San Francisco, California

Awnings

Typical Year (TMY3) HDD65 2737 / CDD65 96, Hot Year (2010) HDD65 2673 / CDD65 240

Tables 99-102 show the impact of awnings on a typical house in San Francisco with different window orientations over a typical year. Tables 103-106 repeat this analysis for a hot year in San Francisco. The impact varies depending on the type of window glazing and whether the awnings are in place all twelve months or only during the cooling season. For a house with windows equally distributed in the four orientations, Table 99 shows the annual heating and cooling energy use as well as the peak electricity demand for each combination of glazing and shading condition. The table also shows the impact on the total cost for heating and cooling. In all cases, the net and percent savings are in reference to a house with no shading.

Table 99 shows that awnings reduce cooling energy use by 64-80 percent as compared to the unshaded house. The higher savings are for awnings at 165 degrees over windows with clear glazings, while the lower savings are for awnings at 90 degrees over windows with Low-E glazings. Because awnings block useful solar gain in winter, heating energy use increases when the awnings remain in place 12 months a year. Using the awnings only during the cooling season produces the largest net energy savings. The net energy savings are from -12 to -7 percent in San Francisco when awnings are used only during the cooling season from April through June, and from August through October, while the penalties are from -60 to -33 percent when they are deployed throughout the year.

Table 99 also shows that awnings reduce peak electricity demand by 25-35 percent in San Francisco, with larger reductions for the clear glazings and smaller reductions for the Low-E glazing. Tables 100, 101, and 102 show results for houses in San Francisco where the windows predominantly face to the east, south, and west, respectively. Both the cooling energy savings and the peak demand reductions are largest on west-facing awnings. Tables 103-106 show the impact of awnings on a particularly hot year (2010) in San Francisco. The main effect is to increase the cooling savings by 389 percent due to the hotter or longer summer.

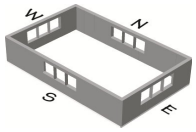

Table 99. Impact of awnings on a house in San Francisco, California with equally distributed windows on a typical year

Window Type	Awning	Operation	Heating			Cooling				Heat+Cool			Peak Cooling		
			Energy (MBtu)	Savings (MBtu)	Savings ($)	Cool (kWh)	Savings (kWh)	Savings ($)	Savings (%)	Cost ($)	Savings ($)	Savings (%)	Peak (kW)	Savings (kW)	Savings (%)
Single Clear	None		30.8			142				370			2.17		
	Black Awning 90°	summer	34.6	-3.9	-44	39	103	13	73	401	-31	-8	1.52	0.65	30
		12 month	44.9	-14.2	-162	34	108	14	76	518	-148	-40	1.52	0.65	30
	Linen Awning 90°	summer	34.0	-3.2	-37	50	92	12	65	395	-25	-7	1.62	0.56	26
		12 month	42.6	-11.8	-135	44	98	13	69	493	-122	-33	1.62	0.56	26
	Black Awning 165°	summer	35.9	-5.1	-58	29	113	15	80	414	-44	-12	1.40	0.77	36
		12 month	49.5	-18.7	-214	24	118	15	83	569	-199	-54	1.40	0.77	36
	Linen Awning 165°	summer	34.8	-4.1	-46	41	101	13	71	404	-33	-9	1.53	0.64	30
		12 month	45.7	-15.0	-171	36	106	14	75	528	-157	-43	1.53	0.64	30
Double Clear	None		23.5			108				283			1.86		
	Black Awning 90°	summer	26.5	-3.0	-34	30	78	10	72	307	-24	-8	1.31	0.55	29
		12 month	34.8	-11.3	-129	26	82	11	76	401	-118	-42	1.31	0.55	29
	Linen Awning 90°	summer	26.0	-2.4	-28	39	69	9	64	302	-19	-7	1.39	0.47	25
		12 month	33.0	-9.5	-108	35	73	9	68	382	-99	-35	1.39	0.47	25
	Black Awning 165°	summer	27.4	-3.9	-45	22	86	11	80	317	-33	-12	1.21	0.65	35
		12 month	38.4	-14.8	-170	19	89	12	82	441	-158	-56	1.21	0.65	35
	Linen Awning 165°	summer	26.6	-3.1	-36	31	77	10	71	309	-26	-9	1.31	0.54	29
		12 month	35.4	-11.9	-136	27	81	11	75	409	-126	-44	1.31	0.54	29
Double HiSol LowE	None		20.0			108				242			1.82		
	Black Awning 90°	summer	22.6	-2.7	-31	32	76	10	70	263	-21	-9	1.28	0.54	30
		12 month	30.4	-10.4	-119	28	80	10	74	351	-109	-45	1.28	0.54	30
	Linen Awning 90°	summer	22.2	-2.2	-25	39	69	9	64	259	-16	-7	1.36	0.46	25
		12 month	28.7	-8.7	-100	35	73	9	68	333	-90	-37	1.36	0.46	25
	Black Awning 165°	summer	23.5	-3.6	-41	22	86	11	80	272	-30	-12	1.18	0.64	35
		12 month	33.8	-13.8	-158	19	89	12	82	389	-146	-60	1.18	0.64	35
	Linen Awning 165°	summer	22.8	-2.8	-32	32	76	10	70	265	-22	-9	1.28	0.53	29
		12 month	31.0	-11.1	-126	28	80	10	74	358	-116	-48	1.28	0.53	29

