
	Shaded	120	160	220	270	340	390	370	290	230	180	130	100	230
East	Unshaded	320	450	620	790	910	990	1040	950	820	600	360	290	680
	Shaded	290	400	540	680	770	840	880	810	710	530	320	270	590
South	Unshaded	860	900	850	720	580	520	560	720	970	1090	880	850	790
	Shaded	840	840	660	450	360	350	340	390	670	960	850	830	630
West	Unshaded	320	420	570	720	830	900	970	890	780	580	350	290	640
	Shaded	290	380	500	620	710	760	820	760	690	510	310	260	550

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	29.4	35.9	40.1	46.2	55.4	64.5	72.2	69.7	59.5	48.7	37.8	29.8	49.1
Daily Minimum Temp	16.7	22.8	25.2	29.4	37.7	45.8	51.2	48.7	38.8	29.3	23.3	17.0	32.2
Daily Maximum Temp	42.1	49.0	55.0	63.0	73.0	83.1	93.0	90.6	80.1	68.1	52.3	42.7	66.0
Record Minimum Temp	-24.0	-28.0	-3.0	6.0	12.0	23.0	29.0	28.0	12.0	7.0	-8.0	-37.0	-37.0
Record Maximum Temp	68.0	74.0	81.0	90.0	96.0	106.0	106.0	108.0	103.0	91.0	77.0	67.0	108.0
HDD, Base 65°F	1104	815	772	564	307	104	6	28	203	505	816	1091	6315
CDD, Base 65°F	0	0	0	0	9	89	229	173	38	0	0	0	538
Humidity Ratio (#w/#da)	0.0027	0.0031	0.0031	0.0033	0.0042	0.0052	0.0052	0.0050	0.0041	0.0035	0.0033	0.0028	0.0038
Wind Speed (mph)	7.2	8.0	8.7	8.9	8.9	8.8	8.6	8.1	8.0	7.5	7.8	7.5	8.2
Clearness Index, Kt	0.50	0.52	0.54	0.57	0.59	0.63	0.67	0.66	0.65	0.60	0.50	0.49	0.60

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

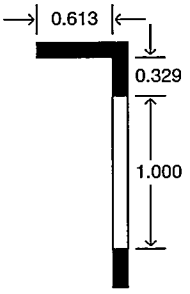
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	45/29	75/50	82/53	62/41	24/16	55/39	89/66	103/78	96/72	68/47	35/23	72/50	87/63	78/56	46/31	18/11	42/27	46/28	26/17	0/0
North	10/10	14/15	14/16	12/14	7/6	16/14	15/17	16/18	16/18	13/14	9/9	13/14	15/17	14/16	10/11	6/5	10/10	10/10	7/7	0/0
East	81/38	53/34	14/16	12/14	7/6	87/50	71/51	25/24	16/18	13/14	80/39	70/44	22/21	14/16	10/11	50/16	37/20	10/10	7/7	0/0
South	48/25	78/46	85/48	65/37	24/13	12/13	35/30	49/40	42/35	18/17	28/17	64/41	79/55	70/48	38/24	49/16	88/37	93/39	63/24	0/0
West	10/10	14/15	28/22	71/39	67/27	12/13	15/17	16/18	56/44	84/51	9/9	13/14	15/17	58/41	82/44	6/5	10/10	26/16	52/21	0/0
M. Clr (%hrs)	34	30	26	25	26	61	58	53	47	46	71	70	66	63	61	33	33	33	31	34

Albany, NY

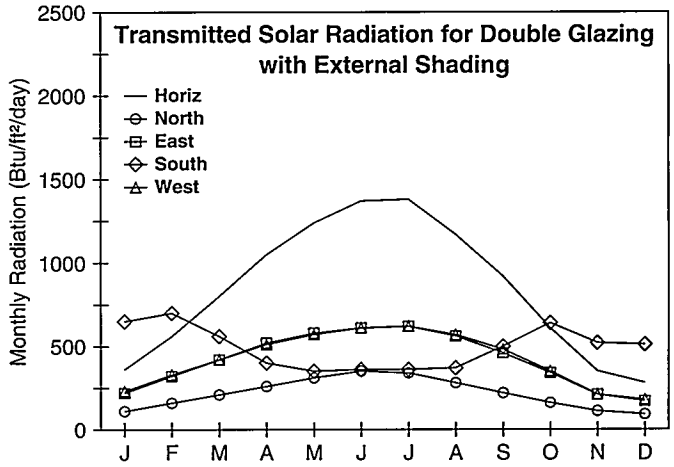
WBAN NO. 14735

LATITUDE: 42.75° N
LONGITUDE: 73.80° W
ELEVATION: 292 feet
MEAN PRESSURE: 14.6 psia

STATION TYPE: Primary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	560	830	1140	1470	1720	1890	1900	1630	1290	890	540	440	1190
	Std.Dev.	56	75	85	115	148	136	102	83	101	79	46	39	32
	Minimum	370	610	900	1220	1430	1600	1610	1320	900	650	440	340	1030
	Maximum	670	1050	1280	1700	2030	2170	2090	1820	1450	1140	630	510	1290
	Diffuse	330	460	590	730	850	910	880	770	610	450	340	280	600
	Clear-Day Global	780	1140	1650	2160	2520	2650	2550	2240	1770	1250	830	670	1690
North	Global	190	270	350	440	550	620	590	480	370	270	190	160	370
	Diffuse	190	270	350	430	500	540	530	460	370	270	190	160	360
	Clear-Day Global	170	230	310	420	570	690	620	470	340	250	170	150	370
East	Global	380	540	700	880	980	1050	1070	960	780	560	350	290	710
	Diffuse	230	330	430	520	600	640	640	570	450	330	230	190	430
	Clear-Day Global	620	840	1120	1360	1480	1520	1480	1370	1160	890	640	540	1090
South	Global	900	1050	1050	960	860	830	880	960	1050	1020	740	700	920
	Diffuse	350	450	500	550	580	600	600	580	510	420	330	300	480
	Clear-Day Global	1800	1940	1870	1500	1170	1020	1070	1340	1670	1860	1780	1700	1560
West	Global	380	540	710	860	970	1050	1060	960	800	580	350	300	710
	Diffuse	240	330	430	520	610	650	650	570	460	340	230	200	440
	Clear-Day Global	620	840	1120	1360	1480	1520	1480	1370	1160	890	640	540	1090

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

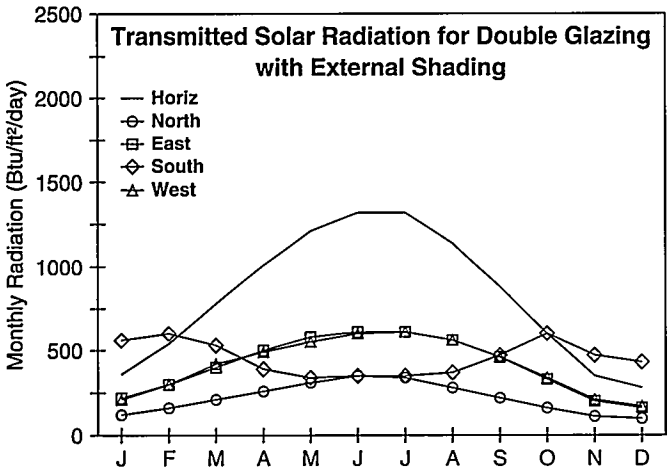
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	360	560	800	1050	1240	1370	1380	1170	920	610	350	280	840
North	Unshaded	130	180	240	300	360	410	390	330	260	190	130	110	250
	Shaded	110	160	210	260	310	350	340	280	220	160	110	92	220
East	Unshaded	260	380	500	630	700	750	760	680	550	390	240	200	500
	Shaded	220	320	420	520	580	610	620	560	460	340	210	170	420
South	Unshaded	670	770	730	640	550	520	550	620	720	740	550	530	630
	Shaded	650	700	560	400	350	360	360	370	500	640	520	510	490
West	Unshaded	260	380	500	610	690	750	750	680	570	410	240	200	500
	Shaded	230	330	420	510	570	610	620	570	480	350	210	180	420

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	20.6	23.5	34.3	46.4	57.6	66.9	71.8	69.6	61.3	50.2	39.7	26.5	47.4
Daily Minimum Temp	11.0	13.8	24.5	35.1	45.4	54.6	59.6	57.8	49.4	38.6	30.7	18.2	36.6
Daily Maximum Temp	30.2	33.2	44.0	57.5	69.7	79.0	84.0	81.4	73.2	61.8	48.7	34.9	58.1
Record Minimum Temp	-28.0	-21.0	-21.0	10.0	26.0	36.0	40.0	34.0	24.0	16.0	5.0	-22.0	-28.0
Record Maximum Temp	62.0	67.0	86.0	92.0	94.0	99.0	100.0	99.0	100.0	89.0	82.0	71.0	100.0
HDD, Base 65°F	1376	1162	952	558	247	34	0	12	141	459	759	1194	6894
CDD, Base 65°F	0	0	0	0	18	91	213	155	30	0	0	0	507
Humidity Ratio (#w/#da)	0.0018	0.0020	0.0027	0.0040	0.0066	0.0094	0.0112	0.0109	0.0086	0.0056	0.0038	0.0024	0.0058
Wind Speed (mph)	9.4	9.8	10.5	10.4	8.8	8.1	7.4	7.0	7.3	7.7	9.2	9.4	8.8
Clearness Index, Kt	0.46	0.49	0.49	0.49	0.50	0.51	0.53	0.51	0.50	0.46	0.40	0.41	0.49

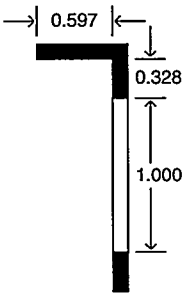
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	39/23	69/43	76/47	59/37	22/14	50/31	84/54	99/69	91/65	65/43	30/17	65/40	81/54	72/48	43/26	12/8	36/21	39/23	22/13	0/0
North	10/9	14/15	14/16	12/14	7/6	15/13	16/18	17/19	17/19	15/15	9/7	14/14	15/17	15/16	11/10	5/4	9/9	10/10	7/6	0/0
East	72/26	52/29	14/16	12/14	7/6	79/33	70/40	28/25	17/19	15/15	66/20	66/33	24/21	15/16	11/10	33/9	34/14	10/10	7/6	0/0
South	43/18	76/37	84/40	65/31	24/10	12/12	37/27	52/38	45/34	22/18	24/11	60/31	78/44	68/39	37/19	32/9	77/24	82/27	51/15	0/0
West	10/9	14/15	26/20	67/32	59/19	12/12	16/18	17/19	54/38	79/41	9/7	14/14	15/17	54/33	73/31	5/4	9/9	22/13	41/13	0/0
M. Clr (%hrs)	28	25	25	26	28	33	31	25	25	28	36	33	30	31	33	22	20	21	23	25



Binghamton, NY

WBAN NO. 04725



Shading Geometry
(Not to Scale)

LATITUDE: 42.22° N
LONGITUDE: 75.98° W
ELEVATION: 1637 feet
MEAN PRESSURE: 13.9 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±11%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	550	790	1110	1420	1680	1840	1830	1590	1240	870	530	430	1160
	Std.Dev.	42	62	81	117	150	139	120	77	104	69	45	33	26
	Minimum	480	690	970	1200	1390	1500	1590	1410	1020	750	450	380	1120
	Maximum	640	990	1260	1670	2010	2150	2090	1760	1400	1110	620	500	1210
	Diffuse	370	510	630	740	850	900	870	780	630	460	360	320	620
	Clear-Day Global	830	1190	1680	2190	2520	2650	2560	2250	1800	1280	870	710	1710
North	Global	200	280	360	440	540	610	590	480	370	270	200	170	380
	Diffuse	200	280	360	430	500	540	520	460	370	270	200	170	360
	Clear-Day Global	170	230	310	420	570	690	630	470	340	250	170	150	370
East	Global	370	510	670	840	980	1030	1040	930	760	550	340	280	690
	Diffuse	250	340	440	520	590	630	630	560	450	330	240	200	430
	Clear-Day Global	660	880	1140	1360	1480	1500	1470	1370	1170	910	680	580	1100
South	Global	790	910	980	910	830	800	840	920	980	960	680	610	850
	Diffuse	370	460	510	540	570	590	590	570	510	420	330	310	480
	Clear-Day Global	1920	2020	1870	1500	1170	1020	1070	1330	1670	1890	1870	1810	1590
West	Global	360	500	690	830	940	1020	1030	940	760	570	350	280	690
	Diffuse	250	340	440	520	600	640	630	570	460	340	240	200	440
	Clear-Day Global	660	880	1140	1360	1480	1500	1470	1370	1170	910	680	580	1100

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±11%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	360	540	780	1010	1210	1320	1320	1140	880	600	350	280	820
North	Unshaded	140	190	250	300	360	400	390	320	260	190	140	120	260
	Shaded	120	160	210	260	310	350	340	280	220	160	110	97	220
East	Unshaded	250	360	470	600	700	730	740	660	540	390	240	190	490
	Shaded	220	300	400	500	580	610	610	560	460	330	200	160	410
South	Unshaded	590	670	690	600	530	500	520	600	670	700	500	460	580
	Shaded	560	600	530	390	340	350	350	370	470	600	470	430	460
West	Unshaded	250	350	490	590	660	730	730	670	540	400	240	190	490
	Shaded	210	300	420	490	550	600	610	560	460	340	210	170	410

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	21.1	22.7	32.6	44.4	55.8	64.2	69.2	67.2	59.6	48.8	38.3	26.5	45.9
Daily Minimum Temp	14.3	15.3	24.7	35.2	46.2	54.6	59.7	57.9	50.6	40.3	31.6	20.3	37.6
Daily Maximum Temp	27.9	30.1	40.4	53.5	65.4	73.8	78.6	76.4	68.6	57.3	44.9	32.7	54.1
Record Minimum Temp	-20.0	-15.0	-6.0	9.0	25.0	33.0	39.0	37.0	25.0	17.0	3.0	-18.0	-20.0
Record Maximum Temp	63.0	66.0	82.0	88.0	89.0	94.0	98.0	94.0	96.0	82.0	77.0	65.0	98.0
HDD, Base 65°F	1361	1184	1004	618	305	73	16	35	180	502	801	1194	7273
CDD, Base 65°F	0	0	0	0	20	49	147	103	18	0	0	0	337
Humidity Ratio (#w/#da)	0.0020	0.0021	0.0029	0.0042	0.0068	0.0097	0.0114	0.0111	0.0091	0.0059	0.0041	0.0026	0.0060
Wind Speed (mph)	11.2	11.0	11.6	11.5	10.0	9.2	8.2	8.2	8.8	9.7	10.9	11.1	10.1
Clearness Index, Kt	0.44	0.46	0.47	0.47	0.48	0.50	0.51	0.50	0.47	0.44	0.38	0.39	0.47

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±11%

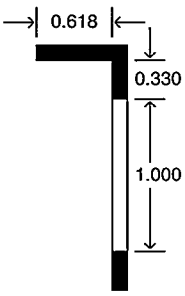
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	37/22	69/42	78/47	62/38	25/16	47/29	82/52	98/66	93/64	67/45	27/15	63/37	80/52	74/48	46/27	11/7	35/21	41/24	24/15	0/0
North	10/9	14/16	15/17	13/14	8/7	17/13	16/17	17/19	17/19	15/15	8/7	14/14	16/17	15/16	11/11	5/4	9/9	10/10	7/7	0/0
East	72/24	56/29	15/17	13/14	8/7	77/32	71/39	31/26	17/19	15/15	63/19	68/31	28/22	15/16	11/11	32/9	36/15	10/10	7/7	0/0
South	39/16	74/35	85/40	67/31	27/12	12/11	35/25	50/36	46/33	23/19	21/10	57/28	76/43	70/38	39/19	29/8	74/24	83/26	55/17	1/0
West	10/9	14/16	22/19	65/30	63/21	12/11	16/17	17/19	51/36	77/42	8/7	14/14	16/17	51/31	72/30	5/4	9/9	20/12	41/14	1/0
M. Clr (%hrs)	22	21	20	21	24	34	30	22	22	26	34	30	23	23	29	12	12	12	14	16

Buffalo, NY

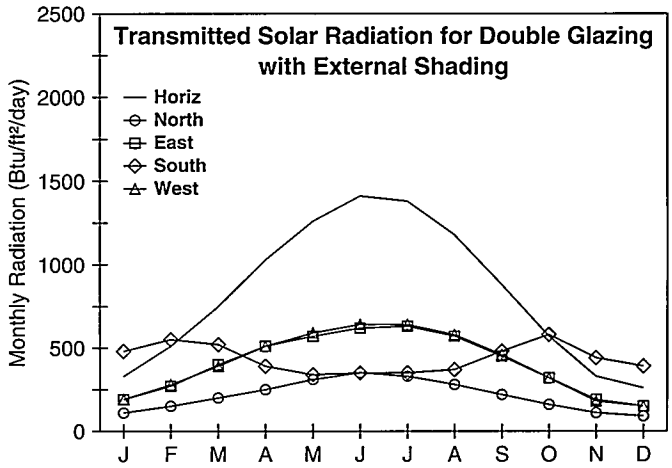
WBAN NO. 14733

LATITUDE: 42.93° N
LONGITUDE: 78.73° W
ELEVATION: 705 feet
MEAN PRESSURE: 14.4 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	500	740	1070	1440	1740	1940	1910	1640	1240	840	500	400	1170
	Std.Dev.	40	59	85	119	157	134	109	101	110	73	42	38	39
	Minimum	430	640	940	1140	1360	1610	1700	1460	1070	700	420	330	1080
	Maximum	580	870	1270	1640	2060	2200	2110	1870	1430	1060	590	480	1260
	Diffuse	360	500	600	700	790	840	820	740	600	450	340	300	590
	Clear-Day Global	790	1150	1640	2170	2510	2650	2560	2240	1770	1240	830	670	1690
North	Global	190	270	340	430	530	610	590	470	360	270	190	160	370
	Diffuse	190	270	340	420	490	530	520	450	360	270	190	160	350
	Clear-Day Global	170	230	310	420	570	690	640	460	340	250	170	150	370
East	Global	320	460	660	860	990	1070	1070	960	760	540	320	260	690
	Diffuse	240	330	420	510	580	620	620	550	450	320	220	190	420
	Clear-Day Global	630	850	1110	1350	1480	1520	1480	1360	1160	880	650	550	1090
South	Global	680	850	970	940	870	840	870	970	1000	940	630	550	840
	Diffuse	360	440	490	530	560	580	580	560	500	410	310	290	470
	Clear-Day Global	1850	1990	1870	1510	1180	1040	1090	1340	1680	1860	1810	1740	1580
West	Global	320	470	650	850	1000	1090	1090	970	770	540	310	260	700
	Diffuse	240	330	420	510	590	630	630	560	450	330	220	190	430
	Clear-Day Global	630	850	1110	1350	1480	1520	1480	1360	1160	880	650	550	1090

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

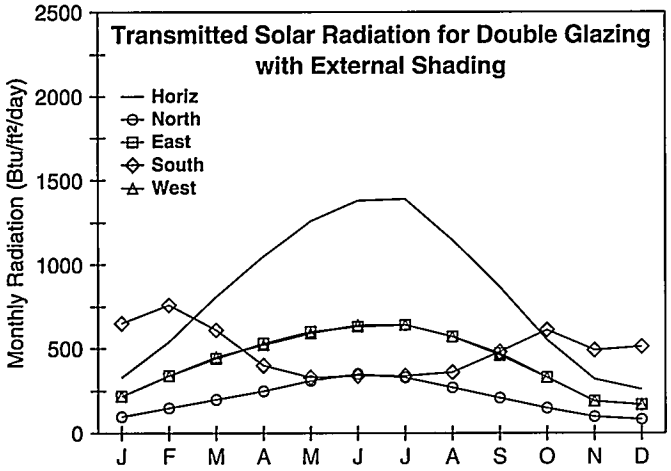
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	330	510	750	1030	1260	1410	1380	1180	880	570	330	260	830
North	Unshaded	130	190	240	290	350	400	380	320	250	180	130	110	250
	Shaded	110	150	200	250	310	350	330	280	220	160	110	91	210
East	Unshaded	220	330	470	610	700	760	760	680	540	380	220	170	490
	Shaded	190	270	400	510	570	620	630	570	450	320	190	150	410
South	Unshaded	510	620	680	630	550	520	540	630	690	680	470	410	580
	Shaded	480	550	520	390	340	350	350	370	480	580	440	390	430
West	Unshaded	220	330	460	610	710	780	780	690	550	380	220	170	490
	Shaded	190	280	390	510	590	640	640	580	460	320	180	150	410

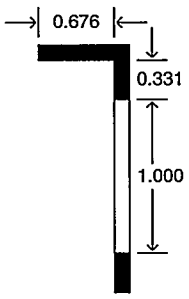
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	23.6	24.5	33.8	45.2	56.6	65.9	71.1	69.0	61.9	51.1	40.5	29.1	47.7
Daily Minimum Temp	17.0	17.4	25.9	36.2	47.0	56.5	61.9	60.1	53.0	42.7	33.9	22.9	39.5
Daily Maximum Temp	30.2	31.6	41.7	54.2	66.1	75.3	80.2	77.9	70.8	59.4	47.1	35.3	55.8
Record Minimum Temp	-16.0	-20.0	-7.0	12.0	26.0	35.0	43.0	38.0	32.0	20.0	9.0	-10.0	-20.0
Record Maximum Temp	72.0	65.0	81.0	94.0	90.0	96.0	97.0	99.0	98.0	87.0	80.0	74.0	99.0
HDD, Base 65°F	1283	1134	967	594	279	59	5	17	130	431	735	1113	6747
CDD, Base 65°F	0	0	0	0	19	86	194	141	37	0	0	0	477
Humidity Ratio (#w/#da)	0.0022	0.0022	0.0031	0.0044	0.0067	0.0095	0.0112	0.0111	0.0090	0.0060	0.0042	0.0028	0.0061
Wind Speed (mph)	13.8	12.6	12.3	11.9	10.8	10.2	9.7	9.2	9.5	10.3	11.8	12.5	11.2
Clearness Index, Kt	0.41	0.44	0.46	0.48	0.50	0.52	0.53	0.51	0.48	0.43	0.37	0.37	0.48

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	33/19	66/39	78/46	63/38	29/17	44/27	80/51	98/67	95/65	71/48	23/13	60/35	79/50	75/48	49/29	8/5	32/19	40/23	25/15	2/2
North	9/8	13/14	14/16	13/14	8/7	18/12	16/16	17/18	17/18	15/16	7/6	13/13	15/16	15/16	12/11	4/3	9/8	10/10	8/7	1/1
East	70/23	59/29	14/16	13/14	8/7	77/32	74/41	35/28	17/18	15/16	57/18	70/32	32/23	15/16	12/11	24/6	37/14	10/10	8/7	1/1
South	36/14	73/33	86/39	70/31	32/13	11/10	33/24	51/37	48/35	26/21	17/8	55/27	76/41	71/39	43/21	21/5	71/21	83/25	57/17	6/2
West	9/8	13/14	17/17	62/29	68/21	11/10	16/16	17/18	47/34	78/45	7/6	13/13	15/16	47/29	73/30	4/3	9/8	16/11	40/13	8/2
M. Clr (%hrs)	23	21	19	19	21	37	33	31	33	33	35	28	26	27	32	11	11	11	11	12





Shading Geometry
(Not to Scale)

Massena, NY

WBAN NO. 94725

LATITUDE: 44.93° N
LONGITUDE: 74.85° W
ELEVATION: 207 feet
MEAN PRESSURE: 14.6 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	520	820	1170	1470	1750	1910	1920	1610	1230	820	490	410	1180
	Std.Dev.	43	76	82	101	133	129	95	74	95	62	36	39	28
	Minimum	400	660	1010	1190	1490	1630	1740	1480	1020	700	420	340	1130
	Maximum	600	1000	1280	1620	1980	2120	2130	1760	1370	1020	560	500	1240
	Diffuse	320	440	580	680	780	830	790	710	570	420	320	270	560
	Clear-Day Global	730	1090	1610	2150	2520	2670	2580	2240	1740	1190	770	610	1660
North	Global	180	260	350	430	550	630	590	470	350	260	180	150	370
	Diffuse	180	260	350	420	490	530	510	450	350	260	180	150	340
	Clear-Day Global	150	220	290	400	580	710	640	460	320	230	160	130	360
East	Global	370	560	750	910	1040	1110	1120	980	790	550	330	290	730
	Diffuse	220	330	430	510	580	630	610	550	440	310	220	180	420
	Clear-Day Global	620	860	1150	1410	1540	1580	1540	1420	1190	900	640	540	1120
South	Global	900	1130	1160	1010	910	870	920	990	1050	990	690	710	940
	Diffuse	350	450	510	530	570	590	580	560	500	400	310	300	470
	Clear-Day Global	1880	2040	1940	1580	1250	1090	1140	1400	1740	1920	1840	1770	1630
West	Global	370	560	760	900	1020	1110	1120	980	780	550	320	290	730
	Diffuse	230	330	430	510	590	640	620	560	440	320	220	190	420
	Clear-Day Global	620	860	1150	1410	1540	1580	1540	1420	1190	900	640	540	1120

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	330	540	810	1050	1260	1380	1390	1150	870	550	320	260	830
North	Unshaded	120	180	240	290	360	410	390	320	250	180	120	100	250
	Shaded	100	150	200	250	310	350	330	270	210	150	100	84	210
East	Unshaded	250	390	530	650	740	790	800	700	560	390	230	190	520
	Shaded	220	340	440	530	600	630	640	570	470	330	190	170	430
South	Unshaded	680	840	820	680	580	540	580	650	730	720	520	540	650
	Shaded	650	760	610	400	330	340	340	360	480	610	490	510	490
West	Unshaded	250	400	540	640	730	790	800	700	560	390	220	200	520
	Shaded	220	340	450	520	590	640	640	570	460	330	190	170	430

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	14.3	16.5	28.3	42.7	55.2	63.9	69.2	66.5	58.0	47.0	35.3	20.2	43.1
Daily Minimum Temp	4.3	6.5	19.1	32.6	43.8	52.5	57.7	55.5	47.2	37.0	27.7	11.7	33.0
Daily Maximum Temp	24.2	26.5	37.5	52.7	66.6	75.3	80.6	77.5	68.8	56.9	42.8	28.7	53.2
Record Minimum Temp	-38.0	-34.1	-24.0	7.0	21.9	30.9	37.9	35.1	27.0	16.0	-5.1	-32.1	-38.0
Record Maximum Temp	59.0	61.0	82.0	89.1	93.9	93.0	96.1	100.0	91.0	82.0	75.0	64.9	100.0
HDD, Base 65°F	1572	1358	1138	669	318	73	16	52	221	558	891	1389	8255
CDD, Base 65°F	0	0	0	0	14	40	146	99	11	0	0	0	310
Humidity Ratio (#w/#da)	0.0016	0.0017	0.0025	0.0040	0.0064	0.0094	0.0111	0.0106	0.0084	0.0055	0.0037	0.0022	0.0056
Wind Speed (mph)	9.4	9.1	9.4	9.6	8.5	7.5	6.9	6.5	6.8	8.0	8.9	9.0	8.3
Clearness Index, Kt	0.48	0.52	0.52	0.50	0.50	0.52	0.53	0.51	0.49	0.45	0.39	0.42	0.50

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

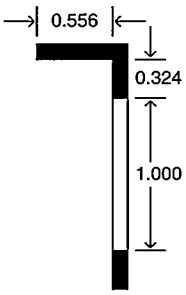
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	37/23	66/43	74/47	58/37	23/15	50/31	82/52	97/66	90/63	66/45	27/17	61/37	77/50	70/45	42/26	10/7	31/20	36/22	20/13	0/0
North	9/9	13/15	14/17	12/14	7/7	14/12	15/17	16/19	16/18	14/15	8/7	13/13	15/16	14/15	11/10	4/3	8/9	9/9	6/6	0/0
East	73/26	54/30	14/17	12/14	7/7	80/36	70/40	28/25	16/18	14/15	66/23	66/31	25/21	14/15	11/10	31/8	33/15	9/9	6/6	0/0
South	43/18	78/38	87/43	68/32	27/12	12/12	39/27	54/38	48/35	24/20	23/11	60/29	79/44	70/38	39/20	30/8	73/24	83/27	54/17	0/0
West	9/9	13/15	23/20	66/32	64/22	12/12	15/17	16/19	51/37	78/45	8/7	13/13	15/16	52/31	71/30	4/3	8/9	20/12	41/14	0/0
M. Clr (%hrs)	32	31	31	31	31	37	34	29	28	31	37	34	28	29	34	22	21	19	20	23

New York City, NY

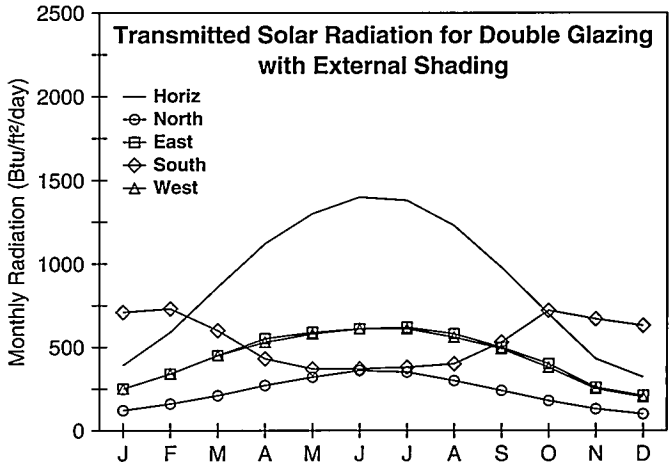
WBAN NO. 94728

LATITUDE: 40.78° N
LONGITUDE: 73.97° W
ELEVATION: 187 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Primary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	610	870	1220	1560	1800	1940	1910	1710	1370	1010	640	510	1260
	Std.Dev.	35	73	74	108	134	122	106	87	87	67	52	39	30
	Minimum	530	720	1050	1360	1520	1600	1670	1540	1220	910	540	430	1180
	Maximum	690	1040	1400	1740	2040	2170	2080	1870	1540	1200	750	570	1320
	Diffuse	320	430	580	740	900	970	950	840	660	470	340	280	630
	Clear-Day Global	840	1190	1670	2160	2470	2580	2500	2210	1780	1290	890	730	1700
North	Global	190	260	350	450	550	620	600	500	390	290	210	170	380
	Diffuse	190	260	350	440	520	560	550	480	390	290	210	170	370
	Clear-Day Global	180	240	330	430	580	670	620	480	360	270	200	160	380
East	Global	410	560	740	910	1000	1040	1050	970	820	650	430	350	750
	Diffuse	240	330	430	540	630	670	660	600	490	370	260	210	450
	Clear-Day Global	640	840	1090	1300	1410	1430	1390	1300	1120	880	660	560	1050
South	Global	980	1090	1100	990	870	820	850	970	1080	1140	940	860	970
	Diffuse	350	430	510	560	600	620	620	610	550	470	360	310	500
	Clear-Day Global	1800	1890	1770	1440	1120	980	1030	1270	1590	1780	1760	1710	1510
West	Global	410	550	740	890	980	1040	1030	950	800	630	410	340	730
	Diffuse	240	330	440	540	630	680	670	600	490	370	250	200	450
	Clear-Day Global	640	840	1090	1300	1410	1430	1390	1300	1120	880	660	560	1050

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	390	590	860	1120	1300	1400	1380	1230	980	700	430	320	890
North	Unshaded	130	180	240	310	370	410	400	340	270	200	140	120	260
	Shaded	120	160	210	270	320	360	350	300	240	180	130	100	230
East	Unshaded	280	390	520	650	700	740	740	690	580	450	300	230	520
	Shaded	250	340	450	550	590	610	620	580	500	400	260	210	450
South	Unshaded	730	800	770	650	550	510	530	620	740	820	700	650	670
	Shaded	710	730	600	430	370	370	380	400	530	720	670	630	540
West	Unshaded	280	380	520	630	690	730	730	670	570	440	280	230	510
	Shaded	250	340	450	530	580	610	610	560	490	380	250	200	440

Average Climatic Conditions

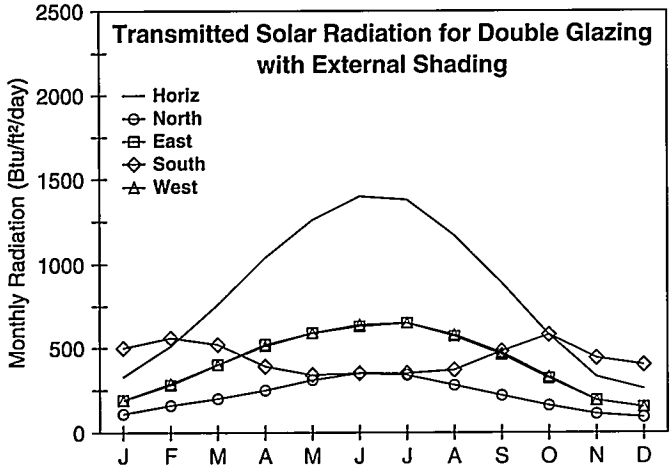
Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	31.5	33.6	42.4	52.5	62.7	71.6	76.8	75.5	68.2	57.5	47.6	36.6	54.7
Daily Minimum Temp	25.3	26.9	34.8	43.8	53.7	63.0	68.4	67.3	60.1	49.7	41.1	30.7	47.1
Daily Maximum Temp	37.6	40.3	50.0	61.2	71.7	80.1	85.2	83.7	76.2	65.3	54.0	42.5	62.3
Record Minimum Temp	-6.0	-15.0	3.0	12.0	32.0	44.0	52.0	50.0	39.0	28.0	5.0	-13.0	-15.0
Record Maximum Temp	72.0	75.0	86.0	96.0	99.0	101.0	106.0	104.0	102.0	94.0	84.0	72.0	106.0
HDD, Base 65°F	1039	879	701	375	125	0	0	0	34	250	522	880	4805
CDD, Base 65°F	0	0	0	0	54	203	366	326	130	17	0	0	1096
Humidity Ratio (#w/#da)	0.0024	0.0025	0.0033	0.0047	0.0074	0.0102	0.0123	0.0123	0.0099	0.0067	0.0046	0.0030	0.0066
Wind Speed (mph)	13.7	13.6	13.6	13.0	11.6	11.0	10.5	10.6	11.1	11.5	12.9	13.4	12.2
Clearness Index, Kt	0.46	0.48	0.50	0.51	0.51	0.52	0.53	0.53	0.51	0.50	0.44	0.42	0.50

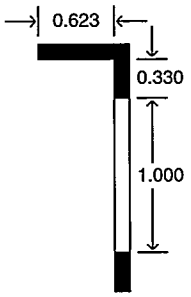
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	39/23	71/45	79/48	60/38	22/14	48/31	83/54	100/71	93/67	64/44	28/17	66/41	82/56	73/50	42/27	14/9	38/23	42/25	24/15	0/0
North	10/9	14/15	15/16	13/14	7/6	17/13	17/18	18/20	18/20	16/16	9/8	15/15	17/18	16/17	12/11	5/4	10/9	10/10	7/6	0/0
East	69/25	53/30	15/16	13/14	7/6	72/33	69/40	29/26	18/20	16/16	60/21	65/33	26/22	16/17	12/11	34/11	34/16	10/10	7/6	0/0
South	40/17	73/38	82/41	62/32	22/10	13/12	35/25	49/37	43/33	21/18	22/11	58/30	75/44	65/38	34/19	33/10	75/28	81/29	52/18	0/0
West	10/9	14/15	26/20	66/33	55/19	13/12	17/18	18/20	55/39	75/42	9/8	15/15	17/18	54/33	66/30	5/4	10/9	22/13	42/15	0/0
M. Clr (%hrs)	38	35	34	32	34	38	39	34	34	35	43	46	40	39	39	33	32	31	30	35

Rochester, NY

WBAN NO. 14768





Shading Geometry
(Not to Scale)

LATITUDE: 43.12° N
LONGITUDE: 77.67° W
ELEVATION: 554 feet
MEAN PRESSURE: 14.4 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	500	750	1080	1460	1750	1930	1910	1630	1250	840	500	400	1170
	Std.Dev.	38	56	69	113	167	137	105	89	102	69	38	30	28
	Minimum	430	680	930	1180	1410	1630	1660	1460	1050	720	430	360	1110
	Maximum	600	880	1210	1650	2040	2180	2060	1850	1460	1070	570	470	1230
	Diffuse	350	500	610	700	800	840	810	730	600	450	350	300	590
	Clear-Day Global	780	1140	1650	2160	2520	2650	2560	2240	1770	1240	830	660	1690
North	Global	190	270	350	430	540	620	590	480	370	270	190	160	370
	Diffuse	190	270	350	420	490	530	510	450	360	270	190	160	350
	Clear-Day Global	160	230	310	410	580	690	640	460	330	240	170	140	360
East	Global	330	470	660	870	1010	1090	1100	970	780	540	320	250	700
	Diffuse	230	330	420	510	580	620	620	550	450	320	230	190	420
	Clear-Day Global	620	850	1130	1360	1500	1530	1500	1380	1170	890	650	550	1100
South	Global	710	860	970	950	870	830	870	960	1020	940	630	560	850
	Diffuse	350	450	500	530	560	580	580	560	500	410	310	290	470
	Clear-Day Global	1850	1990	1880	1520	1180	1030	1080	1340	1680	1870	1830	1740	1580
West	Global	330	480	670	870	1010	1100	1100	970	780	550	320	260	700
	Diffuse	230	340	420	520	590	630	620	560	450	330	230	190	430
	Clear-Day Global	620	850	1130	1360	1500	1530	1500	1380	1170	890	650	550	1100

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	330	510	760	1040	1260	1400	1380	1170	890	580	330	260	830
North	Unshaded	130	190	240	300	360	410	390	320	250	190	130	110	250
	Shaded	110	160	200	250	310	350	340	280	220	160	110	91	210
East	Unshaded	230	330	470	620	720	780	790	690	550	380	220	170	500
	Shaded	190	280	400	520	590	630	650	570	460	320	190	150	410
South	Unshaded	530	630	680	630	550	520	540	620	700	680	470	420	580
	Shaded	500	560	520	390	340	350	350	370	480	580	440	400	440
West	Unshaded	230	340	480	620	720	780	790	700	560	380	220	180	500
	Shaded	190	290	400	510	590	640	650	580	470	330	190	150	420

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	23.6	24.6	34.3	45.9	57.1	65.1	70.2	68.0	61.7	51.1	40.5	29.1	47.6
Daily Minimum Temp	16.3	16.6	25.7	35.9	46.3	54.3	59.6	57.8	51.7	41.6	33.3	22.4	38.5
Daily Maximum Temp	30.9	32.5	42.7	55.9	67.8	75.8	80.7	78.1	71.8	60.5	47.8	35.8	56.7
Record Minimum Temp	-16.0	-19.0	-6.0	13.0	26.0	35.0	42.0	36.0	28.0	20.0	5.0	-16.0	-19.0
Record Maximum Temp	74.0	67.0	84.0	93.0	94.0	100.0	98.0	99.0	99.0	91.0	81.0	72.0	100.0
HDD, Base 65°F	1283	1131	952	573	270	62	10	33	137	435	735	1113	6734
CDD, Base 65°F	0	0	0	0	25	65	171	126	38	0	0	0	425
Humidity Ratio (#w/#da)	0.0021	0.0022	0.0031	0.0045	0.0069	0.0098	0.0115	0.0114	0.0093	0.0061	0.0043	0.0028	0.0062
Wind Speed (mph)	12.1	11.2	11.2	11.3	9.7	9.0	8.2	8.0	8.3	8.9	10.4	11.0	9.9
Clearness Index, Kt	0.42	0.45	0.46	0.48	0.50	0.52	0.53	0.51	0.48	0.44	0.37	0.38	0.48

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

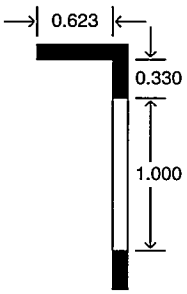
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	34/20	66/40	77/46	62/38	27/17	46/28	81/50	98/67	94/65	70/46	24/14	61/36	79/50	74/48	47/28	8/6	32/19	39/23	24/15	1/1
North	9/9	13/15	14/17	13/14	8/7	17/13	15/17	16/19	16/19	15/15	8/6	13/13	15/17	15/16	11/11	4/3	9/9	10/10	7/7	0/0
East	71/22	57/28	14/17	13/14	8/7	79/34	74/39	34/28	16/19	15/15	61/19	70/32	30/23	15/16	11/11	25/7	35/14	10/10	7/7	0/0
South	37/15	73/33	86/39	69/31	30/12	11/11	34/24	51/37	48/35	26/20	19/9	57/27	76/42	71/39	42/21	23/6	69/21	82/25	55/16	2/1
West	9/9	13/15	19/18	63/29	66/21	11/11	15/17	16/19	48/35	79/42	8/6	13/13	15/17	49/30	73/30	4/3	9/9	17/12	40/13	3/1
M. Clr (%hrs)	23	21	21	22	23	38	37	31	29	34	35	31	27	27	33	11	12	12	11	13

Syracuse, NY

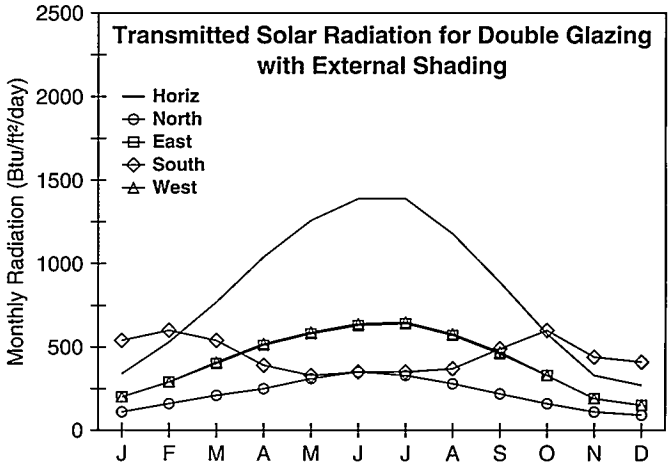
WBAN NO. 14771

LATITUDE: 43.12° N
LONGITUDE: 76.12° W
ELEVATION: 407 feet
MEAN PRESSURE: 14.5 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	520	780	1100	1460	1750	1920	1920	1640	1260	850	500	410	1180
	Std.Dev.	34	53	72	103	167	118	104	80	105	67	38	33	25
	Minimum	460	670	990	1230	1400	1700	1670	1480	970	730	420	350	1130
	Maximum	610	920	1260	1630	2090	2140	2060	1810	1430	1090	580	480	1220
	Diffuse	360	500	610	690	790	840	800	730	590	440	350	300	580
	Clear-Day Global	780	1140	1650	2160	2520	2660	2570	2250	1770	1240	820	660	1690
North	Global	190	270	350	430	540	620	590	480	360	270	190	160	370
	Diffuse	190	270	350	420	490	530	510	450	360	270	190	160	350
	Clear-Day Global	170	230	310	410	580	690	630	460	330	240	170	140	370
East	Global	340	490	680	870	1000	1080	1100	960	770	550	320	260	700
	Diffuse	240	340	430	510	580	620	610	550	450	320	230	190	420
	Clear-Day Global	620	850	1130	1370	1500	1540	1500	1380	1170	890	650	540	1100
South	Global	760	910	1000	950	870	830	880	970	1030	970	630	580	870
	Diffuse	360	460	500	530	560	580	580	560	500	410	310	290	470
	Clear-Day Global	1840	1980	1880	1520	1190	1030	1080	1340	1680	1870	1810	1730	1580
West	Global	340	490	690	880	1010	1100	1100	980	790	560	320	260	710
	Diffuse	240	340	430	510	590	630	620	560	450	330	230	190	430
	Clear-Day Global	620	850	1130	1370	1500	1540	1500	1380	1170	890	650	540	1100

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

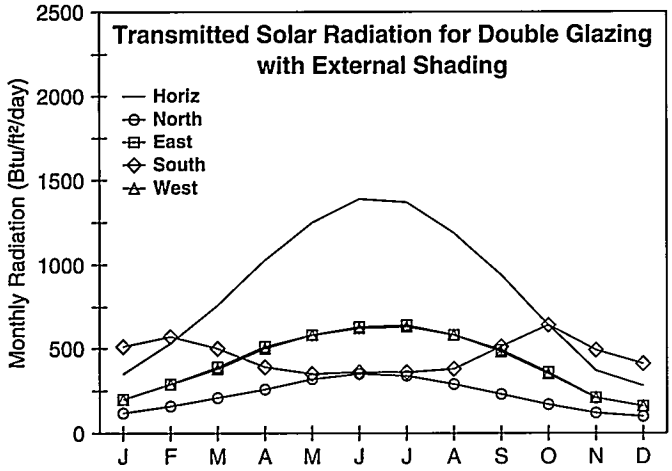
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	340	530	770	1040	1260	1390	1390	1180	890	580	330	270	830
North	Unshaded	130	190	240	290	360	410	390	320	250	180	130	110	250
	Shaded	110	160	210	250	310	350	330	280	220	160	110	91	210
East	Unshaded	240	340	480	620	710	770	780	680	550	380	220	180	500
	Shaded	200	290	400	510	580	630	640	570	460	330	190	150	410
South	Unshaded	570	670	700	630	550	520	540	630	710	700	470	430	590
	Shaded	540	600	540	390	330	350	350	370	490	600	440	410	450
West	Unshaded	240	340	490	620	720	780	780	700	560	390	220	180	500
	Shaded	200	290	410	520	590	640	650	580	470	330	190	150	420

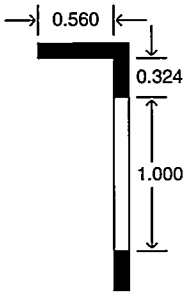
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	22.4	24.0	33.9	45.7	57.1	65.3	70.4	68.4	61.5	50.7	40.5	28.3	47.4
Daily Minimum Temp	14.2	15.4	25.1	35.5	46.0	53.8	59.0	57.7	51.4	41.1	33.0	21.1	37.8
Daily Maximum Temp	30.6	32.5	42.7	56.0	68.3	76.7	81.7	79.0	71.6	60.3	48.0	35.4	56.9
Record Minimum Temp	-26.0	-26.0	-16.0	9.0	25.0	35.0	45.0	40.0	28.0	19.0	5.0	-22.0	-26.0
Record Maximum Temp	70.0	69.0	87.0	92.0	96.0	98.0	97.0	97.0	97.0	87.0	81.0	70.0	98.0
HDD, Base 65°F	1321	1148	964	579	268	61	10	28	139	443	735	1138	6834
CDD, Base 65°F	0	0	0	0	23	70	178	133	34	0	0	0	438
Humidity Ratio (#w/#da)	0.0020	0.0021	0.0030	0.0043	0.0069	0.0097	0.0114	0.0113	0.0091	0.0060	0.0042	0.0027	0.0061
Wind Speed (mph)	10.8	10.8	10.7	10.4	9.0	8.0	7.8	7.6	8.0	8.5	10.1	10.5	9.3
Clearness Index, Kt	0.44	0.46	0.47	0.48	0.50	0.52	0.53	0.51	0.49	0.44	0.37	0.38	0.48

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	36/21	68/41	77/46	61/38	25/16	48/30	82/52	98/67	93/65	68/45	26/16	63/37	79/51	74/48	45/28	10/7	33/20	39/23	23/14	0/0
North	9/9	13/15	14/17	13/14	8/7	16/13	16/17	16/19	16/19	14/15	8/7	13/14	15/17	15/16	11/11	4/3	9/9	10/10	7/7	0/0
East	71/23	56/28	14/17	13/14	8/7	80/34	72/40	31/26	16/19	14/15	63/22	68/31	28/22	15/16	11/11	29/8	35/14	10/10	7/7	0/0
South	39/16	75/35	86/39	67/32	27/12	12/11	36/25	52/37	47/35	24/19	21/10	58/28	77/43	70/40	39/21	27/7	73/22	82/25	53/16	0/0
West	9/9	13/15	22/19	65/31	63/21	12/11	16/17	16/19	51/37	79/43	8/7	13/14	15/17	51/31	72/32	4/3	9/9	19/12	40/13	0/0
M. Clr (%hrs)	25	23	22	22	24	36	35	30	31	32	33	33	28	27	33	11	14	13	12	13





Shading Geometry
(Not to Scale)

Akron, OH

WBAN NO. 14895

LATITUDE: 40.92° N
LONGITUDE: 81.43° W
ELEVATION: 1237 feet
MEAN PRESSURE: 14.1 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	530	770	1080	1440	1740	1920	1890	1660	1320	930	560	430	1190
	Std.Dev.	39	70	68	121	149	127	97	100	107	73	58	32	32
	Minimum	470	640	960	1140	1430	1730	1740	1450	1150	800	430	380	1130
	Maximum	610	980	1260	1680	2030	2250	2130	1870	1510	1170	660	500	1250
	Diffuse	360	480	630	740	860	910	890	790	630	470	360	310	620
	Clear-Day Global	840	1190	1680	2170	2500	2610	2530	2240	1800	1300	890	730	1710
North	Global	200	270	350	440	540	610	590	480	380	280	200	170	380
	Diffuse	200	270	350	430	500	540	530	470	380	280	200	170	360
	Clear-Day Global	190	250	330	430	580	680	630	480	360	270	200	160	380
East	Global	340	480	650	850	970	1060	1070	950	800	590	350	270	700
	Diffuse	240	320	420	520	600	650	640	570	470	350	240	200	440
	Clear-Day Global	630	840	1090	1310	1420	1450	1410	1310	1130	880	660	560	1060
South	Global	720	870	920	910	840	800	840	940	1040	1020	710	580	850
	Diffuse	340	430	490	540	580	600	600	580	530	440	330	290	480
	Clear-Day Global	1790	1890	1790	1450	1130	980	1030	1280	1610	1800	1760	1700	1510
West	Global	340	480	640	830	960	1040	1040	950	790	580	350	270	690
	Diffuse	240	330	430	520	610	650	650	580	480	350	240	200	440
	Clear-Day Global	630	840	1090	1310	1420	1450	1410	1310	1130	880	660	560	1060

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	350	530	760	1030	1250	1390	1370	1190	940	640	370	280	850
North	Unshaded	140	190	240	300	360	410	390	330	260	200	140	120	260
	Shaded	120	160	210	260	320	350	340	290	230	170	120	99	220
East	Unshaded	230	330	460	600	690	760	760	680	570	410	240	190	490
	Shaded	200	290	390	510	580	630	640	580	490	360	210	160	420
South	Unshaded	540	630	640	600	530	500	520	600	710	730	520	430	580
	Shaded	510	570	500	390	350	360	360	380	510	640	490	410	460
West	Unshaded	230	340	450	590	680	740	740	680	560	400	240	180	490
	Shaded	200	290	380	500	580	620	630	580	480	350	210	160	420

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	24.8	27.4	38.0	48.5	59.0	67.8	71.9	70.3	63.7	52.4	42.0	30.7	49.7
Daily Minimum Temp	16.9	18.9	28.6	37.9	48.2	57.0	61.5	60.1	53.7	42.7	34.2	23.6	40.3
Daily Maximum Temp	32.6	35.9	47.3	59.1	69.7	78.5	82.3	80.4	73.7	62.1	49.7	37.7	59.1
Record Minimum Temp	-24.0	-13.0	-3.0	10.0	24.0	32.0	43.0	41.0	32.0	20.0	-1.0	-16.0	-24.0
Record Maximum Temp	70.0	68.0	81.0	88.0	93.0	100.0	101.0	98.0	99.0	86.0	80.0	76.0	101.0
HDD, Base 65°F	1246	1053	837	495	224	37	0	13	103	399	690	1063	6160
CDD, Base 65°F	0	0	0	0	38	121	217	177	64	8	0	0	625
Humidity Ratio (#w/#da)	0.0023	0.0025	0.0035	0.0049	0.0074	0.0104	0.0121	0.0119	0.0097	0.0062	0.0044	0.0030	0.0065
Wind Speed (mph)	11.7	11.0	11.3	10.7	9.2	8.3	7.6	7.3	8.1	9.2	10.8	11.4	9.7
Clearness Index, Kt	0.40	0.43	0.44	0.47	0.49	0.52	0.53	0.51	0.49	0.46	0.38	0.36	0.48

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

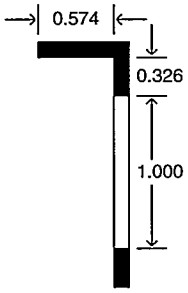
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	30/17	65/38	79/46	67/40	33/19	39/24	77/51	98/70	96/68	72/49	19/11	58/34	80/52	78/52	51/33	7/5	33/19	44/24	30/17	4/3
North	9/7	13/14	15/17	14/15	9/8	20/13	16/17	17/19	17/19	16/16	7/5	13/13	16/17	16/17	13/12	3/2	9/8	10/10	8/8	2/2
East	65/19	61/28	17/17	14/15	9/8	69/29	75/43	41/32	17/19	16/16	49/15	71/32	37/26	16/17	13/12	23/5	40/14	10/10	8/8	2/2
South	30/12	67/30	83/37	70/31	33/14	11/10	29/22	47/36	46/35	27/21	13/7	51/25	74/41	71/42	44/24	19/4	69/19	85/24	63/18	10/3
West	9/7	13/14	15/17	59/28	66/21	11/10	16/17	17/19	43/33	74/44	7/5	13/13	16/17	44/30	70/33	3/2	9/8	13/11	42/14	13/3
M. Clr (%hrs)	23	22	21	20	22	38	37	29	27	30	42	39	33	29	35	15	15	14	13	15

Cleveland, OH

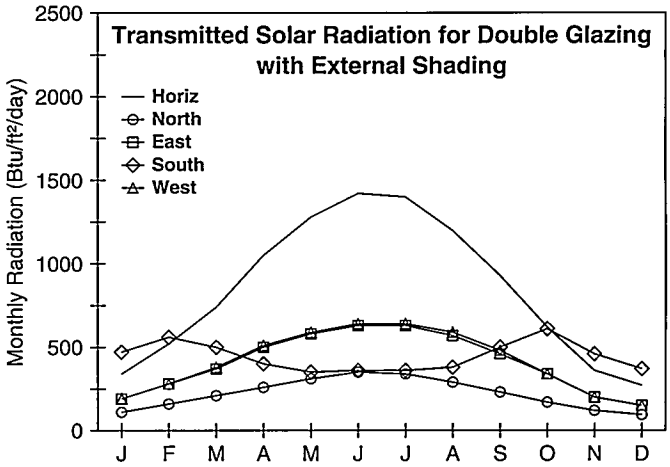
WBAN NO. 14820

LATITUDE: 41.40° N
LONGITUDE: 81.85° W
ELEVATION: 804 feet
MEAN PRESSURE: 14.3 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	510	760	1060	1460	1770	1950	1930	1670	1300	900	530	410	1190
	Std.Dev.	38	61	70	105	122	123	103	113	96	77	53	32	28
	Minimum	440	660	920	1190	1520	1700	1740	1420	1120	770	430	370	1130
	Maximum	600	960	1280	1650	2040	2300	2180	1910	1460	1150	660	480	1250
	Diffuse	360	480	620	730	830	870	860	770	620	470	350	310	610
	Clear-Day Global	820	1170	1660	2160	2480	2600	2520	2220	1780	1270	870	710	1690
North	Global	190	270	350	430	540	610	590	480	380	280	200	170	370
	Diffuse	190	270	350	430	500	540	530	460	380	280	200	170	360
	Clear-Day Global	180	250	330	430	580	680	630	470	360	270	190	160	380
East	Global	320	460	620	830	970	1060	1060	940	770	560	330	250	680
	Diffuse	230	320	420	520	600	640	630	570	460	340	230	190	430
	Clear-Day Global	620	830	1080	1310	1420	1450	1420	1310	1120	870	640	550	1050
South	Global	670	850	910	930	860	820	860	950	1030	980	670	530	840
	Diffuse	340	420	490	540	570	590	590	570	520	430	320	280	470
	Clear-Day Global	1770	1890	1790	1460	1150	990	1050	1280	1610	1790	1740	1680	1520
West	Global	320	470	640	850	990	1080	1080	970	790	560	330	260	690
	Diffuse	230	320	420	520	600	640	640	570	470	340	230	200	430
	Clear-Day Global	620	830	1080	1310	1420	1450	1420	1310	1120	870	640	550	1050

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

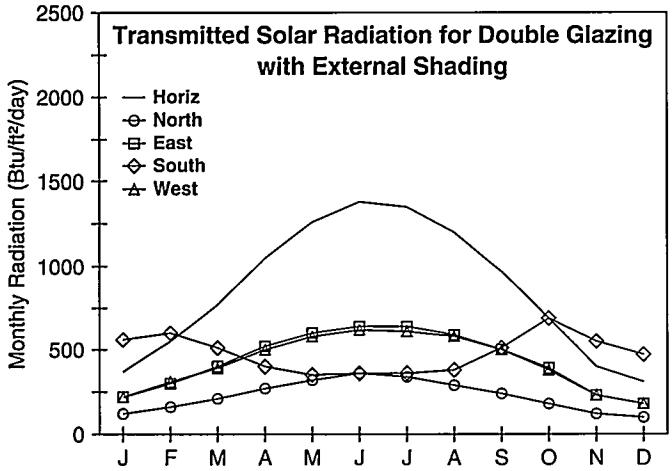
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	340	520	740	1050	1280	1420	1400	1200	930	620	360	270	850
North	Unshaded	130	180	240	300	360	400	390	320	260	190	140	120	250
	Shaded	110	160	210	260	310	350	340	290	230	170	120	95	220
East	Unshaded	220	320	440	590	690	760	750	670	540	390	230	170	480
	Shaded	190	280	370	500	580	630	630	570	460	340	200	150	410
South	Unshaded	500	620	630	620	540	500	530	610	700	710	490	400	570
	Shaded	470	560	500	400	350	360	360	380	500	610	460	370	440
West	Unshaded	220	330	450	600	700	770	770	690	560	390	230	180	490
	Shaded	190	280	380	510	590	640	640	590	480	340	200	150	420

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	24.8	27.2	37.3	47.6	58.0	67.6	71.9	70.4	63.9	52.8	42.6	30.9	49.6
Daily Minimum Temp	17.6	19.3	28.2	37.3	47.3	56.8	61.4	60.3	54.2	43.5	35.0	24.5	40.5
Daily Maximum Temp	31.9	35.0	46.3	57.9	68.6	78.3	82.4	80.5	73.6	62.1	50.0	37.4	58.7
Record Minimum Temp	-19.0	-15.0	-5.0	10.0	25.0	31.0	41.0	38.0	32.0	19.0	3.0	-15.0	-19.0
Record Maximum Temp	73.0	69.0	83.0	88.0	92.0	104.0	103.0	102.0	101.0	90.0	82.0	77.0	104.0
HDD, Base 65°F	1246	1058	859	522	250	40	0	11	99	387	672	1057	6201
CDD, Base 65°F	0	0	0	0	33	118	218	178	66	8	0	0	621
Humidity Ratio (#w/#da)	0.0023	0.0024	0.0035	0.0049	0.0074	0.0103	0.0120	0.0119	0.0097	0.0063	0.0044	0.0029	0.0065
Wind Speed (mph)	12.3	11.4	11.8	11.2	9.6	9.1	8.4	8.1	8.7	9.7	11.2	11.7	10.3
Clearness Index, Kt	0.39	0.43	0.44	0.48	0.50	0.53	0.54	0.52	0.49	0.45	0.37	0.35	0.48

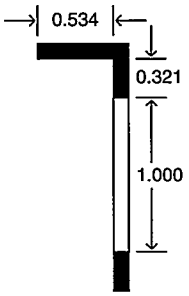
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	28/16	64/37	78/45	66/39	33/19	39/25	77/50	97/68	97/68	75/50	18/11	57/33	79/52	78/51	52/33	6/4	32/18	42/23	29/17	4/3
North	8/7	13/14	15/17	14/15	9/8	20/13	16/16	17/19	17/19	16/16	7/5	13/13	16/17	16/17	13/12	3/2	9/8	10/10	8/8	2/1
East	63/18	61/27	18/18	14/15	9/8	70/30	76/42	41/32	17/19	16/16	47/15	70/31	38/26	16/17	13/12	20/4	39/13	10/10	8/8	2/1
South	29/11	67/29	83/37	70/31	34/14	11/10	29/22	48/36	48/35	28/22	13/6	50/24	73/41	71/42	45/24	16/4	66/17	83/23	62/17	10/3
West	8/7	13/14	15/17	58/27	67/21	11/10	16/16	17/19	43/33	76/44	7/5	13/13	16/17	43/29	71/33	3/2	9/8	13/11	41/13	13/3
M. Clr (%hrs)	21	20	21	22	22	37	37	33	34	36	37	35	31	33	35	12	14	12	12	13



Columbus, OH

WBAN NO. 14821



Shading Geometry
(Not to Scale)

LATITUDE: 40.00° N
LONGITUDE: 82.88° W
ELEVATION: 833 feet
MEAN PRESSURE: 14.3 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	570	800	1100	1460	1740	1900	1860	1670	1360	990	600	470	1210
	Std.Dev.	50	67	71	127	144	121	102	98	98	78	69	40	33
	Minimum	490	690	980	1180	1460	1620	1710	1430	1210	830	450	390	1150
	Maximum	670	1020	1260	1680	2020	2240	2070	1880	1530	1250	740	550	1280
	Diffuse	360	480	620	750	860	900	890	790	630	460	360	310	620
	Clear-Day Global	880	1230	1710	2190	2500	2620	2530	2260	1830	1340	930	770	1740
North	Global	200	270	350	440	550	610	590	490	380	290	210	170	380
	Diffuse	200	270	350	430	500	540	530	470	380	290	210	170	360
	Clear-Day Global	190	250	330	430	580	670	620	470	360	270	200	170	380
East	Global	360	500	660	850	990	1060	1060	970	820	630	380	300	720
	Diffuse	240	330	430	520	600	640	640	570	470	350	250	210	440
	Clear-Day Global	660	870	1110	1320	1420	1440	1420	1320	1140	900	680	590	1070
South	Global	780	900	920	900	820	770	810	920	1050	1090	780	650	870
	Diffuse	350	420	490	540	580	590	590	580	530	440	340	300	480
	Clear-Day Global	1840	1920	1790	1420	1090	940	990	1250	1600	1810	1800	1760	1520
West	Global	360	500	640	820	950	1020	1010	950	810	620	380	290	700
	Diffuse	240	330	430	530	610	650	640	580	480	360	250	210	440
	Clear-Day Global	660	870	1110	1320	1420	1440	1420	1320	1140	900	680	590	1070

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	370	550	770	1050	1260	1380	1350	1200	970	690	400	310	860
North	Unshaded	140	190	250	300	360	400	390	330	270	200	140	120	260
	Shaded	120	160	210	270	320	360	340	290	240	180	120	100	230
East	Unshaded	250	350	470	610	710	760	760	690	580	440	270	200	510
	Shaded	220	300	400	520	600	640	640	590	500	390	230	180	440
South	Unshaded	580	650	640	590	520	480	500	590	710	790	580	490	590
	Shaded	560	600	510	400	350	360	360	380	510	690	550	470	480
West	Unshaded	250	350	450	580	670	730	720	680	570	440	260	200	490
	Shaded	220	310	390	500	580	620	610	580	500	380	230	180	430

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	26.4	29.6	40.9	51.0	61.2	69.2	73.2	71.5	65.5	53.7	42.9	31.9	51.4
Daily Minimum Temp	18.5	21.2	31.2	40.0	50.1	58.0	62.7	60.8	54.8	42.9	34.3	24.6	41.6
Daily Maximum Temp	34.1	38.0	50.5	62.0	72.3	80.4	83.7	82.1	76.2	64.5	51.4	39.2	61.2
Record Minimum Temp	-19.0	-13.0	-6.0	14.0	25.0	35.0	43.0	39.0	31.0	20.0	5.0	-17.0	-19.0
Record Maximum Temp	74.0	73.0	85.0	89.0	94.0	102.0	100.0	101.0	100.0	90.0	80.0	76.0	102.0
HDD, Base 65°F	1197	991	747	420	187	23	0	12	81	361	663	1026	5708
CDD, Base 65°F	0	0	0	0	69	149	258	214	96	11	0	0	797
Humidity Ratio (#w/#da)	0.0024	0.0026	0.0037	0.0052	0.0080	0.0110	0.0128	0.0124	0.0100	0.0063	0.0045	0.0031	0.0068
Wind Speed (mph)	9.9	9.5	10.2	9.6	8.2	7.3	6.6	6.2	6.4	7.3	8.9	9.6	8.3
Clearness Index, Kt	0.41	0.44	0.44	0.47	0.50	0.52	0.52	0.51	0.50	0.48	0.40	0.38	0.48

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

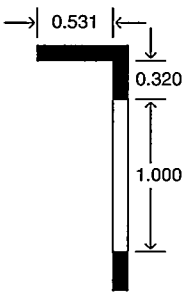
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	28/16	64/37	79/46	68/41	35/21	37/23	76/48	97/68	97/69	75/50	17/10	57/33	81/53	80/53	55/34	7/4	34/19	45/25	32/19	5/4
North	8/7	13/14	15/17	14/15	9/9	20/12	16/16	17/19	17/19	16/16	6/5	13/13	16/17	16/17	13/13	3/2	9/8	11/10	9/8	3/2
East	64/18	63/28	20/18	14/15	9/9	68/27	77/41	43/33	17/19	16/16	47/14	72/31	40/28	16/17	13/13	22/5	42/14	11/10	9/8	3/2
South	28/11	65/29	81/36	70/32	35/15	11/9	27/21	45/34	45/35	27/22	12/6	49/23	72/42	71/42	46/25	18/4	69/19	85/25	66/19	15/4
West	8/7	13/14	15/17	57/28	68/23	11/9	16/16	17/19	41/32	74/44	6/5	13/13	16/17	42/29	71/34	3/2	9/8	12/11	42/14	19/4
M. Clr (%hrs)	26	24	22	21	20	42	39	30	23	26	43	44	35	31	35	19	18	18	19	18

Dayton, OH

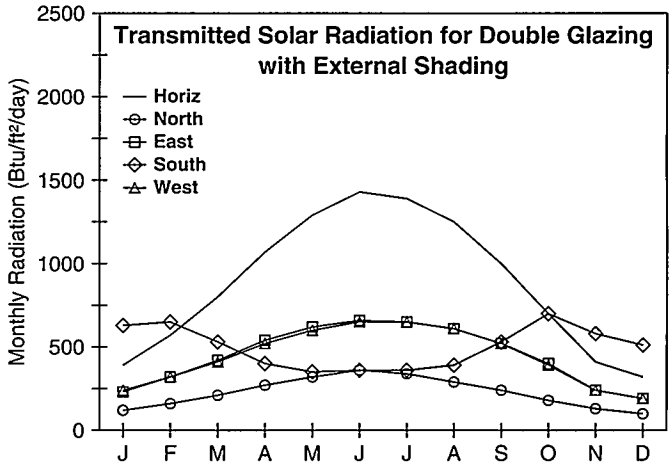
WBAN NO. 93815

LATITUDE: 39.90° N
LONGITUDE: 84.22° W
ELEVATION: 1004 feet
MEAN PRESSURE: 14.2 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	600	830	1130	1500	1790	1970	1910	1730	1400	1010	620	480	1250
	Std.Dev.	48	78	72	142	145	116	109	107	97	85	64	43	38
	Minimum	500	670	1010	1210	1490	1770	1710	1460	1220	820	480	390	1190
	Maximum	730	1030	1280	1800	2080	2250	2090	1960	1600	1270	740	570	1320
	Diffuse	350	460	610	730	840	880	860	760	610	450	360	310	600
	Clear-Day Global	890	1240	1720	2200	2510	2620	2540	2260	1840	1340	940	780	1740
North	Global	200	270	350	440	550	620	590	480	380	290	210	170	380
	Diffuse	200	270	350	430	500	540	520	460	380	290	210	170	360
	Clear-Day Global	190	250	330	430	580	680	620	470	360	270	200	170	380
East	Global	380	520	680	880	1020	1090	1070	990	840	640	400	310	740
	Diffuse	240	320	430	520	600	640	630	570	470	350	250	210	440
	Clear-Day Global	670	870	1120	1330	1420	1450	1420	1330	1150	910	690	590	1080
South	Global	870	970	960	920	840	790	820	950	1090	1120	820	710	900
	Diffuse	350	420	490	540	570	580	580	570	520	440	340	300	480
	Clear-Day Global	1870	1930	1790	1420	1090	940	990	1250	1600	1830	1820	1780	1520
West	Global	400	530	670	850	990	1080	1070	1000	840	630	390	310	730
	Diffuse	250	330	430	530	610	650	640	580	480	360	250	210	440
	Clear-Day Global	670	870	1120	1330	1420	1450	1420	1330	1150	910	690	590	1080

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

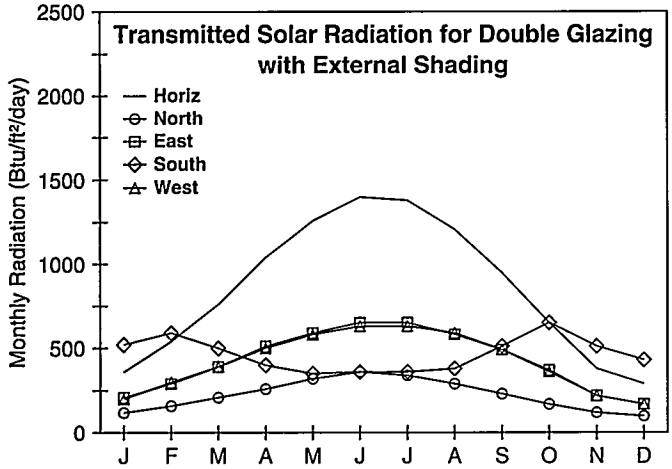
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	390	570	800	1070	1290	1430	1390	1250	1000	700	410	320	890
North	Unshaded	140	190	240	300	360	410	390	330	260	200	150	120	260
	Shaded	120	160	210	270	320	360	340	290	240	180	130	100	230
East	Unshaded	260	370	480	630	720	780	760	710	600	450	280	210	520
	Shaded	230	320	420	540	620	660	650	610	520	400	240	190	450
South	Unshaded	650	710	670	600	520	480	500	600	730	800	610	530	620
	Shaded	630	650	530	400	350	360	360	390	530	700	580	510	500
West	Unshaded	270	370	470	600	700	770	760	710	600	450	270	210	520
	Shaded	240	320	410	520	600	650	650	610	520	390	240	190	450

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	26.0	29.4	40.5	51.2	61.7	70.4	74.2	72.2	65.8	54.1	42.9	31.6	51.7
Daily Minimum Temp	17.9	20.8	31.0	40.5	51.0	59.2	63.4	61.3	55.1	43.6	34.4	24.0	41.9
Daily Maximum Temp	34.1	38.0	50.0	61.9	72.5	81.6	84.9	83.0	76.5	64.5	51.3	39.1	61.5
Record Minimum Temp	-24.0	-16.0	-7.0	15.0	27.0	40.0	44.0	40.0	32.0	21.0	-2.0	-20.0	-24.0
Record Maximum Temp	71.0	71.0	82.0	89.0	93.0	102.0	102.0	102.0	101.0	89.0	79.0	72.0	102.0
HDD, Base 65°F	1209	997	760	414	185	11	0	6	73	355	663	1035	5708
CDD, Base 65°F	0	0	0	0	83	173	285	230	97	18	0	0	886
Humidity Ratio (#w/#da)	0.0024	0.0027	0.0040	0.0054	0.0080	0.0109	0.0128	0.0124	0.0100	0.0064	0.0046	0.0031	0.0069
Wind Speed (mph)	11.2	10.7	11.5	10.9	9.2	8.7	7.8	7.3	7.9	8.8	10.3	10.8	9.6
Clearness Index, Kt	0.43	0.45	0.46	0.48	0.51	0.53	0.53	0.53	0.51	0.49	0.41	0.39	0.49

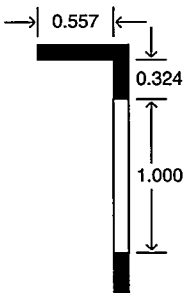
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	27/15	65/37	81/48	71/42	38/22	35/22	75/50	98/70	98/70	77/54	16/10	57/34	82/54	81/56	57/37	6/4	34/19	46/25	34/19	7/5
North	8/7	13/14	15/17	14/15	10/9	21/12	16/16	17/19	17/19	16/17	6/5	13/13	16/17	16/17	13/13	3/2	9/8	11/11	9/8	3/2
East	64/19	66/30	22/19	14/15	10/9	68/28	79/45	45/35	17/19	16/17	46/14	75/33	42/29	16/17	13/13	22/5	44/15	12/11	9/8	3/2
South	27/11	66/30	83/40	72/34	38/17	10/9	25/21	45/35	46/35	28/23	11/6	48/24	73/43	73/44	48/27	17/4	70/19	87/27	71/21	18/5
West	8/7	13/14	15/17	57/29	72/26	10/9	16/16	17/19	39/31	74/47	6/5	13/13	16/17	40/29	73/36	3/2	9/8	11/11	43/15	23/6
M. Clr (%hrs)	27	23	22	20	21	41	37	31	29	30	43	40	35	33	37	20	21	20	19	19



Mansfield, OH

WBAN NO. 14891



Shading Geometry
(Not to Scale)

LATITUDE: 40.82° N
LONGITUDE: 82.52° W
ELEVATION: 1296 feet
MEAN PRESSURE: 14.1 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	540	790	1080	1450	1750	1930	1900	1670	1330	950	570	440	1200
	Std.Dev.	36	73	82	127	141	118	96	109	97	75	58	37	36
	Minimum	470	680	950	1110	1480	1740	1730	1390	1170	800	440	380	1130
	Maximum	610	1050	1260	1660	2040	2310	2080	1830	1500	1190	670	530	1300
	Diffuse	360	480	630	750	850	890	890	780	630	460	350	310	620
	Clear-Day Global	840	1200	1680	2170	2490	2610	2520	2240	1800	1300	890	730	1710
North	Global	200	270	350	440	550	620	590	480	380	290	200	170	380
	Diffuse	200	270	350	430	510	540	530	470	380	290	200	170	360
	Clear-Day Global	190	250	330	430	580	680	630	480	360	270	200	170	380
East	Global	340	480	650	850	990	1080	1070	960	810	600	360	280	710
	Diffuse	240	320	420	520	600	640	640	570	470	350	240	200	440
	Clear-Day Global	630	840	1090	1310	1420	1450	1410	1310	1130	880	660	560	1060
South	Global	740	880	910	900	840	800	840	940	1040	1040	730	610	860
	Diffuse	340	420	490	540	580	590	600	580	530	440	330	290	480
	Clear-Day Global	1790	1900	1790	1450	1130	970	1020	1270	1610	1800	1760	1700	1510
West	Global	340	490	640	820	960	1050	1050	970	800	590	360	280	700
	Diffuse	240	330	430	530	610	650	650	580	470	350	240	200	440
	Clear-Day Global	630	840	1090	1310	1420	1450	1410	1310	1130	880	660	560	1060

