# Outdoor Substation Conductor Ratings

## Transmission and Substation Design Committee
## Substation Conductor Rating Task Force

**PJM Interconnection, LLC**

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## 1.0 Scope / Introduction

The PJM Transmission and Substation Design Subcommittee (TSDS) was requested to review and update the existing Determination of Ratings for Tubular Bus document issued by the TSDS in August 1979. This document contains ampacity ratings for tubular bus used in substations and was based on calculations performed using a similar methodology and set of parameters determined for transmission line conductors. A task force consisting of representatives from PJM member operating companies was assigned the task of updating the tubular bus ratings. The results of the task force work are incorporated into this new document.

The task force utilized the information and methodology contained in IEEE Std 605-1998, "Guide for Design of Substation Rigid-Bus Structures" as a primary reference in developing new ampacity ratings for tubular bus as well as other wire conductors used in substations. The task force analyzed existing industry standards on bus design and line conductor ampacities, and determined the recommended values for the key parameters used in calculating conductor ampacity. Several of the key parameter values used by the task force in the ampacity calculations were changed from the values used in the 1979 tubular bus ratings.

This report includes a discussion of the key parameters used in calculating the ampacities of round shaped conductors used in outdoor substations. These parameters include wind speed and direction, ambient temperature, solar gain, emissivity, absorptivity, and maximum conductor temperature limitations for conditions of normal (continuous) and emergency (one hour and 24-hour) ratings. The report also contains a discussion on the calculation methodology, conductor materials, fittings and accessories, other ampacity considerations, and risk associated with wind speed different than assumed for calculations.

Lastly, this report includes new revised ampacity ratings for substation conductors used in facilities under the control of PJM. **The ratings provided in this document are for outdoor applications of aluminum and copper tubular bus, and bare aluminum and copper wire of various sizes.**

## 2.0 Definitions and Terms

| | |
|---|---|
| Normal Conditions | All equipment in normal configuration, and normally expected range of ambient weather conditions. |
| Normal Rating | The maximum permissible constant load at normal conditions, at the maximum allowable conductor temperature for that conductor. |
| Emergency Conditions | Equipment has been operating at Normal Rating. The equipment is then exposed to an out of configuration condition. |
| Emergency Rating | The maximum permissible constant load at emergency conditions, at the maximum allowable conductor temperature. (for a period longer than 15 minutes, but not to exceed 24 hours) |
| Weather Conditions | Ambient temperature, solar and sky radiated heat flux, wind speed, wind direction, and elevation above sea level. |
| Max. Allowable Condr. Temp. | The maximum temperature limit that is selected in order to minimize loss of strength, conductor sag, line losses, or a combination of the above. |
| Time Risk | The time during which the conductor is vulnerable to operation at temperatures greater than the design temperature. |
| Temperature Risk | The maximum increase in conductor temperature above design temperature which can be experienced if the conductor carries its rated current simultaneously with an occurrence of the most severe set of ambient conditions. |

## 3.0 Weather Assumptions

Ambient weather conditions have a major effect on thermal ratings of a substation conductor. There are many factors to consider when determining the precise weather model to utilize in the ampacity calculations of substation bus conductors. However, wind (speed and direction) and ambient temperature are major variables to consider and have the most effect in determining the final thermal ratings of substation conductor. The following sections will outline these major variables that are critical in the calculation of the overall thermal rating.

It is important to note that weather data was collected and analyzed in PJM work performed by the original transmission line conductor rating task force in 1973. The weather data included 10 years of data from Pittsburgh from January 1, 1949 through December 31, 1958 and 16 years of data from the Washington D.C. National Airport from January 1, 1949 through December 31, 1964. All of the data was combined to form an hourly composite record that was representative of the entire PJM service territory. The current task force evaluated this original data and believes it to remain representative of the weather conditions that exist within the present PJM territory.

### 3.1 Wind Speed

Wind speed is an important variable in determining the ratings of a substation conductor. The 1979 PJM tubular bus rating document followed the recommendations of the 1973 PJM transmission line rating work and used a zero wind speed in determining the normal rating of bus and 3.38 feet per second (fps) wind speed in determining the emergency rating of bus. These wind speed values were modified from those used for the transmission line rating work to acknowledge that substation environments were more open and less shielded from winds. The current task force has decided to utilize a rating philosophy for substation bus that is more consistent with other substation equipment and depart from ratings based upon different weather conditions that was used previously and is currently used for transmission line conductors. These systems operate in different clearance and safety environments and have different inherent risk limitations and therefore can have different rating assumptions. The operation of substation bus within a fenced in substation which is accessible only by trained personnel is inherently different than a transmission line which crosses a roadway, or public lands. Also, the original PJM bus rating criteria is in contrast to what is recommended in the IEEE Standard 605. Section C.3 (Heat Transfer) in Annex C of the IEEE Standard 605 document states that a wind speed of 2 fps is used for all substation conductor thermal rating calculations. In IEEE Standard 605, it is concluded that assumption of a 2 fps wind is a conservative, yet realistic approach and was chosen for the basis of the IEEE document.

In consideration of the above, the present task force recommends that a wind speed of 2 fps be used in the calculation of both normal and emergency thermal ratings of substation conductor and therefore is the basis for the published tables in this document. The inherent risks associated with utilizing this wind speed are discussed in Section 11 of this document.

### 3.2 Wind Direction

Both the 1979 PJM bus rating work and the IEEE Standard 605 agree in the utilization of a wind perpendicular to the substation conductor. A perpendicular wind (a $90^{o}$ cross wind) is recommended by this task force for the calculations of substation conductor thermal ratings and is used in the published tables.

### 3.3 Ambient Temperature

Ambient temperature is an important parameter to consider when calculating substation conductor thermal ratings. As stated in the 1979 PJM bus rating document, for the summer rating period, an ambient temperature of 35°C is to be used for substation conductor thermal rating calculations. Examination of the original PJM weather data indicates that the actual summer temperatures are less than or equal to 35°C over 99% of the time.

For the winter rating period an ambient temperature of 10°C is to be used for substation conductor thermal rating calculations. This is a reduction in ambient temperature versus the 1979 PJM work ($10^{o}$C versus $20^{o}$C) and is believed to be a conservative, yet realistic selection. Examination of the original PJM weather data indicates that the actual winter temperatures are less than or equal to 10°C over 88% of the time.

The composite weather data supporting the above statistics can be found in Section 11. The inherent risk associated with utilizing the various ambient temperature parameters can be found in Section 11 of this document.

### 3.4 Rating Tables

The rating tables for each type of substation conductor will provide a specific thermal rating based on the wind and ambient temperature recommendations discussed above. The tables are ambient temperature adjusted so as to allow the system operator to determine the ampacity of a substation conductor based on real time information known at that specific time. Each table provides thermal ratings based on ambient temperatures from -15°C to +40°C in 5° increments.

### 3.5 Solar Gain & Atmosphere

The model utilized by the PJM task force is based upon the solar gain (solar heating) equations used in both IEEE Standard 605 and IEEE Standard 738-1993 “IEEE Standard for Calculating the Current-Temperature of Bare Overhead Conductors”. Both of these standards allow for adjustments in solar gain effects due to varying atmosphere clarity. The atmosphere clarity varies between a clear atmosphere and a hazy industrial atmosphere. The clear atmosphere allows for more solar heating of the bus conductor and results in a slightly lower bus ampacity rating when compared to the industrial atmosphere assumption. The bus ampacity tables published in IEEE Standard 605 are based upon a clear atmosphere. Utilizing this flexibility, the task force has chosen to utilize a clear atmosphere for ampacity calculations as defined by IEEE Standards 738 and 605. The task force believes this is a conservative, yet realistic approach and was chosen for the basis of this document.

# 4.0 Method of Calculation

## 4.1 Calculating the Current-Temperature Relationship of Conductors

Early in its deliberations, The PJM Tubular Bus Rating Task Force recognized that an updated method of calculating conductor ratings was needed to replace the original computer code that was written in FORTRAN in August 1979. Another goal of the task force was to have a user-friendly program that could operate in today's PC oriented office environment.

The task force selected the method of IEEE Standard 605. Copies of the standard are widely available and earlier IEEE source documents discuss the calculations in greater detail than the standard. IEEE Standard 605 is widely accepted as a standard within the industry and forms a commonly accepted basis for calculations. With this in mind, the task force developed a Microsoft Excel © Spreadsheet to accommodate a wide base of possible users. The spreadsheet applies the IEEE Standard 605 approach to these calculations for use by all PJM member companies.

## 4.2 Description of IEEE Standard 605-1998

This standard presents a method of calculating the current-temperature relationship of bare substation rigid-bus conductors based on a 2 fps wind perpendicular to the length of the conductors. The authors of the standard chose a 2 fps wind because it was, "conservative, yet realistic" and had the additional advantage of simplifying many of the equations.

The conductor temperature is a function of:

a. Conductor material
b. Conductor diameter
c. Conductor surface condition
d. Ambient weather conditions
e. Conductor electrical current

IEEE Standard 605 includes mathematical models to calculate conductor temperatures and conductor thermal ratings. The standard contains calculated tables with numerous temperature-current relationships for specific conductors (materials and shapes) and weather conditions, in all cases with a 2 fps wind present. Each user of the standard must assess which weather data and conductor characteristics are appropriate for his needs.

The source document for the ampacity calculation and table portion of IEEE Standard 605, PAS 96, No. 4, July/August 1977, Page 1341, "Thermal Considerations for Outdoor Bus Conductor Design Ampacity Tables," notes an elevation of sea level was used in preparing the ampacity tables. Conductor temperatures ranged from 70 °C to 150 °C. Ambient temperature was 40 °C.

The equations relating electrical current to conductor temperature may be used in either of the following two ways:

- To calculate the conductor temperature when the electrical current is known
- To calculate the current for a given conductor temperature (by iteration)

The Standard's approach to calculating ampacity requires first calculating the convective heat loss ($q_c$), the radiation loss ($q_r$), and the solar heat gain ($q_s$), of the conductor under investigation. Since the Task Force decided that calculations should be able to be performed at any wind speed, the convection equations contained in IEEE Standard 605 were modified to be suitable for variable wind speeds. The modifications were based on IEEE Standard 738.
Since both standards use the same sets of equations to calculate the radiation loss and the solar heat gain, the balance of this discussion will focus on convective heat loss considerations.

### 4.3 Convective Heat Loss Considerations

Convective heat loss, or the cooling due to air movement, is a major factor in determining the thermal rating of a conductor. There are two conditions to consider: (a) cooling due to natural convection – or a zero wind speed, and (b) cooling due to forced convection – or a non-zero wind speed. This section reviews material taken from IEEE Standards 605 and 738, to permit bus ampacity calculations for any wind speed.

#### 4.3.1 Natural Convection

Natural convection applies to surfaces shielded from direct exposure to the wind. Assuming, however, that there is enough space for natural convection to occur, then surface heat loss can be calculated using generally accepted equations for natural convection. In Section C.3.2.3, IEEE Standard 605 (Substation Rigid-Bus Structures) gives equation (1.) below for natural convection over a cylindrical surface:

**(1.)** $$\mathbf{q_c = 0.0022 * \Delta T^{1.25} * l^{-0.25} * A}$$

$\Delta T$ = temperature difference between the conductor surface and the surrounding air in degrees Celsius.

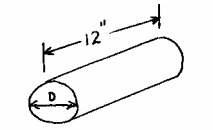
l = length of conductor surface in inches
= 12 for a one foot length of conductor.

A = conductor surface area in inches$^2$ / foot length.

$q_c$ = convective heat loss in watts per linear foot.

Let's turn this into a more useful equation that can be put into a spreadsheet and used to calculate $q_c$.

A = area = $\pi$ * D * 12 in$^2$ / ft
l = length of conductor surface in inches
= 12 * L = 12




Substituting into (eq. 1.) gives:

$q_c = 0.0022 * \Delta T^{1.25} * 12^{-0.25} * 12 * \pi * D$
$q_c = 0.0022 * \Delta T^{1.25} * 20.255166 * D$

**(2.)** $$\mathbf{q_c = .044561 * D * \Delta T^{1.25} \text{ watts / ft}}$$

By comparison, IEEE Standard 738 (Bare Overhead Conductors) explicitly recognizes more of the factors involved in natural convection heat loss. As noted in Section 2.4.4 of that Standard:

**(3.)** $\mathbf{q_{c0} = .283 * \rho_r^{0.5} * D^{0.75} * \Delta T^{1.25}}$ **watts/ft**

$q_{c0}$ = convective heat loss due to zero wind
$\rho_r$= density of air in lb/ft$^3$
D= conductor outer diameter in inches
$\Delta$T= temperature difference between the conductor surface and the surrounding air in degrees Celsius

Since the spreadsheet developed by the task force is based on the work of the previous Conductor Rating Task Force, equation (3.) above is used. This facilitates recognizing the effect of elevation upon conductor ratings (higher elevation results in lower air density and therefore lower heat transfer, all else being equal.).

### 4.3.2 Forced Convection

IEEE Standard 605, section C.3.2 2 gives the following equation for heat transfer where there is a 2 fps wind.

**(4.)** $\mathbf{q_c = .010 * (D^{-0.4}) * A * \Delta T}$

D = outer diameter of cylinder in inches
A = surface area of cylinder in inches$^2$ per foot length
$\Delta$T = temperature difference in degrees Celsius between the conductor surface and the ambient air temperature.

Remembering that the surface area of a 12 inch long cylinder = 12 * $\pi$ * D and then substituting in equation (4.) gives:

**(5.)** $\mathbf{q_c = 0.376991 * D^{0.6} * \Delta T}$

This equation, again, is valid only for a 2 fps wind. As stated in section C.3 of IEEE Standard 605, an assumption of a 2 fps wind is a conservative, yet realistic approach, and it will be used in the examples given herein.

IEEE Standard 738 notes in section 2.6.1.2, "Since the wind velocity is greater than 0 ft/second, the forced convection heat loss for perpendicular wind is calculated according to equations (6a.) and (6b.) corrected for wind direction, and compared to the natural convection heat loss. The larger of the heat losses due to both natural and forced convection is then used in calculating the thermal rating."

**(6a.)** $\mathbf{q_{c1} = [\ 1.01 + 0.371 * (3600\ D\ \rho_r\ V/\mu_r)^{0.52}\ ] * k_f * (T_c - T_a)}$

**(6b.)** $\mathbf{q_{c2} = .1695 * (3600\ D\ \rho_r\ V/\mu_r)^{0.52} * k_f * (T_c - T_a)}$

where V = wind velocity in feet per second.

