

# Solar Position and Insolation Values for 24° North Latitude

## BTUH/ft<sup>2</sup> Total Insolation on Surface<sup>a</sup>

Date	Solar Time			Solar Position			South Facing Surface Angle with Horiz.					
	a.m.	p.m.	Alt.	Azm.	Normal <sup>b</sup>	Horiz.	14	24	34	44	90	
January 21	7	5	4.8	65.6			17	21	25	28	31	
	8	4	16.9	58.3	239	83	110	126	137	145	127	
	9	3	27.9	48.8	288	151	188	207	221	228	176	
	10	2	37.2	36.1	308	204	246	268	282	287	207	
	11	1	43.6	19.6	317	237	283	306	319	324	226	
	12		46.0	0.0	320	249	296	319	332	336	232	
	Surface daily totals			2766	1622	1984	2174	2300	2360	2360	1766	
February 21	7	5	9.3	74.6	158	35	44	49	53	56	46	
	8	4	22.3	67.2	263	116	135	145	150	151	102	
	9	3	34.4	57.6	298	187	213	225	230	228	141	
	10	2	45.1	44.2	314	241	273	286	291	287	168	
	11	1	53.0	25.0	321	276	310	324	328	323	185	
	12		56.0	0.0	324	288	323	337	341	335	191	
	Surface daily totals			3036	1998	2276	2396	2436	2424	2424	1476	
March 21	7	5	13.7	83.3	194	60	63	64	62	59	27	
	8	4	27.2	76.8	267	141	150	152	149	142	64	
	9	3	40.2	67.9	295	212	226	229	225	214	95	
	10	2	52.3	54.8	309	266	285	288	283	270	120	
	11	1	61.9	33.4	315	300	322	326	320	305	135	
	12		66.0	0.0	317	312	334	339	333	317	140	
	Surface daily totals			3078	2270	2428	2456	2412	2298	2298	1022	

(continued)

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	Solar Time		Alt.		Azm.		Normal <sup>b</sup>	Horiz.	South Facing Surface Angle with Horiz.					
	a.m.	p.m.							14	24	34	44	54	90
April 21	6	6	4.7	100.6	40	7	5	4	4	3	2			
	7	5	18.3	94.9	203	83	77	70	62	51	10			
	8	4	32.0	89.0	256	160	157	149	137	122	16			
	9	3	45.6	81.9	280	227	227	220	206	186	46			
	10	2	59.0	71.8	292	278	282	275	259	237	61			
	11	1	71.1	51.6	298	310	316	309	293	269	74			
	12		77.6	0.0	299	321	328	321	305	280	79			
	Surface daily totals				3036	2454	2458	2374	2228	2016	488			
May 21	6	6	8.0	108.4	86	22	15	10	9	9	5			
	7	5	21.2	103.2	203	98	85	73	59	44	12			
	8	4	34.6	98.5	248	171	159	145	127	106	15			
	9	3	48.3	93.6	269	233	224	210	190	165	16			
	10	2	62.0	87.7	280	281	275	261	239	211	22			
	11	1	75.5	76.9	286	311	307	293	270	240	34			
	12		86.0	0.0	288	322	317	304	281	250	37			
	Surface daily totals				3032	2556	2447	2286	2072	1800	246			

June 21	6	9.3	111.6	97	29	20	12	12	11	7
	7	5	22.3	106.8	201	103	87	73	58	41
	8	4	35.5	102.6	242	173	158	142	122	99
	9	3	49.0	98.7	263	234	221	204	182	155
	10	2	62.6	95.0	274	280	269	253	229	199
	11	1	76.3	90.8	279	309	300	283	259	227
	<u>12</u>		<u>89.4</u>	<u>0.0</u>	<u>281</u>	<u>319</u>	<u>310</u>	<u>294</u>	<u>269</u>	<u>236</u>
	Surface daily totals			2994	2574	2422	2230	1992	1700	204
July 21	6	8.2	109.0	81	23	16	11	10	9	6
	7	5	21.4	103.8	195	98	85	73	59	44
	8	4	34.8	99.2	239	169	157	143	125	104
	9	3	48.4	94.5	261	231	221	207	187	161
	10	2	62.1	89.0	272	278	270	256	235	206
	11	1	75.7	79.2	278	307	302	287	265	235
	<u>12</u>		<u>86.6</u>	<u>0.0</u>	<u>280</u>	<u>317</u>	<u>312</u>	<u>298</u>	<u>275</u>	<u>245</u>
	Surface daily totals			2932	2526	2412	2250	2036	1766	246
August 21	6	5.0	101.3	35	7	5	4	4	4	2
	7	5	18.5	95.6	186	82	76	69	60	50
	8	4	32.2	89.7	241	158	154	146	134	118
	9	3	45.9	82.9	265	223	222	214	200	181
	10	2	59.3	73.0	278	273	275	268	252	230
	11	1	71.6	53.2	284	304	309	301	285	261
	<u>12</u>		<u>78.3</u>	<u>0.0</u>	<u>286</u>	<u>315</u>	<u>320</u>	<u>313</u>	<u>296</u>	<u>272</u>
	Surface daily totals			2864	2408	2402	2316	2168	1958	470

(continued)

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	a.m.	p.m.	Alt.	Azm.	Normal <sup>b</sup>	Horiz.	14	24	34	44	90	
September 21	7	5	13.7	83.8	173	57	60	60	59	56	26	
	8	4	27.2	76.8	248	136	144	146	143	136	62	
	9	3	40.2	67.9	278	205	218	221	217	206	93	
	10	2	52.3	54.8	292	258	275	278	273	261	116	
	11	1	61.9	33.4	299	291	311	315	309	295	131	
	12		66.0	0.0	301	302	323	327	321	306	136	
	Surface daily totals			2878	2194	2342	2366	2322	2212	992		
	7	5	9.1	74.1	138	32	40	45	48	50	42	
	8	4	22.0	66.7	247	111	129	139	144	145	99	
	9	3	34.1	57.1	284	180	206	217	223	221	138	
	10	2	44.7	43.8	301	234	265	277	282	279	165	
	11	1	52.5	24.7	309	268	301	315	319	314	182	
	12		55.5	0.0	311	279	314	328	332	327	188	
Surface daily totals			2868	1928	2198	2314	2364	2346	1442			

November 21	7	5	4.9	65.8	67	10	16	20	24	27	29
	8	4	17.0	58.4	232	82	108	123	135	142	124
	9	3	28.0	48.9	282	150	186	205	217	224	172
	10	2	37.3	36.3	303	203	244	265	278	283	204
	11	1	43.8	19.7	312	236	280	302	316	320	222
	<u>12</u>		46.2	0.0	315	247	293	315	328	332	228
Surface daily totals				2706	1610	1962	2146	2268	2324	1730	
December 21	7	5	3.2	62.6	30	3	7	9	11	12	14
	8	4	14.9	55.3	225	71	99	116	129	139	130
	9	3	25.5	46.0	281	137	176	198	214	223	184
	10	2	34.3	33.7	304	189	234	258	275	283	217
	11	1	40.4	18.2	314	221	270	295	312	320	236
	<u>12</u>		42.6	0.0	317	232	282	308	325	332	243
Surface daily totals				2624	1474	1852	2058	2204	2286	1808	

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

<sup>a</sup> 1 Btu/h · ft<sup>2</sup> = 3.152 W/m<sup>2</sup>. Ground reflection not included on normal or horizontal surfaces.

<sup>b</sup> Normal insolation does not include diffuse component.