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	360	540	760	1040	1260	1400	1380	1210	950	650	380	290	850
North	Unshaded	140	190	240	300	360	410	390	330	260	200	140	120	260
	Shaded	120	160	210	260	320	360	340	290	230	170	120	99	220
East	Unshaded	240	340	460	600	710	770	770	680	570	420	250	190	500
	Shaded	210	290	390	510	590	650	650	580	490	370	220	170	430
South	Unshaded	550	650	640	600	530	490	520	600	710	750	540	460	590
	Shaded	520	590	500	400	350	360	360	380	510	650	510	430	460
West	Unshaded	240	350	450	580	690	750	750	690	570	420	250	190	490
	Shaded	200	300	390	500	580	630	630	590	490	360	220	170	420

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	24.5	27.0	37.6	48.4	58.8	67.8	72.1	70.3	63.9	52.7	41.6	29.8	49.5
Daily Minimum Temp	16.8	18.9	28.6	38.2	48.3	57.3	62.0	60.4	54.0	43.1	33.9	22.7	40.4
Daily Maximum Temp	32.1	35.0	46.6	58.6	69.3	78.2	82.1	80.1	73.7	62.3	49.2	36.8	58.7
Record Minimum Temp	-22.0	-11.0	-6.0	8.0	25.0	37.0	43.0	40.0	33.0	20.0	2.0	-17.0	-22.0
Record Maximum Temp	63.0	67.0	82.0	86.0	92.0	101.0	100.0	97.0	93.0	85.0	78.0	73.0	101.0
HDD, Base 65°F	1256	1064	849	498	229	43	0	20	110	396	702	1091	6258
CDD, Base 65°F	0	0	0	0	37	127	225	185	77	15	0	0	666
Humidity Ratio (#w/#da)	0.0024	0.0026	0.0036	0.0050	0.0076	0.0106	0.0123	0.0120	0.0097	0.0062	0.0044	0.0030	0.0066
Wind Speed (mph)	13.1	11.6	12.6	12.2	10.9	9.5	8.6	8.2	9.0	10.0	11.7	13.0	10.9
Clearness Index, Kt	0.41	0.44	0.44	0.47	0.50	0.52	0.53	0.52	0.50	0.47	0.39	0.37	0.48

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

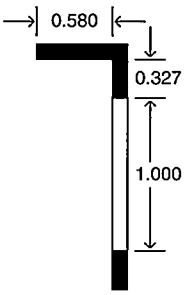
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	28/16	64/37	80/46	67/39	34/20	38/23	76/48	98/68	98/68	75/50	18/10	57/33	80/52	79/52	54/34	6/4	33/18	44/24	31/18	5/3
North	8/7	13/14	15/17	14/15	9/9	20/12	16/16	17/19	17/19	16/17	7/5	13/13	16/17	16/17	13/13	3/2	9/8	10/10	9/8	2/2
East	64/17	62/28	19/18	14/15	9/9	70/27	77/40	42/32	17/19	16/17	47/13	72/29	39/27	16/17	13/13	21/4	41/14	11/10	9/8	2/2
South	29/11	66/29	84/36	71/30	35/14	11/9	28/21	47/35	47/35	28/22	12/6	50/23	73/41	72/42	46/25	17/4	69/18	85/23	65/18	12/3
West	8/7	13/14	15/17	57/27	68/21	11/9	16/16	17/19	42/32	75/43	7/5	13/13	16/17	42/29	71/34	3/2	9/8	12/11	42/14	16/4
M. Clr (%hrs)	25	22	21	22	23	43	41	30	27	32	43	42	33	29	36	19	18	17	15	17

Toledo, OH

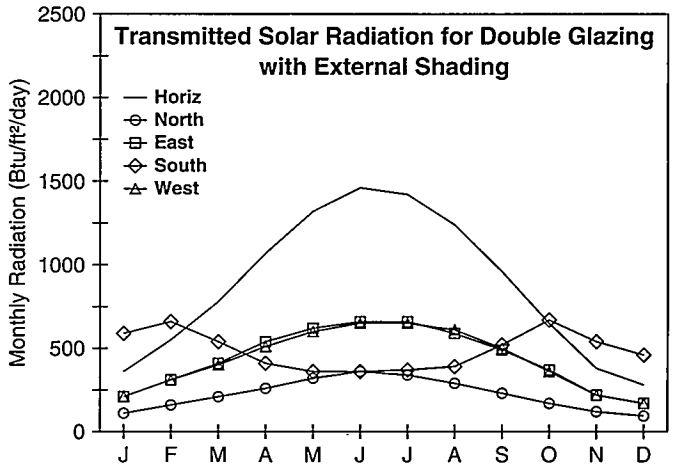
WBAN NO. 94830

LATITUDE: 41.60° N
LONGITUDE: 83.80° W
ELEVATION: 692 feet
MEAN PRESSURE: 14.4 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	550	810	1110	1490	1830	2010	1970	1720	1350	940	570	440	1230
	Std.Dev.	39	73	77	115	136	112	87	105	91	69	51	38	30
	Minimum	470	700	980	1170	1490	1780	1790	1510	1200	820	430	360	1180
	Maximum	630	1060	1270	1710	2090	2280	2130	1930	1510	1140	650	510	1300
	Diffuse	330	450	600	730	840	870	860	760	620	450	340	290	600
	Clear-Day Global	810	1160	1650	2150	2480	2600	2520	2220	1770	1270	860	700	1680
North	Global	190	260	350	440	550	620	600	480	380	280	200	160	380
	Diffuse	190	260	350	430	510	540	530	460	380	280	200	160	360
	Clear-Day Global	180	240	330	430	580	680	630	480	360	270	190	160	380
East	Global	360	520	680	890	1040	1120	1110	990	810	600	370	280	730
	Diffuse	230	320	420	530	610	650	640	570	470	350	240	200	440
	Clear-Day Global	610	820	1080	1310	1420	1450	1420	1310	1110	870	630	540	1050
South	Global	820	990	990	960	890	840	880	990	1080	1070	770	640	910
	Diffuse	340	430	500	550	590	600	600	580	530	440	330	290	480
	Clear-Day Global	1760	1880	1790	1470	1150	1000	1050	1290	1620	1800	1740	1670	1520
West	Global	360	510	670	850	1010	1100	1100	1010	820	590	360	280	720
	Diffuse	230	330	430	530	620	660	650	590	480	350	240	200	440
	Clear-Day Global	610	820	1080	1310	1420	1450	1420	1310	1110	870	630	540	1050

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

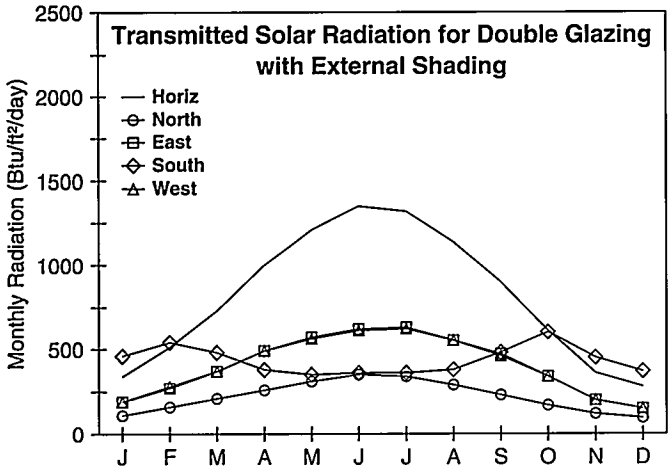
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	360	550	780	1070	1320	1460	1420	1240	960	650	380	280	870
North	Unshaded	130	180	240	300	370	410	390	330	260	190	140	110	260
	Shaded	110	160	210	260	320	360	340	290	230	170	120	95	220
East	Unshaded	240	360	480	640	740	800	790	700	570	420	250	190	520
	Shaded	210	310	410	540	620	660	660	590	490	370	220	170	440
South	Unshaded	610	730	690	640	560	520	540	640	740	770	570	480	620
	Shaded	590	660	540	410	360	360	370	390	520	670	540	460	490
West	Unshaded	250	360	470	600	720	790	780	720	590	420	250	190	510
	Shaded	210	310	400	510	600	650	650	610	500	360	220	170	430

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	22.5	25.2	36.2	47.6	58.6	67.9	72.1	69.9	63.0	51.2	40.0	27.9	48.5
Daily Minimum Temp	14.9	17.0	26.8	36.4	46.7	56.0	60.6	58.4	51.5	40.0	31.5	20.5	38.4
Daily Maximum Temp	30.2	33.4	45.5	58.8	70.5	79.8	83.4	81.3	74.4	62.4	48.5	35.2	58.6
Record Minimum Temp	-20.0	-14.0	-6.0	8.0	25.0	32.0	40.0	34.0	26.0	15.0	2.0	-19.0	-20.0
Record Maximum Temp	62.0	68.0	80.0	88.0	95.0	104.0	103.0	98.0	98.0	91.0	78.0	68.0	104.0
HDD, Base 65°F	1318	1114	893	522	238	33	0	16	109	436	750	1150	6579
CDD, Base 65°F	0	0	0	0	40	120	225	168	49	8	0	0	610
Humidity Ratio (#w/#da)	0.0021	0.0023	0.0033	0.0048	0.0073	0.0103	0.0122	0.0120	0.0096	0.0060	0.0042	0.0028	0.0064
Wind Speed (mph)	11.2	10.6	11.3	10.9	9.5	8.4	7.3	6.9	7.5	8.5	10.0	10.4	9.4
Clearness Index, Kt	0.43	0.46	0.46	0.49	0.52	0.54	0.55	0.53	0.51	0.47	0.40	0.38	0.50

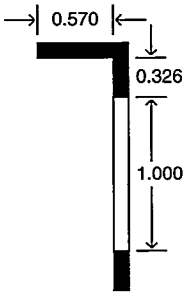
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	26/15	62/38	77/47	67/42	35/22	36/24	75/51	97/71	97/73	75/55	16/10	55/34	78/54	78/55	54/36	5/3	31/17	43/24	31/18	5/4
North	8/7	13/14	15/16	14/15	9/9	20/13	16/16	17/19	17/19	16/17	6/4	13/12	16/17	16/17	13/13	2/2	8/8	10/10	9/8	3/2
East	61/19	64/30	21/19	14/15	9/9	68/32	78/46	44/35	17/19	16/17	43/14	72/34	41/29	16/17	13/13	16/4	41/14	11/10	9/8	3/2
South	26/11	66/31	83/40	72/36	37/17	10/9	28/22	47/37	48/38	30/24	11/6	48/25	73/44	73/46	47/27	13/3	66/19	85/27	65/20	13/4
West	8/7	13/14	15/16	55/30	68/26	10/9	16/16	17/19	40/33	73/48	6/4	13/12	16/17	40/29	70/37	2/2	8/8	11/10	40/15	17/4
M. Clr (%hrs)	28	24	23	22	22	39	40	31	29	32	39	40	33	31	36	18	18	16	17	19



Youngstown, OH

WBAN NO. 14852



Shading Geometry
(Not to Scale)

LATITUDE: 41.27° N
LONGITUDE: 80.67° W
ELEVATION: 1184 feet
MEAN PRESSURE: 14.1 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	510	740	1050	1400	1690	1870	1830	1590	1260	890	530	420	1150
	Std.Dev.	34	67	70	116	154	129	97	109	108	74	50	30	33
	Minimum	450	630	920	1110	1380	1650	1680	1430	1040	780	420	360	1080
	Maximum	570	940	1270	1610	1970	2230	2050	1840	1440	1180	640	490	1220
	Diffuse	360	490	630	760	870	910	900	810	640	470	360	320	630
	Clear-Day Global	820	1180	1660	2160	2490	2610	2520	2230	1790	1280	880	720	1700
North	Global	200	270	350	440	540	610	590	480	380	280	200	170	380
	Diffuse	200	270	350	430	510	540	530	470	380	280	200	170	360
	Clear-Day Global	180	250	330	430	580	680	630	480	360	270	190	160	380
East	Global	320	460	620	820	960	1040	1050	920	770	560	330	260	680
	Diffuse	230	320	420	520	600	640	640	570	460	340	230	200	430
	Clear-Day Global	620	830	1080	1310	1420	1450	1420	1310	1130	880	650	550	1060
South	Global	660	820	880	880	820	790	820	900	980	960	650	530	810
	Diffuse	340	420	490	540	580	590	600	580	520	430	320	280	470
	Clear-Day Global	1780	1890	1790	1460	1140	990	1040	1280	1610	1800	1750	1690	1520
West	Global	320	470	620	810	940	1030	1030	920	760	550	340	260	670
	Diffuse	230	320	420	520	600	650	640	580	470	340	240	200	440
	Clear-Day Global	620	830	1080	1310	1420	1450	1420	1310	1130	880	650	550	1060

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	340	510	730	1000	1210	1350	1320	1140	900	610	360	280	810
North	Unshaded	140	190	240	300	360	400	390	330	260	190	140	120	260
	Shaded	110	160	210	260	310	350	340	290	230	170	120	96	220
East	Unshaded	220	320	440	580	680	740	750	650	550	390	230	180	480
	Shaded	190	270	370	490	570	620	630	550	470	340	200	150	410
South	Unshaded	490	600	620	580	520	490	510	580	670	690	480	390	550
	Shaded	460	540	480	380	350	360	360	380	480	600	450	370	430
West	Unshaded	220	330	440	580	660	730	730	650	540	390	230	170	470
	Shaded	190	280	370	490	560	610	620	550	460	340	200	150	400

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	23.6	25.9	36.3	47.3	57.5	66.2	70.3	68.8	62.2	51.2	41.0	29.5	48.3
Daily Minimum Temp	16.4	17.9	27.3	36.8	46.2	54.9	59.2	57.9	51.6	41.5	33.6	22.9	38.9
Daily Maximum Temp	30.7	33.9	45.3	57.7	68.7	77.4	81.3	79.6	72.6	60.9	48.4	36.0	57.7
Record Minimum Temp	-20.0	-14.0	-10.0	11.0	24.0	30.0	42.0	32.0	29.0	20.0	1.0	-12.0	-20.0
Record Maximum Temp	71.0	67.0	82.0	88.0	92.0	99.0	100.0	97.0	99.0	87.0	80.0	76.0	100.0
HDD, Base 65°F	1283	1095	890	531	268	62	8	22	129	435	720	1101	6544
CDD, Base 65°F	0	0	0	0	35	98	172	140	45	7	0	0	497
Humidity Ratio (#w/#da)	0.0022	0.0024	0.0034	0.0047	0.0072	0.0102	0.0118	0.0115	0.0095	0.0061	0.0043	0.0029	0.0064
Wind Speed (mph)	11.6	11.0	11.4	10.8	9.4	8.2	7.7	7.3	8.0	9.1	10.6	11.2	9.7
Clearness Index, Kt	0.39	0.42	0.43	0.46	0.48	0.51	0.51	0.49	0.47	0.44	0.37	0.35	0.46

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

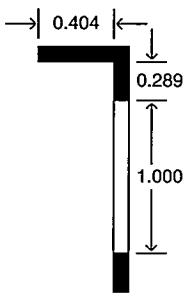
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	31/17	65/37	79/44	65/38	31/18	40/25	78/49	97/66	96/65	72/47	20/11	59/34	79/51	77/49	51/31	7/5	33/18	42/23	29/17	3/3
North	9/7	14/15	15/17	14/15	9/8	19/13	16/17	17/19	17/19	16/16	7/5	13/13	16/17	16/17	13/12	3/2	9/8	11/10	8/8	2/1
East	66/18	61/27	16/17	14/15	9/8	71/29	75/40	39/30	17/19	16/16	51/14	70/30	36/25	16/17	13/12	22/5	39/13	11/10	8/8	2/1
South	31/12	68/29	83/35	69/29	32/13	11/10	30/22	48/35	47/34	26/20	14/7	52/24	73/40	71/39	43/22	18/4	69/18	81/22	62/17	8/2
West	9/7	14/15	15/17	59/27	65/20	11/10	16/17	17/19	45/33	75/41	7/5	13/13	16/17	45/28	70/31	3/2	9/8	14/11	42/13	11/3
M. Clr (%hrs)	23	20	19	20	21	37	36	26	25	30	41	36	27	24	32	13	13	12	10	12

Oklahoma City, OK

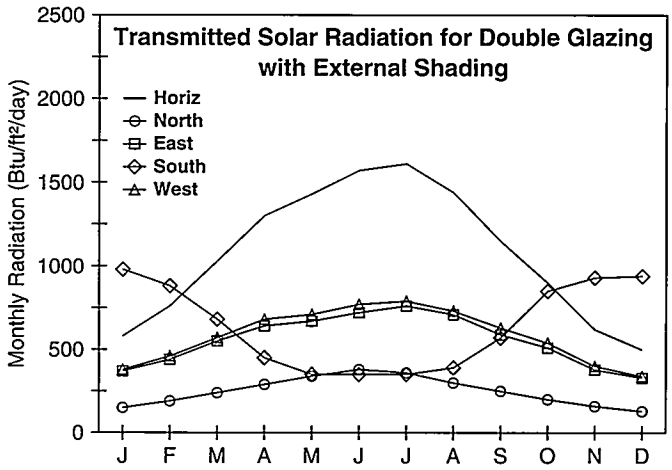
WBAN NO. 13967

LATITUDE: 35.40° N
LONGITUDE: 97.60° W
ELEVATION: 1303 feet
MEAN PRESSURE: 14.1 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	870	1100	1450	1790	1960	2150	2200	1980	1600	1280	920	770	1510
	Std.Dev.	72	83	127	101	120	107	132	105	115	115	77	57	33
	Minimum	690	940	1150	1600	1770	1940	1850	1760	1310	1030	750	640	1450
	Maximum	1010	1260	1680	2030	2190	2340	2490	2170	1810	1460	1100	890	1560
	Diffuse	340	450	570	670	770	780	720	660	590	440	360	300	550
	Clear-Day Global	1110	1450	1900	2320	2570	2650	2590	2360	2000	1550	1160	1000	1890
North	Global	230	300	370	450	560	650	620	490	390	310	250	210	400
	Diffuse	230	300	370	440	500	530	510	450	390	310	250	210	370
	Clear-Day Global	210	270	340	430	580	690	630	480	360	290	220	190	390
East	Global	570	690	850	1000	1050	1130	1190	1110	920	790	590	510	870
	Diffuse	280	360	450	540	590	620	610	560	490	380	300	250	460
	Clear-Day Global	800	980	1200	1360	1430	1450	1420	1350	1210	1020	820	720	1150
South	Global	1340	1280	1200	1000	790	710	760	940	1130	1330	1290	1260	1090
	Diffuse	400	450	510	540	540	540	530	540	520	460	400	360	480
	Clear-Day Global	2020	1990	1730	1270	910	770	830	1090	1510	1860	1970	1970	1490
West	Global	590	720	890	1050	1110	1200	1230	1130	970	820	620	520	900
	Diffuse	290	370	460	550	610	640	620	570	500	390	300	260	460
	Clear-Day Global	800	980	1200	1360	1430	1450	1420	1350	1210	1020	820	720	1150

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

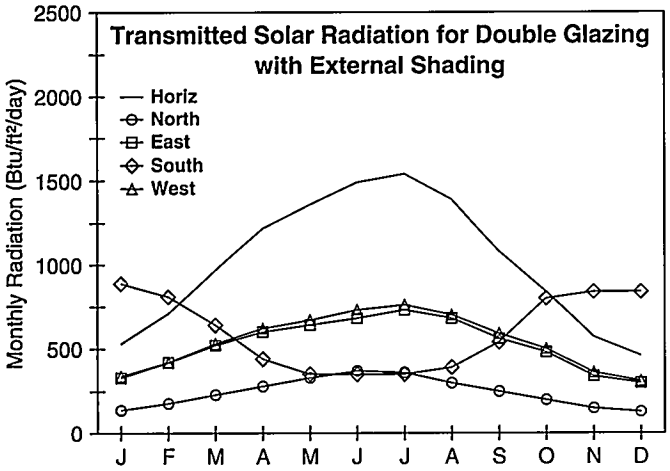
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	580	760	1030	1300	1430	1570	1610	1440	1150	900	620	500	1080
North	Unshaded	160	210	260	310	360	410	390	320	270	220	170	150	270
	Shaded	150	190	240	290	340	380	360	300	250	200	160	130	250
East	Unshaded	400	480	610	710	740	800	850	790	660	560	410	360	610
	Shaded	370	440	550	640	670	720	760	710	590	510	380	330	560
South	Unshaded	1000	930	820	630	470	420	440	570	740	940	960	950	740
	Shaded	980	880	680	450	350	350	350	390	570	850	930	940	640
West	Unshaded	410	500	630	750	800	860	880	810	690	580	430	360	640
	Shaded	380	460	570	680	710	770	790	730	630	540	400	340	580

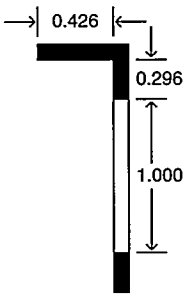
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	35.9	40.9	50.3	60.4	68.4	76.7	82.0	81.1	73.0	62.0	49.6	39.3	60.0
Daily Minimum Temp	25.2	29.6	38.5	48.8	57.7	66.1	70.6	69.6	62.2	50.4	38.6	28.6	48.8
Daily Maximum Temp	46.7	52.1	62.0	71.9	79.1	87.3	93.4	92.5	83.8	73.6	60.4	49.9	71.1
Record Minimum Temp	-4.0	-3.0	3.0	20.0	37.0	47.0	53.0	51.0	36.0	22.0	11.0	-8.0	-8.0
Record Maximum Temp	80.0	84.0	93.0	100.0	104.0	105.0	109.0	110.0	102.0	96.0	87.0	86.0	110.0
HDD, Base 65°F	902	675	464	176	31	0	0	0	15	137	462	797	3659
CDD, Base 65°F	0	0	9	38	136	351	527	499	255	44	0	0	1859
Humidity Ratio (#w/#da)	0.0030	0.0036	0.0050	0.0072	0.0104	0.0135	0.0142	0.0137	0.0118	0.0078	0.0053	0.0036	0.0082
Wind Speed (mph)	12.4	12.9	14.0	13.7	12.5	11.0	10.8	10.2	10.8	11.5	12.2	11.9	12.0
Clearness Index, Kt	0.54	0.54	0.55	0.56	0.55	0.58	0.61	0.60	0.56	0.56	0.53	0.52	0.56

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	33/19	72/45	88/59	77/50	40/26	37/25	78/56	103/75	101/79	77/60	20/12	64/40	89/59	87/62	59/42	12/8	44/28	57/36	43/26	10/7
North	9/8	14/16	15/18	14/16	10/10	23/15	16/17	17/19	17/19	16/17	7/6	14/14	16/18	16/18	13/14	5/4	10/10	11/13	10/10	4/3
East	75/24	67/35	20/20	14/16	10/10	71/34	79/50	43/35	17/19	16/17	56/18	77/37	41/30	16/18	13/14	42/11	50/23	12/13	10/10	4/3
South	31/13	65/35	80/47	70/39	37/20	10/10	21/20	38/32	38/33	21/21	13/7	48/27	70/42	68/46	45/29	33/9	80/33	94/42	79/31	28/9
West	9/8	14/16	15/18	62/36	77/34	10/10	16/17	17/19	42/36	77/55	7/6	14/14	16/18	44/33	76/44	5/4	10/10	13/13	52/23	37/11
M. Clr (%hrs)	39	40	40	39	42	42	43	42	43	49	47	48	46	45	50	43	43	42	43	44





Shading Geometry
(Not to Scale)

Tulsa, OK

WBAN NO. 13968

LATITUDE: 36.20° N
LONGITUDE: 95.90° W
ELEVATION: 676 feet
MEAN PRESSURE: 14.4 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	800	1030	1370	1690	1870	2040	2110	1900	1500	1200	840	710	1420
	Std.Dev.	74	72	116	114	121	125	134	117	125	123	85	52	32
	Minimum	640	870	1120	1470	1650	1810	1940	1660	1190	970	710	610	1380
	Maximum	920	1150	1590	2000	2100	2360	2460	2080	1700	1390	1020	820	1530
	Diffuse	340	450	590	710	810	820	750	680	610	460	370	310	580
	Clear-Day Global	1070	1410	1870	2300	2560	2640	2580	2340	1960	1510	1120	960	1860
North	Global	230	290	370	460	560	640	610	490	390	310	240	200	400
	Diffuse	230	290	370	440	500	530	510	450	390	310	240	200	370
	Clear-Day Global	210	270	340	430	580	690	630	470	360	290	220	190	390
East	Global	520	650	810	950	1020	1080	1150	1070	880	750	540	470	820
	Diffuse	270	350	450	540	600	620	610	560	480	380	290	250	450
	Clear-Day Global	760	960	1180	1360	1430	1450	1410	1340	1200	1000	800	710	1130
South	Global	1210	1200	1130	970	780	720	770	930	1070	1260	1160	1140	1030
	Diffuse	380	440	510	540	550	550	540	540	520	460	390	350	480
	Clear-Day Global	1990	1980	1740	1300	940	800	850	1130	1530	1850	1950	1950	1500
West	Global	530	660	830	980	1060	1150	1180	1090	910	770	560	480	850
	Diffuse	280	350	450	550	610	640	620	570	490	390	290	250	460
	Clear-Day Global	760	960	1180	1360	1430	1450	1410	1340	1200	1000	800	710	1130

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	530	710	970	1220	1360	1490	1540	1390	1080	840	570	460	1010
North	Unshaded	160	200	260	310	360	410	390	320	270	220	170	140	270
	Shaded	140	180	230	280	330	370	360	300	250	200	150	130	240
East	Unshaded	360	460	570	680	720	770	820	770	620	530	370	320	580
	Shaded	330	420	520	600	640	680	730	680	560	480	340	300	520
South	Unshaded	910	870	770	610	480	430	450	570	710	890	860	860	700
	Shaded	890	810	640	440	350	350	350	390	540	800	840	840	600
West	Unshaded	370	470	590	700	750	820	850	780	650	540	390	330	600
	Shaded	340	420	530	620	670	730	760	700	590	500	360	310	540

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	35.2	40.3	50.6	61.5	69.3	77.7	83.3	81.5	73.3	62.2	49.9	38.9	60.3
Daily Minimum Temp	24.9	29.5	39.1	49.9	58.8	67.7	72.8	70.6	63.0	50.7	39.5	28.9	49.6
Daily Maximum Temp	45.4	51.0	62.1	73.0	79.7	87.7	93.7	92.5	83.6	73.8	60.3	48.8	71.0
Record Minimum Temp	-8.0	-7.0	-3.0	22.0	35.0	49.0	51.0	52.0	35.0	26.0	10.0	-8.0	-8.0
Record Maximum Temp	79.0	86.0	96.0	102.0	96.0	103.0	112.0	110.0	109.0	98.0	87.0	80.0	112.0
HDD, Base 65°F	924	692	457	151	41	0	0	0	20	144	453	809	3691
CDD, Base 65°F	0	0	11	46	174	381	567	512	269	57	0	0	2017
Humidity Ratio (#w/#da)	0.0030	0.0035	0.0049	0.0073	0.0107	0.0141	0.0152	0.0145	0.0122	0.0080	0.0053	0.0036	0.0085
Wind Speed (mph)	10.2	10.7	11.9	12.0	11.0	9.8	9.5	9.1	9.1	9.6	10.5	10.1	10.3
Clearness Index, Kt	0.51	0.51	0.52	0.53	0.53	0.55	0.58	0.58	0.53	0.54	0.49	0.49	0.54

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

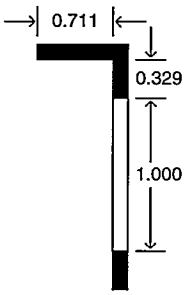
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	35/19	73/44	87/54	74/45	37/22	39/24	80/51	103/71	101/73	75/54	22/13	65/39	88/55	85/57	56/37	13/8	44/26	55/33	39/23	7/5
North	9/8	14/16	15/18	14/16	9/9	22/14	16/17	17/19	17/19	16/17	7/6	14/14	16/18	16/18	13/14	5/4	10/10	11/12	9/9	3/3
East	74/22	65/32	17/19	14/16	9/9	72/30	77/43	40/32	17/19	16/17	58/17	76/35	38/27	16/18	13/14	42/10	47/20	11/12	9/9	3/3
South	33/13	67/33	81/43	69/35	34/16	11/10	24/20	40/32	39/32	21/20	15/7	50/26	71/40	69/42	43/25	34/9	81/29	93/36	74/26	21/6
West	9/8	14/16	15/18	63/33	74/28	11/10	16/17	17/19	45/36	78/50	7/6	14/14	16/18	47/32	76/37	5/4	10/10	16/14	51/20	29/8
M. Clr (%hrs)	38	37	38	39	39	43	42	38	37	45	44	44	44	42	47	40	39	40	42	43

Astoria, OR

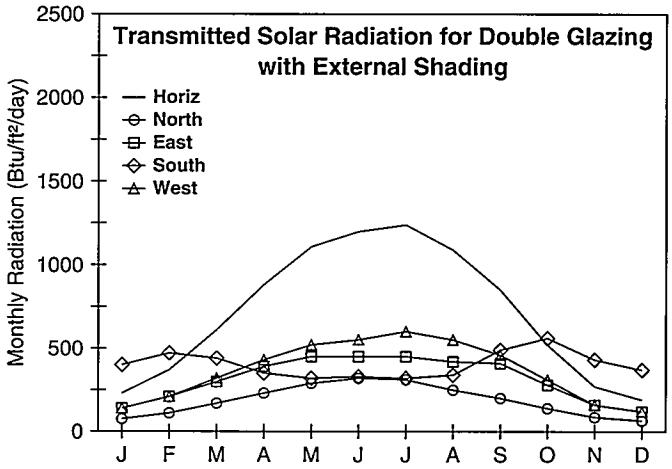
WBAN NO. 94224

LATITUDE: 46.15° N
LONGITUDE: 123.88° W
ELEVATION: 23 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	360	560	880	1240	1550	1670	1710	1510	1210	760	420	310	1020
	Std.Dev.	42	67	90	114	130	143	133	129	97	85	48	29	37
	Minimum	280	410	710	1030	1270	1400	1450	1280	1030	600	340	270	940
	Maximum	440	720	1070	1430	1790	1930	1980	1770	1430	910	520	400	1080
	Diffuse	240	350	520	700	830	890	820	700	530	390	270	210	540
	Clear-Day Global	630	980	1500	2080	2490	2650	2560	2200	1690	1130	700	540	1600
North	Global	140	200	300	410	520	570	550	450	340	240	160	120	330
	Diffuse	140	200	300	400	480	520	500	430	340	240	160	120	320
	Clear-Day Global	130	190	280	400	580	700	650	450	310	220	150	110	350
East	Global	250	360	530	700	820	830	830	760	720	480	280	210	570
	Diffuse	160	240	350	470	560	590	570	500	410	290	180	140	370
	Clear-Day Global	560	770	1070	1350	1520	1570	1530	1400	1160	860	610	490	1080
South	Global	570	710	830	870	850	810	860	950	1080	920	620	520	800
	Diffuse	240	310	420	510	560	580	570	530	470	370	260	210	420
	Clear-Day Global	1750	1900	1870	1590	1290	1140	1200	1440	1750	1880	1770	1660	1600
West	Global	240	370	560	760	940	1000	1070	970	800	520	280	210	650
	Diffuse	160	240	360	490	580	610	600	530	420	290	190	140	380
	Clear-Day Global	560	770	1070	1350	1520	1570	1530	1400	1160	860	610	490	1080

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

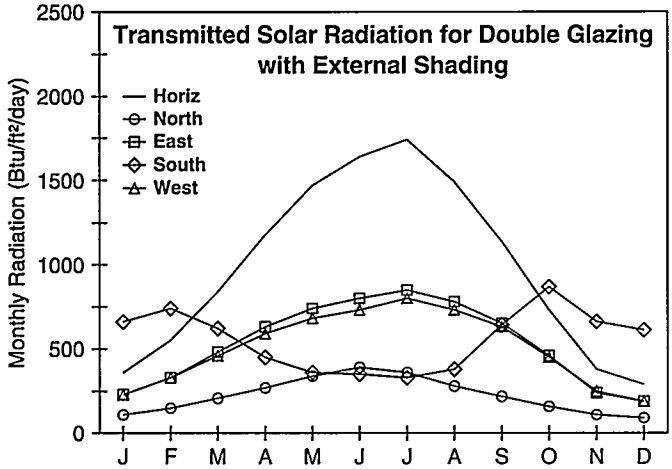
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	230	370	610	880	1110	1200	1240	1090	850	520	270	190	720
North	Unshaded	95	140	210	280	350	380	370	300	230	170	110	82	230
	Shaded	75	110	170	230	290	320	310	250	200	140	86	65	190
East	Unshaded	170	250	380	500	580	590	580	540	510	340	190	140	400
	Shaded	140	210	300	390	450	450	450	420	410	280	160	120	310
South	Unshaded	430	520	590	590	550	520	550	630	750	670	460	390	560
	Shaded	400	470	440	350	320	330	320	340	490	560	430	370	400
West	Unshaded	170	260	400	540	670	710	760	690	570	370	200	140	460
	Shaded	140	210	320	430	520	550	600	550	460	310	160	120	370

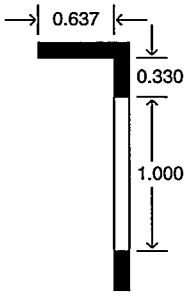
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	41.9	44.2	45.7	48.2	52.5	56.9	60.0	60.7	58.4	52.6	46.9	42.4	50.9
Daily Minimum Temp	35.9	37.3	38.1	40.3	44.8	49.5	52.4	52.6	49.0	44.0	40.2	36.6	43.4
Daily Maximum Temp	47.8	51.0	53.2	56.0	60.1	64.1	67.5	68.8	67.8	61.1	53.5	48.2	58.3
Record Minimum Temp	11.0	9.0	22.0	29.0	30.0	37.0	39.0	39.0	33.0	26.0	15.0	6.0	6.0
Record Maximum Temp	67.0	72.0	73.0	83.0	87.0	93.0	100.0	96.0	95.0	85.0	71.0	64.0	100.0
HDD, Base 65°F	716	582	598	504	388	243	157	141	201	384	543	701	5158
CDD, Base 65°F	0	0	0	0	0	0	0	8	0	0	0	0	8
Humidity Ratio (#w/#da)	0.0048	0.0051	0.0052	0.0055	0.0066	0.0077	0.0086	0.0090	0.0083	0.0070	0.0058	0.0049	0.0065
Wind Speed (mph)	9.6	9.3	9.2	9.1	8.7	9.2	9.0	8.4	7.8	7.8	9.2	9.1	8.9
Clearness Index, Kt	0.35	0.37	0.40	0.43	0.45	0.45	0.48	0.48	0.49	0.43	0.36	0.34	0.44

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	29/16	59/33	70/38	57/33	26/15	44/24	78/42	95/58	94/58	71/41	22/12	57/31	76/45	72/44	47/27	5/3	26/15	34/17	20/12	0/0
North	8/7	12/13	13/14	12/13	8/7	16/11	15/16	16/19	16/19	14/15	7/6	12/12	14/16	14/15	11/10	2/2	7/7	9/7	6/5	0/0
East	67/19	56/24	13/14	12/13	8/7	78/24	73/31	35/26	16/19	14/15	59/15	69/27	32/22	14/15	11/10	20/4	35/12	9/7	6/5	0/0
South	35/13	73/28	86/35	69/29	31/12	11/10	37/21	55/34	53/34	30/20	18/8	57/24	79/39	76/39	46/21	17/4	69/18	82/20	56/14	0/0
West	8/7	12/13	16/14	58/26	64/20	11/10	15/16	16/19	46/31	78/36	7/6	12/12	14/16	47/28	73/28	2/2	7/7	14/8	38/11	0/0
M. Clr (%hrs)	13	15	16	15	15	12	18	22	26	29	29	33	37	39	42	13	14	15	15	16





Shading Geometry
(Not to Scale)

Burns, OR

WBAN NO. 94185

LATITUDE: 43.58° N
LONGITUDE: 119.05° W
ELEVATION: 4170 feet
MEAN PRESSURE: 12.7 psia

STATION TYPE: Primary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	560	830	1200	1660	2040	2250	2380	2060	1610	1070	590	470	1400
	Std.Dev.	45	83	94	140	126	134	101	155	119	98	69	49	38
	Minimum	480	690	990	1390	1740	2040	2140	1720	1350	910	450	360	1300
	Maximum	640	1020	1400	1960	2270	2560	2550	2310	1810	1270	750	570	1500
	Diffuse	330	440	570	720	770	740	580	520	430	360	320	270	500
	Clear-Day Global	790	1150	1670	2240	2630	2780	2690	2360	1850	1290	850	680	1750
North	Global	190	260	350	460	590	690	640	480	350	260	190	160	390
	Diffuse	190	260	350	450	510	540	490	430	350	260	190	160	350
	Clear-Day Global	160	210	290	400	600	730	660	470	320	230	160	140	370
East	Global	380	550	800	1060	1250	1360	1440	1300	1060	750	410	330	890
	Diffuse	230	320	430	550	620	630	580	520	430	330	240	200	420
	Clear-Day Global	660	880	1180	1450	1600	1640	1610	1490	1260	960	690	580	1170
South	Global	920	1100	1160	1130	1010	940	1040	1210	1420	1390	920	840	1090
	Diffuse	360	430	510	580	590	580	540	510	470	410	340	310	470
	Clear-Day Global	1950	2050	1950	1570	1220	1070	1120	1410	1780	2000	1930	1860	1660
West	Global	390	550	760	990	1160	1250	1360	1220	1040	730	410	330	850
	Diffuse	240	320	440	560	630	640	590	530	440	330	240	200	430
	Clear-Day Global	660	880	1180	1450	1600	1640	1610	1490	1260	960	690	580	1170

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	360	550	840	1180	1470	1640	1740	1490	1140	730	380	290	990
North	Unshaded	130	180	240	310	390	440	410	310	240	180	130	110	260
	Shaded	110	150	210	270	340	390	360	280	220	160	110	92	220
East	Unshaded	260	390	570	760	890	970	1040	930	760	530	280	220	630
	Shaded	230	330	480	630	740	800	850	780	650	460	240	190	530
South	Unshaded	690	810	820	750	630	570	620	770	970	1010	690	630	750
	Shaded	660	740	620	450	360	350	330	380	640	870	660	610	560
West	Unshaded	270	380	540	710	830	890	970	880	740	510	280	220	600
	Shaded	230	330	460	590	680	730	800	730	630	450	250	190	510

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	23.3	29.4	36.3	42.8	50.8	58.0	66.2	64.2	55.0	45.0	33.6	25.1	44.1
Daily Minimum Temp	13.0	19.3	24.9	29.0	35.9	41.6	47.2	45.0	36.3	28.1	22.0	15.1	29.8
Daily Maximum Temp	33.6	39.5	47.7	56.5	65.6	74.4	85.1	83.3	73.6	61.8	45.2	35.2	58.5
Record Minimum Temp	-26.0	-27.9	3.9	17.1	21.9	25.0	26.1	32.0	17.1	8.1	-13.0	-25.1	-27.9
Record Maximum Temp	55.0	63.0	73.9	84.0	93.0	95.0	99.0	100.9	97.0	86.0	71.6	57.9	100.9
HDD, Base 65°F	1293	997	890	666	440	224	58	103	315	620	942	1237	7785
CDD, Base 65°F	0	0	0	0	0	14	95	78	15	0	0	0	202
Humidity Ratio (#w/#da)	0.0027	0.0032	0.0033	0.0035	0.0046	0.0059	0.0061	0.0058	0.0048	0.0040	0.0036	0.0028	0.0042
Wind Speed (mph)	4.7	4.9	6.6	7.9	7.7	6.8	6.6	5.2	5.7	5.1	4.9	5.3	6.0
Clearness Index, Kt	0.48	0.50	0.52	0.55	0.59	0.61	0.66	0.65	0.62	0.56	0.45	0.45	0.58

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

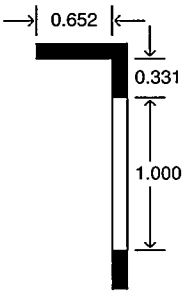
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	40/26	69/46	77/51	59/40	23/16	53/38	87/63	101/77	95/72	68/47	31/21	67/45	82/59	74/55	45/31	12/8	35/22	39/25	22/14	0/0
North	10/10	13/15	14/17	12/14	7/7	14/14	15/17	16/19	16/18	13/15	8/8	13/14	14/17	13/16	10/10	5/4	9/9	10/10	7/6	0/0
East	76/32	53/32	14/17	12/14	7/7	87/48	72/49	27/26	16/18	13/15	76/34	69/40	24/22	13/16	10/10	37/11	34/16	10/10	7/6	0/0
South	45/22	78/42	87/48	67/36	26/13	11/13	38/30	53/43	47/38	22/19	26/15	64/37	81/54	71/49	40/25	36/11	78/28	85/31	56/19	0/0
West	10/10	13/15	25/21	68/36	64/25	11/13	15/17	16/19	54/42	83/49	8/8	13/14	14/17	55/39	79/43	5/4	9/9	22/14	44/16	0/0
M. Clr (%hrs)	31	27	24	22	25	52	51	47	39	37	65	65	61	58	57	24	25	26	22	24

Eugene, OR

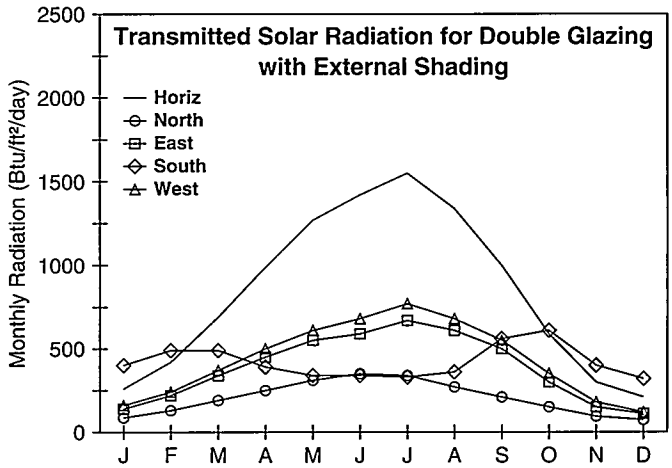
WBAN NO. 24221

LATITUDE: 44.12° N
LONGITUDE: 123.22° W
ELEVATION: 358 feet
MEAN PRESSURE: 14.6 psia

STATION TYPE: Primary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	400	620	990	1390	1760	1970	2130	1850	1400	850	450	330	1180
	Std.Dev.	63	82	102	134	149	167	192	137	129	83	52	40	56
	Minimum	280	450	790	1090	1440	1680	1640	1600	1110	680	350	230	1050
	Maximum	550	750	1260	1660	2000	2280	2410	2060	1660	1050	540	400	1270
	Diffuse	280	390	560	730	820	810	660	600	480	400	310	240	520
	Clear-Day Global	720	1070	1590	2150	2540	2700	2610	2280	1780	1220	790	620	1680
North	Global	150	220	320	430	550	630	610	470	340	250	170	130	360
	Diffuse	150	220	320	420	500	530	500	430	340	250	170	130	330
	Clear-Day Global	150	210	290	400	580	710	650	460	320	230	160	130	360
East	Global	250	370	580	790	960	1040	1160	1040	840	510	270	200	670
	Diffuse	180	260	390	510	590	610	580	520	420	310	200	150	390
	Clear-Day Global	600	820	1110	1380	1540	1580	1550	1430	1200	900	650	540	1110
South	Global	570	740	910	940	900	860	970	1100	1220	1000	580	460	860
	Diffuse	260	350	460	540	580	570	540	530	470	390	280	230	430
	Clear-Day Global	1810	1940	1870	1540	1220	1070	1130	1390	1730	1910	1830	1730	1600
West	Global	270	410	630	850	1060	1190	1300	1150	920	590	300	220	740
	Diffuse	180	270	390	520	600	620	590	530	430	310	200	150	400
	Clear-Day Global	600	820	1110	1380	1540	1580	1550	1430	1200	900	650	540	1110

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

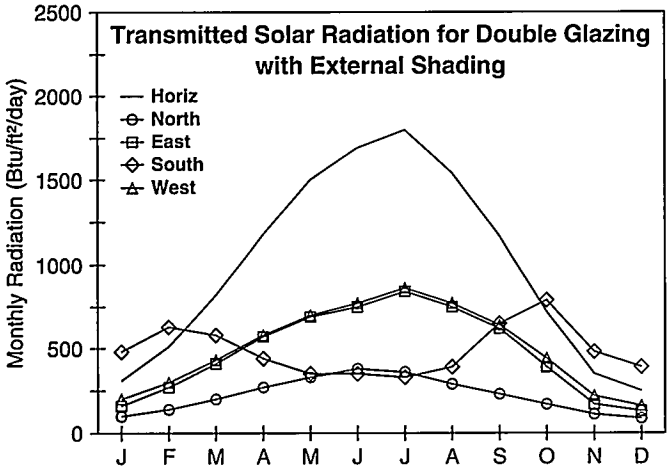
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	260	420	690	990	1270	1420	1550	1340	1000	590	300	210	840
North	Unshaded	110	150	220	290	360	410	390	310	240	180	120	91	240
	Shaded	86	130	190	250	310	350	340	270	210	150	95	73	200
East	Unshaded	170	260	410	560	680	740	830	740	590	350	190	140	470
	Shaded	140	220	340	450	550	590	670	610	500	300	150	110	390
South	Unshaded	430	540	640	630	570	530	590	710	840	730	430	340	580
	Shaded	400	490	490	390	340	340	330	360	560	610	400	320	420
West	Unshaded	190	290	450	610	760	850	940	830	660	420	210	150	530
	Shaded	160	240	370	500	610	680	770	680	550	350	180	120	440

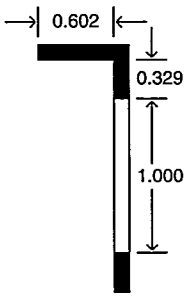
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	40.8	44.2	47.4	50.6	55.8	62.0	67.3	67.6	62.8	54.1	46.1	41.1	53.3
Daily Minimum Temp	35.2	37.0	38.9	40.6	44.5	49.7	52.8	53.2	49.3	43.5	39.7	35.9	43.4
Daily Maximum Temp	46.4	51.4	55.9	60.5	67.1	74.2	81.7	81.8	76.2	64.6	52.4	46.2	63.2
Record Minimum Temp	-4.0	-3.0	20.0	27.0	28.0	32.0	39.0	38.0	32.0	19.0	12.0	-12.0	-12.0
Record Maximum Temp	67.0	71.0	77.0	86.0	93.0	100.0	105.0	108.0	103.0	94.0	76.0	68.0	108.0
HDD, Base 65°F	750	582	546	432	285	121	38	30	116	338	567	741	4546
CDD, Base 65°F	0	0	0	0	0	31	109	110	50	0	0	0	300
Humidity Ratio (#w/#da)	0.0047	0.0051	0.0053	0.0056	0.0067	0.0078	0.0083	0.0085	0.0077	0.0068	0.0058	0.0049	0.0064
Wind Speed (mph)	7.6	7.9	8.2	7.8	7.4	7.6	7.8	7.4	7.3	6.5	7.8	7.7	7.6
Clearness Index, Kt	0.35	0.38	0.43	0.47	0.51	0.53	0.59	0.58	0.55	0.46	0.35	0.32	0.49

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	32/19	64/38	73/44	61/37	27/16	46/27	81/48	100/65	96/64	73/48	24/14	61/36	79/53	75/51	48/31	7/4	30/16	36/19	22/12	0/0
North	9/8	13/14	14/15	12/13	8/7	17/12	15/17	16/19	16/19	14/16	7/6	12/13	14/16	14/15	11/11	3/2	8/7	9/8	7/6	0/0
East	66/22	57/28	14/15	12/13	8/7	81/29	74/37	34/28	16/19	14/16	64/19	71/33	31/24	14/15	11/11	21/5	36/12	9/8	7/6	0/0
South	35/15	72/33	83/40	69/33	30/13	11/11	35/24	53/36	50/35	27/21	19/9	57/29	78/46	74/45	44/25	19/5	70/18	79/21	54/14	1/0
West	9/8	13/14	18/16	62/30	65/23	11/11	15/17	16/19	48/34	81/44	7/6	12/13	14/16	48/32	75/37	3/2	8/7	15/9	38/11	1/0
M. Clr (%hrs)	14	13	16	17	18	31	31	34	38	42	40	43	46	49	52	8	7	8	11	13





Shading Geometry
(Not to Scale)

Medford, OR

WBAN NO. 24225

LATITUDE: 42.37° N
LONGITUDE: 122.87° W
ELEVATION: 1299 feet
MEAN PRESSURE: 14.1 psia

STATION TYPE: Primary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	470	750	1160	1640	2060	2310	2450	2110	1640	1050	530	390	1380
	Std.Dev.	64	97	123	148	147	138	115	150	115	112	67	43	41
	Minimum	360	560	910	1360	1740	2040	2250	1720	1420	810	370	290	1260
	Maximum	590	950	1400	1930	2360	2600	2600	2360	1860	1280	670	460	1440
	Diffuse	300	410	560	690	730	710	540	530	450	400	340	270	490
	Clear-Day Global	780	1130	1660	2200	2580	2720	2640	2320	1830	1280	850	680	1730
North	Global	170	240	340	450	570	670	640	490	360	270	190	150	380
	Diffuse	170	240	340	430	500	530	490	440	360	270	190	150	340
	Clear-Day Global	160	220	300	410	590	710	660	470	330	240	170	150	370
East	Global	280	450	690	960	1170	1290	1410	1250	1020	650	300	230	810
	Diffuse	200	290	410	540	600	620	580	540	450	340	220	170	410
	Clear-Day Global	610	830	1120	1390	1540	1580	1550	1430	1210	920	670	550	1120
South	Global	680	940	1080	1100	990	930	1020	1200	1410	1260	690	550	990
	Diffuse	290	390	490	560	570	560	530	520	490	430	310	260	450
	Clear-Day Global	1790	1930	1850	1500	1170	1010	1070	1340	1700	1900	1830	1720	1560
West	Global	330	500	720	980	1180	1300	1430	1270	1050	710	370	270	840
	Diffuse	210	300	420	540	600	630	580	550	450	340	230	180	420
	Clear-Day Global	610	830	1120	1390	1540	1580	1550	1430	1210	920	670	550	1120

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	310	510	820	1180	1500	1690	1800	1540	1170	720	350	250	990
North	Unshaded	120	170	230	300	370	430	400	320	250	190	130	100	250
	Shaded	99	140	200	270	330	380	360	290	230	170	110	86	220
East	Unshaded	190	310	490	680	830	920	1010	900	730	450	200	150	570
	Shaded	160	270	410	570	690	750	840	750	620	390	170	130	480
South	Unshaded	510	690	760	730	610	550	600	760	960	920	510	420	670
	Shaded	480	630	580	440	350	350	330	390	650	790	480	390	490
West	Unshaded	230	350	510	690	840	930	1020	910	740	500	250	190	600
	Shaded	200	300	430	580	700	770	860	770	640	440	220	160	510

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	38.1	42.8	47.0	51.3	58.2	66.5	72.9	72.5	65.5	54.9	44.1	37.8	54.3
Daily Minimum Temp	30.4	32.2	35.4	38.0	43.4	50.7	55.2	55.1	48.2	40.4	35.5	31.2	41.3
Daily Maximum Temp	45.7	53.3	58.5	64.6	72.9	82.1	90.5	89.9	82.8	69.4	52.6	44.3	67.2
Record Minimum Temp	-3.0	6.0	16.0	21.0	28.0	31.0	38.0	39.0	29.0	18.0	10.0	-6.0	-6.0
Record Maximum Temp	71.0	77.0	86.0	93.0	103.0	109.0	115.0	114.0	110.0	99.0	75.0	72.0	115.0
HDD, Base 65°F	834	622	558	416	219	60	8	11	93	320	627	843	4611
CDD, Base 65°F	0	0	0	0	8	105	253	244	108	7	0	0	725
Humidity Ratio (#w/#da)	0.0041	0.0044	0.0047	0.0050	0.0060	0.0071	0.0076	0.0078	0.0068	0.0059	0.0051	0.0042	0.0057
Wind Speed (mph)	3.9	4.6	5.3	5.6	5.7	6.0	5.9	5.4	4.6	3.7	3.8	3.6	4.8
Clearness Index, Kt	0.38	0.44	0.49	0.54	0.59	0.62	0.68	0.66	0.63	0.53	0.38	0.35	0.56

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

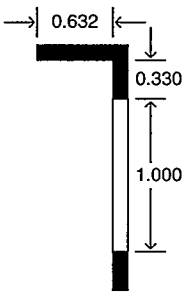
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	36/20	69/42	81/51	65/41	29/17	48/31	84/59	103/77	99/73	75/52	26/15	64/41	84/60	79/55	51/33	9/5	34/17	41/22	26/14	2/2
North	9/8	14/14	15/16	13/14	8/7	18/14	15/17	16/19	16/19	14/16	8/6	13/14	15/17	14/16	11/11	4/2	9/8	10/9	8/6	1/1
East	72/25	59/32	15/16	13/14	8/7	84/39	76/49	34/30	16/19	14/16	67/24	73/38	31/26	14/16	11/11	27/5	37/12	10/9	8/6	1/1
South	37/16	74/37	86/47	70/36	31/14	11/11	34/27	51/41	48/38	25/21	20/10	58/33	80/52	74/48	45/25	24/5	73/17	85/24	61/17	5/1
West	9/8	14/14	19/18	65/34	70/25	11/11	15/17	16/19	49/39	83/50	8/6	13/14	15/17	51/35	79/40	4/2	9/8	18/11	44/14	7/2
M. Clr (%hrs)	23	25	24	23	23	52	54	55	54	52	62	66	67	66	64	8	10	13	17	17

North Bend, OR

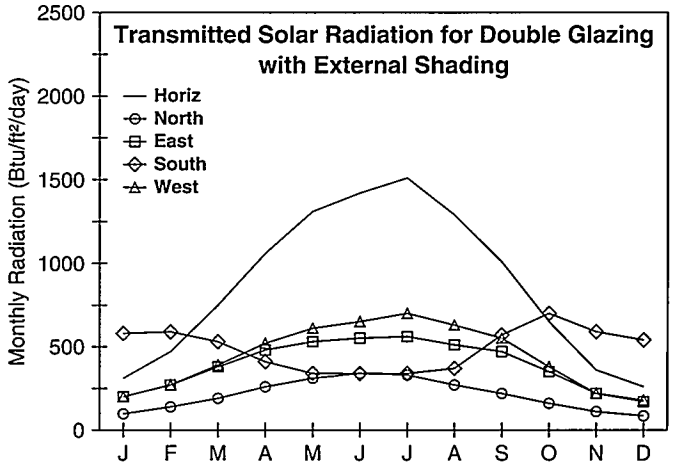
WBAN NO. 24284

LATITUDE: 43.42° N
LONGITUDE: 124.25° W
ELEVATION: 16 feet
MEAN PRESSURE: 14.8 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	490	700	1070	1480	1800	1950	2060	1780	1420	940	550	420	1220
	Std.Dev.	53	74	98	100	115	140	146	121	82	77	56	46	34
	Minimum	410	530	870	1260	1520	1600	1790	1530	1270	750	440	330	1140
	Maximum	600	830	1280	1720	2060	2240	2440	2040	1570	1140	660	510	1280
	Diffuse	280	400	560	720	800	830	720	660	520	410	310	250	540
	Clear-Day Global	750	1100	1620	2160	2530	2680	2600	2280	1790	1240	820	650	1690
North	Global	170	240	330	430	540	600	570	460	360	270	190	150	360
	Diffuse	170	240	330	430	490	530	500	440	360	270	190	150	340
	Clear-Day Global	150	220	300	410	580	700	650	460	330	240	170	140	360
East	Global	340	450	640	830	940	970	1010	890	800	590	370	290	680
	Diffuse	200	280	400	520	590	610	580	530	440	330	230	180	410
	Clear-Day Global	620	830	1110	1370	1510	1550	1520	1400	1190	910	670	560	1110
South	Global	800	880	990	1000	920	860	950	1060	1220	1130	830	740	950
	Diffuse	300	380	480	550	570	580	560	540	490	420	320	270	460
	Clear-Day Global	1840	1950	1860	1530	1200	1050	1110	1360	1710	1900	1860	1770	1590
West	Global	330	460	660	890	1060	1130	1210	1080	920	630	380	300	760
	Diffuse	200	290	410	530	600	630	600	540	450	330	230	180	420
	Clear-Day Global	620	830	1110	1370	1510	1550	1520	1400	1190	910	670	560	1110

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	310	470	750	1060	1310	1420	1510	1290	1010	650	360	260	870
North	Unshaded	120	160	230	300	360	400	370	310	250	190	130	100	240
	Shaded	97	140	190	260	310	340	330	270	220	160	110	85	210
East	Unshaded	230	320	450	590	660	690	710	630	560	410	260	200	480
	Shaded	200	270	380	480	530	550	560	510	470	350	220	170	390
South	Unshaded	600	650	700	670	580	530	580	690	840	820	620	560	650
	Shaded	580	590	530	410	340	340	340	370	570	700	590	540	490
West	Unshaded	230	320	470	630	750	810	860	770	660	440	260	200	530
	Shaded	200	270	390	520	610	650	700	630	550	380	220	180	440

Average Climatic Conditions

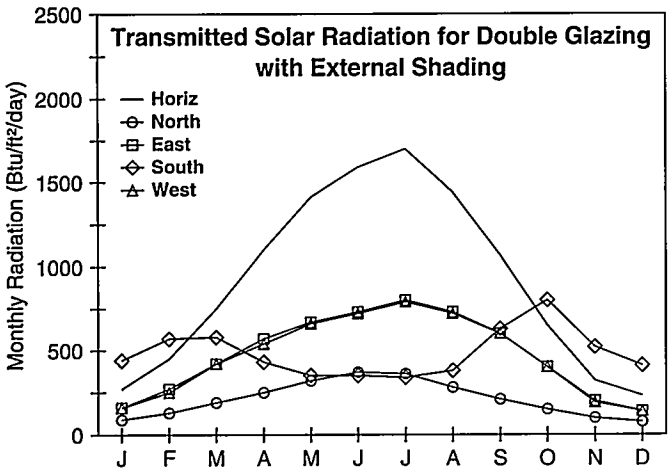
Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	45.4	47.3	48.0	49.5	53.4	57.3	59.4	60.1	58.7	54.9	50.1	46.1	52.5
Daily Minimum Temp	38.9	40.5	41.1	42.4	46.6	50.7	52.5	53.0	50.5	46.7	43.2	39.7	45.5
Daily Maximum Temp	51.8	54.0	54.8	56.5	60.2	63.8	66.3	67.1	66.9	63.0	56.9	52.4	59.5
Record Minimum Temp	19.0	16.0	27.0	28.9	36.0	39.0	41.0	44.1	36.0	28.9	24.1	12.9	12.9
Record Maximum Temp	69.1	75.9	77.0	86.0	82.9	82.9	84.9	84.0	88.0	84.9	73.9	69.1	88.0
HDD, Base 65°F	608	496	527	465	360	231	174	156	194	313	447	586	4557
CDD, Base 65°F	0	0	0	0	0	0	0	0	0	0	0	0	0
Humidity Ratio (#w/#da)	0.0053	0.0056	0.0056	0.0057	0.0066	0.0077	0.0084	0.0087	0.0081	0.0072	0.0063	0.0055	0.0067
Wind Speed (mph)	8.5	8.8	9.5	9.7	10.1	10.7	11.3	9.9	8.7	7.6	8.8	8.6	9.3
Clearness Index, Kt	0.41	0.42	0.46	0.49	0.52	0.53	0.57	0.56	0.55	0.49	0.42	0.40	0.51

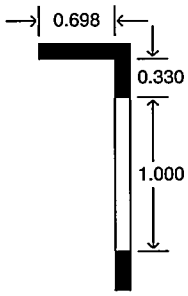
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	31/19	64/39	76/46	63/40	29/18	44/25	80/47	99/66	96/67	74/48	23/13	60/36	80/54	77/51	50/32	7/5	31/19	40/23	25/16	2/2
North	9/8	13/14	14/15	13/14	8/8	18/12	15/17	16/19	16/19	14/16	7/6	13/13	15/17	14/16	11/12	3/2	8/8	9/9	7/7	1/1
East	67/24	59/30	14/15	13/14	8/8	78/27	75/37	36/29	16/19	14/16	62/17	72/32	33/25	14/16	11/12	28/7	39/15	9/9	7/7	1/1
South	34/15	72/35	85/42	70/36	32/14	11/10	33/23	52/36	49/36	28/21	18/8	57/27	78/46	74/43	46/25	24/6	73/24	87/29	62/20	7/2
West	9/8	13/14	16/16	62/32	67/24	11/10	15/17	16/19	46/34	80/44	7/6	13/13	15/17	47/31	76/36	3/2	8/8	15/11	43/16	10/2
M. Clr (%hrs)	18	19	21	18	18	23	31	37	41	41	29	40	50	54	52	20	21	20	20	21

Pendleton, OR

WBAN NO. 24155





Shading Geometry
(Not to Scale)

LATITUDE: 45.68° N
LONGITUDE: 118.85° W
ELEVATION: 1496 feet
MEAN PRESSURE: 14.0 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	420	670	1090	1550	1950	2190	2330	2000	1520	960	490	360	1300
	Std.Dev.	29	65	82	121	119	148	113	148	117	81	41	28	35
	Minimum	360	550	930	1200	1630	1910	2100	1630	1320	780	420	310	1220
	Maximum	480	860	1270	1760	2150	2430	2530	2250	1760	1150	590	430	1350
	Diffuse	300	410	530	680	760	750	590	530	440	360	310	260	490
	Clear-Day Global	680	1040	1590	2170	2580	2740	2640	2280	1760	1190	750	580	1670
North	Global	160	230	330	440	570	670	630	480	350	250	180	140	370
	Diffuse	160	230	320	420	500	540	500	430	340	250	180	140	340
	Clear-Day Global	140	200	290	400	600	740	660	470	320	230	150	120	360
East	Global	280	460	720	980	1170	1280	1400	1250	1010	670	340	240	820
	Diffuse	200	290	400	520	610	640	590	530	430	320	220	170	410
	Clear-Day Global	590	830	1150	1430	1590	1640	1600	1470	1220	910	630	520	1130
South	Global	630	870	1100	1110	1030	980	1090	1250	1420	1290	740	580	1010
	Diffuse	310	390	480	560	590	590	550	530	480	410	320	270	460
	Clear-Day Global	1830	2000	1960	1620	1300	1140	1190	1460	1800	1960	1850	1730	1650
West	Global	280	440	710	940	1150	1270	1370	1240	1010	670	330	240	810
	Diffuse	200	290	410	530	610	640	600	530	440	320	220	170	410
	Clear-Day Global	590	830	1150	1430	1590	1640	1600	1470	1220	910	630	520	1130

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	270	450	750	1100	1410	1590	1700	1440	1070	650	320	230	920
North	Unshaded	110	160	220	300	380	430	410	320	240	180	120	97	250
	Shaded	90	130	190	250	320	370	360	280	210	150	99	77	210
East	Unshaded	190	320	510	700	840	920	1000	900	720	470	230	170	580
	Shaded	160	270	420	570	670	730	800	730	600	400	200	140	480
South	Unshaded	470	640	780	750	650	600	670	800	980	940	550	430	690
	Shaded	440	570	580	430	350	350	340	380	630	800	520	410	480
West	Unshaded	190	310	500	670	820	900	990	890	720	470	230	170	570
	Shaded	160	250	420	540	660	720	790	720	600	400	190	140	470

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	33.5	39.2	44.8	50.3	57.9	66.2	72.9	72.0	63.1	52.4	41.5	34.3	52.3
Daily Minimum Temp	27.2	31.6	35.4	39.4	45.8	52.9	58.0	57.7	49.9	41.0	34.1	27.9	41.7
Daily Maximum Temp	39.7	46.9	54.2	61.3	70.0	79.5	87.8	86.2	76.3	63.7	48.9	40.5	62.9
Record Minimum Temp	-22.0	-18.0	10.0	18.0	25.0	35.0	42.0	40.0	30.0	11.0	-12.0	-19.0	-22.0
Record Maximum Temp	68.0	72.0	79.0	91.0	100.0	108.0	110.0	113.0	102.0	92.0	77.0	67.0	113.0
HDD, Base 65°F	977	722	626	441	226	71	15	23	145	391	705	952	5294
CDD, Base 65°F	0	0	0	0	6	107	260	240	88	0	0	0	701
Humidity Ratio (#w/#da)	0.0033	0.0038	0.0040	0.0045	0.0054	0.0061	0.0062	0.0063	0.0056	0.0048	0.0042	0.0034	0.0048
Wind Speed (mph)	7.4	7.5	8.4	9.2	8.7	8.5	8.2	7.8	7.7	6.9	7.2	6.9	7.9
Clearness Index, Kt	0.40	0.44	0.49	0.53	0.56	0.59	0.65	0.63	0.61	0.54	0.41	0.39	0.55

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

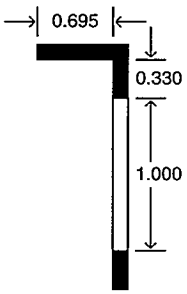
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	38/23	66/42	73/46	56/36	21/14	53/36	85/59	100/74	94/70	67/47	30/20	65/43	80/57	72/51	44/28	9/6	30/18	34/20	18/11	0/0
North	9/9	13/14	14/15	12/13	7/6	13/13	15/17	16/19	16/18	13/15	8/8	13/14	14/16	13/15	10/10	4/3	8/8	9/9	6/5	0/0
East	75/29	52/29	14/15	12/13	7/6	85/44	71/46	27/25	16/18	13/15	74/31	68/39	23/21	13/15	10/10	31/8	32/13	9/9	6/5	0/0
South	45/20	79/40	88/44	67/34	25/12	12/13	41/31	57/44	50/40	24/20	27/15	65/38	83/54	74/46	41/23	30/8	74/22	81/23	49/14	0/0
West	9/9	13/14	25/20	67/34	61/23	12/12	15/17	16/19	54/42	82/49	8/8	13/14	14/16	55/37	79/39	4/3	8/8	21/11	38/12	0/0
M. Clr (%hrs)	27	24	21	20	24	47	46	40	38	43	59	59	57	56	55	13	14	13	13	16

Portland, OR

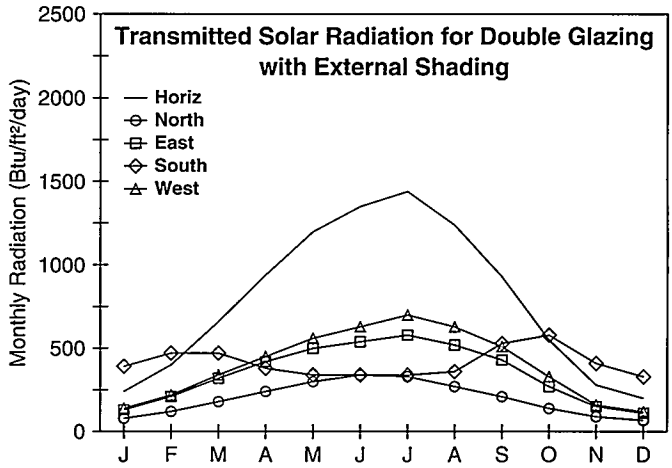
WBAN NO. 24229

LATITUDE: 45.60° N
LONGITUDE: 122.60° W
ELEVATION: 39 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Primary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	370	590	940	1330	1670	1870	1990	1720	1310	810	430	310	1110
	Std.Dev.	52	75	108	109	154	184	177	148	116	94	53	38	51
	Minimum	280	430	760	1070	1370	1540	1590	1470	1020	580	290	230	990
	Maximum	460	750	1210	1520	1940	2180	2270	2010	1550	1000	530	420	1200
	Diffuse	260	380	550	750	860	890	780	670	530	410	290	220	550
	Clear-Day Global	640	980	1500	2080	2480	2640	2550	2200	1690	1130	710	540	1600
North	Global	140	210	310	430	540	620	600	470	350	250	160	120	350
	Diffuse	140	210	310	420	500	540	520	440	350	250	160	120	330
	Clear-Day Global	140	200	290	410	580	690	640	470	330	230	160	120	360
East	Global	240	360	560	750	900	980	1040	920	760	470	260	200	620
	Diffuse	170	250	370	510	600	630	610	530	430	300	190	150	390
	Clear-Day Global	530	750	1050	1330	1490	1540	1510	1370	1140	830	580	470	1050
South	Global	550	720	890	920	900	870	970	1070	1170	960	590	470	840
	Diffuse	250	340	450	550	590	600	580	550	490	390	270	220	440
	Clear-Day Global	1660	1840	1850	1580	1290	1140	1200	1430	1730	1830	1690	1560	1570
West	Global	250	390	590	800	1000	1110	1230	1100	880	560	290	210	700
	Diffuse	170	250	380	520	610	640	630	550	440	310	190	150	400
	Clear-Day Global	530	750	1050	1330	1490	1540	1510	1370	1140	830	580	470	1050

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

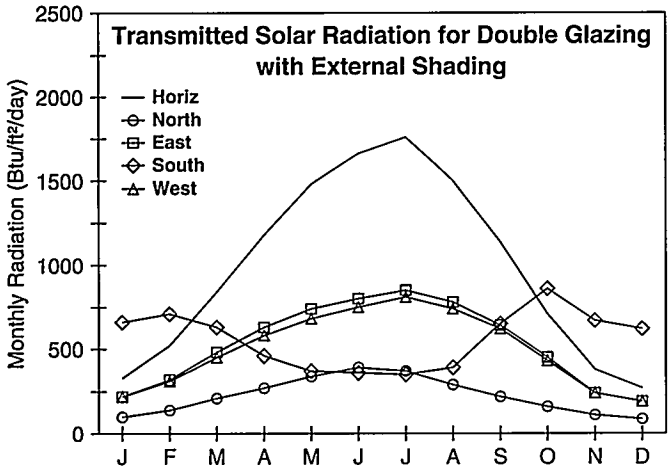
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	240	400	660	940	1200	1350	1440	1240	930	550	280	200	790
North	Unshaded	99	150	220	290	360	410	390	310	240	170	110	85	240
	Shaded	79	120	180	240	300	340	330	270	210	140	89	67	200
East	Unshaded	160	250	390	530	640	690	740	650	530	320	180	130	440
	Shaded	130	210	320	420	500	540	580	520	430	270	150	110	350
South	Unshaded	410	530	630	630	580	550	610	700	810	700	440	350	580
	Shaded	390	470	470	380	340	340	340	360	530	580	410	330	410
West	Unshaded	170	270	420	570	710	790	880	790	620	390	200	140	500
	Shaded	140	220	340	450	560	630	700	630	510	330	160	120	400

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	39.6	43.6	47.3	51.0	57.1	63.5	68.2	68.6	63.3	54.5	46.1	40.2	53.6
Daily Minimum Temp	33.7	36.1	38.6	41.3	47.0	52.9	56.5	56.9	52.0	44.9	39.5	34.8	44.5
Daily Maximum Temp	45.4	51.0	56.0	60.6	67.1	74.0	79.9	80.3	74.6	64.0	52.6	45.6	62.6
Record Minimum Temp	-2.0	-3.0	19.0	29.0	29.0	39.0	43.0	44.0	34.0	26.0	13.0	6.0	-3.0
Record Maximum Temp	63.0	71.0	80.0	87.0	100.0	100.0	107.0	107.0	105.0	92.0	73.0	64.0	107.0
HDD, Base 65°F	787	599	549	420	249	91	28	35	102	326	567	769	4522
CDD, Base 65°F	0	0	0	0	0	46	127	147	51	0	0	0	371
Humidity Ratio (#w/#da)	0.0042	0.0046	0.0050	0.0055	0.0065	0.0077	0.0085	0.0089	0.0080	0.0068	0.0054	0.0045	0.0063
Wind Speed (mph)	9.9	9.4	8.5	7.6	7.5	7.7	7.9	7.4	6.9	6.7	9.0	9.4	8.1
Clearness Index, Kt	0.35	0.38	0.42	0.45	0.48	0.51	0.56	0.55	0.52	0.45	0.35	0.33	0.47

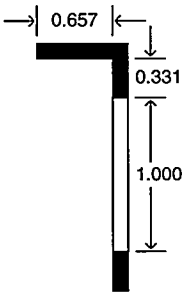
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	32/17	62/36	72/41	58/34	25/14	46/26	80/48	98/62	95/61	71/44	23/13	59/34	77/49	73/46	46/28	6/4	28/15	34/18	20/11	0/0
North	9/7	13/13	14/15	12/13	8/6	15/12	15/17	16/20	16/19	14/15	8/6	13/13	15/16	14/16	11/11	3/2	8/7	9/8	7/5	0/0
East	66/19	55/25	14/15	12/13	8/6	79/27	73/36	34/27	16/19	14/15	59/16	69/29	30/22	14/16	11/11	20/4	34/11	9/8	7/5	0/0
South	36/13	73/31	87/38	69/30	28/11	11/11	38/24	56/36	52/35	28/21	19/8	59/26	80/42	75/39	44/22	18/4	68/16	78/19	51/13	0/0
West	9/7	13/13	19/16	61/27	60/19	11/11	15/17	16/20	49/33	80/39	8/6	13/13	15/16	49/29	74/32	3/2	8/7	16/9	37/10	0/0
M. Clr (%hrs)	15	17	18	17	18	24	28	31	34	37	33	39	46	49	48	10	12	14	13	16



Redmond, OR

WBAN NO. 24230



Shading Geometry
(Not to Scale)

