ACSR and ACSS Conductor Specs and Rating

From Application, Appendix 7

SW MN 345 kV Split Rock – Lakefield Jct.

PUC Docket E-002/CN-01-1958

Computation of Bare ACSR Overhead Conductor Ampacities   (Steady State)

Per ANSI/IEEE Standard 738-1986

	mi/hr	ft/s		Temperature C	Temperature F		
Wind speed	1.36	2.00	Ambient air temp	40	104	Latitude	45 degrees N
Coefficient of emissivity		0.5	Conductor surface temp	100	212	Azimuth of line	90 degrees
Coefficient of solar absorption		0.5				Elev above msl	1000 ft

Air viscosity @ T ave	0.04943	lb/h ft
Air density	0.06192	lb/ft^3
Air thermal conductivity	0.00898	W/ft C
Altitude of sun	68.1	degrees
Azimuth of sun	180	degrees
Heat rec'd by a surface	94.64	W/ft^2
Elevation correction factor	1.0340	

Conductor kcm	Conductor strand	Conductor diam.in	Resistance, Ohm/mi 50 deg C	100 deg C	100 deg C	Ohm/kft 100 deg C	Forced convection heat loss qc1	qc2	max	Radiated heat loss	Solar heat gain	Ampacity cond/ph:	kV: 69 1	115 1	138 1	161 1	230 1	345 2	500 3	kcm
4/0	6/1	0.563	0.5920	0.6979	0.6979	0.13218	17.43	15.27	17.43	3.79	2.30	378	45	75	90	106				4/0
266	6/7	0.633	0.5520	0.6507	0.6507	0.12324	18.49	16.36	18.49	4.26	2.58	405	48	81	97	113				266
336	18/1	0.684	0.3059	0.3606	0.3606	0.06830	19.23	17.16	19.23	4.61	2.79	555	66	111	133	155				336
336	26/7	0.721	0.3072	0.3623	0.3623	0.06862	19.75	17.71	19.75	4.85	2.94	562	67	112	134	157				336
477	26/7	0.858	0.2169	0.2557	0.2557	0.04843	21.57	19.66	21.57	5.78	3.50	702	84	140	168	196				477
477	24/7	0.846	0.2168	0.2556	0.2556	0.04841	21.42	19.50	21.42	5.70	3.45	699	84	139	167	195				477
556	26/7	0.927	0.1860	0.2192	0.2192	0.04152	22.43	20.60	22.43	6.24	3.78	774	93	154	185	216				556
636	24/7	0.977	0.1631	0.1922	0.1922	0.03640	23.04	21.26	23.04	6.56	3.98	839	100	167	201	234	334			636
795	26/7	1.108	0.1306	0.1538	0.1538	0.02913	24.56	22.92	24.56	7.46	4.52	972	116	194	232	271	387	1161	2525	795
795	45/7	1.115	0.1313	0.1544	0.1544	0.02924	24.64	23.01	24.64	7.51	4.55	972	116	194	232	271	387	1161	2524	795
795	30/19	1.140	0.1307	0.1540	0.1540	0.02917	24.92	23.32	24.92	7.68	4.65	979	117	195	234	273	390	1170	2543	795
954	45/7	1.165	0.1099	0.1291	0.1291	0.02445	25.19	23.62	25.19	7.84	4.75	1076	129	214	257	300	429	1286	2795	954
954	54/7	1.196	0.1094	0.1287	0.1287	0.02438	25.53	24.00	25.53	8.05	4.88	1085	130	216	259	303	432	1297	2820	954
1192	54/19	1.338	0.0863	0.1013	0.1013	0.01919	27.03	25.67	27.03	9.01	5.46	1263	151	252	302	352	503	1509	3261	1192
1272	54/19	1.382	0.0851	0.0996	0.0996	0.01886	27.48	26.17	27.48	9.31	5.63	1285	154	256	307	358	512	1536	3339	1272
1590	54/19	1.545	0.0657	0.0767	0.0767	0.01453	29.09	27.98	29.09	10.40	6.30	1512	181	301	361	422	602	1807	3928	1590
2312	76/19	1.802	0.0505	0.0584	0.0584	0.01106	31.47	30.69	31.47	12.13	7.35	1811	216	361	433	505	721	2164	4704	2312

Notes:
Sun computations based on noon local sun time.
Solar absorption based on "Clear atmosphere"
Azimuth of line: N-S = 0, E-W = 90