Taking this guidance leads to the conclusion that the proper method of calculating $q_c$ is to use the specific equations for $q_{c0}$, $q_{c1}$, and $q_{c2}$ and then pick the one yielding the greatest value. To recap, $q_{c0}$ is the convective heat loss due to zero wind, and $q_{c1}$ is the convective heat loss due to low wind velocity. The $q_{c1}$ equation applies at low wind speeds, but gives values that are too low at high wind speeds. $q_{c2}$ is the convective heat loss due to high wind speed. This equation gives values that are too low at low wind speeds. Hence the largest heat loss value is chosen

In the spreadsheet, the following equations will be used for the calculations:

**$q_c$ = Maximum ( $q_{c0}$, $q_{c1}$, and $q_{c2}$ )**

**$q_{c0}$ = Equation (3.) = $.283 * \rho_r^{0.5} * D^{0.75} * \Delta T^{1.25}$ watts/ft**

**$q_{c1}$ = Equation (6a.) = $[ 1.01 + 0.371*( 3600 D \rho_r V/\mu_r)^{0.52} ] * k_f * (T_c - T_a)$ watts/ft**

**$q_{c2}$ = Equation (6b.) = $.1695 * (3600 D \rho_r V/\mu_r)^{0.52} * k_f * (T_c - T_a)$ watts/ft**

The tables below compares the values of $q_c$ obtained for a 2 fps wind speed using the equations of IEEE Standard 605 and the Task Force's spreadsheet for various diameter tubes.

**6" Diameter Tubes**

| Tc | Ta | $q_c$ 605 | $q_c$ spreadsheet | 605/spreadsheet |
|---|---|---|---|---|
| 60 | 40 | 22.09 | 21.29 | 3.77% |
| 80 | 40 | 44.19 | 42.34 | 4.36% |
| 100 | 40 | 66.28 | 63.16 | 4.94% |
| 120 | 40 | 88.37 | 83.78 | 5.48% |
| 150 | 40 | 121.51 | 114.36 | 6.26% |
| 180 | 40 | 154.65 | 144.46 | 7.06% |

**4" Diameter Tubes**

| Tc | Ta | $q_c$ 605 | $q_c$ spreadsheet | 605/spreadsheet |
|---|---|---|---|---|
| 60 | 40 | 17.32 | 16.70 | 3.73% |
| 80 | 40 | 34.64 | 33.20 | 4.35% |
| 100 | 40 | 51.97 | 49.52 | 4.94% |
| 120 | 40 | 69.29 | 65.69 | 5.48% |
| 150 | 40 | 95.27 | 89.66 | 6.26% |
| 180 | 40 | 121.26 | 113.34 | 6.98% |

**2” Diameter Tubes**

| Tc | Ta | $q_c$ 605 | $q_c$ spreadsheet | 605/spreadsheet |
|---|---|---|---|---|
| 60 | 40 | 11.43 | 11.09 | 3.05% |
| 80 | 40 | 22.86 | 22.15 | 3.19% |
| 100 | 40 | 34.29 | 33.19 | 3.30% |
| 120 | 40 | 45.71 | 44.22 | 3.38% |
| 150 | 40 | 62.86 | 60.76 | 3.45% |
| 180 | 40 | 80.00 | 77.28 | 3.52% |

In conclusion, the $q_c$ calculation in the spreadsheet gives $q_c$ values that are between 3% and 7% lower than those calculated by the formula of IEEE Standard 605. The practical impact of these upon conductor ampacity is minimal, as shown in the tables below. These tables compare the spreadsheet against the values in IEEE Standard 605, Table B.3 for schedule 40 aluminum (6063 alloy – 53.0 % conductivity) tubular bus at a 40°C ambient at sea level. The small differences are attributable to rounding errors, errors due to curve fitting to data in the standard, and unavailability of the actual conductor constants that were used in preparing the original tables.

**6” Diameter Tubes**

| Size | Conductor Temperature | | | | | |
|---|---|---|---|---|---|---|
| | 80°C | 90 °C | 100 °C | 110 °C | 140 °C | 150 °C |
| 6” from 605 | 3771 | 4435 | 5003 | 5506 | 6382 | 7144 |
| 6” spdsht | 3876 | 4506 | 5047 | 5528 | 6366 | 7096 |
| **Difference** | **105 amps** | **71 amps** | **44 amps** | **22 amps** | **-16 amps** | **-48 amps** |

**4” Diameter Tubes**

| Size | Conductor Temperature | | | | | |
|---|---|---|---|---|---|---|
| | 80°C | 90 °C | 100 °C | 110 °C | 140 °C | 150 °C |
| 4” from 605 | 2534 | 2954 | 3315 | 3535 | 4192 | 4675 |
| 4” spdsht | 2589 | 2990 | 3335 | 3642 | 4176 | 4640 |
| **Difference** | **55 amps** | **46 amps** | **20 amps** | **7 amps** | **-16 amps** | **-35 amps** |

**2” Diameter Tubes**

| Size | Conductor Temperature | | | | | |
|---|---|---|---|---|---|---|
| | 80°C | 90 °C | 100 °C | 110 °C | 140 °C | 150 °C |
| 2” from 605 | 1217 | 1402 | 1561 | 1703 | 1949 | 2161 |
| 2” spdsht | 1235 | 1413 | 1566 | 1702 | 1942 | 2150 |
| **Difference** | **18 amps** | **11 amps** | **5 amps** | **-1 amp** | **-7 amps** | **-11 amps** |

## 5.0 Emissivity and Absorptivity

For all ampacity calculations within this guide the emissivity and absorptivity of rigid bus conductors are considered to be equal. The values used for emissivity and absorptivity for copper bus are 0.85 and for aluminum bus are 0.50. These values are typical after extended outdoor exposure resulting in weathered conductors and are in alignment with IEEE Standard 605.

The values of emissivity and absorptivity used in the original PJM document for tubular bus were based upon tests made on stranded aluminum conductors. As stated above, the task force has chosen to utilize the values for emissivity and absorptivity from IEEE Standard 605. These changes have a small impact on the ampacity of the bus.

For stranded aluminum and copper conductors used in a substation, an emissivity value of 0.7 and an absorptivity value of 0.9 will be used for both materials. These values are based on the 1973 study titled *"Determination of Bare Overhead Conductor Ratings"* and are identical to the values used in the previous tubular bus rating guide.

## 6.0 Maximum Conductor Temperature Limitations

It is extremely important to choose conductor operating temperatures that will enable the conductor to operate without any significant reduction in mechanical strength or life. Many studies have been performed to determine the temperatures at which conductors can operate without loss of strength or life. ECAR (East Central Area Reliability) report 74-TFP-37, "*Transmission Conductors Loss of Strength Due To Elevated Temperature"*, and report 74-EEP-42, "*A Uniform Method For the Determination of Load Capability of Line Terminal Equipment*" have both been used to assist the task force in selecting the recommendations for substation conductor maximum operating temperatures. Much of the information in this section of the report has been taken from the referenced ECAR reports.

When selecting the maximum temperature at which a conductor is to operate, one must consider the annealing characteristic of the conductor. The annealing process causes a loss of the conductor strength. A loss in strength occurs whenever the conductor is exposed to elevated temperature operation for a period of time. After a conductor is operated at an elevated temperature, there is no recovery of the amount of strength lost when the conductor is allowed to cool. Additional loss of strength from subsequent heating cycle will begin with the loss established by the previous heating cycle and will continue to accumulate as long as the elevated temperatures exist. The amount of loss of strength will increase rapidly under extreme emergency operating conditions and can be calculated if sufficient information on the conductor materials and operating history is available with respect to temperatures experienced and the duration of the exposure. ECAR report 74-TFP-37 provides a method for performing these calculations.

Conductor loss of strength is a function of the conductor temperature and the duration of time the conductor is at that temperature. For stranded conductors, factors considered in the determination of conductor loss of strength include the loss of strength factor, the strength ratio of conductor components, the strength adjustment due to stranding of cabling factor, and the adjustment to test strand data. The loss of strength factor is a percent loss of strength of test strands taken from suppliers' data. The ratios of the strength of each component part of a cable to the total strength of the cable are given in ECAR report 74-TFP-37, and reflect the composite effect of the rated strength of strands, cabling reduction, and metal proportions. The cabling process reduces the effective strength of the individual components of the cable relative to the sum of the individual strands. This factor is given by ASTM standards. The adjustment to test strand factor is needed since the entire cable is composed of strands that may not be of identical type and strength. The initial strength of strands is a function of the cold drawing process at the wire mill. The final strength in the fully annealed state is related only to the metal alloy. Consequently, the portion of the initial strength that can be lost through annealing will be greater for the higher strength strands than for the lower strength strands.

The conductor temperature limitations chosen by the task force are based on ECAR report 74-EEP-42. The temperature limits are based on the annealing characteristics of hard-drawn copper and two representative aluminum conductor materials. The maximum

normal conductor temperatures chosen are based on a normal temperature limit at which operation at this temperature will result in no reduction of conductor strength. The normal operating temperatures chosen are 75°C for copper wire, 90°C for aluminum and copper tube, and 105°C for aluminum wire (AAC, AAAC, ACAR, & ACSR). The maximum 24 hour conductor emergency operating temperatures chosen are based on a temperature limit at which operation at this temperature for 24 hours will rarely result in more than one percent loss of strength. The emergency 24 hour operating temperatures chosen are 95°C for copper wire, 115°C for aluminum and copper tube and 130°C for aluminum wire. The maximum one hour conductor emergency operating temperatures chosen are based on a temperature limit at which operation at this temperature for one hour will rarely result in more than one percent loss of strength. The emergency one hour operating temperatures chosen are 110°C for copper wire, 130°C for aluminum and copper tube, and 140°C for aluminum wire.

A ten to fifteen percent loss of initial conductor tensile strength over the lifespan of the conductor is considered to be the limit for maintaining safe mechanical integrity of the conductor.

## 7.0 Conductor Materials

Copper and aluminum are the main basic materials used in commercial manufacturing of most types of electrical conductors for current carrying applications in electric power systems.

Conductivity standards of copper (percent International Annealed Copper Standard (IACS)[1]) apply to pure copper in the annealed or unrestrained condition, for as the metal is cold worked its resistance is increased and conductivity decreased. The cold working of copper greatly increases its ultimate tensile strength. Likewise, greater strength is obtained if certain alloying ingredients are added, but its conductivity is decreased. Commercial hard drawn copper conductor is considered as having conductivity of 97% IACS.

Pure aluminum has an electrical conductivity of 65% IACS. Commercial high-purity aluminum alloys such as 1350, 6063 and 6061 are the forms of aluminum most widely used for electrical conductors. They have a conductivity of approximately 61, 53 and 41 % IACS respectively. Again, greater strength is obtained if certain alloying ingredients are added, but its conductivity is decreased. Aluminum conductors are manufactured to meet appropriate ASTM (American Society for Testing and Materials) specifications.

In general, a high strength metallic alloy can only be produced at the expense of conductivity. Conversely, a high conductivity metallic alloy can only be produced at the expense of high strength. Improvement of strength may be achieved by: addition of alloying elements, cold working, or heat treatment (i.e. temper).

The task force has decided to publish ampacity tables for various sized of copper and aluminum tube and wire. These tables are included in Section 13 of this document.

[1] ***Note*** : International Annealed Copper Standard (IACS) – In 1913 the International Electro-Technical Commission established an annealed copper standard (IACS) which in terms of weight resistivity specifies the resistance of a copper wire one meter long that weighs one gram. The reference temperature is taken to be at 20ºC.

# 8.0 Other Considerations

The purpose of this document is to define the ampacity rating method to be used for substation conductors. It is not intended to be a comprehensive bus design standard. Other elements of bus design are the responsibility of the design engineer. Some of the other elements that need to be considered are described below:

## 8.1 Connections to Station Equipment

Bus ratings within this document are based on maximum allowable conductor temperatures over the specified time period to prevent significant loss of conductor strength. It is important to recognize that the heat generated by a bus conductor may be conducted to any attached equipment. While fittings and connectors often act as heat sinks and can dissipate heat generated by the bus, equipment temperature limitations must be considered to insure proper bus design. Equipment temperature limitations should be obtained from the applicable specification or equipment manufacturer.

## 8.2 Thermal Expansion

Bus conductors expand and contract as their temperature changes. This expansion and contraction, if not properly designed for, can induce significant loadings on bus supports. For long bus spans, provisions should be made to allow for expansion and contraction of bus conductors over the operating temperature range through the use of expansion fittings.

## 8.3 De-rating of Parallel Busses or Conductors

All ratings within this guide apply to bus configuration with one conductor per phase and sufficient spacing between phases as to not impact the conductor rating. When more than one conductor per phase is used and the conductors are in close proximity, the conductors' ability to radiate heat is reduced. Consequently, the ampacity of the bus conductor is reduced. In these situations an appropriate ampacity rating reduction should be taken.

## 8.4 Uneven Loading of Parallel Conductors

Parallel conductors are often used to increase the ampacity of a bus. Depending on their physical configuration, mutual inductance between conductors can result in an impedance imbalance and uneven loading. The uneven loading of parallel conductors should be considered when calculating the overall ampacity rating of the bus.

## 9.0 Fittings and Accessories

The 1979 PJM Tubular Bus Rating task force contacted several manufacturers and electric utility companies to determine the effect of elevated temperatures on bus fittings and accessories. Replies confirmed that properly installed bus fittings and accessories can be operated at temperatures up to 120$^{o}$C without incurring either electrical or mechanical limitations. Several tests conducted by manufacturers showed that many conductor accessories operated at temperatures 50$^{o}$C to 100$^{o}$C lower than the conductor when operating at temperatures above 180$^{o}$C. This property is mainly dependent on the large mass and surface area of the fittings. The current PJM Tubular Bus Rating task force believes this information to still be valid. Overall, the quality of workmanship installing the fittings and accessories will directly affect the ability to operate at elevated temperatures. Therefore, it is imperative that fittings and accessories be properly installed in accordance with manufacturer's recommendations to insure the desired performance.

## 10.0 Rating Assumptions

Assumptions for Calculations shown in the results tables

| | |
|---|---|
| Design Ambient Temperatures | 35°C summer<br>10°C winter |
| Ambient Temperature Range | -15°C to 40°C |
| Wind Speed | 2 Ft. per sec. (Normal & Emergency) |
| Wind Direction | 90° to the conductor |
| Maximum allowable conductor Temp. range | 70°C to 140°C (table 12-1, pg. 23) |
| Solar / Sky Radiated Heat Flux | Day Time / Clear |
| Elevation | 1000 Ft. above sea level |
| latitude | 40° North Latitude |
| Sun Time | 14:00 Hrs. |

Maximum **normal** operating temperature

| | |
|---|---|
| Aluminum tube | 90°C |
| Aluminum wire | 105°C # |
| Copper tube | 90°C |
| Copper wire | 75°C |

Maximum **emergency** (up to 24 hours) operating temperature

| | |
|---|---|
| Aluminum tube | 115°C # |
| Aluminum wire | 130°C # |
| Copper tube | 115°C # |
| Copper wire | 95°C # |

Maximum SHORT TERM (up to 1 hour) **emergency** operating temperature

| | |
|---|---|
| Aluminum tube | 130°C # |
| Aluminum wire | 140°C # |
| Copper tube | 130°C # |
| Copper wire | 110°C # |

# Since heat generated in the bus conductor may be conducted to attached equipment, allowable conductor temperatures may be governed by the temperature limitations of the attached equipment. Equipment temperature limitations should be obtained from the applicable specification or equipment manufacturer.