LATITUDE: 44.27° N
LONGITUDE: 121.15° W
ELEVATION: 3084 feet
MEAN PRESSURE: 13.2 psia

STATION TYPE: Primary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	520	780	1200	1660	2050	2280	2410	2080	1600	1050	590	440	1390
	Std.Dev.	42	73	80	112	119	128	112	133	108	79	49	43	37
	Minimum	450	610	1020	1360	1770	2000	2160	1790	1390	880	490	370	1300
	Maximum	600	930	1390	1880	2240	2490	2650	2290	1800	1220	680	530	1470
	Diffuse	290	410	570	720	790	770	610	560	470	380	320	250	510
	Clear-Day Global	740	1100	1640	2200	2600	2760	2670	2330	1820	1250	810	640	1720
North	Global	170	250	350	460	590	700	650	500	360	270	190	150	390
	Diffuse	170	250	350	450	520	550	510	450	360	270	190	150	350
	Clear-Day Global	150	210	290	410	600	740	670	470	320	230	160	130	360
East	Global	370	540	800	1060	1260	1370	1450	1310	1060	740	410	320	890
	Diffuse	220	310	440	560	630	650	610	550	460	340	240	190	430
	Clear-Day Global	630	850	1160	1430	1590	1640	1600	1470	1240	940	670	560	1150
South	Global	910	1050	1190	1160	1040	980	1080	1250	1440	1380	940	850	1110
	Diffuse	340	420	530	590	610	600	560	540	510	440	360	300	480
	Clear-Day Global	1890	2010	1940	1590	1250	1090	1150	1420	1780	1970	1900	1800	1650
West	Global	370	510	760	990	1170	1290	1390	1250	1040	720	410	320	850
	Diffuse	220	310	440	560	640	660	620	560	460	340	240	190	440
	Clear-Day Global	630	850	1160	1430	1590	1640	1600	1470	1240	940	670	560	1150

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	330	520	840	1180	1480	1660	1760	1500	1140	710	380	270	980
North	Unshaded	120	170	240	310	390	450	420	330	250	190	130	100	260
	Shaded	100	140	210	270	340	390	370	290	220	160	110	87	230
East	Unshaded	250	370	560	760	900	980	1050	940	760	520	280	220	630
	Shaded	220	320	480	630	740	800	850	780	640	450	240	190	530
South	Unshaded	690	780	840	770	660	590	650	800	990	1000	710	640	760
	Shaded	660	710	630	460	370	360	350	390	650	860	670	620	560
West	Unshaded	250	360	540	710	840	920	990	890	740	500	280	220	600
	Shaded	220	310	450	580	680	750	810	740	620	430	240	190	500

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	31.4	36.0	39.5	44.1	51.0	59.4	65.9	65.1	57.0	48.3	38.2	31.8	47.3
Daily Minimum Temp	21.4	24.9	26.2	28.9	34.7	42.1	46.4	46.2	38.7	32.2	27.3	21.8	32.6
Daily Maximum Temp	41.2	47.1	52.7	59.2	67.2	76.7	85.2	83.9	75.3	64.2	49.0	41.7	62.0
Record Minimum Temp	-25.1	-18.0	1.9	12.0	14.0	26.1	30.9	30.9	19.0	5.0	-5.1	-25.1	-25.1
Record Maximum Temp	64.9	71.1	79.0	86.0	98.1	100.4	102.0	105.1	98.1	91.0	75.0	66.0	105.1
HDD, Base 65°F	1042	812	791	627	434	193	80	96	263	518	804	1029	6689
CDD, Base 65°F	0	0	0	0	0	25	108	99	23	0	0	0	255
Humidity Ratio (#w/#da)	0.0030	0.0032	0.0032	0.0036	0.0046	0.0057	0.0062	0.0063	0.0051	0.0042	0.0037	0.0030	0.0043
Wind Speed (mph)	7.3	7.8	8.0	8.1	7.9	7.7	7.3	7.0	6.8	6.6	7.3	6.9	7.4
Clearness Index, Kt	0.46	0.48	0.53	0.56	0.59	0.62	0.67	0.65	0.63	0.57	0.46	0.44	0.58

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

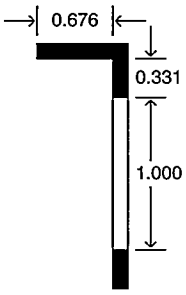
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	36/25	67/47	76/53	60/41	25/17	50/37	84/63	101/78	96/74	71/51	28/19	64/46	82/62	76/56	48/32	9/7	33/21	38/25	22/15	0/0
North	9/9	13/15	14/16	12/14	7/7	15/14	15/17	16/19	16/19	14/15	8/8	13/14	14/17	14/16	11/11	4/3	8/9	9/10	7/6	0/0
East	74/34	56/36	14/16	12/14	7/7	85/50	74/52	31/29	16/19	14/15	72/32	71/44	28/25	14/16	11/11	32/11	36/18	9/10	7/6	0/0
South	42/22	77/46	87/52	69/39	28/14	11/12	37/31	54/44	49/40	25/22	23/14	62/40	82/58	75/52	44/26	29/10	77/31	86/35	58/22	0/0
West	9/9	13/15	21/20	65/37	65/28	11/12	15/17	16/19	51/41	82/52	8/8	13/14	14/17	53/38	79/42	4/3	8/9	19/13	43/18	0/0
M. Clr (%hrs)	26	24	23	22	23	52	48	43	40	40	61	60	56	55	55	21	22	21	19	24

Salem, OR

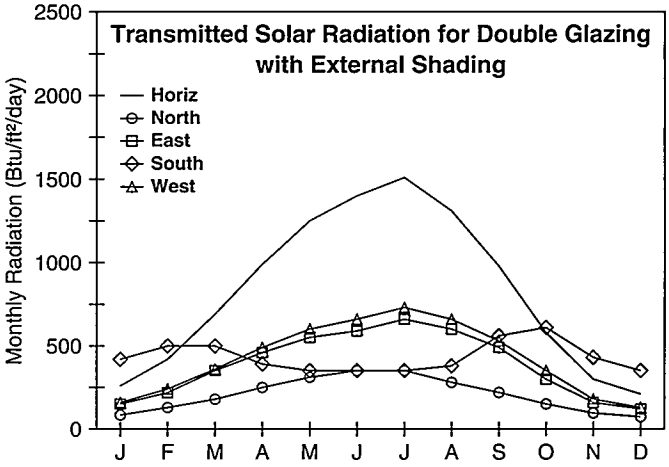
WBAN NO. 24232

LATITUDE: 44.92° N
LONGITUDE: 123.02° W
ELEVATION: 200 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	400	620	990	1390	1740	1940	2080	1820	1380	850	450	330	1170
	Std.Dev.	51	71	103	98	151	168	162	129	118	92	49	33	43
	Minimum	300	470	800	1120	1430	1610	1760	1540	1120	640	340	280	1070
	Maximum	530	770	1250	1570	1960	2220	2350	2060	1630	1060	570	450	1240
	Diffuse	270	390	560	740	850	870	740	660	530	420	310	240	550
	Clear-Day Global	670	1020	1540	2100	2490	2650	2560	2210	1710	1160	740	570	1620
North	Global	150	220	320	430	550	630	610	480	360	260	170	130	360
	Diffuse	150	220	320	430	510	550	520	450	360	260	170	130	340
	Clear-Day Global	150	210	300	410	580	690	640	460	330	230	160	130	360
East	Global	260	380	600	810	960	1040	1150	1040	840	520	280	210	680
	Diffuse	180	260	390	520	600	630	610	550	440	310	200	160	410
	Clear-Day Global	550	770	1070	1340	1500	1550	1510	1380	1150	850	600	480	1060
South	Global	590	760	930	960	910	880	990	1120	1220	1010	620	490	870
	Diffuse	270	360	470	560	600	600	580	560	500	410	290	240	450
	Clear-Day Global	1700	1880	1860	1570	1260	1110	1170	1410	1720	1850	1720	1600	1570
West	Global	270	410	620	840	1040	1160	1270	1130	910	590	310	220	730
	Diffuse	180	270	390	530	620	650	630	560	450	320	210	160	420
	Clear-Day Global	550	770	1070	1340	1500	1550	1510	1380	1150	850	600	480	1060

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

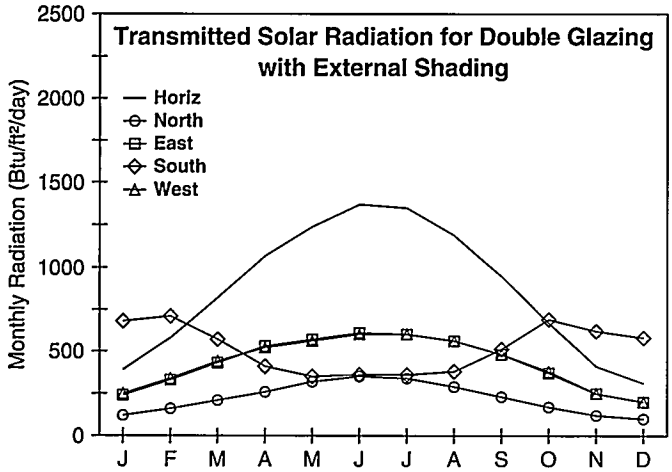
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	260	420	690	990	1250	1400	1510	1310	980	580	300	210	830
North	Unshaded	110	150	220	300	370	420	400	320	250	180	120	92	240
	Shaded	85	130	180	250	310	350	350	280	220	150	96	73	210
East	Unshaded	180	270	420	570	680	740	820	740	590	360	190	140	480
	Shaded	150	220	350	460	550	590	660	600	490	300	160	120	390
South	Unshaded	440	560	660	650	590	550	610	720	850	730	460	370	600
	Shaded	420	500	500	390	350	350	350	380	560	610	430	350	430
West	Unshaded	180	290	440	600	740	830	910	810	650	410	210	150	520
	Shaded	160	240	360	490	600	660	730	660	530	350	180	130	420

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	39.6	42.8	45.7	49.1	54.6	61.4	66.3	66.7	61.6	52.7	45.0	40.0	52.1
Daily Minimum Temp	32.7	34.1	35.6	37.7	42.2	48.3	50.9	51.4	47.1	41.1	37.5	33.6	41.0
Daily Maximum Temp	46.4	51.5	55.7	60.4	67.0	74.5	81.6	82.0	76.0	64.2	52.4	46.4	63.2
Record Minimum Temp	-10.0	-4.0	12.0	23.0	25.0	32.0	37.0	36.0	26.0	23.0	9.0	-12.0	-12.0
Record Maximum Temp	65.0	72.0	80.0	88.0	100.0	102.0	108.0	108.0	104.0	93.0	72.0	66.0	108.0
HDD, Base 65°F	787	622	598	477	322	141	41	52	131	381	600	775	4927
CDD, Base 65°F	0	0	0	0	0	33	81	104	29	0	0	0	247
Humidity Ratio (#w/#da)	0.0044	0.0048	0.0050	0.0054	0.0064	0.0076	0.0082	0.0083	0.0075	0.0065	0.0055	0.0046	0.0062
Wind Speed (mph)	7.9	7.9	8.0	7.4	6.8	6.8	6.8	6.2	6.1	5.9	8.0	7.6	7.1
Clearness Index, Kt	0.36	0.39	0.44	0.47	0.50	0.52	0.58	0.57	0.55	0.46	0.36	0.34	0.49

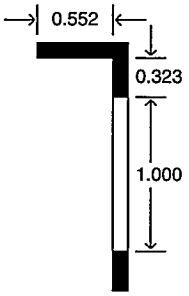
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	31/18	63/38	73/43	59/36	26/16	46/27	80/49	99/64	95/64	72/47	24/13	59/35	79/51	74/49	47/30	6/4	28/16	35/19	21/13	0/0
North	9/8	13/14	14/15	13/13	8/7	16/12	15/17	16/20	16/19	14/16	7/6	13/13	15/17	14/16	11/11	3/2	8/7	9/8	7/6	0/0
East	66/22	56/28	14/15	13/13	8/7	80/30	74/37	34/27	16/19	14/16	61/18	69/31	31/24	14/16	11/11	21/5	34/12	9/8	7/6	0/0
South	36/14	73/34	86/40	69/32	29/12	11/11	36/24	55/36	51/36	28/21	19/9	58/27	80/44	75/43	44/24	19/5	67/18	79/21	53/15	0/0
West	9/8	13/14	18/16	61/29	61/21	11/11	15/17	16/20	48/35	80/43	7/6	13/13	15/17	49/31	75/36	3/2	8/7	16/9	37/12	0/0
M. Clr (%hrs)	18	16	17	17	20	31	31	33	35	38	43	46	47	49	49	9	10	11	12	16



Allentown, PA

WBAN NO. 14737



Shading Geometry
(Not to Scale)

LATITUDE: 40.65° N
LONGITUDE: 75.43° W
ELEVATION: 384 feet
MEAN PRESSURE: 14.5 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±11%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	590	850	1170	1490	1720	1880	1860	1650	1330	970	620	490	1220
	Std.Dev.	42	75	72	111	134	125	106	93	101	77	53	35	29
	Minimum	500	730	1060	1260	1500	1590	1650	1470	1130	840	490	400	1160
	Maximum	680	1060	1310	1720	1990	2150	2050	1860	1490	1160	730	540	1290
	Diffuse	320	440	580	730	860	920	890	780	630	450	340	280	600
	Clear-Day Global	860	1210	1680	2170	2480	2590	2510	2230	1800	1300	900	740	1710
North	Global	190	270	350	440	540	610	580	480	380	280	210	170	370
	Diffuse	190	270	350	430	500	540	530	460	380	280	210	170	360
	Clear-Day Global	190	250	330	430	570	680	620	480	360	270	200	160	380
East	Global	400	550	710	870	960	1030	1020	940	790	610	410	330	720
	Diffuse	240	330	430	530	600	640	630	570	470	350	250	200	440
	Clear-Day Global	650	850	1090	1300	1410	1440	1410	1310	1130	890	670	570	1060
South	Global	930	1050	1040	940	830	790	820	930	1040	1090	870	800	930
	Diffuse	350	430	500	540	580	590	590	570	520	440	350	300	480
	Clear-Day Global	1820	1910	1780	1440	1110	970	1020	1270	1600	1800	1770	1730	1510
West	Global	410	550	720	860	950	1020	1010	940	790	620	400	330	720
	Diffuse	240	330	430	530	610	650	640	580	470	350	250	200	440
	Clear-Day Global	650	850	1090	1300	1410	1440	1410	1310	1130	890	670	570	1060

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±11%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	390	580	820	1070	1240	1370	1350	1190	950	670	410	310	860
North	Unshaded	140	180	240	300	360	400	380	330	260	200	140	120	250
	Shaded	120	160	210	260	320	350	340	290	230	170	120	100	220
East	Unshaded	270	380	500	620	680	730	720	660	560	430	280	220	510
	Shaded	240	330	430	530	570	610	600	560	480	370	250	200	430
South	Unshaded	700	770	730	620	520	490	510	600	710	790	650	600	640
	Shaded	680	710	570	410	350	360	360	380	510	690	620	580	520
West	Unshaded	280	380	510	610	670	720	710	670	550	430	280	220	500
	Shaded	250	340	440	520	560	600	600	560	480	380	250	200	430

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	26.6	29.3	39.4	49.7	60.3	69.4	74.1	72.2	64.7	53.2	43.1	31.8	51.2
Daily Minimum Temp	18.8	20.9	29.9	38.8	49.3	58.8	63.6	62.0	54.2	42.5	34.2	24.4	41.5
Daily Maximum Temp	34.3	37.7	48.8	60.4	71.3	80.0	84.5	82.3	75.1	63.8	51.8	39.2	60.8
Record Minimum Temp	-12.0	-7.0	-1.0	16.0	28.0	39.0	48.0	41.0	30.0	21.0	11.0	-8.0	-12.0
Record Maximum Temp	72.0	76.0	86.0	93.0	97.0	100.0	105.0	100.0	99.0	90.0	81.0	72.0	105.0
HDD, Base 65°F	1190	1000	794	459	183	10	0	8	82	373	657	1029	5785
CDD, Base 65°F	0	0	0	0	38	142	282	231	73	7	0	0	773
Humidity Ratio (#w/#da)	0.0022	0.0024	0.0032	0.0046	0.0074	0.0104	0.0122	0.0120	0.0097	0.0064	0.0044	0.0028	0.0065
Wind Speed (mph)	10.2	10.2	11.0	10.8	9.1	8.2	7.2	7.1	7.4	8.1	9.6	9.8	9.1
Clearness Index, Kt	0.45	0.47	0.48	0.49	0.49	0.51	0.52	0.51	0.49	0.48	0.42	0.41	0.49

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±11%

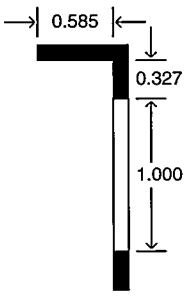
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	38/22	70/42	79/46	61/37	24/15	46/28	82/51	99/67	93/63	65/43	27/15	64/37	82/52	74/48	44/26	13/8	37/21	43/23	25/15	1/1
North	10/9	14/15	15/16	13/14	8/6	18/13	17/18	17/20	17/19	16/15	9/7	14/14	16/18	16/17	12/11	5/4	9/9	10/10	8/7	1/0
East	69/24	54/29	15/16	13/14	8/6	73/29	71/37	31/26	17/19	16/15	60/18	67/29	28/22	16/17	12/11	35/9	36/15	10/10	8/7	1/0
South	38/16	72/35	82/38	63/30	24/10	12/11	33/24	48/35	43/32	21/18	21/9	56/26	74/40	67/38	36/18	33/8	75/24	83/25	56/17	2/1
West	10/9	14/15	23/19	65/30	58/19	12/11	17/18	17/20	52/36	75/40	9/7	14/14	16/18	52/31	68/27	5/4	9/9	21/12	43/15	3/1
M. Clr (%hrs)	34	30	31	33	35	40	39	35	33	35	42	44	39	36	40	29	28	29	28	32

Bradford, PA

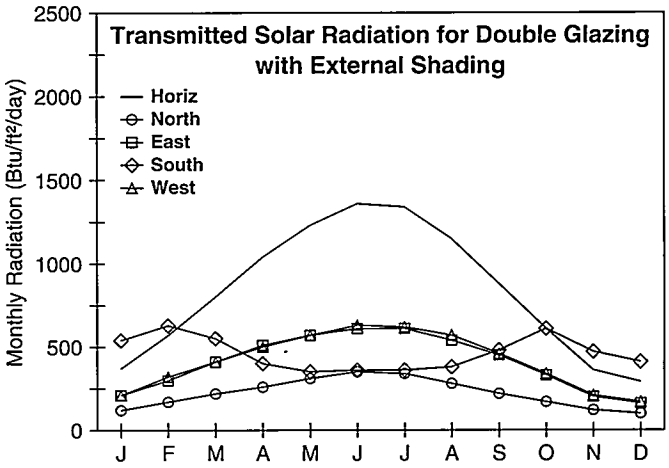
WBAN NO. 04751

LATITUDE: 41.80° N
LONGITUDE: 78.63° W
ELEVATION: 1969 feet
MEAN PRESSURE: 13.6 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	550	830	1140	1450	1710	1880	1850	1600	1250	890	540	440	1180
	Std.Dev.	38	68	73	130	160	135	108	75	104	81	49	36	36
	Minimum	480	700	1020	1120	1390	1580	1660	1480	1020	750	440	390	1100
	Maximum	620	950	1260	1730	2040	2140	2070	1800	1420	1170	620	520	1250
	Diffuse	390	530	650	740	860	900	890	790	640	460	360	330	630
	Clear-Day Global	840	1210	1690	2180	2520	2640	2550	2250	1800	1280	880	720	1710
North	Global	210	290	360	440	540	620	590	480	370	280	200	180	380
	Diffuse	210	290	360	430	500	540	530	460	370	280	200	180	360
	Clear-Day Global	180	250	330	430	580	690	630	470	350	260	190	160	380
East	Global	350	510	680	850	970	1040	1040	900	740	540	330	270	690
	Diffuse	250	350	450	520	600	640	630	560	460	340	240	210	440
	Clear-Day Global	650	870	1120	1340	1460	1490	1450	1340	1150	890	670	570	1080
South	Global	760	960	1000	930	840	810	840	920	980	970	680	590	860
	Diffuse	380	480	520	550	580	590	600	580	520	430	330	320	490
	Clear-Day Global	1870	1980	1850	1490	1160	1010	1060	1310	1650	1840	1820	1760	1560
West	Global	360	530	690	850	960	1060	1050	950	770	560	350	280	700
	Diffuse	260	360	450	530	610	650	650	580	470	340	240	210	440
	Clear-Day Global	650	870	1120	1340	1460	1490	1450	1340	1150	890	670	570	1080

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

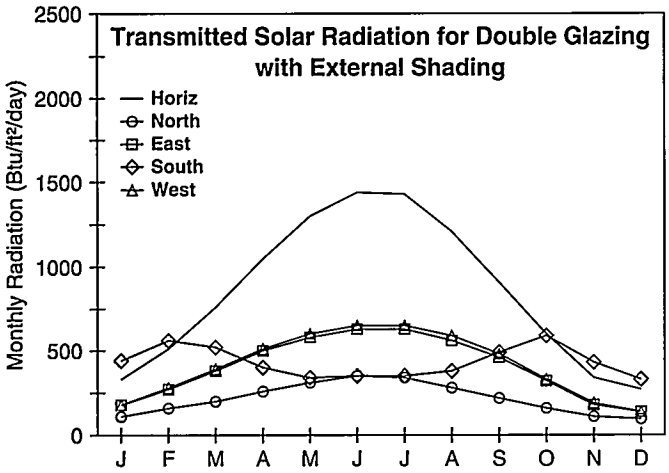
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	370	570	800	1040	1230	1360	1340	1150	880	610	360	290	830
North	Unshaded	140	200	250	300	360	410	390	320	260	190	140	120	260
	Shaded	120	170	220	260	310	350	340	280	220	170	120	100	220
East	Unshaded	240	360	480	610	690	740	740	640	520	380	230	190	480
	Shaded	210	300	410	510	570	610	610	540	450	330	200	160	410
South	Unshaded	570	700	700	610	530	500	530	600	670	700	500	440	590
	Shaded	540	630	550	400	350	360	360	380	480	610	470	410	460
West	Unshaded	250	370	490	600	680	750	740	680	550	400	240	190	490
	Shaded	210	320	410	500	570	630	620	570	460	340	210	170	420

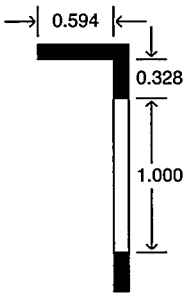
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	19.3	21.1	31.2	42.3	52.7	60.9	65.2	63.6	56.8	46.6	36.1	24.8	43.4
Daily Minimum Temp	11.8	12.4	22.1	32.0	41.0	49.4	53.9	52.6	46.2	36.8	28.7	18.0	33.7
Daily Maximum Temp	26.6	29.7	40.2	52.6	64.3	72.4	76.4	74.6	67.4	56.3	43.4	31.5	53.0
Record Minimum Temp	-27.0	-26.0	-18.0	6.1	18.0	26.1	33.1	26.1	25.0	10.0	-2.0	-20.0	-27.0
Record Maximum Temp	60.1	62.1	78.1	84.9	86.0	88.0	93.9	91.9	84.9	78.1	73.0	69.1	93.9
HDD, Base 65°F	1417	1229	1048	681	390	146	69	98	256	570	867	1246	8017
CDD, Base 65°F	0	0	0	0	9	23	76	55	10	0	0	0	173
Humidity Ratio (#w/#da)	0.0020	0.0021	0.0030	0.0042	0.0065	0.0095	0.0111	0.0108	0.0089	0.0057	0.0040	0.0027	0.0059
Wind Speed (mph)	9.9	9.2	9.5	9.2	7.9	6.9	5.9	5.8	6.4	7.6	9.2	9.6	8.1
Clearness Index, Kt	0.44	0.48	0.48	0.48	0.49	0.51	0.51	0.50	0.47	0.45	0.38	0.39	0.48

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	33/20	68/42	80/48	65/40	29/18	43/27	80/51	97/69	94/67	70/48	23/13	61/35	80/51	76/51	48/30	9/6	35/21	43/24	28/17	3/2
North	9/9	14/15	15/17	13/15	8/8	18/13	16/17	17/19	17/19	15/15	8/6	13/13	16/17	15/17	12/11	4/3	9/9	10/11	8/8	2/1
East	69/23	59/30	15/17	13/15	8/8	74/31	74/41	35/29	17/19	15/15	57/16	70/31	32/24	15/17	12/11	28/7	39/15	10/11	8/8	2/1
South	35/15	72/34	86/40	69/32	31/13	11/11	32/23	49/37	46/35	25/20	17/8	54/26	75/41	71/41	42/22	24/6	73/22	86/25	61/18	7/2
West	9/9	14/15	18/18	63/30	67/22	11/11	16/17	17/19	47/36	76/45	8/6	13/13	16/17	48/31	71/32	4/3	9/9	17/12	44/15	9/2
M. Clr (%hrs)	22	23	23	24	24	33	31	23	22	25	30	29	24	21	27	10	11	13	11	11





Shading Geometry
(Not to Scale)

Erie, PA

WBAN NO. 14860

LATITUDE: 42.08° N
LONGITUDE: 80.18° W
ELEVATION: 738 feet
MEAN PRESSURE: 14.4 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	500	750	1080	1470	1790	1990	1970	1680	1290	870	510	400	1190
	Std.Dev.	32	65	70	115	127	146	89	101	98	81	47	27	31
	Minimum	430	660	920	1180	1470	1710	1740	1480	1100	760	390	360	1140
	Maximum	580	940	1260	1670	2060	2280	2110	1940	1440	1160	590	450	1250
	Diffuse	370	490	610	710	810	830	820	740	610	460	360	330	590
	Clear-Day Global	810	1160	1650	2160	2500	2620	2530	2230	1780	1260	860	700	1690
North	Global	200	270	350	430	540	610	590	470	370	270	190	170	370
	Diffuse	200	270	350	430	500	530	520	460	370	270	190	170	350
	Clear-Day Global	170	240	320	430	580	680	630	470	350	260	180	160	370
East	Global	300	460	640	850	990	1070	1080	940	760	540	310	250	680
	Diffuse	230	320	420	510	590	630	630	560	460	330	230	200	430
	Clear-Day Global	620	840	1090	1330	1450	1480	1440	1330	1140	880	660	560	1070
South	Global	630	850	950	950	880	840	880	970	1030	950	620	480	840
	Diffuse	350	430	490	540	570	580	580	560	510	420	310	290	470
	Clear-Day Global	1820	1940	1820	1490	1170	1020	1070	1310	1640	1830	1790	1730	1550
West	Global	310	480	650	860	1020	1110	1110	990	800	550	320	240	700
	Diffuse	240	330	420	520	600	640	630	560	460	330	230	200	430
	Clear-Day Global	620	840	1090	1330	1450	1480	1440	1330	1140	880	660	560	1070

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	330	510	760	1050	1300	1440	1430	1210	910	600	340	270	850
North	Unshaded	140	190	240	300	360	400	380	320	260	190	130	120	250
	Shaded	110	160	200	260	310	350	340	280	220	160	110	96	220
East	Unshaded	210	320	450	600	700	760	770	670	540	380	220	170	480
	Shaded	180	270	380	500	580	630	630	560	460	320	180	140	400
South	Unshaded	470	620	670	630	550	510	540	630	700	690	460	360	570
	Shaded	440	560	520	400	340	350	350	380	490	590	430	330	430
West	Unshaded	220	330	460	610	730	790	790	710	570	380	220	170	500
	Shaded	180	280	390	510	600	650	650	590	480	330	190	140	420

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	25.4	25.8	35.9	46.1	56.9	66.5	71.3	70.1	64.0	53.3	43.2	31.5	49.2
Daily Minimum Temp	18.2	17.9	28.1	37.7	47.8	57.6	62.6	61.8	55.9	45.6	37.0	25.2	41.3
Daily Maximum Temp	32.5	33.7	43.6	54.5	65.9	75.3	79.9	78.5	72.1	61.0	49.4	37.8	57.0
Record Minimum Temp	-16.0	-17.0	-9.0	12.0	26.0	32.0	44.0	37.0	33.0	24.0	7.0	-6.0	-17.0
Record Maximum Temp	65.0	67.0	81.0	89.0	90.0	100.0	99.0	93.0	94.0	88.0	80.0	75.0	100.0
HDD, Base 65°F	1228	1098	902	567	268	52	0	12	89	370	654	1039	6279
CDD, Base 65°F	0	0	0	0	17	97	199	171	59	7	0	0	550
Humidity Ratio (#w/#da)	0.0022	0.0023	0.0032	0.0045	0.0069	0.0098	0.0117	0.0115	0.0094	0.0061	0.0043	0.0029	0.0063
Wind Speed (mph)	13.7	12.3	12.6	11.9	10.7	10.1	9.5	9.5	10.2	11.7	13.6	13.9	11.6
Clearness Index, Kt	0.40	0.44	0.45	0.48	0.51	0.54	0.55	0.52	0.49	0.44	0.36	0.36	0.48

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

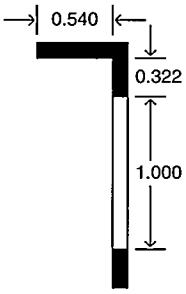
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	31/18	65/38	78/45	65/38	30/18	41/26	79/51	98/67	97/66	74/48	21/12	58/35	79/50	77/50	51/31	7/5	33/19	41/23	27/16	3/2
North	9/8	13/14	15/17	13/15	9/8	19/13	16/17	17/19	17/19	15/16	7/5	13/13	16/17	15/17	12/12	3/2	9/9	10/10	8/7	2/1
East	67/20	60/28	15/17	13/15	9/8	73/32	76/42	38/30	17/19	15/16	53/16	70/32	35/25	15/17	12/12	24/5	40/13	10/10	8/7	2/1
South	33/13	70/30	84/36	70/31	32/13	11/10	31/23	50/36	48/35	27/21	15/7	53/26	74/41	72/41	44/23	21/5	72/18	83/23	59/16	8/2
West	9/8	13/14	15/17	60/28	66/21	11/10	16/17	17/19	45/33	78/43	7/5	13/13	16/17	46/29	72/33	3/2	9/9	15/11	40/13	11/2
M. Clr (%hrs)	22	23	25	23	24	37	36	38	41	43	31	33	31	33	35	7	8	8	7	7

Harrisburg, PA

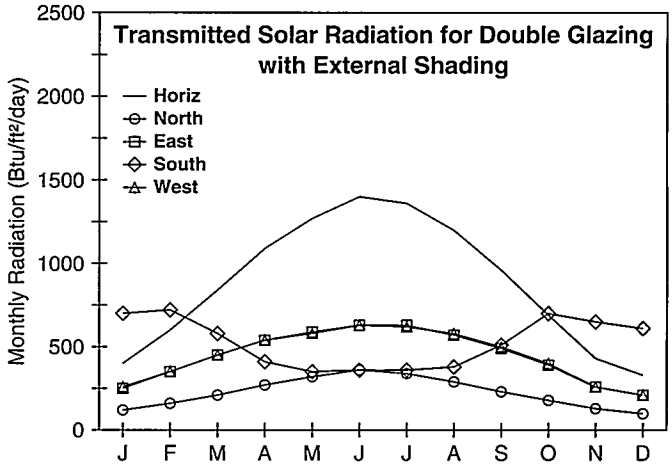
WBAN NO. 14751

LATITUDE: 40.22° N
LONGITUDE: 76.85° W
ELEVATION: 348 feet
MEAN PRESSURE: 14.6 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	620	870	1190	1520	1760	1930	1880	1670	1350	1000	640	520	1250
	Std.Dev.	47	74	77	132	142	118	108	94	110	80	57	36	36
	Minimum	530	690	1060	1290	1470	1700	1660	1500	1160	880	520	450	1180
	Maximum	720	1050	1360	1810	2040	2120	2080	1910	1530	1220	760	580	1320
	Diffuse	330	450	580	720	860	910	890	780	630	460	350	290	600
	Clear-Day Global	880	1240	1710	2180	2490	2600	2520	2240	1810	1330	930	770	1730
North	Global	200	270	350	440	540	620	590	480	380	290	210	180	380
	Diffuse	200	270	350	430	510	540	530	470	380	290	210	180	360
	Clear-Day Global	180	250	330	430	580	680	620	480	360	270	190	160	380
East	Global	410	560	730	890	980	1060	1050	950	810	630	430	340	740
	Diffuse	240	330	430	520	600	650	640	570	470	360	260	210	440
	Clear-Day Global	670	880	1110	1310	1420	1440	1410	1310	1140	900	690	600	1070
South	Global	960	1070	1060	950	830	790	820	930	1040	1120	910	830	940
	Diffuse	360	430	490	540	580	590	590	570	530	450	360	310	480
	Clear-Day Global	1880	1950	1790	1420	1090	950	1000	1250	1590	1810	1830	1800	1530
West	Global	420	570	730	890	970	1050	1020	950	810	640	430	350	740
	Diffuse	250	330	430	530	610	650	640	580	480	360	260	210	450
	Clear-Day Global	670	880	1110	1310	1420	1440	1410	1310	1140	900	690	600	1070

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

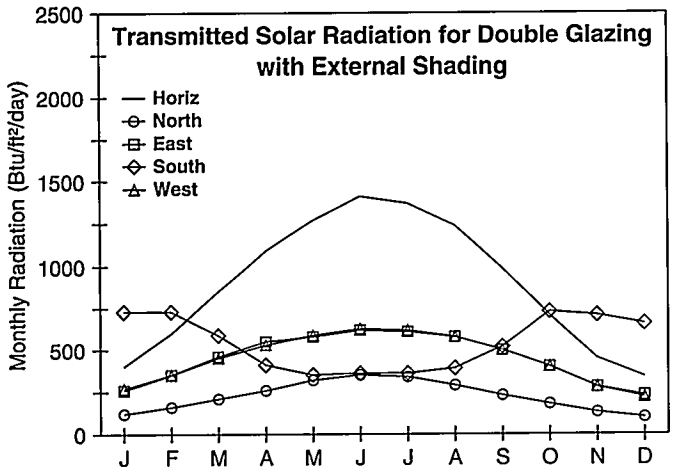
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	400	600	840	1090	1270	1400	1360	1200	960	690	430	330	880
North	Unshaded	140	190	240	300	360	410	390	330	260	200	150	120	260
	Shaded	120	160	210	270	320	360	340	290	230	180	130	100	230
East	Unshaded	280	390	510	630	700	750	740	670	570	440	290	230	520
	Shaded	250	350	450	540	590	630	630	570	490	390	260	210	450
South	Unshaded	720	790	740	620	520	490	510	590	710	800	680	630	650
	Shaded	700	720	580	410	350	360	360	380	510	700	650	610	530
West	Unshaded	290	400	520	630	690	750	730	680	570	450	300	240	520
	Shaded	260	350	450	540	580	630	620	580	500	400	260	210	450

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	28.6	31.3	41.2	51.6	61.8	70.9	75.7	74.1	66.4	54.7	44.4	33.6	52.9
Daily Minimum Temp	21.2	23.3	32.0	41.2	51.1	60.6	65.6	64.3	56.5	44.6	36.1	26.6	43.6
Daily Maximum Temp	35.9	39.2	50.3	62.0	72.5	81.2	85.8	83.8	76.3	64.7	52.6	40.6	62.1
Record Minimum Temp	-9.0	-5.0	5.0	19.0	31.0	40.0	49.0	45.0	30.0	23.0	13.0	-8.0	-9.0
Record Maximum Temp	73.0	75.0	86.0	93.0	97.0	100.0	107.0	101.0	102.0	97.0	84.0	75.0	107.0
HDD, Base 65°F	1128	944	738	402	147	9	0	0	59	329	618	973	5347
CDD, Base 65°F	0	0	0	0	48	186	332	285	101	10	0	0	962
Humidity Ratio (#w/#da)	0.0022	0.0024	0.0033	0.0049	0.0078	0.0109	0.0128	0.0128	0.0102	0.0066	0.0044	0.0028	0.0068
Wind Speed (mph)	8.4	8.4	9.2	9.1	7.4	6.8	6.3	5.9	6.0	6.7	7.9	8.0	7.5
Clearness Index, Kt	0.46	0.48	0.48	0.49	0.50	0.52	0.52	0.51	0.50	0.49	0.43	0.42	0.49

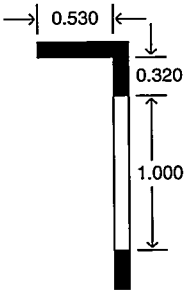
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	37/21	70/42	80/47	63/39	27/17	45/28	82/52	99/70	94/67	68/47	25/15	64/38	83/54	76/51	47/29	12/8	38/22	44/26	28/17	2/2
North	9/9	14/15	15/16	13/14	8/7	18/13	17/17	17/20	17/19	16/16	8/7	14/14	16/18	16/17	12/11	5/4	9/9	10/10	8/7	1/1
East	71/24	57/29	15/16	13/14	8/7	73/32	72/40	33/28	17/19	16/16	58/18	69/31	30/24	16/17	12/11	35/10	38/16	10/10	8/7	1/1
South	37/16	71/34	82/38	65/32	27/12	12/11	32/24	47/36	44/33	22/19	19/9	55/27	74/42	68/40	38/20	31/9	76/26	85/30	60/20	6/2
West	9/9	14/15	21/18	64/31	63/22	12/11	17/17	17/20	50/37	76/44	8/7	14/14	16/18	51/32	71/32	5/4	9/9	20/13	45/16	9/2
M. Clr (%hrs)	34	31	31	31	33	39	39	32	30	33	42	40	35	33	37	27	27	27	27	31



Philadelphia, PA

WBAN NO. 13739



Shading Geometry
(Not to Scale)

LATITUDE: 39.88° N
LONGITUDE: 75.25° W
ELEVATION: 30 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±11%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	620	870	1200	1520	1760	1940	1890	1710	1380	1020	680	530	1260
	Std.Dev.	42	72	91	118	135	115	116	88	100	74	55	39	35
	Minimum	520	770	1010	1230	1530	1640	1580	1530	1180	880	560	430	1200
	Maximum	710	1080	1370	1740	2050	2220	2110	1850	1560	1150	800	610	1350
	Diffuse	310	420	550	700	840	880	870	760	610	450	330	280	580
	Clear-Day Global	890	1240	1710	2190	2490	2590	2510	2240	1820	1340	940	780	1730
North	Global	190	260	340	430	540	610	580	480	380	290	210	170	370
	Diffuse	190	260	340	430	500	530	520	460	380	290	210	170	360
	Clear-Day Global	180	240	330	430	580	680	620	480	360	270	200	160	380
East	Global	420	570	740	900	970	1050	1030	970	820	650	450	370	740
	Diffuse	240	320	420	520	600	630	630	570	470	360	250	210	430
	Clear-Day Global	680	870	1110	1310	1410	1430	1400	1310	1140	910	690	610	1070
South	Global	1000	1080	1070	950	830	790	820	940	1070	1150	990	900	960
	Diffuse	340	410	480	540	570	580	580	570	520	450	360	310	480
	Clear-Day Global	1880	1930	1780	1410	1080	940	990	1240	1580	1810	1830	1800	1520
West	Global	430	560	730	880	970	1050	1030	960	820	650	450	370	740
	Diffuse	240	320	420	520	610	640	630	580	470	360	260	210	440
	Clear-Day Global	680	870	1110	1310	1410	1430	1400	1310	1140	910	690	610	1070

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±11%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	400	600	850	1090	1270	1410	1370	1240	990	710	450	340	890
North	Unshaded	130	180	240	300	360	400	380	330	260	200	140	120	250
	Shaded	120	160	210	260	320	350	340	290	230	180	130	100	220
East	Unshaded	290	400	520	640	690	740	730	690	580	450	310	250	520
	Shaded	260	350	460	550	580	620	610	580	500	400	280	230	450
South	Unshaded	750	790	740	620	520	480	500	600	730	830	740	680	660
	Shaded	730	730	590	410	350	360	360	390	520	730	710	660	540
West	Unshaded	300	390	520	620	690	740	730	680	580	450	310	250	520
	Shaded	270	350	450	530	590	630	620	580	500	400	280	220	450

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	30.4	33.0	42.4	52.4	62.9	71.8	76.7	75.5	68.2	56.4	46.4	35.8	54.3
Daily Minimum Temp	22.8	24.8	33.2	42.1	52.7	61.8	67.2	66.3	58.7	46.4	37.6	28.1	45.1
Daily Maximum Temp	37.9	41.0	51.6	62.6	73.1	81.7	86.1	84.6	77.6	66.3	55.1	43.4	63.4
Record Minimum Temp	-7.0	-4.0	7.0	19.0	28.0	44.0	51.0	44.0	35.0	25.0	15.0	1.0	-7.0
Record Maximum Temp	74.0	74.0	87.0	94.0	97.0	100.0	104.0	101.0	100.0	96.0	81.0	72.0	104.0
HDD, Base 65°F	1073	896	701	378	123	5	0	0	32	283	558	905	4954
CDD, Base 65°F	0	0	0	0	58	209	363	326	128	17	0	0	1101
Humidity Ratio (#w/#da)	0.0025	0.0027	0.0036	0.0050	0.0080	0.0111	0.0133	0.0130	0.0104	0.0070	0.0048	0.0032	0.0071
Wind Speed (mph)	10.3	10.7	11.2	10.8	9.6	8.7	8.0	8.0	8.4	8.7	9.7	10.0	9.5
Clearness Index, Kt	0.45	0.48	0.49	0.49	0.50	0.52	0.53	0.53	0.51	0.49	0.45	0.43	0.50

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±11%

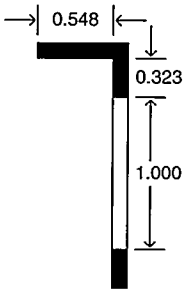
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	39/22	71/43	80/48	63/37	25/15	47/28	83/55	100/69	94/66	66/44	28/16	66/40	83/53	76/50	45/28	14/8	40/22	45/26	27/16	2/2
North	10/9	14/15	15/16	13/13	8/6	18/13	17/18	17/20	17/19	16/15	9/7	14/14	16/18	16/16	12/11	5/4	10/9	10/10	8/7	1/1
East	72/25	55/29	15/16	13/13	8/6	75/31	71/42	30/26	17/19	16/15	62/20	68/33	27/22	16/16	12/11	39/10	37/16	10/10	8/7	1/1
South	39/17	73/35	82/40	64/30	25/11	12/11	33/25	47/35	42/32	21/17	21/10	57/29	75/42	67/39	37/20	36/10	79/27	85/31	58/19	5/1
West	10/9	14/15	24/19	66/31	61/20	12/11	17/18	17/20	53/38	76/42	9/7	14/14	16/18	53/33	71/31	5/4	10/9	22/13	46/16	7/2
M. Clr (%hrs)	36	33	31	32	35	40	39	37	35	37	43	45	43	39	40	33	32	30	31	36

Pittsburgh, PA

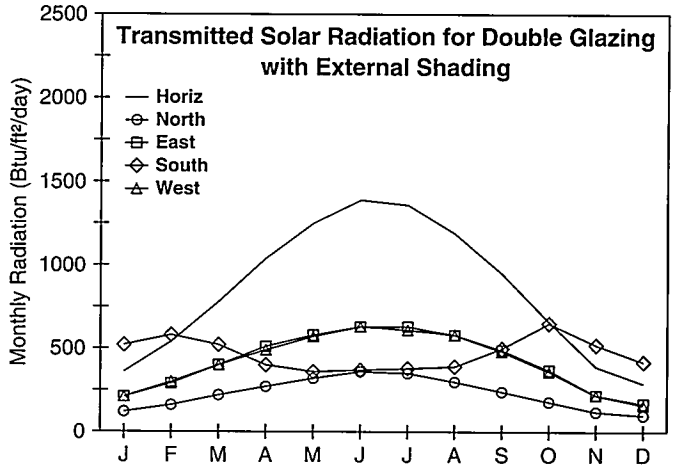
WBAN NO. 94823

LATITUDE: 40.50° N
LONGITUDE: 80.22° W
ELEVATION: 1224 feet
MEAN PRESSURE: 14.1 psia

STATION TYPE: Primary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	550	790	1110	1450	1730	1920	1880	1660	1330	960	580	440	1200
	Std.Dev.	43	68	83	146	148	118	133	90	104	72	59	34	36
	Minimum	430	690	960	1120	1430	1610	1670	1480	1160	790	470	370	1130
	Maximum	620	980	1340	1720	1980	2160	2120	1850	1540	1210	680	500	1280
	Diffuse	370	500	640	770	910	980	970	850	680	490	370	320	650
	Clear-Day Global	860	1210	1680	2180	2480	2600	2520	2240	1800	1310	900	750	1710
North	Global	200	280	360	440	550	630	600	500	390	290	210	170	390
	Diffuse	200	280	360	440	520	560	550	480	390	290	210	170	370
	Clear-Day Global	190	250	330	440	580	680	630	480	360	280	200	170	380
East	Global	350	480	660	840	970	1050	1050	950	800	610	370	280	700
	Diffuse	240	330	430	530	620	670	660	590	490	360	250	200	450
	Clear-Day Global	630	840	1080	1310	1410	1440	1410	1300	1130	880	660	570	1060
South	Global	740	880	950	900	830	800	830	930	1020	1040	740	600	850
	Diffuse	350	440	510	550	590	620	620	600	550	450	340	300	490
	Clear-Day Global	1800	1890	1770	1430	1110	960	1020	1260	1590	1790	1760	1710	1510
West	Global	340	490	660	820	960	1050	1020	950	780	590	370	280	690
	Diffuse	240	330	440	540	620	680	670	600	490	360	250	200	450
	Clear-Day Global	630	840	1080	1310	1410	1440	1410	1300	1130	880	660	570	1060

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	360	540	780	1040	1250	1390	1360	1190	950	660	390	290	850
North	Unshaded	140	190	250	300	370	420	400	340	270	200	140	120	260
	Shaded	120	160	220	270	320	360	350	300	240	180	120	100	230
East	Unshaded	240	340	460	600	690	750	750	680	570	420	250	190	500
	Shaded	210	290	400	510	580	630	630	580	490	370	220	170	420
South	Unshaded	550	640	660	600	530	500	520	600	700	750	550	440	590
	Shaded	520	580	520	400	360	370	380	390	500	650	520	420	470
West	Unshaded	240	340	460	580	680	750	730	680	560	420	250	190	490
	Shaded	210	300	400	490	570	630	610	580	480	360	220	160	420

Average Climatic Conditions

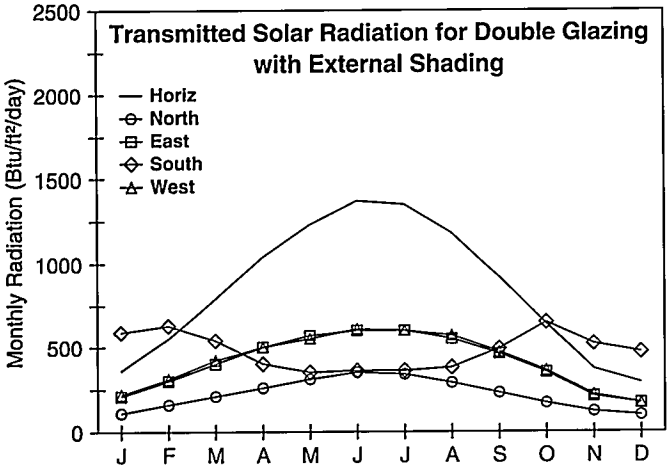
Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	26.1	28.7	39.4	49.6	59.5	67.9	72.1	70.5	63.9	52.4	42.3	31.5	50.3
Daily Minimum Temp	18.5	20.3	29.8	38.8	48.4	56.9	61.6	60.2	53.5	42.3	34.1	24.4	40.7
Daily Maximum Temp	33.7	36.9	49.0	60.3	70.6	78.9	82.6	80.8	74.3	62.5	50.4	38.6	59.9
Record Minimum Temp	-18.0	-12.0	-1.0	14.0	26.0	34.0	42.0	39.0	31.0	16.0	-1.0	-12.0	-18.0
Record Maximum Temp	69.0	69.0	82.0	89.0	91.0	98.0	103.0	100.0	97.0	87.0	82.0	74.0	103.0
HDD, Base 65°F	1206	1016	794	462	214	36	6	14	100	400	681	1039	5968
CDD, Base 65°F	0	0	0	0	44	123	227	184	67	9	0	0	654
Humidity Ratio (#w/#da)	0.0023	0.0025	0.0035	0.0047	0.0072	0.0100	0.0118	0.0116	0.0095	0.0060	0.0043	0.0030	0.0064
Wind Speed (mph)	10.6	10.1	10.5	10.1	8.7	7.8	7.1	6.7	7.1	8.1	9.5	10.2	8.9
Clearness Index, Kt	0.41	0.44	0.45	0.47	0.49	0.52	0.52	0.51	0.50	0.47	0.39	0.37	0.48

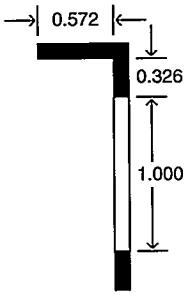
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	32/18	67/40	80/48	67/40	31/19	40/25	79/53	99/70	96/71	72/51	21/12	60/37	81/55	77/53	50/33	9/5	35/19	44/25	30/17	3/3
North	9/8	14/15	15/17	14/15	9/8	19/13	16/17	17/20	18/20	16/17	7/6	14/14	17/18	16/17	13/13	4/3	9/8	11/10	9/7	2/1
East	67/20	61/29	16/17	14/15	9/8	70/29	75/43	39/31	18/20	16/17	51/15	70/32	36/27	16/17	13/13	25/6	39/14	11/10	9/7	2/1
South	32/13	69/32	82/39	69/32	31/13	11/10	30/23	47/36	45/36	26/21	15/7	52/26	74/44	69/42	42/24	21/5	70/20	83/25	61/17	9/2
West	9/8	14/15	16/17	61/29	65/22	11/10	16/17	17/20	45/36	75/45	7/6	14/14	17/18	46/31	68/34	4/3	9/8	16/11	42/14	11/3
M. Clr (%hrs)	24	22	24	20	23	36	32	24	22	26	40	39	28	25	31	16	15	15	14	16

Wilkes-Barre, PA

WBAN NO. 14777





Shading Geometry
(Not to Scale)

LATITUDE: 41.33° N
LONGITUDE: 75.73° W
ELEVATION: 948 feet
MEAN PRESSURE: 14.3 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±11%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	550	800	1130	1460	1710	1880	1860	1640	1290	930	560	450	1190
	Std.Dev.	43	65	69	118	151	127	103	95	108	75	45	30	26
	Minimum	490	660	1010	1240	1400	1590	1670	1500	1090	820	480	400	1150
	Maximum	670	980	1270	1710	1980	2130	2040	1870	1460	1180	660	500	1260
	Diffuse	340	470	600	740	860	910	880	780	640	460	350	300	610
	Clear-Day Global	820	1180	1670	2160	2480	2600	2520	2230	1780	1280	880	710	1690
North	Global	190	270	350	440	540	610	580	480	380	280	200	170	370
	Diffuse	190	270	350	430	500	540	520	460	380	280	200	170	360
	Clear-Day Global	180	250	330	430	580	680	620	480	360	270	190	160	380
East	Global	360	500	670	850	960	1030	1020	920	760	580	360	280	690
	Diffuse	230	330	420	520	600	640	630	560	460	340	240	200	430
	Clear-Day Global	620	840	1090	1310	1420	1450	1410	1310	1130	880	650	550	1060
South	Global	820	950	990	930	830	800	840	940	1010	1030	740	660	880
	Diffuse	340	430	500	540	580	590	590	570	520	430	330	290	480
	Clear-Day Global	1790	1900	1800	1460	1140	1000	1040	1290	1610	1800	1760	1690	1520
West	Global	370	510	690	840	930	1030	1020	950	770	590	360	290	700
	Diffuse	240	330	430	530	600	650	640	570	470	350	240	200	440
	Clear-Day Global	620	840	1090	1310	1420	1450	1410	1310	1130	880	650	550	1060

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±11%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	360	550	790	1040	1230	1370	1350	1180	920	640	370	290	840
North	Unshaded	140	190	240	300	360	400	380	320	260	190	140	110	250
	Shaded	110	160	210	260	310	350	340	290	230	170	120	97	220
East	Unshaded	240	350	470	600	680	730	720	650	540	400	240	190	490
	Shaded	210	300	400	500	570	600	600	550	460	350	210	170	410
South	Unshaded	610	700	690	610	530	500	520	610	690	750	550	500	600
	Shaded	590	630	540	400	350	360	360	380	490	650	520	470	480
West	Unshaded	250	360	490	600	660	730	720	670	550	420	250	200	490
	Shaded	220	310	420	500	550	610	600	570	470	360	220	170	420

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	24.7	26.8	36.9	48.0	58.8	67.2	71.7	69.9	62.6	51.5	41.4	30.0	49.1
Daily Minimum Temp	17.5	19.0	28.3	38.1	48.3	56.8	61.6	60.0	52.8	42.1	33.9	23.4	40.2
Daily Maximum Temp	31.8	34.5	45.5	57.8	69.3	77.5	81.8	79.7	72.4	61.0	48.8	36.6	58.1
Record Minimum Temp	-14.1	-16.1	-2.0	14.0	28.0	34.0	44.1	39.0	30.0	19.9	9.0	-7.1	-16.1
Record Maximum Temp	66.9	71.1	82.9	91.9	93.0	95.0	100.0	93.9	95.0	82.9	80.1	66.0	100.0
HDD, Base 65°F	1249	1070	871	510	217	38	0	11	109	423	708	1085	6291
CDD, Base 65°F	0	0	0	0	25	104	210	163	37	0	0	0	539
Humidity Ratio (#w/#da)	0.0021	0.0023	0.0031	0.0044	0.0070	0.0101	0.0118	0.0116	0.0094	0.0061	0.0042	0.0028	0.0062
Wind Speed (mph)	8.8	8.7	9.4	9.4	8.4	7.9	7.2	7.0	7.3	7.8	8.6	8.8	8.3
Clearness Index, Kt	0.43	0.46	0.47	0.48	0.49	0.51	0.52	0.51	0.48	0.46	0.39	0.38	0.48

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±11%

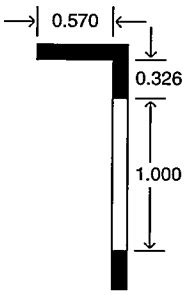
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	37/21	69/41	78/47	61/37	25/15	47/28	83/51	99/68	93/65	67/43	26/15	63/37	81/53	74/48	44/27	12/7	36/21	42/24	25/15	1/1
North	10/9	14/15	15/17	13/14	8/7	17/13	17/18	17/20	17/19	15/15	8/7	14/14	16/18	16/16	12/11	5/4	9/9	10/10	8/7	0/0
East	69/23	55/28	15/17	13/14	8/7	75/30	72/38	31/27	17/19	15/15	58/17	67/30	28/22	16/16	12/11	31/8	35/15	10/10	8/7	0/0
South	38/16	72/34	83/39	65/30	25/11	12/11	34/24	49/36	45/33	22/18	20/9	56/27	75/42	68/37	37/18	29/8	73/23	83/25	56/16	1/0
West	10/9	14/15	23/19	65/30	60/19	12/11	17/18	17/20	52/37	77/40	8/7	14/14	16/18	51/31	69/28	5/4	9/9	20/12	43/14	2/0
M. Clr (%hrs)	25	26	26	27	29	38	38	31	29	33	37	37	32	33	36	17	18	19	19	23

Williamsport, PA

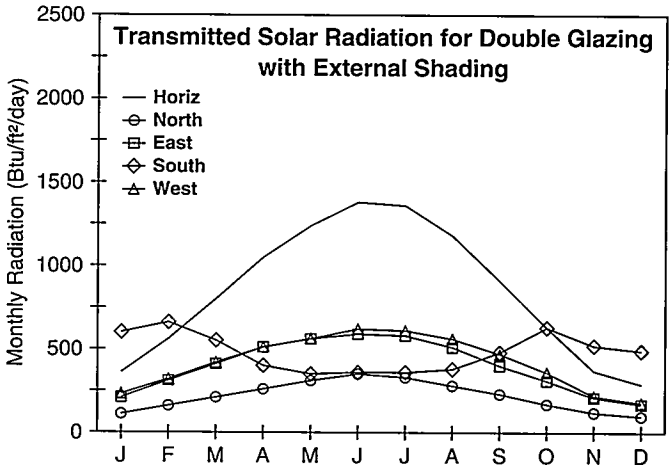
WBAN NO. 14778

LATITUDE: 41.27° N
LONGITUDE: 77.05° W
ELEVATION: 797 feet
MEAN PRESSURE: 14.5 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±11%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	560	820	1140	1460	1720	1900	1870	1630	1270	910	560	450	1190
	Std.Dev.	46	64	69	134	142	134	107	84	101	74	51	31	27
	Minimum	480	700	1020	1160	1410	1580	1690	1490	1080	770	450	400	1140
	Maximum	650	960	1290	1750	1950	2150	2070	1820	1430	1150	670	520	1250
	Diffuse	340	460	600	740	860	900	870	780	640	470	350	290	610
	Clear-Day Global	830	1180	1660	2160	2480	2590	2510	2220	1780	1280	870	710	1690
North	Global	190	270	350	440	540	610	570	470	380	280	200	170	370
	Diffuse	190	270	350	430	500	540	520	460	380	280	200	170	360
	Clear-Day Global	180	250	330	430	580	670	620	480	360	270	190	160	380
East	Global	360	510	680	850	960	1020	990	870	680	530	350	290	680
	Diffuse	230	330	420	520	600	630	620	560	450	340	240	200	430
	Clear-Day Global	620	830	1080	1300	1420	1440	1410	1310	1130	880	650	550	1050
South	Global	830	990	1010	930	840	810	840	940	990	1000	740	680	880
	Diffuse	350	430	500	540	580	590	590	570	520	430	330	290	480
	Clear-Day Global	1790	1900	1790	1450	1130	990	1040	1280	1610	1790	1750	1690	1520
West	Global	380	520	700	850	940	1040	1030	940	780	590	370	300	700
	Diffuse	240	330	430	530	610	650	630	580	470	350	240	200	440
	Clear-Day Global	620	830	1080	1300	1420	1440	1410	1310	1130	880	650	550	1050

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±11%

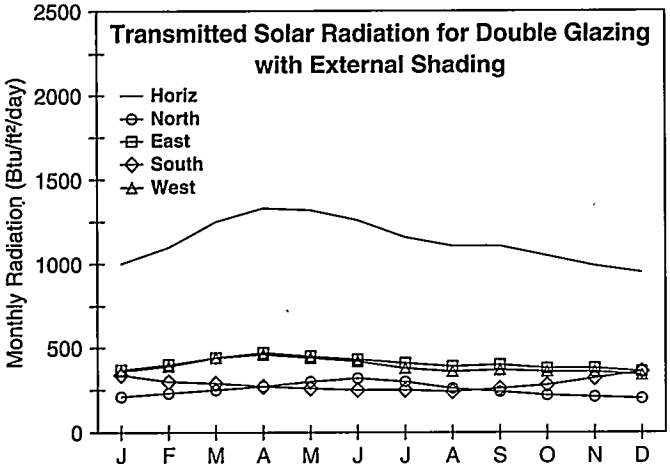
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	360	560	800	1050	1240	1380	1360	1180	910	630	370	290	850
North	Unshaded	130	190	240	300	360	400	380	320	260	190	140	120	250
	Shaded	110	160	210	260	310	350	330	280	230	170	120	97	220
East	Unshaded	250	360	480	600	680	720	700	610	480	370	240	200	470
	Shaded	210	310	410	510	560	590	580	510	400	310	210	170	400
South	Unshaded	620	720	710	610	530	500	520	610	680	720	550	510	610
	Shaded	600	660	550	400	350	360	360	380	480	630	520	490	480
West	Unshaded	260	360	490	600	670	740	730	670	550	410	250	200	500
	Shaded	230	320	420	510	560	620	610	560	470	360	220	180	420

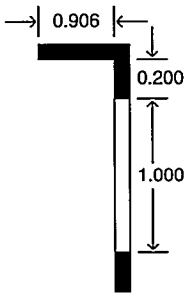
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	25.2	28.0	38.1	49.1	59.5	67.8	72.3	70.8	63.5	52.0	41.8	30.9	49.9
Daily Minimum Temp	17.1	19.2	28.5	38.1	47.9	56.6	61.5	60.5	53.1	41.6	33.6	23.9	40.1
Daily Maximum Temp	33.3	36.6	47.7	60.1	71.1	79.0	83.1	81.2	73.8	62.4	49.9	37.9	59.7
Record Minimum Temp	-17.0	-13.0	-1.0	15.0	28.0	36.0	43.0	38.0	28.0	20.0	8.0	-15.0	-17.0
Record Maximum Temp	69.0	71.0	87.0	92.0	95.0	102.0	103.0	100.0	102.0	91.0	83.0	67.0	103.0
HDD, Base 65°F	1234	1036	834	477	200	30	0	9	106	408	696	1057	6087
CDD, Base 65°F	0	0	0	0	29	114	229	189	61	0	0	0	622
Humidity Ratio (#w/#da)	0.0021	0.0023	0.0032	0.0046	0.0074	0.0106	0.0125	0.0122	0.0098	0.0063	0.0043	0.0027	0.0065
Wind Speed (mph)	9.0	8.7	9.2	9.4	7.9	7.1	6.3	6.1	6.2	6.8	8.2	8.7	7.8
Clearness Index, Kt	0.43	0.46	0.47	0.48	0.49	0.51	0.52	0.50	0.48	0.45	0.39	0.39	0.48

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±11%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	35/20	68/41	79/47	63/39	27/16	45/27	81/51	98/69	93/66	68/44	24/13	62/36	81/52	75/48	46/29	11/7	35/20	42/24	26/15	2/2
North	9/8	14/15	15/16	13/14	8/7	18/13	16/17	17/20	17/19	16/15	8/6	14/14	16/17	16/16	12/11	4/3	9/9	10/10	8/7	1/1
East	68/23	56/29	15/16	13/14	8/7	74/29	73/39	33/28	17/19	16/15	56/15	67/29	30/23	16/16	12/11	30/8	37/15	10/10	8/7	1/1
South	36/15	71/34	83/39	66/31	28/12	12/11	33/24	49/36	45/34	23/19	18/8	54/26	75/41	69/37	39/21	27/7	73/22	83/25	57/17	5/2
West	9/8	14/15	21/18	64/31	63/21	12/11	16/17	17/20	50/36	76/41	8/6	14/14	16/17	50/30	70/32	4/3	9/9	19/12	42/14	6/2
M. Clr (%hrs)	28	26	27	27	28	32	39	33	32	35	18	31	33	34	35	19	20	20	20	22





Shading Geometry
(Not to Scale)

Guam, PI

WBAN NO. 41415

LATITUDE: 13.55° N
LONGITUDE: 144.83° W
ELEVATION: 361 feet
MEAN PRESSURE: 14.5 psia

STATION TYPE: Primary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	1400	1530	1730	1830	1810	1740	1610	1540	1540	1460	1390	1330	1580
	Std.Dev.	93	126	122	109	140	91	93	152	102	110	102	85	58
	Minimum	1210	1290	1470	1660	1500	1540	1440	1210	1310	1160	1180	1150	1470
	Maximum	1570	1780	1930	2050	2080	1870	1820	1870	1730	1700	1590	1460	1710
	Diffuse	670	740	820	850	850	860	900	910	870	800	700	650	800
	Clear-Day Global	1920	2130	2360	2480	2490	2470	2470	2460	2380	2190	1950	1840	2260
North	Global	390	420	460	530	760	860	770	570	460	430	400	380	540
	Diffuse	390	420	460	480	550	580	570	500	460	430	400	380	470
	Clear-Day Global	320	340	360	470	920	1170	1060	600	360	340	320	300	550
East	Global	800	860	950	1000	980	940	890	850	860	830	810	770	880
	Diffuse	490	530	580	610	600	590	600	590	580	540	510	470	560
	Clear-Day Global	1100	1210	1310	1350	1340	1310	1320	1330	1310	1240	1140	1070	1250
South	Global	1220	1060	830	530	470	470	470	480	630	880	1120	1220	780
	Diffuse	600	590	560	490	470	470	470	470	510	570	600	600	530
	Clear-Day Global	1870	1570	1040	460	370	370	370	370	780	1390	1790	1930	1020
West	Global	780	840	940	990	960	910	830	800	800	790	780	750	850
	Diffuse	490	530	580	610	600	590	590	580	570	540	500	470	550
	Clear-Day Global	1100	1210	1310	1350	1340	1310	1320	1330	1310	1240	1140	1070	1250

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	1000	1100	1250	1330	1320	1260	1160	1110	1110	1050	990	950	1130
North	Unshaded	270	290	320	340	440	510	460	360	320	300	280	260	350
	Shaded	210	230	250	270	300	320	300	260	240	220	210	200	250
East	Unshaded	560	610	680	710	700	660	630	610	610	580	570	540	620
	Shaded	370	400	440	470	450	430	410	390	400	380	380	360	410
South	Unshaded	850	690	490	350	320	320	330	330	390	560	760	860	520
	Shaded	340	300	290	270	260	250	250	240	260	280	320	360	280
West	Unshaded	550	600	670	700	680	640	580	560	570	560	550	520	600
	Shaded	360	390	440	460	440	420	380	360	370	360	360	340	390

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	77.3	77.2	77.8	79.0	79.7	79.9	79.4	79.1	79.2	79.1	79.2	78.5	78.8
Daily Minimum Temp	71.0	70.9	71.1	72.1	72.6	72.9	72.4	72.2	72.2	72.4	73.1	72.7	72.1
Daily Maximum Temp	83.6	83.5	84.5	85.8	86.8	86.9	86.3	85.9	86.1	85.9	85.3	84.2	85.4
Record Minimum Temp	56.0	59.0	54.0	59.0	62.0	63.0	64.0	63.0	61.0	64.0	62.0	61.0	54.0
Record Maximum Temp	87.0	89.0	90.0	90.0	91.0	92.0	94.0	91.0	95.0	91.0	89.0	89.0	95.0
HDD, Base 65°F	0	0	0	0	0	0	0	0	0	0	0	0	0
CDD, Base 65°F	381	342	397	420	456	447	446	437	426	437	426	419	5034
Humidity Ratio (#w/#da)	0.0170	0.0165	0.0167	0.0174	0.0181	0.0186	0.0189	0.0190	0.0191	0.0190	0.0186	0.0178	0.0181
Wind Speed (mph)	9.9	10.9	10.5	10.3	9.3	7.4	6.6	5.7	6.1	6.8	8.9	9.8	8.5
Clearness Index, Kt	0.52	0.52	0.53	0.54	0.53	0.52	0.48	0.46	0.47	0.48	0.50	0.51	0.51

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

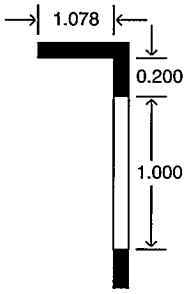
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	45/35	87/71	105/82	90/71	44/34	52/42	91/71	104/79	86/68	46/35	51/38	92/68	102/73	85/60	38/27	36/29	74/58	87/66	68/53	26/19
North	12/12	17/19	17/20	17/20	12/12	33/26	36/32	35/31	36/32	33/24	14/14	17/20	17/19	17/19	11/11	11/11	16/18	17/19	16/17	9/8
East	76/49	66/53	17/20	17/20	12/12	72/50	60/47	17/19	17/19	13/13	76/45	62/45	17/19	17/19	11/11	62/39	55/42	17/19	16/17	9/8
South	23/19	40/35	45/40	41/36	23/18	13/14	17/19	17/19	17/19	13/13	20/17	33/29	38/31	34/26	16/12	44/29	70/51	78/56	66/47	36/20
West	12/12	17/19	18/20	69/53	76/47	13/14	17/19	21/21	65/50	71/44	14/14	17/20	24/23	71/46	72/35	11/11	16/18	23/23	61/44	55/29
M. Clr (%hrs)	15	10	11	10	15	9	6	5	5	9	7	2	3	4	4	19	12	10	10	16

San Juan, PR

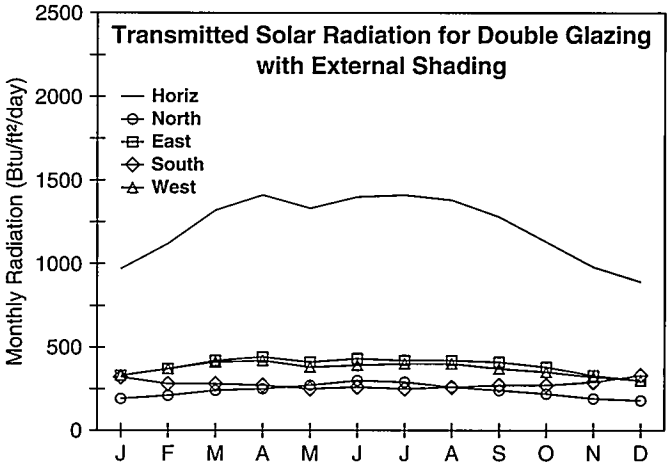
WBAN NO. 11641

LATITUDE: 18.43° N
LONGITUDE: 66.00° W
ELEVATION: 62 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Primary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	1360	1550	1810	1930	1830	1920	1930	1890	1750	1560	1370	1250	1680
	Std.Dev.	51	50	77	95	182	127	81	91	91	89	88	65	43
	Minimum	1260	1480	1640	1730	1400	1670	1750	1660	1500	1370	1160	1080	1560
	Maximum	1460	1670	1950	2070	2080	2150	2060	2070	1930	1710	1550	1430	1750
	Diffuse	570	640	710	770	850	840	820	800	770	710	610	570	720
	Clear-Day Global	1690	1940	2240	2440	2500	2500	2490	2440	2280	2020	1740	1610	2160
North	Global	360	400	430	490	640	810	740	540	450	410	370	350	500
	Diffuse	360	400	430	470	520	560	540	480	440	410	370	350	440
	Clear-Day Global	320	350	380	450	730	970	870	520	390	360	320	310	500
East	Global	770	860	980	1040	990	1030	1010	1010	990	900	780	710	920
	Diffuse	450	500	560	590	600	610	610	600	570	530	470	430	540
	Clear-Day Global	990	1110	1230	1310	1320	1300	1290	1290	1250	1150	1010	950	1180
South	Global	1350	1230	990	640	480	470	470	530	780	1060	1240	1300	880
	Diffuse	580	580	560	500	470	470	470	480	530	580	580	570	530
	Clear-Day Global	1850	1630	1200	650	410	410	410	500	960	1480	1790	1890	1100
West	Global	780	880	980	1000	920	950	970	960	880	820	750	710	880
	Diffuse	450	500	560	590	600	600	600	590	560	520	470	430	540
	Clear-Day Global	990	1110	1230	1310	1320	1300	1290	1290	1250	1150	1010	950	1180

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

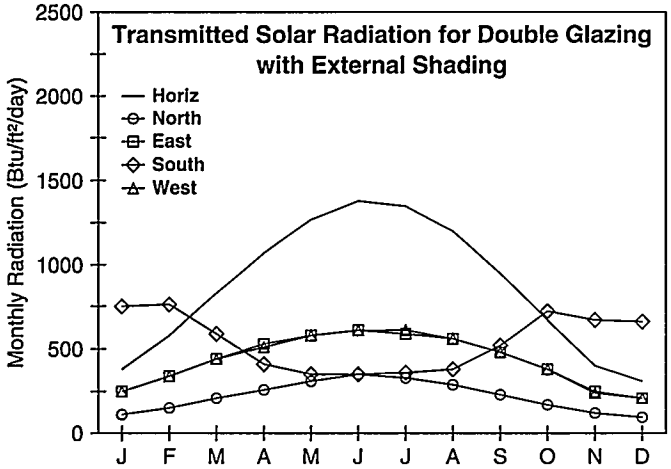
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	970	1120	1320	1410	1330	1400	1410	1380	1280	1130	980	890	1220
North	Unshaded	250	270	300	330	390	470	430	350	310	290	260	240	320
	Shaded	190	210	240	250	270	300	290	260	240	220	190	180	240
East	Unshaded	540	610	690	740	700	730	720	720	710	640	550	490	650
	Shaded	330	370	420	440	410	430	420	420	410	380	330	300	390
South	Unshaded	960	830	590	380	330	330	330	340	460	690	870	930	590
	Shaded	320	280	280	270	250	260	250	260	270	270	290	330	280
West	Unshaded	540	620	700	710	650	670	690	680	620	580	530	500	620
	Shaded	330	370	410	420	380	390	400	400	370	350	320	300	370

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	77.0	77.1	78.0	79.4	80.9	82.3	82.6	82.7	82.5	81.9	80.0	78.1	80.2
Daily Minimum Temp	70.8	70.6	71.6	72.9	74.5	76.1	76.8	76.7	76.2	75.5	74.0	72.4	74.0
Daily Maximum Temp	83.2	83.6	84.4	85.8	87.2	88.6	88.5	88.7	88.8	88.3	85.9	83.8	86.4
Record Minimum Temp	61.0	62.0	60.0	64.0	66.0	69.0	69.0	70.0	69.0	67.0	66.0	63.0	60.0
Record Maximum Temp	92.0	96.0	96.0	97.0	96.0	97.0	95.0	97.0	97.0	98.0	96.0	94.0	98.0
HDD, Base 65°F	0	0	0	0	0	0	0	0	0	0	0	0	0
CDD, Base 65°F	372	339	403	432	493	519	546	549	525	524	450	406	5558
Humidity Ratio (#w/#da)	0.0143	0.0140	0.0141	0.0149	0.0164	0.0174	0.0178	0.0179	0.0177	0.0174	0.0163	0.0151	0.0161
Wind Speed (mph)	7.8	8.4	8.9	8.4	7.8	8.5	9.2	8.3	7.1	6.4	7.1	7.8	8.0
Clearness Index, Kt	0.55	0.56	0.58	0.57	0.53	0.55	0.56	0.56	0.54	0.54	0.53	0.53	0.55

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	40/30	84/67	101/80	86/68	43/31	54/42	92/72	106/84	89/69	49/35	49/38	90/71	103/80	84/63	40/27	29/21	66/51	78/62	61/47	21/15
North	12/11	18/19	18/20	18/19	12/12	31/24	30/27	26/25	30/27	30/21	14/14	18/19	18/20	18/19	12/11	10/9	16/17	17/19	15/16	8/7
East	70/40	67/52	19/21	18/19	12/12	74/49	62/49	16/18	18/19	14/13	75/48	64/50	18/20	18/19	12/11	52/28	52/38	17/19	15/16	8/7
South	24/17	47/38	56/45	48/39	26/18	14/14	18/19	16/18	18/19	14/13	22/19	41/35	46/39	38/31	18/13	38/22	70/49	79/58	66/45	31/16
West	12/11	18/19	18/20	65/50	72/39	14/14	18/19	19/20	65/49	71/41	14/14	18/19	23/23	70/49	69/34	10/9	16/17	21/21	56/39	45/22
M. Clr (%hrs)	49	43	48	49	51	37	30	29	28	27	42	35	31	26	21	40	35	39	40	44

