



**OPPIN STATE UNIVERSITY**

**HEALTH & HUMAN SERVICES BUILDING  
BALTIMORE, MARYLAND**



CORINNE AMBLER • CONSTRUCTION MANAGEMENT • ADVISOR: DR. HORMAN

## **APPENDIX C**

### **MONTHLY SOLAR HEAT GAIN TABLES**

The tables in this appendix are for a four foot overhang and a distance of zero between the sunshade and the head of the window.



Solar Time		Altitude (degrees)	Azimuth (degrees)	Shadow Length (ft)		Percent Shaded (SF)		Solar Heat Gain Factor (Btu/h-ft2)			Solar Heat Gain (Btu)			Solar Heat Gain Coefficient	Sunny Days per Month	Hourly Btu	
				South	East	West	South	East	West	North	South	East	West				
6	7.4	98.9	98.9	-3.36	0.53	0.00	0.07	0.00	11	5	88	5	6951	866	114063	8427	651535
7	18.9	89.5	89.5	156.94	1.37	0.00	1.00	0.19	16	16	201	14	10110	2770	230191	23596	1333335
8	30.3	79.3	79.3	12.59	2.38	0.00	1.00	0.32	22	41	224	21	13902	3808	219163	35394	1361337
9	41.3	67.2	67.2	9.07	3.81	0.00	1.00	0.52	27	83	202	27	17061	4674	153553	45507	1103974
10	51.2	51.4	51.4	7.97	6.37	0.00	1.00	0.87	31	121	152	31	19589	5366	64949	52249	710765
11	58.7	29.2	29.2	7.54	13.49	0.00	1.00	1.00	33	146	81	33	20852	5713	45637	56620	639109
12	61.6	0	0	7.40	0.00	0.00	1.00	1.00	34	154	36	36	21484	5886	49786	60676	689160
1	58.7	29.2	29.2	7.54	13.49	0.00	1.00	1.00	33	146	81	33	20852	5713	45637	56620	639109
2	51.2	51.4	51.4	7.97	6.37	0.00	1.00	0.87	31	121	152	31	19589	5366	64949	52249	710765
3	41.3	67.2	67.2	9.07	3.81	0.00	1.00	0.52	27	83	202	27	17061	4674	153553	45507	1103974
4	30.3	79.3	79.3	12.59	2.38	0.00	1.00	0.32	22	41	224	21	13902	3808	219163	35394	1361337
5	18.9	89.5	89.5	156.94	1.37	0.00	1.00	0.19	16	16	201	14	10110	2770	230191	23596	1333335
6	7.4	98.9	98.9	-3.36	0.53	0.00	0.07	0.00	11	5	88	5	6951	866	114063	8427	651535
<b>Total Btu: 12269298</b>																	

Solar Time		Altitude (degrees)	Azimuth (degrees)	Shadow Length (ft)		Percent Shaded (SF)		Solar Heat Gain Factor (Btu/h-ft2)			Solar Heat Gain (Btu)			Solar Heat Gain Coefficient	Sunny Days per Month	Hourly Btu	
				South	East	West	South	East	West	North	South	East	West				
5	1.9	114.7	114.7	-0.32	0.15	0.00	0.02	0.00	0	0	1	0	0	0	1355	0	7048
6	12.7	105.6	105.6	-3.35	0.94	0.00	0.13	0.00	36	10	141	10	22748	1731	176463	16854	1132541
7	24	96.6	96.6	-15.49	1.79	0.00	0.24	0.00	28	20	209	19	17693	3462	227841	32023	1461301
8	35.4	87.2	87.2	58.19	2.85	0.00	1.00	0.39	27	29	220	25	17061	4674	200661	42136	1375568
9	46.8	76	76	17.61	4.39	0.00	1.00	0.60	31	53	197	30	19589	5366	135013	50563	1094762
10	57.5	60.9	60.9	12.91	7.19	0.00	1.00	0.98	34	83	148	34	21484	5886	50192	57305	701310
11	66.2	37.1	37.1	11.37	15.03	0.00	1.00	1.00	36	105	81	36	22748	6232	49786	60676	725098
12	70	0	0	10.99	0.00	0.00	1.00	1.00	37	113	40	40	23380	6405	55318	67418	793107
1	66.2	37.1	37.1	11.37	15.03	0.00	1.00	1.00	36	105	36	81	22748	6232	49786	60676	725098
2	57.5	60.9	60.9	12.91	7.19	0.00	1.00	0.98	34	83	148	34	21484	5886	47020	61171	704917
3	46.8	76	76	17.61	4.39	0.00	1.00	0.60	31	53	30	197	19589	5366	41488	164545	1201139
4	35.4	87.2	87.2	58.19	2.85	0.00	1.00	0.39	27	29	25	220	17061	4674	34574	244553	1564481
5	24	96.6	96.6	-15.49	1.79	0.00	1.00	0.24	28	20	19	209	17693	3462	26276	277678	1690566
6	12.7	105.6	105.6	-3.35	0.94	0.00	0.13	0.00	36	10	10	141	22748	1731	13829	215062	1317525
7	1.9	114.7	114.7	-0.32	0.15	0.00	0.02	0.00	0	0	0	1	0	0	1652	0	8590
<b>Total Btu: 14496006</b>																	