Window Type	Frame	U-factor	SHGC
Single Clear	Aluminum	1.16	0.77
Double Clear	Wood/vinyl	0.49	0.56
Double HiSol LowE	Wood/vinyl	0.37	0.53

The costs shown here are annual costs for heating and cooling only and thus will be less than the total utility bill. Heating is assumed to be provided by a gas furnace and cooling by a central air-conditioner. Electricity costs used in the analysis are 13.0 cents per kWh and natural gas costs are $11.79 per MBTU, which are the average costs in 2009 for the state of California according to the Energy Information Administration (see Appendix E for details).

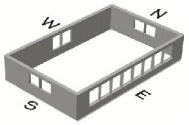

Table 100. Impact of awnings on a house in San Francisco, California with east-facing windows on a typical year

Window Type	Awning	Operation	Heating			Cooling				Heat+Cool			Peak Cooling		
			Energy (MBtu)	Savings (MBtu)	Savings ($)	Cool (kWh)	Savings (kWh)	Savings ($)	Savings (%)	Cost ($)	Savings ($)	Savings (%)	Peak (kW)	Savings (kW)	Savings (%)
Single Clear	None		30.7			161				372			2.15		
	Black Awning	summer	34.8	-4.1	-47	40	121	16	75	404	-32	-9	1.54	0.62	29
	90°	12 month	44.4	-13.7	-157	35	126	16	78	512	-141	-38	1.54	0.62	29
	Linen Awning	summer	34.0	-3.3	-38	55	106	14	66	396	-24	-7	1.69	0.47	22
	90°	12 month	42.0	-11.3	-129	50	111	14	69	487	-115	-31	1.69	0.47	22
	Black Awning	summer	36.6	-5.9	-67	24	137	18	85	421	-49	-13	1.33	0.82	38
	165°	12 month	49.8	-19.1	-218	21	140	18	87	572	-200	-54	1.33	0.82	38
	Linen Awning	summer	35.2	-4.5	-52	39	122	16	76	408	-36	-10	1.53	0.62	29
	165°	12 month	45.7	-15.0	-171	35	126	16	78	527	-155	-42	1.53	0.62	29
Double Clear	None		23.6			131				286			1.92		
	Black Awning	summer	26.9	-3.3	-38	31	100	13	76	311	-25	-9	1.33	0.59	31
	90°	12 month	34.8	-11.2	-128	28	103	13	79	401	-115	-40	1.33	0.59	31
	Linen Awning	summer	26.2	-2.7	-31	43	88	11	67	305	-19	-7	1.47	0.45	24
	90°	12 month	32.9	-9.3	-106	40	91	12	69	381	-95	-33	1.47	0.45	24
	Black Awning	summer	28.2	-4.7	-53	19	112	15	85	325	-39	-14	1.14	0.78	41
	165°	12 month	39.1	-15.5	-177	17	114	15	87	449	-163	-57	1.14	0.78	41
	Linen Awning	summer	27.2	-3.6	-41	30	101	13	77	314	-28	-10	1.33	0.59	31
	165°	12 month	35.8	-12.2	-140	27	104	14	79	413	-127	-44	1.33	0.59	31
Double HiSol LowE	None		19.8			133				244			1.86		
	Black Awning	summer	22.8	-2.9	-33	31	102	13	77	264	-20	-8	1.29	0.57	31
	90°	12 month	30.2	-10.4	-118	28	105	14	79	349	-105	-43	1.29	0.57	31
	Linen Awning	summer	22.2	-2.3	-27	44	89	12	67	259	-15	-6	1.41	0.45	24
	90°	12 month	28.4	-8.6	-98	40	93	12	70	330	-86	-35	1.41	0.45	24
	Black Awning	summer	24.0	-4.2	-48	20	113	15	85	278	-33	-14	1.11	0.76	41
	165°	12 month	34.3	-14.4	-165	17	116	15	87	394	-150	-61	1.11	0.76	41
	Linen Awning	summer	23.1	-3.2	-37	31	102	13	77	268	-23	-10	1.29	0.58	31
	165°	12 month	31.2	-11.3	-129	28	105	14	79	360	-116	-47	1.29	0.58	31

