

Denver, Colorado

Awnings

Typical Year (TMY3) HDD65 5655 / CDD65 923, Hot Year (2001) HDD65 5841 / CDD65 964

Tables 107-110 show the impact of awnings on a typical house in Denver with different window orientations over a typical year. Tables 111-114 repeat this analysis for a hot year in Denver. 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 107 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 107 shows that awnings reduce cooling energy use by 36-51 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 4 to 5 percent in Denver when awnings are used only during the cooling season from May through October, while the penalties are from -9 to -5 percent when they are deployed throughout the year.

Table 107 also shows that awnings reduce peak electricity demand by 15-23 percent in Denver, with larger reductions for the clear glazings and smaller reductions for the Low-E glazing. Tables 108, 109, and 110 show results for houses in Denver 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 111-114 show the impact of awnings on a particularly hot year (2001) in Denver. The main effect is to increase the cooling savings by 16 percent due to the hotter or longer summer.

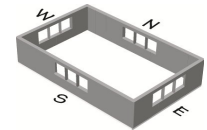


Table 107. Impact of awnings on a house in Denver, Colorado with equally distributed windows on a typical year

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		87.7			1745				1048			4.37		
	Black Awning	summer	89.9	-2.2	-22	985	760	70	44	1001	47	4	3.54	0.83	19
		12 month	100.3	-12.6	-128	985	760	70	44	1107	-58	-6	3.54	0.83	19
	Linen Awning	summer	89.5	-1.8	-18	1087	658	60	38	1006	42	4	3.66	0.71	16
		12 month	98.5	-10.8	-110	1087	658	60	38	1098	-50	-5	3.66	0.71	16
	Black Awning	summer	90.6	-2.9	-29	863	882	81	51	997	51	5	3.35	1.02	23
		12 month	104.4	-16.7	-170	863	882	81	51	1137	-89	-8	3.34	1.03	23
	Linen Awning	summer	89.9	-2.3	-23	988	757	69	43	1002	46	4	3.51	0.86	20
		12 month	101.3	-13.7	-139	988	757	69	43	1118	-69	-7	3.51	0.86	20
Double Clear	None		72.1			1453				863			3.76		
	Black Awning	summer	73.9	-1.8	-19	850	603	55	42	827	37	4	3.07	0.69	18
		12 month	82.7	-10.7	-108	850	603	55	42	916	-53	-6	3.07	0.69	18
	Linen Awning	summer	73.6	-1.5	-15	930	523	48	36	831	32	4	3.17	0.59	16
		12 month	81.2	-9.2	-93	930	523	48	36	908	-45	-5	3.17	0.59	16
	Black Awning	summer	74.5	-2.4	-24	752	701	64	48	824	40	5	2.92	0.84	22
		12 month	86.0	-14.0	-141	752	701	64	48	941	-77	-9	2.92	0.85	22
	Linen Awning	summer	74.0	-1.9	-19	851	602	55	41	827	36	4	3.06	0.71	19
		12 month	83.5	-11.5	-116	851	602	55	41	925	-61	-7	3.06	0.71	19
Double HiSol LowE	None		65.3			1413				791			3.60		
	Black Awning	summer	67.0	-1.8	-18	826	587	54	42	755	36	5	2.92	0.68	19
		12 month	75.6	-10.3	-105	826	587	54	42	842	-51	-6	2.92	0.68	19
	Linen Awning	summer	66.7	-1.4	-14	904	509	47	36	759	32	4	3.02	0.58	16
		12 month	74.2	-8.9	-90	904	509	47	36	834	-44	-6	3.02	0.58	16
	Black Awning	summer	67.6	-2.3	-23	727	686	63	49	751	40	5	2.76	0.84	23
		12 month	78.8	-13.6	-137	727	686	63	49	866	-75	-9	2.76	0.84	23
	Linen Awning	summer	67.1	-1.8	-18	826	587	54	42	755	36	5	2.90	0.70	19
		12 month	76.4	-11.2	-113	826	587	54	42	850	-59	-7	2.90	0.70	19

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 9.2 cents per kWh and natural gas costs are \$10.45 per MBTU, which are the average costs in 2009 for the state of Colorado according to the Energy Information Administration (see Appendix E for details).