Solar Time		Altitude (degrees)	Azimuth (degrees)	Shadow Length (ft)		Percent Shaded (SF)		Solar Heat Gain Factor (Btu/h-ft2)			Solar Heat Gain (Btu)			Solar Heat Gain Coefficient	Sunny Days per Month	Hourly Btu	
				South	East	West	South	East	West	North	South	East	West				
5	4.2	117.3	117.3	-0.64	0.33	0.00	0.05	0.00	10	1	20	1	6319	173	27036	1685	190150
6	14.8	108.4	108.4	-3.35	1.11	0.00	0.15	0.00	48	13	151	13	30331	2250	187190	21911	1305084
7	26	99.7	99.7	-11.58	1.98	0.00	0.27	0.00	37	22	207	21	23380	3808	222817	35394	1541159
8	37.4	90.7	90.7	-250.33	3.06	0.00	0.42	0.00	30	29	216	27	18957	5020	191436	45507	1408967
9	48.8	80.2	80.2	26.84	4.64	0.00	1.00	0.63	33	45	192	32	20852	5713	126491	53934	1117749
10	59.8	65.8	65.8	16.77	7.53	0.00	1.00	1.00	35	69	145	35	22116	6059	48403	58991	732071
11	69.2	41.9	41.9	14.15	15.77	0.00	1.00	1.00	38	88	81	38	24012	6578	52552	64047	794819
12	73.5	0	0	13.50	0.00	0.00	1.00	1.00	38	95	41	41	24012	6578	56701	69103	844527
1	69.2	41.9	41.9	14.15	15.77	0.00	1.00	1.00	38	88	81	38	24012	6578	52552	64047	794819
2	59.8	65.8	65.8	16.77	7.53	0.00	1.00	1.00	35	69	145	35	22116	6059	48403	58991	732071
3	48.8	80.2	80.2	26.84	4.64	0.00	1.00	0.63	33	45	32	192	20852	5713	44254	154160	1214885
4	37.4	90.7	90.7	-250.33	3.06	0.00	1.00	0.42	30	29	27	216	18957	5020	37340	233310	1590982
5	26	99.7	99.7	-11.58	1.98	0.00	0.27	0.00	37	22	21	207	23380	3808	29042	271555	1770042
6	14.8	108.4	108.4	-3.35	1.11	0.00	0.15	0.00	48	13	151	13	30331	2250	17978	228136	1504993
7	4.2	117.3	117.3	-0.64	0.33	0.00	0.05	0.00	10	1	20	1	6319	173	1383	32949	220450
<b>Total Btu: 15572578</b>																	