## 11.0 Risk

As discussed previously, bus conductor ratings are affected by many factors. The most significant of these is wind speed. Unlike many of the other factors such as absorptivity, ambient temperature, conductor resistance, etc., wind speed is truly variable in magnitude and direction. In the early PJM work on transmission line conductors, summarized by the "Determination of Thermal Ratings for Bare Overhead Conductor, 1973", weather data was collected from Washington DC over a period of 16 years, and from Pittsburgh over a 10 year period. These data were pooled to represent a 26-year span of conditions in the PJM service territory. The weather data were summarized on pages A18 and A19 in the 1973 Report in a table format for the frequency distribution of wind and ambient temperature conditions. The tables are reprinted below. In these tables each row lists the probability of occurrence of a given wind speed at a specified ambient temperature. Alternately, each row gives the probability of occurrence of different ambient temperatures given the particular wind speed.

COMPOSITE WEATHER DATA
PITTSBURGH AND WASHINGTON, D.C.

| | | |
|---|---|---|
| PITTSBURGH 1/1/49 – 12/31/58 | - | 10 YEARS |
| NATIONAL AIRPORT 1/1/49 – 12/31/64 | - | 16 YEARS |
| TOTAL COMPOSITE HOURLY RECORD | - | 26 YEARS |

FREQUENCY OF OCCURRENCE (PERCENT)

SUMMER DAYS

| | WIND SPEED-KNOTS | | | | | | |
|---|---|---|---|---|---|---|---|
| **AMBIENT TEMP.°*C*** | ***0*** | ***1*** | ***2*** | ***3*** | ***4*** | ***5*** | ***OVER 5*** |
| 0 | 0.009 | 0.025 | 0.042 | 0.024 | 0.059 | 0.070 | 1.830 |
| 5 | 0.038 | 0.115 | 0.195 | 0.247 | 0.326 | 0.427 | 6.455 |
| 10 | 0.059 | 0.176 | 0.299 | 0.345 | 0.519 | 0.634 | 8.811 |
| 15 | 0.070 | 0.209 | 0.355 | 0.484 | 0.741 | 0.955 | 11.147 |
| 20 | 0.103 | 0.311 | 0.528 | 0.655 | 1.049 | 1.401 | 14.559 |
| 25 | 0.109 | 0.324 | 0.550 | 0.791 | 1.405 | 1.743 | 17.949 |
| 30 | 0.059 | 0.178 | 0.302 | 0.496 | 0.962 | 1.381 | 14.708 |
| 35 | 0.012 | 0.034 | 0.058 | 0.127 | 0.261 | 0.389 | 4.650 |
| Over 35 | 0.000 | 0.001 | 0.001 | 0.003 | 0.009 | 0.010 | 0.187 |
| **Total** | **0.459** | **1.373** | **2.330** | **3.172** | **5.331** | **7.010** | **80.296** |

SUMMER NIGHTS

| | WIND SPEED-KNOTS | | | | | | |
|---|---|---|---|---|---|---|---|
| **AMBIENT TEMP.°*C*** | ***0*** | ***1*** | ***2*** | ***3*** | ***4*** | ***5*** | ***OVER 5*** |
| 0 | 0.031 | 0.090 | 0.153 | 0.114 | 0.248 | 0.271 | 2.998 |
| 5 | 0.125 | 0.373 | 0.632 | 0.659 | 0.921 | 1.135 | 8.495 |
| 10 | 0.174 | 0.524 | 0.887 | 0.987 | 1.340 | 1.453 | 10.003 |
| 15 | 0.257 | 0.773 | 1.312 | 1.174 | 1.654 | 2.089 | 11.975 |
| 20 | 0.351 | 1.020 | 1.730 | 1.582 | 2.254 | 2.600 | 13.952 |
| 25 | 0.236 | 0.711 | 1.207 | 1.671 | 2.205 | 2.582 | 12.846 |
| 30 | 0.037 | 0.112 | 0.188 | 0.342 | 0.426 | 0.516 | 2.490 |
| 35 | 0.000 | 0.001 | 0.002 | 0.006 | 0.013 | 0.011 | 0.064 |
| Over 35 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **Total** | **1.211** | **3.604** | **6.111** | **6.535** | **9.061** | **10.657** | **62.823** |

**Note: Data is taken from page A-18 of 1973 PJM Report, "Determination of Thermal Ratings for Bare Overhead Conductors".**

COMPOSITE WEATHER DATA
PITTSBURGH AND WASHINGTON, D.C.

| | | |
|---|---|---|
| PITTSBURGH 1/1/49 – 12/31/58 | - | 10 YEARS |
| NATIONAL AIRPORT 1/1/49 – 12/31/64 | - | 16 YEARS |
| TOTAL COMPOSITE HOURLY RECORD | - | 26 YEARS |

FREQUENCY OF OCCURRENCE (PERCENT)

WINTER DAYS

| | WIND SPEED-KNOTS | | | | | | |
|---|---|---|---|---|---|---|---|
| **AMBIENT TEMP.*°C*** | ***0*** | ***1*** | ***2*** | ***3*** | ***4*** | ***5*** | ***OVER 5*** |
| 0 | 0.105 | 0.321 | 0.541 | 0.751 | 1.315 | 1.649 | 22.146 |
| 5 | 0.233 | 0.695 | 1.184 | 1.633 | 2.380 | 2.912 | 31.418 |
| 10 | 0.118 | 0.354 | 0.600 | 0.875 | 1.079 | 1.351 | 16.749 |
| 15 | 0.046 | 0.134 | 0.230 | 0.282 | 0.344 | 0.433 | 7.302 |
| 20 | 0.007 | 0.023 | 0.039 | 0.062 | 0.062 | 0.082 | 2.164 |
| 25 | 0.000 | 0.000 | 0.000 | 0.003 | 0.000 | 0.003 | 0.348 |
| 30 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.007 |
| 35 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Over 35 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **Total** | **0.509** | **1.527** | **2.594** | **3.606** | **5.180** | **6.430** | **80.134** |

WINTER NIGHTS

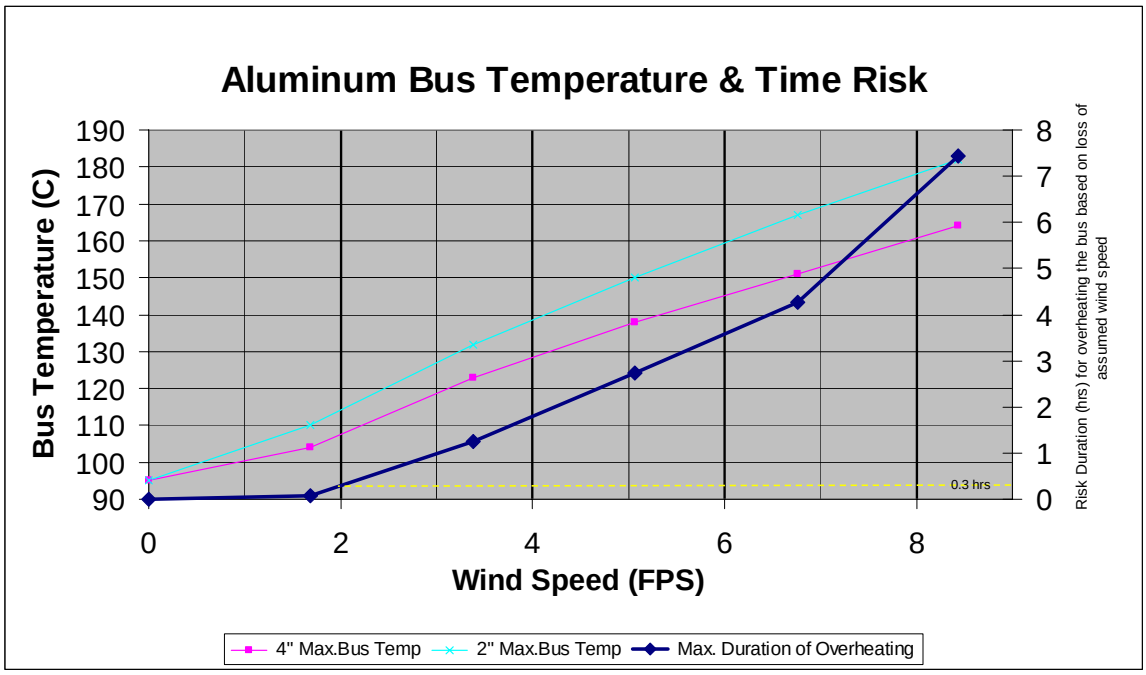
| | WIND SPEED-KNOTS | | | | | | |
|---|---|---|---|---|---|---|---|
| **AMBIENT TEMP.*°C*** | ***0*** | ***1*** | ***2*** | ***3*** | ***4*** | ***5*** | ***OVER 5*** |
| 0 | 0.287 | 0.856 | 1.453 | 1.581 | 2.709 | 3.038 | 27.265 |
| 5 | 0.450 | 1.345 | 2.282 | 2.778 | 3.286 | 3.592 | 28.548 |
| 10 | 0.136 | 0.411 | 0.791 | 0.709 | 0.884 | 1.073 | 10.873 |
| 15 | 0.023 | 0.078 | 0.132 | 0.151 | 0.213 | 0.190 | 3.953 |
| 20 | 0.004 | 0.008 | 0.016 | 0.004 | 0.012 | 0.012 | 0.918 |
| 25 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.008 |
| 30 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 35 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Over 35 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **Total** | **0.900** | **2.698** | **4.674** | **5.223** | **7.104** | **7.905** | **71.565** |

**Note: Data is taken from page A-19 of 1973 PJM Report, "Determination of Thermal Ratings for Bare Overhead Conductors".**

When rating bus conductors, the choice of wind speed used is important due to the significant effect on the rating. While a higher wind speed is desired for the higher rating, there is a cost. What happens if the wind speed that actually occurs at the substation is less than the assumed value? As the original PJM work showed, the wind speed is characterized by a distribution of wind speeds with higher and lower values. A wind speed lower than assumed would result in a higher bus temperature than designed. For example, if a rating were based upon 100°C with 2 feet/sec. of wind and a lesser wind were to occur it would cause an increase in conductor temperature to a temperature above 100°C. The risk due to the magnitude of the over temperature condition is called temperature risk.

The duration of these lower wind speeds is also of concern. The acceptability of a particular temperature risk changes with the duration of that risk. For example, while a temperature overrun of 25°C would not be of major concern for 5 minutes, it would be more problematic if it were for 6 hours during mid-day. The risk due to the duration of the over temperature condition is called time risk.

The figure shown below illustrates these risks. On the horizontal axis are listed the wind speeds that could be used for the basis of a bus rating. On the left vertical axis are the bus temperatures that would result if the assumed wind conditions were not achieved. On the right are the durations for the wind speeds at or less than the rated values. For example with a rating of a section of 2" aluminum bus based upon 90°C and a wind speed of 2 feet per second, for times when the wind speed drops below 2 fps, the bus could rise in temperature up to approximately 115°C and may experience overheating above 90°C for about ¼% of the time.




From this chart it can be seen that the magnitude of over temperature condition is higher with small bus sizes, and reduced with large bus sizes. Additionally, it can be seen that the duration of an over temperature condition does not vary by bus size.

While the original PJM transmission line work evaluated these risks and developed a reasonable approach to manage these risks using normal ratings based upon 0 knots of wind, this approach is not applicable for substation bus conductor. It is not appropriate for substation ratings because transmission conductors are often sag limited. The maximum sags are controlled by operating and legal limitations. For substation bus, sag limitations do not typically exist, but thermal expansion issues and loss of mechanical strength is of concern.

### 11.1 Normal Ratings

The task force recommends normal ratings based upon 2 fps at normal bus operating temperatures of 90°C for aluminum tube, 105°C for aluminum wire, 90°C for copper tube, and 75°C for copper wire. These temperatures have been chosen to generally mitigate loss of mechanical strength of the aluminum or copper conductors through annealing. This philosophy includes an inherent temperature risk of overheating that can be quantified. For example, 4" schedule 80, 6063 aluminum bus has a proposed summer normal rating of 3713 amperes. This is based on a 35°C ambient temperature, a wind of 2 fps, and a bus operating temperature of 90°C. If during this period the wind speed were to fall to zero, then the bus temperature would rise due to the decrease in heat loss from the bus. In this case the bus temperature would rise to approximately 108°C. This represents a temperature risk of 18°C. While this may be relatively small, ratings based upon higher wind speeds will have commensurately higher temperature risk. The substation designer must consider the magnitude of temperature risk when designing for expansion and contraction of the bus over the wide range of possible operating temperatures. The temperature risk will change with changes in bus conductor size.

Once the temperature risk has been evaluated, the next logical question is how long will this over temperature condition exist. There are discrete probabilities that exist for weather conditions that will cause an overheated conductor based upon the assumed conditions. For a summer time assumed ambient temperature of 35°C and a wind speed of 2 fps, there is a possibility that the ambient temperature could actually be higher than 35°C and winds at or below 2 fps. From the composite weather figures shown earlier, it is possible to calculate the joint probability of summer daytime temperatures above 35°C and wind speeds of 2 fps. It is also possible to calculate the joint probabilities of occurrence for lesser wind speeds and ambient temperature combinations that result in bus overheating. These probabilities can then be summed to calculate the total probability of bus overheating for an assumed set of ambient conditions such as 35°C and 2 fps of wind. For the 4" aluminum bus described above, this calculation summing probabilities result in any bus overheating above 90°C yields a 0.3% duration of risk for summer daylight hours. Assuming 15 daylight hours per day in the summer time, and 180 days of summertime rating, this equates to 8 hours of risk per year.

Therefore, the bus conductor could be expected to overheat by up to 18°C for up to 0.3% of the time or about 8 hours per summer. This quantifies the magnitude of temperature and time risk in this example. In reality the probability is small of the bus operating at the rated load concurrently and with less than assumed wind.

Based on this type of analysis, it is possible to calculate the cumulative time and temperature risk for a 40 year expected lifetime of substation bus, and use these results to make a judgment about any concerns of loss of bus strength due to annealing. The task force believes the time and temperature risk in the magnitude depicted in this example does not represent a significant design concern for the substation bus conductor. The substation designer must make this evaluation for each individual substation design to determine what maximum operating temperature to utilize.

## 11.2 Emergency Ratings

Emergency ratings are provided for abnormal out of configuration system conditions. The duration of emergency conditions is much shorter, and based upon previous PJM work on transmission line conductors; PJM assumes emergency operations could exist for up to 4 hours per year. This is also a reasonable assumption for substation bus conductors. To help manage abnormal conditions, emergency ratings with durations of 24 hours and 1 hour are provided by this document.