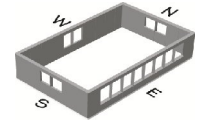


Table 108. Impact of awnings on a house in Denver, Colorado with east-facing windows on a typical year

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		87.8			2029				1075			3.83		
	Black Awning	summer	90.1	-2.3	-24	1006	1023	94	50	1006	70	6	3.39	0.44	12
	90°	12 month	99.7	-11.9	-121	1006	1023	94	50	1103	-27	-3	3.39	0.44	12
	Linen Awning	summer	89.7	-1.9	-19	1140	889	81	44	1013	62	6	3.46	0.37	10
	90°	12 month	98.0	-10.2	-104	1140	889	81	44	1098	-22	-2	3.46	0.37	10
	Black Awning	summer	91.5	-3.7	-37	817	1212	111	60	1002	74	7	3.27	0.56	15
	165°	12 month	104.3	-16.5	-168	817	1212	111	60	1132	-57	-5	3.27	0.56	15
	Linen Awning	summer	90.5	-2.8	-28	985	1044	96	51	1008	68	6	3.37	0.46	12
165°	12 month	101.2	-13.4	-136	985	1044	96	51	1116	-40	-4	3.37	0.46	12	
Double Clear	None		72.3			1700				888			3.39		
	Black Awning	summer	74.4	-2.0	-21	872	828	76	49	833	55	6	2.98	0.41	12
	90°	12 month	82.7	-10.4	-105	872	828	76	49	918	-29	-3	2.98	0.41	12
	Linen Awning	summer	74.0	-1.7	-17	981	719	66	42	840	49	6	3.05	0.34	10
	90°	12 month	81.2	-8.9	-91	981	719	66	42	913	-25	-3	3.05	0.34	10
	Black Awning	summer	75.3	-3.0	-31	718	982	90	58	829	59	7	2.87	0.52	15
	165°	12 month	86.5	-14.2	-144	718	982	90	58	942	-54	-6	2.87	0.52	15
	Linen Awning	summer	74.6	-2.3	-24	856	844	77	50	835	54	6	2.97	0.42	12
165°	12 month	83.9	-11.6	-117	856	844	77	50	929	-40	-5	2.97	0.42	12	
Double HiSol LowE	None		65.2			1644				811			3.23		
	Black Awning	summer	67.1	-1.9	-20	846	798	73	49	758	53	7	2.83	0.40	12
	90°	12 month	75.3	-10.2	-103	846	798	73	49	841	-30	-4	2.83	0.40	12
	Linen Awning	summer	66.7	-1.6	-16	951	693	63	42	763	47	6	2.89	0.34	10
	90°	12 month	73.9	-8.7	-89	951	693	63	42	836	-25	-3	2.89	0.34	10
	Black Awning	summer	68.0	-2.9	-29	691	953	87	58	753	58	7	2.71	0.51	16
	165°	12 month	79.0	-13.8	-140	691	953	87	58	864	-53	-7	2.71	0.51	16
	Linen Awning	summer	67.4	-2.2	-22	828	816	75	50	759	52	6	2.81	0.42	13
165°	12 month	76.5	-11.3	-115	828	816	75	50	851	-40	-5	2.81	0.42	13	

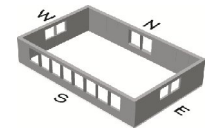


Table 109. Impact of awnings on a house in Denver, Colorado with south-facing windows on a typical year

