



Response:

The thermal ratings of the requested conductors and voltages are noted in the table below. Conductor ratings are based on the “IEEE Standard for calculation of Bare Overhead Conductor Temperature and Ampacity Under Steady-State Conditions,” ANSI/IEEE Standard 738. Alcoa SAG10 Ratekit was used to calculate conductor ratings.

A regulatory authority does not set the conductor steady state thermal rating variables. The CapX2020 Member Utilities Transmission Line Standards Committee (“Committee”) developed the conductor steady state thermal rating variables for summer ratings based upon member utilities’ standard of practice..

The summer steady state thermal rating variables are as follows:

- Conductor orientation relative to north: 90 degrees
- Atmosphere: Clear
- Air Temperature: 40 degrees C for Summer
- Wind Speed: 2 ft/sec
- Wind angle relative to conductor: 90 degrees
- Elevation above sea level: 1000 ft
- Latitude: 45 degrees N
- Date: July 8
- Solar time: 12 hours
- Coefficient of emissivity: 0.7
- Coefficient of absorption: 0.9
- 200 degrees C maximum operating temperature for ACSS
- 100 degrees C maximum operating temperature for ACSR

The Committee defined the Emergency Line Rating as equal to the steady state thermal rating.

The Committee specified that conductors meet minimum clearances to ground based upon voltage and nature of surface under the conductor (*i.e.*, roads, interstate highway, railroads, etc.). The minimum specified clearances were chosen to assure that the final constructed lines meet or exceed the National Electrical Safety Code (“NESC”) minimum clearances. Conductor sags are to be calculated based upon conductor size, conductor temperature, span length, design tension, structure heights and loading conditions. Vertical clearances shall be applied to the greatest sag resulting from either the maximum operating temperature of 200°C (for the ACSS

conductor) and 100°C (for the ACSR conductor) or the maximum loaded condition (ice plus wind).

<b><u>Conductor</u></b>	<b><u>Summer Thermal Ampacity Rating</u></b>	<b><u>Summer Thermal MVA Rating</u></b>
Single 795 kcm 26/7 ACSR, 115 KV	965 amps	192 MVA
Single 795 kcm 26/7 ACSS, 115 KV	1655 amps	330 MVA
Twin bundled 795 kcm 26/7 ACSR, 115 KV	1930 amps	384 MVA
Twin bundled 795 kcm 26/7 ACSS, 115 KV	3310 amps	659 MVA
Single 954 kcm 54/19 ACSS, 115 KV	1850 amps	368 MVA
Single 795 kcm 26/7 ACSS, 161 KV	1655 amps	462 MVA
Single 954 kcm 54/19 ACSS, 161 KV	1850 amps	516 MVA
Single 795 kcm 26/7 ACSR, 230 KV	965 amps	384 MVA
Single 795 kcm 26/7 ACSS, 230 KV	1655 amps	659 MVA
Single 954 kcm 54/19 ACSS, 230 KV	1850 amps	737 MVA
Twin bundled 795 kcm 26/7 ACSR, 345 KV	1930 amps	1153 MVA
Twin bundled 954 kcm 54/19 ACSS, 345 KV	3700 amps	2211 MVA
Triple bundled 954 kcm 54/19 ACSS, 500 KV	5550 amps	4806 MVA
Triple bundled conductor as used on the Forbes – Chisago 500 KV line (Triple bundled 1192.5 kcm 45/7 ACSR)	3648 amps	3159 MVA

The Committee did not develop steady state thermal rating variables for winter ratings. Xcel Energy – NSP Operating Territory uses 0°C for the winter rating air temperature for calculating the rating during the winter operating season of November 1 to April 30. The April 30 date produces the lowest allowable line rating of the winter rating period, so it is used in the following table. The April 30 date and 0°C air temperature were used in conjunction with the other steady state thermal