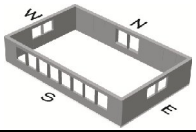

Table 101. Impact of awnings on a house in San Francisco, California with south-facing windows on a typical year

Window Type	Awning	Operation	Heating			Cooling				Heat+Cool			Peak Cooling		
			Energy (MBtu)	Savings (MBtu)	Savings ($)	Cool (kWh)	Savings (kWh)	Savings ($)	Savings (%)	Cost ($)	Savings ($)	Savings (%)	Peak (kW)	Savings (kW)	Savings (%)
Single Clear	None		27.2			192				336			2.43		
	Black Awning	summer	31.0	-3.8	-44	39	153	20	80	360	-24	-7	1.72	0.72	29
	90°	12 month	45.0	-17.8	-203	30	162	21	84	518	-182	-54	1.42	1.01	42
	Linen Awning	summer	30.3	-3.1	-36	51	141	18	73	353	-17	-5	1.73	0.71	29
	90°	12 month	41.6	-14.4	-165	42	150	20	78	481	-145	-43	1.47	0.96	40
	Black Awning	summer	31.8	-4.6	-53	33	159	21	83	368	-32	-10	1.70	0.74	30
	165°	12 month	50.8	-23.6	-269	24	168	22	88	583	-248	-74	1.38	1.05	43
	Linen Awning	summer	30.9	-3.7	-43	45	147	19	77	359	-23	-7	1.71	0.72	30
	165°	12 month	45.4	-18.2	-209	36	156	20	81	524	-188	-56	1.47	0.96	40
Double Clear	None		20.3			142				251			2.08		
	Black Awning	summer	23.3	-3.0	-34	27	115	15	81	270	-19	-8	1.23	0.86	41
	90°	12 month	35.1	-14.8	-169	24	118	15	83	405	-154	-61	1.23	0.86	41
	Linen Awning	summer	22.8	-2.5	-28	36	106	14	75	265	-14	-6	1.29	0.80	38
	90°	12 month	32.4	-12.1	-138	32	110	14	77	375	-124	-50	1.29	0.80	38
	Black Awning	summer	24.0	-3.7	-42	22	120	16	85	277	-26	-11	1.20	0.89	43
	165°	12 month	39.7	-19.4	-222	19	123	16	87	457	-206	-82	1.16	0.93	44
	Linen Awning	summer	23.3	-2.9	-34	32	110	14	77	270	-19	-8	1.23	0.85	41
	165°	12 month	35.5	-15.2	-174	28	114	15	80	410	-159	-63	1.23	0.85	41
Double HiSol LowE	None		16.8			137				210			1.97		
	Black Awning	summer	19.6	-2.7	-31	27	110	14	80	227	-17	-8	1.20	0.77	39
	90°	12 month	30.4	-13.6	-155	24	113	15	82	351	-141	-67	1.20	0.77	39
	Linen Awning	summer	19.1	-2.2	-26	39	98	13	72	223	-13	-6	1.26	0.71	36
	90°	12 month	27.9	-11.1	-127	35	102	13	74	324	-114	-54	1.26	0.71	36
	Black Awning	summer	20.2	-3.4	-38	22	115	15	84	234	-23	-11	1.14	0.83	42
	165°	12 month	34.8	-18.0	-206	19	118	15	86	401	-190	-90	1.13	0.84	43
	Linen Awning	summer	19.5	-2.7	-31	32	105	14	77	227	-17	-8	1.20	0.76	39
	165°	12 month	30.9	-14.0	-160	28	109	14	80	357	-146	-69	1.20	0.76	39