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		80.0			1693				966			3.70		
	Black Awning	summer	82.3	-2.2	-23	915	778	71	46	917	49	5	3.33	0.37	10
	90°	12 month	98.6	-18.5	-188	912	781	71	46	1083	-117	-12	3.33	0.37	10
	Linen Awning	summer	81.7	-1.7	-17	1014	679	62	40	921	45	5	3.38	0.32	9
	90°	12 month	95.4	-15.3	-155	1009	684	63	40	1059	-93	-10	3.38	0.32	9
	Black Awning	summer	82.7	-2.7	-27	847	846	77	50	916	50	5	3.26	0.44	12
	165°	12 month	105.3	-25.3	-256	843	850	78	50	1145	-178	-18	3.26	0.44	12
	Linen Awning	summer	81.9	-1.9	-19	962	731	67	43	918	48	5	3.33	0.37	10
165°	12 month	99.9	-19.9	-202	959	734	67	43	1101	-135	-14	3.33	0.37	10	
Double Clear	None		65.4			1406				792			3.27		
	Black Awning	summer	67.4	-2.0	-20	800	606	55	43	756	35	4	2.93	0.33	10
	90°	12 month	81.8	-16.4	-166	799	607	56	43	902	-111	-14	2.93	0.33	10
	Linen Awning	summer	66.9	-1.5	-15	876	530	48	38	758	33	4	2.98	0.28	9
	90°	12 month	79.1	-13.7	-139	874	532	49	38	882	-90	-11	2.98	0.28	9
	Black Awning	summer	67.8	-2.3	-24	742	664	61	47	755	37	5	2.87	0.40	12
	165°	12 month	87.2	-21.8	-221	741	665	61	47	952	-160	-20	2.87	0.40	12
	Linen Awning	summer	67.1	-1.7	-17	829	577	53	41	756	35	4	2.93	0.34	10
165°	12 month	82.8	-17.4	-177	828	578	53	41	915	-124	-16	2.93	0.34	10	
Double HiSol LowE	None		58.7			1365				719			3.12		
	Black Awning	summer	60.5	-1.9	-19	776	589	54	43	685	35	5	2.78	0.33	11
	90°	12 month	74.4	-15.8	-160	776	589	54	43	826	-106	-15	2.78	0.33	11
	Linen Awning	summer	60.1	-1.4	-14	850	515	47	38	687	33	5	2.83	0.29	9
	90°	12 month	71.8	-13.2	-133	850	515	47	38	806	-86	-12	2.83	0.29	9
	Black Awning	summer	60.9	-2.3	-23	714	651	60	48	683	37	5	2.71	0.41	13
	165°	12 month	79.7	-21.0	-213	714	651	60	48	873	-153	-21	2.71	0.41	13
	Linen Awning	summer	60.3	-1.6	-16	803	562	51	41	684	35	5	2.78	0.34	11
165°	12 month	75.4	-16.8	-170	803	562	51	41	838	-118	-16	2.78	0.34	11	

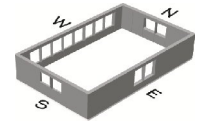


Table 110. Impact of awnings on a house in Denver, Colorado with west-facing windows on a typical year

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		91.6			1978				1109			6.04		
	Black Awning	summer	93.4	-1.9	-19	1031	947	87	48	1041	68	6	3.84	2.20	36
	90°	12 month	102.3	-10.7	-109	1031	947	87	48	1131	-22	-2	3.84	2.20	36
	Linen Awning	summer	93.1	-1.5	-15	1153	825	75	42	1049	60	5	4.16	1.87	31
	90°	12 month	100.7	-9.2	-93	1153	825	75	42	1126	-17	-2	4.16	1.87	31
	Black Awning	summer	94.2	-2.7	-27	847	1131	103	57	1032	77	7	3.30	2.74	45
	165°	12 month	106.1	-14.6	-148	847	1131	103	57	1153	-44	-4	3.30	2.74	45
	Linen Awning	summer	93.6	-2.0	-20	1009	969	89	49	1041	68	6	3.76	2.28	38
165°	12 month	103.4	-11.8	-120	1009	969	89	49	1140	-31	-3	3.76	2.28	38	
Double Clear	None		75.0			1648				911			5.11		
	Black Awning	summer	76.6	-1.6	-16	894	754	69	46	858	53	6	3.31	1.80	35
	90°	12 month	84.4	-9.4	-95	894	754	69	46	937	-26	-3	3.31	1.80	35
	Linen Awning	summer	76.3	-1.3	-13	993	655	60	40	864	47	5	3.57	1.53	30
	90°	12 month	83.0	-8.1	-82	993	655	60	40	933	-22	-2	3.57	1.53	30
	Black Awning	summer	77.2	-2.2	-23	747	901	82	55	851	60	7	2.88	2.22	44
	165°	12 month	87.6	-12.6	-128	747	901	82	55	956	-46	-5	2.88	2.22	44
	Linen Awning	summer	76.7	-1.7	-18	876	772	71	47	858	53	6	3.25	1.85	36
165°	12 month	85.3	-10.3	-105	876	772	71	47	945	-34	-4	3.25	1.85	36	
Double HiSol LowE	None		67.6			1598				831			4.87		
	Black Awning	summer	69.1	-1.5	-15	865	733	67	46	779	52	6	3.14	1.73	36
	90°	12 month	76.7	-9.2	-93	865	733	67	46	857	-26	-3	3.14	1.73	36
	Linen Awning	summer	68.8	-1.2	-13	963	635	58	40	785	46	5	3.39	1.48	30
	90°	12 month	75.4	-7.9	-80	963	635	58	40	853	-22	-3	3.39	1.48	30
	Black Awning	summer	69.7	-2.1	-22	720	878	80	55	772	59	7	2.72	2.15	44
	165°	12 month	79.9	-12.3	-125	720	878	80	55	876	-45	-5	2.72	2.15	44
	Linen Awning	summer	69.2	-1.6	-16	848	750	69	47	779	52	6	3.08	1.79	37
165°	12 month	77.6	-10.1	-102	848	750	69	47	864	-33	-4	3.08	1.79	37	