While there is some non-zero additional time and temperature risk that is accumulated by emergency operation, the various emergency operating temperatures (95$^{o}$C, 115$^{o}$C and 130$^{o}$C) do not significantly increase loss of strength from annealing above the values previously described because the duration of temperatures above normal operating temperatures are small in the overall bus lifespan. The concern with emergency operations at high temperature becomes the adequate management of the expansion of the bus. Emergency rating periods are not to exceed 24 hours.

## 12.0 PJM Method Comparison

In the previous sections, the task force has detailed the changes recommended in the method and parameters for the calculation of substation bus conductor ratings.

Table 12-1 summarizes the changes in input parameters and provides a qualitative impact to the ratings for the change. The effect of any change in individual parameter should not be considered excessively, but the cumulative effect of all of the changes needs to be evaluated.

Table 12-2 summarizes the effective changes in ratings for 3 sizes of aluminum tubular bus between the original PJM ratings and the proposed ratings recommended in this document. It can be seen from the table that while the new ratings generally show an increase in capability when compared to the original PJM ratings, the table shows that there is a reduction in rating by between 5% and 8% for summer emergency conditions. The task force generally believes this reduction to be tolerable for a number of reasons. Firstly, some utility companies utilize the normal ratings for both normal and emergency conditions which render this concern meaningless. Second, some utility companies utilize a lower bus design temperature which provides a lower rating and therefore eliminates the concern.

The task force believes that there will be an inherent variance between any old method and a new one due to rounding issues, and variability in the bus resistance and temperature values. As a result of these alone, the task force believes that ratings that are within a few percent tolerance essentially represent identical ratings. As a result, the 5% to 8% reduction shown for summer emergency conditions in Table 12-2 are thought to be of little concern.

# Table 12-1
# PJM Substation Bus Conductor
# Ampacity Parameter Summary

| Parameter | | Original PJM Value | New PJM Value | Resultant effect on ampacity |
|---|---|---|---|---|
| Wind Speed | Normal | 0 fps | 2 fps | Increase |
| | Emergency | 3.38 fps | 2 fps | Decrease |
| Summer Ambient | Normal | 35°C | 35°C | No change |
| | Emergency | 20°C | 35°C | Decrease |
| Winter Ambient | Normal | 20°C | 10°C | Increase |
| | Emergency | 10°C | 10°C | No change |
| Emissivity | Al Tube | 0.7 | 0.5 | Decrease |
| | Cu Tube | 0.7 | 0.85 | Increase |
| Absorptivity | Al Tube | 0.9 | 0.5 | Increase |
| | Cu Tube | 0.9 | 0.85 | Increase |
| Atmosphere Clarity | | Clear | Clear | No Change |
| Normal Operating Temperature | Al Tube | * | 90°C | Undefined : New values based on ECAR Study 74-EEP-42 |
| | Al Wire | * | 105°C | |
| | Cu Tube | * | 90°C | |
| | Cu Wire | * | 75°C | |
| 24 Hr. Emergency Operating Temperature | Al Tube | * | 115°C | |
| | Al Wire | * | 130°C | |
| | Cu Tube | * | 115°C | |
| | Cu Wire | * | 95°C | |
| 1 Hour Emergency Operating Temperature | Al Tube | * | 130°C | |
| | Al Wire | * | 140°C | |
| | Cu Tube | * | 130°C | |
| | Cu Wire | * | 110°C | |

* Operating temperatures were selected by individual utility companies in the range of 70°C to 120°C

# Table 12-2
# PJM Substation Bus Conductor
# Rating Comparison Table

| Bus Size | Rating Condition | Original PJM (Amperes) *(See Note Below)* | New PJM Ratings (Amperes) | Change |
|---|---|---|---|---|
| 2" Aluminum Sch. 40 6061 Alloy | Summer Normal | 1170 | 1313 | +12% |
| | Summer Emergency <24 Hrs. | 1740 | 1623 | **-7%** |
| | Summer Emergency <1 Hr. | 1855 | 1781 | **-4%** |
| | Winter Normal | 1345 | 1614 | +20% |
| | Winter Emergency <24 Hrs. | 1855 | 1860 | 0% |
| | Winter Emergency <1 Hr. | 1855 | 1991 | +7% |
| 4" Aluminum Sch. 40 6061 Alloy | Summer Normal | 2620 | 2783 | +6% |
| | Summer Emergency <24 Hrs. | 3665 | 3477 | **-5%** |
| | Summer Emergency <1 Hr. | 4030 | 3829 | **-5%** |
| | Winter Normal | 3015 | 3434 | +14% |
| | Winter Emergency <24 Hrs. | 3910 | 3989 | +2% |
| | Winter Emergency <1 Hr. | 4030 | 4285 | +6% |
| 5" Aluminum Sch. 40 6061 Alloy | Summer Normal | 3340 | 3479 | +4% |
| | Summer Emergency <24 Hrs. | 4585 | 4365 | **-5%** |
| | Summer Emergency <1 Hr. | 5135 | 4816 | **-6%** |
| | Winter Normal | 3840 | 4298 | +12% |
| | Winter Emergency <24 Hrs. | 4890 | 5008 | +2% |
| | Winter Emergency <1 Hr. | 5135 | 5387 | +5% |

Note: The original PJM ratings published in the "Determination of Ratings for Tubular Bus" dated 1979 establish bus conductor ratings based upon a bus conductor design temperature ranging between 70°C and 120°C. The ratings shown in the table above are based on 90°C and represent typical values used. Individual substation owners may currently use different ratings due to the use of a different design temperature.

# Table 12-2 ( cont'd )
# PJM Substation Bus Conductor
# Rating Comparison Table

| Bus Size | Rating Condition | Original PJM (Amperes) *(See Note Below)* | New PJM Ratings (Amperes) | Change |
|---|---|---|---|---|
| 2" Aluminum Sch. 40 6063 Alloy | Summer Normal | 1310 | 1473 | +12% |
| | Summer Emergency <24 Hrs. | 1950 | 1808 | **-7%** |
| | Summer Emergency <1 Hr. | 2085 | 1977 | **-5%** |
| | Winter Normal | 1505 | 1811 | +20% |
| | Winter Emergency <24 Hrs. | 2080 | 2073 | 0% |
| | Winter Emergency <1 Hr. | 2085 | 2211 | +6% |
| 4" Aluminum Sch. 40 6063 Alloy | Summer Normal | 2940 | 3122 | +6% |
| | Summer Emergency <24 Hrs. | 4115 | 3872 | **-6%** |
| | Summer Emergency <1 Hr. | 4555 | 4248 | **-7%** |
| | Winter Normal | 3380 | 3852 | +14% |
| | Winter Emergency <24 Hrs. | 4385 | 4443 | +1% |
| | Winter Emergency <1 Hr. | 4555 | 4754 | +4% |
| 5" Aluminum Sch. 40 6063 Alloy | Summer Normal | 3740 | 3899 | +4% |
| | Summer Emergency <24 Hrs. | 5135 | 4857 | **-5%** |
| | Summer Emergency <1 Hr. | 5825 | 5338 | **-8%** |
| | Winter Normal | 4300 | 4817 | +12% |
| | Winter Emergency <24 Hrs. | 5475 | 5572 | +2% |
| | Winter Emergency <1 Hr. | 5825 | 5971 | +3% |

Note: The original PJM ratings published in the "Determination of Ratings for Tubular Bus" dated 1979 establish bus conductor ratings based upon a bus conductor design temperature ranging between 70°C and 120°C. The ratings shown in the table above are based on 90°C and represent typical values used. Individual substation owners may currently use different ratings due to the use of a different design temperature.

# Table 12-2 ( cont'd )
# PJM Substation Bus Conductor
# Rating Comparison Table

| Bus Size | Rating Condition | Original PJM (Amperes) *(See Note Below)* | New PJM Ratings (Amperes) | Change |
|---|---|---|---|---|
| 2" Aluminum Sch. 80 6061 Alloy | Summer Normal | 1370 | 1539 | +12% |
| | Summer Emergency <24 Hrs. | 2040 | 1902 | **-7%** |
| | Summer Emergency <1 Hr. | 2175 | 2087 | **-4%** |
| | Winter Normal | 1575 | 1892 | +20% |
| | Winter Emergency <24 Hrs. | 2175 | 2180 | 0% |
| | Winter Emergency <1 Hr. | 2175 | 2334 | +7% |
| 4" Aluminum Sch. 80 6061 Alloy | Summer Normal | 3075 | 3263 | +6% |
| | Summer Emergency <24 Hrs. | 4305 | 4070 | **-5%** |
| | Summer Emergency <1 Hr. | 4980 | 4479 | **-10%** |
| | Winter Normal | 3540 | 4025 | +14% |
| | Winter Emergency <24 Hrs. | 4590 | 4669 | +2% |
| | Winter Emergency <1 Hr. | 4980 | 5012 | +1% |
| 5" Aluminum Sch. 80 6061 Alloy | Summer Normal | 3955 | 4115 | +4% |
| | Summer Emergency <24 Hrs. | 5425 | 5159 | **-5%** |
| | Summer Emergency <1 Hr. | 6495 | 5689 | **-12%** |
| | Winter Normal | 4545 | 5084 | +12% |
| | Winter Emergency <24 Hrs. | 5785 | 5918 | +2% |
| | Winter Emergency <1 Hr. | 6495 | 6364 | **-2%** |

Note: The original PJM ratings published in the "Determination of Ratings for Tubular Bus" dated 1979 establish bus conductor ratings based upon a bus conductor design temperature ranging between 70°C and 120°C. The ratings shown in the table above are based on 90°C and represent typical values used. Individual substation owners may currently use different ratings due to the use of a different design temperature.

# Table 12-2 ( cont'd )
# PJM Substation Bus Conductor
# Rating Comparison Table

| Bus Size | Rating Condition | Original PJM (Amperes) *(See Note Below)* | New PJM Ratings (Amperes) | Change |
|---|---|---|---|---|
| 2" Aluminum Sch. 80 6063 Alloy | Summer Normal | 1530 | 1722 | +13% |
| | Summer Emergency <24 Hrs. | 2280 | 2112 | **-7%** |
| | Summer Emergency <1 Hr. | 2435 | 2308 | **-5%** |
| | Winter Normal | 1760 | 2116 | +20% |
| | Winter Emergency <24 Hrs. | 2435 | 2421 | **-1%** |
| | Winter Emergency <1 Hr. | 2435 | 2581 | +6% |
| 4" Aluminum Sch. 80 6063 Alloy | Summer Normal | 3445 | 3713 | +8% |
| | Summer Emergency <24 Hrs. | 4815 | 4617 | **-4%** |
| | Summer Emergency <1 Hr. | 5575 | 5072 | **-9%** |
| | Winter Normal | 3960 | 4580 | +16% |
| | Winter Emergency <24 Hrs. | 5135 | 5296 | +3% |
| | Winter Emergency <1 Hr. | 5575 | 5676 | +2% |
| 5" Aluminum Sch. 80 6063 Alloy | Summer Normal | 4420 | 4586 | +4% |
| | Summer Emergency <24 Hrs. | 6065 | 5693 | **-6%** |
| | Summer Emergency <1 Hr. | 7265 | 6244 | **-14%** |
| | Winter Normal | 5080 | 5665 | +12% |
| | Winter Emergency <24 Hrs. | 6470 | 6530 | +1% |
| | Winter Emergency <1 Hr. | 7265 | 6984 | **-4%** |

Note: The original PJM ratings published in the "Determination of Ratings for Tubular Bus" dated 1979 establish bus conductor ratings based upon a bus conductor design temperature ranging between 70°C and 120°C. The ratings shown in the table above are based on 90°C and represent typical values used. Individual substation owners may currently use different ratings due to the use of a different design temperature.

## 13.0 Ampacity Tables

Below are tubular bus sizes and wire sizes that are included in the following in the published ampacity tables of this report:

# Tubular Bus Conductors

**Aluminum Tubular Bus**

| Schedule 40, 6061 Alloy | Schedule 80, 6061 Alloy | Schedule 40, 6063 Alloy | Schedule 80, 6063 Alloy |
|---|---|---|---|
| 1" Alum, Sched 40, 6061 Alloy | 1" Alum, Sched 80, 6061 Alloy | 1" Alum, Sched 40, 6063 Alloy | 1" Alum, Sched 80, 6063 Alloy |
| 1-1/2" Alum, Sched 40, 6061 Alloy | 1-1/2" Alum, Sched 80, 6061 Alloy | 1-1/2" Alum, Sched 40, 6063 Alloy | 1-1/2" Alum, Sched 80, 6063 Alloy |
| 2" Alum, Sched 40, 6061 Alloy | 2" Alum, Sched 80, 6061 Alloy | 2" Alum, Sched 40, 6063 Alloy | 2" Alum, Sched 80, 6063 Alloy |
| 2-1/2" Alum, Sched 40, 6061 Alloy | 2-1/2" Alum, Sched 80, 6061 Alloy | 2-1/2" Alum, Sched 40, 6063 Alloy | 2-1/2" Alum, Sched 80, 6063 Alloy |
| 3" Alum, Sched 40, 6061 Alloy | 3" Alum, Sched 80, 6061 Alloy | 3" Alum, Sched 40, 6063 Alloy | 3" Alum, Sched 80, 6063 Alloy |
| 3-1/2" Alum, Sched 40, 6061 Alloy | 3-1/2" Alum, Sched 80, 6061 Alloy | 3-1/2" Alum, Sched 40, 6063 Alloy | 3-1/2" Alum, Sched 80, 6063 Alloy |
| 4" Alum, Sched 40, 6061 Alloy | 4" Alum, Sched 80, 6061 Alloy | 4" Alum, Sched 40, 6063 Alloy | 4" Alum, Sched 80, 6063 Alloy |
| 5" Alum, Sched 40, 6061 Alloy | 5" Alum, Sched 80, 6061 Alloy | 4-1/2" Alum, Sched 40, 6063 Alloy | 4-1/2" Alum, Sched 80, 6063 Alloy |
| 6" Alum, Sched 40, 6061 Alloy | 6" Alum, Sched 80, 6061 Alloy | 5" Alum, Sched 40, 6063 Alloy | 5" Alum, Sched 80, 6063 Alloy |
| | | 6" Alum, Sched 40, 6063 Alloy | 6" Alum, Sched 80, 6063 Alloy |

**Copper Tubular Bus**

| Schedule 40 | Schedule 80 |
|---|---|
| ¾" Schedule 40 | |
| 1" Schedule 40 | 1" Schedule 80 |
| 1 ¼" Schedule 40 | |
| 1 ½" Schedule 40 | 1 ½" Schedule 80 |
| 2" Schedule 40 | 2" Schedule 80 |
| 2 ½" Schedule 40 | 2 ½" Schedule 80 |
| 3" Schedule 40 | 3" Schedule 80 |
| 4" Schedule 40 | 4" Schedule 80 |