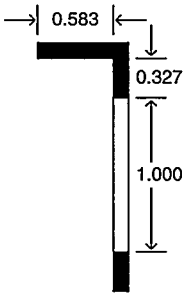


Providence, RI

WBAN NO. 14765

LATITUDE: 41.73° N
LONGITUDE: 71.43° W
ELEVATION: 62 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±11%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	590	850	1180	1490	1760	1900	1870	1660	1340	970	610	490	1230
	Std.Dev.	42	77	93	127	124	144	130	106	78	68	45	39	42
	Minimum	530	710	970	1230	1500	1580	1630	1440	1210	870	530	410	1160
	Maximum	710	1050	1310	1720	2010	2200	2070	1880	1500	1170	690	560	1300
	Diffuse	290	410	550	710	840	890	880	780	610	430	310	250	580
	Clear-Day Global	800	1150	1640	2140	2470	2590	2500	2210	1760	1260	850	690	1680
North	Global	180	250	340	430	540	610	580	480	380	280	190	160	370
	Diffuse	180	250	340	430	500	540	530	460	380	280	190	160	350
	Clear-Day Global	180	240	330	430	580	680	620	480	360	260	190	160	380
East	Global	410	560	730	880	980	1050	1010	950	800	620	410	340	730
	Diffuse	230	310	420	520	600	630	630	570	460	340	230	200	430
	Clear-Day Global	620	820	1080	1300	1420	1450	1410	1310	1120	860	630	540	1050
South	Global	1020	1120	1090	960	860	810	850	960	1080	1150	930	900	980
	Diffuse	340	420	490	540	580	590	600	580	520	440	330	300	480
	Clear-Day Global	1770	1880	1790	1470	1150	1010	1050	1300	1610	1790	1730	1670	1520
West	Global	410	550	730	860	980	1040	1040	940	800	620	400	340	730
	Diffuse	230	320	420	520	610	640	640	580	470	350	240	200	430
	Clear-Day Global	620	820	1080	1300	1420	1450	1410	1310	1120	860	630	540	1050

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±11%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	380	580	830	1070	1270	1380	1350	1200	950	670	400	310	870
North	Unshaded	130	180	240	300	360	400	380	320	260	190	130	110	250
	Shaded	110	150	210	260	310	350	330	290	230	170	120	95	220
East	Unshaded	280	390	510	630	690	740	720	670	570	440	280	230	510
	Shaded	250	340	440	530	580	610	590	560	480	380	250	210	440
South	Unshaded	770	820	760	640	550	500	530	620	740	830	700	680	680
	Shaded	750	760	590	410	350	350	360	380	520	720	670	660	540
West	Unshaded	280	390	510	610	700	740	740	670	560	440	280	230	510
	Shaded	250	340	440	510	580	610	610	560	480	380	240	210	430

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	27.9	29.7	37.4	47.4	57.3	66.9	72.7	71.3	64.1	53.6	44.0	32.8	50.4
Daily Minimum Temp	19.1	20.9	28.8	37.7	47.3	56.8	63.2	61.9	53.8	43.0	34.9	24.4	41.0
Daily Maximum Temp	36.6	38.3	46.1	57.0	67.3	76.9	82.1	80.7	74.3	64.1	53.0	41.2	59.8
Record Minimum Temp	-13.0	-7.0	1.0	14.0	29.0	41.0	48.0	40.0	33.0	20.0	6.0	-10.0	-13.0
Record Maximum Temp	66.0	72.0	80.0	98.0	94.0	97.0	102.0	104.0	100.0	86.0	78.0	70.0	104.0
HDD, Base 65°F	1150	988	856	528	246	31	0	8	90	359	630	998	5884
CDD, Base 65°F	0	0	0	0	7	88	239	203	63	6	0	0	606
Humidity Ratio (#w/#da)	0.0022	0.0023	0.0031	0.0042	0.0067	0.0097	0.0120	0.0118	0.0092	0.0062	0.0044	0.0028	0.0062
Wind Speed (mph)	10.9	11.5	12.0	12.0	10.7	9.8	9.3	9.2	9.3	9.5	10.6	10.7	10.4
Clearness Index, Kt	0.47	0.49	0.49	0.49	0.50	0.51	0.52	0.51	0.50	0.49	0.43	0.43	0.50

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±11%

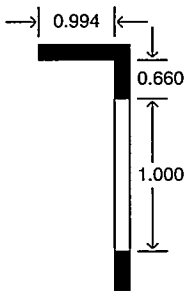
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	42/24	72/43	77/45	56/34	19/12	53/32	86/54	99/69	90/63	62/41	32/19	67/41	81/54	70/47	38/24	15/9	38/22	40/23	20/12	0/0
North	10/10	14/15	15/16	12/13	7/5	15/13	17/18	17/20	17/19	15/14	9/8	14/15	16/17	15/16	11/10	6/4	10/9	10/9	7/6	0/0
East	71/25	49/27	15/16	12/13	7/5	79/33	67/38	24/23	17/19	15/14	64/22	63/32	21/20	15/16	11/10	37/10	32/15	10/9	7/6	0/0
South	45/18	77/35	82/38	60/28	19/8	13/12	38/26	51/37	43/32	19/16	26/12	61/31	76/44	65/37	32/17	38/10	78/27	81/28	48/15	0/0
West	10/10	14/15	30/21	67/30	51/16	13/12	17/18	17/20	57/39	77/40	9/8	14/15	16/17	56/34	67/29	6/4	10/9	26/13	41/13	0/0
M. Clr (%hrs)	37	35	34	34	37	39	37	32	29	34	44	43	39	37	39	37	36	36	36	39

Charleston, SC

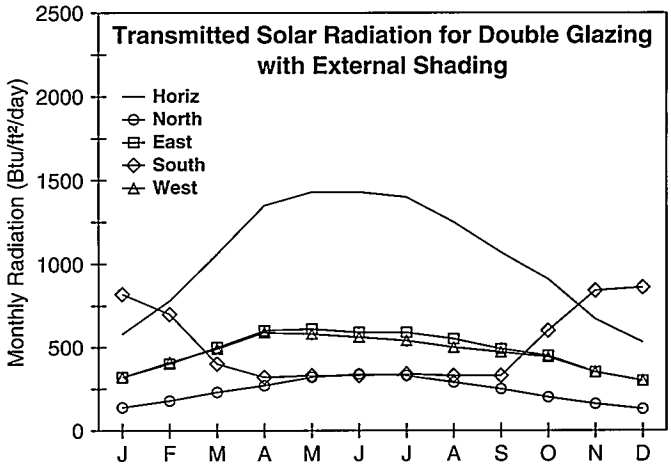
WBAN NO. 13880

LATITUDE: 32.90° N
LONGITUDE: 80.03° W
ELEVATION: 39 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Primary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	860	1120	1480	1860	1970	1970	1930	1730	1490	1280	970	800	1460
	Std.Dev.	57	98	108	113	120	137	124	113	137	106	76	61	34
	Minimum	730	970	1240	1650	1590	1760	1510	1520	1170	1020	740	690	1360
	Maximum	1000	1360	1660	2140	2160	2200	2140	1990	1770	1460	1090	910	1520
	Diffuse	360	450	570	680	850	920	930	860	730	510	390	330	630
	Clear-Day Global	1180	1510	1930	2310	2510	2570	2490	2290	1970	1570	1210	1070	1890
North	Global	240	300	370	460	570	620	600	500	420	340	260	220	410
	Diffuse	240	300	370	440	510	540	530	480	420	340	260	220	390
	Clear-Day Global	220	270	340	430	580	680	620	490	390	310	240	210	400
East	Global	540	680	870	1060	1080	1050	1050	980	860	780	610	520	840
	Diffuse	290	360	460	550	630	650	650	610	530	420	320	270	480
	Clear-Day Global	810	990	1170	1320	1370	1360	1320	1260	1150	990	810	740	1110
South	Global	1180	1220	1150	970	750	660	690	800	980	1240	1260	1190	1010
	Diffuse	380	450	510	540	560	560	570	570	560	500	430	380	500
	Clear-Day Global	1990	1930	1630	1170	830	700	750	1010	1400	1740	1880	1930	1410
West	Global	540	690	850	1030	1030	1010	980	900	820	760	610	510	810
	Diffuse	290	370	460	560	630	650	640	600	520	420	320	270	480
	Clear-Day Global	810	990	1170	1320	1370	1360	1320	1260	1150	990	810	740	1110

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

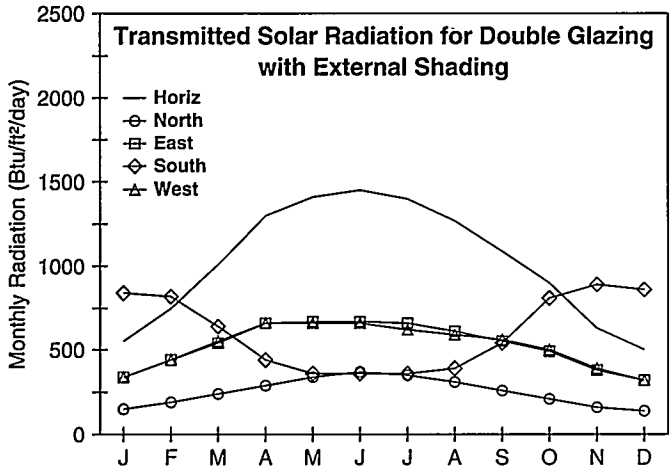
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	580	780	1060	1350	1430	1430	1400	1250	1070	910	670	530	1040
North	Unshaded	170	210	260	310	370	410	390	340	290	230	180	160	280
	Shaded	140	180	230	270	320	340	330	290	250	200	160	130	240
East	Unshaded	380	480	620	750	770	750	750	700	610	550	420	350	590
	Shaded	320	400	500	600	610	590	590	550	490	450	350	300	480
South	Unshaded	880	880	770	600	450	410	420	500	640	870	930	890	690
	Shaded	820	700	400	320	330	330	340	330	330	600	840	860	520
West	Unshaded	380	490	610	740	730	710	690	640	580	540	420	350	570
	Shaded	320	410	490	590	580	560	540	500	470	440	350	300	460

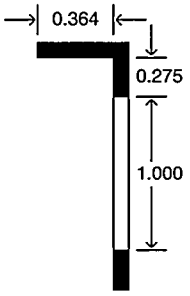
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	47.8	50.5	58.1	64.9	72.8	78.3	81.5	80.6	76.4	66.8	58.4	51.2	65.6
Daily Minimum Temp	37.7	40.0	47.5	53.9	62.9	69.1	72.7	72.2	67.9	56.3	47.2	40.7	55.7
Daily Maximum Temp	57.8	61.0	68.6	75.8	82.7	87.6	90.2	89.0	84.9	77.2	69.5	61.6	75.5
Record Minimum Temp	6.0	12.0	15.0	29.0	36.0	50.0	58.0	56.0	42.0	27.0	15.0	8.0	6.0
Record Maximum Temp	83.0	87.0	90.0	94.0	98.0	103.0	104.0	102.0	99.0	94.0	88.0	83.0	104.0
HDD, Base 65°F	548	414	239	66	0	0	0	0	0	74	233	439	2013
CDD, Base 65°F	15	8	25	63	242	399	512	484	342	130	35	11	2266
Humidity Ratio (#w/#da)	0.0051	0.0053	0.0069	0.0085	0.0118	0.0149	0.0166	0.0166	0.0144	0.0101	0.0076	0.0059	0.0103
Wind Speed (mph)	8.8	9.6	9.8	9.6	8.5	8.2	7.8	7.4	7.7	8.1	8.0	8.3	8.5
Clearness Index, Kt	0.49	0.51	0.54	0.58	0.55	0.54	0.54	0.52	0.51	0.54	0.52	0.49	0.53

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	38/23	78/50	91/59	76/49	37/23	38/27	80/58	103/78	99/74	72/49	22/15	66/45	89/64	84/60	53/37	17/10	50/30	60/36	43/27	9/6
North	10/9	14/16	16/18	14/16	10/9	23/16	17/18	18/20	18/19	17/16	8/7	16/16	18/19	18/19	14/14	6/5	11/11	12/13	10/10	4/3
East	76/30	65/37	16/18	14/16	10/9	66/36	75/50	39/33	18/19	17/16	50/21	73/41	37/30	18/19	14/14	47/14	48/24	12/13	10/10	4/3
South	33/16	65/37	76/45	64/37	31/16	12/11	21/20	35/31	34/29	18/17	14/8	48/29	67/45	62/42	38/24	38/12	81/35	92/41	73/31	22/7
West	10/9	14/16	16/18	65/37	73/31	12/11	17/18	18/20	47/37	75/44	8/7	16/16	18/19	48/35	69/38	6/5	11/11	18/15	53/24	31/9
M. Clr (%hrs)	40	41	39	39	38	35	34	29	29	35	41	38	31	28	33	39	39	39	38	40





Shading Geometry
(Not to Scale)

Columbia, SC

WBAN NO. 13883

LATITUDE: 33.95° N
LONGITUDE: 81.12° W
ELEVATION: 226 feet
MEAN PRESSURE: 14.6 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	820	1080	1410	1790	1930	1990	1920	1740	1510	1270	930	760	1430
	Std.Dev.	59	95	119	108	108	124	137	125	117	114	73	56	33
	Minimum	680	930	1180	1560	1720	1720	1570	1510	1260	1030	700	620	1360
	Maximum	970	1280	1620	2040	2140	2220	2170	2000	1730	1490	1060	870	1480
	Diffuse	350	440	570	670	820	880	890	810	670	490	370	320	610
	Clear-Day Global	1150	1480	1910	2300	2520	2590	2520	2300	1960	1540	1180	1030	1880
North	Global	230	290	370	450	550	620	580	490	410	330	250	210	400
	Diffuse	230	290	370	440	500	530	520	470	410	330	250	210	380
	Clear-Day Global	220	270	340	430	580	690	630	490	390	310	230	200	400
East	Global	520	670	830	1020	1050	1050	1030	960	850	760	580	490	820
	Diffuse	280	350	450	540	610	630	630	580	500	400	310	260	460
	Clear-Day Global	800	990	1180	1330	1380	1380	1340	1270	1150	970	800	730	1110
South	Global	1140	1210	1120	970	760	670	700	830	1020	1260	1230	1160	1000
	Diffuse	370	430	500	530	550	550	560	560	550	490	410	360	490
	Clear-Day Global	1990	1950	1670	1220	880	740	790	1050	1440	1760	1890	1930	1440
West	Global	530	680	840	1010	1030	1040	970	930	870	780	600	500	810
	Diffuse	280	350	460	550	610	640	630	590	510	410	310	260	470
	Clear-Day Global	800	990	1180	1330	1380	1380	1340	1270	1150	970	800	730	1110

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	550	750	1010	1300	1410	1450	1400	1270	1090	900	630	500	1020
North	Unshaded	160	200	260	310	360	400	380	330	280	230	170	150	270
	Shaded	150	190	240	290	340	370	350	310	260	210	160	140	250
East	Unshaded	360	470	590	730	740	740	730	680	600	530	410	340	580
	Shaded	340	440	540	660	670	670	660	610	550	490	380	320	530
South	Unshaded	850	870	760	600	460	410	430	510	670	890	910	870	680
	Shaded	840	820	640	440	360	360	360	390	540	810	890	860	610
West	Unshaded	370	480	600	720	730	730	690	660	620	550	420	340	570
	Shaded	340	440	550	660	660	660	620	590	560	500	390	320	530

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	43.8	46.8	55.2	63.0	70.9	77.4	80.8	79.7	74.2	63.3	54.6	46.9	63.1
Daily Minimum Temp	32.1	34.2	42.2	49.4	58.2	66.0	70.0	69.2	63.2	50.1	41.5	34.9	50.9
Daily Maximum Temp	55.3	59.3	68.2	76.5	83.5	88.8	91.6	90.1	85.1	76.3	67.8	58.8	75.1
Record Minimum Temp	-1.0	5.0	4.0	26.0	34.0	44.0	54.0	53.0	40.0	23.0	12.0	4.0	-1.0
Record Maximum Temp	84.0	84.0	91.0	94.0	101.0	107.0	107.0	107.0	101.0	101.0	90.0	83.0	107.0
HDD, Base 65°F	665	514	317	108	18	0	0	0	5	138	323	561	2649
CDD, Base 65°F	8	0	13	48	201	372	490	456	281	86	11	0	1966
Humidity Ratio (#w/#da)	0.0044	0.0046	0.0060	0.0075	0.0107	0.0136	0.0155	0.0156	0.0132	0.0089	0.0065	0.0050	0.0093
Wind Speed (mph)	7.2	7.7	8.1	8.1	6.9	6.5	6.1	5.6	6.1	6.1	6.3	6.9	6.8
Clearness Index, Kt	0.48	0.51	0.52	0.56	0.54	0.54	0.53	0.52	0.52	0.54	0.51	0.48	0.53

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

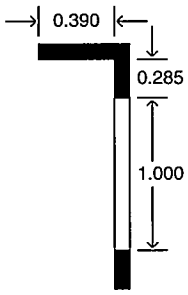
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	35/21	75/45	89/55	76/48	38/24	37/24	79/54	101/74	99/74	72/51	21/12	65/39	88/60	85/60	56/38	15/9	47/27	58/34	43/25	9/6
North	9/8	14/15	15/17	14/16	10/9	22/14	17/17	17/20	17/19	17/16	8/6	15/15	17/19	17/19	14/14	5/4	10/10	12/12	10/10	4/3
East	75/25	66/34	17/18	14/16	10/9	66/30	76/45	41/33	17/19	17/16	51/14	74/35	38/29	17/19	14/14	44/11	48/21	12/12	10/10	4/3
South	31/14	65/34	78/42	66/37	33/17	11/10	21/19	36/31	35/30	19/18	13/7	47/26	67/42	65/42	40/25	35/10	80/31	92/38	75/29	24/7
West	9/8	14/15	15/17	63/36	75/31	11/10	17/17	17/20	45/36	74/46	8/6	15/15	17/19	46/33	72/38	5/4	10/10	16/14	52/22	33/9
M. Clr (%hrs)	38	39	38	37	38	38	43	39	36	37	41	44	41	39	43	40	39	40	40	41

Greenville, SC

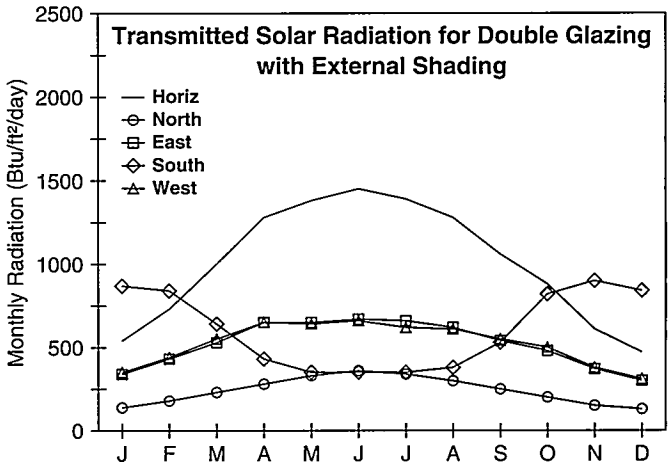
WBAN NO. 03870

LATITUDE: 34.90° N
LONGITUDE: 82.22° W
ELEVATION: 971 feet
MEAN PRESSURE: 14.3 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	810	1060	1400	1760	1900	1990	1900	1750	1480	1240	900	720	1410
	Std.Dev.	62	98	117	129	107	139	141	124	104	110	95	56	36
	Minimum	690	880	1170	1460	1740	1760	1680	1510	1290	1060	660	610	1340
	Maximum	940	1260	1610	2070	2120	2270	2170	1990	1670	1450	1080	830	1470
	Diffuse	330	400	540	640	780	840	840	760	640	440	340	290	570
	Clear-Day Global	1120	1450	1890	2290	2520	2590	2510	2290	1940	1510	1150	1000	1860
North	Global	220	280	360	440	540	610	570	480	400	310	240	200	390
	Diffuse	220	280	360	430	490	520	510	460	390	310	240	200	370
	Clear-Day Global	210	260	340	430	570	680	620	490	380	300	230	190	390
East	Global	520	670	820	1000	1030	1050	1040	970	840	750	580	470	810
	Diffuse	260	330	430	520	590	620	610	560	490	380	290	240	440
	Clear-Day Global	790	980	1180	1330	1390	1390	1350	1280	1150	970	790	710	1110
South	Global	1190	1220	1140	970	760	680	710	850	1020	1280	1240	1140	1020
	Diffuse	350	410	480	520	540	540	550	550	530	460	390	330	470
	Clear-Day Global	2010	1970	1700	1240	900	770	820	1080	1460	1770	1900	1930	1460
West	Global	540	680	840	1000	1010	1040	970	950	860	780	580	480	810
	Diffuse	270	340	440	530	590	630	610	570	490	390	290	240	450
	Clear-Day Global	790	980	1180	1330	1390	1390	1350	1280	1150	970	790	710	1110

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

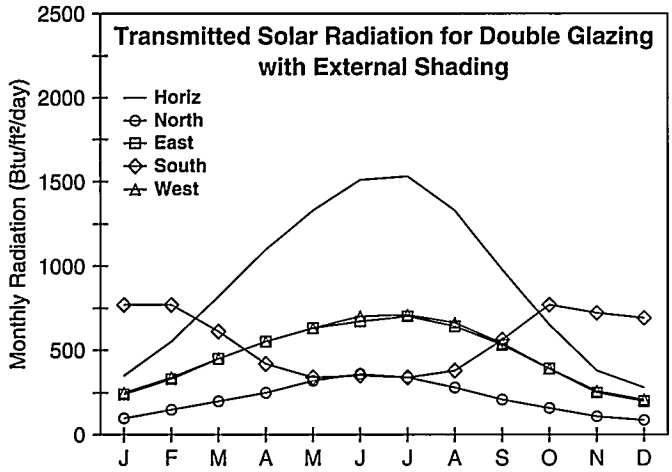
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	540	730	1000	1280	1380	1450	1390	1280	1060	880	610	470	1010
North	Unshaded	150	190	250	300	360	390	370	320	270	220	170	140	260
	Shaded	140	180	230	280	330	360	340	300	250	200	150	130	240
East	Unshaded	360	470	580	720	730	750	740	690	600	530	400	330	570
	Shaded	340	430	530	650	650	670	660	620	540	480	370	300	520
South	Unshaded	890	890	770	600	460	410	430	520	680	900	920	860	690
	Shaded	870	840	640	430	350	350	350	380	530	820	900	840	610
West	Unshaded	370	480	600	720	720	740	690	680	610	550	410	330	570
	Shaded	350	440	550	650	640	660	620	610	550	500	380	310	520

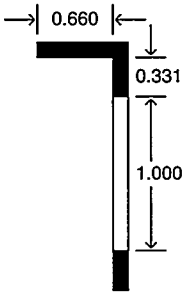
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	40.1	43.4	51.7	59.8	67.9	75.0	78.2	77.1	71.2	60.5	51.6	43.3	60.0
Daily Minimum Temp	30.0	32.4	39.9	47.6	56.4	64.4	68.3	67.4	61.2	49.0	40.5	33.4	49.2
Daily Maximum Temp	50.1	54.3	63.5	72.0	79.4	85.5	88.2	86.8	81.1	71.9	62.5	53.2	70.7
Record Minimum Temp	-6.0	8.0	11.0	25.0	31.0	40.0	54.0	52.0	36.0	25.0	12.0	5.0	-6.0
Record Maximum Temp	79.0	79.0	88.0	93.0	97.0	100.0	103.0	103.0	96.0	92.0	85.0	76.0	103.0
HDD, Base 65°F	772	605	412	177	49	0	0	0	7	175	402	673	3272
CDD, Base 65°F	0	0	0	21	139	300	409	375	193	36	0	0	1473
Humidity Ratio (#w/#da)	0.0037	0.0039	0.0052	0.0068	0.0100	0.0130	0.0149	0.0147	0.0122	0.0080	0.0058	0.0044	0.0086
Wind Speed (mph)	7.7	8.2	8.4	8.4	7.2	6.7	6.2	6.0	6.4	6.7	7.2	7.4	7.2
Clearness Index, Kt	0.49	0.51	0.52	0.55	0.54	0.54	0.53	0.53	0.52	0.54	0.51	0.47	0.52

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	33/19	72/44	88/51	76/49	39/24	36/22	78/49	100/72	99/73	74/51	19/11	63/36	87/57	85/58	57/37	13/7	45/25	57/30	42/24	10/6
North	9/8	14/15	15/17	14/16	10/9	22/13	16/16	17/19	17/19	16/16	7/5	14/14	17/18	17/18	14/13	5/4	10/10	11/11	10/10	4/3
East	74/25	66/34	19/18	14/16	10/9	67/28	78/42	42/34	17/19	16/16	51/15	75/32	40/29	17/18	14/13	41/10	49/19	11/11	10/10	4/3
South	30/13	65/33	79/39	68/38	35/18	11/9	21/18	37/31	37/31	21/19	12/6	47/23	68/41	66/42	42/25	32/8	80/27	93/33	76/27	25/8
West	9/8	14/15	15/17	61/36	76/31	11/9	16/16	17/19	42/35	75/46	7/5	14/14	17/18	44/31	73/37	5/4	10/10	14/12	52/21	34/9
M. Clr (%hrs)	40	40	41	39	39	40	44	42	36	37	41	45	41	39	43	42	41	41	41	41





Shading Geometry
(Not to Scale)

Huron, SD

WBAN NO. 14936

LATITUDE: 44.38° N
LONGITUDE: 98.22° W
ELEVATION: 1289 feet
MEAN PRESSURE: 14.1 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	560	820	1180	1530	1850	2070	2110	1840	1390	960	600	460	1280
	Std.Dev.	37	68	107	151	128	147	97	101	136	76	40	29	43
	Minimum	470	650	960	1210	1530	1800	1930	1680	1100	800	470	420	1210
	Maximum	630	1000	1380	1790	2080	2360	2350	2060	1670	1110	650	520	1400
	Diffuse	280	420	580	680	780	780	710	620	510	390	300	250	520
	Clear-Day Global	740	1100	1630	2160	2530	2670	2570	2250	1760	1210	800	630	1670
North	Global	180	250	350	440	560	640	600	470	350	260	190	150	370
	Diffuse	180	250	350	430	500	530	510	440	350	260	190	150	340
	Clear-Day Global	160	220	300	410	590	700	640	460	330	230	160	140	360
East	Global	400	560	750	930	1080	1160	1210	1090	880	650	410	330	790
	Diffuse	220	310	430	520	600	630	610	540	440	330	230	190	420
	Clear-Day Global	620	850	1140	1380	1520	1550	1520	1400	1180	900	650	540	1110
South	Global	1050	1140	1150	1060	950	910	980	1120	1220	1230	1000	930	1060
	Diffuse	340	430	520	550	580	580	570	540	490	420	340	300	470
	Clear-Day Global	1880	2010	1930	1570	1240	1080	1130	1390	1740	1920	1860	1770	1620
West	Global	410	560	750	930	1080	1200	1220	1130	900	650	430	350	800
	Diffuse	220	320	440	520	600	640	620	550	440	330	230	190	430
	Clear-Day Global	620	850	1140	1380	1520	1550	1520	1400	1180	900	650	540	1110

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	350	550	820	1100	1330	1510	1530	1330	980	650	380	280	900
North	Unshaded	120	180	240	300	370	410	390	310	240	180	130	110	250
	Shaded	100	150	200	250	320	360	340	280	210	160	110	88	210
East	Unshaded	270	390	530	670	770	830	860	780	630	460	290	230	560
	Shaded	240	330	450	550	630	670	700	640	530	390	250	200	460
South	Unshaded	800	840	810	710	600	560	600	720	840	900	760	710	740
	Shaded	770	770	610	420	340	350	340	380	560	770	720	690	560
West	Unshaded	280	390	530	670	770	860	870	810	640	460	300	240	570
	Shaded	250	340	450	550	630	700	710	660	540	390	260	210	470

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	13.2	19.4	31.9	46.3	57.6	67.9	74.4	71.8	60.8	48.5	32.4	18.1	45.2
Daily Minimum Temp	2.3	9.1	21.7	34.0	44.8	55.5	61.7	58.8	47.3	35.4	21.8	7.8	33.4
Daily Maximum Temp	24.1	29.7	42.1	58.6	70.4	80.3	87.1	84.8	74.2	61.5	43.0	28.3	57.0
Record Minimum Temp	-37.0	-39.0	-24.0	-2.0	17.0	32.0	37.0	36.0	19.0	9.0	-21.0	-30.0	-39.0
Record Maximum Temp	63.0	71.0	89.0	97.0	99.0	109.0	112.0	110.0	106.0	102.0	78.0	62.0	112.0
HDD, Base 65°F	1606	1277	1026	561	256	48	10	22	173	512	978	1454	7923
CDD, Base 65°F	0	0	0	0	27	135	302	232	47	0	0	0	743
Humidity Ratio (#w/#da)	0.0015	0.0019	0.0029	0.0045	0.0071	0.0103	0.0121	0.0111	0.0078	0.0049	0.0029	0.0018	0.0057
Wind Speed (mph)	11.3	10.9	12.3	12.5	11.7	10.5	9.7	9.8	10.5	10.7	10.9	10.8	11.0
Clearness Index, Kt	0.50	0.51	0.51	0.52	0.53	0.56	0.59	0.58	0.54	0.52	0.47	0.47	0.54

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

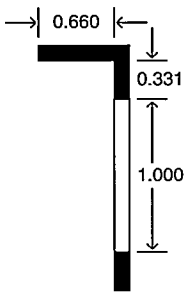
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	27/17	60/40	75/51	65/42	34/23	39/25	75/52	97/68	97/70	76/55	17/11	55/34	78/48	77/50	54/34	4/3	28/18	39/25	28/18	3/3
North	8/7	12/14	14/17	13/15	9/9	19/13	15/16	16/18	16/18	15/17	6/5	12/12	14/16	14/16	12/12	2/2	8/8	9/10	8/8	2/2
East	68/23	64/33	19/19	13/15	9/9	76/34	78/47	43/33	16/18	15/17	54/18	75/34	40/26	14/16	12/12	17/4	41/17	10/10	8/8	2/2
South	31/13	71/35	88/46	76/37	39/18	10/10	31/24	52/38	52/39	32/26	13/7	53/27	78/40	77/43	51/27	14/4	69/25	87/35	69/26	12/4
West	8/7	12/14	14/17	57/31	72/29	10/10	15/16	16/18	40/32	75/50	6/5	12/12	14/16	41/27	74/36	2/2	8/8	10/10	42/18	15/4
M. Clr (%hrs)	30	28	28	28	29	41	41	41	41	41	47	47	47	46	47	31	30	30	31	36

Pierre, SD

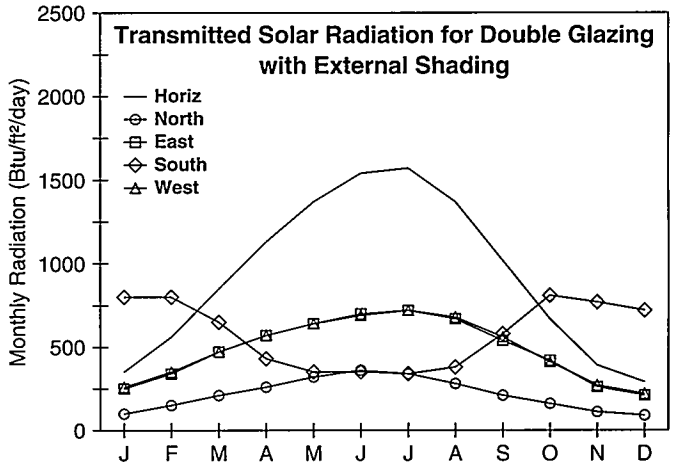
WBAN NO. 24025

LATITUDE: 44.38° N
LONGITUDE: 100.28° W
ELEVATION: 1726 feet
MEAN PRESSURE: 13.8 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	570	840	1220	1580	1890	2120	2150	1890	1440	990	620	480	1320
	Std.Dev.	41	58	91	140	121	132	87	102	115	80	41	27	32
	Minimum	440	740	1000	1220	1640	1830	1950	1680	1200	830	510	440	1250
	Maximum	650	960	1390	1820	2140	2340	2340	2090	1660	1150	700	540	1370
	Diffuse	280	410	560	670	760	750	680	590	490	380	300	250	510
	Clear-Day Global	750	1110	1640	2180	2550	2690	2590	2260	1780	1230	810	640	1690
North	Global	180	250	350	440	560	640	600	470	350	260	190	150	370
	Diffuse	180	250	350	430	500	520	500	440	350	260	190	150	340
	Clear-Day Global	160	220	300	410	590	710	650	460	320	230	160	140	360
East	Global	410	570	790	970	1110	1210	1240	1140	910	680	430	350	820
	Diffuse	230	320	430	520	600	620	600	540	430	330	230	190	420
	Clear-Day Global	630	860	1160	1400	1540	1580	1540	1420	1200	910	660	550	1120
South	Global	1090	1180	1220	1090	970	930	990	1160	1280	1290	1060	980	1100
	Diffuse	350	440	520	550	580	570	560	540	490	420	350	310	470
	Clear-Day Global	1890	2020	1940	1580	1240	1080	1130	1390	1740	1940	1880	1800	1630
West	Global	430	580	790	970	1100	1200	1240	1150	940	680	450	360	830
	Diffuse	230	320	440	530	610	630	610	550	440	330	240	200	430
	Clear-Day Global	630	860	1160	1400	1540	1580	1540	1420	1200	910	660	550	1120

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

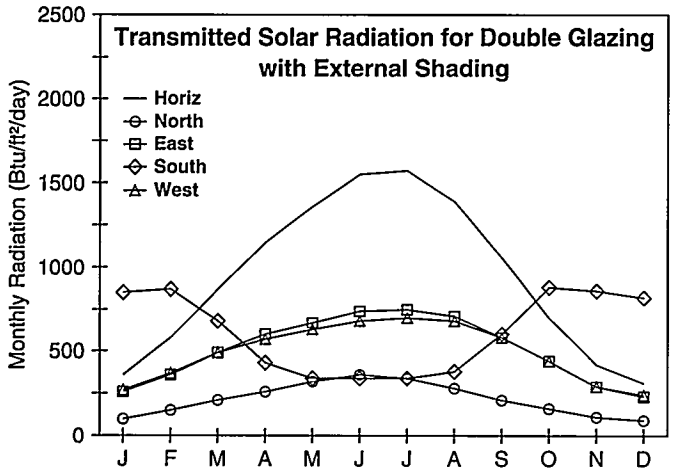
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	350	560	850	1130	1370	1540	1570	1370	1020	670	390	290	930
North	Unshaded	120	180	240	300	370	410	390	310	240	180	130	110	250
	Shaded	100	150	210	260	320	360	340	280	210	160	110	90	220
East	Unshaded	280	400	560	690	790	860	890	820	650	480	300	240	580
	Shaded	250	340	470	570	640	700	720	670	540	420	260	210	480
South	Unshaded	830	880	860	730	620	560	610	740	880	940	800	740	770
	Shaded	800	800	650	430	350	350	340	380	580	810	770	720	580
West	Unshaded	290	400	560	690	790	860	890	820	670	480	310	250	590
	Shaded	260	350	470	570	640	690	720	680	560	410	270	220	490

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	16.9	22.5	33.4	47.1	58.3	68.7	76.0	73.9	62.4	50.0	34.1	20.9	47.0
Daily Minimum Temp	6.7	12.1	22.7	34.8	45.6	55.8	62.0	59.9	48.5	37.0	23.6	11.1	35.0
Daily Maximum Temp	27.1	32.8	44.0	59.4	70.9	81.5	89.9	88.0	76.2	62.9	44.6	30.7	59.0
Record Minimum Temp	-32.1	-25.1	-15.0	5.0	21.9	37.9	42.1	39.9	25.0	14.0	-13.0	-29.0	-32.1
Record Maximum Temp	66.0	73.0	86.0	97.0	105.1	111.9	113.0	113.0	108.0	93.9	78.1	64.9	113.0
HDD, Base 65°F	1491	1190	980	537	238	44	7	17	148	465	927	1367	7411
CDD, Base 65°F	0	0	0	0	31	155	348	293	70	0	0	0	897
Humidity Ratio (#w/#da)	0.0016	0.0020	0.0028	0.0042	0.0066	0.0097	0.0111	0.0101	0.0071	0.0046	0.0028	0.0019	0.0054
Wind Speed (mph)	12.3	11.6	13.0	13.2	12.6	11.0	10.8	10.9	11.3	11.2	11.2	11.7	11.7
Clearness Index, Kt	0.51	0.52	0.53	0.53	0.54	0.57	0.60	0.60	0.56	0.53	0.49	0.48	0.55

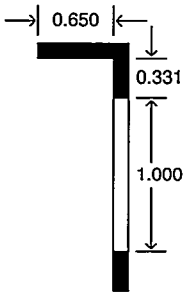
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	24/15	59/40	75/52	67/46	36/25	37/24	74/51	96/67	97/74	78/58	15/9	53/33	77/49	78/54	56/38	3/2	27/18	39/26	29/19	5/4
North	7/7	12/14	14/17	13/15	9/10	20/13	14/16	16/18	16/18	15/17	6/4	11/12	14/15	14/16	12/13	2/1	8/7	9/10	8/8	2/2
East	66/21	66/35	23/21	13/15	9/10	74/34	80/49	46/34	16/18	15/17	50/15	76/35	43/28	14/16	12/13	13/4	42/18	12/11	8/8	2/2
South	28/12	69/36	88/49	78/43	42/22	10/9	29/23	51/38	53/42	34/28	11/6	50/26	78/43	78/48	54/32	10/3	66/26	87/38	71/28	16/5
West	7/7	12/14	14/17	54/33	72/33	10/9	14/16	16/18	36/32	74/52	6/4	11/12	14/15	37/28	74/40	2/1	8/7	9/10	41/18	20/6
M. Clr (%hrs)	33	32	29	30	30	45	46	45	40	40	49	49	48	49	50	31	31	31	35	38



Rapid City, SD

WBAN NO. 24090



Shading Geometry
(Not to Scale)

LATITUDE: 44.05° N
LONGITUDE: 103.07° W
ELEVATION: 3169 feet
MEAN PRESSURE: 13.1 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	590	870	1250	1610	1890	2130	2150	1920	1490	1040	660	510	1350
	Std.Dev.	39	39	84	129	121	135	72	76	118	67	34	29	30
	Minimum	510	770	1090	1440	1620	1890	2010	1790	1170	900	580	470	1290
	Maximum	660	950	1410	1880	2080	2370	2260	2100	1700	1160	720	570	1420
	Diffuse	270	380	540	660	730	720	650	560	450	350	280	230	490
	Clear-Day Global	770	1130	1670	2220	2580	2720	2630	2300	1810	1260	830	660	1720
North	Global	170	250	340	440	560	640	600	470	350	260	190	150	370
	Diffuse	170	250	340	430	490	520	490	430	340	260	190	150	340
	Clear-Day Global	150	210	300	410	590	720	640	470	320	230	160	140	360
East	Global	430	600	820	1020	1150	1270	1290	1200	970	730	470	390	860
	Diffuse	220	310	430	520	580	610	590	530	430	320	240	190	410
	Clear-Day Global	640	880	1180	1440	1570	1610	1560	1450	1230	940	680	570	1150
South	Global	1150	1270	1260	1110	950	910	980	1160	1330	1390	1180	1100	1150
	Diffuse	340	430	520	550	560	560	550	530	470	410	350	310	460
	Clear-Day Global	1930	2050	1960	1580	1230	1070	1120	1400	1760	1980	1920	1850	1650
West	Global	440	610	820	970	1080	1170	1210	1150	960	720	480	390	830
	Diffuse	220	310	440	530	590	610	600	540	430	330	240	200	420
	Clear-Day Global	640	880	1180	1440	1570	1610	1560	1450	1230	940	680	570	1150

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	360	580	870	1150	1360	1550	1570	1390	1060	700	420	310	950
North	Unshaded	120	170	240	300	360	410	390	310	240	180	130	110	250
	Shaded	100	150	210	260	320	360	340	280	210	160	110	91	220
East	Unshaded	290	420	580	730	820	910	920	860	690	510	330	260	610
	Shaded	260	360	490	600	670	740	750	710	580	440	290	230	510
South	Unshaded	870	940	890	740	600	550	590	740	910	1010	890	840	800
	Shaded	850	870	680	430	340	340	340	380	600	880	860	820	610
West	Unshaded	300	430	580	690	770	840	860	830	690	510	330	270	590
	Shaded	270	370	490	570	630	680	700	680	580	440	290	240	500

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	22.3	26.7	34.1	45.1	55.2	64.8	72.2	70.6	60.0	48.7	34.8	24.2	46.6
Daily Minimum Temp	10.7	15.2	22.2	32.2	42.3	51.7	58.2	56.1	45.5	34.9	22.8	12.7	33.7
Daily Maximum Temp	33.8	38.2	45.9	57.9	68.1	77.8	86.2	85.1	74.4	62.5	46.7	35.6	59.4
Record Minimum Temp	-27.0	-24.0	-17.0	1.0	18.0	31.0	39.0	38.0	18.0	-2.0	-19.0	-30.0	-30.0
Record Maximum Temp	76.0	75.0	82.0	93.0	98.0	106.0	110.0	106.0	104.0	94.0	78.0	75.0	110.0
HDD, Base 65°F	1324	1072	958	597	311	103	18	31	211	505	906	1265	7301
CDD, Base 65°F	0	0	0	0	7	97	241	205	61	0	0	0	611
Humidity Ratio (#w/#da)	0.0018	0.0022	0.0028	0.0039	0.0061	0.0089	0.0100	0.0088	0.0062	0.0040	0.0027	0.0020	0.0050
Wind Speed (mph)	11.4	11.4	12.7	13.4	12.5	11.0	10.3	10.3	11.1	11.2	10.7	10.9	11.4
Clearness Index, Kt	0.51	0.54	0.54	0.54	0.54	0.58	0.60	0.61	0.58	0.55	0.51	0.50	0.56

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

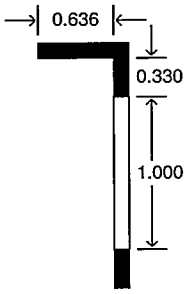
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	41/27	69/48	75/54	57/41	22/15	54/35	85/61	99/73	92/65	66/46	32/18	66/45	81/55	72/48	43/28	13/9	36/24	39/27	21/14	0/0
North	10/10	13/15	14/16	12/13	7/6	13/13	15/17	16/18	16/17	13/14	8/7	13/14	14/16	13/15	10/10	5/4	9/9	9/10	7/6	0/0
East	76/35	52/33	14/16	12/13	7/6	85/44	69/47	26/24	16/17	13/14	76/27	67/40	22/20	13/15	10/10	39/14	35/18	9/10	7/6	0/0
South	47/24	80/45	88/52	67/39	25/12	12/12	39/31	53/42	47/35	22/19	28/13	64/38	81/49	71/42	39/22	39/14	84/36	89/41	57/23	0/0
West	10/10	13/15	26/23	68/40	65/25	12/12	15/17	16/18	55/40	81/49	8/7	13/14	14/16	56/35	77/38	5/4	9/9	24/16	45/19	0/0
M. Clr (%hrs)	32	31	28	28	29	51	49	45	38	35	54	53	55	52	51	34	36	35	37	38

Sioux Falls, SD

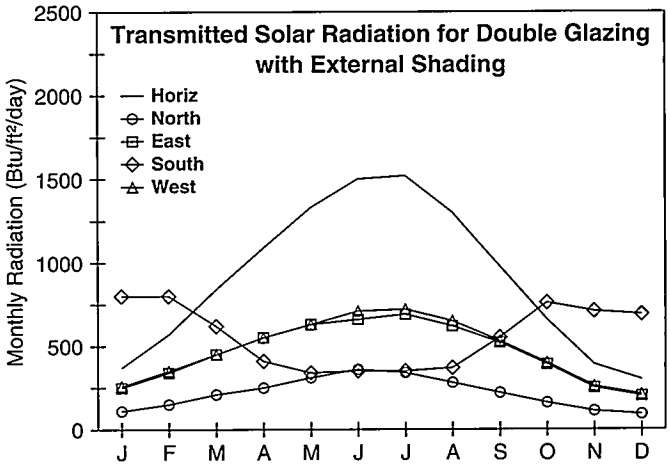
WBAN NO. 14944

LATITUDE: 43.57° N
LONGITUDE: 96.73° W
ELEVATION: 1427 feet
MEAN PRESSURE: 14.0 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	590	860	1200	1530	1840	2060	2090	1800	1380	970	610	480	1290
	Std.Dev.	36	63	105	154	142	128	106	124	142	86	51	32	45
	Minimum	520	700	1020	1110	1410	1780	1880	1580	1040	770	460	430	1200
	Maximum	650	1020	1510	1790	2070	2330	2320	2090	1630	1120	690	550	1380
	Diffuse	290	410	560	660	770	790	730	650	520	390	300	250	530
	Clear-Day Global	770	1130	1640	2160	2520	2660	2570	2250	1770	1240	820	660	1690
North	Global	180	260	350	430	550	640	600	470	360	260	190	160	370
	Diffuse	180	260	340	420	490	530	510	440	350	260	190	160	350
	Clear-Day Global	160	220	310	420	590	700	640	450	330	240	160	140	360
East	Global	420	570	760	920	1070	1130	1180	1050	870	650	420	340	780
	Diffuse	230	320	430	510	590	630	610	540	440	330	230	190	420
	Clear-Day Global	630	850	1120	1360	1500	1540	1500	1370	1170	900	650	560	1100
South	Global	1090	1180	1160	1040	930	890	950	1070	1180	1220	990	940	1050
	Diffuse	340	430	500	530	570	580	570	550	480	410	330	300	470
	Clear-Day Global	1890	2000	1890	1540	1210	1060	1110	1350	1710	1900	1850	1790	1610
West	Global	430	580	750	930	1070	1210	1220	1090	880	660	430	350	800
	Diffuse	230	320	430	510	600	640	620	550	440	330	240	200	430
	Clear-Day Global	630	850	1120	1360	1500	1540	1500	1370	1170	900	650	560	1100

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

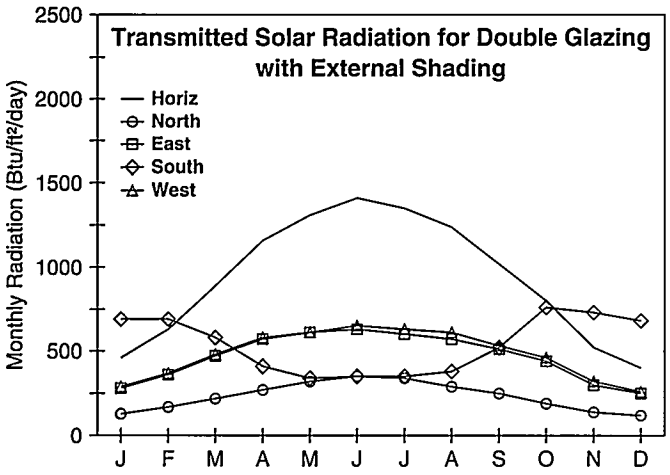
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	370	570	840	1090	1330	1500	1520	1300	980	660	390	300	910
North	Unshaded	130	180	240	290	360	410	390	310	250	180	130	110	250
	Shaded	110	150	210	250	310	360	340	280	220	160	110	92	220
East	Unshaded	290	400	540	660	760	810	840	750	620	460	290	230	550
	Shaded	250	340	450	550	630	660	690	620	520	390	250	200	460
South	Unshaded	830	870	820	690	590	540	580	690	810	890	750	710	730
	Shaded	800	800	620	410	340	350	350	370	550	760	710	690	560
West	Unshaded	300	410	540	660	760	860	870	780	630	460	300	240	570
	Shaded	260	350	450	550	630	710	720	650	530	400	260	210	480

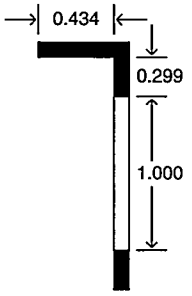
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	13.8	19.7	32.5	46.9	58.4	68.3	74.3	71.4	60.9	48.6	33.0	18.3	45.5
Daily Minimum Temp	3.3	9.7	22.6	34.8	45.9	56.1	62.3	59.4	48.7	36.0	22.6	8.6	34.2
Daily Maximum Temp	24.3	29.6	42.3	59.0	70.7	80.5	86.3	83.3	73.1	61.2	43.4	28.0	56.8
Record Minimum Temp	-36.0	-31.0	-23.0	5.0	17.0	33.0	38.0	34.0	22.0	9.0	-17.0	-28.0	-36.0
Record Maximum Temp	66.0	70.0	87.0	94.0	100.0	110.0	108.0	108.0	104.0	94.0	76.0	61.0	110.0
HDD, Base 65°F	1587	1268	1008	543	240	50	10	22	165	508	960	1448	7809
CDD, Base 65°F	0	0	0	0	35	149	298	220	42	0	0	0	744
Humidity Ratio (#w/#da)	0.0015	0.0019	0.0030	0.0045	0.0071	0.0102	0.0122	0.0115	0.0083	0.0051	0.0031	0.0019	0.0059
Wind Speed (mph)	11.0	10.9	12.4	12.9	11.7	10.6	9.9	9.8	10.2	10.5	11.2	10.8	11.0
Clearness Index, Kt	0.50	0.52	0.52	0.51	0.53	0.56	0.58	0.56	0.53	0.51	0.46	0.46	0.53

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	29/18	63/40	77/50	65/42	32/22	41/26	77/51	98/68	97/71	75/55	19/11	57/34	79/48	77/49	52/32	5/4	31/19	40/26	28/18	3/3
North	8/7	13/14	14/17	13/15	9/9	19/13	15/16	17/19	17/19	15/16	7/5	12/13	15/16	15/16	12/12	3/2	8/8	10/10	8/7	2/1
East	69/24	63/32	17/18	13/15	9/9	76/33	77/44	41/31	17/19	15/16	57/16	74/32	37/24	15/16	12/12	21/5	41/16	10/10	8/7	2/1
South	33/14	71/35	88/46	75/37	37/17	11/10	31/24	51/37	51/39	30/25	15/7	54/26	78/39	76/41	48/25	18/5	73/24	88/34	69/23	10/3
West	8/7	13/14	14/17	59/31	70/28	11/10	15/16	17/19	42/34	77/51	7/5	12/13	15/16	43/28	74/34	3/2	8/8	12/11	44/17	13/4
M. Clr (%hrs)	32	32	30	31	30	39	41	39	39	41	48	48	46	44	47	32	32	32	32	35





Shading Geometry
(Not to Scale)

Bristol, TN

WBAN NO. 13877

LATITUDE: 36.48° N
LONGITUDE: 82.40° W
ELEVATION: 1506 feet
MEAN PRESSURE: 14.0 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	690	920	1260	1600	1800	1940	1850	1710	1420	1130	760	610	1310
	Std.Dev.	53	74	98	147	129	131	135	84	101	103	69	49	39
	Minimum	560	750	1130	1320	1580	1690	1630	1520	1260	1000	590	530	1240
	Maximum	780	1080	1490	1970	2050	2290	2100	1870	1670	1380	890	730	1400
	Diffuse	360	450	570	680	790	860	850	770	630	460	360	310	590
	Clear-Day Global	1050	1400	1840	2270	2520	2600	2520	2280	1910	1460	1080	930	1830
North	Global	220	280	350	430	530	600	560	470	390	300	230	190	380
	Diffuse	220	280	350	430	480	520	510	460	390	300	230	190	360
	Clear-Day Global	200	260	330	430	570	680	620	490	370	290	220	190	390
East	Global	440	560	740	900	970	1010	960	910	800	690	480	390	740
	Diffuse	260	330	430	520	580	620	600	560	480	370	280	230	440
	Clear-Day Global	760	960	1170	1330	1400	1410	1370	1290	1150	950	760	680	1100
South	Global	960	1020	1040	920	770	710	730	870	1020	1190	1020	930	930
	Diffuse	350	410	480	520	540	550	550	560	520	460	370	320	470
	Clear-Day Global	1990	1980	1730	1300	960	820	870	1130	1510	1790	1880	1900	1490
West	Global	450	590	760	910	970	1040	1010	970	840	710	500	410	760
	Diffuse	260	340	430	520	590	630	620	570	490	380	280	230	440
	Clear-Day Global	760	960	1170	1330	1400	1410	1370	1290	1150	950	760	680	1100

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	460	630	890	1160	1310	1410	1350	1240	1020	800	520	400	930
North	Unshaded	150	190	240	300	350	390	370	320	270	210	160	130	260
	Shaded	130	170	220	270	320	350	340	290	250	190	140	120	230
East	Unshaded	300	400	520	640	690	720	680	640	570	480	330	270	520
	Shaded	280	360	470	570	610	630	600	570	510	440	300	250	460
South	Unshaded	710	740	710	590	470	430	450	540	680	850	760	700	640
	Shaded	690	690	580	410	340	350	350	380	520	760	730	680	540
West	Unshaded	310	410	540	650	690	740	720	690	600	500	350	280	540
	Shaded	290	370	480	580	610	650	630	610	530	460	320	260	480

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	34.0	37.4	47.2	55.2	63.4	71.1	74.4	73.6	67.9	56.7	47.0	38.2	55.5
Daily Minimum Temp	24.3	26.8	35.4	43.0	51.6	59.9	64.1	63.1	56.6	44.2	35.9	28.2	44.4
Daily Maximum Temp	43.7	48.0	58.9	67.4	75.2	82.2	84.6	84.1	79.1	69.1	58.2	48.1	66.6
Record Minimum Temp	-21.0	-5.0	-2.0	21.0	30.0	38.0	45.0	43.0	34.0	20.0	5.0	-9.0	-21.0
Record Maximum Temp	79.0	80.0	85.0	89.0	92.0	97.0	102.0	101.0	100.0	90.0	81.0	78.0	102.0
HDD, Base 65°F	961	773	552	298	121	6	0	0	44	280	540	831	4406
CDD, Base 65°F	0	0	0	0	71	189	291	267	131	23	0	0	972
Humidity Ratio (#w/#da)	0.0033	0.0035	0.0047	0.0061	0.0092	0.0122	0.0139	0.0137	0.0112	0.0072	0.0052	0.0039	0.0078
Wind Speed (mph)	6.3	6.7	7.1	6.9	5.3	4.7	4.2	3.9	4.2	4.6	5.6	6.0	5.4
Clearness Index, Kt	0.44	0.46	0.48	0.51	0.51	0.53	0.51	0.52	0.51	0.51	0.45	0.43	0.50

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

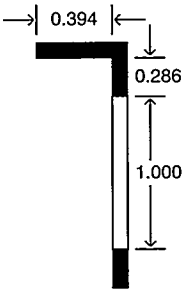
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	32/18	69/41	85/51	73/45	38/23	35/22	77/48	98/71	97/72	74/51	18/11	61/35	84/56	82/55	56/35	11/6	41/23	53/29	39/22	8/5
North	9/7	13/14	15/17	14/15	9/9	21/12	16/16	17/19	17/19	16/16	7/5	14/13	16/18	16/17	14/13	4/3	10/9	11/11	9/9	4/3
East	71/22	65/32	19/18	14/15	9/9	65/26	76/41	42/33	17/19	16/16	47/14	74/31	40/28	16/17	14/13	36/8	47/18	11/11	9/9	4/3
South	30/12	64/32	79/40	68/35	36/17	11/9	23/19	39/32	39/32	23/19	12/6	47/23	69/41	67/41	43/24	28/7	76/25	90/32	74/26	22/6
West	9/7	13/14	15/17	60/32	75/28	11/9	16/16	17/19	42/34	74/46	7/5	14/13	16/18	43/30	72/36	4/3	10/9	13/12	49/19	29/8
M. Clr (%hrs)	30	31	31	30	30	38	39	35	35	36	38	42	39	39	42	29	28	28	29	32

Chattanooga, TN

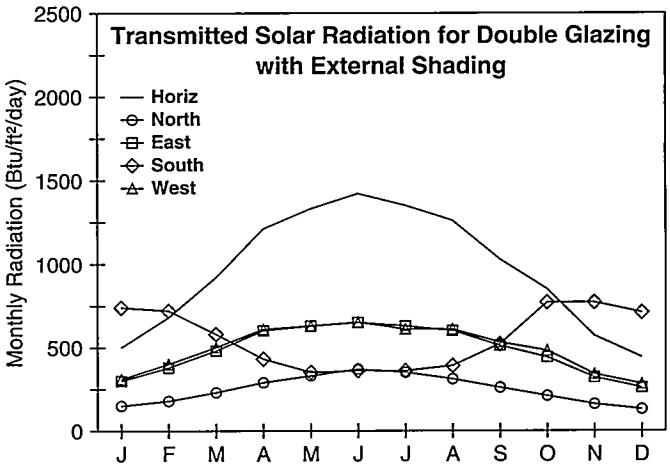
WBAN NO. 13882

LATITUDE: 35.03° N
LONGITUDE: 85.20° W
ELEVATION: 689 feet
MEAN PRESSURE: 14.4 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	750	980	1290	1670	1840	1950	1860	1740	1440	1200	830	670	1350
	Std.Dev.	56	81	109	127	125	157	145	122	106	106	75	56	44
	Minimum	620	880	1070	1410	1650	1610	1550	1500	1210	1020	680	590	1280
	Maximum	880	1230	1560	1910	2240	2290	2130	1980	1630	1440	960	780	1470
	Diffuse	380	470	610	720	840	900	900	810	680	490	390	340	630
	Clear-Day Global	1120	1450	1890	2300	2530	2600	2520	2300	1940	1510	1150	990	1860
North	Global	230	290	370	450	550	620	580	490	400	320	250	210	400
	Diffuse	230	290	370	440	500	540	520	470	400	320	250	210	380
	Clear-Day Global	210	260	340	430	580	680	630	490	380	300	230	190	390
East	Global	470	600	760	940	1000	1030	1000	950	800	690	500	420	760
	Diffuse	280	340	440	540	600	640	620	580	490	390	290	250	460
	Clear-Day Global	800	980	1190	1340	1390	1400	1360	1290	1150	960	790	710	1110
South	Global	1020	1070	1020	920	750	690	710	850	990	1200	1070	960	940
	Diffuse	370	430	500	540	550	560	560	570	540	480	390	340	490
	Clear-Day Global	2010	1970	1710	1250	910	780	830	1090	1470	1780	1910	1930	1470
West	Global	490	620	770	950	980	1030	970	950	830	740	530	440	780
	Diffuse	280	350	450	540	610	650	630	590	500	400	300	250	460
	Clear-Day Global	800	980	1190	1340	1390	1400	1360	1290	1150	960	790	710	1110

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

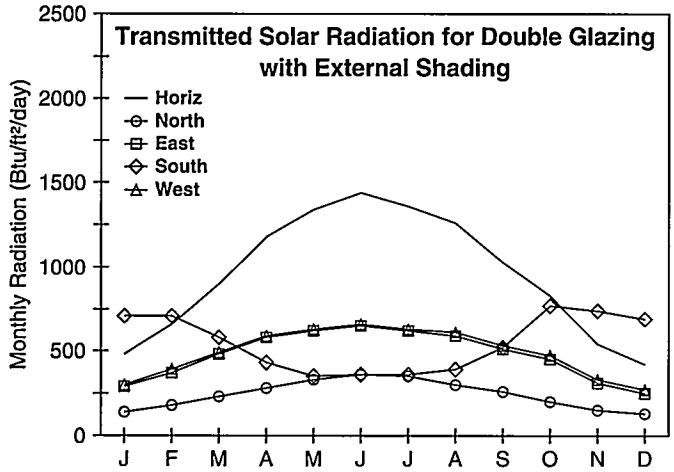
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	500	680	920	1210	1330	1420	1350	1260	1030	850	570	440	960
North	Unshaded	160	200	260	310	360	400	380	330	280	220	170	140	270
	Shaded	150	180	230	290	330	370	350	310	260	210	160	130	250
East	Unshaded	320	420	530	660	710	730	710	670	560	480	350	290	540
	Shaded	300	380	480	600	630	650	630	600	510	440	320	260	480
South	Unshaded	760	770	700	580	460	420	440	530	650	850	790	720	640
	Shaded	740	720	580	430	350	360	360	390	520	770	770	710	560
West	Unshaded	340	430	550	670	700	730	680	670	590	520	370	300	550
	Shaded	310	400	500	610	630	650	610	610	530	480	340	280	500

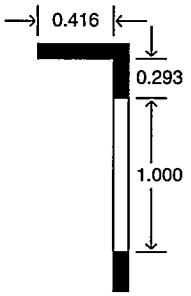
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	37.4	41.8	50.4	59.1	66.9	75.2	78.7	77.9	72.4	60.4	50.5	41.1	59.3
Daily Minimum Temp	28.0	31.1	39.0	46.8	55.4	63.9	68.3	67.7	62.6	48.9	39.9	31.2	48.6
Daily Maximum Temp	46.8	52.4	61.8	71.4	78.5	86.4	89.0	88.2	82.1	72.0	61.1	50.8	70.0
Record Minimum Temp	-10.0	1.0	8.0	26.0	34.0	41.0	51.0	50.0	36.0	22.0	4.0	-2.0	-10.0
Record Maximum Temp	78.0	79.0	87.0	93.0	99.0	104.0	106.0	105.0	102.0	94.0	84.0	78.0	106.0
HDD, Base 65°F	856	650	453	196	57	0	0	0	9	190	435	741	3587
CDD, Base 65°F	0	0	0	19	116	306	425	400	231	47	0	0	1544
Humidity Ratio (#w/#da)	0.0036	0.0040	0.0054	0.0070	0.0102	0.0134	0.0152	0.0151	0.0126	0.0082	0.0059	0.0043	0.0087
Wind Speed (mph)	6.8	7.2	7.6	7.2	5.9	5.2	5.0	4.7	4.9	4.9	5.8	6.5	6.0
Clearness Index, Kt	0.46	0.47	0.49	0.52	0.52	0.53	0.51	0.52	0.50	0.52	0.47	0.44	0.50

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	29/16	69/41	88/51	77/49	44/26	31/20	74/47	99/72	100/74	77/53	15/9	59/33	86/57	86/59	60/39	10/6	42/23	56/30	44/26	13/8
North	8/7	13/15	15/17	14/16	10/10	22/12	16/16	18/20	17/19	17/17	6/4	14/13	17/19	17/19	14/14	4/3	10/10	12/12	10/10	5/4
East	69/21	69/32	24/20	14/16	10/10	61/26	79/41	47/36	17/19	17/17	41/12	75/29	45/31	17/19	14/14	34/8	51/19	14/13	10/10	5/4
South	26/11	61/30	78/38	69/37	40/19	10/8	19/18	37/31	38/32	23/20	9/5	43/21	67/40	67/43	45/26	25/6	75/25	92/29	79/29	32/10
West	8/7	13/15	15/17	57/32	78/30	10/8	16/16	18/20	38/32	73/45	6/4	14/13	17/19	40/30	71/36	4/3	10/10	12/12	49/21	40/12
M. Clr (%hrs)	28	29	32	27	27	32	43	32	28	38	29	41	35	33	37	24	27	33	28	28





Shading Geometry
(Not to Scale)

Knoxville, TN

WBAN NO. 13891

LATITUDE: 35.82° N
LONGITUDE: 83.98° W
ELEVATION: 981 feet
MEAN PRESSURE: 14.3 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	720	950	1270	1640	1840	1980	1870	1740	1440	1180	790	640	1340
	Std.Dev.	54	69	96	118	124	135	146	103	109	106	70	49	39
	Minimum	580	850	1100	1390	1670	1700	1570	1520	1240	1020	650	570	1290
	Maximum	830	1150	1470	1910	2160	2340	2130	1920	1660	1470	930	740	1440
	Diffuse	380	470	610	730	840	890	890	800	670	480	390	330	620
	Clear-Day Global	1080	1420	1870	2280	2530	2610	2530	2290	1930	1480	1110	960	1840
North	Global	230	290	370	450	550	620	580	490	400	310	240	200	390
	Diffuse	230	290	370	440	500	540	520	470	400	310	240	200	380
	Clear-Day Global	210	260	340	430	580	680	630	490	380	300	220	190	390
East	Global	460	580	750	920	990	1040	990	940	810	700	490	400	760
	Diffuse	270	350	440	540	600	630	620	580	490	390	290	240	450
	Clear-Day Global	780	970	1180	1340	1400	1410	1370	1290	1140	950	770	690	1110
South	Global	980	1040	1020	930	770	710	730	870	1010	1210	1030	940	940
	Diffuse	370	430	500	540	560	560	570	570	540	470	390	340	490
	Clear-Day Global	2000	1970	1720	1280	940	800	850	1110	1490	1790	1890	1920	1480
West	Global	480	600	770	930	1000	1050	1000	970	830	730	510	420	780
	Diffuse	280	350	450	540	610	650	630	590	500	390	290	240	460
	Clear-Day Global	780	970	1180	1340	1400	1410	1370	1290	1140	950	770	690	1110

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	480	660	900	1180	1340	1440	1360	1260	1030	830	540	420	960
North	Unshaded	160	200	250	310	360	400	380	330	280	220	170	140	270
	Shaded	140	180	230	280	330	360	350	300	260	200	150	130	240
East	Unshaded	320	410	530	650	700	730	700	660	570	490	340	280	530
	Shaded	290	370	480	580	620	650	620	590	510	450	310	250	480
South	Unshaded	730	760	700	590	470	430	450	540	670	860	760	700	640
	Shaded	710	710	580	430	350	360	360	390	520	770	740	690	550
West	Unshaded	330	420	540	660	710	740	710	690	590	510	360	290	550
	Shaded	300	390	490	590	630	660	630	610	530	470	330	270	490

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	36.0	40.1	49.0	57.5	65.4	73.2	76.6	76.0	70.1	58.4	48.7	40.1	57.6
Daily Minimum Temp	26.0	29.1	36.6	44.6	53.1	61.8	66.0	65.3	59.0	46.0	37.5	30.0	46.3
Daily Maximum Temp	45.9	50.9	61.3	70.4	77.6	84.5	87.1	86.7	81.2	70.6	59.9	50.1	68.9
Record Minimum Temp	-24.0	-2.0	1.0	22.0	32.0	43.0	49.0	49.0	36.0	25.0	5.0	-6.0	-24.0
Record Maximum Temp	77.0	83.0	86.0	92.0	94.0	102.0	103.0	102.0	103.0	91.0	84.0	80.0	103.0
HDD, Base 65°F	899	697	496	234	94	0	0	0	18	238	489	772	3937
CDD, Base 65°F	0	0	0	9	106	246	360	341	171	33	0	0	1266
Humidity Ratio (#w/#da)	0.0036	0.0039	0.0053	0.0069	0.0101	0.0131	0.0149	0.0147	0.0122	0.0080	0.0057	0.0043	0.0086
Wind Speed (mph)	7.5	7.9	8.3	8.2	6.7	6.3	6.0	5.6	5.6	5.6	6.7	7.2	6.8
Clearness Index, Kt	0.45	0.47	0.48	0.52	0.52	0.54	0.52	0.53	0.51	0.52	0.46	0.44	0.50

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

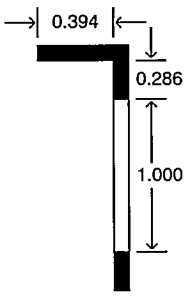
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	30/17	69/41	86/50	76/47	41/24	33/21	75/48	99/70	100/75	76/54	16/10	60/34	85/56	84/58	59/37	10/6	41/23	54/29	42/24	10/7
North	8/7	14/15	15/17	14/16	10/10	22/12	16/17	18/20	17/20	17/17	6/5	14/13	17/18	17/18	14/14	4/3	10/10	11/12	10/10	4/3
East	70/20	67/31	22/19	14/16	10/10	64/25	78/42	45/35	17/20	17/17	43/13	74/31	43/29	17/18	14/14	34/8	48/18	12/12	10/10	4/3
South	28/11	63/30	79/38	69/36	37/17	10/9	21/19	38/31	39/33	23/20	10/6	45/22	68/40	67/42	45/25	26/6	74/24	91/29	75/26	27/7
West	8/7	14/15	15/17	58/32	75/27	10/9	16/17	18/20	40/33	73/46	6/5	14/13	17/18	42/30	72/35	4/3	10/10	12/12	48/19	35/9
M. Clr (%hrs)	31	30	30	30	31	38	42	38	35	37	35	39	38	37	39	27	29	30	31	33

Memphis, TN

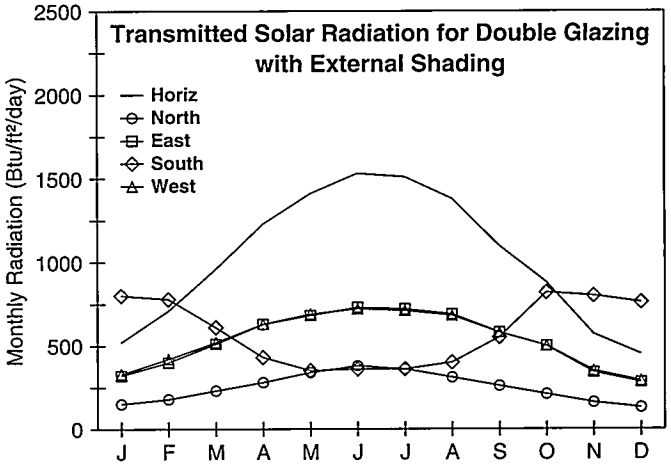
WBAN NO. 13893

LATITUDE: 35.05° N
LONGITUDE: 89.98° W
ELEVATION: 285 feet
MEAN PRESSURE: 14.6 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	780	1020	1340	1710	1940	2100	2060	1890	1530	1250	850	690	1430
	Std.Dev.	60	80	116	118	137	119	121	115	91	96	73	67	37
	Minimum	670	880	1150	1460	1660	1830	1790	1690	1360	1000	630	580	1360
	Maximum	930	1200	1590	1910	2220	2340	2330	2110	1740	1460	950	800	1520
	Diffuse	360	450	580	700	800	840	830	760	650	460	380	330	600
	Clear-Day Global	1100	1440	1880	2290	2520	2600	2520	2300	1940	1510	1140	980	1850
North	Global	230	290	370	450	560	640	600	500	400	320	240	210	400
	Diffuse	230	290	370	440	500	540	520	470	400	320	240	210	380
	Clear-Day Global	210	270	340	430	590	680	630	480	380	300	230	200	400
East	Global	500	630	790	970	1060	1140	1130	1070	890	770	530	450	830
	Diffuse	280	350	450	540	610	640	640	590	500	400	290	250	460
	Clear-Day Global	790	970	1180	1340	1410	1410	1370	1300	1160	970	780	710	1120
South	Global	1100	1140	1080	940	770	700	740	910	1070	1290	1110	1030	990
	Diffuse	380	430	500	530	550	560	560	570	540	480	390	350	490
	Clear-Day Global	1980	1950	1700	1260	920	770	820	1080	1470	1780	1880	1920	1460
West	Global	510	650	810	980	1080	1130	1110	1060	900	770	550	460	830
	Diffuse	280	350	450	540	620	650	640	600	510	400	300	250	470
	Clear-Day Global	790	970	1180	1340	1410	1410	1370	1300	1160	970	780	710	1120

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

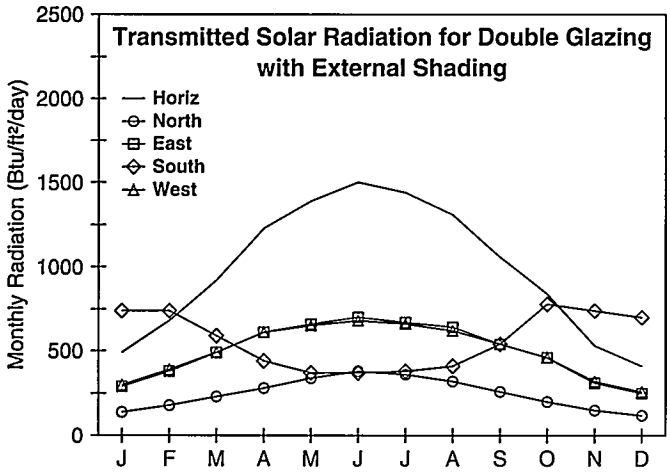
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	520	710	960	1230	1410	1530	1510	1380	1100	880	570	450	1020
North	Unshaded	160	200	250	310	370	410	390	330	280	220	170	140	270
	Shaded	150	180	230	280	340	380	360	310	260	210	160	130	250
East	Unshaded	350	440	560	690	750	810	800	760	630	540	370	310	590
	Shaded	320	400	510	630	680	730	720	690	580	500	340	280	530
South	Unshaded	820	820	730	590	470	430	450	560	700	910	820	770	670
	Shaded	800	780	610	430	350	360	360	400	550	820	800	760	580
West	Unshaded	350	460	570	700	770	800	790	750	640	550	380	310	590
	Shaded	330	420	520	630	690	720	710	680	580	500	350	290	530

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	39.7	44.2	53.1	62.9	71.2	79.1	82.6	81.0	74.2	63.1	52.5	43.7	62.3
Daily Minimum Temp	30.9	34.8	43.0	52.4	61.2	68.9	72.9	71.1	64.5	51.9	42.7	34.8	52.4
Daily Maximum Temp	48.5	53.5	63.2	73.3	81.0	89.3	92.3	90.8	83.9	74.3	62.3	52.5	72.1
Record Minimum Temp	-4.0	-11.0	12.0	29.0	38.0	48.0	52.0	48.0	36.0	25.0	9.0	-13.0	-13.0
Record Maximum Temp	78.0	81.0	85.0	94.0	99.0	104.0	108.0	105.0	103.0	95.0	85.0	81.0	108.0
HDD, Base 65°F	784	582	383	127	25	0	0	0	10	131	380	660	3082
CDD, Base 65°F	0	0	14	64	217	423	546	496	286	72	0	0	2118
Humidity Ratio (#w/#da)	0.0037	0.0042	0.0057	0.0079	0.0109	0.0140	0.0161	0.0154	0.0129	0.0083	0.0060	0.0044	0.0091
Wind Speed (mph)	9.5	9.8	10.4	10.0	8.7	7.8	7.4	6.9	7.3	7.6	8.8	9.5	8.6
Clearness Index, Kt	0.47	0.49	0.51	0.53	0.55	0.57	0.57	0.57	0.54	0.55	0.48	0.46	0.53