Solar Time	Altitude (degrees)	Azimuth (degrees)	Shadow Length (ft)			Percent Shaded (SF)			Solar Heat Gain Factor (Btu/h-ft <sup>2</sup> )			Solar Heat Gain (Btu)			Solar Heat Gain Coefficient	Sunny Days per Month	Hourly Btu
			South	East	West	South	East	West	North	South	East	West	North	South			
5	2.3	115.2	-0.38	0.18	0.00	0.00	0.02	0.00	1	0	2	632	0	2732	0	15	20186
6	13.1	106.1	-3.36	0.97	0.00	0.00	0.13	0.00	37	11	137	23380	1904	171193	18540	15	1290102
7	24.3	97.2	-14.41	1.82	0.00	0.00	0.25	0.00	30	21	201	18957	3635	219267	33709	15	1653409
8	35.8	87.8	75.15	2.89	0.00	1.00	0.39	0.00	28	30	216	17693	4847	196361	43822	15	1576333
9	47.2	76.7	18.78	4.44	0.00	1.00	0.61	0.00	32	52	193	20220	5540	132142	52249	15	1260906
10	57.9	61.7	13.45	7.24	0.00	1.00	0.99	0.00	35	81	146	22116	6059	50312	58991	15	824864
11	66.7	37.9	11.77	15.12	0.00	1.00	1.00	0.00	37	102	81	23380	6405	51169	62361	15	859892
12	70.6	0	11.36	0.00	0.00	1.00	0.00	0.00	38	109	41	24012	6578	56701	69103	15	938364
1	66.7	37.9	11.77	0.00	15.12	1.00	0.00	1.00	37	102	37	23380	6405	51169	62361	15	859892
2	57.9	61.7	13.45	0.00	7.24	1.00	0.00	0.99	35	81	35	22116	6059	48403	61317	15	827369
3	47.2	76.7	18.78	0.00	4.44	1.00	0.00	0.61	32	52	31	20220	5540	42871	161046	15	1378066
4	35.8	87.8	75.15	0.00	2.89	1.00	0.00	0.39	28	30	26	17693	4847	35957	239312	15	1786850
5	24.3	97.2	-14.41	0.00	1.82	1.00	0.00	0.25	30	21	201	18957	3635	27659	267229	15	1904879
6	13.1	106.1	-3.36	0.00	0.97	0.00	0.00	0.13	37	11	11	23380	1904	15212	208639	15	1494813
7	2.3	115.2	-0.38	0.00	0.18	0.00	0.00	0.02	1	0	0	632	0	0	3330	15	23772
<b>Total Btu: 16679511</b>																	

Solar Time	Altitude (degrees)	Azimuth (degrees)	Shadow Length (ft)			Percent Shaded (SF)			Solar Heat Gain Factor (Btu/h-ft <sup>2</sup> )			Solar Heat Gain (Btu)			Solar Heat Gain Coefficient	Sunny Days per Month	Hourly Btu
			South	East	West	South	East	West	North	South	East	West	North	South			
6	7.9	99.5	-3.36	0.56	0.00	0.00	0.08	0.00	12	6	82	7583	1039	104858	8427	14.5	707060
7	19.3	90.1	-802.59	1.40	0.00	0.00	0.19	0.00	17	17	191	10742	2943	214249	26967	14.5	1478427
8	30.7	79.9	13.54	2.41	0.00	1.00	0.33	0.00	24	41	216	15165	4155	201816	38765	14.5	1507425
9	41.8	67.9	9.51	3.86	0.00	1.00	0.53	0.00	28	80	197	17693	4847	131588	47192	14.5	1167661
10	51.7	52.1	8.25	6.42	0.00	1.00	0.88	0.00	32	116	150	20220	5540	30722	53934	14.5	640413
11	59.3	29.7	7.76	13.60	0.00	1.00	1.00	0.00	35	141	81	22116	6059	6059	58991	14.5	540702
12	62.3	0	7.62	0.00	0.00	1.00	0.00	0.00	35	149	38	22116	6059	52552	64047	14.5	839688
1	59.3	29.7	7.76	0.00	13.60	1.00	0.00	1.00	35	141	35	22116	6059	48403	6059	14.5	479294
2	51.7	52.1	8.25	0.00	6.42	1.00	0.00	0.88	32	116	32	20220	5540	44254	36381	14.5	617094
3	41.8	67.9	9.51	0.00	3.86	1.00	0.00	0.53	28	80	28	17693	4847	38722	159813	14.5	1282240
4	30.7	79.9	13.54	0.00	2.41	1.00	0.00	0.33	24	41	23	15165	4155	31808	245661	14.5	1721375
5	19.3	90.1	-802.59	0.00	1.40	1.00	0.00	0.19	17	17	16	10742	2943	22127	260990	14.5	1721454
6	7.9	99.5	-3.36	0.00	0.56	0.00	0.00	0.08	12	6	5	7583	1039	6915	127760	14.5	831116
<b>Total Btu: 13533949</b>																	