# Strain Bus Conductors

## AAC Wire

| | | | | |
|---|---|---|---|---|
| 3/0 7 str | 350 kcm 19 str | 795 kcm 61 str | 1590 kcm 61 str | |
| 250 kcm 19 str | 500 kcm 19 str | 1000 kcm 37 str | 2000 kcm 127 str | |
| 300 kcm 19 str. | 556.5 kcm 37 str | 1033.5 kcm 61 str | 3500 kcm 127 str. | |
| 336.4 kcm 19 str | 795 kcm 37 str | 1510.5 kcm 61 str | | |

## ACAR Wire

2493 kcm 54/37

## ACSR Wire

| | | | | |
|---|---|---|---|---|
| 1/0 6/1 | 266.8 kcm 26/7 | 477 kcm 26/7 | 795 kcm 26/7 | 1272 kcm 45/7 |
| 2/0 6/1 | 266.8 kcm 30/7 | | 795 kcm 30/7 | |
| 3/0 6/1 | | | 795 kcm 30/19 | |
| 4/0 6/1 | 336 kcm 18/1 | 556.5 kcm 24/7 | 954 kcm, 45/7 | 1590 kcm 45/7 |
| | 336.4 kcm 26/7 | 556.5 kcm 26/7 | 954 kcm 48/7 | 1590 kcm 54/19 |
| 159 kcm 12/7 | 336.4 kcm 30/7 | 556.5 kcm 30/7 | | |
| 203.2 kcm 16/19 | 397.5 kcm 26/7 | 605 kcm 24/7 | 1033.5 kcm 45/7 | 2167 kcm 72/7 |
| | 397.5 kcm 30/7 | | 1033.5 kcm 54/7 | |

## Copper Wire

| | | | | |
|---|---|---|---|---|
| 1/0 7 Str | 4/0 7 str | 350 kcm 19 str | 750 kcm 37 str | 1500 kcm SD 61 str |
| | 4/0 19 str | 350 kcm 37 str | 750 kcm HD 61 str | |
| 2/0 7 Str | 250 kcm 19 str | 500 kcm 19 str | 1000 kcm 37 str | 2000 kcm 127 str |
| | | 500 kcm HD 37 Str | 1000 kcm SD 61 str | |

## Bus Conductor: **1" Alum, Sched 40, 6061 Alloy**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 891 | 859 | 825 | 789 | 752 | 712 | 670 | 624 | 574 | 519 | 457 | 384 |
| | 70 | 949 | 920 | 889 | 857 | 823 | 788 | 751 | 711 | 669 | 624 | 574 | 520 |
| | 80 | 1003 | 976 | 948 | 918 | 888 | 856 | 823 | 787 | 751 | 711 | 669 | 624 |
| **Normal** | **90** | **1053** | **1028** | **1002** | **975** | **947** | **917** | **887** | **855** | **822** | **788** | **751** | **712** |
| | 100 | 1100 | 1076 | 1052 | 1027 | 1001 | 974 | 946 | 917 | 887 | 856 | 823 | 788 |
| | 110 | 1145 | 1122 | 1100 | 1076 | 1052 | 1027 | 1001 | 974 | 947 | 918 | 888 | 857 |
| **Emergency (<24 hrs)** | **115** | **1166** | **1144** | **1122** | **1100** | **1076** | **1052** | **1027** | **1001** | **975** | **947** | **918** | **889** |
| | 120 | 1187 | 1166 | 1144 | 1122 | 1100 | 1076 | 1052 | 1028 | 1002 | 975 | 948 | 919 |
| **Emergency (< 1 hr )** | **130** | **1227** | **1208** | **1187** | **1166** | **1145** | **1123** | **1101** | **1077** | **1054** | **1029** | **1003** | **977** |
| | 140 | 1266 | 1248 | 1228 | 1209 | 1188 | 1168 | 1147 | 1125 | 1102 | 1079 | 1056 | 1031 |
| | 150 | 1304 | 1286 | 1268 | 1249 | 1230 | 1210 | 1190 | 1170 | 1149 | 1127 | 1105 | 1082 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 1" Alum, Sched 40, 6061 Alloy | | Outside Diameter = | 1.315 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 4.1E-05 ohms/ft | $R_{high}$ = | 4.7E-05 ohms/ft |

## Bus Conductor: **1-1/2" Alum, Sched 40, 6061 Alloy**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 1256 | 1209 | 1160 | 1109 | 1056 | 999 | 937 | 871 | 799 | 719 | 628 | 520 |
| | 70 | 1340 | 1298 | 1254 | 1208 | 1160 | 1110 | 1056 | 1000 | 939 | 873 | 802 | 722 |
| | 80 | 1418 | 1380 | 1339 | 1298 | 1254 | 1209 | 1161 | 1111 | 1058 | 1002 | 941 | 876 |
| **Normal** | **90** | **1492** | **1456** | **1419** | **1380** | **1340** | **1299** | **1256** | **1211** | **1163** | **1114** | **1061** | **1005** |
| | 100 | 1561 | 1527 | 1493 | 1457 | 1420 | 1382 | 1342 | 1301 | 1258 | 1213 | 1166 | 1117 |
| | 110 | 1626 | 1595 | 1562 | 1529 | 1495 | 1460 | 1423 | 1385 | 1346 | 1305 | 1262 | 1217 |
| **Emergency (<24 hrs)** | **115** | **1658** | **1627** | **1596** | **1564** | **1531** | **1496** | **1461** | **1425** | **1387** | **1348** | **1307** | **1264** |
| | 120 | 1689 | 1659 | 1629 | 1597 | 1565 | 1532 | 1498 | 1463 | 1427 | 1389 | 1350 | 1309 |
| **Emergency (< 1 hr )** | **130** | **1748** | **1721** | **1692** | **1663** | **1632** | **1601** | **1570** | **1537** | **1503** | **1468** | **1432** | **1394** |
| | 140 | 1806 | 1780 | 1753 | 1725 | 1697 | 1667 | 1637 | 1607 | 1575 | 1542 | 1508 | 1474 |
| | 150 | 1862 | 1837 | 1811 | 1785 | 1758 | 1731 | 1702 | 1673 | 1643 | 1613 | 1581 | 1549 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 1-1/2" Alum, Sched 40, 6061 Alloy | | Outside Diameter = | 1.9 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 2.5E-05 ohms/ft | $R_{high}$ = | 2.9E-05 ohms/ft |

## Bus Conductor: **2" Alum, Sched 40, 6061 Alloy**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 1563 | 1504 | 1443 | 1378 | 1310 | 1238 | 1160 | 1076 | 984 | 882 | 766 | 626 |
| | 70 | 1669 | 1616 | 1560 | 1502 | 1441 | 1377 | 1309 | 1238 | 1161 | 1078 | 987 | 885 |
| | 80 | 1767 | 1718 | 1667 | 1614 | 1559 | 1501 | 1441 | 1378 | 1310 | 1239 | 1163 | 1080 |
| **Normal** | **90** | **1858** | **1812** | **1765** | **1717** | **1666** | **1614** | **1559** | **1502** | **1442** | **1379** | **1313** | **1242** |
| | 100 | 1944 | 1901 | 1858 | 1812 | 1766 | 1717 | 1667 | 1615 | 1561 | 1505 | 1445 | 1383 |
| | 110 | 2025 | 1985 | 1944 | 1902 | 1859 | 1814 | 1768 | 1720 | 1670 | 1619 | 1566 | 1510 |
| **Emergency (<24 hrs)** | **115** | **2064** | **2026** | **1986** | **1945** | **1903** | **1860** | **1816** | **1769** | **1722** | **1673** | **1623** | **1570** |
| | 120 | 2103 | 2065 | 2027 | 1987 | 1947 | 1905 | 1862 | 1818 | 1773 | 1726 | 1677 | 1626 |
| **Emergency (< 1 hr )** | **130** | **2177** | **2142** | **2105** | **2068** | **2030** | **1991** | **1952** | **1911** | **1869** | **1826** | **1781** | **1734** |
| | 140 | 2249 | 2215 | 2181 | 2146 | 2111 | 2075 | 2038 | 2000 | 1961 | 1920 | 1878 | 1835 |
| | 150 | 2318 | 2287 | 2255 | 2223 | 2190 | 2156 | 2121 | 2085 | 2048 | 2010 | 1971 | 1931 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 2" Alum, Sched 40, 6061 Alloy | | Outside Diameter = | 2.375 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 1.9E-05 ohms/ft | $R_{high}$ = | 2.1E-05 ohms/ft |

## Bus Conductor: **2-1/2" Alum, Sched 40, 6061 Alloy**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 2091 | 2012 | 1930 | 1843 | 1751 | 1653 | 1548 | 1434 | 1310 | 1170 | 1011 | 819 |
| | 70 | 2236 | 2164 | 2089 | 2011 | 1929 | 1843 | 1752 | 1655 | 1551 | 1438 | 1314 | 1177 |
| | 80 | 2369 | 2303 | 2235 | 2164 | 2090 | 2012 | 1931 | 1846 | 1755 | 1659 | 1555 | 1444 |
| **Normal** | **90** | **2494** | **2433** | **2370** | **2304** | **2236** | **2166** | **2092** | **2016** | **1935** | **1850** | **1760** | **1664** |
| | 100 | 2611 | 2554 | 2496 | 2435 | 2372 | 2307 | 2240 | 2170 | 2097 | 2021 | 1941 | 1856 |
| | 110 | 2723 | 2669 | 2614 | 2558 | 2500 | 2439 | 2377 | 2313 | 2246 | 2177 | 2104 | 2028 |
| **Emergency (<24 hrs)** | **115** | **2776** | **2724** | **2671** | **2617** | **2560** | **2502** | **2443** | **2381** | **2317** | **2250** | **2181** | **2108** |
| | 120 | 2829 | 2778 | 2727 | 2674 | 2620 | 2564 | 2506 | 2446 | 2385 | 2321 | 2254 | 2185 |
| **Emergency (< 1 hr )** | **130** | **2931** | **2883** | **2835** | **2785** | **2734** | **2682** | **2628** | **2572** | **2515** | **2455** | **2394** | **2330** |
| | 140 | 3029 | 2984 | 2938 | 2891 | 2843 | 2794 | 2743 | 2691 | 2638 | 2582 | 2525 | 2466 |
| | 150 | 3125 | 3082 | 3039 | 2994 | 2949 | 2902 | 2854 | 2805 | 2755 | 2703 | 2650 | 2595 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 2-1/2" Alum, Sched 40, 6061 Alloy | | Outside Diameter = | 2.875 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 1.2E-05 ohms/ft | $R_{high}$ = | 1.4E-05 ohms/ft |

## Bus Conductor: **3" Alum, Sched 40, 6061 Alloy**

| Rating | Rated Operating Temperature | Assumed Wind Speed = 2 fps<br>Ambient Temperature (°C)<br>-15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 2546 | 2450 | 2348 | 2241 | 2128 | 2008 | 1879 | 1738 | 1584 | 1412 | 1212 | 970 |
| | 70 | 2726 | 2638 | 2546 | 2451 | 2350 | 2244 | 2132 | 2013 | 1885 | 1746 | 1593 | 1422 |
| | 80 | 2892 | 2811 | 2727 | 2640 | 2550 | 2455 | 2355 | 2250 | 2139 | 2020 | 1893 | 1755 |
| **Normal** | **90** | **3047** | **2972** | **2895** | **2815** | **2732** | **2646** | **2556** | **2461** | **2362** | **2258** | **2148** | **2030** |
| | 100 | 3192 | 3123 | 3051 | 2977 | 2901 | 2822 | 2739 | 2654 | 2564 | 2471 | 2372 | 2269 |
| | 110 | 3331 | 3266 | 3199 | 3130 | 3059 | 2986 | 2910 | 2831 | 2749 | 2664 | 2575 | 2482 |
| **Emergency (<24 hrs)** | **115** | **3398** | **3335** | **3270** | **3203** | **3135** | **3064** | **2991** | **2915** | **2837** | **2755** | **2670** | **2582** |
| | 120 | 3463 | 3402 | 3339 | 3275 | 3209 | 3140 | 3070 | 2997 | 2922 | 2843 | 2762 | 2677 |
| **Emergency (< 1 hr )** | **130** | **3591** | **3533** | **3474** | **3413** | **3351** | **3287** | **3221** | **3153** | **3083** | **3011** | **2936** | **2858** |
| | 140 | 3714 | 3659 | 3603 | 3546 | 3488 | 3428 | 3366 | 3302 | 3237 | 3169 | 3100 | 3027 |
| | 150 | 3833 | 3781 | 3729 | 3674 | 3619 | 3562 | 3504 | 3445 | 3383 | 3320 | 3255 | 3188 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 3" Alum, Sched 40, 6061 Alloy | | Outside Diameter = | 3.5 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 9.1E-06 ohms/ft | $R_{high}$ = | 1E-05 ohms/ft |

## Bus Conductor: **3-1/2" Alum, Sched 40, 6061 Alloy**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 2901 | 2791 | 2675 | 2552 | 2423 | 2284 | 2136 | 1974 | 1797 | 1597 | 1366 | 1084 |
| | 70 | 3122 | 3021 | 2916 | 2806 | 2690 | 2569 | 2439 | 2302 | 2154 | 1993 | 1816 | 1618 |
| | 80 | 3328 | 3235 | 3138 | 3038 | 2933 | 2824 | 2709 | 2587 | 2459 | 2321 | 2174 | 2014 |
| **Normal** | **90** | **3522** | **3436** | **3346** | **3254** | **3158** | **3058** | **2954** | **2845** | **2730** | **2609** | **2481** | **2343** |
| | 100 | 3706 | 3626 | 3543 | 3457 | 3368 | 3276 | 3181 | 3081 | 2977 | 2868 | 2754 | 2633 |
| | 110 | 3883 | 3808 | 3730 | 3650 | 3567 | 3482 | 3393 | 3302 | 3206 | 3107 | 3003 | 2894 |
| **Emergency (<24 hrs)** | **115** | **3969** | **3896** | **3821** | **3743** | **3663** | **3580** | **3495** | **3407** | **3315** | **3220** | **3121** | **3017** |
| | 120 | 4054 | 3983 | 3909 | 3834 | 3757 | 3677 | 3595 | 3509 | 3421 | 3330 | 3234 | 3135 |
| **Emergency (< 1 hr )** | **130** | **4219** | **4152** | **4083** | **4012** | **3939** | **3864** | **3787** | **3707** | **3625** | **3540** | **3452** | **3360** |
| | 140 | 4380 | 4316 | 4250 | 4183 | 4115 | 4044 | 3971 | 3897 | 3820 | 3740 | 3658 | 3573 |
| | 150 | 4537 | 4476 | 4414 | 4350 | 4285 | 4218 | 4150 | 4079 | 4007 | 3932 | 3856 | 3776 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 3-1/2" Alum, Sched 40, 6061 Alloy | | Outside Diameter = | 4 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 8E-06 ohms/ft | $R_{high}$ = | 8.6E-06 ohms/ft |