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	44/25	79/47	87/53	69/43	28/17	47/33	86/63	103/79	96/75	67/51	30/18	71/44	89/61	81/58	48/33	21/11	49/28	55/31	35/20	3/3
North	10/10	15/16	15/18	13/15	8/7	21/16	17/18	17/19	18/19	16/16	9/8	16/16	17/19	17/18	13/12	7/5	11/11	11/12	9/8	2/1
East	78/28	57/31	15/18	13/15	8/7	75/41	72/50	30/28	18/19	16/16	64/23	70/36	28/24	17/18	13/12	50/13	41/19	11/12	9/8	2/1
South	40/18	70/35	78/41	62/32	26/12	13/12	27/24	39/33	35/31	16/16	20/11	54/30	70/45	63/42	34/22	46/12	84/29	90/32	66/22	9/3
West	10/10	15/16	25/21	70/35	68/24	13/12	17/18	17/19	54/43	77/52	9/8	16/16	17/19	55/38	72/38	7/5	11/11	25/15	54/19	14/3
M. Clr (%hrs)	33	34	35	34	34	48	45	36	37	42	48	49	40	39	46	35	34	35	35	38

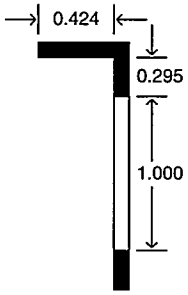


Nashville, TN

WBAN NO. 13897

LATITUDE: 36.12° N
LONGITUDE: 86.68° W
ELEVATION: 591 feet
MEAN PRESSURE: 14.4 psia

STATION TYPE: Primary



Shading Geometry
(Not to Scale)

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	730	980	1290	1700	1910	2070	1980	1810	1480	1190	790	630	1380
	Std.Dev.	68	84	129	126	142	133	133	106	110	100	69	66	48
	Minimum	580	850	1120	1460	1560	1650	1550	1590	1300	1030	630	520	1270
	Maximum	850	1190	1600	2050	2230	2280	2250	2000	1720	1420	950	750	1470
	Diffuse	370	470	600	720	860	930	940	850	690	490	380	310	640
	Clear-Day Global	1060	1400	1850	2280	2530	2610	2530	2290	1920	1470	1100	940	1830
North	Global	230	290	360	450	560	640	610	510	410	320	240	200	400
	Diffuse	230	290	360	440	520	560	550	490	410	320	240	200	380
	Clear-Day Global	210	260	340	430	580	680	630	480	380	290	230	190	390
East	Global	470	600	770	970	1050	1110	1080	1010	850	720	490	400	790
	Diffuse	270	340	440	540	620	670	670	620	510	390	280	230	470
	Clear-Day Global	770	950	1180	1340	1410	1410	1380	1300	1150	950	760	680	1110
South	Global	1030	1100	1050	970	800	740	770	910	1050	1230	1030	950	970
	Diffuse	370	430	500	550	570	590	600	600	560	480	380	330	500
	Clear-Day Global	1980	1960	1720	1290	950	810	860	1120	1500	1780	1870	1890	1480
West	Global	480	620	770	960	1030	1090	1050	990	850	720	500	420	790
	Diffuse	270	350	450	550	630	670	670	620	520	400	290	230	470
	Clear-Day Global	770	950	1180	1340	1410	1410	1380	1300	1150	950	760	680	1110

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	490	680	920	1230	1390	1500	1440	1310	1060	840	530	410	990
North	Unshaded	160	200	250	310	370	420	400	350	280	220	160	140	270
	Shaded	140	180	230	280	340	380	360	320	260	200	150	120	250
East	Unshaded	320	420	540	690	750	790	760	720	600	510	340	280	560
	Shaded	290	380	490	610	660	700	670	640	540	460	310	250	500
South	Unshaded	760	800	720	620	490	450	470	570	700	870	770	720	660
	Shaded	740	740	590	440	370	370	380	410	540	780	740	700	570
West	Unshaded	330	430	550	680	730	770	740	700	600	510	350	290	560
	Shaded	300	390	490	610	650	680	660	620	540	460	320	260	500

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	36.2	40.4	50.2	59.2	67.7	75.6	79.3	78.1	71.8	60.4	50.0	40.5	59.1
Daily Minimum Temp	26.5	29.9	39.1	47.5	56.6	64.7	68.9	67.7	61.1	48.3	39.6	30.9	48.4
Daily Maximum Temp	45.9	50.8	61.2	70.8	78.8	86.5	89.5	88.4	82.5	72.5	60.4	50.2	69.8
Record Minimum Temp	-17.0	-13.0	2.0	23.0	34.0	42.0	51.0	47.0	36.0	26.0	-1.0	-10.0	-17.0
Record Maximum Temp	78.0	84.0	86.0	91.0	97.0	106.0	107.0	104.0	105.0	94.0	84.0	79.0	107.0
HDD, Base 65°F	893	689	469	193	59	0	0	0	21	195	450	760	3729
CDD, Base 65°F	0	0	10	19	143	318	443	406	225	52	0	0	1616
Humidity Ratio (#w/#da)	0.0035	0.0039	0.0052	0.0070	0.0102	0.0132	0.0152	0.0147	0.0121	0.0078	0.0057	0.0042	0.0086
Wind Speed (mph)	9.2	9.5	10.1	9.4	7.9	7.3	6.8	6.4	6.6	7.2	8.5	9.4	8.2
Clearness Index, Kt	0.46	0.48	0.50	0.54	0.54	0.56	0.55	0.55	0.52	0.53	0.46	0.43	0.52

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

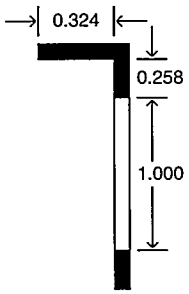
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	49/27	81/48	87/52	64/38	23/13	52/36	89/66	103/81	93/71	61/44	34/21	74/47	88/60	77/54	41/28	24/12	50/27	53/29	30/16	1/1
North	11/11	15/16	15/17	13/14	7/6	20/16	18/19	18/20	18/20	17/16	11/9	17/16	18/19	17/17	12/11	7/5	11/11	11/11	8/7	1/1
East	79/28	53/30	15/17	13/14	7/6	75/40	69/49	25/25	18/20	16/15	64/25	66/36	23/21	17/17	12/11	51/13	37/17	11/11	8/7	1/1
South	45/19	74/37	80/41	59/29	21/9	14/13	31/27	42/36	35/30	16/15	24/13	57/33	71/45	61/39	30/18	51/13	86/29	90/32	60/18	2/1
West	11/11	15/16	31/23	72/33	60/19	14/13	18/19	18/20	58/45	74/45	11/9	17/16	18/19	58/38	66/33	7/5	11/11	29/16	52/16	4/1
M. Clr (%hrs)	32	30	29	30	32	46	40	34	34	41	44	44	39	38	44	30	29	31	33	35

Abilene, TX

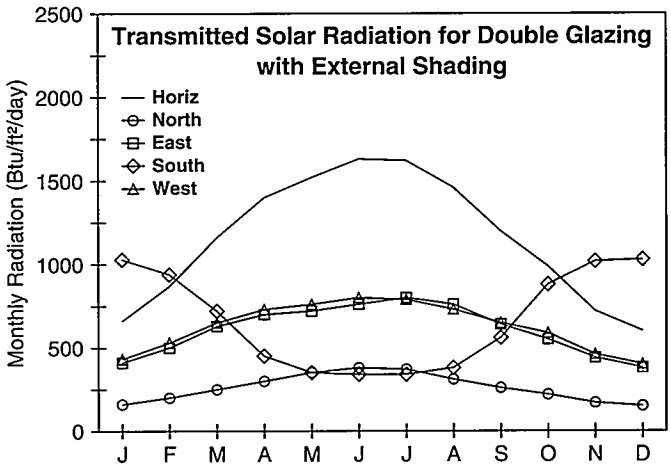
WBAN NO. 13962

LATITUDE: 32.43° N
LONGITUDE: 99.68° W
ELEVATION: 1752 feet
MEAN PRESSURE: 13.8 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	980	1240	1620	1920	2070	2220	2200	2000	1660	1390	1060	900	1610
	Std.Dev.	88	97	131	135	122	102	140	110	122	115	81	74	31
	Minimum	800	1070	1390	1680	1810	2050	1900	1740	1470	1170	910	720	1540
	Maximum	1140	1440	1880	2130	2250	2500	2500	2240	1880	1560	1200	1050	1680
	Diffuse	350	440	550	650	740	730	710	680	610	450	370	320	550
	Clear-Day Global	1240	1580	2000	2380	2590	2650	2600	2410	2070	1660	1300	1140	1970
North	Global	250	310	380	460	570	660	630	500	410	330	270	230	420
	Diffuse	250	310	380	450	500	520	500	460	400	330	270	230	380
	Clear-Day Global	230	280	350	430	590	700	650	480	370	300	240	210	400
East	Global	630	760	950	1070	1100	1160	1220	1160	960	830	670	580	920
	Diffuse	300	380	470	550	590	610	600	570	500	400	330	280	470
	Clear-Day Global	860	1040	1240	1380	1420	1420	1410	1360	1230	1060	880	790	1180
South	Global	1400	1380	1270	990	740	640	690	870	1090	1370	1400	1400	1100
	Diffuse	410	460	520	530	530	520	520	530	520	470	420	380	480
	Clear-Day Global	2070	1990	1670	1170	810	670	720	990	1430	1830	2010	2050	1450
West	Global	650	800	980	1110	1160	1220	1200	1100	980	880	700	610	950
	Diffuse	310	380	480	560	600	620	620	580	510	410	330	280	470
	Clear-Day Global	860	1040	1240	1380	1420	1420	1410	1360	1230	1060	880	790	1180

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

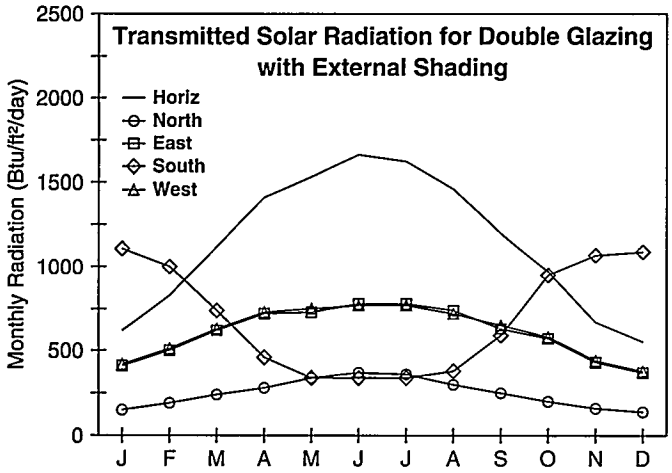
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	660	870	1160	1400	1520	1630	1620	1460	1200	990	720	600	1150
North	Unshaded	170	210	270	310	370	410	390	330	280	230	190	160	280
	Shaded	160	200	250	300	350	380	370	310	260	220	170	150	260
East	Unshaded	430	530	670	760	780	830	870	830	690	590	470	400	650
	Shaded	410	500	630	700	720	760	800	760	640	550	440	380	610
South	Unshaded	1040	990	850	600	430	380	400	510	700	960	1030	1050	740
	Shaded	1030	940	720	450	350	340	340	380	560	880	1020	1030	670
West	Unshaded	450	560	700	800	830	870	850	790	700	620	490	420	670
	Shaded	430	530	650	730	760	800	790	730	650	590	460	400	630

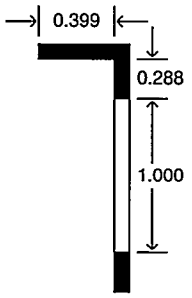
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	42.8	47.4	56.1	65.4	72.7	80.2	84.0	83.2	76.0	66.4	54.9	45.5	64.6
Daily Minimum Temp	30.8	35.1	43.3	52.9	61.1	68.9	72.7	71.7	65.3	54.8	43.4	33.9	52.8
Daily Maximum Temp	54.8	59.7	68.9	77.8	84.4	91.4	95.2	94.5	86.7	77.9	66.3	57.0	76.2
Record Minimum Temp	-9.0	-7.0	7.0	25.0	36.0	47.0	55.0	55.0	35.0	28.0	14.0	-7.0	-9.0
Record Maximum Temp	89.0	90.0	97.0	99.0	107.0	109.0	110.0	109.0	106.0	103.0	92.0	89.0	110.0
HDD, Base 65°F	688	493	299	94	7	0	0	0	6	75	317	605	2584
CDD, Base 65°F	0	0	23	106	245	456	589	564	336	118	14	0	2451
Humidity Ratio (#w/#da)	0.0036	0.0042	0.0053	0.0076	0.0105	0.0129	0.0130	0.0130	0.0118	0.0085	0.0059	0.0041	0.0084
Wind Speed (mph)	11.1	11.6	13.1	13.0	12.7	11.4	10.3	9.5	9.9	10.5	11.2	10.8	11.2
Clearness Index, Kt	0.55	0.56	0.59	0.60	0.58	0.61	0.61	0.60	0.56	0.58	0.56	0.54	0.58

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	32/19	74/49	93/66	83/57	46/32	33/23	77/56	103/77	104/82	80/63	18/11	63/41	91/61	91/65	64/45	13/8	48/31	63/41	50/32	16/11
North	8/8	14/16	16/19	15/17	10/11	24/15	16/17	17/19	17/18	16/17	6/5	14/14	16/18	16/19	14/15	5/4	10/11	12/14	11/11	5/5
East	75/27	71/41	24/23	15/17	10/11	68/34	80/54	46/38	17/18	16/17	53/17	79/40	45/32	16/19	14/15	46/13	54/27	14/14	11/11	5/5
South	27/13	62/36	77/51	69/44	39/24	10/9	16/17	32/29	33/30	19/19	10/6	43/26	66/41	66/45	45/30	34/10	80/36	96/47	83/39	38/15
West	8/8	14/16	16/19	60/39	82/42	10/9	15/17	17/19	39/34	76/57	6/5	14/14	16/18	42/32	76/45	5/4	10/11	12/14	53/27	50/18
M. Clr (%hrs)	45	46	46	47	45	48	48	47	50	52	50	50	46	44	48	44	44	46	46	45





Shading Geometry
(Not to Scale)

Amarillo, TX

WBAN NO. 23047

LATITUDE: 35.23° N
LONGITUDE: 101.70° W
ELEVATION: 3603 feet
MEAN PRESSURE: 12.9 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	940	1200	1560	1930	2100	2260	2210	1990	1660	1380	1000	840	1590
	Std.Dev.	67	88	113	102	121	121	110	111	90	111	74	66	30
	Minimum	790	960	1400	1710	1870	2030	2030	1800	1550	1160	820	670	1530
	Maximum	1040	1350	1750	2130	2300	2500	2480	2210	1910	1590	1120	990	1650
	Diffuse	310	400	520	610	690	680	690	620	540	380	320	280	500
	Clear-Day Global	1150	1490	1950	2370	2620	2700	2630	2400	2030	1590	1210	1040	1930
North	Global	230	290	370	450	560	640	610	480	390	310	250	210	400
	Diffuse	230	290	370	430	490	510	500	450	380	310	250	210	370
	Clear-Day Global	210	260	330	430	590	700	650	470	350	290	220	190	390
East	Global	640	770	950	1120	1150	1230	1230	1150	980	860	660	580	940
	Diffuse	290	360	450	530	580	600	600	550	470	380	300	260	450
	Clear-Day Global	840	1010	1250	1410	1470	1480	1470	1390	1260	1050	850	770	1190
South	Global	1500	1460	1320	1070	810	710	760	930	1180	1490	1470	1460	1180
	Diffuse	400	450	500	530	530	520	520	520	500	450	400	360	470
	Clear-Day Global	2110	2040	1770	1290	910	750	810	1090	1530	1900	2050	2080	1530
West	Global	650	790	970	1120	1160	1210	1200	1110	1000	890	680	600	950
	Diffuse	290	360	460	540	590	610	610	560	490	380	310	260	460
	Clear-Day Global	840	1010	1250	1410	1470	1480	1470	1390	1260	1050	850	770	1190

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	620	830	1120	1410	1530	1660	1620	1460	1200	970	670	550	1140
North	Unshaded	160	200	250	300	360	400	390	320	270	210	170	150	270
	Shaded	150	190	240	280	340	370	360	300	250	200	160	140	250
East	Unshaded	440	540	670	800	820	870	870	820	700	610	460	400	670
	Shaded	410	500	620	720	730	780	780	740	630	570	430	370	610
South	Unshaded	1130	1060	890	660	470	410	440	560	770	1050	1100	1100	800
	Shaded	1110	1000	740	460	340	340	340	380	590	950	1070	1090	700
West	Unshaded	450	560	690	800	830	860	860	790	720	630	480	410	670
	Shaded	420	510	630	730	750	770	770	720	650	580	440	380	610

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	35.1	39.2	47.1	56.8	65.4	74.1	78.6	76.5	69.1	58.5	46.0	36.9	56.9
Daily Minimum Temp	21.2	25.5	32.7	42.1	51.6	60.7	65.5	63.8	56.4	44.5	32.3	23.7	43.3
Daily Maximum Temp	49.0	52.8	61.6	71.5	79.1	87.6	91.7	89.1	81.8	72.5	59.7	50.1	70.5
Record Minimum Temp	-11.0	-14.0	-3.0	14.0	28.0	42.0	51.0	49.0	30.0	15.0	0.0	-8.0	-14.0
Record Maximum Temp	81.0	88.0	94.0	98.0	102.0	108.0	105.0	106.0	102.0	95.0	87.0	81.0	108.0
HDD, Base 65°F	927	722	555	266	89	6	0	0	26	226	570	871	4258
CDD, Base 65°F	0	0	0	20	102	279	422	357	149	25	0	0	1354
Humidity Ratio (#w/#da)	0.0024	0.0029	0.0035	0.0049	0.0075	0.0106	0.0117	0.0119	0.0098	0.0061	0.0040	0.0027	0.0065
Wind Speed (mph)	13.3	13.8	15.1	15.2	14.7	13.9	13.0	11.8	12.7	12.9	13.2	12.8	13.5
Clearness Index, Kt	0.58	0.58	0.59	0.61	0.59	0.61	0.61	0.60	0.58	0.61	0.57	0.56	0.60

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

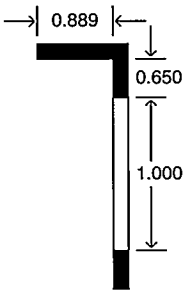
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	28/17	69/46	89/62	81/57	47/33	31/21	74/53	101/73	104/81	83/63	15/9	59/38	88/58	89/64	65/47	8/6	42/27	58/39	47/32	16/11
North	8/7	13/15	15/18	14/16	10/11	24/14	14/16	16/18	16/18	15/17	6/4	12/13	15/17	16/18	13/15	4/3	10/10	11/13	10/11	5/5
East	73/26	73/41	27/24	14/16	10/11	69/32	82/51	49/38	16/18	15/17	49/16	81/39	47/32	16/18	13/15	36/10	55/27	16/15	10/11	5/5
South	26/12	63/36	80/51	73/47	43/26	9/8	17/17	36/30	38/34	23/22	9/5	44/25	68/41	70/47	49/32	26/8	79/36	97/49	85/41	40/16
West	8/7	13/15	15/18	56/38	81/43	9/8	14/16	16/18	35/31	74/55	6/4	12/13	15/17	37/30	76/46	4/3	10/10	11/13	49/27	50/18
M. Clr (%hrs)	45	46	46	43	45	55	57	58	52	51	50	52	53	51	51	48	48	49	50	52

Austin, TX

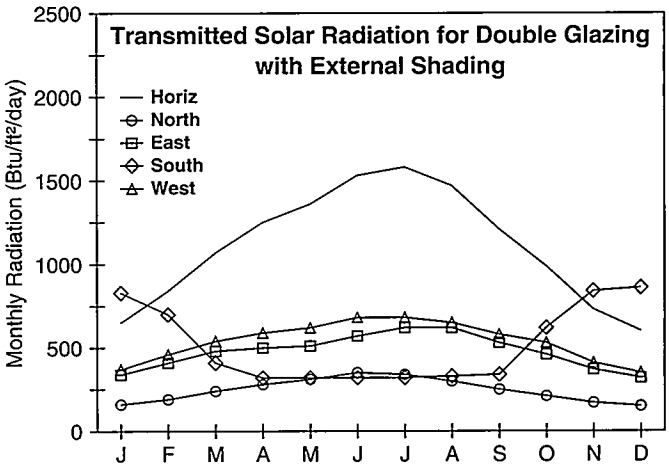
WBAN NO. 13958

LATITUDE: 30.30° N
LONGITUDE: 97.70° W
ELEVATION: 620 feet
MEAN PRESSURE: 14.4 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	940	1200	1500	1720	1870	2090	2150	2010	1660	1380	1050	880	1540
	Std.Dev.	77	97	116	161	149	130	137	111	118	109	103	68	32
	Minimum	800	980	1240	1480	1450	1810	1770	1740	1410	1110	800	770	1500
	Maximum	1110	1400	1740	2100	2110	2310	2380	2230	1930	1550	1250	1080	1610
	Diffuse	410	490	630	740	830	810	750	700	640	500	420	380	610
	Clear-Day Global	1320	1630	2030	2380	2560	2620	2570	2400	2100	1720	1370	1210	1990
North	Global	270	320	400	460	560	640	610	500	410	340	280	250	420
	Diffuse	270	320	400	450	500	520	510	460	410	340	280	250	390
	Clear-Day Global	240	290	360	440	590	710	650	490	370	310	250	230	410
East	Global	570	690	810	870	900	1010	1100	1070	910	780	620	540	820
	Diffuse	320	380	470	540	580	610	610	580	510	420	340	300	470
	Clear-Day Global	880	1050	1220	1340	1390	1390	1370	1340	1230	1070	900	820	1170
South	Global	1200	1210	1080	850	660	590	640	820	1040	1260	1260	1200	980
	Diffuse	420	460	520	530	520	510	510	530	540	500	440	400	490
	Clear-Day Global	2050	1930	1600	1090	740	610	660	930	1360	1770	1980	2040	1390
West	Global	610	760	920	1000	1060	1170	1160	1100	970	870	680	580	910
	Diffuse	330	390	490	560	610	630	620	590	520	430	350	300	480
	Clear-Day Global	880	1050	1220	1340	1390	1390	1370	1340	1230	1070	900	820	1170

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

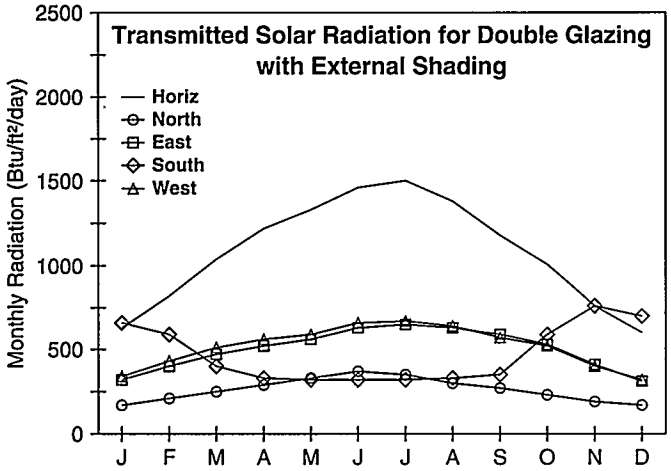
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	650	840	1070	1250	1360	1530	1580	1470	1210	990	730	600	1110
North	Unshaded	180	220	270	320	360	400	390	330	280	240	200	170	280
	Shaded	160	190	240	280	310	350	340	300	250	210	170	150	250
East	Unshaded	390	480	570	610	640	710	780	760	640	550	430	370	580
	Shaded	340	410	480	500	510	570	620	620	530	460	370	320	480
South	Unshaded	880	860	720	520	400	370	380	480	660	880	920	900	660
	Shaded	830	700	410	320	320	320	320	330	340	620	840	860	520
West	Unshaded	430	530	650	720	760	830	830	780	690	620	480	400	640
	Shaded	370	460	540	590	620	680	680	650	580	530	410	350	540

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	48.8	52.8	61.5	69.6	75.6	81.3	84.5	84.8	80.2	71.1	60.9	51.6	68.6
Daily Minimum Temp	38.6	42.1	51.1	59.8	66.5	71.5	73.9	73.9	69.8	60.0	49.9	41.2	58.2
Daily Maximum Temp	58.9	63.4	71.9	79.4	84.7	91.1	95.0	95.5	90.5	82.1	71.8	62.0	78.9
Record Minimum Temp	-2.0	7.0	18.0	35.0	43.0	53.0	64.0	61.0	41.0	32.0	20.0	4.0	-2.0
Record Maximum Temp	90.0	97.0	98.0	98.0	100.0	105.0	109.0	106.0	104.0	98.0	91.0	90.0	109.0
HDD, Base 65°F	514	353	175	28	0	0	0	0	0	17	175	426	1688
CDD, Base 65°F	12	11	66	166	329	489	605	614	456	206	52	10	3016
Humidity Ratio (#w/#da)	0.0052	0.0058	0.0075	0.0102	0.0131	0.0153	0.0156	0.0153	0.0141	0.0106	0.0079	0.0058	0.0105
Wind Speed (mph)	9.6	10.2	10.6	10.1	9.3	8.6	7.9	7.5	7.9	7.9	8.9	9.2	9.0
Clearness Index, Kt	0.50	0.52	0.53	0.53	0.53	0.57	0.60	0.60	0.56	0.56	0.52	0.50	0.55

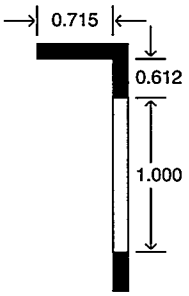
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	35/19	77/46	95/59	82/52	43/28	34/21	77/56	102/78	102/80	76/59	20/12	66/44	92/68	91/67	62/44	18/10	53/30	66/38	51/30	15/10
North	9/8	14/17	16/19	15/17	10/11	24/13	18/18	17/19	17/19	17/18	7/6	14/15	17/19	17/19	14/15	6/5	11/12	13/14	11/12	5/4
East	76/20	69/34	21/21	15/17	10/11	65/26	77/51	43/36	17/19	17/17	55/17	77/42	42/34	17/19	14/15	52/11	54/23	13/14	11/12	5/4
South	29/12	61/31	74/42	64/37	35/19	10/9	17/17	29/27	29/27	17/17	12/7	43/28	63/45	62/45	41/28	39/10	82/30	94/38	80/32	35/11
West	9/8	14/17	16/19	63/36	79/35	10/9	17/17	17/19	42/36	75/55	7/6	14/15	17/19	45/35	76/46	6/5	11/12	14/15	55/25	47/14
M. Clr (%hrs)	32	35	39	42	43	26	37	41	45	54	38	40	43	44	49	34	37	39	40	41



Brownsville, TX

WBAN NO. 12919



Shading Geometry
(Not to Scale)

LATITUDE: 25.90° N
LONGITUDE: 97.43° W
ELEVATION: 20 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Primary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	910	1160	1450	1680	1830	2010	2050	1900	1640	1420	1090	870	1500
	Std.Dev.	107	134	131	129	146	103	146	123	152	105	107	90	56
	Minimum	690	880	1190	1450	1420	1830	1730	1670	1200	1130	880	720	1370
	Maximum	1120	1420	1770	1910	2070	2190	2320	2130	1860	1600	1270	1080	1590
	Diffuse	480	550	680	810	870	860	820	770	710	580	490	450	670
	Clear-Day Global	1420	1710	2060	2350	2480	2510	2470	2350	2110	1780	1470	1330	2000
North	Global	280	330	400	470	570	670	640	510	430	370	310	270	440
	Diffuse	280	330	400	460	500	530	520	470	420	370	310	270	410
	Clear-Day Global	270	320	370	450	600	730	670	490	390	340	280	260	430
East	Global	520	650	770	850	920	1030	1060	1020	940	840	650	510	810
	Diffuse	330	400	490	560	600	630	620	600	540	460	370	320	490
	Clear-Day Global	890	1030	1180	1280	1300	1290	1280	1250	1180	1060	910	840	1120
South	Global	960	1020	940	740	580	520	540	680	910	1160	1150	1000	850
	Diffuse	430	470	520	530	510	500	500	520	540	530	480	420	500
	Clear-Day Global	1920	1780	1420	940	600	500	540	770	1210	1630	1860	1930	1250
West	Global	550	690	830	920	980	1070	1100	1030	910	830	650	520	840
	Diffuse	340	400	500	570	610	630	620	590	540	460	380	320	500
	Clear-Day Global	890	1030	1180	1280	1300	1290	1280	1250	1180	1060	910	840	1120

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	630	820	1040	1220	1330	1460	1500	1380	1180	1010	760	600	1080
North	Unshaded	200	230	280	320	370	420	400	330	290	250	210	190	290
	Shaded	170	210	250	290	330	370	350	300	270	230	190	170	260
East	Unshaded	360	460	540	600	650	730	750	730	670	590	460	350	570
	Shaded	320	400	470	520	560	630	650	630	590	530	410	310	500
South	Unshaded	700	710	610	450	370	350	350	400	560	790	830	730	570
	Shaded	660	590	400	330	320	320	320	330	350	590	760	700	470
West	Unshaded	380	480	590	650	690	760	780	740	650	580	460	370	590
	Shaded	340	430	510	560	590	660	670	640	570	520	400	320	520

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	59.4	62.4	68.8	75.3	79.9	83.0	84.5	84.5	81.8	75.7	68.7	62.1	73.8
Daily Minimum Temp	49.9	52.5	59.1	66.5	72.0	74.9	75.7	75.4	73.2	66.1	59.0	52.4	64.7
Daily Maximum Temp	68.9	72.2	78.4	84.0	87.8	91.0	93.3	93.6	90.4	85.3	78.3	71.7	82.9
Record Minimum Temp	19.0	22.0	32.0	38.0	52.0	60.0	68.0	63.0	55.0	40.0	33.0	16.0	16.0
Record Maximum Temp	93.0	94.0	106.0	102.0	102.0	102.0	102.0	102.0	104.0	96.0	97.0	94.0	106.0
HDD, Base 65°F	232	135	41	0	0	0	0	0	0	0	50	177	635
CDD, Base 65°F	59	62	159	312	462	540	605	605	504	332	161	87	3888
Humidity Ratio (#w/#da)	0.0087	0.0093	0.0111	0.0136	0.0160	0.0175	0.0176	0.0177	0.0169	0.0139	0.0115	0.0095	0.0136
Wind Speed (mph)	10.6	11.8	13.1	13.4	12.8	11.5	11.2	10.2	9.3	9.2	10.6	10.7	11.2
Clearness Index, Kt	0.43	0.46	0.49	0.51	0.52	0.56	0.58	0.56	0.53	0.54	0.49	0.43	0.52

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

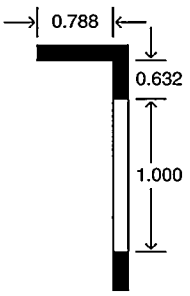
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	36/20	78/48	97/62	84/52	43/27	29/23	71/58	101/79	102/79	76/58	20/13	65/49	92/69	91/68	61/44	20/11	57/32	70/41	54/32	17/10
North	10/9	16/17	17/19	16/17	11/11	22/16	23/21	18/19	18/19	24/22	8/6	16/16	18/19	18/19	15/15	7/5	13/12	14/15	12/12	6/5
East	70/23	68/36	21/21	16/17	11/11	53/32	71/54	43/36	18/19	17/18	47/21	73/49	41/34	18/19	15/15	48/12	52/24	14/15	12/12	6/5
South	26/12	55/31	68/41	59/34	31/17	10/9	17/18	22/22	22/22	17/18	11/7	39/28	56/42	55/41	36/25	36/10	75/30	87/39	72/31	31/10
West	10/9	16/17	17/19	63/36	74/32	10/9	17/18	18/19	43/37	75/53	8/6	16/16	18/19	46/36	74/44	7/5	13/12	16/16	53/25	42/13
M. Clr (%hrs)	27	28	30	32	34	49	34	29	38	48	59	41	28	33	44	31	26	26	28	33

Corpus Christi, TX

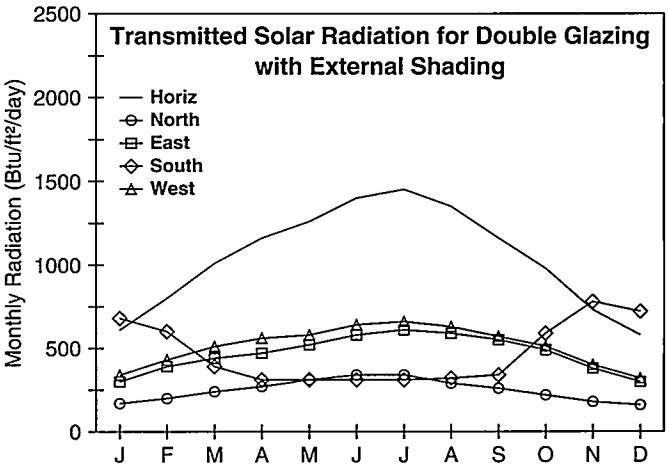
WBAN NO. 12924

LATITUDE: 27.77° N
LONGITUDE: 97.50° W
ELEVATION: 43 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary



Shading Geometry (Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	880	1130	1400	1600	1730	1920	1980	1850	1600	1370	1040	840	1450
	Std.Dev.	70	99	124	135	131	136	137	97	119	91	102	72	29
	Minimum	750	960	1150	1390	1470	1710	1660	1600	1390	1110	840	690	1360
	Maximum	1030	1330	1700	1890	1940	2220	2200	2030	1830	1530	1270	1050	1490
	Diffuse	450	520	640	750	820	820	790	740	660	520	440	420	630
	Clear-Day Global	1370	1670	2040	2340	2500	2530	2500	2360	2100	1740	1410	1270	1990
North	Global	270	320	390	450	540	630	610	490	410	350	290	260	420
	Diffuse	270	320	390	440	480	510	500	460	410	350	290	260	390
	Clear-Day Global	260	300	360	440	600	710	650	490	390	320	270	240	420
East	Global	500	640	730	790	860	960	1010	970	890	790	610	490	770
	Diffuse	320	380	460	530	570	600	610	580	520	430	350	300	470
	Clear-Day Global	880	1030	1190	1300	1330	1320	1310	1280	1190	1050	900	820	1130
South	Global	990	1040	950	740	580	530	560	710	940	1180	1170	1020	870
	Diffuse	410	460	500	510	500	490	490	510	530	500	440	400	480
	Clear-Day Global	1960	1830	1480	1000	660	540	580	830	1270	1680	1890	1950	1300
West	Global	550	690	840	930	970	1060	1100	1040	930	830	660	530	850
	Diffuse	330	390	470	540	580	610	600	580	520	440	350	310	480
	Clear-Day Global	880	1030	1190	1300	1330	1320	1310	1280	1190	1050	900	820	1130

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

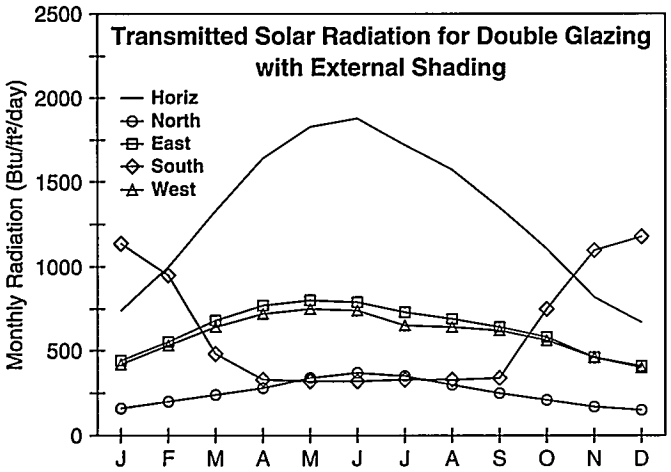
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	610	800	1010	1160	1260	1400	1450	1350	1160	980	730	580	1040
North	Unshaded	190	220	270	310	350	400	380	320	280	240	200	180	280
	Shaded	170	200	240	270	310	340	340	290	260	220	180	160	250
East	Unshaded	350	450	520	560	610	680	710	690	640	560	430	340	540
	Shaded	300	390	440	470	520	580	610	590	550	490	380	300	470
South	Unshaded	720	730	620	450	360	340	350	420	590	800	850	750	580
	Shaded	680	600	390	310	310	310	310	320	340	590	780	720	470
West	Unshaded	390	490	600	660	690	750	780	750	660	590	460	370	600
	Shaded	340	430	510	560	580	640	660	630	570	510	400	320	510

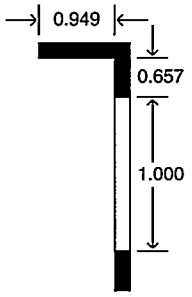
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	55.1	58.5	65.6	72.5	77.9	81.9	84.1	84.2	81.0	73.9	65.7	58.3	71.6
Daily Minimum Temp	45.3	48.0	55.3	63.2	69.5	73.4	74.8	75.0	72.3	63.9	55.6	48.4	62.1
Daily Maximum Temp	65.0	69.0	75.7	81.7	86.2	90.4	93.3	93.4	89.7	83.9	75.8	68.3	81.0
Record Minimum Temp	14.0	18.0	24.0	33.0	47.0	58.0	64.0	64.0	50.0	39.0	29.0	13.0	13.0
Record Maximum Temp	91.0	98.0	102.0	102.0	103.0	101.0	104.0	103.0	103.0	98.0	98.0	91.0	104.0
HDD, Base 65°F	338	213	100	9	0	0	0	0	0	0	95	261	1016
CDD, Base 65°F	31	31	119	234	400	507	592	595	480	281	116	53	3439
Humidity Ratio (#w/#da)	0.0075	0.0081	0.0101	0.0130	0.0158	0.0177	0.0179	0.0179	0.0168	0.0133	0.0105	0.0083	0.0131
Wind Speed (mph)	12.0	13.4	14.3	14.4	12.8	11.2	11.4	11.1	11.0	10.8	12.4	12.2	12.2
Clearness Index, Kt	0.44	0.47	0.48	0.48	0.49	0.53	0.56	0.55	0.52	0.53	0.49	0.44	0.50

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	35/18	77/45	94/58	82/50	43/26	30/22	73/55	99/74	100/76	75/55	19/13	64/46	92/65	90/67	61/45	19/10	54/30	68/38	52/30	16/10
North	9/8	15/16	16/19	15/17	11/10	22/15	21/20	17/19	17/19	21/19	7/6	15/16	17/18	17/19	15/15	6/5	12/12	13/14	12/12	6/5
East	73/19	67/33	20/20	15/17	11/10	56/30	73/51	43/35	17/19	17/17	48/21	74/46	41/32	17/19	15/15	50/12	52/22	13/14	12/12	6/5
South	27/11	57/29	69/39	61/34	33/17	10/9	17/17	24/23	24/23	17/17	11/7	41/28	60/41	58/43	38/27	38/10	77/29	89/37	75/29	32/10
West	9/8	15/16	16/19	62/35	77/32	10/9	17/17	17/19	42/35	75/51	7/6	15/16	17/18	45/36	75/47	6/5	12/12	15/15	54/23	44/13
M. Clr (%hrs)	29	28	31	36	38	33	22	25	37	49	50	33	29	36	45	27	29	29	32	36





Shading Geometry
(Not to Scale)

El Paso, TX

WBAN NO. 23044

LATITUDE: 31.80° N
LONGITUDE: 106.40° W
ELEVATION: 3918 feet
MEAN PRESSURE: 12.8 psia

STATION TYPE: Primary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	1090	1430	1840	2240	2470	2540	2330	2140	1860	1560	1200	1010	1810
	Std.Dev.	90	95	103	100	82	104	96	105	109	94	82	75	39
	Minimum	920	1210	1540	1990	2270	2310	2150	1830	1650	1350	990	860	1750
	Maximum	1250	1590	2020	2390	2670	2720	2490	2360	2040	1740	1330	1120	1870
	Diffuse	330	390	490	560	600	620	730	670	550	420	340	310	500
	Clear-Day Global	1290	1630	2070	2460	2690	2740	2650	2460	2130	1720	1350	1180	2030
North	Global	260	310	390	470	610	710	630	500	400	340	270	240	430
	Diffuse	260	310	390	450	500	520	520	470	400	340	270	240	390
	Clear-Day Global	230	280	350	440	620	740	670	480	370	300	240	220	410
East	Global	720	920	1140	1310	1380	1380	1280	1200	1090	970	780	680	1070
	Diffuse	320	390	480	550	590	610	630	580	510	430	340	300	480
	Clear-Day Global	880	1070	1280	1430	1500	1490	1450	1390	1280	1100	910	830	1220
South	Global	1610	1640	1450	1100	790	660	700	900	1210	1550	1640	1610	1240
	Diffuse	430	480	520	530	510	510	530	540	520	500	440	410	490
	Clear-Day Global	2110	2020	1700	1180	800	650	690	970	1440	1860	2050	2090	1460
West	Global	700	890	1070	1240	1320	1310	1160	1120	1060	950	770	670	1020
	Diffuse	320	390	480	560	600	610	630	590	510	430	340	300	480
	Clear-Day Global	880	1070	1280	1430	1500	1490	1450	1390	1280	1100	910	830	1220

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	740	1000	1330	1640	1830	1880	1720	1570	1350	1110	820	670	1310
North	Unshaded	180	220	270	310	380	430	400	330	280	230	190	170	280
	Shaded	160	200	240	280	340	370	350	300	250	210	170	150	250
East	Unshaded	500	650	820	940	990	990	910	850	780	690	540	470	760
	Shaded	440	550	680	770	800	790	730	690	640	580	460	410	630
South	Unshaded	1200	1180	960	650	440	380	410	520	770	1080	1210	1210	830
	Shaded	1140	950	480	330	320	320	330	330	340	750	1100	1180	630
West	Unshaded	490	620	760	880	940	930	820	790	750	670	540	460	720
	Shaded	420	530	640	720	750	740	650	640	620	560	460	400	590

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	42.8	48.1	55.1	63.4	71.8	80.4	82.3	80.1	74.4	64.0	52.4	44.1	63.2
Daily Minimum Temp	29.4	33.9	40.2	48.0	56.5	64.3	68.4	66.6	61.6	49.6	38.4	30.7	49.0
Daily Maximum Temp	56.1	62.2	69.9	78.7	87.1	96.5	96.1	93.5	87.1	78.4	66.4	57.5	77.5
Record Minimum Temp	-8.0	8.0	14.0	23.0	31.0	46.0	57.0	56.0	41.0	25.0	1.0	5.0	-8.0
Record Maximum Temp	80.0	83.0	89.0	98.0	104.0	111.0	112.0	108.0	104.0	96.0	87.0	80.0	112.0
HDD, Base 65°F	688	473	316	110	7	0	0	0	0	88	378	648	2708
CDD, Base 65°F	0	0	10	62	217	462	536	468	282	57	0	0	2094
Humidity Ratio (#w/#da)	0.0031	0.0031	0.0031	0.0035	0.0048	0.0070	0.0108	0.0112	0.0097	0.0063	0.0041	0.0034	0.0059
Wind Speed (mph)	7.2	7.9	9.8	9.9	9.1	7.9	7.2	6.6	6.4	6.2	6.9	6.8	7.6
Clearness Index, Kt	0.61	0.64	0.67	0.69	0.70	0.70	0.65	0.64	0.63	0.64	0.62	0.60	0.66

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

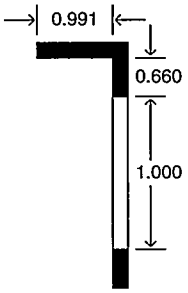
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	48/34	85/66	96/76	77/59	34/24	47/35	89/70	109/92	103/87	72/58	31/20	75/53	96/72	88/67	53/40	25/16	57/39	64/46	43/31	6/5
North	10/11	15/17	16/18	14/16	9/9	24/18	16/18	16/18	16/18	17/18	9/8	15/16	16/19	16/18	12/13	7/7	12/13	12/14	10/11	3/2
East	86/50	63/47	16/18	14/16	9/9	82/48	76/58	33/31	16/18	14/16	72/31	75/47	31/27	16/18	12/13	59/25	47/29	12/14	10/11	3/2
South	40/26	69/52	78/60	63/46	29/18	11/12	20/21	33/32	29/29	14/16	20/12	52/34	68/49	62/46	36/25	51/22	88/49	95/57	74/41	18/7
West	10/11	15/17	23/23	72/51	77/39	11/12	16/18	16/18	52/47	82/61	9/8	15/16	16/19	55/42	79/48	7/7	12/13	24/20	60/34	27/10
M. Clr (%hrs)	62	59	55	54	56	77	78	77	75	67	62	66	63	61	61	58	59	54	54	54

Fort Worth, TX

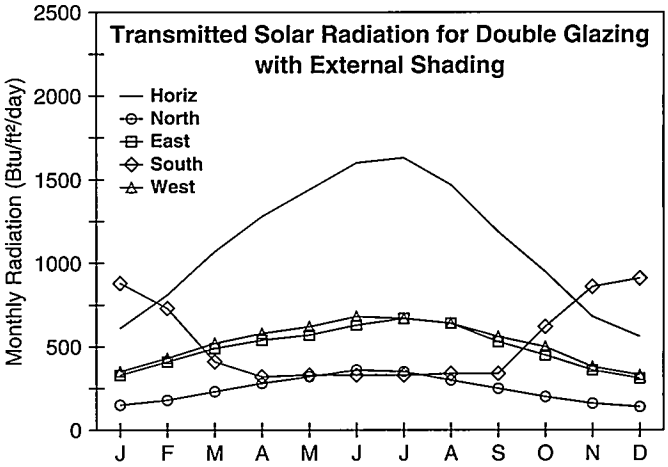
WBAN NO. 03927

LATITUDE: 32.83° N
LONGITUDE: 97.05° W
ELEVATION: 538 feet
MEAN PRESSURE: 14.4 psia

STATION TYPE: Primary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	910	1160	1490	1770	1970	2190	2220	2010	1650	1330	990	830	1550
	Std.Dev.	86	91	117	139	132	110	121	112	117	114	82	62	30
	Minimum	710	1000	1230	1560	1610	2010	1990	1760	1420	1100	820	720	1500
	Maximum	1050	1360	1700	2100	2200	2370	2470	2200	1840	1510	1130	980	1610
	Diffuse	370	460	610	740	840	840	780	740	650	490	390	340	600
	Clear-Day Global	1210	1540	1960	2340	2560	2630	2570	2370	2030	1620	1260	1100	1930
North	Global	250	310	390	470	570	660	630	510	420	340	260	230	420
	Diffuse	250	310	390	460	510	540	520	480	410	340	260	230	390
	Clear-Day Global	230	280	350	430	580	690	640	480	370	300	230	210	400
East	Global	560	710	850	950	1020	1120	1200	1120	930	790	610	530	870
	Diffuse	300	370	470	550	610	640	630	600	520	410	320	270	480
	Clear-Day Global	830	1010	1200	1340	1400	1410	1390	1330	1210	1030	860	770	1150
South	Global	1260	1270	1160	930	740	680	720	890	1090	1290	1290	1260	1050
	Diffuse	400	450	520	550	550	550	540	560	550	490	420	370	500
	Clear-Day Global	2030	1960	1660	1180	820	690	740	1010	1430	1800	1960	2000	1440
West	Global	600	740	900	1020	1100	1190	1190	1110	970	840	650	560	900
	Diffuse	310	370	480	570	630	660	640	600	530	420	320	270	480
	Clear-Day Global	830	1010	1200	1340	1400	1410	1390	1330	1210	1030	860	770	1150

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

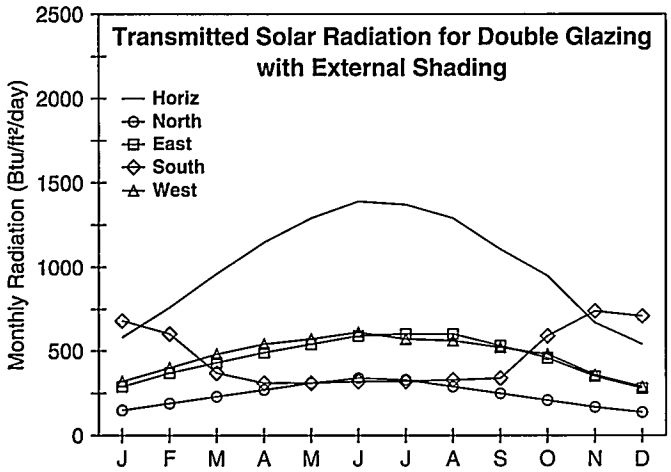
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	610	810	1070	1280	1440	1600	1630	1470	1190	950	680	560	1110
North	Unshaded	170	210	270	320	370	420	400	340	290	230	180	160	280
	Shaded	150	180	230	280	320	360	350	300	250	200	160	140	240
East	Unshaded	390	490	600	680	720	800	850	800	660	560	430	370	610
	Shaded	330	410	490	540	570	630	670	640	530	450	360	310	490
South	Unshaded	940	910	780	580	450	410	420	530	710	910	950	940	710
	Shaded	880	730	410	320	330	330	330	340	340	620	860	910	530
West	Unshaded	420	520	640	730	780	850	850	790	690	590	450	390	640
	Shaded	350	430	520	580	620	680	670	640	560	500	380	330	520

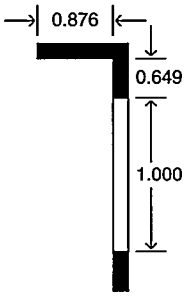
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	43.4	47.9	56.7	65.5	72.8	81.0	85.3	84.9	77.4	67.2	56.2	46.9	65.4
Daily Minimum Temp	32.7	36.9	45.6	54.7	62.6	70.0	74.1	73.6	66.9	55.8	45.4	36.3	54.6
Daily Maximum Temp	54.1	58.9	67.8	76.3	82.9	91.9	96.5	96.2	87.8	78.5	66.8	57.5	76.3
Record Minimum Temp	4.0	7.0	15.0	29.0	41.0	51.0	59.0	56.0	43.0	29.0	20.0	-1.0	-1.0
Record Maximum Temp	88.0	88.0	96.0	95.0	103.0	113.0	110.0	108.0	106.0	102.0	89.0	88.0	113.0
HDD, Base 65°F	670	484	286	75	0	0	0	0	0	51	275	566	2407
CDD, Base 65°F	0	5	29	90	246	480	629	617	372	119	11	5	2603
Humidity Ratio (#w/#da)	0.0042	0.0048	0.0065	0.0090	0.0121	0.0145	0.0149	0.0145	0.0131	0.0093	0.0067	0.0048	0.0095
Wind Speed (mph)	11.3	12.0	12.9	12.7	11.6	10.3	9.7	8.9	9.5	9.9	11.0	10.9	10.9
Clearness Index, Kt	0.52	0.53	0.54	0.55	0.56	0.60	0.62	0.60	0.56	0.56	0.53	0.51	0.56

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	35/20	76/48	92/59	79/52	41/26	36/25	80/59	105/80	103/83	77/60	21/13	66/43	92/64	89/65	59/43	16/9	50/29	62/38	47/28	12/8
North	9/8	14/16	16/19	15/17	10/10	24/15	16/18	17/20	18/20	17/18	7/6	15/15	17/19	17/19	14/15	6/4	11/11	12/14	10/11	5/4
East	76/25	68/37	19/20	15/17	10/10	69/33	79/53	43/36	18/20	17/18	54/19	77/40	41/31	17/19	14/15	48/12	51/23	12/14	10/11	5/4
South	31/14	64/35	78/45	67/39	35/19	11/10	19/20	34/31	34/32	19/19	13/7	46/28	67/44	65/45	42/28	37/10	82/32	95/41	79/32	29/10
West	9/8	14/16	16/19	63/37	77/34	11/10	16/18	17/20	44/39	77/55	7/6	15/15	17/19	46/35	75/44	6/4	11/11	15/14	55/25	40/12
M. Clr (%hrs)	36	37	40	40	42	41	41	42	44	53	46	46	45	46	51	40	40	42	43	45





Shading Geometry
(Not to Scale)

Houston, TX

WBAN NO. 12960

LATITUDE: 29.98° N
LONGITUDE: 95.37° W
ELEVATION: 108 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	840	1080	1340	1590	1780	1910	1880	1780	1540	1330	970	790	1400
	Std.Dev.	80	93	113	152	144	156	122	126	121	128	104	54	39
	Minimum	710	880	1130	1350	1470	1620	1600	1520	1330	1040	690	690	1330
	Maximum	1000	1290	1600	2020	2030	2180	2130	2000	1790	1660	1240	930	1510
	Diffuse	420	500	630	760	830	860	860	790	680	520	430	390	640
	Clear-Day Global	1300	1620	2010	2350	2520	2570	2520	2350	2060	1680	1340	1190	1960
North	Global	260	310	380	450	550	630	590	500	410	340	270	240	410
	Diffuse	260	310	380	440	490	520	510	470	410	340	270	240	390
	Clear-Day Global	240	290	360	430	590	700	640	490	390	320	260	230	410
East	Global	490	620	730	840	930	1020	1030	1010	900	780	580	470	780
	Diffuse	300	370	450	530	590	620	620	590	520	430	330	290	470
	Clear-Day Global	860	1030	1200	1320	1360	1350	1330	1280	1180	1030	860	800	1130
South	Global	990	1050	950	780	630	570	610	750	960	1190	1130	1000	880
	Diffuse	390	440	490	520	520	510	520	540	540	500	420	380	480
	Clear-Day Global	2000	1900	1570	1070	730	610	660	920	1340	1720	1900	1960	1360
West	Global	530	660	800	910	980	1030	980	950	870	800	610	490	800
	Diffuse	310	370	460	540	600	620	610	580	510	430	330	290	470
	Clear-Day Global	860	1030	1200	1320	1360	1350	1330	1280	1180	1030	860	800	1130

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	580	760	960	1150	1290	1390	1370	1290	1110	950	670	540	1010
North	Unshaded	180	220	260	310	360	400	380	330	280	240	190	170	280
	Shaded	150	190	230	270	310	340	330	290	250	210	170	140	240
East	Unshaded	340	440	520	600	650	720	730	720	640	550	400	330	550
	Shaded	290	370	430	490	540	590	600	600	530	460	350	280	460
South	Unshaded	730	740	630	480	390	360	380	450	610	830	820	740	600
	Shaded	680	600	370	310	310	320	320	330	340	590	740	710	470
West	Unshaded	370	470	570	650	690	730	690	670	610	560	420	340	570
	Shaded	320	400	480	540	570	610	570	560	520	480	360	290	470

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	50.4	53.9	60.6	68.3	74.5	80.4	82.6	82.3	78.2	69.6	61.0	53.5	67.9
Daily Minimum Temp	39.7	42.6	50.0	58.1	64.4	70.6	72.4	72.0	67.9	57.6	49.6	42.2	57.3
Daily Maximum Temp	61.0	65.3	71.1	78.4	84.6	90.1	92.7	92.5	88.4	81.6	72.4	64.7	78.6
Record Minimum Temp	12.0	20.0	22.0	31.0	44.0	52.0	62.0	62.0	48.0	32.0	19.0	7.0	7.0
Record Maximum Temp	84.0	91.0	91.0	95.0	97.0	103.0	104.0	107.0	102.0	96.0	89.0	83.0	107.0
HDD, Base 65°F	468	322	187	36	0	0	0	0	0	31	181	374	1599
CDD, Base 65°F	16	11	50	135	295	462	546	536	396	174	61	18	2700
Humidity Ratio (#w/#da)	0.0063	0.0068	0.0086	0.0113	0.0138	0.0163	0.0172	0.0171	0.0154	0.0115	0.0090	0.0071	0.0117
Wind Speed (mph)	8.9	9.4	9.9	9.9	8.8	8.1	7.2	6.8	7.3	7.6	8.5	8.7	8.4
Clearness Index, Kt	0.44	0.47	0.47	0.49	0.50	0.52	0.52	0.53	0.52	0.53	0.48	0.44	0.50

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

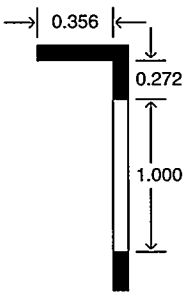
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	39/20	78/44	94/54	79/45	39/22	36/24	78/56	101/73	99/71	72/51	23/15	68/46	92/64	86/61	56/39	20/10	54/29	65/36	48/26	12/7
North	10/9	15/16	16/18	15/16	10/9	24/15	18/18	17/19	18/19	19/18	8/7	15/16	17/19	17/18	14/14	7/5	11/12	13/14	11/11	5/4
East	77/21	65/31	16/19	15/16	10/9	64/31	74/49	39/32	18/19	17/17	53/21	74/43	38/30	17/18	14/14	51/12	50/21	13/14	11/11	5/4
South	31/12	61/29	72/38	62/31	31/15	11/10	17/18	29/26	28/25	17/17	14/8	45/29	64/43	60/40	38/24	40/10	80/28	91/34	74/25	26/8
West	10/9	15/16	16/19	65/32	76/25	11/10	17/18	17/19	46/36	74/47	8/7	15/16	17/19	48/34	73/40	7/5	11/12	18/15	55/21	37/10
M. Clr (%hrs)	28	29	30	32	36	42	31	28	30	38	51	38	33	34	39	29	29	30	32	32

Lubbock, TX

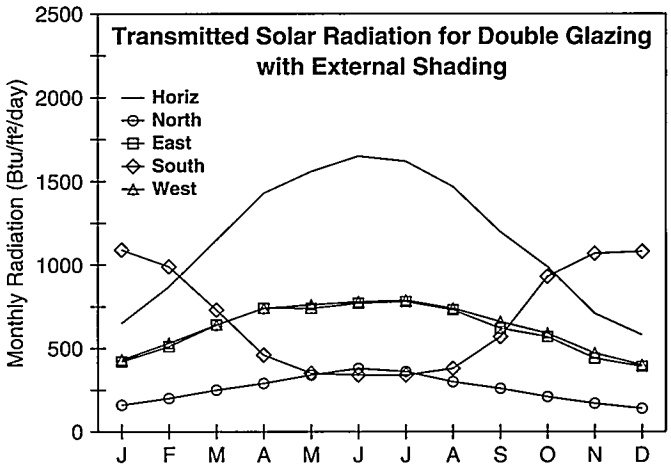
WBAN NO. 23042

LATITUDE: 33.65° N
LONGITUDE: 101.82° W
ELEVATION: 3242 feet
MEAN PRESSURE: 13.1 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	970	1240	1610	1960	2130	2240	2200	2010	1660	1400	1050	890	1620
	Std.Dev.	74	94	105	108	108	122	134	126	122	122	82	74	35
	Minimum	840	1070	1430	1760	1880	2020	1900	1750	1430	1180	870	700	1550
	Maximum	1100	1430	1790	2180	2340	2480	2480	2220	1900	1610	1180	1030	1670
	Diffuse	330	410	530	610	700	700	690	640	570	410	340	300	520
	Clear-Day Global	1210	1550	1990	2390	2620	2690	2620	2410	2060	1640	1270	1100	1960
North	Global	240	300	380	460	570	650	620	490	400	320	260	220	410
	Diffuse	240	300	380	440	490	510	500	450	390	320	260	220	370
	Clear-Day Global	220	270	340	430	590	710	650	470	360	290	230	200	400
East	Global	640	780	980	1120	1150	1200	1210	1130	950	860	680	600	940
	Diffuse	300	370	470	540	590	600	600	560	480	390	310	270	460
	Clear-Day Global	860	1030	1250	1400	1460	1460	1440	1380	1260	1060	870	790	1190
South	Global	1480	1450	1300	1040	780	670	710	900	1120	1440	1480	1450	1150
	Diffuse	410	460	520	530	530	510	520	520	510	460	410	380	480
	Clear-Day Global	2110	2020	1730	1230	850	700	750	1030	1480	1870	2040	2070	1490
West	Global	660	800	980	1120	1170	1210	1210	1130	1010	890	710	610	960
	Diffuse	300	370	470	550	600	610	610	570	500	390	320	280	470
	Clear-Day Global	860	1030	1250	1400	1460	1460	1440	1380	1260	1060	870	790	1190

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

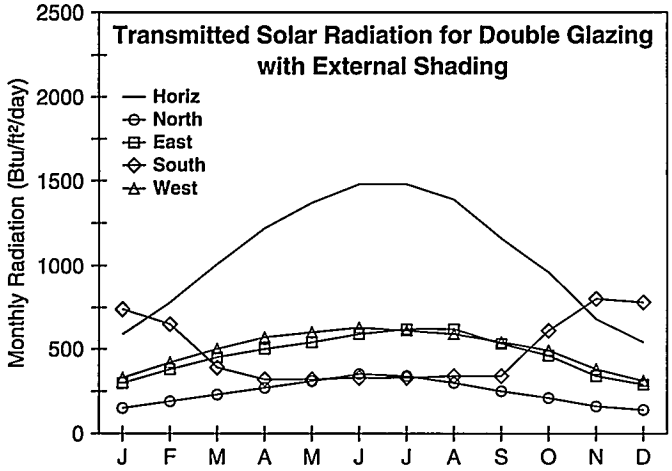
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	650	870	1150	1430	1560	1650	1620	1470	1200	990	710	580	1160
North	Unshaded	170	210	260	310	360	410	390	320	270	220	180	150	270
	Shaded	160	200	250	290	340	380	360	300	260	210	170	140	250
East	Unshaded	440	550	690	800	820	850	860	800	680	610	470	410	670
	Shaded	420	510	640	740	740	770	780	730	620	570	440	390	610
South	Unshaded	1100	1040	870	630	450	390	410	530	730	1020	1090	1090	780
	Shaded	1090	990	730	460	350	340	340	380	570	930	1070	1080	690
West	Unshaded	460	560	700	800	830	860	860	810	720	630	500	420	680
	Shaded	430	530	640	740	760	780	790	740	660	590	470	400	630

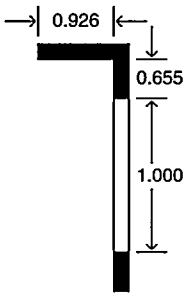
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	38.8	43.1	51.2	61.1	69.4	77.2	80.0	77.9	71.1	61.4	49.8	40.6	60.1
Daily Minimum Temp	24.6	28.6	36.4	46.7	55.8	64.3	68.0	66.2	59.4	48.1	36.5	27.2	46.8
Daily Maximum Temp	52.9	57.6	66.0	75.4	83.1	90.0	91.9	89.6	82.9	74.7	63.2	54.1	73.5
Record Minimum Temp	-16.0	-8.0	2.0	22.0	30.0	44.0	51.0	52.0	33.0	20.0	-1.0	-2.0	-16.0
Record Maximum Temp	83.0	87.0	95.0	100.0	104.0	110.0	108.0	106.0	103.0	98.0	86.0	81.0	110.0
HDD, Base 65°F	812	613	437	161	25	0	0	0	17	154	456	756	3431
CDD, Base 65°F	0	0	10	44	162	366	465	400	200	42	0	0	1689
Humidity Ratio (#w/#da)	0.0028	0.0033	0.0040	0.0055	0.0082	0.0113	0.0124	0.0127	0.0109	0.0072	0.0046	0.0032	0.0072
Wind Speed (mph)	12.6	13.3	14.6	14.9	14.6	13.3	11.5	10.1	10.6	11.3	11.9	11.9	12.5
Clearness Index, Kt	0.57	0.58	0.59	0.61	0.60	0.61	0.61	0.60	0.57	0.60	0.57	0.56	0.59

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	28/17	71/48	91/65	83/56	48/34	30/20	74/52	101/75	103/80	83/62	14/9	60/37	89/58	91/65	66/47	10/6	44/28	60/40	50/33	17/12
North	8/7	13/15	15/18	15/17	11/12	24/13	15/16	16/18	16/18	16/17	6/4	13/13	16/18	16/18	14/15	4/3	10/10	12/13	11/11	6/5
East	73/27	73/43	28/25	15/17	11/12	67/29	81/51	49/39	16/18	16/17	47/15	80/37	48/32	16/18	14/15	39/11	56/27	17/16	11/11	6/5
South	25/12	61/37	77/53	71/45	42/26	9/8	15/16	33/29	35/31	22/21	8/5	42/23	66/40	68/46	48/32	28/8	78/35	95/49	85/41	41/17
West	8/7	13/15	15/18	56/37	82/44	9/8	15/16	16/18	35/31	74/54	6/4	13/13	16/18	37/30	75/46	4/3	10/10	12/13	50/27	51/20
M. Clr (%hrs)	48	48	45	45	45	54	54	56	56	54	48	50	51	48	51	48	50	49	49	50





Shading Geometry
(Not to Scale)

Luffkin, TX

WBAN NO. 93987

LATITUDE: 31.23° N
LONGITUDE: 94.75° W
ELEVATION: 315 feet
MEAN PRESSURE: 14.6 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	860	1110	1410	1680	1880	2030	2030	1910	1600	1350	990	800	1470
	Std.Dev.	76	89	103	137	128	140	112	84	81	119	88	52	29
	Minimum	720	910	1210	1410	1640	1660	1770	1710	1380	1070	770	720	1400
	Maximum	1020	1280	1670	2070	2140	2260	2280	2100	1760	1560	1130	940	1530
	Diffuse	410	500	630	760	850	870	860	780	680	510	410	370	640
	Clear-Day Global	1260	1580	1980	2330	2530	2580	2520	2340	2040	1640	1290	1150	1940
North	Global	260	310	390	460	560	640	600	500	420	340	270	240	420
	Diffuse	260	310	390	450	510	530	520	470	420	340	270	240	390
	Clear-Day Global	240	290	350	440	590	690	640	490	390	320	250	220	410
East	Global	510	650	780	880	950	1040	1080	1070	910	780	580	490	810
	Diffuse	310	370	460	550	600	630	630	600	520	420	330	280	480
	Clear-Day Global	840	1010	1190	1330	1370	1370	1340	1290	1190	1020	850	780	1130
South	Global	1070	1130	1030	850	680	620	660	820	1030	1260	1200	1100	950
	Diffuse	400	460	510	540	540	530	540	550	550	510	430	380	500
	Clear-Day Global	2000	1910	1600	1120	780	650	700	960	1380	1740	1920	1960	1390
West	Global	550	700	850	980	1050	1100	1060	1020	920	830	640	530	850
	Diffuse	310	380	470	560	620	640	640	600	530	430	330	290	480
	Clear-Day Global	840	1010	1190	1330	1370	1370	1340	1290	1190	1020	850	780	1130

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	590	780	1010	1220	1370	1480	1480	1390	1160	960	680	540	1060
North	Unshaded	180	220	270	320	370	410	390	340	290	240	190	160	280
	Shaded	150	190	230	270	310	350	340	300	250	210	160	140	240
East	Unshaded	360	450	550	620	670	730	760	760	640	550	400	340	570
	Shaded	300	380	450	500	540	590	620	620	530	460	340	290	470
South	Unshaded	790	810	690	530	420	380	400	490	660	880	880	820	640
	Shaded	740	650	390	320	320	330	330	340	340	610	800	780	500
West	Unshaded	390	490	600	700	740	780	750	720	650	590	440	360	600
	Shaded	330	420	500	570	600	630	610	590	540	490	380	310	500

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	47.6	51.5	59.5	67.4	73.9	79.8	82.8	82.5	77.4	67.7	58.3	50.3	66.6
Daily Minimum Temp	36.9	39.8	47.4	55.8	63.2	69.5	72.2	71.3	66.5	54.9	46.4	38.9	55.2
Daily Maximum Temp	58.3	63.1	71.5	78.9	84.5	90.1	93.2	93.6	88.2	80.4	70.2	61.7	77.8
Record Minimum Temp	8.1	16.0	19.0	30.0	43.0	51.1	57.9	55.0	39.0	30.2	18.0	3.0	3.0
Record Maximum Temp	84.9	91.0	90.0	93.9	98.1	100.0	102.9	107.1	102.0	95.0	89.6	82.0	107.1
HDD, Base 65°F	550	387	214	54	0	0	0	0	0	48	232	466	1951
CDD, Base 65°F	11	9	44	126	276	444	552	543	372	132	31	11	2551
Humidity Ratio (#w/#da)	0.0055	0.0060	0.0077	0.0103	0.0132	0.0159	0.0169	0.0163	0.0145	0.0104	0.0080	0.0062	0.0109
Wind Speed (mph)	7.1	7.7	8.1	7.9	6.9	5.8	5.4	5.4	5.8	5.9	6.8	7.3	6.7
Clearness Index, Kt	0.47	0.49	0.50	0.52	0.53	0.55	0.56	0.57	0.54	0.55	0.50	0.47	0.53

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

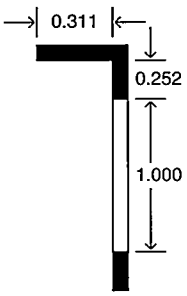
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	39/21	78/46	92/56	77/47	37/23	38/25	79/58	101/79	99/77	71/52	24/14	68/46	91/67	86/64	55/40	20/11	52/29	63/36	46/25	10/6
North	10/9	15/17	16/19	15/16	10/9	23/15	17/18	18/19	18/19	18/18	8/7	15/16	18/19	17/19	14/14	6/5	11/12	12/14	10/10	4/3
East	77/21	64/32	16/19	15/16	10/9	66/30	74/50	39/33	18/19	17/17	56/19	74/41	37/31	17/19	14/14	51/12	48/21	12/14	10/10	4/3
South	32/13	63/32	74/40	62/33	31/16	11/10	19/19	32/29	30/28	17/17	14/8	46/29	65/46	61/44	38/25	41/10	80/29	92/36	74/25	24/7
West	10/9	15/17	17/19	65/34	74/28	11/10	17/18	18/19	47/39	75/48	8/7	15/16	18/19	49/37	73/42	6/5	11/12	19/15	55/21	34/9
M. Clr (%hrs)	33	35	35	37	40	40	37	37	39	50	48	46	38	41	46	32	34	37	39	42

Midland, TX

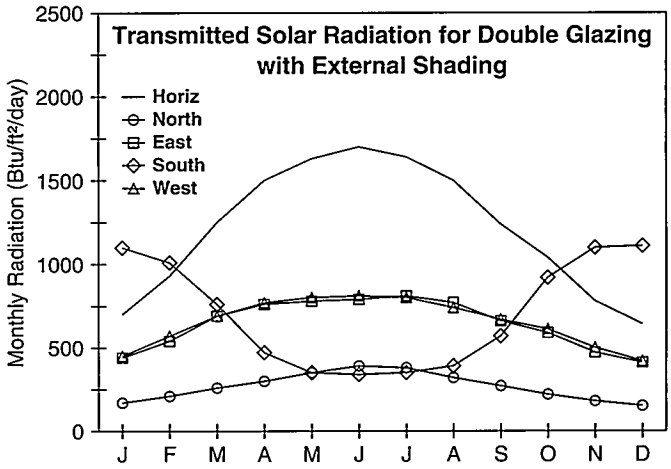
WBAN NO. 23023

LATITUDE: 31.93° N
LONGITUDE: 102.20° W
ELEVATION: 2858 feet
MEAN PRESSURE: 13.3 psia

STATION TYPE: Primary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	1040	1330	1730	2050	2220	2320	2230	2050	1710	1470	1130	960	1690
	Std.Dev.	85	87	110	147	96	108	147	109	126	126	98	72	30
	Minimum	900	1140	1500	1790	2020	2120	1870	1810	1400	1230	860	810	1630
	Maximum	1210	1510	1920	2310	2350	2600	2520	2240	1920	1650	1290	1130	1740
	Diffuse	350	430	540	640	710	720	730	690	590	430	360	310	540
	Clear-Day Global	1280	1620	2050	2420	2630	2680	2610	2420	2100	1690	1340	1180	2000
North	Global	260	320	390	470	590	670	640	510	400	330	270	240	420
	Diffuse	260	320	390	450	500	520	520	470	400	330	270	240	390
	Clear-Day Global	230	280	350	440	600	720	650	480	360	300	240	210	400
East	Global	670	820	1030	1150	1190	1210	1230	1170	990	880	710	630	970
	Diffuse	310	380	480	560	600	610	610	580	500	410	330	280	470
	Clear-Day Global	890	1060	1270	1400	1450	1450	1430	1370	1250	1080	910	820	1200
South	Global	1490	1480	1340	1030	760	650	680	870	1100	1440	1510	1500	1150
	Diffuse	410	470	530	540	530	520	520	540	520	470	430	390	490
	Clear-Day Global	2110	2010	1690	1170	790	650	690	970	1430	1850	2050	2100	1460
West	Global	690	850	1040	1170	1210	1240	1210	1120	1000	920	750	650	990
	Diffuse	310	390	490	570	610	630	630	590	510	410	330	290	480
	Clear-Day Global	890	1060	1270	1400	1450	1450	1430	1370	1250	1080	910	820	1200

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

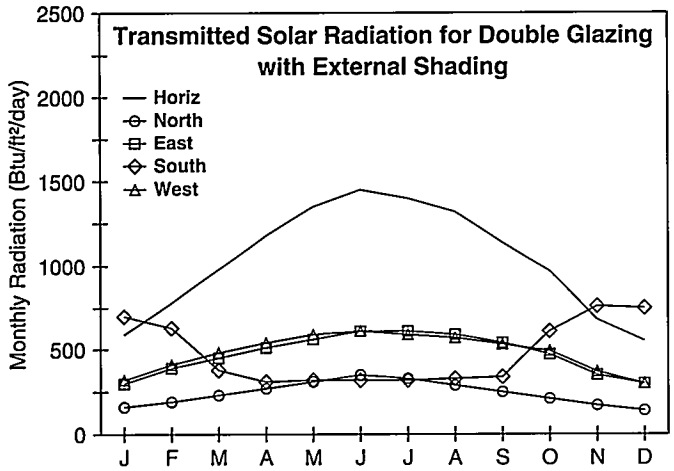
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	700	930	1250	1500	1630	1700	1640	1500	1240	1040	780	640	1210
North	Unshaded	180	220	270	320	380	420	400	330	280	230	190	160	280
	Shaded	170	210	260	300	350	390	380	320	270	220	180	150	270
East	Unshaded	460	570	730	820	840	860	870	830	700	620	500	430	690
	Shaded	440	540	690	760	780	790	810	770	660	590	470	410	640
South	Unshaded	1110	1060	890	620	440	380	400	510	700	1000	1120	1120	780
	Shaded	1100	1010	760	470	350	340	350	390	570	920	1100	1110	700
West	Unshaded	480	600	740	830	870	880	860	800	720	650	520	450	700
	Shaded	450	570	690	770	800	810	800	740	670	610	500	420	650