Solar Time	Altitude (degrees)	Azimuth (degrees)	Shadow Length (ft)			Percent Shaded (SF)			Solar Heat Gain Factor (Btu/h-ft <sup>2</sup> )			Solar Heat Gain (Btu)			Solar Heat Gain Coefficient	Sunny Days per Month	Hourly Btu
			South	East	West	South	East	West	North	South	East	West	North	South			
7	11.4	80.2	4.74	0.82	0.00	0.69	0.11	0.00	9	21	146	5687	2195	180784	15169	15.5	1263649
8	22.5	69.6	4.75	1.77	0.00	0.70	0.24	0.00	17	71	205	10742	5788	220831	28653	15.5	1649290
9	32.8	57.3	4.77	3.06	0.00	0.70	0.42	0.00	22	124	194	13902	9136	168928	37080	15.5	1420081
10	41.6	41.9	4.77	5.32	0.00	0.70	0.73	0.00	27	165	148	17061	11883	83332	45507	15.5	978255
11	47.7	22.6	4.76	11.44	0.00	0.70	1.00	0.00	29	191	78	18325	13623	40105	48878	15.5	749151
12	50	0	4.77	0.00	0.00	0.70	0.00	0.00	30	200	32	18957	14092	44254	53934	15.5	813672
1	47.7	22.6	4.76	0.00	11.44	0.70	0.00	1.00	29	191	29	18325	13623	40105	48878	15.5	749151
2	41.6	41.9	4.77	0.00	5.32	0.70	0.00	0.73	27	148	17061	17061	11883	37340	101560	15.5	1040628
3	32.8	57.3	4.77	0.00	3.06	0.70	0.00	0.42	22	124	22	13902	9136	30425	205879	15.5	1607914
4	22.5	69.6	4.75	0.00	1.77	0.70	0.00	0.24	17	71	17	10742	5788	23510	269135	15.5	1916890
5	11.4	80.2	4.74	0.00	0.82	0.69	0.00	0.11	9	21	9	5687	2195	12447	220303	15.5	1491915
<b>Total Btu: 13680595</b>																	

Solar Time		Altitude (degrees)	Azimuth (degrees)	Shadow Length (ft)			Percent Shaded (SF)			Solar Heat Gain Factor (Btu/h-ft2)			Solar Heat Gain (Btu)			Solar Heat Gain Coefficient	Sunny Days per Month	Hourly Btu
				South	East	West	South	East	West	North	South	East	West	North	South			
7	8	4.5	72.3	1.04	0.33	0.00	0.15	0.05	0.00	2	12	45	2	1264	1815	59553	3371	422416
8	15	61.9	61.9	2.28	1.22	0.00	0.33	0.17	0.00	11	89	173	11	6951	10910	202130	18540	1526600
9	24.5	49.8	49.8	2.82	2.39	0.00	0.41	0.33	0.00	17	151	180	17	10742	16553	175567	28653	1481690
10	32.4	35.6	35.6	3.12	4.36	0.00	0.46	0.59	0.00	21	196	139	21	13270	20089	95191	35394	1049241
11	37.6	18.7	18.7	3.25	9.61	0.00	0.48	1.00	0.00	24	224	71	24	15165	22300	33191	40451	711080
12	39.5	0	0	3.30	0.00	0.00	0.48	0.00	0.00	25	234	27	27	15797	23050	37340	45507	778838
1	37.6	18.7	18.7	3.25	0.00	9.61	0.48	0.00	1.00	24	224	24	71	15165	22300	33191	40451	711080
2	32.4	35.6	35.6	3.12	0.00	4.36	0.46	0.00	0.59	21	196	21	139	13270	20089	29042	116013	1141844
3	24.5	49.8	49.8	2.82	0.00	2.39	0.41	0.00	0.33	17	151	17	180	10742	16553	23510	213970	1694557
4	15	61.9	61.9	2.28	0.00	1.22	0.33	0.00	0.17	11	89	11	173	6951	10910	15212	246343	1788268
5	4.5	72.3	72.3	1.04	0.00	0.33	0.15	0.00	0.05	2	12	2	45	1264	1815	2766	72579	501913
<b>Total Btu: 11807527</b>																		