## Bus Conductor: **4" Alum, Sched 40, 6061 Alloy**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 3292 | 3166 | 3034 | 2894 | 2746 | 2588 | 2418 | 2234 | 2030 | 1801 | 1534 | 1206 |
| | 70 | 3530 | 3416 | 3296 | 3172 | 3041 | 2902 | 2755 | 2599 | 2430 | 2247 | 2045 | 1818 |
| | 80 | 3750 | 3645 | 3536 | 3423 | 3305 | 3181 | 3051 | 2914 | 2768 | 2612 | 2445 | 2263 |
| **Normal** | **90** | **3955** | **3858** | **3758** | **3654** | **3546** | **3434** | **3317** | **3194** | **3065** | **2928** | **2783** | **2629** |
| | 100 | 4148 | 4058 | 3965 | 3869 | 3770 | 3667 | 3560 | 3449 | 3332 | 3210 | 3081 | 2946 |
| | 110 | 4332 | 4248 | 4161 | 4072 | 3980 | 3885 | 3786 | 3684 | 3578 | 3467 | 3351 | 3229 |
| **Emergency (<24 hrs)** | **115** | **4421** | **4340** | **4256** | **4170** | **4081** | **3989** | **3894** | **3796** | **3694** | **3588** | **3477** | **3361** |
| | 120 | 4508 | 4429 | 4348 | 4265 | 4179 | 4090 | 3999 | 3904 | 3806 | 3704 | 3599 | 3488 |
| **Emergency (< 1 hr )** | **130** | **4678** | **4603** | **4527** | **4449** | **4368** | **4285** | **4200** | **4112** | **4021** | **3927** | **3829** | **3728** |
| | 140 | 4842 | 4771 | 4699 | 4625 | 4550 | 4472 | 4392 | 4310 | 4225 | 4137 | 4047 | 3953 |
| | 150 | 5001 | 4934 | 4866 | 4796 | 4725 | 4652 | 4577 | 4499 | 4420 | 4338 | 4253 | 4166 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 4" Alum, Sched 40, 6061 Alloy | | Outside Diameter = | 4.5 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 6.4E-06 ohms/ft | $R_{high}$ = | 7.3E-06 ohms/ft |

## Bus Conductor: **5" Alum, Sched 40, 6061 Alloy**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 4104 | 3946 | 3779 | 3604 | 3417 | 3218 | 3003 | 2769 | 2510 | 2217 | 1874 | 1447 |
| | 70 | 4407 | 4264 | 4115 | 3958 | 3793 | 3619 | 3434 | 3236 | 3023 | 2790 | 2534 | 2244 |
| | 80 | 4688 | 4557 | 4420 | 4278 | 4130 | 3975 | 3811 | 3638 | 3454 | 3258 | 3046 | 2815 |
| **Normal** | **90** | **4950** | **4829** | **4704** | **4574** | **4439** | **4298** | **4150** | **3996** | **3833** | **3662** | **3479** | **3283** |
| | 100 | 5198 | 5085 | 4969 | 4849 | 4725 | 4596 | 4462 | 4322 | 4175 | 4022 | 3860 | 3689 |
| | 110 | 5433 | 5328 | 5220 | 5109 | 4994 | 4874 | 4751 | 4623 | 4489 | 4350 | 4204 | 4051 |
| **Emergency (<24 hrs)** | **115** | **5547** | **5446** | **5341** | **5233** | **5122** | **5008** | **4889** | **4766** | **4638** | **4504** | **4365** | **4220** |
| | 120 | 5659 | 5561 | 5459 | 5355 | 5248 | 5137 | 5023 | 4904 | 4781 | 4654 | 4521 | 4382 |
| **Emergency (< 1 hr )** | **130** | **5877** | **5784** | **5689** | **5591** | **5491** | **5387** | **5281** | **5170** | **5057** | **4939** | **4816** | **4689** |
| | 140 | 6087 | 6000 | 5910 | 5818 | 5724 | 5627 | 5527 | 5424 | 5318 | 5208 | 5095 | 4977 |
| | 150 | 6292 | 6209 | 6125 | 6038 | 5949 | 5857 | 5763 | 5667 | 5568 | 5465 | 5359 | 5250 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 5" Alum, Sched 40, 6061 Alloy | | Outside Diameter = | 5.563 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 4.7E-06 ohms/ft | $R_{high}$ = | 5.4E-06 ohms/ft |

Bus Conductor: **6" Alum, Sched 40, 6061 Alloy**

| Rating | Rated Operating Temperature | Assumed Wind Speed = 2 fps<br>Ambient Temperature ($^{o}$C)<br>-15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 4948 | 4756 | 4554 | 4341 | 4114 | 3871 | 3608 | 3322 | 3004 | 2643 | 2219 | 1683 |
| | 70 | 5322 | 5148 | 4967 | 4777 | 4576 | 4364 | 4139 | 3898 | 3638 | 3353 | 3038 | 2681 |
| | 80 | 5667 | 5508 | 5343 | 5171 | 4991 | 4802 | 4604 | 4393 | 4169 | 3930 | 3671 | 3389 |
| **Normal** | **90** | **5990** | **5844** | **5692** | **5535** | **5371** | **5200** | **5021** | **4834** | **4636** | **4427** | **4204** | **3966** |
| | 100 | 6295 | 6159 | 6019 | 5874 | 5723 | 5567 | 5404 | 5235 | 5057 | 4870 | 4673 | 4465 |
| | 110 | 6586 | 6459 | 6328 | 6194 | 6054 | 5910 | 5761 | 5605 | 5443 | 5274 | 5097 | 4911 |
| **Emergency (<24 hrs)** | **115** | **6726** | **6604** | **6478** | **6347** | **6213** | **6074** | **5931** | **5781** | **5626** | **5465** | **5296** | **5119** |
| | 120 | 6864 | 6746 | 6623 | 6498 | 6368 | 6234 | 6096 | 5952 | 5803 | 5649 | 5487 | 5319 |
| **Emergency (< 1 hr )** | **130** | **7133** | **7021** | **6907** | **6789** | **6668** | **6543** | **6414** | **6280** | **6143** | **6000** | **5851** | **5697** |
| | 140 | 7394 | 7288 | 7180 | 7069 | 6955 | 6838 | 6718 | 6593 | 6465 | 6332 | 6195 | 6052 |
| | 150 | 7647 | 7548 | 7446 | 7341 | 7234 | 7123 | 7010 | 6893 | 6773 | 6649 | 6521 | 6389 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 6" Alum, Sched 40, 6061 Alloy | | Outside Diameter = | 6.625 inches |
| | $T_{low}$ = | 20 $^{o}$C | $T_{high}$ = | 70 $^{o}$C |
| | $R_{low}$ = | 3.6E-06 ohms/ft | $R_{high}$ = | 4.1E-06 ohms/ft |

Bus Conductor: **1" Alum, Sched 80, 6061 Alloy**

| Rating | Rated Operating Temperature | Assumed Wind Speed = 2 fps<br>Ambient Temperature ($^{o}$C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **-15** | **-10** | **-5** | **0** | **5** | **10** | **15** | **20** | **25** | **30** | **35** | **40** |
| | 60 | 1014 | 977 | 938 | 898 | 855 | 810 | 762 | 710 | 653 | 591 | 520 | 437 |
| | 70 | 1080 | 1046 | 1011 | 975 | 937 | 896 | 854 | 809 | 761 | 710 | 653 | 591 |
| | 80 | 1141 | 1110 | 1078 | 1044 | 1010 | 974 | 936 | 896 | 854 | 809 | 761 | 710 |
| **Normal** | **90** | **1198** | **1169** | **1139** | **1109** | **1077** | **1044** | **1009** | **973** | **935** | **896** | **854** | **810** |
| | 100 | 1251 | 1225 | 1197 | 1168 | 1139 | 1108 | 1076 | 1043 | 1009 | 973 | 936 | 897 |
| | 110 | 1302 | 1277 | 1251 | 1224 | 1196 | 1168 | 1139 | 1108 | 1077 | 1044 | 1010 | 975 |
| **Emergency (<24 hrs)** | **115** | **1326** | **1302** | **1277** | **1251** | **1224** | **1197** | **1168** | **1139** | **1109** | **1077** | **1045** | **1011** |
| | 120 | 1350 | 1326 | 1302 | 1277 | 1251 | 1224 | 1197 | 1169 | 1140 | 1110 | 1078 | 1046 |
| **Emergency (< 1 hr )** | **130** | **1396** | **1374** | **1351** | **1327** | **1303** | **1278** | **1252** | **1226** | **1199** | **1170** | **1141** | **1111** |
| | 140 | 1441 | 1419 | 1397 | 1375 | 1352 | 1328 | 1304 | 1280 | 1254 | 1228 | 1201 | 1173 |
| | 150 | 1483 | 1463 | 1442 | 1421 | 1399 | 1377 | 1354 | 1331 | 1307 | 1282 | 1257 | 1231 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 1" Alum, Sched 80, 6061 Alloy | | Outside Diameter = | 1.315 inches |
| | $T_{low}$ = | 20 $^{o}$C | $T_{high}$ = | 70 $^{o}$C |
| | $R_{low}$ = | 3.2E-05 ohms/ft | $R_{high}$ = | 3.6E-05 ohms/ft |

Bus Conductor: **1-1/2" Alum, Sched 80, 6061 Alloy**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 1452 | 1397 | 1341 | 1282 | 1220 | 1154 | 1083 | 1007 | 924 | 831 | 726 | 600 |
| | 70 | 1548 | 1499 | 1449 | 1396 | 1341 | 1282 | 1221 | 1155 | 1085 | 1009 | 926 | 834 |
| | 80 | 1639 | 1594 | 1548 | 1499 | 1449 | 1397 | 1342 | 1284 | 1223 | 1157 | 1088 | 1012 |
| **Normal** | **90** | **1723** | **1682** | **1639** | **1595** | **1549** | **1501** | **1451** | **1399** | **1344** | **1286** | **1226** | **1161** |
| | 100 | 1803 | 1764 | 1724 | 1683 | 1641 | 1597 | 1551 | 1503 | 1454 | 1402 | 1348 | 1290 |
| | 110 | 1879 | 1842 | 1805 | 1767 | 1727 | 1686 | 1644 | 1600 | 1555 | 1507 | 1458 | 1406 |
| **Emergency (<24 hrs)** | **115** | **1915** | **1880** | **1844** | **1807** | **1768** | **1729** | **1688** | **1646** | **1602** | **1557** | **1510** | **1460** |
| | 120 | 1951 | 1917 | 1882 | 1845 | 1808 | 1770 | 1731 | 1690 | 1648 | 1605 | 1559 | 1512 |
| **Emergency (< 1 hr )** | **130** | **2020** | **1988** | **1955** | **1921** | **1886** | **1850** | **1813** | **1775** | **1736** | **1696** | **1654** | **1610** |
| | 140 | 2087 | 2056 | 2025 | 1993 | 1960 | 1926 | 1891 | 1856 | 1819 | 1781 | 1742 | 1702 |
| | 150 | 2151 | 2122 | 2092 | 2062 | 2031 | 1999 | 1966 | 1933 | 1898 | 1863 | 1827 | 1789 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 1-1/2" Alum, Sched 80, 6061 Alloy | | Outside Diameter = | 1.9 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 1.9E-05 ohms/ft | $R_{high}$ = | 2.2E-05 ohms/ft |

Bus Conductor: **2" Alum, Sched 80, 6061 Alloy**

| Rating | Rated Operating Temperature | Assumed Wind Speed = 2 fps<br>Ambient Temperature ($^{o}$C)<br>-15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 1832 | 1763 | 1691 | 1616 | 1536 | 1451 | 1360 | 1261 | 1154 | 1034 | 897 | 734 |
| | 70 | 1957 | 1894 | 1829 | 1761 | 1689 | 1614 | 1535 | 1451 | 1361 | 1263 | 1157 | 1038 |
| | 80 | 2071 | 2013 | 1954 | 1892 | 1827 | 1760 | 1689 | 1615 | 1536 | 1453 | 1363 | 1266 |
| **Normal** | **90** | **2178** | **2125** | **2069** | **2012** | **1953** | **1892** | **1828** | **1761** | **1691** | **1617** | **1539** | **1456** |
| | 100 | 2279 | 2229 | 2177 | 2124 | 2070 | 2013 | 1954 | 1894 | 1830 | 1764 | 1694 | 1621 |
| | 110 | 2374 | 2327 | 2279 | 2230 | 2179 | 2126 | 2072 | 2016 | 1958 | 1898 | 1835 | 1770 |
| **Emergency (<24 hrs)** | **115** | **2420** | **2374** | **2328** | **2280** | **2231** | **2180** | **2128** | **2074** | **2019** | **1961** | **1902** | **1840** |
| | 120 | 2465 | 2421 | 2375 | 2329 | 2282 | 2233 | 2182 | 2131 | 2078 | 2023 | 1966 | 1906 |
| **Emergency (< 1 hr )** | **130** | **2552** | **2510** | **2468** | **2424** | **2379** | **2334** | **2288** | **2240** | **2191** | **2140** | **2087** | **2033** |
| | 140 | 2636 | 2596 | 2556 | 2516 | 2475 | 2432 | 2389 | 2344 | 2298 | 2251 | 2202 | 2151 |
| | 150 | 2717 | 2680 | 2643 | 2605 | 2566 | 2527 | 2486 | 2444 | 2400 | 2356 | 2310 | 2263 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 2" Alum, Sched 80, 6061 Alloy | | Outside Diameter = | 2.375 inches |
| | $T_{low}$ = | 20 $^{o}$C | $T_{high}$ = | 70 $^{o}$C |
| | $R_{low}$ = | 1.4E-05 ohms/ft | $R_{high}$ = | 1.6E-05 ohms/ft |