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	42.5	47.1	55.7	64.6	72.8	79.6	82.0	80.8	73.3	64.0	52.6	44.6	63.3
Daily Minimum Temp	28.5	32.6	40.2	49.4	58.1	65.7	68.5	67.5	61.1	50.6	38.9	30.8	49.3
Daily Maximum Temp	56.5	61.6	71.2	79.8	87.4	93.4	95.4	94.1	85.4	77.3	66.2	58.4	77.2
Record Minimum Temp	-8.0	-11.0	9.0	20.0	34.0	47.0	53.0	54.0	36.0	26.0	13.0	-1.0	-11.0
Record Maximum Temp	84.0	90.0	95.0	101.0	108.0	109.0	112.0	107.0	107.0	100.0	89.0	85.0	112.0
HDD, Base 65°F	698	501	309	108	10	0	0	0	10	106	377	632	2751
CDD, Base 65°F	0	0	21	96	252	438	527	490	259	75	5	0	2163
Humidity Ratio (#w/#da)	0.0032	0.0037	0.0043	0.0059	0.0086	0.0114	0.0119	0.0120	0.0112	0.0080	0.0052	0.0036	0.0074
Wind Speed (mph)	10.8	11.5	13.0	13.1	12.9	12.6	11.2	10.5	10.4	10.4	10.7	10.5	11.5
Clearness Index, Kt	0.58	0.60	0.63	0.63	0.63	0.63	0.62	0.61	0.58	0.61	0.59	0.57	0.61

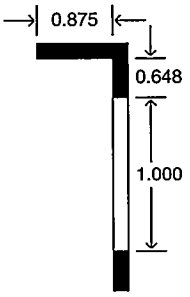
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	29/18	73/51	94/68	86/63	51/36	29/20	74/54	103/77	106/84	84/67	14/9	61/38	91/60	93/66	68/49	11/7	48/30	65/42	54/35	20/13
North	8/7	14/16	16/19	15/18	11/12	24/14	17/18	17/19	16/19	16/18	6/4	13/14	16/18	16/19	14/15	4/3	10/11	12/14	11/12	6/6
East	74/27	75/45	29/26	15/18	11/12	65/29	83/52	51/41	16/19	16/18	47/14	82/38	49/34	16/19	14/15	43/11	58/27	18/17	11/12	6/6
South	25/12	60/38	76/53	70/48	42/27	9/8	15/17	30/28	33/30	20/21	8/5	41/24	64/40	66/45	47/32	30/9	80/35	97/48	87/42	45/18
West	8/7	14/16	16/19	57/41	83/46	9/8	15/17	17/19	35/32	75/57	6/4	13/14	16/18	37/30	76/47	4/3	10/11	12/14	51/28	56/22
M. Clr (%hrs)	53	54	52	51	49	52	58	61	59	57	51	53	52	48	48	48	51	52	51	50



Port Arthur, TX

WBAN NO. 12917



Shading Geometry
(Not to Scale)

LATITUDE: 29.95° N
LONGITUDE: 94.02° W
ELEVATION: 23 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	860	1110	1370	1630	1850	1990	1920	1810	1580	1360	980	810	1440
	Std.Dev.	69	94	109	140	136	136	110	102	88	96	85	55	32
	Minimum	730	920	1190	1370	1570	1730	1640	1650	1400	1130	710	710	1380
	Maximum	990	1280	1620	2040	2190	2190	2120	1970	1750	1520	1160	930	1500
	Diffuse	430	490	630	750	830	840	860	790	680	510	420	380	640
	Clear-Day Global	1300	1610	2000	2330	2500	2550	2490	2330	2040	1670	1330	1190	1950
North	Global	260	310	380	460	560	630	600	500	410	340	280	240	410
	Diffuse	260	310	380	450	500	520	510	470	410	340	280	240	390
	Clear-Day Global	240	290	350	430	590	690	640	490	390	320	260	230	410
East	Global	510	650	760	880	970	1050	1030	1010	910	800	590	500	810
	Diffuse	310	370	460	540	600	630	620	590	520	430	330	290	470
	Clear-Day Global	870	1020	1190	1310	1350	1330	1310	1260	1170	1020	860	800	1130
South	Global	1020	1090	970	800	650	580	610	760	990	1230	1150	1050	910
	Diffuse	400	450	500	520	520	510	520	540	540	500	430	380	490
	Clear-Day Global	2000	1890	1550	1070	730	610	660	910	1330	1700	1890	1960	1350
West	Global	540	680	810	920	1010	1060	1010	970	890	820	620	510	820
	Diffuse	310	380	460	550	610	630	620	590	520	430	340	290	480
	Clear-Day Global	870	1020	1190	1310	1350	1330	1310	1260	1170	1020	860	800	1130

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	590	780	980	1180	1350	1450	1400	1320	1140	970	680	550	1030
North	Unshaded	180	220	270	310	360	400	380	330	280	240	190	170	280
	Shaded	160	190	230	270	310	350	330	290	250	210	170	140	240
East	Unshaded	350	460	540	620	680	740	730	720	650	560	410	340	570
	Shaded	300	390	450	510	560	610	610	590	540	470	350	300	470
South	Unshaded	750	770	640	490	390	370	380	460	630	850	840	780	610
	Shaded	700	630	380	310	320	320	320	330	340	610	760	750	480
West	Unshaded	370	480	570	650	720	750	710	690	630	580	430	350	580
	Shaded	320	410	480	540	590	610	590	570	530	490	370	300	480

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	50.9	54.4	61.4	68.9	75.2	80.7	82.8	82.6	78.6	69.7	61.2	54.3	68.4
Daily Minimum Temp	41.5	44.4	51.3	59.5	66.3	72.0	73.7	73.3	69.7	59.2	51.2	44.3	58.9
Daily Maximum Temp	60.3	64.3	71.5	78.3	84.1	89.4	91.9	91.7	87.3	80.2	71.3	64.2	77.9
Record Minimum Temp	14.0	20.0	23.0	32.0	46.0	56.0	61.0	60.0	45.0	32.0	22.0	12.0	12.0
Record Maximum Temp	81.0	85.0	87.0	94.0	97.0	100.0	103.0	107.0	100.0	95.0	88.0	84.0	107.0
HDD, Base 65°F	450	307	155	32	0	0	0	0	0	26	177	352	1499
CDD, Base 65°F	13	10	43	149	316	471	552	546	408	172	63	21	2764
Humidity Ratio (#w/#da)	0.0066	0.0071	0.0090	0.0117	0.0145	0.0172	0.0184	0.0181	0.0161	0.0118	0.0093	0.0075	0.0123
Wind Speed (mph)	10.2	10.9	11.1	11.3	9.9	8.4	7.2	6.9	8.1	8.5	9.8	10.0	9.3
Clearness Index, Kt	0.45	0.48	0.48	0.50	0.52	0.55	0.53	0.54	0.53	0.54	0.49	0.45	0.51

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

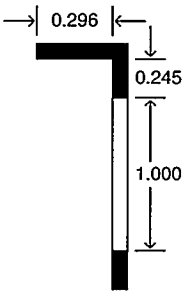
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	41/22	80/48	94/57	78/45	37/22	37/27	79/60	102/77	98/75	70/52	24/17	69/49	92/64	87/64	54/40	22/12	55/31	64/37	47/26	10/7
North	10/9	15/17	16/19	15/16	10/9	23/17	18/18	17/19	18/19	20/19	9/7	16/16	18/18	17/19	14/14	7/5	12/12	13/14	10/10	4/3
East	77/22	63/33	16/19	15/16	10/9	63/37	73/52	37/32	18/19	17/17	54/24	73/45	35/29	17/19	14/14	54/14	48/22	13/14	10/10	4/3
South	33/14	62/33	72/41	60/31	29/14	12/11	18/18	29/26	28/26	17/17	15/9	46/31	63/43	60/42	36/24	44/12	81/31	90/37	73/26	24/7
West	10/9	15/17	18/19	67/33	75/26	12/11	17/18	17/19	48/39	75/50	9/7	16/16	18/18	51/38	73/43	7/5	12/12	20/16	56/22	35/9
M. Clr (%hrs)	31	29	29	32	35	45	37	36	40	43	50	40	36	35	39	31	31	31	33	34

San Angelo, TX

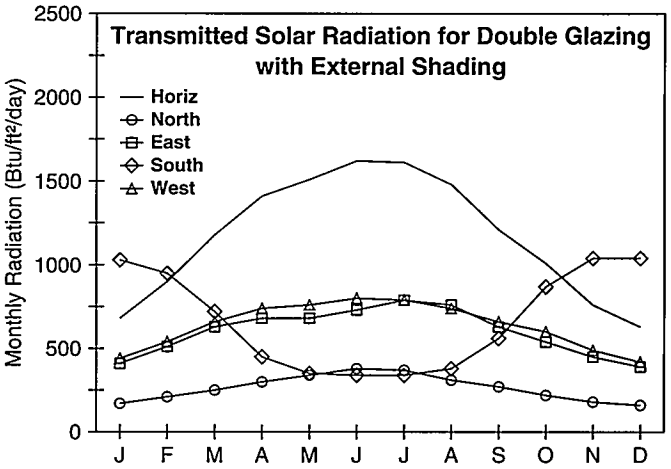
WBAN NO. 23034

LATITUDE: 31.37° N
LONGITUDE: 100.50° W
ELEVATION: 1910 feet
MEAN PRESSURE: 13.8 psia

STATION TYPE: Secondary



Shading Geometry (Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	1010	1280	1640	1930	2060	2200	2190	2020	1670	1420	1100	940	1620
	Std.Dev.	94	106	132	135	120	112	152	123	127	119	86	75	35
	Minimum	830	1070	1370	1710	1770	2030	1770	1680	1490	1210	940	770	1550
	Maximum	1170	1470	1900	2180	2260	2500	2460	2260	1940	1620	1280	1110	1710
	Diffuse	360	450	550	660	740	730	710	660	610	460	370	330	550
	Clear-Day Global	1290	1610	2030	2390	2590	2650	2600	2420	2100	1690	1340	1180	1990
North	Global	260	320	380	460	570	650	630	500	410	330	270	240	420
	Diffuse	260	320	380	450	490	510	500	460	410	330	270	240	390
	Clear-Day Global	230	290	350	440	590	710	650	480	370	310	250	220	410
East	Global	630	770	950	1030	1050	1120	1200	1150	950	820	670	590	910
	Diffuse	310	380	470	550	590	600	600	570	500	410	330	290	470
	Clear-Day Global	880	1050	1240	1370	1410	1420	1410	1360	1240	1070	890	810	1180
South	Global	1400	1390	1250	960	710	620	660	840	1070	1350	1430	1410	1090
	Diffuse	410	470	510	530	520	510	510	520	520	470	430	390	480
	Clear-Day Global	2080	1970	1640	1140	770	630	690	950	1400	1810	2010	2060	1430
West	Global	670	820	990	1120	1150	1220	1190	1110	990	890	730	630	960
	Diffuse	320	390	480	560	600	620	610	580	510	410	340	290	480
	Clear-Day Global	880	1050	1240	1370	1410	1420	1410	1360	1240	1070	890	810	1180

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

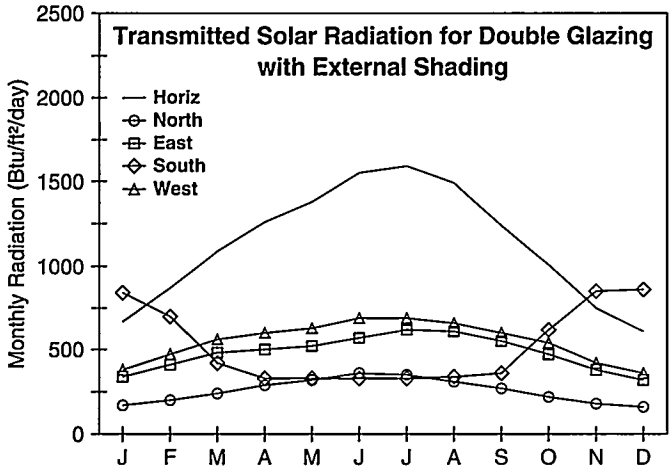
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	680	900	1180	1410	1510	1620	1610	1480	1210	1010	760	630	1170
North	Unshaded	180	220	270	310	360	410	390	330	280	230	190	170	280
	Shaded	170	210	250	300	340	380	370	310	270	220	180	160	260
East	Unshaded	440	540	670	730	740	790	850	820	670	580	470	410	640
	Shaded	410	510	630	680	680	730	790	760	630	540	450	390	600
South	Unshaded	1040	990	830	580	420	370	390	490	680	940	1050	1050	740
	Shaded	1030	950	720	450	350	340	340	380	560	870	1040	1040	670
West	Unshaded	460	580	710	800	820	870	850	790	710	640	520	440	680
	Shaded	440	540	660	740	760	800	790	740	660	600	490	420	640

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	43.7	48.4	58.1	67.0	74.2	79.5	82.7	81.9	75.4	66.2	55.4	46.0	64.9
Daily Minimum Temp	30.6	34.7	43.5	52.7	61.1	66.4	69.1	68.4	64.0	53.6	42.6	33.0	51.6
Daily Maximum Temp	56.8	62.0	72.6	81.2	87.4	92.7	96.2	95.3	86.8	78.8	68.2	59.0	78.1
Record Minimum Temp	5.0	-1.0	8.0	25.0	35.0	48.0	56.0	54.0	37.0	28.0	13.0	-4.0	-4.0
Record Maximum Temp	90.0	91.0	97.0	103.0	107.0	110.0	111.0	109.0	107.0	100.0	93.0	91.0	111.0
HDD, Base 65°F	660	465	247	70	7	0	0	0	6	71	299	589	2414
CDD, Base 65°F	0	0	33	130	292	435	549	524	318	108	11	0	2400
Humidity Ratio (#w/#da)	0.0039	0.0045	0.0056	0.0077	0.0107	0.0131	0.0130	0.0132	0.0124	0.0092	0.0063	0.0045	0.0087
Wind Speed (mph)	10.2	10.8	12.3	11.8	11.3	10.4	9.4	8.8	8.7	8.9	9.8	9.6	10.2
Clearness Index, Kt	0.55	0.57	0.59	0.59	0.58	0.60	0.61	0.60	0.57	0.58	0.56	0.55	0.58

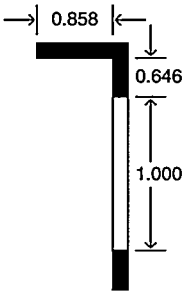
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	31/18	74/49	93/65	84/58	48/32	31/20	75/52	102/75	104/80	81/63	16/10	63/39	91/61	92/67	66/47	13/8	49/31	65/42	53/33	18/12
North	8/8	14/16	16/19	15/17	11/12	24/14	17/17	17/19	17/19	16/17	6/5	14/14	16/18	16/19	14/15	5/4	11/11	12/14	11/12	6/5
East	75/24	73/41	26/24	15/17	11/12	65/29	80/49	48/38	17/19	16/17	50/16	80/38	46/33	16/19	14/15	46/12	56/27	15/15	11/12	6/5
South	26/12	60/36	75/50	68/43	40/23	9/8	15/17	30/27	31/29	18/19	9/6	41/24	63/41	64/45	44/30	33/9	80/35	95/47	84/38	41/16
West	8/8	14/16	16/19	59/39	83/41	9/8	15/16	17/19	37/33	75/56	6/5	14/14	16/18	40/32	76/46	5/4	11/11	12/14	53/27	53/19
M. Clr (%hrs)	46	47	48	48	48	44	49	52	56	59	47	49	47	46	50	43	44	46	50	49



San Antonio, TX

WBAN NO. 12921



Shading Geometry
(Not to Scale)

LATITUDE: 29.53° N
LONGITUDE: 98.47° W
ELEVATION: 794 feet
MEAN PRESSURE: 14.3 psia

STATION TYPE: Primary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	970	1230	1520	1740	1890	2120	2170	2040	1720	1420	1080	900	1570
	Std.Dev.	74	108	122	157	127	136	148	100	100	106	104	70	37
	Minimum	820	1040	1210	1380	1560	1790	1790	1780	1480	1140	850	780	1490
	Maximum	1120	1460	1820	2030	2060	2320	2430	2240	1950	1610	1310	1100	1640
	Diffuse	420	510	650	790	890	870	820	780	700	530	440	400	650
	Clear-Day Global	1350	1660	2050	2380	2560	2610	2570	2410	2120	1740	1390	1240	2010
North	Global	270	330	400	480	570	660	630	520	430	350	290	260	430
	Diffuse	270	330	400	470	520	540	530	490	430	350	290	260	410
	Clear-Day Global	240	290	360	440	590	710	660	490	380	310	260	230	410
East	Global	580	700	810	860	900	1000	1080	1050	920	790	630	530	820
	Diffuse	330	390	480	560	610	640	630	610	540	430	350	310	490
	Clear-Day Global	900	1050	1230	1340	1370	1380	1370	1330	1230	1070	910	830	1170
South	Global	1210	1220	1080	840	660	600	640	820	1050	1270	1270	1200	990
	Diffuse	430	470	530	540	540	530	530	550	560	510	450	410	510
	Clear-Day Global	2050	1920	1570	1060	710	580	630	900	1340	1760	1980	2040	1380
West	Global	620	770	930	1020	1070	1170	1180	1120	1000	890	700	590	920
	Diffuse	330	400	500	580	630	650	640	620	550	450	360	310	500
	Clear-Day Global	900	1050	1230	1340	1370	1380	1370	1330	1230	1070	910	830	1170

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	670	870	1090	1260	1380	1550	1590	1490	1240	1010	750	610	1130
North	Unshaded	190	230	280	320	370	420	400	340	300	250	200	180	290
	Shaded	170	200	240	290	320	360	350	310	270	220	180	160	250
East	Unshaded	400	490	570	610	630	700	760	750	650	550	440	370	580
	Shaded	340	410	480	500	520	570	620	610	550	470	380	320	480
South	Unshaded	890	860	710	520	410	380	390	480	660	880	930	890	670
	Shaded	840	700	420	330	330	330	330	340	360	620	850	860	520
West	Unshaded	440	540	660	730	760	840	840	800	710	630	490	410	650
	Shaded	380	470	560	600	630	690	690	660	600	540	420	360	550

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	49.3	53.5	61.7	69.3	75.5	82.2	85.0	84.9	79.3	70.2	60.4	52.2	68.6
Daily Minimum Temp	37.9	41.3	49.7	58.4	65.7	72.6	75.0	74.5	69.2	58.8	48.8	40.8	57.7
Daily Maximum Temp	60.8	65.7	73.5	80.3	85.3	91.8	95.0	95.3	89.3	81.7	71.9	63.5	79.5
Record Minimum Temp	0.0	6.0	19.0	31.0	43.0	53.0	62.0	61.0	41.0	33.0	21.0	6.0	0.0
Record Maximum Temp	89.0	97.0	100.0	100.0	103.0	105.0	106.0	108.0	103.0	99.0	94.0	90.0	108.0
HDD, Base 65°F	494	332	167	32	0	0	0	0	0	30	180	409	1644
CDD, Base 65°F	8	10	64	161	326	516	620	617	429	191	42	12	2996
Humidity Ratio (#w/#da)	0.0053	0.0059	0.0077	0.0104	0.0134	0.0155	0.0157	0.0155	0.0143	0.0108	0.0081	0.0061	0.0107
Wind Speed (mph)	8.7	9.4	10.1	9.9	9.8	9.6	9.3	8.6	8.5	8.5	8.6	8.5	9.1
Clearness Index, Kt	0.50	0.52	0.53	0.53	0.53	0.58	0.61	0.60	0.57	0.56	0.53	0.50	0.55

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

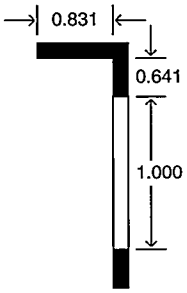
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	35/18	77/46	95/62	84/54	45/30	33/21	76/57	103/81	104/85	78/62	19/13	66/46	93/69	92/72	63/49	17/9	53/31	67/40	53/32	17/11
North	9/8	15/17	16/20	15/18	11/11	24/14	19/19	18/20	18/19	18/19	7/6	15/16	17/19	17/20	15/16	6/4	11/12	13/15	11/12	6/5
East	76/19	70/34	22/22	15/18	11/11	64/27	78/51	45/38	18/19	17/18	52/19	78/46	44/35	17/20	15/16	51/11	54/23	13/15	11/12	6/5
South	28/11	59/31	73/44	64/38	35/20	10/9	17/18	28/27	28/27	17/18	11/7	42/29	62/45	61/48	41/30	38/9	80/30	93/40	80/33	37/12
West	9/8	15/17	16/20	62/37	80/37	10/9	17/18	18/20	42/37	75/56	7/6	15/16	17/19	44/37	76/50	6/4	11/12	14/15	55/25	49/15
M. Clr (%hrs)	31	34	38	41	42	21	30	38	44	53	34	37	41	43	48	33	35	38	39	42

Victoria, TX

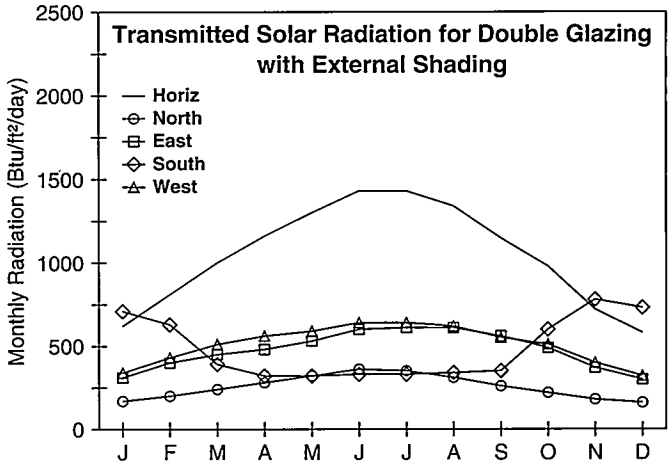
WBAN NO. 12912

LATITUDE: 28.85° N
LONGITUDE: 96.92° W
ELEVATION: 105 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	900	1150	1400	1610	1790	1970	1970	1850	1600	1380	1040	840	1460
	Std.Dev.	64	98	110	145	137	133	130	96	108	103	98	62	30
	Minimum	750	960	1180	1390	1450	1740	1720	1660	1420	1050	810	740	1400
	Maximum	1030	1400	1650	1940	2000	2250	2230	2010	1800	1560	1220	1040	1530
	Diffuse	470	540	690	820	890	900	890	830	720	560	460	430	680
	Clear-Day Global	1340	1660	2040	2370	2530	2580	2520	2370	2090	1720	1380	1240	1990
North	Global	280	330	400	480	570	660	630	520	430	360	290	260	430
	Diffuse	280	330	400	470	510	540	530	490	430	360	290	260	410
	Clear-Day Global	250	300	360	440	600	710	650	500	390	330	270	240	420
East	Global	520	660	750	820	910	1010	1030	1010	920	810	610	500	800
	Diffuse	330	400	480	560	610	640	640	610	540	440	350	310	490
	Clear-Day Global	880	1040	1210	1320	1350	1350	1330	1290	1200	1050	880	810	1140
South	Global	1030	1090	960	780	620	570	600	750	960	1210	1170	1040	900
	Diffuse	430	480	520	540	530	520	530	550	560	520	460	410	500
	Clear-Day Global	1990	1870	1540	1040	700	570	620	880	1310	1710	1910	1970	1340
West	Global	560	710	840	930	1000	1080	1080	1030	910	840	650	530	850
	Diffuse	340	400	490	570	620	640	640	610	540	450	360	320	500
	Clear-Day Global	880	1040	1210	1320	1350	1350	1330	1290	1200	1050	880	810	1140

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

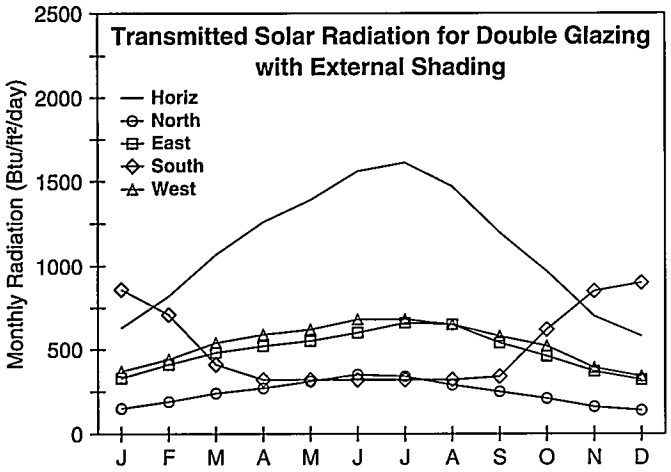
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	620	810	1000	1160	1300	1430	1430	1340	1150	980	720	580	1050
North	Unshaded	190	230	280	320	370	420	400	340	300	250	200	180	290
	Shaded	170	200	240	280	320	360	350	310	260	220	180	160	250
East	Unshaded	370	460	530	580	650	720	730	720	660	570	430	350	560
	Shaded	310	400	450	480	530	600	610	610	560	490	370	300	480
South	Unshaded	760	770	640	480	390	370	380	450	610	830	850	770	610
	Shaded	710	630	390	320	320	330	330	340	350	600	780	730	480
West	Unshaded	390	500	600	660	710	770	770	730	650	590	460	370	600
	Shaded	340	430	510	560	590	640	640	620	550	510	400	320	510

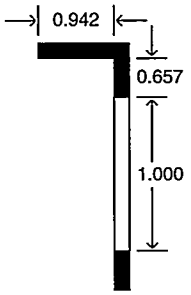
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	52.7	56.1	63.3	70.6	76.6	81.7	84.1	84.1	79.6	71.7	62.9	55.6	69.9
Daily Minimum Temp	42.5	45.4	52.8	61.0	67.7	72.7	74.6	74.2	70.3	60.9	52.4	45.2	60.0
Daily Maximum Temp	62.8	66.8	73.7	80.2	85.3	90.7	93.5	93.9	88.9	82.4	73.4	66.0	79.8
Record Minimum Temp	14.0	19.0	21.0	33.0	49.0	59.0	62.0	63.0	49.0	36.0	24.0	9.0	9.0
Record Maximum Temp	88.0	95.0	97.0	98.0	101.0	101.0	104.0	107.0	102.0	99.0	93.0	88.0	107.0
HDD, Base 65°F	403	266	128	15	0	0	0	0	0	15	147	322	1296
CDD, Base 65°F	21	17	76	183	360	501	592	592	438	223	84	31	3118
Humidity Ratio (#w/#da)	0.0068	0.0072	0.0091	0.0119	0.0145	0.0168	0.0174	0.0173	0.0159	0.0122	0.0095	0.0075	0.0122
Wind Speed (mph)	10.5	11.3	11.8	11.7	11.0	9.7	9.1	8.6	9.0	9.2	10.1	10.4	10.2
Clearness Index, Kt	0.46	0.49	0.49	0.49	0.51	0.54	0.55	0.55	0.53	0.54	0.50	0.45	0.51

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	37/20	78/46	95/58	82/50	42/26	33/24	76/58	102/77	101/79	74/56	20/14	66/48	92/67	89/66	60/44	19/10	54/31	67/39	51/30	15/9
North	10/9	15/17	16/19	15/17	10/11	23/16	20/20	18/19	18/19	20/19	8/6	15/16	18/19	18/19	15/15	6/5	12/12	13/15	11/12	6/4
East	75/21	68/33	19/21	15/17	10/11	59/33	75/53	42/35	18/19	17/18	50/22	75/47	40/32	18/19	15/15	50/12	52/23	13/15	11/12	6/4
South	29/12	60/31	71/39	62/33	33/17	11/10	17/18	27/25	27/25	17/18	12/8	43/30	62/43	60/43	39/26	39/10	79/29	91/37	76/29	31/10
West	10/9	15/17	16/19	63/34	78/31	11/10	17/18	18/19	44/37	75/52	8/6	15/16	18/19	46/36	74/45	6/5	12/12	16/16	55/23	43/12
M. Clr (%hrs)	25	26	28	32	35	34	21	22	26	42	50	35	29	29	37	29	28	28	31	34





Shading Geometry
(Not to Scale)

Waco, TX

WBAN NO. 13959

LATITUDE: 31.62° N
LONGITUDE: 97.22° W
ELEVATION: 509 feet
MEAN PRESSURE: 14.5 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	920	1170	1500	1730	1910	2130	2200	2020	1660	1360	1020	860	1540
	Std.Dev.	77	95	113	156	154	136	139	107	110	110	88	65	34
	Minimum	770	970	1250	1470	1490	1890	1830	1780	1390	1120	800	720	1490
	Maximum	1080	1350	1750	2160	2210	2330	2480	2210	1910	1500	1180	1020	1630
	Diffuse	390	480	610	740	810	790	730	680	620	480	400	350	590
	Clear-Day Global	1270	1590	2000	2360	2560	2630	2580	2390	2070	1670	1310	1160	1970
North	Global	260	320	390	470	560	650	620	500	410	330	270	240	420
	Diffuse	260	320	390	450	500	520	510	460	410	330	270	240	390
	Clear-Day Global	230	290	360	430	590	700	650	490	370	310	240	220	410
East	Global	560	690	830	910	960	1060	1170	1120	930	790	620	540	850
	Diffuse	310	380	470	550	590	610	610	570	510	410	330	280	470
	Clear-Day Global	860	1030	1210	1350	1390	1400	1380	1340	1220	1060	880	800	1160
South	Global	1230	1230	1120	880	690	620	670	850	1070	1290	1270	1240	1010
	Diffuse	410	460	520	540	530	520	520	530	530	480	420	380	490
	Clear-Day Global	2050	1950	1630	1140	780	650	700	970	1400	1800	1970	2020	1420
West	Global	610	740	920	1020	1080	1180	1180	1110	980	860	660	570	910
	Diffuse	320	390	480	560	610	630	620	580	510	420	330	290	480
	Clear-Day Global	860	1030	1210	1350	1390	1400	1380	1340	1220	1060	880	800	1160

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	630	820	1070	1260	1390	1560	1610	1470	1200	970	700	580	1110
North	Unshaded	180	220	270	320	360	410	390	330	280	230	190	160	280
	Shaded	150	190	240	270	310	350	340	290	250	210	160	140	240
East	Unshaded	390	490	590	650	680	750	830	800	660	560	430	370	600
	Shaded	330	410	480	520	550	600	660	650	540	460	370	320	490
South	Unshaded	910	880	750	540	420	380	390	500	690	900	930	930	680
	Shaded	860	710	410	320	320	320	320	320	340	620	850	900	520
West	Unshaded	420	520	650	730	770	840	840	800	700	610	460	400	650
	Shaded	370	440	540	590	620	680	680	650	580	520	390	340	530

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	45.2	49.4	58.2	67.1	74.3	81.5	85.6	85.6	78.6	68.5	57.7	48.3	66.7
Daily Minimum Temp	34.2	38.0	46.8	56.2	64.2	70.9	74.4	74.0	67.6	56.8	46.6	37.3	55.6
Daily Maximum Temp	56.1	60.8	69.6	78.0	84.4	92.0	96.8	97.2	89.6	80.3	68.8	59.3	77.7
Record Minimum Temp	-5.0	4.0	15.0	27.0	37.0	52.0	60.0	57.0	40.0	29.0	17.0	-4.0	-5.0
Record Maximum Temp	88.0	92.0	100.0	101.0	102.0	109.0	108.0	112.0	106.0	101.0	92.0	91.0	112.0
HDD, Base 65°F	620	441	247	66	0	0	0	0	0	38	243	524	2179
CDD, Base 65°F	6	0	36	129	288	495	639	639	408	146	24	6	2816
Humidity Ratio (#w/#da)	0.0047	0.0054	0.0071	0.0097	0.0127	0.0149	0.0151	0.0149	0.0136	0.0101	0.0074	0.0053	0.0101
Wind Speed (mph)	11.5	12.3	13.3	12.9	12.0	11.0	10.7	10.0	10.1	10.2	11.0	11.0	11.3
Clearness Index, Kt	0.51	0.52	0.54	0.53	0.54	0.58	0.61	0.60	0.56	0.56	0.52	0.51	0.56

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

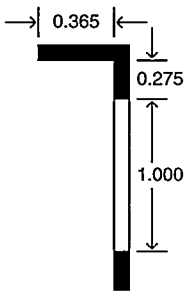
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	36/19	77/46	94/59	81/51	42/27	36/23	79/56	103/77	102/80	76/58	21/13	66/44	92/65	90/66	61/42	17/10	51/30	64/39	49/29	13/9
North	9/8	14/17	16/19	15/17	10/10	24/14	16/18	17/19	17/19	16/17	7/6	14/15	17/19	17/19	14/15	6/4	11/12	12/14	11/11	5/4
East	77/21	68/34	20/21	15/17	10/10	68/30	78/50	43/35	17/19	16/17	56/19	77/42	41/32	17/19	14/15	50/12	52/23	12/14	11/11	5/4
South	30/12	62/32	76/43	65/37	35/19	11/9	17/18	31/28	31/29	17/18	12/7	45/28	65/44	63/45	41/27	39/10	82/31	95/41	79/31	32/10
West	9/8	14/17	16/19	63/36	79/33	11/9	16/18	17/19	43/37	77/54	7/6	14/15	17/19	46/35	77/44	6/4	11/12	15/15	55/24	44/13
M. Clr (%hrs)	35	38	40	41	45	36	40	44	46	55	46	46	47	48	51	37	39	39	44	45

Wichita Falls, TX

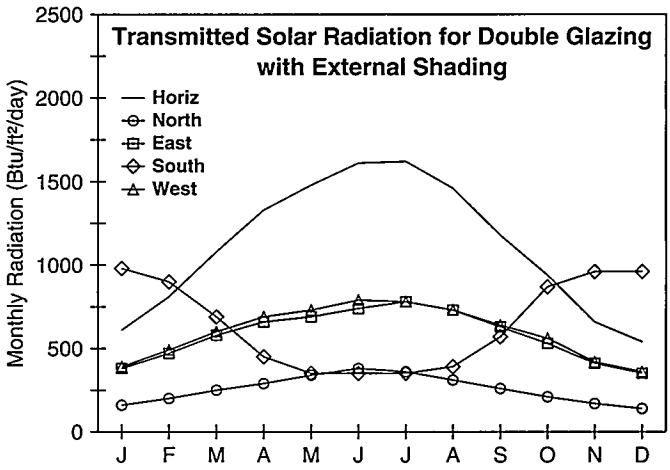
WBAN NO. 13966

LATITUDE: 33.97° N
LONGITUDE: 98.48° W
ELEVATION: 1030 feet
MEAN PRESSURE: 14.2 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	910	1160	1500	1830	2030	2200	2200	2000	1640	1340	980	820	1550
	Std.Dev.	77	82	118	124	122	106	121	108	113	115	77	64	35
	Minimum	710	1010	1270	1590	1820	2030	1990	1740	1430	1080	850	660	1480
	Maximum	1020	1340	1700	2030	2230	2430	2510	2180	1850	1500	1110	960	1620
	Diffuse	350	450	570	680	760	760	720	660	580	450	370	320	560
	Clear-Day Global	1170	1510	1940	2340	2570	2650	2590	2380	2030	1600	1220	1060	1920
North	Global	240	300	380	460	560	650	620	490	400	320	260	220	410
	Diffuse	240	300	380	450	500	520	510	460	390	320	260	220	380
	Clear-Day Global	220	280	350	430	580	700	640	480	360	290	230	200	400
East	Global	590	720	890	1020	1080	1150	1200	1120	960	810	630	540	890
	Diffuse	290	370	470	550	600	620	610	570	490	390	320	270	460
	Clear-Day Global	820	1010	1210	1360	1410	1440	1420	1350	1220	1030	840	750	1160
South	Global	1330	1310	1210	990	770	690	730	910	1120	1360	1320	1300	1080
	Diffuse	400	460	520	540	540	530	530	530	520	470	420	370	490
	Clear-Day Global	2040	1980	1700	1220	860	720	780	1050	1470	1840	1980	2000	1470
West	Global	610	750	910	1060	1120	1210	1210	1130	980	850	640	550	920
	Diffuse	300	370	470	560	610	630	620	580	500	400	320	270	470
	Clear-Day Global	820	1010	1210	1360	1410	1440	1420	1350	1220	1030	840	750	1160

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

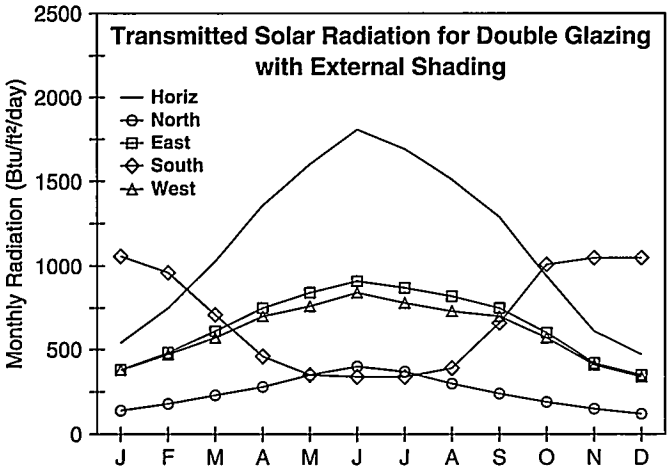
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	610	810	1080	1330	1480	1610	1620	1460	1180	940	660	540	1110
North	Unshaded	170	210	260	310	370	410	390	320	270	220	180	150	270
	Shaded	160	200	250	290	340	380	360	310	260	210	170	140	260
East	Unshaded	410	500	630	730	770	820	860	800	680	570	440	370	630
	Shaded	380	470	580	660	690	740	780	730	630	530	410	350	580
South	Unshaded	1000	950	810	610	460	410	430	540	730	950	980	970	730
	Shaded	980	900	690	450	350	350	350	390	570	870	960	960	650
West	Unshaded	420	530	650	760	800	870	860	800	700	610	450	380	650
	Shaded	390	490	600	690	730	790	780	730	640	560	420	360	600

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	39.8	44.7	53.5	63.1	71.2	79.8	85.0	83.6	75.4	64.6	52.4	42.8	63.0
Daily Minimum Temp	27.6	32.1	40.6	50.3	59.1	68.0	72.7	71.4	63.9	52.2	40.6	30.8	50.8
Daily Maximum Temp	52.0	57.2	66.4	75.8	83.3	91.5	97.2	95.9	86.8	76.9	64.2	54.9	75.2
Record Minimum Temp	-5.0	-8.0	8.0	24.0	36.0	51.0	54.0	54.0	38.0	25.0	14.0	-7.0	-8.0
Record Maximum Temp	87.0	92.0	100.0	102.0	105.0	117.0	114.0	113.0	108.0	102.0	89.0	88.0	117.0
HDD, Base 65°F	781	568	377	125	10	0	0	0	6	104	383	688	3042
CDD, Base 65°F	0	0	20	68	202	444	620	577	318	91	0	0	2340
Humidity Ratio (#w/#da)	0.0034	0.0040	0.0055	0.0079	0.0109	0.0136	0.0138	0.0137	0.0123	0.0085	0.0058	0.0040	0.0086
Wind Speed (mph)	11.5	12.1	13.1	13.2	12.8	11.7	11.1	10.3	10.6	10.9	11.4	10.9	11.6
Clearness Index, Kt	0.53	0.54	0.56	0.57	0.57	0.60	0.61	0.60	0.57	0.57	0.53	0.52	0.57

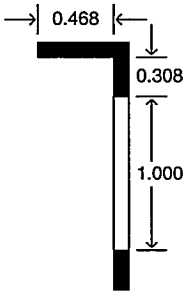
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	32/19	73/46	90/60	79/52	43/28	35/24	78/57	102/77	103/81	79/62	19/12	64/41	90/57	89/61	62/42	13/8	46/29	59/38	46/28	12/8
North	9/8	14/16	15/18	14/17	10/11	24/15	16/17	17/19	17/19	16/18	7/5	14/14	16/18	16/19	14/14	5/4	10/11	12/13	10/11	5/4
East	74/25	69/37	22/21	14/17	10/11	70/35	79/53	44/37	17/19	16/18	54/18	78/40	43/30	16/19	14/14	43/12	52/24	12/14	10/11	5/4
South	29/13	63/35	78/47	69/40	37/21	10/10	19/19	35/31	36/32	20/20	12/7	46/27	68/40	67/43	45/28	33/10	81/33	94/44	80/33	32/11
West	9/8	14/16	15/18	61/36	79/36	10/10	16/17	17/19	41/36	77/57	7/5	14/14	16/18	43/32	77/43	5/4	10/11	13/14	52/24	42/13
M. Clr (%hrs)	42	42	42	42	43	45	46	47	49	52	51	51	52	50	52	44	43	43	45	46



Cedar City, UT

WBAN NO. 93129



Shading Geometry
(Not to Scale)

LATITUDE: 37.70° N
LONGITUDE: 113.10° W
ELEVATION: 5617 feet
MEAN PRESSURE: 12.0 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	840	1100	1460	1880	2200	2460	2300	2070	1800	1360	920	750	1600
	Std.Dev.	62	100	111	122	135	128	131	161	124	96	64	69	51
	Minimum	740	910	1220	1640	1980	2220	2010	1740	1480	1020	820	590	1480
	Maximum	980	1260	1680	2150	2400	2710	2550	2350	1980	1490	1100	890	1730
	Diffuse	300	400	540	620	660	610	650	580	440	350	310	260	480
	Clear-Day Global	1070	1420	1920	2390	2700	2820	2730	2450	2050	1540	1130	960	1930
North	Global	220	280	360	460	590	700	640	490	370	290	230	190	400
	Diffuse	220	280	360	430	490	510	500	440	370	290	230	190	360
	Clear-Day Global	180	240	310	420	610	740	670	470	340	260	200	170	390
East	Global	600	750	950	1170	1330	1440	1380	1290	1160	920	650	550	1020
	Diffuse	270	350	450	530	590	600	590	540	460	360	280	230	440
	Clear-Day Global	820	1010	1260	1460	1560	1590	1560	1460	1300	1070	840	740	1220
South	Global	1430	1410	1290	1110	900	810	840	1030	1380	1580	1440	1400	1220
	Diffuse	380	440	510	540	540	520	530	520	490	430	380	340	470
	Clear-Day Global	2160	2130	1870	1390	1020	860	910	1200	1650	2000	2120	2120	1620
West	Global	590	730	890	1090	1200	1330	1240	1150	1090	890	630	540	950
	Diffuse	270	350	460	540	600	610	600	550	470	370	280	240	440
	Clear-Day Global	820	1010	1260	1460	1560	1590	1560	1460	1300	1070	840	740	1220

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	540	750	1030	1360	1600	1810	1690	1510	1290	940	610	470	1140
North	Unshaded	150	190	250	300	380	440	400	320	260	200	160	130	270
	Shaded	140	180	230	280	350	400	370	300	240	190	150	120	240
East	Unshaded	410	530	680	840	960	1040	990	930	840	650	450	380	730
	Shaded	380	480	610	750	840	910	870	820	750	600	420	350	650
South	Unshaded	1080	1030	880	700	530	460	480	630	910	1130	1080	1060	830
	Shaded	1060	960	710	460	350	340	340	390	660	1010	1050	1050	700
West	Unshaded	410	510	640	780	860	950	890	820	780	630	440	370	680
	Shaded	380	470	570	700	760	840	780	730	700	570	410	340	600

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	29.5	34.6	40.0	47.5	56.5	66.7	74.1	72.0	63.0	51.6	39.7	30.6	50.5
Daily Minimum Temp	17.2	22.1	27.1	33.4	41.1	49.6	58.0	56.5	47.1	36.2	26.7	18.2	36.1
Daily Maximum Temp	41.7	47.0	52.9	61.5	71.9	83.7	90.2	87.4	79.0	67.0	52.7	43.0	64.8
Record Minimum Temp	-16.1	-23.1	3.0	10.0	21.9	32.0	42.1	39.0	24.1	-4.0	-4.0	-23.1	-23.1
Record Maximum Temp	66.9	72.0	75.0	82.0	91.9	100.9	102.9	99.0	93.0	84.9	73.9	66.0	102.9
HDD, Base 65°F	1101	851	775	525	275	60	0	0	129	421	759	1066	5962
CDD, Base 65°F	0	0	0	0	12	111	282	219	69	5	0	0	698
Humidity Ratio (#w/#da)	0.0026	0.0029	0.0032	0.0034	0.0043	0.0048	0.0071	0.0075	0.0056	0.0041	0.0033	0.0026	0.0043
Wind Speed (mph)	6.0	6.9	8.3	8.9	8.8	8.5	8.1	7.7	7.7	6.7	7.3	6.0	7.6
Clearness Index, Kt	0.56	0.56	0.57	0.60	0.62	0.67	0.64	0.63	0.65	0.62	0.57	0.55	0.61

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

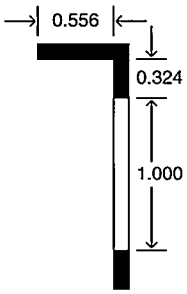
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	33/21	71/48	87/61	76/52	41/27	40/29	80/62	103/82	104/77	81/59	21/14	63/46	87/67	87/64	61/44	10/7	42/27	54/37	41/27	9/7
North	8/8	13/15	15/17	14/16	9/10	23/17	14/16	16/18	16/17	14/16	6/6	12/14	15/17	15/17	12/13	4/3	9/10	11/12	9/10	4/3
East	80/34	69/40	20/20	14/16	9/10	82/46	81/60	43/37	16/17	14/16	66/29	80/50	41/34	15/17	12/13	43/14	52/26	11/12	9/10	4/3
South	32/17	68/40	83/54	73/44	40/21	9/10	23/22	41/36	42/35	24/22	14/9	50/34	73/54	72/52	48/32	34/11	84/38	99/50	82/39	31/10
West	8/8	13/15	15/17	61/38	81/37	9/10	14/16	16/18	41/34	79/54	6/6	12/14	15/17	43/34	79/49	4/3	9/10	12/13	52/27	42/13
M. Clr (%hrs)	44	39	34	31	32	73	71	67	59	55	71	70	65	59	58	47	46	41	41	43

Salt Lake City, UT

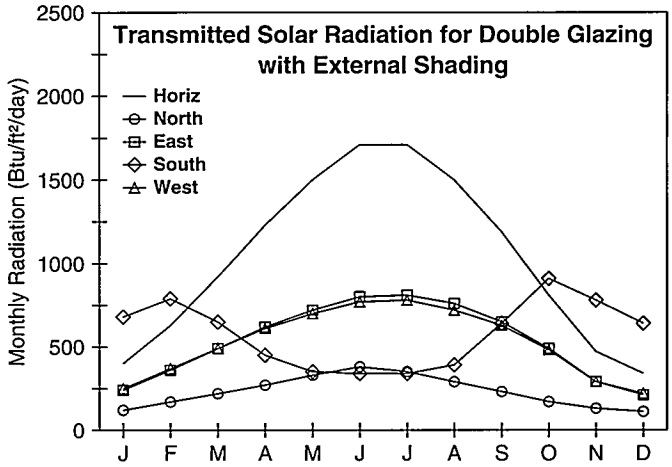
WBAN NO. 24127

LATITUDE: 40.77° N
LONGITUDE: 111.97° W
ELEVATION: 4226 feet
MEAN PRESSURE: 12.6 psia

STATION TYPE: Primary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	610	920	1300	1710	2060	2330	2320	2060	1660	1170	710	530	1450
	Std.Dev.	62	83	112	126	157	149	113	98	117	89	69	65	50
	Minimum	490	710	970	1430	1730	1980	2140	1920	1370	980	560	360	1320
	Maximum	770	1060	1490	1920	2370	2570	2520	2280	1870	1330	850	660	1540
	Diffuse	350	440	560	680	720	670	610	550	450	360	330	300	500
	Clear-Day Global	890	1260	1770	2290	2640	2770	2670	2370	1920	1390	960	790	1810
North	Global	200	270	350	450	570	660	620	480	360	270	210	180	390
	Diffuse	200	270	350	440	490	520	490	430	360	270	210	180	350
	Clear-Day Global	180	240	310	420	600	720	660	460	340	260	190	160	380
East	Global	400	590	800	1010	1190	1330	1330	1240	1050	780	480	350	880
	Diffuse	250	340	430	530	590	610	590	530	450	340	260	220	430
	Clear-Day Global	690	920	1180	1420	1550	1590	1550	1430	1250	980	730	620	1160
South	Global	940	1160	1200	1090	950	880	930	1130	1370	1440	1090	880	1090
	Diffuse	370	450	510	560	560	550	530	520	480	420	360	330	470
	Clear-Day Global	1960	2040	1880	1480	1120	950	1010	1290	1700	1950	1950	1890	1600
West	Global	410	600	800	1000	1160	1270	1280	1170	1020	770	480	360	860
	Diffuse	250	340	440	540	600	620	590	540	450	350	260	220	430
	Clear-Day Global	690	920	1180	1420	1550	1590	1550	1430	1250	980	730	620	1160

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

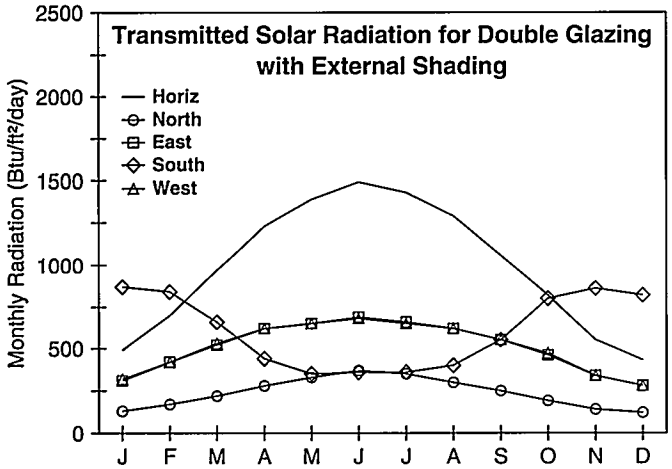
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	400	630	920	1230	1500	1710	1710	1500	1190	810	470	340	1030
North	Unshaded	140	190	240	300	370	420	390	310	250	190	140	120	260
	Shaded	120	170	220	270	330	380	350	290	230	170	130	110	230
East	Unshaded	280	410	570	720	850	950	950	890	750	550	330	240	630
	Shaded	240	360	490	620	720	800	810	760	650	490	290	210	540
South	Unshaded	710	850	840	710	580	510	540	700	930	1040	810	670	740
	Shaded	680	790	650	450	350	340	340	390	640	910	780	640	580
West	Unshaded	280	420	570	710	830	910	920	840	730	540	330	250	610
	Shaded	250	370	490	610	700	770	780	720	630	480	290	220	530

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	27.9	34.1	41.8	49.7	58.8	69.1	77.9	75.6	65.2	53.2	40.8	29.7	52.0
Daily Minimum Temp	19.3	24.6	31.4	37.9	45.6	55.4	63.7	61.8	51.0	40.2	30.9	21.6	40.3
Daily Maximum Temp	36.4	43.6	52.2	61.3	71.9	82.8	92.2	89.4	79.2	66.1	50.8	37.8	63.6
Record Minimum Temp	-22.0	-30.0	2.0	14.0	25.0	35.0	40.0	37.0	27.0	16.0	-14.0	-21.0	-30.0
Record Maximum Temp	62.0	69.0	78.0	85.0	93.0	104.0	107.0	104.0	100.0	89.0	75.0	67.0	107.0
HDD, Base 65°F	1150	865	719	464	215	51	0	0	108	373	726	1094	5765
CDD, Base 65°F	0	0	0	0	23	174	400	329	114	7	0	0	1047
Humidity Ratio (#w/#da)	0.0027	0.0032	0.0037	0.0043	0.0055	0.0066	0.0078	0.0077	0.0063	0.0050	0.0038	0.0029	0.0050
Wind Speed (mph)	7.8	8.4	9.6	9.9	9.5	9.5	9.7	9.6	9.4	8.5	8.4	7.6	9.0
Clearness Index, Kt	0.46	0.51	0.53	0.56	0.59	0.63	0.65	0.64	0.62	0.58	0.48	0.44	0.58

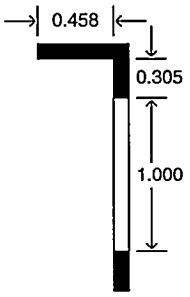
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	31/19	67/44	82/56	72/47	37/23	42/28	79/58	101/78	100/77	78/57	20/13	61/42	82/61	82/60	56/39	7/5	34/21	45/29	32/21	4/3
North	8/8	13/14	15/17	14/15	9/9	21/15	14/16	16/18	16/18	14/16	6/5	12/13	14/16	15/16	12/12	3/2	9/9	11/11	9/8	2/2
East	73/27	64/36	18/18	14/15	9/9	80/40	78/54	41/35	16/18	14/16	62/24	77/46	38/30	15/16	12/12	25/7	42/19	11/11	9/8	2/2
South	32/15	69/38	85/51	74/41	38/19	10/10	27/24	46/39	46/38	27/23	15/8	53/34	75/52	74/51	48/30	20/6	71/28	88/37	68/27	13/5
West	8/8	13/14	15/17	62/36	77/32	10/10	14/16	16/18	42/36	79/53	6/5	12/13	14/16	44/33	78/45	3/2	9/9	13/12	44/20	18/6
M. Clr (%hrs)	30	29	28	28	27	59	58	57	52	50	61	62	61	57	59	21	23	24	23	23



Lynchburg, VA

WBAN NO. 13733



Shading Geometry
(Not to Scale)

LATITUDE: 37.33° N
LONGITUDE: 79.20° W
ELEVATION: 915 feet
MEAN PRESSURE: 14.3 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	750	1010	1360	1700	1910	2050	1960	1780	1480	1160	810	660	1390
	Std.Dev.	51	80	92	140	82	107	125	93	99	91	74	36	30
	Minimum	640	820	1180	1460	1750	1850	1750	1590	1240	1000	640	590	1320
	Maximum	860	1170	1540	2050	2080	2250	2210	1960	1660	1340	950	740	1440
	Diffuse	320	420	540	670	800	860	860	770	630	450	340	290	580
	Clear-Day Global	1020	1370	1820	2260	2520	2610	2530	2280	1890	1430	1050	900	1810
North	Global	210	280	350	450	550	620	590	490	390	310	230	190	390
	Diffuse	210	280	350	430	500	540	520	470	390	310	230	190	370
	Clear-Day Global	200	260	330	430	580	680	620	480	370	290	220	180	390
East	Global	500	650	820	980	1050	1110	1060	990	870	730	540	450	810
	Diffuse	260	340	430	530	600	640	630	580	490	380	280	230	450
	Clear-Day Global	740	940	1160	1340	1410	1420	1380	1300	1150	940	750	670	1100
South	Global	1180	1230	1180	1000	820	750	780	920	1090	1260	1190	1110	1040
	Diffuse	360	430	490	540	560	570	570	570	530	470	390	340	480
	Clear-Day Global	1960	1990	1760	1340	1000	850	900	1160	1530	1800	1870	1890	1500
West	Global	510	650	840	990	1040	1100	1040	1000	870	740	540	450	810
	Diffuse	260	340	440	540	610	650	640	590	490	380	280	240	460
	Clear-Day Global	740	940	1160	1340	1410	1420	1380	1300	1150	940	750	670	1100

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	490	700	970	1230	1390	1490	1430	1290	1060	820	550	430	990
North	Unshaded	150	190	250	300	360	400	380	330	270	210	160	130	260
	Shaded	130	170	220	280	330	370	350	300	250	190	140	120	240
East	Unshaded	340	460	580	700	750	780	750	700	620	510	370	310	570
	Shaded	310	420	520	620	650	690	660	620	550	460	340	280	510
South	Unshaded	880	900	810	640	500	450	470	580	730	900	880	840	710
	Shaded	870	840	660	440	350	360	360	400	550	800	860	820	610
West	Unshaded	350	460	590	710	740	780	740	710	620	520	370	310	580
	Shaded	320	420	530	620	650	680	650	620	550	470	340	280	510

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	34.2	37.2	46.4	55.7	64.1	71.7	75.6	74.6	68.1	57.0	47.7	38.4	55.9
Daily Minimum Temp	24.7	27.4	35.4	43.8	52.6	60.8	65.1	64.4	57.7	45.7	37.3	29.1	45.3
Daily Maximum Temp	43.6	47.1	57.3	67.6	75.6	82.6	86.0	84.9	78.5	68.3	58.1	47.6	66.4
Record Minimum Temp	-10.0	0.0	7.0	20.0	31.0	40.0	49.0	45.0	36.0	21.0	8.0	-4.0	-10.0
Record Maximum Temp	76.0	79.0	87.0	92.0	93.0	100.0	103.0	102.0	101.0	93.0	83.0	78.0	103.0
HDD, Base 65°F	955	778	577	283	95	6	0	0	32	270	519	825	4340
CDD, Base 65°F	0	0	0	0	67	207	329	298	125	22	0	0	1048
Humidity Ratio (#w/#da)	0.0028	0.0031	0.0041	0.0056	0.0088	0.0120	0.0138	0.0135	0.0110	0.0072	0.0049	0.0035	0.0075
Wind Speed (mph)	7.9	7.9	8.6	8.5	7.0	6.6	6.0	6.0	6.2	6.6	7.3	7.6	7.2
Clearness Index, Kt	0.50	0.52	0.53	0.54	0.54	0.56	0.54	0.54	0.53	0.53	0.49	0.48	0.53

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

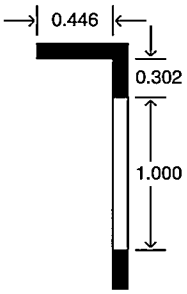
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	36/22	72/45	85/54	70/46	33/21	41/28	81/55	101/74	97/74	71/52	23/14	65/40	85/57	82/56	52/34	13/8	43/25	51/30	35/22	5/4
North	9/9	14/15	15/17	14/15	9/8	21/14	16/17	17/19	17/19	16/16	8/6	14/14	17/18	16/18	13/12	5/4	10/10	11/11	9/9	2/2
East	74/28	62/34	15/17	14/15	9/8	72/34	75/45	37/31	17/19	16/16	56/19	73/35	35/26	16/18	13/12	39/12	44/20	11/11	9/9	2/2
South	35/16	69/37	81/44	67/37	32/16	11/11	26/22	42/34	40/33	21/19	16/8	52/28	71/42	68/42	40/23	33/11	80/31	91/36	70/27	14/4
West	9/9	14/15	17/17	64/36	72/29	11/11	16/17	17/19	47/38	76/49	8/6	14/14	17/18	49/33	73/36	5/4	10/10	18/13	50/21	19/6
M. Clr (%hrs)	38	37	37	39	39	44	43	39	37	41	45	45	44	42	45	38	39	38	38	40

Norfolk, VA

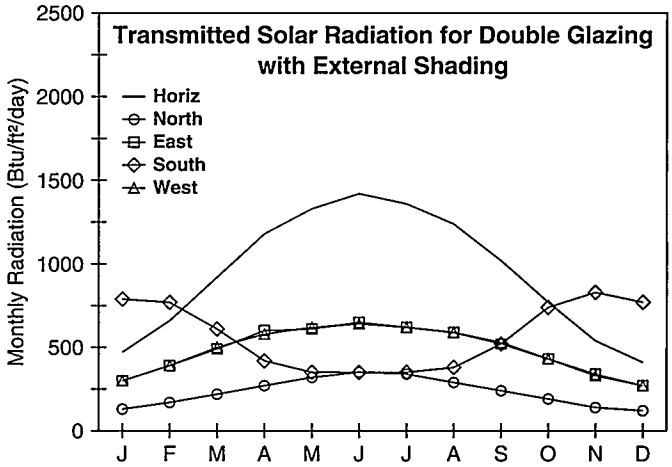
WBAN NO. 13737

LATITUDE: 36.90° N
LONGITUDE: 76.20° W
ELEVATION: 30 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	710	960	1290	1630	1830	1950	1860	1710	1420	1100	800	640	1330
	Std.Dev.	57	89	92	132	103	105	129	124	88	102	79	42	32
	Minimum	600	760	1080	1370	1580	1780	1640	1460	1230	830	610	550	1270
	Maximum	820	1140	1460	1930	2030	2130	2130	1940	1600	1260	930	710	1390
	Diffuse	310	410	530	670	790	840	840	760	620	460	330	290	570
	Clear-Day Global	1020	1360	1810	2240	2500	2580	2500	2260	1880	1430	1060	900	1800
North	Global	210	270	340	440	530	600	570	470	380	300	220	190	380
	Diffuse	210	270	340	430	490	520	510	460	380	300	220	190	360
	Clear-Day Global	200	250	330	430	580	670	620	480	370	290	210	180	380
East	Global	470	610	780	940	990	1050	1000	950	820	680	530	430	770
	Diffuse	250	320	420	520	590	620	610	570	480	370	280	230	440
	Clear-Day Global	750	940	1150	1320	1410	1410	1370	1290	1150	940	750	670	1100
South	Global	1080	1140	1090	950	790	720	740	880	1030	1160	1140	1040	980
	Diffuse	340	410	470	520	540	550	550	550	520	450	370	330	470
	Clear-Day Global	1950	1950	1720	1310	980	830	880	1140	1500	1780	1870	1880	1480
West	Global	480	610	780	920	1000	1040	1000	940	840	680	520	430	770
	Diffuse	250	330	420	520	590	630	610	570	480	370	280	230	440
	Clear-Day Global	750	940	1150	1320	1410	1410	1370	1290	1150	940	750	670	1100

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

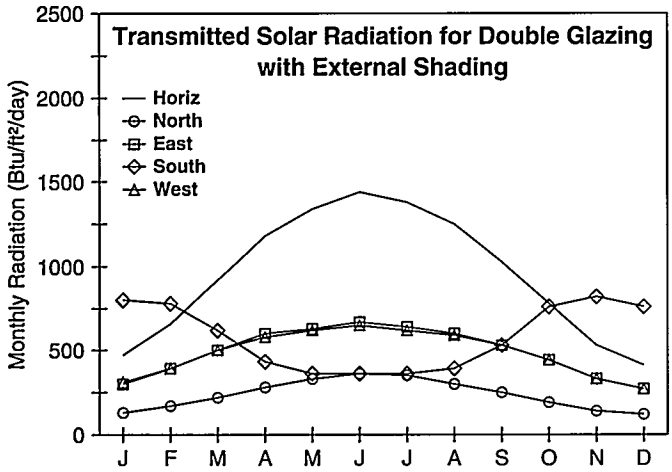
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	470	660	920	1180	1330	1420	1360	1240	1020	770	540	410	940
North	Unshaded	140	190	240	300	350	390	370	320	270	210	160	130	260
	Shaded	130	170	220	270	320	350	340	290	240	190	140	120	230
East	Unshaded	330	430	550	670	700	740	710	670	580	480	370	290	540
	Shaded	300	390	490	600	610	650	620	590	520	430	340	270	480
South	Unshaded	810	830	750	600	480	430	450	550	690	820	850	780	670
	Shaded	790	770	610	420	350	350	350	380	520	740	830	770	570
West	Unshaded	330	430	550	650	710	730	700	670	590	480	360	300	540
	Shaded	300	390	500	580	620	640	620	590	530	430	330	270	480

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	39.1	41.0	48.6	57.0	66.1	74.1	78.2	77.2	71.9	61.2	52.5	43.8	59.2
Daily Minimum Temp	30.9	32.3	39.3	47.1	56.8	65.2	70.0	69.4	64.2	52.9	43.8	35.4	50.6
Daily Maximum Temp	47.3	49.7	57.9	66.9	75.3	82.9	86.4	85.1	79.6	69.5	61.2	52.2	67.8
Record Minimum Temp	-3.0	8.0	18.0	28.0	36.0	45.0	54.0	49.0	45.0	27.0	20.0	7.0	-3.0
Record Maximum Temp	78.0	81.0	88.0	97.0	100.0	101.0	103.0	104.0	99.0	95.0	86.0	80.0	104.0
HDD, Base 65°F	803	672	508	249	51	0	0	0	11	164	380	657	3495
CDD, Base 65°F	0	0	0	9	85	277	409	378	218	46	0	0	1422
Humidity Ratio (#w/#da)	0.0036	0.0038	0.0049	0.0063	0.0094	0.0127	0.0149	0.0149	0.0124	0.0085	0.0061	0.0044	0.0085
Wind Speed (mph)	11.5	12.1	12.6	11.9	10.7	10.1	9.2	9.0	9.9	10.4	10.8	11.4	10.8
Clearness Index, Kt	0.46	0.48	0.50	0.52	0.52	0.53	0.52	0.52	0.51	0.50	0.48	0.45	0.50

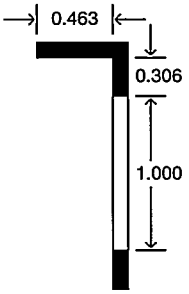
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	41/22	75/44	85/49	67/40	28/17	45/29	83/57	100/72	96/69	68/47	27/16	67/42	86/57	79/54	48/31	17/10	44/26	51/29	33/19	3/3
North	10/9	14/15	15/16	13/14	8/7	20/14	17/18	17/19	17/19	15/15	9/7	15/15	17/18	16/17	12/12	6/4	10/10	11/11	8/8	2/1
East	75/24	58/30	15/16	13/14	8/7	73/34	72/45	32/27	17/19	15/15	59/21	69/35	29/24	16/17	12/12	45/12	41/19	11/11	8/8	2/1
South	38/16	70/34	79/39	64/31	27/12	12/11	28/23	42/33	38/31	18/17	19/10	53/29	71/43	64/40	36/21	40/12	81/31	90/35	65/23	9/3
West	10/9	14/15	22/19	67/33	67/22	12/11	17/18	17/19	51/39	77/45	9/7	15/15	17/18	52/34	71/35	6/4	10/10	22/14	51/19	13/4
M. Clr (%hrs)	40	38	37	36	37	39	39	36	34	34	40	41	39	38	40	36	34	35	36	38



Richmond, VA

WBAN NO. 13740



Shading Geometry
(Not to Scale)

LATITUDE: 37.50° N
LONGITUDE: 77.33° W
ELEVATION: 164 feet
MEAN PRESSURE: 14.7 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	710	960	1300	1640	1840	1980	1900	1720	1430	1110	790	630	1340
	Std.Dev.	53	84	85	124	86	117	132	103	81	87	66	43	34
	Minimum	620	770	1080	1410	1680	1730	1660	1500	1270	900	640	560	1270
	Maximum	800	1120	1440	1940	2050	2150	2130	1910	1610	1280	920	740	1410
	Diffuse	330	430	560	710	840	900	890	800	650	470	340	300	600
	Clear-Day Global	1000	1350	1800	2240	2510	2590	2520	2270	1880	1420	1040	890	1790
North	Global	210	280	360	450	550	620	580	490	390	310	230	190	390
	Diffuse	210	280	360	440	510	540	520	470	390	310	230	190	370
	Clear-Day Global	200	250	330	430	580	680	620	480	370	290	210	180	390
East	Global	470	620	790	950	1020	1080	1040	970	850	700	520	430	790
	Diffuse	260	340	430	540	610	650	630	580	490	380	280	240	450
	Clear-Day Global	740	930	1150	1330	1410	1410	1380	1300	1150	940	750	660	1100
South	Global	1090	1140	1110	970	810	750	770	900	1050	1190	1140	1030	1000
	Diffuse	360	430	490	550	570	580	580	580	540	470	380	340	490
	Clear-Day Global	1950	1970	1750	1340	1000	860	910	1160	1530	1790	1870	1880	1500
West	Global	480	610	790	940	1000	1060	1010	950	840	690	520	430	780
	Diffuse	260	340	440	540	620	650	640	590	500	380	280	240	460
	Clear-Day Global	740	930	1150	1330	1410	1410	1380	1300	1150	940	750	660	1100

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	470	660	920	1180	1340	1440	1380	1250	1030	780	530	410	950
North	Unshaded	150	190	250	310	360	410	380	330	270	210	160	130	260
	Shaded	130	170	220	280	330	360	350	300	250	190	140	120	240
East	Unshaded	330	440	560	680	720	770	730	690	600	490	360	290	550
	Shaded	300	390	500	600	630	670	640	600	530	440	330	270	490
South	Unshaded	820	830	760	620	500	460	470	570	710	850	850	780	680
	Shaded	800	780	620	430	360	360	360	390	530	760	820	760	580
West	Unshaded	330	430	560	660	710	750	710	670	590	490	360	290	550
	Shaded	310	390	500	580	620	650	620	590	530	440	330	270	490

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	35.7	38.7	48.0	57.3	66.0	73.9	78.0	76.8	70.0	58.6	49.6	40.1	57.7
Daily Minimum Temp	25.7	28.1	36.3	44.6	54.2	62.7	67.5	66.4	59.0	46.5	37.9	29.9	46.6
Daily Maximum Temp	45.7	49.2	59.5	70.0	77.8	85.1	88.4	87.1	80.9	70.7	61.3	50.2	68.8
Record Minimum Temp	-12.0	-10.0	11.0	23.0	31.0	40.0	51.0	46.0	35.0	21.0	10.0	-1.0	-12.0
Record Maximum Temp	80.0	83.0	93.0	96.0	100.0	104.0	105.0	102.0	103.0	99.0	86.0	80.0	105.0
HDD, Base 65°F	908	736	527	241	61	0	0	0	23	233	462	772	3963
CDD, Base 65°F	0	0	0	10	92	270	403	366	173	34	0	0	1348
Humidity Ratio (#w/#da)	0.0032	0.0034	0.0045	0.0061	0.0094	0.0127	0.0148	0.0146	0.0118	0.0078	0.0054	0.0039	0.0081
Wind Speed (mph)	8.2	8.7	9.3	9.1	8.0	7.5	7.0	6.5	6.7	7.2	7.7	8.0	7.8
Clearness Index, Kt	0.47	0.49	0.51	0.52	0.52	0.54	0.53	0.52	0.51	0.51	0.48	0.46	0.51

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

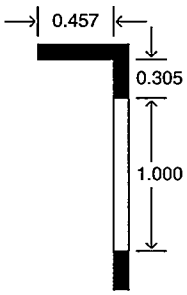
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	39/22	73/45	84/51	68/43	30/18	44/28	82/57	101/74	95/73	68/48	26/15	67/41	86/59	79/55	49/32	15/9	43/25	50/30	33/20	4/3
North	10/9	14/15	15/17	13/15	8/8	20/14	17/18	17/20	17/19	16/16	8/7	15/15	17/18	16/18	13/12	5/4	10/10	11/11	9/8	2/2
East	74/27	59/32	15/17	13/15	8/8	73/33	74/45	34/30	17/19	16/16	58/20	71/36	32/26	16/18	13/12	42/12	41/19	11/11	9/8	2/2
South	37/17	70/36	80/41	65/34	29/13	12/11	28/23	43/35	39/33	20/18	18/9	54/29	72/45	66/42	38/22	37/11	80/30	88/35	66/23	10/3
West	10/9	14/15	20/19	65/34	68/25	12/11	17/18	17/20	50/39	76/46	8/7	15/15	17/18	51/34	71/35	5/4	10/10	20/14	49/19	14/4
M. Clr (%hrs)	38	36	34	34	37	40	40	33	27	33	43	43	36	34	38	35	35	35	35	37

Roanoke, VA

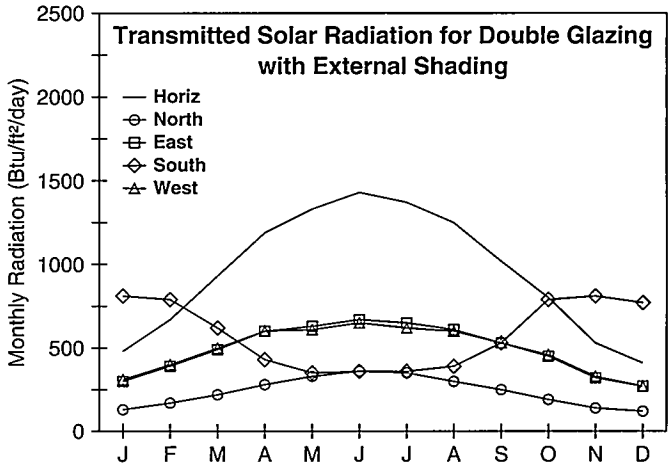
WBAN NO. 13741

LATITUDE: 37.32° N
LONGITUDE: 79.97° W
ELEVATION: 1175 feet
MEAN PRESSURE: 14.2 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	730	980	1310	1650	1840	1960	1880	1730	1430	1150	790	640	1340
	Std.Dev.	51	75	93	149	91	116	129	92	111	88	75	40	31
	Minimum	620	790	1110	1390	1610	1760	1630	1550	1160	1030	610	560	1260
	Maximum	840	1160	1460	2020	2030	2190	2170	1880	1640	1350	930	730	1400
	Diffuse	330	440	560	690	830	890	890	790	640	450	350	300	600
	Clear-Day Global	1020	1360	1820	2260	2520	2610	2530	2280	1890	1440	1060	900	1810
North	Global	210	280	360	450	550	620	580	490	390	300	230	190	390
	Diffuse	210	280	360	430	500	540	520	470	390	300	230	190	370
	Clear-Day Global	200	260	330	430	580	680	620	480	370	290	210	180	390
East	Global	480	620	770	950	1020	1070	1040	970	840	710	520	430	780
	Diffuse	260	340	430	530	600	640	630	580	490	380	280	230	450
	Clear-Day Global	740	940	1150	1340	1410	1420	1380	1300	1150	940	750	670	1100
South	Global	1110	1160	1120	970	800	740	760	900	1040	1230	1130	1050	1000
	Diffuse	360	430	490	540	560	570	570	570	530	460	380	340	480
	Clear-Day Global	1960	1980	1750	1340	1000	850	900	1160	1530	1800	1890	1900	1500
West	Global	490	630	790	950	990	1040	1000	960	840	720	520	430	780
	Diffuse	260	340	440	540	610	640	630	580	490	380	280	240	450
	Clear-Day Global	740	940	1150	1340	1410	1420	1380	1300	1150	940	750	670	1100

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

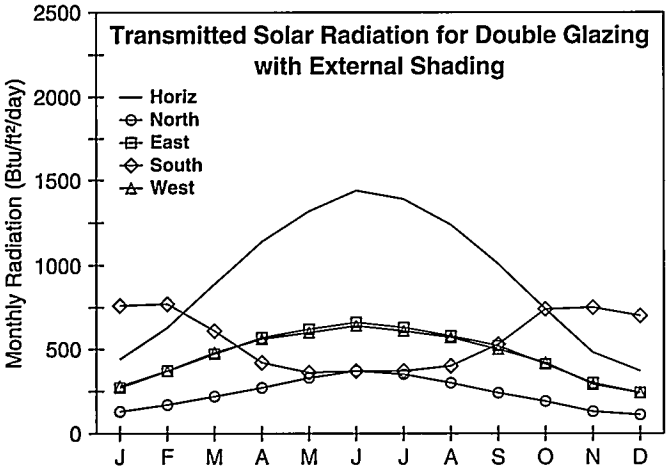
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	480	670	930	1190	1330	1430	1370	1250	1020	800	530	410	950
North	Unshaded	150	190	250	300	360	400	380	330	270	210	160	130	260
	Shaded	130	170	220	280	330	360	350	300	250	190	140	120	240
East	Unshaded	330	430	550	670	720	760	740	690	590	500	360	290	550
	Shaded	300	390	490	600	630	670	650	610	530	450	320	270	490
South	Unshaded	830	840	770	620	490	450	470	560	700	880	840	790	690
	Shaded	810	790	620	430	350	360	360	390	530	790	810	770	580
West	Unshaded	340	440	560	680	700	740	710	680	590	510	360	300	550
	Shaded	310	400	500	600	610	650	620	600	530	460	330	270	490