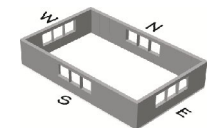


Table 111. Impact of awnings on a house in Denver, Colorado with equally distributed windows on a hot year

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		87.5			1941				1065			3.51		
	Black Awning	summer	91.2	-3.6	-37	1126	815	75	42	1027	38	4	2.81	0.69	20
	90°	12 month	101.7	-14.2	-144	1120	821	75	42	1134	-69	-6	2.81	0.69	20
	Linen Awning	summer	90.6	-3.0	-31	1232	709	65	37	1031	34	3	2.91	0.59	17
	90°	12 month	99.7	-12.2	-123	1226	715	65	37	1123	-58	-5	2.91	0.59	17
	Black Awning	summer	92.3	-4.8	-48	978	963	88	50	1025	40	4	2.69	0.82	23
	165°	12 month	106.6	-19.0	-193	973	968	89	50	1169	-104	-10	2.69	0.82	23
	Linen Awning	summer	91.4	-3.8	-39	1114	827	76	43	1028	37	3	2.80	0.71	20
165°	12 month	103.2	-15.6	-158	1108	833	76	43	1147	-82	-8	2.80	0.71	20	
Double Clear	None		71.6			1614				873			3.07		
	Black Awning	summer	74.6	-3.0	-30	982	632	58	39	846	27	3	2.52	0.55	18
	90°	12 month	83.4	-11.8	-119	979	635	58	39	935	-61	-7	2.52	0.55	18
	Linen Awning	summer	74.1	-2.5	-26	1064	550	50	34	849	25	3	2.60	0.47	15
	90°	12 month	81.7	-10.1	-103	1062	552	51	34	926	-52	-6	2.60	0.47	15
	Black Awning	summer	75.5	-3.9	-39	863	751	69	47	844	29	3	2.40	0.67	22
	165°	12 month	87.3	-15.7	-159	861	753	69	47	963	-90	-10	2.40	0.67	22
	Linen Awning	summer	74.8	-3.2	-32	971	643	59	40	847	27	3	2.51	0.56	18
165°	12 month	84.5	-12.9	-131	969	645	59	40	945	-72	-8	2.51	0.56	18	
Double HiSol LowE	None		64.7			1566				799			2.96		
	Black Awning	summer	67.6	-2.9	-29	954	612	56	39	773	27	3	2.43	0.53	18
	90°	12 month	76.1	-11.4	-115	952	614	56	39	859	-59	-7	2.43	0.53	18
	Linen Awning	summer	67.2	-2.4	-25	1036	530	48	34	775	24	3	2.50	0.46	15
	90°	12 month	74.5	-9.8	-99	1034	532	49	34	850	-50	-6	2.50	0.46	15
	Black Awning	summer	68.4	-3.7	-38	838	728	67	46	770	29	4	2.32	0.64	22
	165°	12 month	79.8	-15.1	-153	837	729	67	47	886	-86	-11	2.32	0.64	22
	Linen Awning	summer	67.8	-3.0	-31	942	624	57	40	773	26	3	2.41	0.55	18
165°	12 month	77.2	-12.5	-126	940	626	57	40	868	-69	-9	2.41	0.55	18	

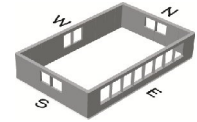


Table 112. Impact of awnings on a house in Denver, Colorado with east-facing windows on a hot year