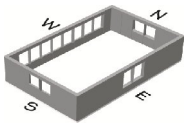

Table 102. Impact of awnings on a house in San Francisco, California with west-facing windows on a typical year

Window Type	Awning	Operation	Heating			Cooling				Heat+Cool			Peak Cooling		
			Energy (MBtu)	Savings (MBtu)	Savings ($)	Cool (kWh)	Savings (kWh)	Savings ($)	Savings (%)	Cost ($)	Savings ($)	Savings (%)	Peak (kW)	Savings (kW)	Savings (%)
Single Clear	None		32.9			180				399			3.01		
	Black Awning	summer	36.9	-4.0	-46	48	132	17	73	428	-29	-7	1.88	1.13	38
	90°	12 month	46.0	-13.2	-150	38	142	18	79	531	-132	-33	1.54	1.47	49
	Linen Awning	summer	36.0	-3.2	-36	62	118	15	66	420	-21	-5	1.91	1.11	37
	90°	12 month	43.6	-10.7	-122	52	128	17	71	505	-106	-26	1.66	1.36	45
	Black Awning	summer	38.6	-5.7	-66	33	147	19	82	446	-47	-12	1.85	1.17	39
	165°	12 month	51.4	-18.5	-211	23	157	20	87	590	-191	-48	1.42	1.60	53
	Linen Awning	summer	37.2	-4.4	-50	49	131	17	73	432	-33	-8	1.88	1.14	38
	165°	12 month	47.1	-14.3	-163	39	141	18	78	544	-145	-36	1.56	1.46	48
Double Clear	None		24.9			142				304			2.55		
	Black Awning	summer	28.1	-3.1	-36	37	105	14	74	326	-22	-7	1.54	1.02	40
	90°	12 month	35.6	-10.7	-122	31	111	14	78	411	-108	-36	1.34	1.21	47
	Linen Awning	summer	27.4	-2.5	-29	47	95	12	67	320	-16	-5	1.56	0.99	39
	90°	12 month	33.7	-8.8	-100	41	101	13	71	391	-87	-29	1.41	1.14	45
	Black Awning	summer	29.4	-4.5	-51	23	119	15	84	339	-36	-12	1.51	1.04	41
	165°	12 month	39.8	-14.8	-170	19	123	16	87	457	-154	-51	1.22	1.33	52
	Linen Awning	summer	28.3	-3.4	-39	37	105	14	74	329	-25	-8	1.55	1.00	39
	165°	12 month	36.5	-11.5	-132	31	111	14	78	421	-118	-39	1.35	1.20	47
Double HiSol LowE	None		21.1			141				260			2.49		
	Black Awning	summer	23.8	-2.7	-31	36	105	14	74	277	-17	-7	1.52	0.97	39
	90°	12 month	30.9	-9.8	-112	31	110	14	78	357	-98	-38	1.31	1.19	48
	Linen Awning	summer	23.3	-2.1	-24	48	93	12	66	272	-12	-5	1.53	0.97	39
	90°	12 month	29.1	-8.0	-91	42	99	13	70	338	-78	-30	1.38	1.12	45
	Black Awning	summer	25.1	-3.9	-45	24	117	15	83	290	-30	-11	1.48	1.01	41
	165°	12 month	34.8	-13.6	-156	19	122	16	87	400	-140	-54	1.19	1.31	52
	Linen Awning	summer	24.1	-3.0	-34	37	104	14	74	280	-20	-8	1.52	0.98	39
	165°	12 month	31.7	-10.6	-121	32	109	14	77	367	-107	-41	1.31	1.18	47

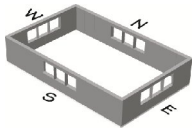

Table 103. Impact of awnings on a house in San Francisco, California with equally distributed windows on a hot year