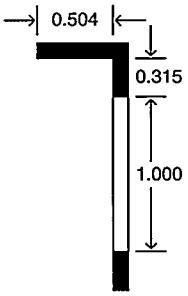
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	34.5	37.3	46.8	55.6	64.1	71.5	75.6	74.6	67.7	56.5	47.5	38.3	55.8
Daily Minimum Temp	25.0	27.2	35.7	43.8	52.5	60.2	64.8	63.8	56.8	44.8	37.0	28.9	45.0
Daily Maximum Temp	43.8	47.3	57.8	67.3	75.7	82.9	86.4	85.3	78.5	68.1	58.0	47.6	66.6
Record Minimum Temp	-11.0	1.0	10.0	20.0	31.0	39.0	47.0	42.0	34.0	22.0	9.0	-4.0	-11.0
Record Maximum Temp	78.0	80.0	87.0	95.0	96.0	100.0	104.0	105.0	101.0	93.0	83.0	76.0	105.0
HDD, Base 65°F	946	776	564	289	105	5	0	0	39	283	525	828	4360
CDD, Base 65°F	0	0	0	7	78	200	329	298	120	20	0	0	1052
Humidity Ratio (#w/#da)	0.0027	0.0030	0.0041	0.0056	0.0087	0.0117	0.0134	0.0132	0.0109	0.0070	0.0048	0.0034	0.0074
Wind Speed (mph)	9.5	9.1	9.7	9.6	7.7	6.9	6.5	6.1	6.0	6.8	7.8	8.4	7.8
Clearness Index, Kt	0.48	0.50	0.51	0.52	0.52	0.53	0.52	0.52	0.51	0.52	0.48	0.46	0.51

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	35/20	71/43	84/50	70/45	34/21	40/26	80/53	99/72	96/69	72/48	22/13	63/38	85/56	81/54	53/33	12/8	42/24	51/29	36/22	5/4
North	9/8	14/15	15/17	14/15	9/8	21/14	16/17	17/19	17/19	16/16	8/6	14/14	17/18	16/18	13/13	5/4	10/10	11/11	9/9	3/2
East	71/25	62/32	15/17	14/15	9/8	70/31	75/44	38/31	17/19	16/16	54/16	72/33	36/27	16/18	13/13	37/11	44/19	11/11	9/9	3/2
South	33/15	68/34	80/40	67/35	32/16	11/10	26/21	42/33	40/32	22/19	15/7	50/25	71/42	67/40	41/22	31/9	78/29	90/32	71/26	15/5
West	9/8	14/15	16/17	63/34	71/27	11/10	16/17	17/19	46/35	75/43	8/6	14/14	17/18	47/31	72/34	5/4	10/10	17/13	50/20	21/6
M. Clr (%hrs)	36	36	38	36	36	43	38	34	34	36	43	43	40	38	41	36	37	37	36	36





Shading Geometry
(Not to Scale)

Sterling, VA

WBAN NO. 93738

LATITUDE: 38.95° N
LONGITUDE: 77.45° W
ELEVATION: 269 feet
MEAN PRESSURE: 14.6 psia

STATION TYPE: Primary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	670	930	1250	1590	1820	1990	1910	1710	1410	1070	720	580	1310
	Std.Dev.	65	86	99	158	117	120	134	95	103	94	68	43	50
	Minimum	530	730	1060	1330	1630	1740	1600	1550	1260	900	580	490	1180
	Maximum	780	1070	1420	1940	2040	2200	2130	1880	1610	1260	850	650	1400
	Diffuse	330	430	570	720	860	950	940	850	660	460	340	290	620
	Clear-Day Global	950	1290	1760	2220	2510	2600	2520	2250	1840	1370	980	820	1760
North	Global	200	270	350	450	550	630	590	500	390	300	220	180	390
	Diffuse	200	270	350	440	510	560	540	480	390	300	220	180	370
	Clear-Day Global	190	250	330	430	580	680	620	480	370	280	200	170	380
East	Global	440	590	760	930	1020	1080	1040	960	830	670	480	390	760
	Diffuse	250	330	430	530	610	670	650	600	490	370	270	220	450
	Clear-Day Global	710	910	1140	1330	1420	1430	1390	1300	1140	920	720	630	1090
South	Global	1040	1130	1100	970	830	790	810	930	1060	1170	1040	950	990
	Diffuse	360	430	500	550	580	610	610	600	540	460	370	320	490
	Clear-Day Global	1940	1980	1780	1390	1050	910	960	1210	1560	1800	1850	1850	1520
West	Global	450	590	770	910	990	1050	1010	940	820	670	470	390	760
	Diffuse	250	330	430	540	620	670	660	600	490	370	270	220	460
	Clear-Day Global	710	910	1140	1330	1420	1430	1390	1300	1140	920	720	630	1090

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	440	630	890	1140	1320	1440	1390	1240	1010	740	480	370	930
North	Unshaded	140	190	240	300	370	410	390	340	270	210	150	130	260
	Shaded	130	170	220	270	330	370	350	300	240	190	130	110	230
East	Unshaded	300	420	540	660	720	770	730	680	590	470	330	260	540
	Shaded	270	370	470	570	620	660	630	580	520	410	300	240	470
South	Unshaded	780	830	760	630	520	490	500	600	720	840	780	720	680
	Shaded	760	770	610	420	360	370	370	400	530	740	750	700	560
West	Unshaded	310	420	540	650	700	740	720	670	580	470	320	270	530
	Shaded	280	370	480	560	600	640	610	570	500	420	290	240	470

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	30.6	33.6	43.2	52.7	62.2	71.0	75.6	74.2	67.1	55.1	45.4	35.4	53.8
Daily Minimum Temp	21.0	23.3	31.8	40.3	50.0	59.2	64.1	62.8	55.4	42.4	34.2	25.8	42.5
Daily Maximum Temp	40.1	43.8	54.6	65.1	74.3	82.8	87.0	85.5	78.9	67.7	56.7	45.0	65.1
Record Minimum Temp	-18.0	-14.0	6.0	17.0	28.0	36.0	41.0	38.0	30.0	15.0	9.0	-4.0	-18.0
Record Maximum Temp	75.0	79.0	89.0	92.0	97.0	100.0	104.0	104.0	99.0	90.0	84.0	78.0	104.0
HDD, Base 65°F	1066	879	676	369	140	7	0	0	44	319	588	918	5006
CDD, Base 65°F	0	0	0	0	53	187	329	285	107	12	0	0	973
Humidity Ratio (#w/#da)	0.0026	0.0028	0.0039	0.0054	0.0086	0.0118	0.0136	0.0132	0.0107	0.0069	0.0047	0.0032	0.0073
Wind Speed (mph)	8.3	8.6	9.2	8.8	7.5	6.8	6.2	5.9	6.1	6.6	7.7	7.9	7.5
Clearness Index, Kt	0.47	0.49	0.50	0.51	0.52	0.54	0.53	0.52	0.51	0.50	0.46	0.44	0.51

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

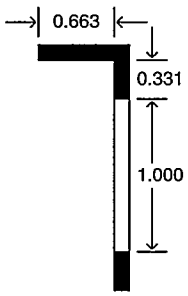
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	37/22	72/44	83/51	67/41	29/18	44/29	81/57	101/74	95/71	69/49	25/15	64/40	84/57	78/53	48/31	13/8	40/24	47/28	30/18	3/2
North	10/9	14/15	15/17	13/14	8/7	19/14	17/18	18/20	18/20	16/16	8/7	15/15	17/18	16/17	13/12	5/4	10/10	11/11	8/8	2/1
East	73/26	59/32	15/17	13/14	8/7	71/33	73/46	35/30	18/20	16/16	57/19	69/35	32/25	16/17	13/12	38/11	40/18	11/11	8/8	2/1
South	37/16	71/37	83/43	67/33	29/13	12/11	30/25	46/37	42/34	22/19	18/9	54/29	73/44	67/41	38/21	34/10	77/29	87/34	63/23	8/3
West	10/9	14/15	20/19	66/33	68/24	12/11	17/18	18/20	50/39	75/45	8/7	15/15	17/18	50/33	70/33	5/4	10/10	19/13	47/18	11/3
M. Clr (%hrs)	33	29	30	32	34	40	38	33	29	33	42	43	38	35	38	29	31	30	32	35

Burlington, VT

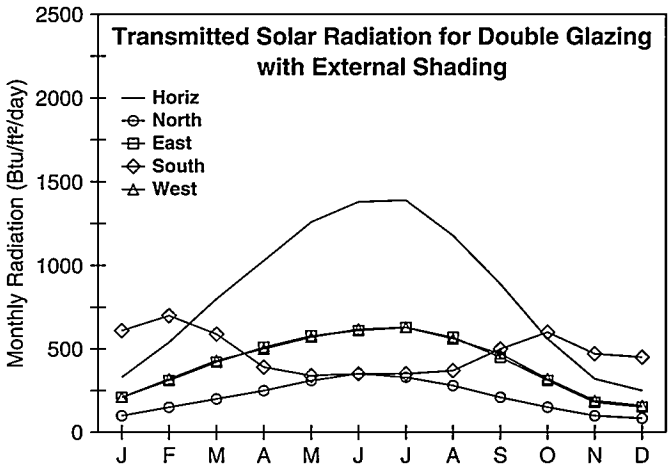
WBAN NO. 14742

LATITUDE: 44.47° N
LONGITUDE: 73.15° W
ELEVATION: 341 feet
MEAN PRESSURE: 14.5 psia

STATION TYPE: Primary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	510	810	1150	1450	1750	1910	1920	1650	1270	830	490	390	1180
	Std.Dev.	52	69	89	124	166	127	102	88	88	79	42	50	37
	Minimum	380	670	960	1090	1370	1630	1720	1410	990	620	390	270	1080
	Maximum	630	990	1360	1680	2070	2150	2120	1790	1390	1030	560	500	1250
	Diffuse	320	460	600	700	820	870	840	750	590	430	330	270	580
	Clear-Day Global	740	1110	1630	2160	2540	2680	2580	2250	1750	1210	790	630	1670
North	Global	180	260	350	430	550	620	590	480	360	260	180	150	370
	Diffuse	180	260	350	420	500	540	520	460	360	260	180	150	350
	Clear-Day Global	150	220	300	400	580	700	630	460	320	230	160	130	360
East	Global	350	530	720	880	1010	1070	1090	980	770	530	310	260	710
	Diffuse	220	330	430	510	590	640	630	560	450	320	220	180	420
	Clear-Day Global	630	870	1160	1400	1540	1580	1540	1420	1190	910	650	550	1120
South	Global	850	1060	1100	980	910	860	920	1000	1070	980	670	630	920
	Diffuse	350	450	510	540	580	600	600	570	510	400	310	290	480
	Clear-Day Global	1890	2030	1940	1560	1230	1080	1120	1390	1730	1920	1860	1790	1620
West	Global	360	540	730	860	990	1080	1090	970	790	550	330	270	710
	Diffuse	230	330	430	510	600	640	630	570	450	320	220	190	430
	Clear-Day Global	630	870	1160	1400	1540	1580	1540	1420	1190	910	650	550	1120

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

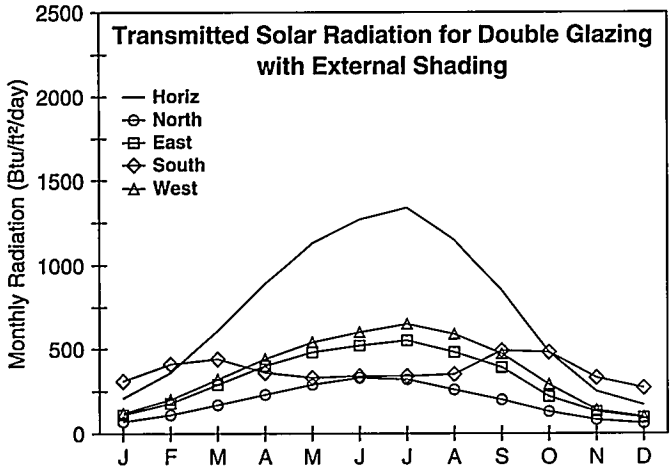
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	330	540	800	1030	1260	1380	1390	1180	890	560	320	250	830
North	Unshaded	120	180	240	290	360	410	390	320	250	180	130	100	250
	Shaded	100	150	200	250	310	350	330	280	210	150	100	83	210
East	Unshaded	240	370	500	620	720	760	780	700	550	370	220	170	500
	Shaded	210	310	420	510	580	610	630	570	450	310	180	150	410
South	Unshaded	640	780	780	660	580	540	580	660	740	710	500	480	630
	Shaded	610	700	590	390	340	350	350	370	500	600	470	450	480
West	Unshaded	250	370	520	610	710	770	780	690	560	380	230	190	500
	Shaded	210	320	430	500	570	620	630	560	470	320	190	160	410

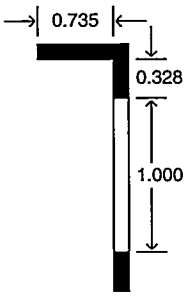
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	16.3	18.2	30.7	43.9	56.3	65.2	70.5	67.9	58.9	47.8	36.8	23.0	44.6
Daily Minimum Temp	7.5	8.9	22.0	34.2	45.4	54.6	59.7	57.9	48.8	38.6	29.6	15.5	35.2
Daily Maximum Temp	25.1	27.5	39.3	53.6	67.2	75.8	81.2	77.9	69.0	57.0	44.0	30.4	54.0
Record Minimum Temp	-30.0	-30.0	-20.0	2.0	24.0	33.0	39.0	35.0	25.0	15.0	-2.0	-26.0	-30.0
Record Maximum Temp	63.0	62.0	84.0	91.0	93.0	97.0	99.0	101.0	94.0	85.0	75.0	65.0	101.0
HDD, Base 65°F	1510	1310	1063	633	282	58	6	29	199	533	846	1302	7771
CDD, Base 65°F	0	0	0	0	13	64	176	119	16	0	0	0	388
Humidity Ratio (#w/#da)	0.0016	0.0017	0.0025	0.0038	0.0063	0.0091	0.0108	0.0105	0.0082	0.0053	0.0035	0.0021	0.0055
Wind Speed (mph)	9.7	9.1	9.6	9.5	8.9	8.6	8.0	7.6	8.2	8.8	9.8	10.0	9.0
Clearness Index, Kt	0.46	0.50	0.50	0.49	0.50	0.52	0.54	0.52	0.50	0.45	0.39	0.39	0.49

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	39/25	68/44	75/48	58/37	21/13	52/33	84/55	98/69	91/63	65/44	30/18	63/41	78/53	71/47	41/25	10/7	33/20	37/22	19/12	0/0
North	10/10	13/16	14/17	12/14	7/6	13/13	16/18	16/19	16/19	14/15	8/8	13/14	15/17	14/16	10/10	4/3	9/9	9/9	6/6	0/0
East	73/28	52/29	14/17	12/14	7/6	81/37	68/40	26/24	16/19	14/15	68/23	64/34	23/20	14/16	10/10	29/9	32/14	9/9	6/6	0/0
South	45/20	79/38	87/43	67/31	24/10	12/12	40/28	54/39	47/34	23/18	25/12	62/33	79/45	70/39	37/18	29/9	74/25	82/26	49/15	0/0
West	10/10	13/16	27/21	69/32	61/19	12/12	16/18	16/19	54/38	80/44	8/8	13/14	15/17	55/33	73/30	4/3	9/9	23/12	39/13	0/0
M. Clr (%hrs)	26	25	26	27	28	30	32	26	26	26	29	30	29	29	31	14	14	15	18	19





Shading Geometry
(Not to Scale)

Olympia, WA

WBAN NO. 24227

LATITUDE: 46.97° N
LONGITUDE: 122.90° W
ELEVATION: 200 feet
MEAN PRESSURE: 14.6 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	320	530	880	1250	1590	1770	1860	1600	1200	700	380	270	1030
	Std.Dev.	31	65	97	116	143	186	167	150	103	76	38	17	38
	Minimum	260	390	710	1020	1280	1460	1540	1260	960	590	300	240	940
	Maximum	400	700	1140	1460	1880	2090	2180	1900	1450	880	480	310	1100
	Diffuse	250	370	530	730	860	900	810	700	550	410	280	210	550
	Clear-Day Global	590	930	1460	2040	2460	2640	2540	2180	1650	1080	660	490	1560
North	Global	130	200	300	420	540	610	590	470	350	240	150	110	340
	Diffuse	130	200	300	410	500	540	520	440	340	240	150	110	330
	Clear-Day Global	130	190	290	400	580	700	650	460	320	220	140	110	350
East	Global	200	320	520	730	880	950	1000	870	700	400	230	170	580
	Diffuse	160	240	360	490	590	620	600	530	420	280	180	130	380
	Clear-Day Global	510	730	1030	1330	1500	1560	1520	1380	1130	820	550	440	1040
South	Global	450	640	830	890	870	860	950	1020	1080	810	490	390	770
	Diffuse	230	320	430	540	590	600	590	550	490	370	250	200	430
	Clear-Day Global	1640	1840	1870	1620	1340	1200	1240	1470	1750	1830	1670	1530	1580
West	Global	220	360	570	770	970	1080	1160	1040	820	510	260	180	660
	Diffuse	160	240	370	500	600	640	630	550	430	300	180	140	400
	Clear-Day Global	510	730	1030	1330	1500	1560	1520	1380	1130	820	550	440	1040

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	210	360	610	890	1130	1270	1340	1150	850	480	250	170	730
North	Unshaded	93	140	210	290	360	410	390	310	240	170	100	79	230
	Shaded	71	110	170	230	290	330	320	260	200	130	81	61	190
East	Unshaded	140	220	370	510	620	670	710	610	490	280	160	120	410
	Shaded	110	180	290	400	480	520	550	480	390	220	130	95	320
South	Unshaded	330	470	590	600	570	550	600	680	750	590	370	290	530
	Shaded	310	410	440	360	330	340	340	350	490	480	330	270	370
West	Unshaded	150	250	400	550	690	770	830	750	580	360	180	120	470
	Shaded	120	200	320	440	540	600	650	590	470	290	140	100	370

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	38.0	41.1	43.8	47.5	53.2	58.7	62.9	63.3	57.9	49.7	42.5	38.2	49.7
Daily Minimum Temp	31.6	32.7	33.6	36.2	41.0	46.4	49.2	49.5	44.7	38.8	35.0	32.1	39.2
Daily Maximum Temp	44.4	49.5	53.9	58.8	65.3	70.9	76.5	77.1	71.0	60.5	50.0	44.2	60.2
Record Minimum Temp	-8.0	-1.0	9.0	23.0	25.0	30.0	35.0	33.0	25.0	20.0	-1.0	-7.0	-8.0
Record Maximum Temp	63.0	73.0	76.0	87.0	96.0	101.0	103.0	104.0	98.0	90.0	74.0	64.0	104.0
HDD, Base 65°F	837	669	657	525	366	201	96	102	222	474	675	831	5655
CDD, Base 65°F	0	0	0	0	0	12	31	49	9	0	0	0	101
Humidity Ratio (#w/#da)	0.0044	0.0046	0.0047	0.0051	0.0061	0.0075	0.0083	0.0085	0.0077	0.0064	0.0053	0.0045	0.0061
Wind Speed (mph)	7.3	7.2	7.3	7.7	7.3	6.9	6.5	6.3	6.0	6.0	7.4	6.9	6.9
Clearness Index, Kt	0.33	0.36	0.40	0.43	0.46	0.48	0.52	0.51	0.49	0.41	0.33	0.32	0.45

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

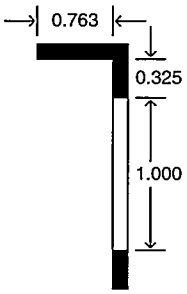
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	29/16	59/33	69/38	55/32	24/15	46/26	79/45	97/60	93/59	70/43	23/12	57/31	75/46	71/45	45/26	5/3	25/14	31/16	18/10	0/0
North	8/7	12/13	13/14	12/12	7/6	15/11	15/16	17/19	16/19	15/15	7/6	13/12	15/16	14/15	11/10	2/2	8/6	8/7	6/5	0/0
East	62/18	54/24	13/14	12/12	7/6	78/27	73/34	34/26	16/19	15/15	59/15	68/27	30/22	14/15	11/10	17/3	31/10	8/7	6/5	0/0
South	35/12	73/28	86/35	69/29	28/12	11/11	39/24	58/36	54/34	30/21	19/8	58/24	81/40	75/40	44/20	15/3	62/14	74/16	48/11	0/0
West	8/7	12/13	17/15	59/26	59/20	11/11	15/16	17/19	48/32	79/38	7/6	13/12	15/16	48/29	73/29	2/2	8/6	15/8	34/9	0/0
M. Clr (%hrs)	15	14	15	17	18	23	23	24	28	31	27	31	35	38	43	8	9	10	11	13

Quillayute, WA

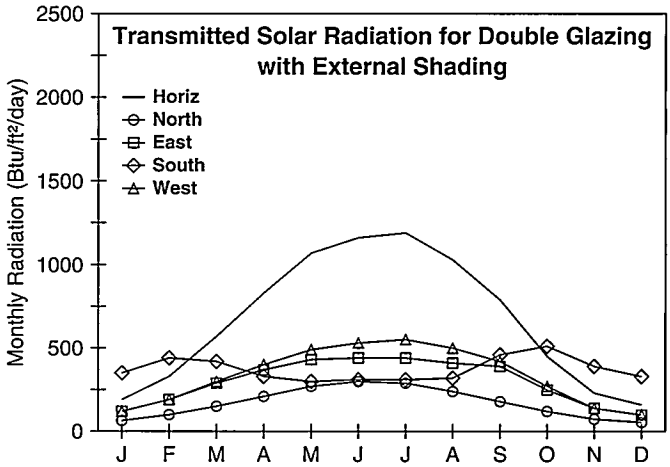
WBAN NO. 94240

LATITUDE: 47.95° N
LONGITUDE: 124.55° W
ELEVATION: 180 feet
MEAN PRESSURE: 14.6 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	310	510	820	1180	1490	1610	1640	1440	1120	680	370	260	950
	Std.Dev.	42	64	83	116	116	159	174	149	87	83	41	27	35
	Minimum	230	380	690	890	1280	1340	1260	1150	950	550	300	220	890
	Maximum	390	640	1040	1370	1710	1880	1960	1710	1380	860	470	340	1030
	Diffuse	210	320	470	660	790	850	790	680	500	360	240	180	500
	Clear-Day Global	560	900	1430	2020	2450	2630	2530	2160	1620	1050	630	470	1540
North	Global	120	180	280	390	500	560	540	430	320	220	140	100	320
	Diffuse	120	180	280	380	470	500	490	420	320	220	140	100	300
	Clear-Day Global	120	180	270	390	580	700	640	450	300	210	130	100	340
East	Global	210	340	520	680	810	820	830	760	700	440	250	180	550
	Diffuse	140	220	330	450	540	570	550	490	390	260	160	120	350
	Clear-Day Global	510	720	1040	1340	1520	1580	1540	1390	1140	820	550	450	1050
South	Global	490	680	810	850	840	810	860	940	1030	840	560	470	760
	Diffuse	210	290	390	490	550	560	550	520	440	340	230	180	400
	Clear-Day Global	1670	1860	1890	1630	1340	1200	1250	1480	1770	1860	1700	1570	1600
West	Global	210	340	530	730	900	980	1020	910	740	470	250	190	610
	Diffuse	140	220	330	460	560	590	580	510	390	270	160	120	360
	Clear-Day Global	510	720	1040	1340	1520	1580	1540	1390	1140	820	550	450	1050

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

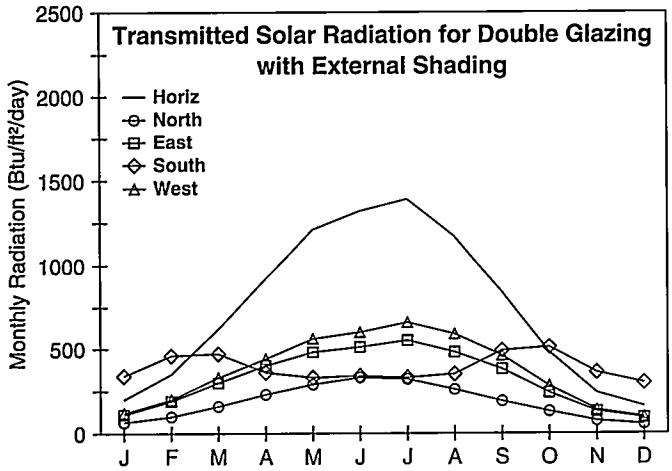
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	190	330	570	830	1070	1160	1190	1030	790	450	230	160	670
North	Unshaded	83	130	190	260	340	380	360	290	220	150	96	71	210
	Shaded	64	99	150	210	270	300	290	240	180	120	74	54	170
East	Unshaded	150	240	370	480	570	580	590	540	490	310	170	120	390
	Shaded	120	190	290	370	430	440	440	410	390	250	140	100	300
South	Unshaded	370	500	580	580	550	520	560	630	720	610	420	350	530
	Shaded	350	440	420	330	300	310	310	320	460	510	390	330	370
West	Unshaded	140	240	380	520	640	700	730	650	520	330	170	130	430
	Shaded	120	190	300	400	490	530	550	500	420	270	140	100	340

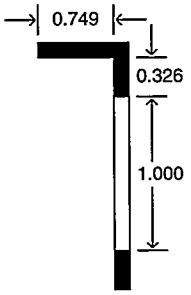
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	39.9	42.0	43.3	46.2	50.9	55.4	58.8	59.4	56.6	50.4	44.1	40.3	48.9
Daily Minimum Temp	33.7	34.9	35.2	37.3	41.8	46.5	49.4	49.7	46.2	41.4	37.2	34.4	40.6
Daily Maximum Temp	46.0	49.1	51.4	55.0	59.9	64.2	68.2	69.1	67.0	59.4	50.9	46.2	57.2
Record Minimum Temp	7.0	11.0	19.0	24.0	29.0	33.0	38.0	36.0	28.0	24.0	5.0	7.0	5.0
Record Maximum Temp	65.0	72.0	71.0	83.0	92.0	96.0	97.0	99.0	97.0	83.0	69.0	64.0	99.0
HDD, Base 65°F	778	644	673	564	437	288	192	180	256	453	627	766	5858
CDD, Base 65°F	0	0	0	0	0	0	0	6	0	0	0	0	6
Humidity Ratio (#w/#da)	0.0048	0.0049	0.0050	0.0053	0.0063	0.0074	0.0083	0.0087	0.0079	0.0067	0.0056	0.0050	0.0063
Wind Speed (mph)	10.2	9.7	9.2	8.3	7.7	7.1	6.9	6.3	6.7	8.1	9.3	9.4	8.2
Clearness Index, Kt	0.33	0.36	0.39	0.41	0.43	0.44	0.46	0.46	0.46	0.40	0.34	0.32	0.42

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	26/15	56/30	65/34	53/31	24/14	44/23	76/40	93/55	91/55	71/39	20/11	54/28	72/42	69/40	46/24	3/2	23/12	30/14	18/10	0/0
North	8/6	12/12	13/13	11/12	7/6	15/10	14/15	16/18	16/18	14/14	7/5	12/11	14/15	13/15	11/10	2/1	7/6	8/6	6/5	0/0
East	62/17	56/23	13/13	11/12	7/6	78/22	74/30	35/25	16/18	14/14	58/14	69/24	32/21	13/15	11/10	15/3	34/10	8/6	6/5	0/0
South	33/11	72/27	86/31	69/27	31/11	11/10	38/21	57/33	55/33	32/20	18/7	58/22	81/36	76/35	47/19	13/3	65/15	78/16	53/12	0/0
West	8/6	12/12	14/13	55/24	60/18	11/10	14/15	16/18	44/29	78/33	7/5	12/11	14/15	45/25	73/25	2/1	7/6	13/7	35/9	0/0
M. Clr (%hrs)	18	16	16	17	19	14	17	21	26	29	31	34	35	36	36	15	15	15	15	17





Shading Geometry
(Not to Scale)

Seattle, WA

WBAN NO. 24233

LATITUDE: 47.45° N
LONGITUDE: 122.30° W
ELEVATION: 400 feet
MEAN PRESSURE: 14.5 psia

STATION TYPE: Primary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	310	520	890	1290	1680	1830	1920	1630	1190	700	370	250	1050
	Std.Dev.	40	74	94	117	128	169	135	148	111	83	43	28	34
	Minimum	250	380	750	1090	1460	1530	1650	1320	870	570	290	200	1000
	Maximum	380	680	1140	1510	1920	2130	2110	1880	1420	890	450	320	1140
	Diffuse	220	320	500	700	830	880	770	670	520	390	250	180	520
	Clear-Day Global	570	900	1430	2020	2450	2630	2520	2160	1620	1050	630	470	1540
North	Global	120	190	290	410	530	600	580	460	330	230	140	100	330
	Diffuse	120	190	290	400	490	540	510	430	330	230	140	100	320
	Clear-Day Global	130	190	280	400	570	690	640	460	310	220	140	110	350
East	Global	200	330	540	730	900	960	1010	880	680	420	240	170	590
	Diffuse	140	220	350	480	580	620	590	520	400	280	170	120	370
	Clear-Day Global	500	710	1030	1320	1490	1560	1520	1370	1120	810	540	430	1030
South	Global	480	690	890	940	940	900	990	1060	1090	850	530	420	820
	Diffuse	210	300	430	530	590	600	580	550	470	370	240	180	420
	Clear-Day Global	1620	1820	1870	1620	1340	1210	1250	1480	1750	1820	1650	1510	1580
West	Global	210	350	580	800	1020	1090	1190	1050	800	490	250	170	670
	Diffuse	150	230	360	500	600	640	620	540	420	290	170	120	390
	Clear-Day Global	500	710	1030	1320	1490	1560	1520	1370	1120	810	540	430	1030

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	200	350	620	920	1210	1320	1390	1170	840	480	240	160	740
North	Unshaded	85	130	200	280	360	400	380	310	230	160	98	71	230
	Shaded	65	100	160	230	290	330	320	260	190	130	76	55	180
East	Unshaded	140	230	380	510	630	680	720	620	480	290	160	110	410
	Shaded	110	190	300	400	480	510	550	480	380	240	130	93	320
South	Unshaded	360	510	640	640	610	570	630	710	760	620	390	310	560
	Shaded	340	460	470	360	330	340	330	350	490	510	360	300	390
West	Unshaded	150	250	410	570	720	780	850	750	570	340	170	120	470
	Shaded	120	200	330	440	560	600	660	590	460	280	140	97	370

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	40.1	43.5	45.6	49.2	55.1	60.9	65.2	65.5	60.6	52.8	45.3	40.5	52.0
Daily Minimum Temp	35.2	37.4	38.5	41.2	46.3	51.9	55.2	55.7	51.9	45.8	40.1	35.8	44.6
Daily Maximum Temp	45.0	49.5	52.7	57.2	63.9	69.9	75.2	75.2	69.3	59.7	50.5	45.1	59.4
Record Minimum Temp	0.0	1.0	11.0	29.0	28.0	38.0	43.0	44.0	35.0	28.0	6.0	6.0	0.0
Record Maximum Temp	64.0	70.0	75.0	85.0	93.0	96.0	99.0	99.0	98.0	89.0	74.0	63.0	99.0
HDD, Base 65°F	772	602	601	474	307	144	58	65	156	378	591	760	4908
CDD, Base 65°F	0	0	0	0	0	21	64	81	24	0	0	0	190
Humidity Ratio (#w/#da)	0.0042	0.0045	0.0046	0.0051	0.0061	0.0072	0.0082	0.0085	0.0078	0.0065	0.0051	0.0044	0.0060
Wind Speed (mph)	9.2	9.0	9.0	8.9	8.3	8.2	7.8	7.6	7.7	7.9	8.9	8.9	8.4
Clearness Index, Kt	0.32	0.36	0.42	0.45	0.49	0.50	0.54	0.53	0.49	0.41	0.33	0.30	0.46

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

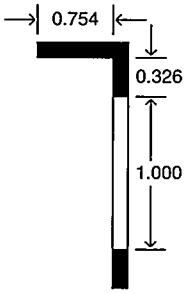
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	29/16	57/33	67/40	55/32	23/14	46/25	78/46	96/63	93/62	70/45	22/12	56/30	73/45	69/43	43/26	4/3	24/13	30/15	17/9	0/0
North	8/7	12/12	14/14	12/12	7/6	14/11	15/16	16/19	16/19	14/15	7/5	12/12	15/15	14/15	11/10	2/1	7/6	8/7	6/4	0/0
East	61/19	52/25	14/14	12/12	7/6	77/26	72/35	33/27	16/19	14/15	56/14	66/26	29/21	14/15	11/10	14/3	30/9	8/7	6/4	0/0
South	35/13	72/31	85/38	68/29	27/11	11/10	39/24	59/38	55/37	30/21	19/7	58/24	80/39	74/38	43/21	13/3	62/15	73/17	47/10	0/0
West	8/7	12/12	18/15	60/27	58/19	11/10	15/16	16/19	49/34	79/42	7/5	12/12	15/15	48/28	71/30	2/1	7/6	15/8	34/8	0/0
M. Clr (%hrs)	17	17	19	20	19	24	27	28	30	32	30	32	40	44	44	11	12	13	13	16

Spokane, WA

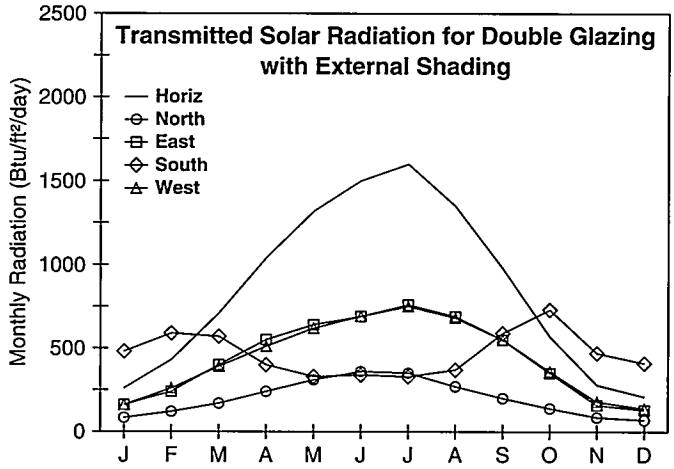
WBAN NO. 24157

LATITUDE: 47.63° N
LONGITUDE: 117.53° W
ELEVATION: 2366 feet
MEAN PRESSURE: 13.5 psia

STATION TYPE: Secondary



Shading Geometry (Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	410	650	1030	1460	1830	2070	2210	1880	1390	860	430	330	1220
	Std.Dev.	38	81	102	119	159	158	131	161	133	80	38	34	36
	Minimum	330	470	840	1190	1520	1800	1860	1580	1160	710	370	260	1160
	Maximum	500	790	1330	1680	2070	2360	2450	2140	1650	1020	500	430	1300
	Diffuse	290	390	500	660	750	770	630	550	440	340	280	240	490
	Clear-Day Global	610	970	1510	2110	2540	2710	2610	2230	1680	1100	670	510	1610
North	Global	160	220	310	420	560	660	630	470	330	230	160	130	360
	Diffuse	160	220	310	410	490	530	500	430	330	230	160	130	330
	Clear-Day Global	130	190	270	400	600	740	670	460	300	210	140	110	350
East	Global	280	430	700	970	1140	1240	1350	1200	950	600	290	230	780
	Diffuse	190	270	380	510	590	630	600	530	420	290	190	160	400
	Clear-Day Global	560	810	1120	1420	1590	1650	1610	1460	1200	870	600	490	1120
South	Global	680	900	1090	1090	1010	980	1100	1240	1350	1190	680	580	990
	Diffuse	320	380	460	550	580	590	560	530	470	380	290	270	450
	Clear-Day Global	1810	2000	1980	1670	1360	1210	1260	1510	1820	1950	1810	1700	1670
West	Global	290	460	680	900	1100	1230	1330	1200	930	610	310	240	780
	Diffuse	200	280	390	510	600	640	600	540	420	300	200	170	400
	Clear-Day Global	560	810	1120	1420	1590	1650	1610	1460	1200	870	600	490	1120

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

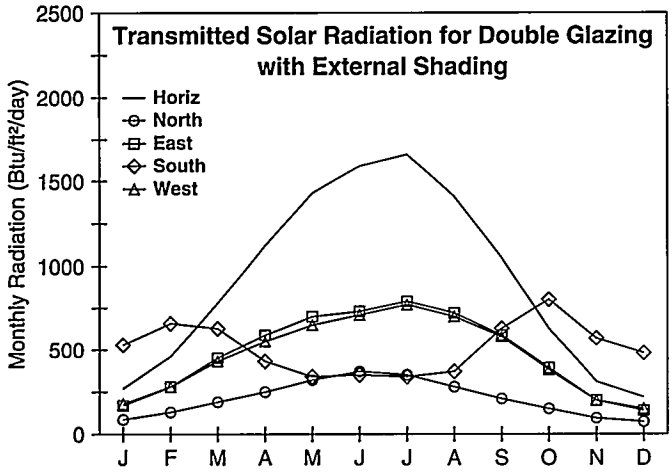
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	260	430	710	1040	1320	1500	1600	1350	980	570	280	210	860
North	Unshaded	110	150	210	290	370	430	400	310	230	160	110	91	240
	Shaded	84	120	170	240	310	360	350	270	200	140	86	70	200
East	Unshaded	190	300	500	690	820	890	970	860	680	420	200	160	560
	Shaded	160	240	400	550	640	690	760	690	550	350	160	130	450
South	Unshaded	510	660	770	740	650	620	690	810	940	870	510	440	690
	Shaded	480	590	570	400	330	340	330	370	590	730	470	410	470
West	Unshaded	200	320	480	640	790	880	960	860	670	430	210	160	550
	Shaded	160	260	390	510	620	690	750	680	550	360	180	140	440

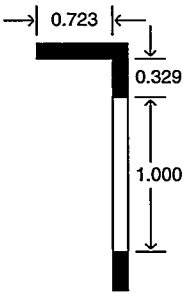
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	27.1	33.3	38.7	45.9	53.9	62.0	68.8	68.4	58.9	47.3	35.1	27.8	47.3
Daily Minimum Temp	20.8	25.9	29.6	34.7	41.9	49.2	54.4	54.3	45.8	36.0	28.8	21.7	36.9
Daily Maximum Temp	33.2	40.6	47.7	57.0	65.8	74.7	83.1	82.5	72.0	58.6	41.4	33.8	57.5
Record Minimum Temp	-22.0	-17.0	-7.0	17.0	24.0	33.0	37.0	35.0	24.0	10.0	-21.0	-25.0	-25.0
Record Maximum Temp	59.0	61.0	71.0	90.0	96.0	100.0	103.0	108.0	98.0	86.0	67.0	56.0	108.0
HDD, Base 65°F	1175	888	815	573	344	139	30	56	223	549	897	1153	6842
CDD, Base 65°F	0	0	0	0	0	49	148	161	40	0	0	0	398
Humidity Ratio (#w/#da)	0.0029	0.0034	0.0037	0.0042	0.0053	0.0066	0.0067	0.0066	0.0057	0.0047	0.0039	0.0031	0.0047
Wind Speed (mph)	9.3	9.6	10.1	10.6	9.8	9.7	9.2	8.5	8.7	8.5	9.5	8.3	9.3
Clearness Index, Kt	0.43	0.45	0.48	0.51	0.53	0.56	0.62	0.61	0.57	0.51	0.40	0.41	0.53

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	38/23	63/41	68/43	52/34	18/13	54/36	84/57	97/70	90/66	65/46	31/19	63/41	77/52	68/47	40/26	9/6	29/18	31/19	15/10	0/0
North	9/9	12/14	13/14	11/12	6/6	12/12	15/16	16/18	15/18	13/14	8/8	12/13	14/15	13/14	9/9	4/3	8/8	8/8	5/5	0/0
East	74/29	49/28	13/14	11/12	6/6	84/45	68/44	24/23	15/18	13/14	73/30	66/37	21/19	13/14	9/9	30/8	30/12	8/8	5/5	0/0
South	48/21	81/40	89/44	67/33	23/11	13/13	44/32	59/44	51/39	25/20	29/15	67/38	84/52	74/45	39/22	30/8	75/21	80/23	46/13	0/0
West	9/9	12/14	26/20	67/34	56/22	12/12	15/16	16/18	55/41	82/50	8/8	12/13	14/15	56/36	76/38	4/3	8/8	22/11	37/11	0/0
M. Clr (%hrs)	25	24	20	17	20	41	39	32	31	34	52	52	47	46	46	13	14	15	15	17





Shading Geometry
(Not to Scale)

Yakima, WA

WBAN NO. 24243

LATITUDE: 46.57° N
LONGITUDE: 120.53° W
ELEVATION: 1066 feet
MEAN PRESSURE: 14.2 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	430	700	1130	1570	1970	2190	2280	1960	1490	940	490	360	1300
	Std.Dev.	29	69	75	107	125	125	114	135	108	62	40	23	27
	Minimum	380	530	960	1300	1670	1900	2060	1730	1260	770	410	330	1250
	Maximum	490	800	1290	1760	2150	2430	2480	2200	1690	1050	550	420	1350
	Diffuse	280	380	500	650	720	730	610	530	430	350	280	240	470
	Clear-Day Global	640	1000	1540	2130	2540	2700	2600	2240	1710	1140	700	540	1630
North	Global	160	220	320	430	570	660	630	480	340	250	170	130	360
	Diffuse	160	220	320	420	490	530	500	430	340	250	170	130	330
	Clear-Day Global	140	200	280	400	590	720	650	470	310	220	150	120	350
East	Global	300	480	760	1020	1220	1300	1380	1240	1010	670	340	250	830
	Diffuse	190	280	400	520	600	630	600	530	430	310	210	160	410
	Clear-Day Global	570	800	1120	1410	1570	1620	1580	1440	1190	880	600	490	1110
South	Global	740	990	1210	1160	1070	1000	1110	1260	1430	1300	810	660	1060
	Diffuse	310	390	490	560	590	590	560	530	480	410	300	270	450
	Clear-Day Global	1790	1960	1940	1640	1320	1160	1210	1470	1790	1930	1790	1680	1640
West	Global	310	480	740	960	1150	1260	1350	1210	980	650	350	260	810
	Diffuse	200	280	400	530	610	640	600	530	430	310	210	170	410
	Clear-Day Global	570	800	1120	1410	1570	1620	1580	1440	1190	880	600	490	1110

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	270	460	780	1120	1430	1590	1660	1410	1050	630	310	220	910
North	Unshaded	110	160	220	290	370	430	400	310	230	170	120	92	240
	Shaded	87	130	190	250	320	370	350	280	210	150	94	73	210
East	Unshaded	200	330	540	730	880	930	990	890	720	470	240	170	590
	Shaded	170	280	450	590	700	730	790	720	590	390	200	140	480
South	Unshaded	560	740	860	780	680	620	680	820	1000	950	610	500	730
	Shaded	530	660	630	430	340	350	340	370	630	800	570	480	510
West	Unshaded	210	330	520	680	820	900	970	870	700	460	240	180	570
	Shaded	180	280	430	550	650	710	770	700	580	380	200	150	470

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	29.7	36.4	43.0	49.4	57.0	64.6	69.9	69.0	60.7	49.9	38.6	29.8	49.8
Daily Minimum Temp	21.8	26.4	30.8	35.5	42.3	49.2	53.1	52.3	44.6	35.3	29.0	22.1	36.9
Daily Maximum Temp	37.5	46.4	55.2	63.2	71.6	79.9	86.7	85.7	76.8	64.4	48.3	37.5	62.8
Record Minimum Temp	-21.0	-25.0	-1.0	20.0	25.0	30.0	34.0	35.0	24.0	11.0	-13.0	-17.0	-25.0
Record Maximum Temp	68.0	69.0	80.0	92.0	102.0	103.0	108.0	110.0	100.0	87.0	73.0	67.0	110.0
HDD, Base 65°F	1094	801	682	468	255	90	19	38	169	468	792	1091	5967
CDD, Base 65°F	0	0	0	0	7	78	171	162	40	0	0	0	458
Humidity Ratio (#w/#da)	0.0028	0.0033	0.0035	0.0039	0.0049	0.0061	0.0070	0.0072	0.0060	0.0046	0.0037	0.0029	0.0047
Wind Speed (mph)	5.8	6.6	7.9	8.6	8.6	8.4	8.1	7.6	7.5	6.7	6.3	5.3	7.3
Clearness Index, Kt	0.43	0.47	0.52	0.54	0.57	0.59	0.64	0.63	0.60	0.54	0.43	0.41	0.56

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

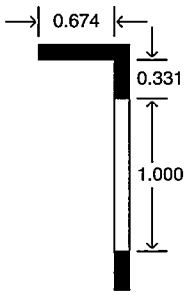
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	35/22	63/43	71/49	55/38	22/15	51/35	83/60	97/73	92/69	69/47	27/18	62/42	78/56	71/50	44/29	7/5	28/17	33/20	18/12	0/0
North	9/9	13/14	14/15	12/13	7/6	13/13	15/16	16/18	16/18	14/15	8/7	12/13	14/16	14/15	10/10	3/2	8/8	9/9	6/5	0/0
East	72/31	54/32	14/15	12/13	7/6	84/46	72/49	30/26	16/18	14/15	69/30	69/41	26/23	14/15	10/10	26/7	32/13	9/9	6/5	0/0
South	42/20	78/43	88/50	68/38	26/13	11/12	41/31	57/44	52/40	27/21	24/13	63/39	83/55	75/48	43/24	25/6	71/21	82/26	52/16	0/0
West	9/9	13/14	22/19	63/36	60/25	11/12	15/16	16/18	51/40	81/48	8/7	12/13	14/16	52/36	76/39	3/2	8/8	19/11	39/13	0/0
M. Clr (%hrs)	32	31	27	26	29	50	46	43	41	44	61	61	59	57	56	17	19	21	20	21

Eau Claire, WI

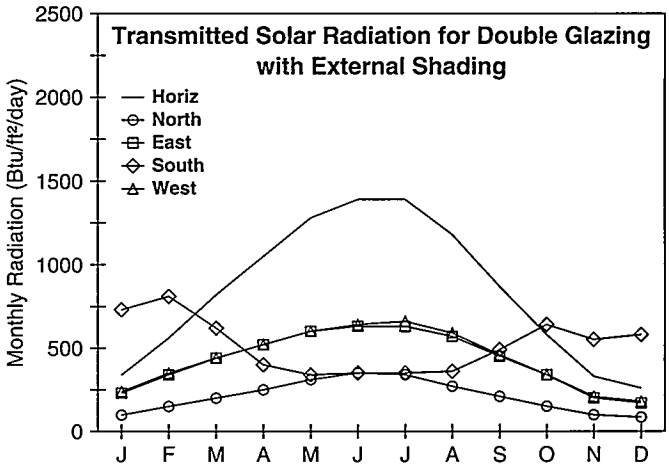
WBAN NO. 14991

LATITUDE: 44.87° N
LONGITUDE: 91.48° W
ELEVATION: 896 feet
MEAN PRESSURE: 14.3 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	550	850	1170	1470	1770	1930	1920	1650	1240	850	510	430	1200
	Std.Dev.	40	57	97	98	148	146	107	107	119	69	41	37	39
	Minimum	430	690	940	1320	1510	1610	1710	1500	990	700	420	360	1110
	Maximum	630	940	1420	1650	2030	2260	2090	1900	1470	990	600	530	1280
	Diffuse	300	430	590	690	790	860	820	710	570	410	310	260	560
	Clear-Day Global	720	1080	1600	2130	2500	2650	2550	2210	1720	1180	760	610	1650
North	Global	180	260	350	430	550	630	600	470	350	260	180	150	370
	Diffuse	180	260	350	420	490	540	520	450	350	260	180	150	350
	Clear-Day Global	160	220	300	410	570	690	630	460	320	230	160	130	360
East	Global	390	570	740	890	1050	1110	1110	990	770	570	340	300	740
	Diffuse	230	330	440	510	590	640	620	550	430	320	220	190	420
	Clear-Day Global	610	830	1120	1360	1500	1550	1510	1380	1160	880	620	520	1090
South	Global	1000	1200	1160	1020	920	880	920	1010	1060	1040	780	790	980
	Diffuse	360	450	520	540	580	600	600	560	490	400	310	300	480
	Clear-Day Global	1850	2000	1930	1570	1250	1100	1150	1410	1730	1890	1800	1730	1610
West	Global	400	580	750	890	1030	1110	1130	1010	790	570	360	310	740
	Diffuse	230	330	440	520	600	650	640	560	440	320	220	190	430
	Clear-Day Global	610	830	1120	1360	1500	1550	1510	1380	1160	880	620	520	1090

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

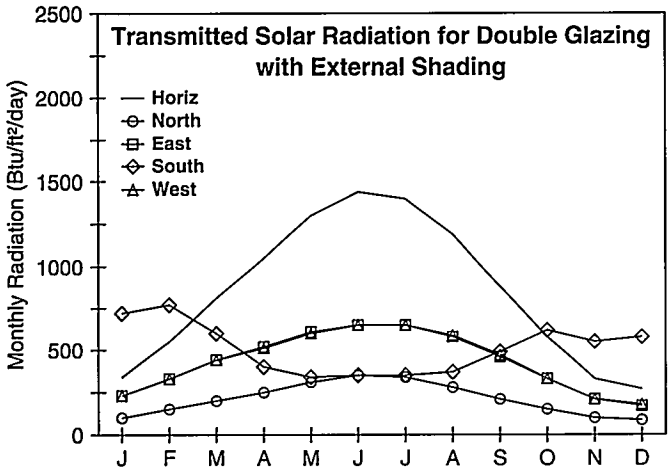
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	340	560	820	1050	1280	1390	1390	1180	870	580	330	260	840
North	Unshaded	120	180	240	290	360	410	390	320	250	180	120	100	250
	Shaded	100	150	200	250	310	350	340	270	210	150	100	85	210
East	Unshaded	270	400	520	640	750	790	790	710	550	400	240	200	520
	Shaded	230	340	440	520	600	630	630	570	450	340	200	170	430
South	Unshaded	760	890	820	680	590	550	580	660	730	750	580	600	680
	Shaded	730	810	620	400	340	350	350	360	490	640	550	580	520
West	Unshaded	270	410	530	630	740	790	810	720	560	400	250	210	530
	Shaded	240	350	440	520	600	640	660	590	460	340	210	180	430

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	10.7	16.3	29.6	45.0	57.3	66.4	71.5	68.6	59.0	47.5	32.4	16.8	43.4
Daily Minimum Temp	0.8	5.7	19.7	33.4	45.0	54.4	59.8	57.2	47.9	36.8	23.8	8.2	32.7
Daily Maximum Temp	20.5	26.8	39.4	56.5	69.5	78.3	83.2	80.0	70.0	58.2	40.9	25.3	54.1
Record Minimum Temp	-36.9	-29.0	-33.0	8.1	23.0	34.0	44.1	39.0	25.0	12.0	-14.1	-31.0	-36.9
Record Maximum Temp	53.1	59.0	84.0	89.1	91.9	99.0	104.0	102.9	96.1	88.0	71.1	63.0	104.0
HDD, Base 65°F	1683	1364	1097	600	277	59	15	28	192	543	978	1494	8330
CDD, Base 65°F	0	0	0	0	38	101	216	140	12	0	0	0	507
Humidity Ratio (#w/#da)	0.0014	0.0017	0.0027	0.0042	0.0066	0.0097	0.0118	0.0112	0.0084	0.0053	0.0032	0.0018	0.0057
Wind Speed (mph)	9.0	8.8	9.8	10.3	9.5	8.9	8.0	7.7	8.3	8.8	9.2	8.9	8.9
Clearness Index, Kt	0.50	0.53	0.52	0.50	0.51	0.52	0.54	0.52	0.49	0.46	0.41	0.44	0.50

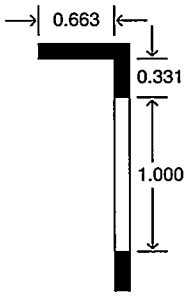
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	34/22	65/44	75/50	59/39	25/17	48/30	81/54	98/67	92/66	68/48	25/15	60/37	78/48	71/47	44/28	8/6	31/20	37/24	21/14	0/0
North	9/9	13/15	14/17	12/14	7/7	15/13	16/17	17/19	16/19	15/15	8/6	13/13	15/16	14/16	11/11	4/3	8/8	9/10	7/6	0/0
East	72/27	56/31	14/17	12/14	7/7	79/36	72/43	32/26	16/19	15/15	63/19	68/32	28/21	14/16	11/11	28/7	36/15	9/10	7/6	0/0
South	41/18	78/39	89/45	70/34	29/13	12/11	38/27	55/38	50/37	26/21	21/10	59/29	80/41	72/41	41/21	26/7	75/25	84/30	57/17	0/0
West	9/9	13/15	21/20	65/33	64/24	12/11	16/17	17/19	50/37	78/47	8/6	13/13	15/16	50/31	72/32	4/3	8/8	18/12	42/14	0/0
M. Clr (%hrs)	28	28	29	29	29	37	34	27	24	28	35	33	30	28	32	25	24	26	27	29



Green Bay, WI

WBAN NO. 14898



Shading Geometry
(Not to Scale)

LATITUDE: 44.48° N
LONGITUDE: 88.13° W
ELEVATION: 702 feet
MEAN PRESSURE: 14.4 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	550	820	1160	1480	1810	1980	1940	1660	1250	850	510	430	1210
	Std.Dev.	45	64	82	93	153	140	82	117	99	65	44	38	37
	Minimum	420	710	940	1330	1560	1700	1750	1480	1060	690	430	330	1140
	Maximum	620	960	1310	1660	2130	2260	2080	1990	1450	970	610	540	1290
	Diffuse	300	420	580	700	800	830	810	720	580	420	310	260	560
	Clear-Day Global	730	1090	1610	2130	2500	2650	2540	2220	1730	1190	770	620	1650
North	Global	180	250	350	430	550	630	590	480	360	260	180	150	370
	Diffuse	180	250	350	420	500	540	520	450	360	260	180	150	350
	Clear-Day Global	160	220	300	410	580	690	620	470	330	230	160	140	360
East	Global	380	560	740	900	1060	1130	1120	990	790	560	350	300	740
	Diffuse	220	320	430	520	600	640	620	550	440	320	220	180	420
	Clear-Day Global	600	840	1120	1360	1500	1540	1490	1380	1150	870	620	530	1080
South	Global	990	1140	1130	1010	930	890	920	1000	1050	1010	770	800	970
	Diffuse	340	440	510	540	580	590	590	560	500	410	310	290	470
	Clear-Day Global	1830	1990	1920	1560	1240	1090	1140	1400	1720	1880	1790	1730	1600
West	Global	390	560	740	880	1040	1130	1120	1000	790	560	350	310	740
	Diffuse	220	320	430	520	600	640	630	560	450	320	220	190	430
	Clear-Day Global	600	840	1120	1360	1500	1540	1490	1380	1150	870	620	530	1080

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	340	550	810	1050	1300	1440	1400	1190	880	580	330	270	850
North	Unshaded	120	180	240	300	370	410	390	320	250	180	120	100	250
	Shaded	100	150	200	250	310	350	340	280	210	150	100	86	210
East	Unshaded	260	390	520	640	750	800	800	710	560	390	240	200	520
	Shaded	230	330	440	520	610	650	650	580	460	330	210	170	430
South	Unshaded	750	840	800	680	600	550	580	650	730	740	580	600	670
	Shaded	720	770	600	400	340	350	350	370	490	620	550	580	510
West	Unshaded	270	390	530	620	740	810	800	720	560	390	240	210	520
	Shaded	230	330	440	510	600	650	650	590	470	330	210	180	430

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	14.3	18.3	30.0	44.0	55.5	64.5	69.7	67.1	59.0	48.0	34.4	20.2	43.8
Daily Minimum Temp	5.8	9.5	21.4	33.9	43.7	53.5	58.9	56.8	48.8	38.5	26.8	12.5	34.2
Daily Maximum Temp	22.8	27.1	38.5	54.0	67.2	75.5	80.5	77.5	69.1	57.4	42.0	27.7	53.3
Record Minimum Temp	-31.0	-26.0	-29.0	7.0	21.0	32.0	40.0	38.0	24.0	15.0	-9.0	-27.0	-31.0
Record Maximum Temp	50.0	55.0	77.0	89.0	91.0	98.0	99.0	99.0	95.0	88.0	72.0	62.0	99.0
HDD, Base 65°F	1572	1308	1085	630	318	93	17	43	189	527	918	1389	8089
CDD, Base 65°F	0	0	0	0	23	78	163	108	9	0	0	0	381
Humidity Ratio (#w/#da)	0.0016	0.0018	0.0027	0.0042	0.0065	0.0094	0.0115	0.0110	0.0085	0.0056	0.0035	0.0020	0.0057
Wind Speed (mph)	10.8	10.2	10.7	11.0	9.8	9.0	7.8	7.7	8.6	9.5	10.2	10.3	9.6
Clearness Index, Kt	0.49	0.51	0.51	0.50	0.52	0.54	0.54	0.52	0.49	0.46	0.41	0.44	0.51

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

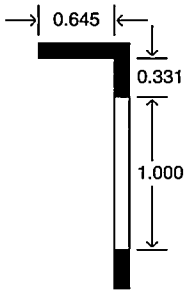
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	40/24	68/44	75/49	57/36	21/14	52/33	85/56	99/67	91/64	65/46	30/17	63/38	79/49	70/45	41/26	11/7	33/21	37/23	19/12	0/0
North	10/10	14/16	14/17	12/13	7/6	13/13	16/18	17/19	16/19	14/15	9/7	13/14	15/17	14/15	10/10	5/3	9/9	9/10	6/5	0/0
East	74/27	52/29	14/17	12/13	7/6	81/37	69/41	26/24	16/19	14/15	67/21	64/31	23/20	14/15	10/10	33/8	33/15	9/10	6/5	0/0
South	45/19	79/38	88/44	67/31	23/10	12/12	40/28	55/38	48/35	23/19	25/11	62/29	80/41	69/37	37/19	33/8	77/25	84/29	52/14	0/0
West	10/10	14/16	27/21	68/32	59/20	12/12	16/18	17/19	55/39	80/47	9/7	13/14	15/17	55/31	72/31	5/3	9/9	23/13	42/12	0/0
M. Clr (%hrs)	30	30	29	30	31	40	38	34	34	36	39	37	30	30	34	27	27	27	30	31

La Crosse, WI

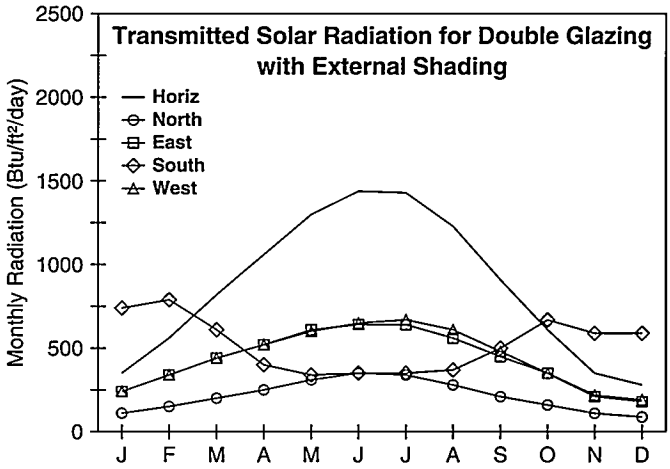
WBAN NO. 14920

LATITUDE: 43.87° N
LONGITUDE: 91.25° W
ELEVATION: 673 feet
MEAN PRESSURE: 14.4 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	560	850	1170	1480	1800	1980	1970	1700	1280	890	540	450	1230
	Std.Dev.	51	57	97	107	150	129	111	105	105	66	42	37	42
	Minimum	440	730	950	1290	1550	1760	1680	1510	1070	750	440	380	1140
	Maximum	670	940	1410	1720	2060	2320	2140	1970	1530	1020	620	540	1330
	Diffuse	300	420	570	690	780	840	800	700	570	420	310	260	560
	Clear-Day Global	750	1110	1610	2130	2500	2640	2540	2220	1740	1210	800	630	1660
North	Global	180	260	340	430	550	630	600	470	360	260	180	150	370
	Diffuse	180	260	340	420	490	530	520	450	360	260	180	150	350
	Clear-Day Global	160	230	310	410	570	680	630	470	330	240	170	140	360
East	Global	400	570	740	890	1050	1120	1110	970	770	590	360	310	740
	Diffuse	220	320	420	510	590	630	620	550	440	320	220	190	420
	Clear-Day Global	610	830	1110	1350	1480	1520	1480	1370	1150	880	630	530	1080
South	Global	1010	1170	1130	1000	920	870	920	1020	1080	1070	820	810	990
	Diffuse	340	440	500	540	570	590	590	560	500	410	310	290	470
	Clear-Day Global	1820	1970	1890	1540	1210	1070	1120	1370	1690	1860	1790	1710	1580
West	Global	400	570	740	880	1040	1130	1150	1040	820	590	370	310	750
	Diffuse	230	320	430	520	600	650	640	570	450	330	220	190	430
	Clear-Day Global	610	830	1110	1350	1480	1520	1480	1370	1150	880	630	530	1080

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

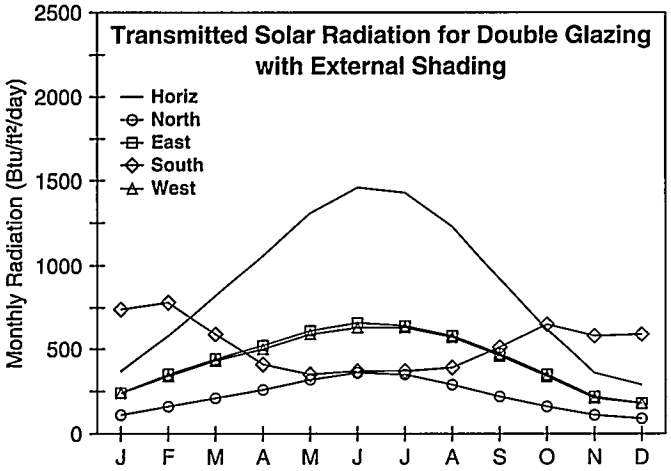
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	350	560	820	1060	1300	1440	1430	1230	910	610	350	280	860
North	Unshaded	120	180	240	290	360	410	390	320	250	180	130	110	250
	Shaded	110	150	200	250	310	350	340	280	210	160	110	88	210
East	Unshaded	270	400	520	640	750	800	790	690	540	410	250	210	520
	Shaded	240	340	440	520	610	640	640	560	450	350	210	180	430
South	Unshaded	760	860	800	670	580	540	570	660	740	780	620	620	680
	Shaded	740	790	610	400	340	350	350	370	500	670	590	590	520
West	Unshaded	270	400	520	630	740	800	820	740	580	410	250	210	530
	Shaded	240	340	440	520	600	650	670	610	480	350	220	190	440

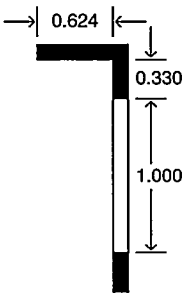
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	14.4	19.9	32.8	47.7	59.5	68.5	73.5	70.8	61.8	50.2	35.6	20.3	46.3
Daily Minimum Temp	5.3	10.1	23.6	37.0	48.1	57.1	62.3	59.9	51.2	40.2	27.7	12.5	36.3
Daily Maximum Temp	23.5	29.6	42.1	58.5	70.9	79.8	84.5	81.6	72.4	60.2	43.4	28.1	56.2
Record Minimum Temp	-37.0	-36.0	-28.0	7.0	26.0	37.0	33.0	40.0	28.0	14.0	-9.0	-30.0	-37.0
Record Maximum Temp	57.0	64.0	84.0	93.0	94.0	102.0	104.0	105.0	100.0	93.0	75.0	64.0	105.0
HDD, Base 65°F	1569	1263	998	519	220	36	7	16	131	464	882	1386	7491
CDD, Base 65°F	0	0	0	0	50	141	270	196	35	0	0	0	692
Humidity Ratio (#w/#da)	0.0016	0.0019	0.0029	0.0045	0.0072	0.0105	0.0127	0.0120	0.0092	0.0057	0.0035	0.0020	0.0061
Wind Speed (mph)	8.7	8.3	9.2	9.9	9.0	8.3	7.5	7.4	8.0	8.8	9.1	8.6	8.6
Clearness Index, Kt	0.49	0.52	0.51	0.50	0.52	0.54	0.55	0.54	0.50	0.47	0.42	0.44	0.51

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	35/22	66/42	75/48	60/38	24/16	48/30	81/55	98/67	93/67	68/47	25/15	61/36	79/49	72/47	44/29	9/6	33/20	38/24	22/14	0/0
North	9/9	13/15	14/17	12/14	7/7	16/13	16/17	17/19	17/19	15/15	8/6	13/14	15/17	15/16	11/11	4/3	9/9	9/10	7/6	0/0
East	72/26	56/30	14/17	12/14	7/7	78/36	72/43	31/26	17/19	15/15	61/18	68/31	28/21	15/16	11/11	29/8	36/15	9/10	7/6	0/0
South	40/17	76/36	87/42	69/33	28/12	12/11	37/27	53/38	48/37	25/20	21/9	59/28	78/40	71/39	40/21	27/7	75/25	84/29	57/17	0/0
West	9/9	13/15	21/19	64/32	63/22	12/11	16/17	17/19	50/38	78/46	8/6	13/14	15/17	50/31	72/32	4/3	9/9	19/12	42/14	0/0
M. Clr (%hrs)	32	32	32	31	30	40	40	34	31	35	33	37	37	36	39	28	28	28	29	31





Shading Geometry
(Not to Scale)

Madison, WI

WBAN NO. 14837

LATITUDE: 43.13° N
LONGITUDE: 89.33° W
ELEVATION: 860 feet
MEAN PRESSURE: 14.3 psia

STATION TYPE: Primary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	580	870	1170	1490	1820	2010	1970	1710	1300	900	550	460	1240
	Std.Dev.	56	68	107	127	183	129	117	143	106	88	60	56	57
	Minimum	420	680	940	1240	1370	1780	1760	1410	1080	710	390	320	1110
	Maximum	690	1000	1360	1690	2200	2310	2210	1970	1480	1110	680	580	1350
	Diffuse	310	450	600	730	840	910	910	810	620	440	310	270	600
	Clear-Day Global	780	1130	1620	2130	2480	2610	2510	2210	1740	1220	820	670	1660
North	Global	190	270	350	440	550	630	600	500	370	270	190	160	380
	Diffuse	190	270	350	430	510	550	540	480	370	270	190	160	360
	Clear-Day Global	160	230	310	420	580	680	620	470	350	250	170	150	370
East	Global	400	580	730	890	1050	1130	1110	990	790	590	370	310	750
	Diffuse	230	330	430	520	610	660	660	590	460	330	220	190	440
	Clear-Day Global	620	840	1100	1330	1450	1480	1440	1330	1130	870	640	550	1070
South	Global	1010	1150	1100	990	920	880	920	1010	1060	1050	810	810	980
	Diffuse	350	460	510	550	590	620	620	610	520	430	320	300	490
	Clear-Day Global	1840	1960	1860	1520	1200	1060	1100	1340	1660	1840	1790	1740	1570
West	Global	400	570	720	860	1010	1100	1080	970	780	570	360	310	730
	Diffuse	230	340	430	530	620	670	670	600	470	340	230	190	440
	Clear-Day Global	620	840	1100	1330	1450	1480	1440	1330	1130	870	640	550	1070

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	370	580	820	1060	1310	1460	1430	1230	920	620	360	290	870
North	Unshaded	130	190	240	300	370	420	400	340	260	190	130	110	260
	Shaded	110	160	210	260	320	360	350	290	220	160	110	90	220
East	Unshaded	270	400	520	630	740	800	790	710	560	410	250	210	530
	Shaded	240	350	440	520	610	660	640	580	470	350	220	180	440
South	Unshaded	760	850	780	660	580	550	570	660	730	760	610	610	680
	Shaded	740	780	590	410	350	370	370	390	510	650	580	590	530
West	Unshaded	270	390	500	610	720	780	770	690	550	400	250	210	510
	Shaded	240	340	430	500	590	630	630	570	460	340	210	180	430

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	16.0	20.6	32.3	45.4	56.5	66.2	71.0	68.3	59.8	48.9	35.4	21.7	45.2
Daily Minimum Temp	7.2	11.1	23.0	34.1	44.2	54.2	59.5	56.9	48.2	37.7	26.7	13.5	34.7
Daily Maximum Temp	24.8	30.1	41.5	56.7	68.9	78.2	82.4	79.6	71.5	59.9	44.0	29.8	55.6
Record Minimum Temp	-37.0	-28.0	-29.0	0.0	19.0	31.0	36.0	35.0	25.0	13.0	-11.0	-25.0	-37.0
Record Maximum Temp	56.0	61.0	82.0	94.0	93.0	101.0	104.0	102.0	99.0	90.0	76.0	62.0	104.0
HDD, Base 65°F	1519	1243	1014	588	294	68	12	38	168	499	888	1342	7673
CDD, Base 65°F	0	0	0	0	30	104	198	141	12	0	0	0	485
Humidity Ratio (#w/#da)	0.0017	0.0020	0.0030	0.0045	0.0069	0.0099	0.0120	0.0114	0.0089	0.0057	0.0037	0.0022	0.0060
Wind Speed (mph)	10.4	10.0	10.9	11.1	9.6	9.0	8.0	7.7	8.4	9.4	10.2	10.1	9.6
Clearness Index, Kt	0.49	0.52	0.50	0.50	0.52	0.54	0.55	0.54	0.50	0.47	0.41	0.43	0.51

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

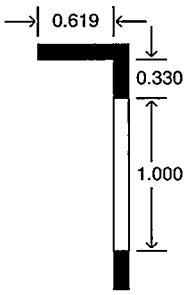
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	39/23	68/45	77/50	60/37	23/14	50/33	83/58	100/71	93/69	66/47	28/16	64/39	80/51	72/47	41/27	12/7	35/21	40/24	22/13	0/0
North	10/9	13/16	15/17	13/14	7/6	15/13	16/18	18/20	18/20	15/16	8/7	14/14	16/17	15/16	12/11	5/3	9/9	10/10	7/6	0/0
East	72/27	53/30	15/17	13/14	7/6	78/38	70/44	29/26	18/20	15/16	61/20	66/31	25/21	15/16	12/11	34/8	34/15	10/10	7/6	0/0
South	43/18	76/39	87/44	67/31	24/10	12/12	37/28	53/39	47/37	23/20	23/10	60/29	78/41	69/37	35/19	32/8	76/26	84/30	52/16	0/0
West	10/9	13/16	25/21	67/31	59/19	12/12	16/18	18/20	54/41	77/46	8/7	14/14	16/17	53/31	66/30	5/3	9/9	22/13	41/14	0/0
M. Clr (%hrs)	30	28	27	28	28	41	38	32	29	36	41	39	35	35	39	27	27	28	28	31

Milwaukee, WI

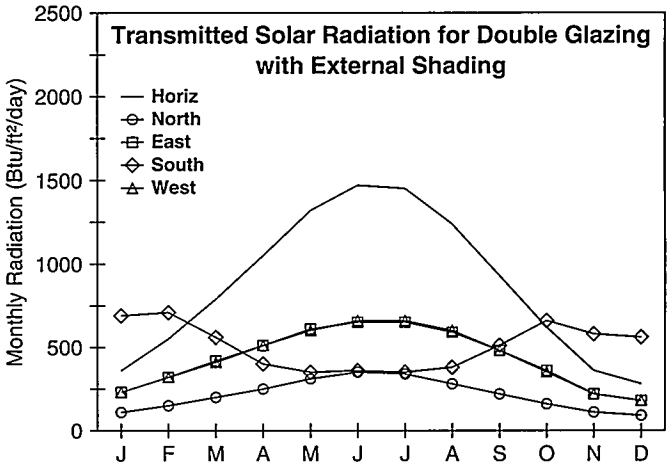
WBAN NO. 14839

LATITUDE: 42.95° N
LONGITUDE: 87.90° W
ELEVATION: 692 feet
MEAN PRESSURE: 14.4 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	570	820	1120	1470	1830	2020	1990	1710	1310	900	550	450	1230
	Std.Dev.	50	65	59	100	153	130	105	124	105	69	50	45	42
	Minimum	440	680	1010	1230	1540	1760	1790	1490	1100	770	450	370	1160
	Maximum	650	940	1230	1640	2150	2340	2150	1930	1510	1040	680	540	1320
	Diffuse	310	440	590	710	800	840	800	720	580	430	320	270	570
	Clear-Day Global	780	1130	1630	2130	2490	2620	2520	2210	1750	1230	820	660	1670
North	Global	190	260	350	430	550	630	590	480	370	270	190	160	370
	Diffuse	190	260	350	430	500	540	520	450	360	270	190	160	350
	Clear-Day Global	170	230	320	420	580	680	620	480	350	250	170	150	370
East	Global	390	540	700	870	1040	1120	1120	1000	800	600	370	300	740
	Diffuse	230	320	420	520	600	640	620	560	450	330	230	190	430
	Clear-Day Global	620	830	1100	1330	1460	1490	1450	1340	1130	870	630	540	1070
South	Global	950	1060	1040	970	910	870	910	1010	1090	1060	810	760	950
	Diffuse	340	430	500	540	580	590	590	570	510	420	320	290	470
	Clear-Day Global	1810	1930	1850	1510	1200	1050	1090	1340	1660	1830	1760	1700	1560
West	Global	390	540	690	860	1030	1130	1130	1020	810	580	360	310	740
	Diffuse	230	320	430	520	610	650	630	570	460	330	230	190	430
	Clear-Day Global	620	830	1100	1330	1460	1490	1450	1340	1130	870	630	540	1070