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		87.6			2214				1091			3.61		
	Black Awning	summer	91.3	-3.7	-38	1171	1043	95	47	1033	58	5	2.84	0.77	21
		12 month	101.2	-13.6	-138	1162	1052	96	48	1132	-42	-4	2.84	0.77	21
	Linen Awning	summer	90.7	-3.1	-31	1311	903	83	41	1039	52	5	2.93	0.68	19
		12 month	99.3	-11.6	-118	1301	913	84	41	1125	-35	-3	2.93	0.68	19
	Black Awning	summer	93.1	-5.5	-56	953	1261	115	57	1031	59	5	2.68	0.94	26
		12 month	106.8	-19.2	-195	945	1269	116	57	1169	-79	-7	2.68	0.94	26
	Linen Awning	summer	91.9	-4.3	-44	1132	1082	99	49	1035	55	5	2.82	0.79	22
		12 month	103.2	-15.6	-158	1122	1092	100	49	1149	-58	-5	2.82	0.79	22
Double Clear	None		71.8			1862				898			3.04		
	Black Awning	summer	75.0	-3.2	-32	1026	836	76	45	854	44	5	2.52	0.52	17
		12 month	83.4	-11.6	-118	1021	841	77	45	939	-41	-5	2.52	0.52	17
	Linen Awning	summer	74.4	-2.7	-27	1137	725	66	39	858	39	4	2.58	0.46	15
		12 month	81.8	-10.0	-101	1133	729	67	39	933	-35	-4	2.58	0.46	15
	Black Awning	summer	76.4	-4.6	-47	846	1016	93	55	851	46	5	2.42	0.62	20
		12 month	88.0	-16.2	-165	843	1019	93	55	969	-71	-8	2.42	0.62	20
	Linen Awning	summer	75.4	-3.6	-37	993	869	80	47	855	43	5	2.51	0.53	17
		12 month	85.0	-13.3	-135	988	874	80	47	952	-55	-6	2.51	0.53	17
Double HiSol LowE	None		64.6			1784				818			2.87		
	Black Awning	summer	67.5	-3.0	-30	985	799	73	45	775	43	5	2.40	0.47	16
		12 month	75.8	-11.2	-114	981	803	73	45	858	-40	-5	2.40	0.47	16
	Linen Awning	summer	67.1	-2.5	-25	1094	690	63	39	780	38	5	2.46	0.41	14
		12 month	74.2	-9.7	-98	1090	694	64	39	852	-35	-4	2.46	0.41	14
	Black Awning	summer	68.9	-4.3	-44	811	973	89	55	772	45	6	2.31	0.56	20
		12 month	80.2	-15.6	-158	808	976	89	55	887	-69	-8	2.31	0.56	20
	Linen Awning	summer	68.0	-3.4	-34	954	830	76	47	776	42	5	2.39	0.48	17
		12 month	77.3	-12.8	-129	950	834	76	47	871	-53	-6	2.39	0.48	17

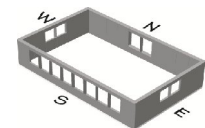


Table 113. Impact of awnings on a house in Denver, Colorado with south-facing windows on a hot year

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		81.0			1917				996			3.40		
	Black Awning	summer	85.0	-4.0	-41	1081	836	76	44	961	36	4	3.09	0.32	9
		12 month	101.6	-20.6	-209	1046	871	80	45	1126	-130	-13	2.74	0.66	19
	Linen Awning	summer	84.3	-3.3	-33	1188	729	67	38	963	34	3	3.09	0.31	9
		12 month	98.3	-17.3	-175	1150	767	70	40	1101	-105	-11	2.81	0.59	17
	Black Awning	summer	85.8	-4.9	-49	994	923	84	48	961	35	4	3.09	0.31	9
		12 month	108.9	-27.9	-283	960	957	88	50	1191	-195	-20	2.64	0.76	22
	Linen Awning	summer	84.8	-3.8	-38	1121	796	73	42	962	35	3	3.09	0.31	9
		12 month	103.3	-22.3	-226	1086	831	76	43	1146	-150	-15	2.74	0.67	20
Double Clear	None		66.1			1582				814			2.89		
	Black Awning	summer	69.5	-3.4	-35	940	642	59	41	790	24	3	2.47	0.42	15
		12 month	83.8	-17.7	-179	929	653	60	41	934	-120	-15	2.47	0.42	15
	Linen Awning	summer	68.9	-2.8	-28	1022	560	51	35	792	23	3	2.53	0.36	13
		12 month	81.0	-14.9	-151	1011	571	52	36	913	-99	-12	2.53	0.36	13
	Black Awning	summer	70.2	-4.1	-42	865	717	66	45	790	24	3	2.39	0.51	17
		12 month	89.6	-23.5	-239	854	728	67	46	986	-172	-21	2.39	0.51	17
	Linen Awning	summer	69.3	-3.2	-33	964	618	57	39	791	24	3	2.46	0.43	15
		12 month	85.0	-19.0	-192	953	629	58	40	949	-135	-17	2.46	0.43	15
Double HiSol LowE	None		59.2			1530				740			2.78		
	Black Awning	summer	62.4	-3.2	-33	914	616	56	40	716	24	3	2.38	0.41	15
		12 month	76.1	-16.9	-171	904	626	57	41	854	-114	-15	2.38	0.41	15
	Linen Awning	summer	61.8	-2.6	-27	991	539	49	35	717	22	3	2.43	0.35	13
		12 month	73.4	-14.2	-144	981	549	50	36	834	-94	-13	2.43	0.35	13
	Black Awning	summer	63.0	-3.9	-39	839	691	63	45	716	24	3	2.29	0.49	18
		12 month	81.7	-22.5	-228	829	701	64	46	904	-164	-22	2.29	0.49	18
	Linen Awning	summer	62.3	-3.1	-31	935	595	54	39	717	23	3	2.37	0.42	15
		12 month	77.3	-18.1	-184	925	605	55	40	868	-129	-17	2.37	0.42	15