Window Type	Awning	Operation	Heating			Cooling				Heat+Cool			Peak Cooling		
			Energy (MBtu)	Savings (MBtu)	Savings ($)	Cool (kWh)	Savings (kWh)	Savings ($)	Savings (%)	Cost ($)	Savings ($)	Savings (%)	Peak (kW)	Savings (kW)	Savings (%)
Single Clear	None		29.8			358				387			3.60		
	Black Awning	summer	30.7	-1.0	-11	181	177	23	49	375	12	3	2.83	0.77	21
	90°	12 month	42.9	-13.1	-150	164	194	25	54	512	-125	-32	2.83	0.77	21
	Linen Awning	summer	30.5	-0.8	-9	202	156	20	44	375	11	3	2.96	0.64	18
	90°	12 month	40.7	-10.9	-125	184	174	23	49	489	-102	-26	2.96	0.65	18
	Black Awning	summer	31.1	-1.4	-16	157	201	26	56	377	10	3	2.76	0.84	23
	165°	12 month	47.5	-17.7	-202	139	219	28	61	561	-174	-45	2.76	0.84	23
	Linen Awning	summer	30.8	-1.1	-12	185	173	23	48	377	10	3	2.91	0.69	19
	165°	12 month	43.9	-14.2	-162	168	190	25	53	524	-137	-36	2.91	0.69	19
Double Clear	None		23.0			300				302			3.12		
	Black Awning	summer	23.7	-0.7	-8	161	139	18	46	292	10	3	2.51	0.61	20
	90°	12 month	33.2	-10.2	-117	149	151	20	50	400	-97	-32	2.51	0.61	20
	Linen Awning	summer	23.6	-0.5	-6	175	125	16	42	292	10	3	2.61	0.52	17
	90°	12 month	31.6	-8.5	-98	164	136	18	45	382	-80	-26	2.61	0.52	17
	Black Awning	summer	24.0	-1.0	-11	139	161	21	54	293	10	3	2.44	0.69	22
	165°	12 month	36.7	-13.7	-156	126	174	23	58	436	-134	-44	2.44	0.69	22
	Linen Awning	summer	23.8	-0.8	-9	162	138	18	46	293	9	3	2.56	0.56	18
	165°	12 month	34.0	-11.0	-126	151	149	19	50	409	-107	-35	2.56	0.56	18
Double HiSol LowE	None		19.7			296				264			3.02		
	Black Awning	summer	20.3	-0.6	-7	159	137	18	46	253	11	4	2.42	0.60	20
	90°	12 month	29.1	-9.4	-107	147	149	19	50	352	-88	-33	2.42	0.60	20
	Linen Awning	summer	20.2	-0.5	-5	176	120	16	41	254	10	4	2.52	0.50	17
	90°	12 month	27.6	-7.8	-89	165	131	17	44	337	-72	-27	2.52	0.50	17
	Black Awning	summer	20.6	-0.9	-10	138	158	21	53	253	11	4	2.35	0.67	22
	165°	12 month	32.3	-12.6	-144	126	170	22	57	386	-122	-46	2.35	0.67	22
	Linen Awning	summer	20.4	-0.6	-7	162	134	17	45	254	10	4	2.47	0.55	18
	165°	12 month	29.9	-10.1	-116	151	145	19	49	361	-97	-37	2.47	0.55	18

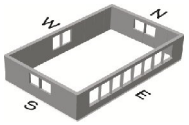

Table 104. Impact of awnings on a house in San Francisco, California with east-facing windows on a hot year