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

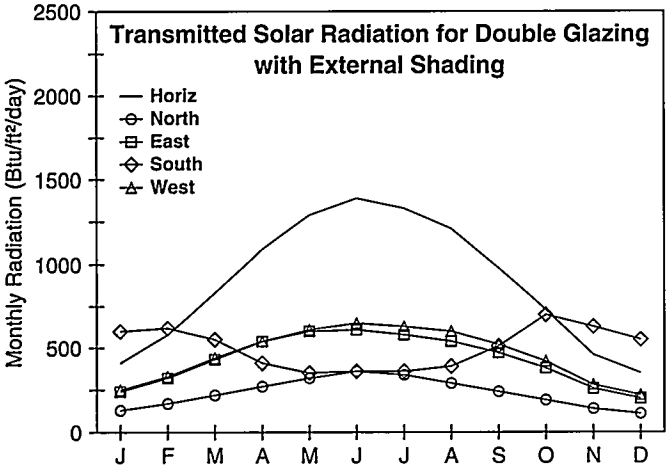
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	360	550	790	1050	1320	1470	1450	1240	930	620	360	280	870
North	Unshaded	130	180	240	300	360	410	390	320	250	190	130	110	250
	Shaded	110	150	200	250	310	350	340	280	220	160	110	91	220
East	Unshaded	270	370	500	620	740	800	800	710	570	420	250	210	520
	Shaded	230	320	420	510	610	650	650	590	480	360	220	180	440
South	Unshaded	720	780	730	640	580	530	560	650	750	770	610	580	660
	Shaded	690	710	560	400	350	360	350	380	510	660	580	560	510
West	Unshaded	270	370	490	610	730	800	810	720	580	410	250	210	520
	Shaded	230	320	410	510	600	660	660	600	480	350	220	180	440

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	18.9	23.0	33.3	44.4	54.6	65.0	70.9	69.3	61.7	50.3	37.7	24.4	46.1
Daily Minimum Temp	11.6	15.9	26.2	35.8	44.8	55.0	62.0	60.8	52.8	41.8	30.7	17.5	37.9
Daily Maximum Temp	26.1	30.1	40.4	52.9	64.3	74.9	79.9	77.8	70.6	58.7	44.7	31.2	54.3
Record Minimum Temp	-26.0	-19.0	-10.0	12.0	21.0	33.0	40.0	44.0	28.0	18.0	-5.0	-20.0	-26.0
Record Maximum Temp	62.0	65.0	82.0	91.0	93.0	101.0	101.0	103.0	98.0	89.0	77.0	63.0	103.0
HDD, Base 65°F	1429	1176	983	618	338	82	14	27	123	456	819	1259	7324
CDD, Base 65°F	0	0	0	0	16	82	197	160	24	0	0	0	479
Humidity Ratio (#w/#da)	0.0019	0.0021	0.0031	0.0044	0.0066	0.0096	0.0119	0.0118	0.0093	0.0060	0.0039	0.0024	0.0061
Wind Speed (mph)	12.4	11.9	12.4	12.3	11.0	10.4	9.7	9.4	10.1	11.1	11.8	11.8	11.2
Clearness Index, Kt	0.47	0.49	0.48	0.49	0.52	0.55	0.55	0.54	0.50	0.47	0.41	0.42	0.51

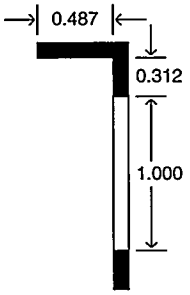
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	40/24	69/43	75/47	57/35	20/13	52/33	85/57	100/70	92/66	65/46	30/18	65/40	80/51	71/46	41/25	13/8	36/21	39/23	21/13	0/0
North	10/10	14/15	14/17	12/13	7/6	15/13	16/18	17/19	17/19	14/15	9/8	14/14	16/17	15/16	11/10	5/4	9/9	10/10	7/6	0/0
East	72/26	51/28	14/17	12/13	7/6	80/38	69/42	26/24	17/19	14/15	65/22	65/32	23/20	15/16	11/10	36/8	33/14	10/10	7/6	0/0
South	44/19	77/36	84/41	64/29	22/9	13/12	38/28	53/38	46/35	21/18	25/12	61/31	78/42	67/37	35/18	36/8	78/23	84/26	52/14	0/0
West	10/10	14/15	27/21	67/30	55/18	13/12	16/18	17/19	56/40	80/48	9/8	14/14	16/17	55/32	70/30	5/4	9/9	23/13	43/13	0/0
M. Clr (%hrs)	28	26	26	25	26	41	41	36	35	35	41	40	38	39	39	25	26	27	27	28



Charleston, WV

WBAN NO. 13866



Shading Geometry
(Not to Scale)

LATITUDE: 38.37° N
LONGITUDE: 81.60° W
ELEVATION: 951 feet
MEAN PRESSURE: 14.3 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	620	850	1180	1510	1780	1910	1840	1670	1370	1040	680	530	1250
	Std.Dev.	46	79	99	152	141	125	123	99	88	76	77	42	49
	Minimum	550	700	970	1160	1530	1680	1480	1490	1210	890	530	460	1110
	Maximum	710	1030	1340	1870	2030	2200	2090	1850	1660	1260	830	620	1360
	Diffuse	380	490	610	740	840	900	890	800	650	480	370	320	620
	Clear-Day Global	970	1320	1790	2240	2520	2620	2530	2270	1870	1400	1010	850	1790
North	Global	210	280	360	440	540	610	570	480	390	300	220	190	380
	Diffuse	210	280	360	440	500	540	520	470	390	300	220	190	370
	Clear-Day Global	190	250	330	430	580	680	620	480	370	280	210	170	380
East	Global	390	520	690	860	970	1000	950	880	760	620	420	330	700
	Diffuse	260	340	430	530	590	630	620	560	470	370	270	220	440
	Clear-Day Global	710	920	1150	1340	1420	1440	1400	1310	1150	930	730	640	1100
South	Global	840	930	990	900	800	750	770	900	1010	1110	890	760	890
	Diffuse	360	430	500	540	560	580	580	570	530	450	360	320	480
	Clear-Day Global	1940	1980	1770	1370	1030	880	930	1200	1560	1810	1870	1860	1510
West	Global	400	540	710	870	980	1060	1020	970	830	670	440	350	740
	Diffuse	260	340	440	530	600	650	630	580	490	370	270	220	450
	Clear-Day Global	710	920	1150	1340	1420	1440	1400	1310	1150	930	730	640	1100

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	410	580	830	1090	1290	1390	1330	1210	980	730	460	350	890
North	Unshaded	150	200	250	300	360	400	380	330	270	210	150	130	260
	Shaded	130	170	220	270	320	360	340	290	240	190	140	110	230
East	Unshaded	270	360	490	610	690	710	680	620	540	430	290	230	490
	Shaded	240	320	430	540	600	610	580	540	470	380	260	200	430
South	Unshaded	630	670	680	590	500	460	470	570	680	800	660	570	610
	Shaded	600	620	550	410	350	360	360	390	510	700	630	550	500
West	Unshaded	280	380	500	620	700	750	730	690	590	470	310	240	520
	Shaded	250	330	440	540	610	650	630	600	520	420	280	220	460

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	32.1	35.5	45.9	54.8	63.5	71.4	75.1	73.9	67.7	56.2	46.8	37.0	55.0
Daily Minimum Temp	23.0	25.7	35.0	42.8	51.5	59.8	64.4	63.4	56.5	44.2	36.3	28.0	44.2
Daily Maximum Temp	41.2	45.3	56.7	66.8	75.5	83.1	85.7	84.4	78.8	68.2	57.3	46.0	65.8
Record Minimum Temp	-15.0	-6.0	0.0	19.0	26.0	33.0	46.0	41.0	34.0	17.0	6.0	-12.0	-15.0
Record Maximum Temp	79.0	78.0	89.0	94.0	93.0	98.0	104.0	101.0	102.0	92.0	85.0	80.0	104.0
HDD, Base 65°F	1020	826	592	312	129	10	0	0	44	299	546	868	4646
CDD, Base 65°F	0	0	0	6	83	202	313	276	125	26	0	0	1031
Humidity Ratio (#w/#da)	0.0029	0.0031	0.0041	0.0055	0.0085	0.0117	0.0138	0.0135	0.0110	0.0070	0.0048	0.0036	0.0075
Wind Speed (mph)	7.2	7.0	7.6	7.4	5.9	5.2	4.9	4.4	4.6	4.9	6.1	6.7	6.0
Clearness Index, Kt	0.43	0.44	0.47	0.48	0.50	0.52	0.51	0.51	0.50	0.49	0.42	0.40	0.48

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

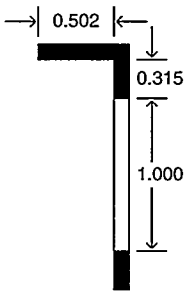
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	31/18	68/40	82/49	70/43	35/21	37/24	77/50	98/70	97/70	74/49	19/11	60/35	83/54	80/54	54/33	10/6	38/21	49/26	35/20	6/4
North	9/8	14/15	15/17	14/15	9/9	21/13	16/17	17/19	17/19	16/16	7/5	14/13	16/18	16/18	13/13	4/3	10/9	11/11	9/9	3/2
East	68/20	63/30	17/18	14/15	9/9	67/29	76/41	41/32	17/19	16/16	48/15	72/30	38/27	16/18	13/13	31/7	43/16	11/11	9/9	3/2
South	30/12	66/31	81/39	69/34	35/15	11/10	26/21	43/33	42/34	24/20	13/7	49/23	71/41	68/41	43/22	25/6	73/22	88/27	69/21	16/4
West	9/8	14/15	15/17	60/31	72/25	11/10	16/17	17/19	43/34	75/43	7/5	14/13	16/18	44/30	72/32	4/3	10/9	14/12	47/17	22/6
M. Clr (%hrs)	26	26	27	25	27	28	34	28	28	36	25	38	34	35	41	20	21	22	23	25

Elkins, WV

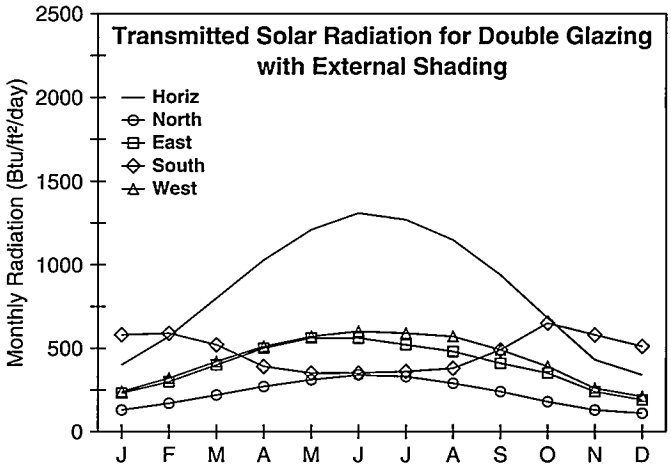
WBAN NO. 13729

LATITUDE: 38.88° N
LONGITUDE: 79.85° W
ELEVATION: 1949 feet
MEAN PRESSURE: 13.7 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	610	830	1130	1440	1680	1810	1760	1590	1310	980	640	510	1190
	Std.Dev.	46	73	85	131	138	111	92	88	97	76	68	37	33
	Minimum	520	680	950	1190	1410	1640	1550	1430	1150	850	520	450	1120
	Maximum	700	990	1290	1790	1890	2100	1910	1770	1510	1210	820	590	1260
	Diffuse	390	510	630	760	860	920	920	810	650	480	380	340	640
	Clear-Day Global	960	1310	1780	2250	2530	2640	2550	2280	1870	1390	1000	840	1780
North	Global	220	290	360	440	530	590	560	480	380	290	220	190	380
	Diffuse	220	290	360	440	500	530	520	460	380	290	220	190	370
	Clear-Day Global	190	250	330	430	580	680	620	480	360	280	200	170	380
East	Global	370	490	650	820	920	930	870	800	690	570	390	320	650
	Diffuse	260	340	430	520	590	620	610	550	460	350	260	220	430
	Clear-Day Global	710	920	1140	1350	1440	1450	1410	1320	1160	930	730	630	1100
South	Global	810	890	940	870	780	740	760	870	970	1030	820	710	850
	Diffuse	370	440	490	540	560	580	580	570	520	440	350	320	480
	Clear-Day Global	1950	1990	1790	1390	1060	900	950	1210	1580	1830	1870	1860	1530
West	Global	390	520	680	830	940	1000	970	930	790	620	420	340	700
	Diffuse	260	350	430	530	600	640	630	580	480	360	260	230	450
	Clear-Day Global	710	920	1140	1350	1440	1450	1410	1320	1160	930	730	630	1100

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

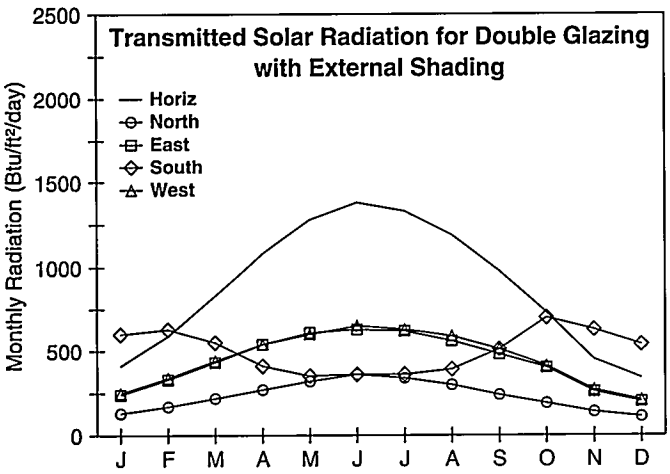
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	400	570	800	1030	1210	1310	1270	1150	940	680	430	340	850
North	Unshaded	150	200	250	300	360	390	370	320	270	200	150	130	260
	Shaded	130	170	220	270	310	340	330	290	240	180	130	110	230
East	Unshaded	260	350	460	580	650	660	610	560	480	400	270	220	460
	Shaded	230	300	400	500	560	560	520	480	410	350	240	190	390
South	Unshaded	600	650	650	570	490	460	480	560	660	740	610	530	580
	Shaded	580	590	520	390	350	350	360	380	490	650	580	510	480
West	Unshaded	270	370	480	590	660	710	690	660	560	440	290	230	500
	Shaded	240	320	420	510	570	600	590	570	490	390	260	210	430

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	27.1	29.8	39.6	48.2	57.4	64.8	68.7	67.8	61.8	50.4	41.3	32.0	49.1
Daily Minimum Temp	16.2	18.3	27.1	34.8	44.0	52.0	56.9	56.2	49.9	37.2	29.7	21.3	37.0
Daily Maximum Temp	37.9	41.3	52.1	61.6	70.9	77.6	80.4	79.3	73.6	63.6	52.9	42.6	61.2
Record Minimum Temp	-24.0	-22.0	-15.0	3.0	20.0	25.0	32.0	34.0	27.0	11.0	0.0	-24.0	-24.0
Record Maximum Temp	76.0	72.0	84.0	89.0	90.0	93.0	99.0	95.0	97.0	86.0	80.0	76.0	99.0
HDD, Base 65°F	1175	986	787	504	249	62	11	23	131	458	711	1023	6120
CDD, Base 65°F	0	0	0	0	13	56	126	110	35	6	0	0	346
Humidity Ratio (#w/#da)	0.0027	0.0029	0.0039	0.0052	0.0079	0.0108	0.0126	0.0123	0.0101	0.0063	0.0045	0.0034	0.0069
Wind Speed (mph)	7.3	7.2	7.9	7.8	6.2	4.9	4.4	4.0	4.3	5.1	6.8	7.1	6.1
Clearness Index, Kt	0.43	0.44	0.45	0.46	0.48	0.49	0.49	0.49	0.48	0.46	0.41	0.40	0.46

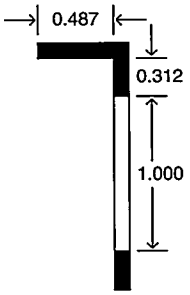
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	34/19	70/40	82/48	70/41	33/19	40/24	79/49	99/69	96/68	72/47	21/12	62/35	84/54	80/53	52/32	11/7	39/22	48/27	33/19	4/3
North	9/8	14/15	15/17	13/15	9/8	20/12	16/17	17/19	17/19	16/16	7/6	14/14	16/18	16/17	13/12	5/3	10/9	11/11	9/8	2/2
East	72/21	62/29	15/17	13/15	9/8	71/27	75/39	38/30	17/19	16/16	53/14	71/30	35/26	16/17	13/12	34/8	42/16	11/11	9/8	2/2
South	34/13	69/31	82/38	69/32	33/14	11/10	28/21	44/34	42/33	23/19	15/7	51/24	72/42	68/41	42/22	29/7	76/23	88/28	67/21	12/3
West	9/8	14/15	16/17	63/30	71/23	11/10	16/17	17/19	46/34	76/42	7/6	14/14	16/18	47/31	72/33	5/3	10/9	16/12	47/16	17/4
M. Clr (%hrs)	18	21	22	21	22	19	28	23	21	26	10	32	29	29	34	14	16	17	19	21



Huntington, WV

WBAN NO. 03860



Shading Geometry
(Not to Scale)

LATITUDE: 38.37° N
LONGITUDE: 82.55° W
ELEVATION: 837 feet
MEAN PRESSURE: 14.3 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	620	850	1170	1510	1770	1900	1840	1660	1370	1040	670	520	1250
	Std.Dev.	55	78	101	133	157	144	117	111	119	97	77	41	60
	Minimum	520	740	980	1240	1490	1690	1680	1450	1170	860	520	460	1160
	Maximum	730	1070	1410	1800	2220	2340	2220	1980	1740	1290	830	620	1490
	Diffuse	370	480	600	730	840	910	900	810	650	470	370	320	620
	Clear-Day Global	970	1320	1790	2240	2520	2620	2540	2270	1870	1400	1010	850	1790
North	Global	210	280	350	440	540	620	580	490	390	300	220	180	380
	Diffuse	210	280	350	430	500	540	520	470	390	300	220	180	370
	Clear-Day Global	190	250	330	430	580	680	620	480	370	280	210	170	380
East	Global	390	530	690	870	990	1030	1000	910	780	640	430	330	720
	Diffuse	250	340	430	520	600	640	630	570	480	360	270	220	440
	Clear-Day Global	720	920	1150	1340	1420	1430	1400	1310	1150	930	730	640	1100
South	Global	840	950	980	900	800	740	770	880	1010	1110	880	750	880
	Diffuse	360	430	490	540	560	580	580	580	530	450	360	310	480
	Clear-Day Global	1940	1970	1770	1370	1030	880	940	1190	1560	1820	1870	1860	1510
West	Global	400	540	710	870	970	1050	1010	950	820	660	430	340	730
	Diffuse	260	340	430	530	600	650	640	590	490	370	270	220	450
	Clear-Day Global	720	920	1150	1340	1420	1430	1400	1310	1150	930	730	640	1100

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	410	590	830	1080	1280	1380	1330	1190	980	730	450	340	880
North	Unshaded	150	190	250	300	360	400	380	330	270	210	150	130	260
	Shaded	130	170	220	270	320	360	340	300	240	190	140	110	230
East	Unshaded	270	370	490	620	700	730	710	650	550	450	300	230	510
	Shaded	240	330	430	540	610	630	620	560	480	400	260	200	440
South	Unshaded	620	690	680	580	500	460	480	560	680	800	660	560	600
	Shaded	600	630	550	410	350	360	360	390	510	700	630	540	500
West	Unshaded	280	380	500	620	690	750	720	680	580	460	300	230	520
	Shaded	250	340	440	540	600	650	630	590	510	410	270	210	450

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	32.0	35.1	46.0	55.3	63.8	70.9	74.7	73.5	67.6	56.1	46.5	36.9	54.9
Daily Minimum Temp	23.2	26.1	35.5	43.8	52.4	60.4	65.0	63.9	57.1	45.0	37.0	28.4	44.8
Daily Maximum Temp	40.7	44.2	56.5	66.8	75.2	81.3	84.3	83.1	78.0	67.2	55.9	45.3	64.9
Record Minimum Temp	-16.0	-6.0	-2.0	20.0	27.0	40.0	46.0	43.0	31.0	16.0	8.0	-13.0	-16.0
Record Maximum Temp	74.0	79.0	86.0	92.0	93.0	100.0	102.0	100.0	97.0	86.0	82.0	80.0	102.0
HDD, Base 65°F	1023	837	589	298	121	11	0	7	53	300	555	871	4665
CDD, Base 65°F	0	0	0	7	83	188	301	271	131	24	0	0	1005
Humidity Ratio (#w/#da)	0.0030	0.0031	0.0042	0.0057	0.0088	0.0121	0.0141	0.0137	0.0110	0.0070	0.0049	0.0036	0.0076
Wind Speed (mph)	7.6	7.5	8.1	7.9	6.3	5.8	5.3	5.1	5.3	5.9	7.1	7.4	6.6
Clearness Index, Kt	0.42	0.44	0.46	0.48	0.50	0.52	0.51	0.50	0.50	0.49	0.42	0.39	0.48

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

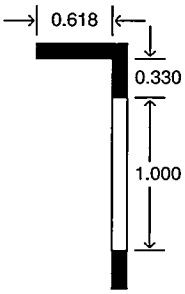
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	31/17	68/40	83/50	72/43	37/22	36/23	77/51	99/69	97/71	75/54	18/11	60/36	84/54	82/56	56/36	9/5	37/21	48/27	36/20	7/4
North	8/7	13/14	15/17	14/15	9/9	21/13	16/17	17/19	17/19	16/17	7/5	14/13	16/18	16/18	14/13	4/3	9/9	11/11	9/9	3/2
East	69/20	65/30	19/18	14/15	9/9	67/29	77/44	42/33	17/19	16/17	48/14	74/32	40/28	16/18	14/13	28/6	44/16	11/11	9/9	3/2
South	30/12	66/31	81/41	70/35	36/17	11/9	25/21	43/33	43/34	25/22	12/6	48/25	71/41	69/43	44/26	22/5	72/22	87/28	70/22	18/5
West	8/7	13/14	15/17	60/31	73/27	11/9	16/17	17/19	42/33	74/48	7/5	14/13	16/18	43/30	71/37	4/3	9/9	13/11	46/16	23/6
M. Clr (%hrs)	25	24	23	21	23	32	33	25	20	26	29	35	33	29	34	21	21	21	20	22

Casper, WY

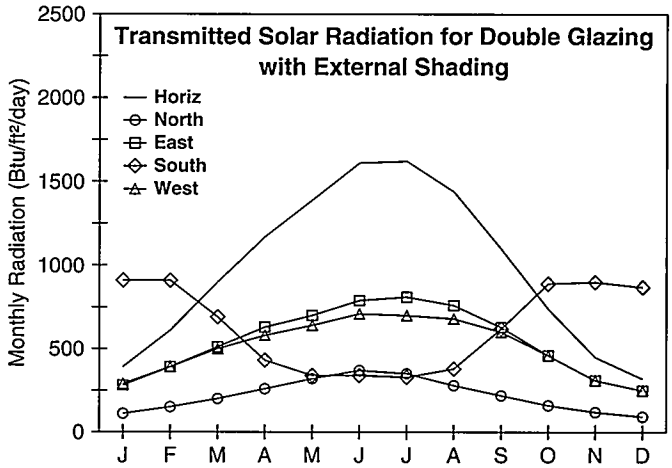
WBAN NO. 24089

LATITUDE: 42.92° N
LONGITUDE: 106.47° W
ELEVATION: 5289 feet
MEAN PRESSURE: 12.1 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	630	910	1280	1640	1920	2200	2220	1990	1550	1090	700	540	1390
	Std.Dev.	32	48	69	92	111	145	83	103	108	75	31	25	35
	Minimum	560	810	1140	1490	1700	1890	2100	1710	1320	920	640	510	1300
	Maximum	700	1020	1410	1880	2130	2410	2370	2130	1750	1230	750	610	1450
	Diffuse	250	350	500	650	730	680	620	540	440	350	280	220	470
	Clear-Day Global	820	1180	1710	2260	2630	2780	2680	2360	1870	1320	890	710	1770
North	Global	180	240	340	440	560	660	610	480	350	270	190	150	370
	Diffuse	180	240	330	420	490	510	490	430	350	270	190	150	340
	Clear-Day Global	150	210	290	400	590	730	660	470	320	230	170	140	360
East	Global	460	630	840	1040	1180	1330	1370	1270	1030	750	510	410	900
	Diffuse	220	300	420	520	580	590	580	530	430	330	240	190	410
	Clear-Day Global	680	900	1200	1450	1590	1630	1600	1480	1270	980	720	600	1180
South	Global	1230	1330	1290	1100	940	900	970	1160	1350	1400	1240	1160	1170
	Diffuse	340	410	490	540	560	550	540	520	470	410	350	300	460
	Clear-Day Global	1990	2080	1950	1550	1190	1030	1090	1370	1770	2010	2000	1910	1660
West	Global	470	630	830	970	1080	1200	1190	1130	980	740	510	410	850
	Diffuse	230	300	420	530	590	610	590	540	440	330	250	190	420
	Clear-Day Global	680	900	1200	1450	1590	1630	1600	1480	1270	980	720	600	1180

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

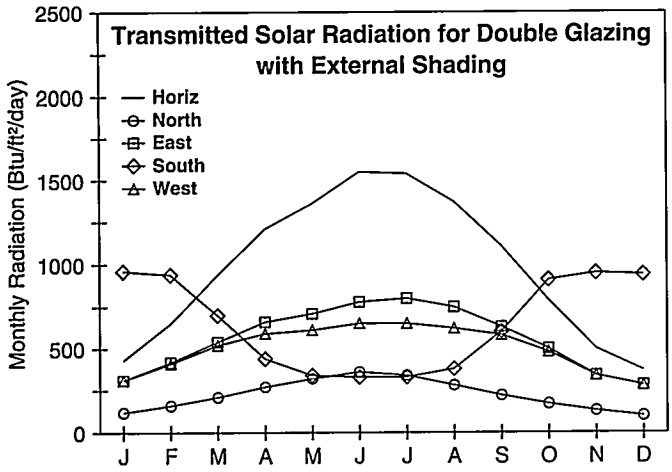
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	390	610	900	1170	1390	1610	1620	1440	1100	740	450	320	980
North	Unshaded	120	170	230	300	370	420	390	310	240	180	130	110	250
	Shaded	110	150	200	260	320	370	350	280	220	160	120	93	220
East	Unshaded	320	440	600	750	850	950	980	910	740	530	350	280	640
	Shaded	280	390	510	630	700	790	810	760	630	460	310	250	540
South	Unshaded	930	990	900	730	590	540	580	740	920	1020	930	880	810
	Shaded	910	910	690	430	340	340	330	380	620	890	900	870	630
West	Unshaded	320	440	590	690	770	860	850	810	700	530	350	280	600
	Shaded	290	390	500	580	640	710	700	680	600	460	310	250	510

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	22.4	26.5	33.5	42.8	52.3	62.7	70.8	68.7	57.8	46.4	33.1	23.8	45.1
Daily Minimum Temp	12.0	16.0	21.8	29.5	37.9	46.9	54.0	51.8	41.6	32.2	21.8	13.7	31.6
Daily Maximum Temp	32.8	37.0	45.2	56.1	66.6	78.6	87.6	85.7	73.8	60.5	44.3	33.9	58.5
Record Minimum Temp	-40.0	-29.0	-21.0	-4.0	16.0	28.0	30.0	33.0	16.0	-3.0	-21.0	-41.0	-41.0
Record Maximum Temp	60.0	68.0	74.0	83.0	92.0	102.0	104.0	102.0	96.0	85.0	71.0	61.0	104.0
HDD, Base 65°F	1321	1078	977	666	394	139	10	36	250	577	957	1277	7682
CDD, Base 65°F	0	0	0	0	0	70	190	151	34	0	0	0	445
Humidity Ratio (#w/#da)	0.0020	0.0023	0.0028	0.0036	0.0051	0.0067	0.0075	0.0068	0.0051	0.0037	0.0027	0.0021	0.0042
Wind Speed (mph)	16.9	15.1	13.9	12.6	11.7	10.7	10.2	10.3	10.9	12.1	14.4	15.5	12.8
Clearness Index, Kt	0.52	0.54	0.55	0.54	0.55	0.60	0.62	0.62	0.60	0.56	0.52	0.50	0.57

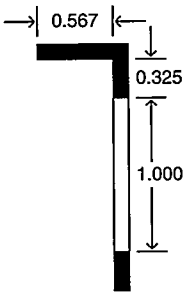
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	38/25	69/48	77/57	62/44	28/19	50/33	84/63	99/76	95/69	71/50	28/18	65/45	83/59	76/52	48/33	11/8	36/24	42/29	26/17	0/0
North	9/9	13/15	14/16	12/14	8/7	16/13	14/16	16/17	15/17	13/15	8/7	12/14	14/16	14/15	10/11	4/4	9/9	9/10	7/7	0/0
East	78/37	58/37	14/16	12/14	8/7	87/44	74/52	31/28	15/17	13/15	75/30	72/44	28/24	14/15	10/11	40/14	39/21	9/10	7/7	0/0
South	42/23	77/46	87/56	70/43	31/16	11/11	35/29	51/41	46/36	24/20	23/12	61/38	80/53	73/46	43/26	36/13	83/39	92/46	66/29	1/0
West	9/9	13/15	20/20	66/41	73/32	11/11	14/16	16/17	50/38	81/52	8/7	12/14	14/16	52/35	80/43	4/4	9/9	20/14	48/23	1/0
M. Clr (%hrs)	30	31	25	25	26	54	52	46	37	31	56	55	52	47	46	32	35	34	33	36



Cheyenne, WY

WBAN NO. 24018



Shading Geometry
(Not to Scale)

LATITUDE: 41.15° N
LONGITUDE: 104.82° W
ELEVATION: 6142 feet
MEAN PRESSURE: 11.8 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	690	970	1340	1690	1880	2130	2110	1890	1550	1150	770	610	1400
	Std.Dev.	38	40	66	78	125	150	81	97	108	73	35	36	30
	Minimum	600	890	1200	1550	1640	1860	1960	1540	1340	940	700	550	1330
	Maximum	750	1040	1460	1830	2100	2380	2260	2020	1720	1260	820	690	1460
	Diffuse	260	360	520	650	750	700	670	600	470	360	290	230	490
	Clear-Day Global	890	1260	1780	2310	2650	2780	2680	2380	1930	1400	970	790	1820
North	Global	190	250	350	440	560	640	600	480	350	270	200	170	380
	Diffuse	190	250	350	430	490	500	490	430	350	270	200	170	340
	Clear-Day Global	170	220	300	410	590	720	660	470	320	240	180	150	370
East	Global	500	670	880	1070	1170	1300	1320	1220	1010	790	540	450	910
	Diffuse	230	320	430	520	580	590	580	530	430	340	260	210	420
	Clear-Day Global	710	930	1220	1460	1580	1610	1570	1470	1270	1000	750	640	1190
South	Global	1290	1370	1290	1090	880	830	880	1050	1280	1440	1300	1260	1160
	Diffuse	340	420	500	540	560	540	540	530	480	420	360	310	460
	Clear-Day Global	2030	2090	1930	1510	1130	970	1020	1310	1720	2000	2020	1960	1640
West	Global	500	660	840	970	1010	1090	1080	1030	940	770	550	450	830
	Diffuse	240	320	440	530	590	600	590	540	440	340	260	210	420
	Clear-Day Global	710	930	1220	1460	1580	1610	1570	1470	1270	1000	750	640	1190

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	430	650	940	1210	1360	1550	1540	1370	1110	790	500	370	990
North	Unshaded	130	170	240	300	360	410	380	310	240	190	140	120	250
	Shaded	120	160	210	270	320	360	340	280	220	170	130	100	220
East	Unshaded	340	470	620	770	840	930	950	880	720	560	380	310	650
	Shaded	310	420	540	660	710	780	800	750	630	500	340	280	560
South	Unshaded	980	1010	900	710	550	490	530	660	870	1040	980	960	810
	Shaded	960	940	700	440	340	330	330	380	600	910	950	940	650
West	Unshaded	340	460	600	690	720	780	770	730	670	540	380	310	580
	Shaded	310	410	520	590	610	650	650	620	580	480	340	280	500

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	26.5	29.3	33.6	42.5	52.0	61.3	68.4	66.4	57.4	47.0	35.2	27.8	45.6
Daily Minimum Temp	15.2	18.1	22.1	30.1	39.4	48.3	54.6	52.8	43.7	33.9	23.7	16.7	33.2
Daily Maximum Temp	37.7	40.5	44.9	54.7	64.6	74.4	82.2	80.0	71.1	60.0	46.8	38.8	58.0
Record Minimum Temp	-29.0	-34.0	-21.0	-8.0	16.0	25.0	38.0	36.0	8.0	-1.0	-14.0	-28.0	-34.0
Record Maximum Temp	66.0	71.0	74.0	82.0	90.0	100.0	100.0	96.0	93.0	83.0	73.0	69.0	100.0
HDD, Base 65°F	1194	1000	973	675	403	150	31	44	251	558	894	1153	7326
CDD, Base 65°F	0	0	0	0	0	39	136	87	23	0	0	0	285
Humidity Ratio (#w/#da)	0.0018	0.0021	0.0025	0.0035	0.0052	0.0071	0.0085	0.0080	0.0057	0.0037	0.0025	0.0019	0.0044
Wind Speed (mph)	15.8	14.7	14.5	14.5	12.9	11.4	10.4	10.4	11.1	12.1	13.3	14.5	13.0
Clearness Index, Kt	0.53	0.55	0.55	0.55	0.54	0.58	0.59	0.58	0.58	0.57	0.53	0.52	0.56

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

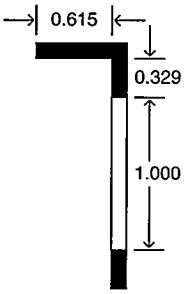
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	41/28	72/50	80/57	63/44	26/17	52/34	85/62	101/74	95/66	68/46	31/19	68/45	84/59	77/52	47/30	15/10	40/27	45/31	27/18	0/0
North	9/10	13/15	14/16	12/14	7/7	17/14	15/17	16/18	16/17	13/14	8/7	13/14	14/17	14/15	10/11	5/5	9/9	10/10	7/7	0/0
East	80/38	56/35	14/16	12/14	7/7	86/45	71/49	28/26	16/17	13/14	77/29	71/41	25/22	14/15	10/11	45/18	39/22	10/10	7/7	0/0
South	45/24	78/45	85/53	68/41	28/14	11/11	33/28	48/38	43/33	20/18	25/13	61/37	78/50	71/43	40/23	43/17	87/42	93/48	65/28	1/0
West	9/10	13/15	24/21	69/42	70/28	11/11	15/17	16/18	52/38	80/48	8/7	13/14	14/17	55/35	80/39	5/5	9/9	23/16	51/23	1/0
M. Clr (%hrs)	35	35	30	27	29	56	54	46	31	25	55	55	53	47	42	36	39	40	41	41

Lander, WY

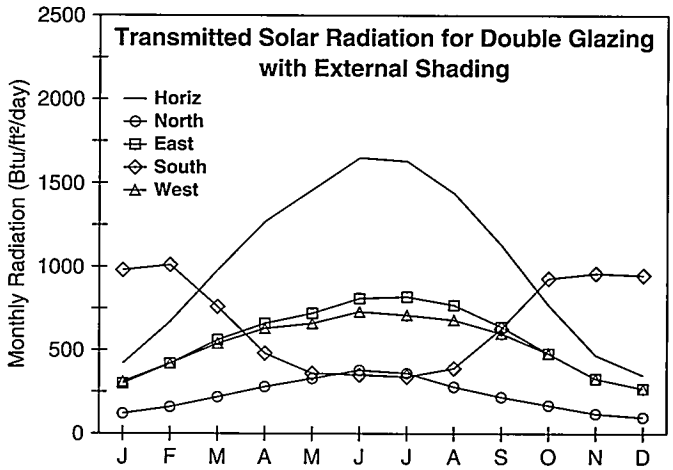
WBAN NO. 24021

LATITUDE: 42.82° N
LONGITUDE: 108.73° W
ELEVATION: 5565 feet
MEAN PRESSURE: 12.0 psia

STATION TYPE: Primary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	680	1000	1400	1770	2010	2260	2230	1990	1590	1130	740	590	1450
	Std.Dev.	47	63	78	126	125	143	94	91	108	71	38	29	36
	Minimum	590	870	1170	1570	1690	1940	1950	1770	1310	970	660	540	1370
	Maximum	750	1130	1530	2070	2240	2500	2420	2110	1800	1210	820	640	1520
	Diffuse	280	390	530	720	780	730	670	580	470	360	290	240	500
	Clear-Day Global	840	1220	1740	2300	2660	2790	2700	2380	1890	1340	910	730	1790
North	Global	190	270	360	470	580	680	630	480	360	270	200	160	390
	Diffuse	190	270	360	460	510	530	500	440	350	270	200	160	350
	Clear-Day Global	160	220	290	410	600	740	670	460	320	230	170	140	370
East	Global	490	690	920	1100	1220	1360	1380	1280	1040	780	540	440	940
	Diffuse	240	340	440	560	620	620	590	530	440	340	260	210	430
	Clear-Day Global	690	930	1210	1470	1610	1640	1610	1480	1280	980	740	620	1190
South	Global	1320	1470	1410	1190	990	920	970	1150	1370	1470	1320	1270	1240
	Diffuse	380	460	530	590	590	570	560	530	490	430	380	330	490
	Clear-Day Global	2040	2140	1980	1570	1200	1030	1090	1370	1780	2030	2030	1940	1680
West	Global	500	690	890	1050	1120	1230	1190	1120	990	770	540	440	880
	Diffuse	250	340	450	580	630	640	610	550	450	340	260	210	440
	Clear-Day Global	690	930	1210	1470	1610	1640	1610	1480	1280	980	740	620	1190

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

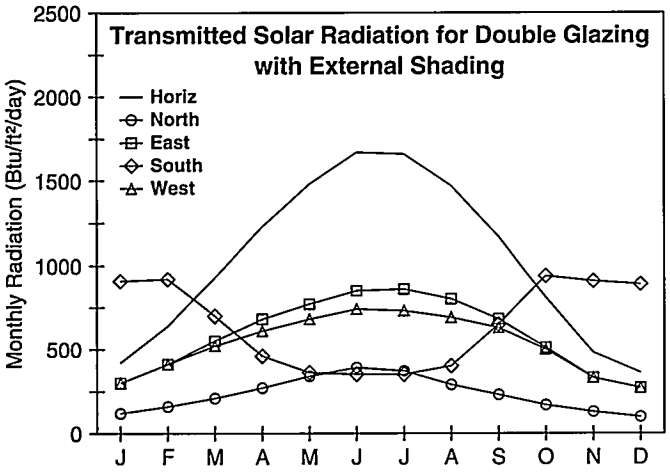
Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	420	670	980	1270	1460	1650	1630	1440	1130	770	470	350	1020
North	Unshaded	130	180	250	320	380	430	400	310	250	190	140	110	260
	Shaded	120	160	220	280	330	380	360	280	220	170	120	100	230
East	Unshaded	340	480	660	790	870	980	1000	920	750	550	370	300	670
	Shaded	300	420	560	660	720	810	820	770	640	480	330	270	570
South	Unshaded	1000	1090	990	790	620	550	580	730	940	1070	990	970	860
	Shaded	980	1010	760	480	360	350	340	390	630	930	960	950	680
West	Unshaded	340	490	630	750	790	880	850	800	710	540	370	300	620
	Shaded	310	420	540	630	660	730	710	680	600	480	330	270	530

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	19.5	25.4	33.9	43.3	53.0	63.1	71.0	68.9	58.3	46.8	31.2	20.8	44.6
Daily Minimum Temp	7.8	13.6	22.1	30.7	39.9	48.8	55.9	53.8	44.2	33.7	19.9	9.4	31.7
Daily Maximum Temp	31.2	37.1	45.7	55.8	66.0	77.4	86.1	83.9	72.3	59.8	42.5	32.1	57.5
Record Minimum Temp	-37.0	-28.0	-16.0	-2.0	18.0	25.0	39.0	35.0	10.0	-3.0	-18.0	-37.0	-37.0
Record Maximum Temp	63.0	68.0	76.0	82.0	91.0	100.0	101.0	101.0	94.0	85.0	70.0	64.0	101.0
HDD, Base 65°F	1411	1109	964	651	376	137	9	38	246	564	1014	1370	7889
CDD, Base 65°F	0	0	0	0	0	80	195	159	45	0	0	0	479
Humidity Ratio (#w/#da)	0.0016	0.0020	0.0024	0.0032	0.0046	0.0060	0.0069	0.0064	0.0049	0.0036	0.0024	0.0017	0.0038
Wind Speed (mph)	5.4	5.7	6.9	7.8	8.0	7.7	7.6	7.3	6.9	6.0	5.6	5.6	6.7
Clearness Index, Kt	0.56	0.59	0.60	0.59	0.58	0.61	0.62	0.62	0.61	0.59	0.55	0.54	0.60

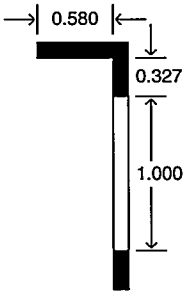
Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	34/25	67/52	81/62	67/50	32/22	47/33	83/63	101/78	99/73	74/55	25/16	64/44	81/61	79/56	50/36	9/7	35/25	43/32	28/21	2/2
North	9/9	13/15	14/17	13/15	8/8	18/14	15/17	16/18	16/18	14/16	7/6	12/13	14/16	14/16	11/12	4/3	9/9	10/11	8/8	1/1
East	76/40	60/42	14/17	13/15	8/8	85/47	76/54	36/31	16/18	14/16	71/29	75/44	32/27	14/16	11/12	33/13	42/23	10/11	8/8	1/1
South	39/23	75/51	90/62	74/48	35/20	10/11	33/28	51/42	49/39	26/23	20/11	59/37	78/55	75/49	46/28	29/12	81/40	93/51	69/35	7/3
West	9/9	13/15	17/19	66/44	75/37	10/11	15/17	16/18	47/38	80/54	7/6	12/13	14/16	49/35	78/44	4/3	9/9	17/14	48/26	10/4
M. Clr (%hrs)	35	35	30	29	30	54	53	45	36	35	57	55	53	47	49	40	38	40	38	38



Rock Springs, WY

WBAN NO. 24027



Shading Geometry
(Not to Scale)

LATITUDE: 41.60° N
LONGITUDE: 109.07° W
ELEVATION: 6746 feet
MEAN PRESSURE: 11.5 psia

STATION TYPE: Secondary

Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	670	960	1330	1710	2040	2290	2270	2020	1640	1180	740	590	1460
	Std.Dev.	46	59	80	110	106	109	83	97	112	81	46	35	36
	Minimum	590	810	1120	1510	1770	2080	2060	1770	1360	1010	680	530	1360
	Maximum	750	1080	1500	1910	2240	2520	2410	2190	1860	1300	840	650	1520
	Diffuse	290	380	530	680	750	710	670	590	460	360	310	250	500
	Clear-Day Global	880	1250	1770	2310	2670	2820	2720	2410	1940	1390	950	780	1830
North	Global	190	260	350	450	580	690	640	490	360	280	210	170	390
	Diffuse	190	260	350	440	500	530	510	440	360	280	210	170	350
	Clear-Day Global	160	220	290	410	600	740	680	470	330	240	180	150	370
East	Global	480	660	880	1100	1260	1400	1420	1300	1090	820	530	440	950
	Diffuse	240	330	440	540	620	620	610	550	450	350	260	220	440
	Clear-Day Global	710	930	1210	1470	1600	1640	1610	1490	1290	1000	750	640	1200
South	Global	1230	1340	1300	1120	960	900	950	1140	1390	1490	1250	1190	1190
	Diffuse	370	440	510	570	580	570	560	540	500	430	380	340	480
	Clear-Day Global	2050	2100	1940	1530	1160	1000	1050	1340	1750	2020	2030	1980	1660
West	Global	480	650	840	1000	1130	1240	1220	1130	1030	800	530	430	870
	Diffuse	250	330	440	550	620	640	620	560	460	350	270	220	440
	Clear-Day Global	710	930	1210	1470	1600	1640	1610	1490	1290	1000	750	640	1200

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	420	640	930	1230	1480	1670	1660	1470	1170	810	480	360	1030
North	Unshaded	130	180	240	310	380	440	410	320	250	190	140	120	260
	Shaded	120	160	210	270	340	390	370	290	230	170	130	100	230
East	Unshaded	330	460	630	790	910	1010	1020	940	780	580	370	300	680
	Shaded	300	410	550	680	770	850	860	800	680	510	330	270	580
South	Unshaded	930	990	910	740	590	530	570	720	940	1080	940	900	820
	Shaded	910	920	700	460	360	350	350	400	650	940	910	890	650
West	Unshaded	330	460	600	710	810	880	870	810	730	560	370	300	620
	Shaded	300	410	520	610	680	740	730	690	630	500	330	270	540

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	20.4	24.3	31.3	40.6	50.3	60.2	68.0	65.8	55.5	44.3	30.4	21.4	42.7
Daily Minimum Temp	11.1	14.3	20.7	28.4	36.8	45.7	52.8	50.7	41.0	31.3	20.0	11.9	30.4
Daily Maximum Temp	29.5	34.3	41.8	52.7	63.7	74.6	83.1	80.8	70.0	57.2	40.7	30.8	54.9
Record Minimum Temp	-35.0	-27.0	-11.0	8.1	16.0	28.9	36.0	33.1	6.1	6.1	-11.9	-29.0	-35.0
Record Maximum Temp	54.0	55.9	93.9	77.0	84.0	93.0	93.9	91.9	88.0	77.0	64.0	57.0	93.9
HDD, Base 65°F	1383	1140	1045	732	456	186	22	66	303	642	1038	1352	8365
CDD, Base 65°F	0	0	0	0	0	42	115	91	18	0	0	0	266
Humidity Ratio (#w/#da)	0.0021	0.0024	0.0028	0.0033	0.0043	0.0053	0.0063	0.0060	0.0047	0.0036	0.0029	0.0022	0.0038
Wind Speed (mph)	11.9	11.9	12.0	12.1	11.2	10.3	9.3	9.1	9.6	9.8	10.6	11.4	10.8
Clearness Index, Kt	0.52	0.54	0.55	0.56	0.58	0.62	0.63	0.63	0.62	0.59	0.52	0.51	0.59

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

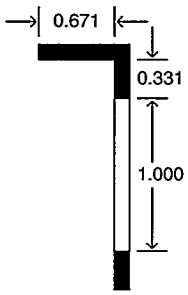
Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	35/24	68/48	79/58	65/47	31/21	46/34	82/64	100/81	97/76	74/57	25/17	64/47	84/63	80/59	52/38	10/7	36/26	44/32	29/21	3/3
North	9/9	13/15	14/16	13/14	8/8	19/15	14/16	16/17	16/17	14/16	7/7	12/14	14/16	14/16	11/12	4/3	9/9	10/11	8/8	2/1
East	77/38	61/39	14/16	13/14	8/8	85/51	76/57	36/32	16/17	14/16	71/32	75/49	33/28	14/16	11/12	35/14	42/24	10/11	8/8	2/1
South	38/21	73/46	85/57	71/44	33/18	10/11	31/27	48/42	46/39	25/22	19/12	57/39	78/56	74/52	46/30	30/12	79/40	91/49	68/34	10/4
West	9/9	13/15	16/18	63/40	72/34	10/11	14/16	16/17	46/39	80/58	7/7	12/14	14/16	49/36	79/48	4/3	9/9	16/14	47/25	14/5
M. Clr (%hrs)	34	34	28	25	28	59	54	45	34	30	61	59	55	46	47	35	37	31	32	37

Sheridan, WY

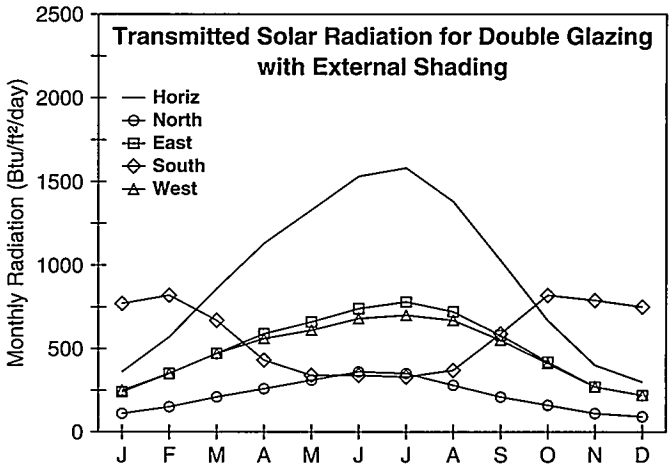
WBAN NO. 24029

LATITUDE: 44.77° N
LONGITUDE: 106.97° W
ELEVATION: 3967 feet
MEAN PRESSURE: 12.7 psia

STATION TYPE: Secondary



Shading Geometry
(Not to Scale)



Average Incident Solar Radiation (Btu/ft²/day), Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Global	570	860	1230	1580	1840	2100	2170	1910	1450	990	630	490	1320
	Std.Dev.	34	53	67	118	128	142	99	92	114	60	38	23	31
	Minimum	510	760	1090	1440	1570	1850	1930	1750	1160	870	560	450	1250
	Maximum	660	970	1350	1870	2080	2350	2380	2100	1640	1090	720	520	1380
	Diffuse	310	430	570	680	760	720	630	560	470	370	310	250	510
	Clear-Day Global	750	1120	1660	2210	2590	2750	2660	2310	1810	1250	820	640	1720
North	Global	190	260	350	440	560	650	610	470	350	260	190	160	370
	Diffuse	190	260	350	430	490	510	490	430	340	260	190	160	340
	Clear-Day Global	150	210	290	400	590	730	670	460	310	230	160	130	360
East	Global	410	590	800	1010	1130	1270	1340	1220	970	690	450	370	850
	Diffuse	240	330	440	530	590	600	580	530	430	330	240	200	420
	Clear-Day Global	650	880	1180	1450	1600	1640	1610	1470	1250	940	690	570	1160
South	Global	1060	1220	1250	1110	950	920	1000	1170	1310	1310	1100	1020	1120
	Diffuse	380	470	530	560	570	560	550	530	480	420	370	330	480
	Clear-Day Global	1950	2080	1990	1610	1260	1090	1150	1430	1800	2000	1950	1860	1680
West	Global	420	590	790	960	1050	1180	1220	1130	930	680	460	370	820
	Diffuse	240	340	440	540	600	620	600	530	430	330	250	200	430
	Clear-Day Global	650	880	1180	1450	1600	1640	1610	1470	1250	940	690	570	1160

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	360	570	860	1130	1330	1530	1580	1380	1030	670	400	300	930
North	Unshaded	130	180	240	300	370	420	390	310	240	180	130	110	250
	Shaded	110	150	210	260	310	360	350	280	210	160	110	91	220
East	Unshaded	280	410	560	720	810	910	960	880	690	480	310	250	610
	Shaded	240	350	470	590	660	740	780	720	580	420	270	220	500
South	Unshaded	800	900	880	740	600	560	610	750	900	950	830	780	780
	Shaded	770	820	670	430	340	340	330	370	590	820	790	750	580
West	Unshaded	290	410	560	680	750	840	870	810	660	480	310	250	580
	Shaded	250	350	470	560	610	680	700	670	550	410	270	220	480

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	20.8	26.4	33.9	43.8	52.7	62.1	69.6	68.4	57.1	46.7	32.5	22.6	44.7
Daily Minimum Temp	8.5	14.5	21.5	30.4	39.0	47.3	53.0	51.7	41.4	31.7	19.7	10.2	30.7
Daily Maximum Temp	33.0	38.3	46.2	57.1	66.3	76.9	86.1	85.2	72.8	61.7	45.3	35.0	58.7
Record Minimum Temp	-35.0	-32.0	-23.0	-2.0	13.0	27.0	35.0	34.0	6.0	-9.0	-25.0	-37.0	-37.0
Record Maximum Temp	70.0	76.0	77.0	87.0	95.0	105.0	106.0	106.0	103.0	91.0	78.0	72.0	106.0
HDD, Base 65°F	1370	1081	964	636	381	156	28	63	269	567	975	1314	7804
CDD, Base 65°F	0	0	0	0	0	69	170	168	32	0	0	0	439
Humidity Ratio (#w/#da)	0.0019	0.0023	0.0028	0.0038	0.0057	0.0079	0.0084	0.0074	0.0057	0.0041	0.0027	0.0020	0.0046
Wind Speed (mph)	7.8	7.8	9.0	9.7	8.9	7.7	7.3	7.2	7.4	7.3	7.3	7.7	7.9
Clearness Index, Kt	0.52	0.54	0.54	0.53	0.53	0.57	0.61	0.60	0.57	0.54	0.50	0.50	0.56

Average Incident Illuminance (klux-hr) for Mostly Clear/Mostly Cloudy Conditions, Uncertainty ±9%

Orientation	March					June					September					December				
	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm	9am	11am	1pm	3pm	5pm
Horizontal	34/24	65/46	75/55	60/43	26/18	49/33	81/60	97/72	93/66	70/49	27/16	62/42	80/56	74/51	47/31	8/6	32/23	39/27	23/17	0/0
North	9/9	13/15	14/17	12/14	8/7	15/13	14/16	16/18	15/17	14/15	7/7	12/13	14/16	14/15	10/11	4/3	8/9	9/10	7/7	0/0
East	74/34	57/35	14/17	12/14	8/7	85/43	73/50	32/28	15/17	14/15	72/28	71/40	29/24	14/15	10/11	32/11	38/19	9/10	7/7	0/0
South	41/21	78/44	89/55	71/41	31/15	11/11	36/29	53/42	49/37	26/22	23/12	61/36	81/51	74/45	44/25	29/10	79/34	89/42	61/26	0/0
West	9/9	13/15	20/20	64/38	69/28	11/11	14/16	16/18	48/37	80/50	7/7	12/13	14/16	50/33	78/39	4/3	8/9	18/14	44/20	0/0
M. Clr (%hrs)	25	28	25	24	25	49	42	39	36	32	51	50	46	45	44	29	29	28	29	32

Appendix—Methodology

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Appendix—Methodology

This Appendix describes the methods used to calculate the monthly and yearly averages of incident and transmitted solar radiation and the illuminance diurnal profiles. It also describes how data uncertainties were determined and how the climatic information was derived.

Calculating Incident Solar Radiation

The incident solar radiation for a horizontal window and vertical windows facing north, east, south, and west was determined using models and hourly data from the 1961–1990 National Solar Radiation Data Base (NSRDB).

Global solar radiation. The incident global solar radiation (I) received by a surface, such as a window, is a combination of direct beam radiation (I_b), sky radiation (I_s), and radiation reflected from the ground in front of the surface (I_r). The following equation can be used to calculate incident global solar radiation:

$$I = I_b \cos\theta + I_s + I_r \qquad (1)$$

where θ is the incident angle of the sun's rays to the surface.

The incident angle is a function of the sun's position in the sky and the orientation of the surface. Algorithms presented by Menicucci and Fernandez (1988) were used to compute incident angles. Hourly values of direct beam solar radiation from the NSRDB were used to determine the direct beam contribution ($I_b \cos\theta$) for each hour. Except for the first and last daylight hour, incident angles were calculated at the midpoint of the hour. For the first and last daylight hour, incident angles were calculated at the midpoint of the period during the hour when the sun was above the horizon.

The sky radiation (I_s) received by the surface was calculated using an anisotropic diffuse radiation model developed by Perez et al. (1990). The model determined the sky radiation striking the surface using hourly values (from the NSRDB) of diffuse horizontal and direct beam solar radiation. Other inputs to the model included the sun's incident angle to the surface, the surface tilt angle from horizontal, and the sun's zenith angle. The Perez et al. model is an improved and refined version of their original model that was recommended by the International Energy Agency for calculating diffuse radiation for tilted surfaces (Hay and McKay 1988). The following equation is the Perez et al. model for diffuse sky radiation for a surface:

$$I_s = I_{dh}\,[\,0.5(1 - F_1)(1 + \cos\beta) + F_1 a/b + F_2 \sin\beta\,] \qquad (2)$$

where

I_{dh} = diffuse horizontal solar radiation

F_1 = circumsolar anisotropy coefficient, function of sky condition

F_2 = horizon/zenith anisotropy coefficient, function of sky condition

β = tilt of the surface from the horizontal

a = 0 or the cosine of the incident angle, whichever is greater

b = 0.087 or the cosine of the solar zenith angle, whichever is greater.

The model coefficients F_1 and F_2 are organized as an array of values that are selected for use depending on the solar zenith angle, the sky's clearness, and the sky's brightness. Perez et al. (1990) describe completely the manner in which this is done.

The ground-reflected radiation (I_r) received by a surface is assumed isotropic and is a function of the global horizontal radiation (I_h), the tilt of the surface from the horizontal (β), and the ground reflectivity or albedo (ρ).

$$I_r = 0.5\,\rho\, I_h\,(1 - \cos\beta). \qquad (3)$$

For the data in this manual, an albedo of 0.2 was used. This albedo is a nominal value for green vegetation and some soil types. The effect of other albedo values can be determined by adding an adjustment (I_{adj}) to the incident global and diffuse solar radiation values in the data tables:

$$I_{adj} = 0.5(\rho_d - 0.2)I_h(1 - \cos\beta) \qquad (4)$$

where

ρ_d = desired albedo

I_h = monthly or yearly average from data tables for incident global horizontal radiation.

Diffuse solar radiation. The incident diffuse solar radiation (I_d) received by a surface is the sum of the sky radiation (I_s) and the radiation reflected from the ground in front of the surface (I_r), both of which are considered diffuse.

$$I_d = I_s + I_r. \qquad (5)$$

Clear-day global solar radiation. Incident clear-day global solar radiation represents the global radiation obtainable under clear skies. It was calculated as above, but using clear sky values of direct beam and diffuse horizontal solar radiation. The clear sky values of direct beam and diffuse horizontal solar radiation were modeled using METSTAT (NSRDB—Vol. 2, 1995), the same model used to model solar radiation for the NSRDB. Inputs to METSTAT included cloud cover values of zero; average monthly values of aerosol optical depth, precipitable water, albedo, and ozone; and the day of the month of which the solar declination equals the monthly average. Average precipitable water values were multiplied by 80% to compensate for expected clear-day precipitable water compared to the mean for all weather conditions.

Calculating Transmitted Solar Radiation

As solar radiation passes through a window, some of it is reflected or absorbed by the glass. Consequently, the solar radiation transmitted into the living space is less than the radiation incident on the outside of the window. The losses are dependent on the type of window. For this manual, the transmitted solar radiation data are for two layers of single-strength clear glass. Each glass is 3.18 mm (0.125 inch) thick and has an index of refraction of 1.526 and an extinction coefficient of 32/meter (for glass with greenish appearance).

Transmitted solar radiation values were determined for windows with and without external shading.

Transmitted solar radiation for unshaded windows. For windows without external shading, transmittance coefficients were applied to the hourly values of incident solar radiation to obtain the transmitted solar radiation (I_t).

$$I_t = \tau_a \tau_r I \qquad (6)$$

where

τ_a = transmittance for absorption of radiation

τ_r = transmittance for reflectance of radiation

I = incident solar radiation.

As presented by Duffie and Beckman (1991), Bouguer's law can be used to determine the transmittance for absorption, and Fresnel equations can be used to determine the transmittance for reflectance. Both transmittance coefficients depend on the incident angle of the solar radiation. Because of their differences in incident angles, diffuse and direct beam radiation were treated separately when determining the transmitted solar radiation.

If incident isotropic diffuse sky radiation is integrated over all angles, it has been shown to have an effective incidence angle of approximately 60° for vertical and horizontal surfaces (Duffie and Beckman 1991). Isotropic ground-reflected diffuse radiation for vertical surfaces also has an effective incidence angle of approximately 60°. To simplify the analysis, and because diffuse radiation from the horizon is a small part of the total radiation, it is treated in the same manner as isotropic sky and ground-reflected diffuse radiation.

To determine the transmitted solar radiation, an incidence angle of 60° was used for all sky radiation (including diffuse radiation from the horizon but not circumsolar diffuse radiation) and ground-reflected radiation values. For direct beam and circumsolar diffuse radiation, the incident angle was the angle of incidence for the direct beam radiation.

Transmitted solar radiation for shaded windows. Windows externally shaded by a roof overhang were treated differently than unshaded windows in two ways. First, the direct beam radiation component and the circumsolar diffuse radiation were reduced if portions of the window were shaded. Second, the isotropic diffuse sky radiation was reduced to account for the reduced field of view of the sky because of the roof overhang. The presence of the roof overhang was assumed to have no effect on the transmitted diffuse radiation from the horizon and on the ground-reflected diffuse radiation.

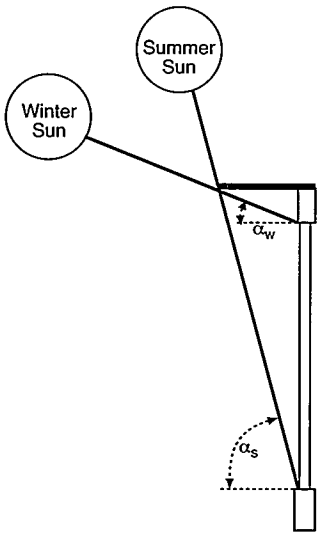
The shading geometry selected for each station balanced the need for maximum solar heat gain for south-facing windows during the heating season without creating unreasonable solar heat gain during the cooling season. For each station, the same shading geometry was used for all vertical windows, and the roof overhang was assumed to extend an infinite distance with respect to the window width.

- Two angles (α_s and α_w) describe the shading geometry. These angles determine the amount of shading of south-facing windows at solar noon throughout the year. If the sun elevation at solar noon is greater than α_s (summer), then the window is completely shaded. If the sun elevation at solar noon is less than α_s but greater than α_w (spring and fall), then the window is partially shaded. If the sun elevation at solar noon is less than α_w (winter), then the window is completely unshaded.

For most stations in this manual, $\alpha_s = 108° - \text{latitude}$ and $\alpha_w = 71° - \text{latitude}$. This shading geometry provides no shading of the south-facing window from November 17 to January 25, and provides complete shading of the window (at solar noon) from May 12 to August 2.

Stations in southern states can benefit from more summertime shading; therefore, the shading geometry was modified to accommodate a longer shading period. Their monthly heating degree day (base 65°F) requirements were examined to find the first fall month with a value greater than zero. If this month was October or later, then $\alpha_s = 92° - \text{latitude}$ and $\alpha_w = 66.5° - \text{latitude}$.

For these stations, this provides no shading of the south-facing window only on December 21, and provides complete shading of the window (at solar noon) from March 26 to September 18.



Shading geometry described using α_s and α_w

Other exceptions to the shading geometry were also made. Hawaii, Guam, and Puerto Rico have zero heating degree days; consequently, their shading geometry provides complete shading of south-facing windows at noon throughout the year. Shading geometries that provide complete shading of south-facing windows at noon throughout the year were also used for stations that had more cooling degree days than heating degree days in December. This included stations in southern Florida. Alaskan stations, with no summer cooling loads, have shading geometries that do not shade south-facing windows at noon throughout the year. For the situations described in this paragraph, the roof overhang width was calculated using 1.0 for the window height and 0.2 for the vertical distance from the window to the overhang.

For each hour, the shading geometry and trigonometric relationships (ASHRAE 1993) were used to determine the fraction of window that was not shaded. This fraction was then multiplied by the transmitted direct beam component for unshaded windows to determine the transmitted beam radiation for shaded windows. Circumsolar diffuse radiation was treated in the same manner.

The transmitted isotropic diffuse sky radiation was reduced to account for the reduced field of view of the sky because of the roof overhang. The fraction of the sky viewed by a vertical window with a roof overhang to that viewed by a vertical window without an overhang can be determined using methods presented by Iqbal (1983). These methods determine the configuration factors between inclined surfaces and the sky. This fraction was determined to be $\sin\alpha$, where α varies from α_w (top of window) to α_s (bottom of window).

An average fraction for the window was calculated by dividing the window into 100 equal horizontal segments and finding the average $\sin\alpha$, where α is based on the midpoint of each segment. This average fraction was multiplied by the transmitted isotropic diffuse sky radiation for unshaded windows to determine the transmitted isotropic diffuse sky radiation for shaded windows.

Hourly values of the total transmitted solar radiation were determined by summing the transmitted component values for direct beam radiation, circumsolar diffuse radiation, isotropic sky diffuse radiation, horizon diffuse radiation, and ground-reflected diffuse radiation.

Calculating Incident Illuminance

Incident illuminance for the horizontal window and vertical windows facing north, east, south, and west was determined using equations 1, 2, and 3 and inputs of global horizontal illuminance, direct beam illuminance, and diffuse horizontal illuminance instead of their solar radiation counterparts. When used to calculate the diffuse illuminance for a tilted surface, equation 2 uses a different array of values for model coefficients F_1 and F_2 than when it is used to calculate the diffuse solar radiation for a tilted surface. The input illuminance values were calculated using luminous efficacy models developed by Perez et al. (1990). Inputs to the luminous efficacy models are global horizontal radiation, direct beam radiation, diffuse horizontal radiation, and dew point temperature.

Averaging Solar Radiation and Illuminance

For each station location and window orientation, hourly values of solar radiation and illuminance for the windows were calculated. Monthly and yearly averages for solar radiation and hourly average profiles for illuminance for 4 months of the year were then determined for the period 1961–1990. Illuminance profiles were determined for mostly clear and mostly cloudy conditions by calculating separate averages for hourly illuminances when the hourly total cloud cover was less than 50% (mostly clear) and when the hourly total cloud cover was equal to or greater than 50% (mostly cloudy).

For a few stations, the averages do not include data for 1989, 1990, or both because NSRDB data did not include those station years. The stations with less than 30 years of NSRDB data and their period of record are listed below:

Tucumcari, NM	1961–1988
Eagle, CO	1961–1988
Minot, ND	1961–1988
Miles City, MT	1961–1989
Cut Bank, MT	1961–1988
Burns, OR	1961–1988

Estimating Solar Radiation and Illuminance Data Uncertainty

The solar radiation and illuminance values were calculated using improved models and data. The estimated data uncertainties assigned to the calculated values show how they might compare with true values. They were determined using the uncertainty method of Abernethy and Ringhiser (1985). This root-sum-square method defines an uncertainty, $\pm U_{RSS}$, in which 95% of the time, the true value will be within plus or minus the uncertainty of the calculated value.

$$U_{RSS} = [(tR)^2 + B^2]^{1/2} \quad (7)$$

where

t = student's T distribution factor (equals 2 for sample size greater than 30)

R = random error

B = bias error.

Random and bias errors. The two types of errors that contribute to uncertainties are random errors and bias errors. Random errors usually follow statistical distributions and result in values both above and below the true values. Random errors tend to cancel when individual values are used to determine an average. For example, a 30-year monthly average of solar radiation may use 10,800 hourly values (assuming 30 days per month and 12 hours of sunlight per day) to determine the average monthly solar radiation. The random error of the average is reduced by a factor of $10{,}800^{1/2}$, or approximately 100. For the hourly averages of illuminance, each hourly average is based on approximately 900 hourly values. The random error of their average is reduced by a factor of $900^{1/2}$, or 30. Consequently, random error sources do not contribute significantly to the uncertainty of the solar radiation and illuminance averages.

Bias errors, however, are not reduced by averaging. Bias errors, which are often referred to as fixed or systematic errors, cause values to be in error by about the same amount and direction. The reason for bias errors, as well as their magnitude and direction, may be unknown; otherwise, corrections such as changes in calibration factor can be made. When detailed information is not known about the bias errors, reasonable estimates of the bias error magnitude can be made using procedures similar to those described in this section.

For the solar radiation and illuminance averages, we evaluated the three major bias errors: (1) errors in direct beam radiation and direct beam illuminance incident on the window because of errors in NSRDB direct beam radiation data, (2) errors in diffuse radiation and diffuse illuminance incident on the window because of errors in NSRDB diffuse horizontal radiation, and (3) errors in diffuse radiation and diffuse illuminance incident on the window because of errors from modeling the diffuse solar radiation or diffuse illuminance for the window. Climate change could also bias monthly average solar radiation and illuminance values but was not considered a major source of error for this work.

The analysis beginning in the next paragraph pertains to the solar radiation incident on the windows, but an analysis for incident illuminance would yield similar results because: (1) errors in the direct beam illuminance and the diffuse horizontal illuminance are predominately the result of errors in the direct normal radiation and diffuse horizontal radiation from which they are modeled, and the errors are the same relative magnitude, and (2) errors from modeling the diffuse solar radiation and diffuse illuminance for the window are approximately equal.

The root-sum-square of the individual bias errors yields the total bias error and, because the random error is negligible, is the same as the total uncertainty of the monthly averages. Consequently, the uncertainty, $\pm U_{RSS}$, can be expressed as:

$$U_{RSS} = B = [\, B_b^2 + B_d^2 + B_m^2 \,]^{1/2} \qquad (8)$$

where

B_b = errors in window direct beam radiation because of errors in direct beam radiation data

B_d = errors in window diffuse radiation because of errors in diffuse horizontal radiation data

B_m = errors in total window radiation because of errors in modeling the diffuse solar radiation for the window.

The bias errors for direct beam and diffuse horizontal radiation were extracted from the NSRDB daily statistic files for each station. The NSRDB daily statistic files include, among other information, 30-year averages and their uncertainties for direct beam and diffuse horizontal radiation. An integer number represents an uncertainty range. Examples of uncertainty ranges for the monthly averages are from 6% to 9%, from 9% to 13%, and from 13% to 18% of the monthly average.

For 30-year averages, most of the stations have direct beam radiation uncertainties in the 6% to 9% range and diffuse horizontal radiation uncertainties in the 9% to 13% range. The remaining stations have direct beam radiation uncertainties in the 9% to 13% range and diffuse horizontal radiation uncertainties in the 13% to 18% range. For the purpose of extracting the bias errors from the daily statistic files, a single integer value near the midpoint of the range was used (8% for the 6% to 9% range, 11% for the 9% to 13% range, and 16% for the 13% to 18% range).

The bias error for modeling the window radiation is attributed to the diffuse solar radiation model because the direct beam component is considered an exact solution ($I_b \cos\theta$). An evaluation of the original Perez model by Hay and McKay (1988) provided information whereby the bias error was estimated to be about 5% of the total window radiation for the applications.

The uncertainty, $\pm U_{RSS}$, can be expressed as a percentage of the total window radiation by the following equation:

$$U_{RSS}\ (\pm\,\%) = 100\,[\,(w_b H_b)^2 + (w_{dh} H_d)^2 + (w_m H_c)^2\,]^{1/2}/H_c \qquad (9)$$

where

H_b = average monthly direct beam radiation incident on the window

H_d = average monthly diffuse radiation incident on the window

H_c = average monthly total radiation incident on the window ($H_b + H_d$)

w_b = percent bias uncertainty of average monthly direct beam radiation

w_{dh} = percent bias uncertainty of average monthly diffuse horizontal radiation

w_m = percent bias uncertainty of the solar radiation modeling for tilted surfaces.

Uncertainty values in tables. Because of the large number of solar radiation and illuminance values presented in the manual, it was judged impractical with respect to space limitations to present uncertainty values for each solar radiation and illuminance value. Rather, a simplifying assumption was made so that only one uncertainty value was presented for all windows. The assumption was that the direct beam radiation and diffuse radiation incident on the window were of equal weight. The uncertainties of the diffuse horizontal and direct beam radiation have about the same value, so this assumption did not create large changes in calculated uncertainties for window radiation.

Over a range of direct beam radiation to diffuse radiation ratios (30/70 to 90/10), the assumption yielded uncertainties within 1% or 2% of uncertainties calculated using the exact proportions of direct beam radiation and diffuse radiation (uncertainty of 8% or 10% instead of 9%, and so on). This was judged acceptable, considering that there are uncertainties associated with the uncertainty values used for the average monthly beam radiation, the average monthly diffuse horizontal radiation, and the solar radiation modeling for tilted surfaces. As a conservative measure, the calculated uncertainties were rounded to the next highest integer value.

For most of the stations in the data manual, uncertainties of 9% were assigned to the solar radiation and illuminance data. The few stations with higher uncertainties for direct beam and diffuse horizontal radiation were assigned uncertainties of 11%.

Deriving Climatic Data

The climatic data were derived using both data from the NSRDB and from climatic data sets provided by the National Climatic Data Center (NCDC), Asheville, North Carolina.

Climatic data pertaining to average temperature, average daily minimum temperature, average daily maximum temperature, average heating degree days base 65°F (18.3°C), and average cooling degree days base 65°F (18.3°C) were extracted from NCDC's data tape "1961–1990 Monthly Station Normals All Elements." This data tape includes temperature and degree day normals for about 4775 stations in the United States and its territories. The normals are averages computed by NCDC for the period of 1961–1990.

For this data set, NCDC used procedures, when possible, to estimate missing data and to correct for other inconsistencies by using data from neighboring stations. For one of the stations in this data manual, data were not available on NCDC's data tape. For this station, in Arcata, California, the averages were computed using NSRDB data, but no attempt was made to estimate missing data or to correct for other inconsistencies.

NSRDB hourly data were used to calculate the average wind speed, average clearness index, and average humidity ratio. The average humidity ratio was determined by first calculating the average station pressure (p) and average partial pressure of water vapor (p_W). Partial pressure of water vapor values were determined using psychometric relationships (ASHRAE 1993) and NSRDB dew point temperatures. The humidity ratio (W) was then calculated using the following equation:

$$W = 0.62918\, p_W / (p - p_W). \qquad (10)$$

This approach gives a more accurate portrayal of the average water vapor content in the air than would be given by averaging hourly values of the humidity ratio or relative humidity (Linacre 1992).

Record minimum and maximum temperatures were obtained primarily from NCDC's data diskette "Comparative Climatic Data Tables—1991." This data diskette contains, among other useful parameters, record minimum and maximum temperatures for about 90% of the stations in this manual and spans periods of records back to 1948 and earlier. For the remaining 10% of the stations, record minimum and maximum temperatures are based on NSRDB data.

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To Convert	Into	Multiply By
Btu per square foot	kilowatt-hours per square meter	0.003152
Btu per square foot	megajoules per square meter	0.01135
Btu per square foot	Langleys	0.2712
Btu per square foot	calories per square centimeter	0.2712
degrees Fahrenheit	degrees Centigrade	(°F-32)/1.8
degree days (base 65°F)	degree days (base 18.3°C)	0.5556
degrees (angle)	radians	0.017543
feet	meters	0.3048
lux	foot-candles	0.0929
miles per hour	meters per second	0.4470
pounds per square inch	atmospheres	0.06804
pounds per square inch	millibars	68.97
pounds per square inch	kilograms per square meter	703.1
pounds per square inch	kilopascals	6.897

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