Bus Conductor: **2-1/2" Alum, Sched 80, 6061 Alloy**

| Rating | Rated Operating Temperature | Assumed Wind Speed = 2 fps<br>Ambient Temperature ($^{o}$C)<br>-15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 2401 | 2311 | 2216 | 2116 | 2010 | 1898 | 1777 | 1647 | 1504 | 1344 | 1161 | 940 |
| | 70 | 2566 | 2484 | 2398 | 2308 | 2214 | 2115 | 2011 | 1899 | 1780 | 1650 | 1509 | 1350 |
| | 80 | 2719 | 2643 | 2564 | 2483 | 2398 | 2309 | 2216 | 2118 | 2014 | 1903 | 1785 | 1656 |
| **Normal** | **90** | **2861** | **2790** | **2718** | **2643** | **2565** | **2484** | **2400** | **2312** | **2219** | **2122** | **2019** | **1909** |
| | 100 | 2994 | 2929 | 2861 | 2792 | 2720 | 2646 | 2569 | 2488 | 2405 | 2317 | 2225 | 2129 |
| | 110 | 3121 | 3059 | 2997 | 2932 | 2865 | 2796 | 2725 | 2651 | 2575 | 2495 | 2412 | 2325 |
| **Emergency (<24 hrs)** | **115** | **3182** | **3122** | **3061** | **2999** | **2934** | **2868** | **2799** | **2729** | **2655** | **2579** | **2499** | **2416** |
| | 120 | 3241 | 3184 | 3125 | 3064 | 3002 | 2938 | 2872 | 2803 | 2733 | 2659 | 2583 | 2504 |
| **Emergency (< 1 hr )** | **130** | **3357** | **3303** | **3247** | **3190** | **3132** | **3072** | **3010** | **2946** | **2881** | **2813** | **2743** | **2670** |
| | 140 | 3469 | 3418 | 3365 | 3312 | 3256 | 3200 | 3142 | 3082 | 3021 | 2958 | 2892 | 2825 |
| | 150 | 3578 | 3529 | 3479 | 3428 | 3376 | 3323 | 3268 | 3212 | 3154 | 3095 | 3034 | 2971 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 2-1/2" Alum, Sched 80, 6061 Alloy | | Outside Diameter = | 2.875 inches |
| | $T_{low}$ = | 20 $^{o}$C | $T_{high}$ = | 70 $^{o}$C |
| | $R_{low}$ = | 9E-06 ohms/ft | $R_{high}$ = | 1E-05 ohms/ft |

Bus Conductor: **3" Alum, Sched 80, 6061 Alloy**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature ($^{o}$C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 2957 | 2844 | 2727 | 2603 | 2471 | 2332 | 2181 | 2019 | 1840 | 1639 | 1408 | 1127 |
| | 70 | 3164 | 3062 | 2956 | 2844 | 2728 | 2605 | 2475 | 2336 | 2187 | 2026 | 1849 | 1650 |
| | 80 | 3355 | 3261 | 3164 | 3063 | 2958 | 2848 | 2732 | 2611 | 2481 | 2344 | 2196 | 2036 |
| **Normal** | **90** | **3533** | **3447** | **3357** | **3264** | **3168** | **3068** | **2964** | **2855** | **2740** | **2619** | **2491** | **2354** |
| | 100 | 3701 | 3620 | 3537 | 3452 | 3363 | 3271 | 3176 | 3076 | 2973 | 2864 | 2750 | 2630 |
| | 110 | 3860 | 3785 | 3707 | 3627 | 3545 | 3460 | 3372 | 3281 | 3186 | 3088 | 2984 | 2877 |
| **Emergency (<24 hrs)** | **115** | **3937** | **3864** | **3789** | **3712** | **3632** | **3550** | **3466** | **3378** | **3287** | **3193** | **3094** | **2991** |
| | 120 | 4012 | 3941 | 3869 | 3794 | 3717 | 3638 | 3556 | 3472 | 3385 | 3294 | 3200 | 3102 |
| **Emergency (< 1 hr )** | **130** | **4158** | **4092** | **4023** | **3953** | **3881** | **3807** | **3731** | **3652** | **3571** | **3487** | **3400** | **3310** |
| | 140 | 4299 | 4236 | 4172 | 4106 | 4038 | 3968 | 3897 | 3823 | 3747 | 3669 | 3588 | 3505 |
| | 150 | 4436 | 4376 | 4315 | 4253 | 4189 | 4123 | 4056 | 3987 | 3916 | 3842 | 3767 | 3689 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 3" Alum, Sched 80, 6061 Alloy | | Outside Diameter = | 3.5 inches |
| | $T_{low}$ = | 20 $^{o}$C | $T_{high}$ = | 70 $^{o}$C |
| | $R_{low}$ = | 6.8E-06 ohms/ft | $R_{high}$ = | 7.7E-06 ohms/ft |

Bus Conductor: **3-1/2" Alum, Sched 80, 6061 Alloy**

| Rating | Rated Operating Temperature | Assumed Wind Speed = 2 fps<br>Ambient Temperature ($^{o}$C)<br>-15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 3405 | 3275 | 3139 | 2996 | 2843 | 2681 | 2507 | 2317 | 2109 | 1875 | 1604 | 1272 |
| | 70 | 3647 | 3529 | 3406 | 3277 | 3142 | 3000 | 2849 | 2689 | 2516 | 2328 | 2121 | 1889 |
| | 80 | 3869 | 3761 | 3649 | 3532 | 3411 | 3283 | 3150 | 3008 | 2859 | 2699 | 2527 | 2341 |
| **Normal** | **90** | **4077** | **3977** | **3874** | **3767** | **3656** | **3540** | **3419** | **3293** | **3160** | **3020** | **2871** | **2713** |
| | 100 | 4272 | 4179 | 4084 | 3985 | 3882 | 3776 | 3666 | 3551 | 3432 | 3306 | 3174 | 3035 |
| | 110 | 4458 | 4371 | 4282 | 4190 | 4095 | 3997 | 3895 | 3790 | 3680 | 3566 | 3447 | 3322 |
| **Emergency (<24 hrs)** | **115** | **4547** | **4463** | **4377** | **4288** | **4196** | **4102** | **4004** | **3903** | **3798** | **3689** | **3575** | **3456** |
| | 120 | 4635 | 4554 | 4470 | 4384 | 4295 | 4204 | 4110 | 4013 | 3912 | 3807 | 3698 | 3585 |
| **Emergency (< 1 hr )** | **130** | **4806** | **4729** | **4650** | **4569** | **4486** | **4401** | **4313** | **4223** | **4129** | **4032** | **3932** | **3828** |
| | 140 | 4970 | 4898 | 4824 | 4747 | 4669 | 4589 | 4507 | 4422 | 4335 | 4245 | 4152 | 4055 |
| | 150 | 5130 | 5061 | 4991 | 4919 | 4846 | 4770 | 4693 | 4613 | 4531 | 4447 | 4360 | 4270 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 3-1/2" Alum, Sched 80, 6061 Alloy | | Outside Diameter = | 4 inches |
| | $T_{low}$ = | 20 $^{o}$C | $T_{high}$ = | 70 $^{o}$C |
| | $R_{low}$ = | 5.5E-06 ohms/ft | $R_{high}$ = | 6.3E-06 ohms/ft |

Bus Conductor: **4" Alum, Sched 80, 6061 Alloy**

| Rating | Rated Operating Temperature | Assumed Wind Speed = 2 fps<br>Ambient Temperature ($^{o}$C)<br>-15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 3867 | 3719 | 3564 | 3400 | 3226 | 3040 | 2841 | 2624 | 2384 | 2115 | 1802 | 1417 |
| | 70 | 4143 | 4009 | 3869 | 3723 | 3569 | 3406 | 3234 | 3050 | 2853 | 2637 | 2400 | 2134 |
| | 80 | 4398 | 4275 | 4148 | 4015 | 3876 | 3731 | 3579 | 3418 | 3247 | 3064 | 2868 | 2654 |
| **Normal** | **90** | **4636** | **4522** | **4405** | **4283** | **4157** | **4025** | **3888** | **3744** | **3592** | **3432** | **3263** | **3081** |
| | 100 | 4860 | 4754 | 4646 | 4533 | 4417 | 4296 | 4171 | 4040 | 3904 | 3761 | 3610 | 3451 |
| | 110 | 5072 | 4974 | 4872 | 4768 | 4660 | 4549 | 4433 | 4313 | 4189 | 4059 | 3923 | 3781 |
| **Emergency (<24 hrs)** | **115** | **5175** | **5080** | **4982** | **4881** | **4777** | **4669** | **4558** | **4443** | **4324** | **4199** | **4070** | **3934** |
| | 120 | 5276 | 5183 | 5088 | 4991 | 4890 | 4786 | 4679 | 4569 | 4454 | 4335 | 4211 | 4082 |
| **Emergency (< 1 hr )** | **130** | **5471** | **5384** | **5295** | **5203** | **5109** | **5012** | **4912** | **4809** | **4703** | **4593** | **4479** | **4360** |
| | 140 | 5660 | 5578 | 5493 | 5407 | 5319 | 5228 | 5134 | 5038 | 4939 | 4837 | 4731 | 4621 |
| | 150 | 5843 | 5765 | 5686 | 5604 | 5521 | 5435 | 5347 | 5257 | 5164 | 5068 | 4970 | 4868 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 4" Alum, Sched 80, 6061 Alloy | | Outside Diameter = | 4.5 inches |
| | $T_{low}$ = | 20 $^{o}$C | $T_{high}$ = | 70 $^{o}$C |
| | $R_{low}$ = | 4.6E-06 ohms/ft | $R_{high}$ = | 5.3E-06 ohms/ft |

Bus Conductor: **5" Alum, Sched 80, 6061 Alloy**

| Rating | Rated Operating Temperature | Assumed Wind Speed = 2 fps<br>Ambient Temperature ($^{o}$C)<br>-15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 4861 | 4674 | 4477 | 4269 | 4048 | 3812 | 3557 | 3280 | 2973 | 2626 | 2220 | 1714 |
| | 70 | 5218 | 5049 | 4871 | 4686 | 4491 | 4285 | 4065 | 3831 | 3579 | 3304 | 3000 | 2656 |
| | 80 | 5548 | 5393 | 5231 | 5063 | 4888 | 4704 | 4510 | 4306 | 4088 | 3856 | 3605 | 3332 |
| **Normal** | **90** | **5856** | **5713** | **5564** | **5411** | **5251** | **5084** | **4910** | **4727** | **4535** | **4331** | **4115** | **3884** |
| | 100 | 6146 | 6013 | 5876 | 5734 | 5587 | 5435 | 5276 | 5110 | 4937 | 4756 | 4564 | 4362 |
| | 110 | 6423 | 6298 | 6171 | 6039 | 5903 | 5762 | 5616 | 5464 | 5306 | 5142 | 4969 | 4789 |
| **Emergency (<24 hrs)** | **115** | **6556** | **6436** | **6312** | **6185** | **6054** | **5918** | **5778** | **5632** | **5481** | **5324** | **5159** | **4987** |
| | 120 | 6687 | 6571 | 6451 | 6328 | 6201 | 6070 | 5935 | 5795 | 5650 | 5499 | 5342 | 5178 |
| **Emergency (< 1 hr )** | **130** | **6942** | **6832** | **6720** | **6604** | **6486** | **6364** | **6238** | **6107** | **5973** | **5834** | **5689** | **5539** |
| | 140 | 7188 | 7085 | 6979 | 6870 | 6759 | 6644 | 6526 | 6405 | 6279 | 6150 | 6016 | 5877 |
| | 150 | 7428 | 7330 | 7230 | 7127 | 7022 | 6914 | 6804 | 6690 | 6572 | 6451 | 6326 | 6197 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 5" Alum, Sched 80, 6061 Alloy | | Outside Diameter = | 5.563 inches |
| | $T_{low}$ = | 20 $^{o}$C | $T_{high}$ = | 70 $^{o}$C |
| | $R_{low}$ = | 3.4E-06 ohms/ft | $R_{high}$ = | 3.8E-06 ohms/ft |

Bus Conductor: **6" Alum, Sched 80, 6061 Alloy**

| Rating | Rated Operating Temperature | Assumed Wind Speed = 2 fps<br>Ambient Temperature (°C)<br>-15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 6035 | 5801 | 5554 | 5294 | 5017 | 4721 | 4401 | 4051 | 3663 | 3224 | 2706 | 2052 |
| | 70 | 6482 | 6271 | 6050 | 5818 | 5574 | 5316 | 5042 | 4748 | 4431 | 4084 | 3701 | 3266 |
| | 80 | 6894 | 6701 | 6500 | 6291 | 6072 | 5843 | 5601 | 5345 | 5073 | 4781 | 4466 | 4123 |
| **Normal** | **90** | **7279** | **7101** | **6917** | **6726** | **6527** | **6319** | **6102** | **5874** | **5634** | **5380** | **5109** | **4819** |
| | 100 | 7641 | 7477 | 7306 | 7130 | 6948 | 6758 | 6560 | 6354 | 6138 | 5912 | 5673 | 5420 |
| | 110 | 7986 | 7832 | 7674 | 7511 | 7342 | 7167 | 6986 | 6797 | 6601 | 6396 | 6181 | 5955 |
| **Emergency (<24 hrs)** | **115** | **8153** | **8004** | **7851** | **7693** | **7531** | **7362** | **7188** | **7007** | **6819** | **6623** | **6419** | **6204** |
| | 120 | 8316 | 8172 | 8024 | 7872 | 7715 | 7552 | 7385 | 7211 | 7031 | 6843 | 6648 | 6443 |
| **Emergency (< 1 hr )** | **130** | **8633** | **8498** | **8359** | **8217** | **8070** | **7918** | **7762** | **7601** | **7434** | **7261** | **7082** | **6895** |
| | 140 | 8940 | 8813 | 8682 | 8548 | 8411 | 8269 | 8123 | 7973 | 7817 | 7657 | 7491 | 7318 |
| | 150 | 9239 | 9119 | 8995 | 8869 | 8739 | 8606 | 8469 | 8328 | 8183 | 8033 | 7879 | 7719 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 6" Alum, Sched 80, 6061 Alloy | | Outside Diameter = | 6.625 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 2.4E-06 ohms/ft | $R_{high}$ = | 2.8E-06 ohms/ft |

## Bus Conductor: **1" Alum, Sched 40, 6063 Alloy**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 1010 | 974 | 935 | 895 | 852 | 807 | 759 | 707 | 651 | 588 | 518 | 436 |
| | 70 | 1073 | 1039 | 1004 | 968 | 930 | 890 | 848 | 804 | 756 | 705 | 649 | 587 |
| | 80 | 1130 | 1099 | 1067 | 1034 | 1000 | 964 | 926 | 887 | 845 | 801 | 754 | 703 |
| **Normal** | **90** | **1183** | **1154** | **1125** | **1094** | **1063** | **1030** | **996** | **961** | **923** | **884** | **843** | **799** |
| | 100 | 1232 | 1206 | 1178 | 1150 | 1121 | 1091 | 1060 | 1027 | 994 | 958 | 921 | 883 |
| | 110 | 1278 | 1254 | 1228 | 1202 | 1175 | 1147 | 1118 | 1088 | 1057 | 1025 | 992 | 957 |
| **Emergency (<24 hrs)** | **115** | **1301** | **1277** | **1252** | **1226** | **1200** | **1173** | **1146** | **1117** | **1087** | **1056** | **1025** | **991** |
| | 120 | 1322 | 1299 | 1275 | 1250 | 1225 | 1199 | 1172 | 1145 | 1116 | 1087 | 1056 | 1024 |
| **Emergency (< 1 hr )** | **130** | **1364** | **1342** | **1319** | **1296** | **1273** | **1248** | **1223** | **1197** | **1171** | **1143** | **1115** | **1086** |
| | 140 | 1404 | 1383 | 1362 | 1340 | 1318 | 1295 | 1271 | 1247 | 1222 | 1197 | 1170 | 1143 |
| | 150 | 1443 | 1423 | 1403 | 1382 | 1361 | 1339 | 1317 | 1294 | 1271 | 1247 | 1222 | 1197 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 1" Alum, Sched 40, 6063 Alloy | | Outside Diameter = | 1.315 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 3.1E-05 ohms/ft | $R_{high}$ = | 3.7E-05 ohms/ft |