Window Type	Awning	Operation	Heating			Cooling				Heat+Cool			Peak Cooling		
			Energy (MBtu)	Savings (MBtu)	Savings ($)	Cool (kWh)	Savings (kWh)	Savings ($)	Savings (%)	Cost ($)	Savings ($)	Savings (%)	Peak (kW)	Savings (kW)	Savings (%)
Single Clear	None		28.8			421				384			3.36		
	Black Awning	summer	29.8	-1.0	-11	198	223	29	53	366	18	5	2.87	0.49	15
	90°	12 month	42.1	-13.3	-152	177	244	32	58	504	-121	-31	2.87	0.49	15
	Linen Awning	summer	29.5	-0.8	-9	225	196	25	47	367	17	4	2.95	0.41	12
	90°	12 month	39.7	-11.0	-125	205	216	28	51	481	-97	-25	2.95	0.41	12
	Black Awning	summer	30.4	-1.6	-18	152	269	35	64	367	17	4	2.68	0.68	20
	165°	12 month	48.3	-19.5	-223	130	291	38	69	569	-185	-48	2.68	0.68	20
	Linen Awning	summer	29.9	-1.2	-13	188	233	30	55	367	17	4	2.85	0.52	15
	165°	12 month	43.9	-15.2	-173	166	255	33	61	524	-140	-36	2.85	0.52	15
Double Clear	None		22.3			346				300			3.00		
	Black Awning	summer	23.0	-0.7	-8	172	174	23	50	286	14	5	2.56	0.44	15
	90°	12 month	32.9	-10.6	-121	159	187	24	54	397	-97	-32	2.56	0.44	15
	Linen Awning	summer	22.9	-0.6	-6	196	150	20	43	287	13	4	2.64	0.36	12
	90°	12 month	31.1	-8.8	-100	184	162	21	47	379	-79	-26	2.64	0.36	12
	Black Awning	summer	23.5	-1.2	-13	130	216	28	62	285	15	5	2.39	0.61	20
	165°	12 month	37.7	-15.4	-176	118	228	30	66	447	-147	-49	2.39	0.61	20
	Linen Awning	summer	23.1	-0.8	-10	163	183	24	53	286	14	5	2.54	0.46	15
	165°	12 month	34.4	-12.1	-138	149	197	26	57	412	-112	-37	2.54	0.46	15
Double HiSol LowE	None		19.0			340				261			2.90		
	Black Awning	summer	19.6	-0.6	-7	172	168	22	49	246	15	6	2.47	0.43	15
	90°	12 month	28.6	-9.7	-110	160	180	23	53	348	-87	-33	2.47	0.43	15
	Linen Awning	summer	19.4	-0.4	-5	196	144	19	42	248	14	5	2.55	0.35	12
	90°	12 month	27.0	-8.0	-91	185	155	20	46	332	-71	-27	2.55	0.35	12
	Black Awning	summer	20.0	-1.0	-12	130	210	27	62	246	16	6	2.30	0.60	21
	165°	12 month	33.1	-14.1	-161	118	222	29	65	394	-132	-51	2.30	0.60	21
	Linen Awning	summer	19.7	-0.7	-8	163	177	23	52	246	15	6	2.45	0.46	16
	165°	12 month	30.0	-11.0	-126	149	191	25	56	362	-101	-39	2.45	0.46	16

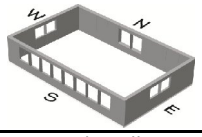

Table 105. Impact of awnings on a house in San Francisco, California with south-facing windows on a hot year

Window Type	Awning	Operation	Heating			Cooling				Heat+Cool			Peak Cooling		
			Energy (MBtu)	Savings (MBtu)	Savings ($)	Cool (kWh)	Savings (kWh)	Savings ($)	Savings (%)	Cost ($)	Savings ($)	Savings (%)	Peak (kW)	Savings (kW)	Savings (%)
Single Clear	None		28.5			475				388			4.31		
	Black Awning	summer	29.4	-0.9	-10	185	290	38	61	360	27	7	3.25	1.06	25
	90°	12 month	44.1	-15.7	-179	154	321	42	68	525	-137	-35	2.75	1.56	36
	Linen Awning	summer	29.2	-0.8	-9	213	262	34	55	362	26	7	3.26	1.05	24
	90°	12 month	41.5	-13.0	-149	185	290	38	61	499	-111	-29	2.86	1.45	34
	Black Awning	summer	29.7	-1.2	-14	175	300	39	63	362	25	7	3.24	1.07	25
	165°	12 month	48.5	-20.1	-229	143	332	43	70	574	-186	-48	2.76	1.55	36
	Linen Awning	summer	29.4	-1.0	-11	210	265	34	56	364	24	6	3.25	1.06	25
	165°	12 month	44.5	-16.0	-183	178	297	39	63	532	-144	-37	2.88	1.43	33
Double Clear	None		21.8			381				299			3.67		
	Black Awning	summer	22.4	-0.7	-8	160	221	29	58	277	21	7	2.68	0.99	27
	90°	12 month	34.4	-12.6	-144	138	243	32	64	411	-112	-38	2.45	1.22	33
	Linen Awning	summer	22.3	-0.5	-6	185	196	25	51	279	19	6	2.69	0.98	27
	90°	12 month	32.3	-10.5	-120	165	216	28	57	390	-92	-31	2.54	1.13	31
	Black Awning	summer	22.7	-0.9	-10	150	231	30	61	279	20	7	2.67	1.00	27
	165°	12 month	37.8	-16.1	-184	129	252	33	66	449	-151	-51	2.44	1.23	33
	Linen Awning	summer	22.5	-0.7	-8	180	201	26	53	280	18	6	2.68	0.99	27
	165°	12 month	34.7	-12.9	-147	158	223	29	59	417	-118	-40	2.55	1.12	31
Double HiSol LowE	None		18.3			374				258			3.54		
	Black Awning	summer	18.9	-0.6	-7	160	214	28	57	236	21	8	2.59	0.95	27
	90°	12 month	29.9	-11.6	-133	139	235	31	63	360	-102	-40	2.37	1.17	33
	Linen Awning	summer	18.7	-0.5	-5	184	190	25	51	238	19	8	2.60	0.94	27
	90°	12 month	27.9	-9.6	-110	165	209	27	56	341	-83	-32	2.46	1.08	31
	Black Awning	summer	19.1	-0.8	-9	148	226	29	60	237	21	8	2.57	0.96	27
	165°	12 month	33.1	-14.9	-170	127	247	32	66	395	-138	-53	2.35	1.18	33
	Linen Awning	summer	18.9	-0.6	-7	178	196	25	52	239	19	7	2.59	0.95	27
	165°	12 month	30.2	-11.9	-136	158	216	28	58	365	-108	-42	2.46	1.08	30