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Table 2

Computation of SAC Overhead Conductor Ampacities   (Steady State)

Per ANSI/IEEE Standard 738-1986

	ml/hr	ft/s			Temperature C	Temperature F		
Wind speed	1.36	2.00						
Coefficient of emissivity		0.5	Ambient air temp		40	104	Latitude	45 degrees N
Coefficient of solar absorption		0.5	Conductor surface temp		200	392	Azimuth of line	90 degrees
							Elev above msl	1000 ft

Air viscosity @ T ave	0.05463	lb/h ft
Air density	0.05403	lb/ft^3
Air thermal conductivity	0.0101	W/ft C
Altitude of sun	68.1	degrees
Azimuth of sun	180	degrees
Heat rec'd by a surface	94.64	W/ft^2
Elevation correction factor	1.0340	

Conductor kcm	strand	diam,in	Resistance, Ohm/ml 50 deg C	100 deg C	200 deg C	Ohm/kft 200 deg C	Forced convection heat loss qc1	qc2	max	Radiated heat loss	Solar heat gain	Ampacity cond/ph:	69 kV 1	115 1	138 1	161 1	230 1	345 2	500 3	kcm
4/0	6/1	0.563	0.5920	0.6979	0.9097	0.17229	46.46	39.77	46.46	15.72	2.30	590	70	117	141	164				4/0
266	6/7	0.633	0.5520	0.6507	0.8481	0.16063	49.28	42.67	49.28	17.67	2.58	633	76	126	151	177				266
336	18/1	0.684	0.3059	0.3606	0.4700	0.08902	51.24	44.70	51.24	19.09	2.79	871	104	174	208	243				336
336	26/7	0.721	0.3072	0.3623	0.4725	0.08949	52.62	46.14	52.62	20.13	2.94	883	106	176	211	246				336
477	26/7	0.858	0.2169	0.2557	0.3333	0.06313	57.44	51.21	57.44	23.95	3.50	1111	133	221	266	310				477
477	24/7	0.846	0.2168	0.2556	0.3332	0.06311	57.04	50.78	57.04	23.62	3.45	1106	132	220	264	308				477
556	26/7	0.927	0.1860	0.2192	0.2856	0.05409	59.73	53.65	59.73	25.88	3.78	1230	147	245	294	343				556
636	24/7	0.977	0.1631	0.1922	0.2504	0.04742	61.34	55.37	61.34	27.27	3.98	1336	160	266	319	373	532			636
795	26/7	1.108	0.1306	0.1538	0.2002	0.03792	65.38	59.71	65.38	30.93	4.52	1556	186	310	372	434	620	1860	4042	795
795	45/7	1.115	0.1313	0.1544	0.2006	0.03799	65.59	59.93	65.59	31.13	4.55	1558	186	310	372	434	620	1861	4047	795
795	30/19	1.140	0.1307	0.1540	0.2006	0.03799	66.33	60.74	66.33	31.82	4.65	1569	187	312	375	437	625	1875	4076	795
954	45/7	1.165	0.1099	0.1291	0.1675	0.03172	67.06	61.53	67.06	32.52	4.75	1729	207	344	413	482	689	2068	4492	954
954	54/7	1.196	0.1094	0.1287	0.1673	0.03169	67.96	62.51	67.96	33.39	4.88	1745	209	348	417	487	695	2085	4533	954
1192	54/19	1.338	0.0863	0.1013	0.1313	0.02487	71.95	66.86	71.95	37.35	5.46	2044	244	407	488	570	814	2442	5309	1192
1272	54/19	1.382	0.0851	0.0996	0.1288	0.02436	73.14	68.17	73.14	38.58	5.63	2087	249	416	499	582	831	2494	5422	1272
1590	54/19	1.545	0.0657	0.0767	0.0987	0.01869	77.41	72.89	77.41	43.13	6.30	2472	295	492	591	689	985	2954	6423	1590
2312	76/19	1.802	0.0505	0.0584	0.0742	0.01405	83.72	79.94	83.72	50.30	7.35	3002	359	598	718	837	1196	3588	7800	2312

Notes:
Sun computations based on noon local sun time
Solar absorption based on "Clear atmosphere"
Azimuth of line: N-S = 0, E-W = 90

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Ex. 35, Application, Appendix 7