

Solar Position and Insolation Values for 40° North Latitude

Date	Solar Time		Solar Position		BTUH/ft² Total Insolation on Surface ^{ba}							
					South Facing Surface Angle with Horiz.							
	a.m.	p.m.	Alt.	Azm.	Normal ^b	Horiz.	30	40	50	60	90	
January 21	8	4	8.1	55.3	142	28	65	74	81	85	84	
	9	3	16.8	44.0	239	83	155	171	182	187	171	
	10	2	23.8	30.9	274	127	218	237	249	254	223	
	11	1	28.4	16.0	289	154	257	277	290	293	253	
	12		30.0	0.0	294	164	270	291	303	306	263	
	Surface daily totals					2182	1660	1810	1906	1944	1726	
February 21	7	5	4.8	72.7	69	10	19	21	23	24	22	
	8	4	15.4	62.2	224	73	114	122	126	127	107	
	9	3	25.0	50.2	274	132	195	205	209	208	167	
	10	2	32.8	35.9	295	178	256	267	271	267	210	
	11	1	38.1	18.9	305	206	293	306	310	304	236	
	12		40.0	0.0	308	216	306	319	323	317	245	
	Surface daily totals					2640	2060	2162	2202	2176	1730	
March 21	7	5	11.4	80.2	171	46	55	55	54	51	35	
	8	4	22.5	69.6	250	114	140	141	138	131	89	
	9	3	32.8	57.3	282	173	215	217	213	202	138	
	10	2	41.6	41.9	297	218	273	276	271	258	176	
	11	1	47.7	22.6	305	247	310	313	307	293	200	
	12		50.0	0.0	307	257	322	326	320	305	208	
	Surface daily totals					2916	2308	2330	2284	2174	1484	

April 21	6	6	7.4	98.9	89	20	11	8	7	7	4	
	7	5	18.9	89.5	206	87	77	70	61	50	12	
	8	4	30.3	79.3	252	152	153	145	133	117	53	
	9	3	41.3	67.2	274	207	221	213	199	179	93	
	10	2	51.2	51.4	286	250	275	267	252	229	126	
	11	1	58.7	29.2	292	277	308	303	285	260	147	
	12		61.6	0.0	293	287	320	313	296	271	154	
	Surface daily totals											
					3092	2274	2412	2320	2168	1956	1022	
	May 21	5	7	1.9	114.7	1	0	0	0	0	0	0
		6	6	12.7	105.6	144	49	25	15	14	13	9
		7	5	24.0	96.6	216	214	89	76	60	44	13
		8	4	35.4	87.2	250	175	158	144	125	104	25
9		3	46.8	76.0	267	227	221	206	186	160	60	
10		2	57.5	60.9	277	267	270	255	233	205	89	
11		1	66.2	37.1	283	293	301	287	264	234	108	
12			70.0	0.0	284	301	312	297	274	243	114	
Surface daily totals												
					3160	2552	2442	2264	2040	1760	724	
June 21		5	7	4.2	117.3	22	4	3	3	2	2	1
		6	6	14.8	108.4	155	60	30	18	17	16	10
		7	5	26.0	99.7	216	123	92	77	59	41	14
	8	4	37.4	90.7	246	182	159	142	121	97	16	
	9	3	48.8	80.2	263	233	219	202	179	151	47	
	10	2	59.8	65.8	272	272	266	248	224	194	74	
	11	1	69.2	41.9	277	296	296	278	253	221	92	
	12		73.5	0.0	279	304	306	289	263	230	98	
	Surface daily totals											
					3180	2648	2434	2224	1974	1670	610	
	(continued)											

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					Normal ^b	Horiz.	South Facing Surface Angle with Horiz.						
	a.m.	p.m.	Alt.	Azm.			30	40	50	60	90		
July 21	5	7	2.3	115.2	2	0	0	0	0	0	0	0	0
	6	6	13.1	106.1	138	50	26	17	15	14	9	9	
	7	5	24.3	97.2	208	114	89	75	60	44	14	14	
	8	4	35.8	87.8	241	174	157	142	124	102	24	24	
	9	3	47.2	76.7	259	225	218	203	182	157	58	58	
	10	2	57.9	61.7	269	265	266	251	229	200	86	86	
	11	1	66.7	37.9	275	290	296	281	258	228	104	104	
	12		70.6	0.0	276	298	307	292	269	238	111	111	
	Surface daily totals												
	3062												
	2534												
	August 21	6	6	7.9	99.5	81	21	12	9	8	7	5	5
7		5	19.3	90.9	191	87	76	69	60	49	12	12	
8		4	30.7	79.9	237	150	150	141	129	113	50	50	
9		3	41.8	67.9	260	205	216	207	193	173	89	89	
10		2	51.7	52.1	272	246	267	259	244	221	120	120	
11		1	59.3	29.7	278	273	300	292	276	252	140	140	
12			62.3	0.0	280	282	311	303	287	262	147	147	
Surface daily totals													
2916													
2244													
2354													
1894													
September 21	7	5	11.4	80.2	149	43	51	51	49	47	32	32	
	8	4	22.5	69.6	230	109	133	134	131	124	84	84	
	9	3	32.8	57.3	263	167	206	208	203	193	132	132	

October 21	10	2	41.6	41.9	280	211	262	265	260	247	168
	11	1	47.7	22.6	287	239	298	301	295	281	192
	12		50.0	0.0	290	249	310	313	307	292	200
	Surface daily totals				2708	1788	2210	2228	2182	2074	1416
	7	5	4.5	72.3	48	7	14	15	17	17	16
	8	4	15.0	61.9	204	68	106	113	117	118	100
	9	3	24.5	49.8	257	126	185	195	200	198	160
	10	2	32.4	35.6	280	170	245	257	261	257	203
	11	1	37.6	18.7	291	199	283	295	299	294	229
	12		39.5	0.0	294	208	295	308	312	306	238
November 21	Surface daily totals				2454	1348	1962	2060	2098	2074	1654
	8	4	8.2	55.4	136	28	63	72	78	82	81
	9	3	17.0	44.1	232	82	152	167	178	183	167
	10	2	24.0	31.0	268	126	215	233	245	249	219
	11	1	28.6	16.1	283	153	254	273	285	288	248
	12		30.2	0.0	288	163	267	287	298	301	258
	Surface daily totals				2128	942	1636	1778	1870	1908	1686
	8	4	5.5	53.0	89	14	39	45	50	54	56
	9	3	14.0	41.9	217	65	135	152	164	171	163
	10	2	20.0	29.4	261	107	200	221	235	242	221
December 21	11	1	25.0	15.2	280	134	239	262	276	283	252
	12		26.6	0.0	285	143	253	275	290	296	263
	Surface daily totals				1978	782	1480	1634	1740	1796	1646
	8	4	5.5	53.0	89	14	39	45	50	54	56
	9	3	14.0	41.9	217	65	135	152	164	171	163
	10	2	20.0	29.4	261	107	200	221	235	242	221
	11	1	25.0	15.2	280	134	239	262	276	283	252
	12		26.6	0.0	285	143	253	275	290	296	263
	Surface daily totals				1978	782	1480	1634	1740	1796	1646
	8	4	5.5	53.0	89	14	39	45	50	54	56

Source: Kreider, J.F. and Kreith, F., *Solar Heating and Cooling*, revised 1st edn., Hemisphere Publ. Corp., Washington, DC, 1977.

^a 1 Btu/h · ft² = 3.152 W/m². Ground reflection not included on normal or horizontal surfaces.

^b Normal insolation does not include diffuse component.