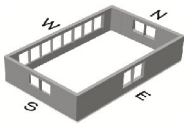

Table 106. Impact of awnings on a house in San Francisco, California with west-facing windows on a hot year

Window Type	Awning	Operation	Heating			Cooling				Heat+Cool			Peak Cooling		
			Energy (MBtu)	Savings (MBtu)	Savings ($)	Cool (kWh)	Savings (kWh)	Savings ($)	Savings (%)	Cost ($)	Savings ($)	Savings (%)	Peak (kW)	Savings (kW)	Savings (%)
Single Clear	None		31.7			411				416			5.17		
	Black Awning	summer	32.7	-0.9	-11	190	221	29	54	398	18	4	2.86	2.31	45
	90°	12 month	44.5	-12.8	-146	172	239	31	58	532	-115	-28	2.86	2.31	45
	Linen Awning	summer	32.4	-0.7	-8	217	194	25	47	399	17	4	3.07	2.09	41
	90°	12 month	42.2	-10.5	-120	200	211	27	51	509	-93	-22	3.07	2.09	41
	Black Awning	summer	33.3	-1.5	-17	156	255	33	62	401	16	4	2.77	2.40	46
	165°	12 month	50.2	-18.5	-211	137	274	36	67	592	-176	-42	2.77	2.40	46
	Linen Awning	summer	32.8	-1.1	-12	189	222	29	54	400	16	4	3.04	2.13	41
	165°	12 month	46.1	-14.4	-164	170	241	31	59	549	-133	-32	3.04	2.13	41
Double Clear	None		24.3			343				323			4.38		
	Black Awning	summer	25.0	-0.7	-8	169	174	23	51	308	15	5	2.54	1.84	42
	90°	12 month	34.5	-10.2	-116	155	188	24	55	414	-92	-28	2.54	1.84	42
	Linen Awning	summer	24.8	-0.5	-6	192	151	20	44	309	14	4	2.73	1.65	38
	90°	12 month	32.7	-8.4	-96	178	165	21	48	397	-74	-23	2.73	1.65	38
	Black Awning	summer	25.4	-1.1	-12	142	201	26	59	309	14	4	2.46	1.93	44
	165°	12 month	38.8	-14.5	-165	126	217	28	63	460	-137	-43	2.46	1.93	44
	Linen Awning	summer	25.1	-0.8	-9	169	174	23	51	309	14	4	2.68	1.70	39
	165°	12 month	35.6	-11.3	-129	154	189	25	55	427	-105	-33	2.68	1.70	39
Double HiSol LowE	None		20.7			341				281			4.27		
	Black Awning	summer	21.2	-0.5	-6	170	171	22	50	265	16	6	2.45	1.82	43
	90°	12 month	29.9	-9.3	-106	155	186	24	55	363	-82	-29	2.45	1.82	43
	Linen Awning	summer	21.1	-0.4	-5	193	148	19	43	266	15	5	2.61	1.66	39
	90°	12 month	28.4	-7.7	-88	179	162	21	48	347	-67	-24	2.61	1.66	39
	Black Awning	summer	21.6	-0.9	-11	141	200	26	59	265	15	6	2.36	1.91	45
	165°	12 month	33.9	-13.2	-151	126	215	28	63	404	-123	-44	2.36	1.91	45
	Linen Awning	summer	21.3	-0.6	-7	169	172	22	50	266	15	5	2.59	1.69	39
	165°	12 month	31.0	-10.3	-118	154	187	24	55	375	-94	-33	2.59	1.69	39