Solar Time		Altitude (degrees)	Azimuth (degrees)	Shadow Length (ft)			Percent Shaded (SF)			Solar Heat Gain Factor (Btu/h-ft2)			Solar Heat Gain (Btu)			Solar Heat Gain Coefficient	Sunny Days per Month	Hourly Btu
				South	East	West	South	East	West	North	South	East	West	North	South			
8	8.2	55.4	55.4	1.02	0.70	0.00	0.15	0.10	0.00	5	72	108	5	3159	10741	135756	8427	758802
9	17	44.1	44.1	1.70	1.76	0.00	0.25	0.24	0.00	12	156	181	12	7583	20793	194307	20225	1165958
10	24	31	31	2.08	3.46	0.00	0.30	0.47	0.00	16	209	122	16	10110	26022	99598	26967	780945
11	28.6	16.1	16.1	2.27	7.86	0.00	0.33	1.00	0.00	19	240	61	19	12006	28838	26276	32023	475889
12	30.2	0	0	2.33	0.00	0.00	0.34	0.00	0.00	20	250	21	21	12638	29713	29042	35394	512577
1	28.6	16.1	16.1	2.27	0.00	7.86	0.33	0.00	1.00	19	240	19	61	12006	28838	26276	32023	475889
2	24	31	31	2.08	0.00	3.46	0.30	0.00	0.47	16	209	16	122	10110	26022	22127	121383	862284
3	17	44.1	44.1	1.70	0.00	1.76	0.25	0.00	0.24	12	156	12	181	7583	20793	16595	236809	1352544
4	8.2	55.4	55.4	1.02	0.00	0.70	0.15	0.00	0.10	5	72	5	108	3159	10741	6915	165451	894077
<b>Total Btu: 7278966</b>																		

Solar Time		Altitude (degrees)	Azimuth (degrees)	Shadow Length (ft)			Percent Shaded (SF)			Solar Heat Gain Factor (Btu/h-ft2)			Solar Heat Gain (Btu)			Solar Heat Gain Coefficient	Sunny Days per Month	Hourly Btu
				South	East	West	South	East	West	North	South	East	West	North	South			
8	5.5	53	53	0.64	0.48	0.00	0.09	0.07	0.00	3	50	67	3	1896	7894	86837	5056	467738
9	14	41.9	41.9	1.34	1.49	0.00	0.20	0.20	0.00	10	151	135	10	6319	21354	151495	16854	901700
10	20.7	29.4	29.4	1.73	3.08	0.00	0.25	0.42	0.00	14	210	113	14	8846	27739	98789	23596	731266
11	25	15.2	15.2	1.93	7.11	0.00	0.28	0.97	0.00	17	242	56	17	10742	30876	25123	28653	438808
12	26.6	0	0	2.00	0.00	0.00	0.29	0.00	0.00	18	253	19	19	11374	31872	26276	32023	467110
1	25	15.2	15.2	1.93	0.00	7.11	0.28	0.00	0.97	17	242	17	56	10742	30876	23510	30618	440431
2	20.7	29.4	29.4	1.73	0.00	3.08	0.25	0.00	0.42	14	210	14	113	8846	27739	19361	120398	811185
3	14	41.9	41.9	1.34	0.00	1.49	0.20	0.00	0.20	10	151	10	135	6319	21354	13829	184632	1040217
4	5.5	53	53	0.64	0.00	0.48	0.09	0.00	0.07	3	50	3	67	1896	7894	4149	105831	550937
<b>Total Btu: 5849392</b>																		