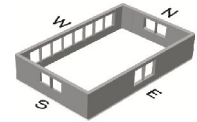


Table 114. Impact of awnings on a house in Denver, Colorado with west-facing windows on a hot year

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		91.4			2237				1131			5.01		
	Black Awning	summer	94.9	-3.4	-35	1184	1053	96	47	1070	61	5	2.90	2.11	42
	90°	12 month	104.1	-12.6	-128	1169	1068	98	48	1162	-30	-3	2.90	2.11	42
	Linen Awning	summer	94.3	-2.9	-29	1314	923	84	41	1076	55	5	3.11	1.90	38
	90°	12 month	102.3	-10.9	-110	1299	938	86	42	1156	-24	-2	3.11	1.90	38
	Black Awning	summer	96.3	-4.8	-49	964	1273	116	57	1064	68	6	2.69	2.32	46
	165°	12 month	109.1	-17.6	-179	952	1285	118	57	1193	-61	-5	2.69	2.32	46
	Linen Awning	summer	95.2	-3.8	-38	1143	1094	100	49	1070	62	5	2.88	2.13	42
165°	12 month	105.8	-14.3	-145	1129	1108	101	50	1175	-44	-4	2.88	2.13	42	
Double Clear	None		74.5			1865				926			4.23		
	Black Awning	summer	77.5	-2.9	-30	1035	830	76	45	880	46	5	2.60	1.63	39
	90°	12 month	85.3	-10.8	-110	1029	836	76	45	959	-33	-4	2.60	1.63	39
	Linen Awning	summer	77.0	-2.5	-25	1142	723	66	39	885	41	4	2.76	1.48	35
	90°	12 month	83.8	-9.3	-95	1134	731	67	39	954	-28	-3	2.76	1.48	35
	Black Awning	summer	78.5	-4.0	-41	856	1009	92	54	874	52	6	2.38	1.85	44
	165°	12 month	89.5	-15.0	-152	851	1014	93	54	985	-59	-6	2.38	1.85	44
	Linen Awning	summer	77.7	-3.2	-32	1002	863	79	46	879	47	5	2.59	1.64	39
165°	12 month	86.8	-12.2	-124	996	869	80	47	971	-45	-5	2.59	1.64	39	
Double HiSol LowE	None		67.1			1805				845			4.08		
	Black Awning	summer	69.8	-2.8	-28	1004	801	73	44	800	45	5	2.51	1.58	39
	90°	12 month	77.5	-10.5	-106	998	807	74	45	877	-32	-4	2.51	1.58	39
	Linen Awning	summer	69.4	-2.3	-24	1109	696	64	39	805	40	5	2.65	1.43	35
	90°	12 month	76.1	-9.0	-91	1103	702	64	39	872	-27	-3	2.65	1.43	35
	Black Awning	summer	70.9	-3.8	-38	829	976	89	54	794	51	6	2.29	1.79	44
	165°	12 month	81.5	-14.4	-146	825	980	90	54	901	-56	-7	2.29	1.79	44
	Linen Awning	summer	70.1	-3.0	-31	971	834	76	46	799	46	5	2.49	1.59	39
165°	12 month	78.8	-11.8	-119	965	840	77	47	888	-43	-5	2.49	1.59	39	