## Bus Conductor: **1-1/2" Alum, Sched 40, 6063 Alloy**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 1424 | 1371 | 1315 | 1257 | 1196 | 1132 | 1062 | 988 | 906 | 815 | 712 | 589 |
| | 70 | 1513 | 1466 | 1416 | 1365 | 1310 | 1254 | 1193 | 1129 | 1061 | 987 | 906 | 816 |
| | 80 | 1597 | 1553 | 1508 | 1461 | 1412 | 1361 | 1308 | 1251 | 1191 | 1128 | 1060 | 987 |
| **Normal** | **90** | **1675** | **1634** | **1593** | **1549** | **1505** | **1458** | **1410** | **1359** | **1306** | **1250** | **1191** | **1128** |
| | 100 | 1747 | 1710 | 1671 | 1631 | 1590 | 1547 | 1503 | 1457 | 1409 | 1358 | 1306 | 1250 |
| | 110 | 1815 | 1780 | 1744 | 1707 | 1669 | 1629 | 1589 | 1546 | 1502 | 1457 | 1409 | 1359 |
| **Emergency (<24 hrs)** | **115** | **1848** | **1814** | **1779** | **1744** | **1707** | **1669** | **1629** | **1588** | **1546** | **1503** | **1457** | **1409** |
| | 120 | 1880 | 1847 | 1814 | 1779 | 1743 | 1706 | 1668 | 1629 | 1589 | 1547 | 1503 | 1458 |
| **Emergency (< 1 hr )** | **130** | **1942** | **1911** | **1879** | **1847** | **1813** | **1779** | **1744** | **1707** | **1669** | **1630** | **1590** | **1548** |
| | 140 | 2002 | 1972 | 1942 | 1912 | 1880 | 1848 | 1815 | 1780 | 1745 | 1709 | 1672 | 1633 |
| | 150 | 2059 | 2031 | 2003 | 1974 | 1944 | 1914 | 1882 | 1850 | 1817 | 1783 | 1748 | 1712 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 1-1/2" Alum, Sched 40, 6063 Alloy | | Outside Diameter = | 1.9 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 1.9E-05 ohms/ft | $R_{high}$ = | 2.3E-05 ohms/ft |

## Bus Conductor: **2" Alum, Sched 40, 6063 Alloy**

| Rating | Rated Operating Temperature | Assumed Wind Speed = 2 fps<br>Ambient Temperature (°C)<br>-15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 1771 | 1704 | 1635 | 1562 | 1484 | 1402 | 1314 | 1219 | 1115 | 1000 | 868 | 710 |
| | 70 | 1885 | 1824 | 1762 | 1696 | 1627 | 1555 | 1479 | 1398 | 1311 | 1217 | 1114 | 1000 |
| | 80 | 1989 | 1934 | 1876 | 1817 | 1755 | 1690 | 1622 | 1551 | 1475 | 1395 | 1309 | 1216 |
| **Normal** | **90** | **2085** | **2034** | **1981** | **1927** | **1870** | **1811** | **1750** | **1686** | **1619** | **1548** | **1473** | **1394** |
| | 100 | 2175 | 2128 | 2079 | 2028 | 1976 | 1922 | 1866 | 1808 | 1747 | 1684 | 1617 | 1548 |
| | 110 | 2260 | 2215 | 2170 | 2123 | 2074 | 2024 | 1973 | 1919 | 1864 | 1807 | 1748 | 1685 |
| **Emergency (<24 hrs)** | **115** | **2301** | **2258** | **2213** | **2168** | **2121** | **2073** | **2023** | **1972** | **1919** | **1865** | **1808** | **1749** |
| | 120 | 2340 | 2299 | 2256 | 2212 | 2167 | 2120 | 2072 | 2023 | 1973 | 1921 | 1867 | 1810 |
| **Emergency (< 1 hr )** | **130** | **2417** | **2378** | **2337** | **2296** | **2254** | **2211** | **2167** | **2122** | **2075** | **2027** | **1977** | **1925** |
| | 140 | 2491 | 2454 | 2416 | 2377 | 2338 | 2299 | 2258 | 2215 | 2172 | 2127 | 2081 | 2033 |
| | 150 | 2562 | 2527 | 2492 | 2457 | 2420 | 2382 | 2344 | 2304 | 2263 | 2221 | 2178 | 2133 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 2" Alum, Sched 40, 6063 Alloy | | Outside Diameter = | 2.375 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 1.4E-05 ohms/ft | $R_{high}$ = | 1.7E-05 ohms/ft |

## Bus Conductor: **2-1/2" Alum, Sched 40, 6063 Alloy**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 2370 | 2280 | 2186 | 2088 | 1984 | 1873 | 1754 | 1625 | 1484 | 1326 | 1145 | 928 |
| | 70 | 2525 | 2444 | 2359 | 2271 | 2179 | 2081 | 1978 | 1869 | 1751 | 1624 | 1484 | 1329 |
| | 80 | 2667 | 2593 | 2516 | 2436 | 2352 | 2265 | 2174 | 2077 | 1976 | 1867 | 1751 | 1625 |
| **Normal** | **90** | **2799** | **2730** | **2659** | **2586** | **2510** | **2431** | **2348** | **2262** | **2171** | **2076** | **1975** | **1868** |
| | 100 | 2922 | 2858 | 2792 | 2724 | 2654 | 2582 | 2507 | 2428 | 2347 | 2261 | 2172 | 2077 |
| | 110 | 3038 | 2978 | 2917 | 2854 | 2789 | 2722 | 2653 | 2581 | 2506 | 2429 | 2348 | 2263 |
| **Emergency (<24 hrs)** | **115** | **3094** | **3036** | **2977** | **2916** | **2853** | **2789** | **2722** | **2653** | **2582** | **2507** | **2430** | **2349** |
| | 120 | 3148 | 3092 | 3035 | 2976 | 2915 | 2853 | 2789 | 2723 | 2654 | 2583 | 2509 | 2432 |
| **Emergency (< 1 hr )** | **130** | **3253** | **3201** | **3147** | **3092** | **3035** | **2977** | **2917** | **2855** | **2791** | **2726** | **2658** | **2587** |
| | 140 | 3355 | 3305 | 3254 | 3202 | 3149 | 3094 | 3038 | 2980 | 2921 | 2860 | 2797 | 2731 |
| | 150 | 3452 | 3405 | 3357 | 3308 | 3258 | 3207 | 3154 | 3100 | 3044 | 2987 | 2928 | 2867 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 2-1/2" Alum, Sched 40, 6063 Alloy | | Outside Diameter = | 2.875 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 9E-06 ohms/ft | $R_{high}$ = | 1.1E-05 ohms/ft |

## Bus Conductor: **3" Alum, Sched 40, 6063 Alloy**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 2885 | 2775 | 2660 | 2539 | 2411 | 2275 | 2128 | 1969 | 1795 | 1599 | 1373 | 1099 |
| | 70 | 3077 | 2978 | 2875 | 2767 | 2653 | 2534 | 2407 | 2272 | 2128 | 1970 | 1798 | 1605 |
| | 80 | 3254 | 3163 | 3069 | 2971 | 2869 | 2762 | 2650 | 2532 | 2406 | 2273 | 2130 | 1974 |
| **Normal** | **90** | **3417** | **3333** | **3247** | **3157** | **3064** | **2967** | **2866** | **2761** | **2650** | **2533** | **2409** | **2277** |
| | 100 | 3570 | 3492 | 3412 | 3329 | 3244 | 3155 | 3063 | 2968 | 2868 | 2763 | 2653 | 2537 |
| | 110 | 3715 | 3642 | 3567 | 3491 | 3411 | 3329 | 3245 | 3157 | 3066 | 2971 | 2872 | 2768 |
| **Emergency (<24 hrs)** | **115** | **3784** | **3714** | **3642** | **3567** | **3491** | **3412** | **3331** | **3247** | **3159** | **3068** | **2974** | **2875** |
| | 120 | 3852 | 3784 | 3714 | 3642 | 3568 | 3492 | 3414 | 3333 | 3249 | 3162 | 3072 | 2977 |
| **Emergency (< 1 hr )** | **130** | **3983** | **3919** | **3854** | **3786** | **3717** | **3646** | **3573** | **3498** | **3420** | **3340** | **3257** | **3170** |
| | 140 | 4109 | 4049 | 3987 | 3924 | 3859 | 3793 | 3724 | 3654 | 3582 | 3507 | 3430 | 3350 |
| | 150 | 4232 | 4174 | 4116 | 4056 | 3995 | 3933 | 3869 | 3803 | 3735 | 3665 | 3593 | 3519 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 3" Alum, Sched 40, 6063 Alloy | | Outside Diameter = | 3.5 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 6.9E-06 ohms/ft | $R_{high}$ = | 8.1E-06 ohms/ft |

## Bus Conductor: **3-1/2" Alum, Sched 40, 6063 Alloy**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 3301 | 3175 | 3043 | 2903 | 2756 | 2599 | 2430 | 2246 | 2044 | 1817 | 1554 | 1233 |
| | 70 | 3524 | 3410 | 3292 | 3167 | 3037 | 2899 | 2754 | 2598 | 2431 | 2250 | 2050 | 1826 |
| | 80 | 3729 | 3625 | 3517 | 3404 | 3287 | 3164 | 3035 | 2899 | 2755 | 2601 | 2436 | 2256 |
| **Normal** | **90** | **3919** | **3823** | **3723** | **3621** | **3514** | **3403** | **3287** | **3165** | **3038** | **2903** | **2760** | **2608** |
| | 100 | 4096 | 4007 | 3916 | 3821 | 3723 | 3621 | 3515 | 3405 | 3290 | 3170 | 3043 | 2910 |
| | 110 | 4264 | 4181 | 4096 | 4008 | 3917 | 3823 | 3726 | 3625 | 3521 | 3412 | 3298 | 3178 |
| **Emergency (<24 hrs)** | **115** | **4345** | **4265** | **4182** | **4097** | **4010** | **3919** | **3826** | **3729** | **3629** | **3525** | **3416** | **3303** |
| | 120 | 4424 | 4346 | 4266 | 4184 | 4100 | 4013 | 3923 | 3830 | 3734 | 3634 | 3530 | 3421 |
| **Emergency (< 1 hr )** | **130** | **4577** | **4504** | **4429** | **4352** | **4273** | **4192** | **4108** | **4022** | **3932** | **3840** | **3745** | **3645** |
| | 140 | 4724 | 4655 | 4584 | 4512 | 4438 | 4362 | 4284 | 4203 | 4120 | 4034 | 3946 | 3854 |
| | 150 | 4866 | 4801 | 4735 | 4666 | 4597 | 4525 | 4451 | 4376 | 4298 | 4218 | 4136 | 4051 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 3-1/2" Alum, Sched 40, 6063 Alloy | | Outside Diameter = | 4 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 5.7E-06 ohms/ft | $R_{high}$ = | 6.8E-06 ohms/ft |

## Bus Conductor: **4" Alum, Sched 40, 6063 Alloy**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 3729 | 3586 | 3437 | 3278 | 3111 | 2932 | 2739 | 2530 | 2299 | 2040 | 1738 | 1367 |
| | 70 | 3985 | 3856 | 3721 | 3580 | 3432 | 3276 | 3110 | 2934 | 2743 | 2536 | 2308 | 2052 |
| | 80 | 4219 | 4101 | 3979 | 3851 | 3718 | 3579 | 3433 | 3278 | 3114 | 2939 | 2751 | 2546 |
| **Normal** | **90** | **4436** | **4327** | **4215** | **4099** | **3978** | **3852** | **3720** | **3582** | **3437** | **3284** | **3122** | **2948** |
| | 100 | 4639 | 4539 | 4435 | 4327 | 4216 | 4101 | 3981 | 3857 | 3726 | 3590 | 3446 | 3294 |
| | 110 | 4831 | 4738 | 4641 | 4541 | 4439 | 4333 | 4223 | 4109 | 3990 | 3866 | 3737 | 3601 |
| **Emergency (<24 hrs)** | **115** | **4924** | **4833** | **4740** | **4644** | **4545** | **4443** | **4337** | **4227** | **4114** | **3996** | **3872** | **3744** |
| | 120 | 5014 | 4926 | 4836 | 4743 | 4648 | 4549 | 4448 | 4342 | 4233 | 4120 | 4002 | 3880 |
| **Emergency (< 1 hr )** | **130** | **5189** | **5107** | **5022** | **4935** | **4846** | **4754** | **4660** | **4562** | **4461** | **4357** | **4248** | **4136** |
| | 140 | 5358 | 5280 | 5201 | 5119 | 5035 | 4949 | 4861 | 4770 | 4676 | 4579 | 4479 | 4375 |
| | 150 | 5522 | 5448 | 5373 | 5296 | 5217 | 5136 | 5053 | 4968 | 4880 | 4790 | 4696 | 4600 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 4" Alum, Sched 40, 6063 Alloy | | Outside Diameter = | 4.5 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 4.8E-06 ohms/ft | $R_{high}$ = | 5.7E-06 ohms/ft |

## Bus Conductor: **4-1/2" Alum, Sched 40, 6063 Alloy**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 4158 | 3998 | 3830 | 3653 | 3465 | 3265 | 3048 | 2813 | 2553 | 2260 | 1919 | 1496 |
| | 70 | 4446 | 4302 | 4151 | 3993 | 3828 | 3653 | 3467 | 3269 | 3055 | 2823 | 2566 | 2277 |
| | 80 | 4710 | 4578 | 4441 | 4299 | 4150 | 3994 | 3831 | 3657 | 3474 | 3277 | 3066 | 2836 |
| **Normal** | **90** | **4955** | **4833** | **4708** | **4578** | **4443** | **4302** | **4155** | **4001** | **3838** | **3667** | **3485** | **3290** |
| | 100 | 5184 | 5072 | 4956 | 4836 | 4712 | 4583 | 4450 | 4310 | 4164 | 4011 | 3850 | 3680 |
| | 110 | 5401 | 5296 | 5189 | 5078 | 4963 | 4844 | 4722 | 4594 | 4461 | 4323 | 4178 | 4026 |
| **Emergency (<24 hrs)** | **115** | **5506** | **5404** | **5300** | **5193** | **5083** | **4969** | **4851** | **4728** | **4601** | **4469** | **4331** | **4187** |
| | 120 | 5608 | 5510 | 5409 | 5306 | 5199 | 5089 | 4976 | 4858 | 4736 | 4610 | 4478 | 4340 |
| **Emergency (< 1 hr )** | **130** | **5806** | **5714** | **5619** | **5523** | **5423** | **5321** | **5215** | **5106** | **4993** | **4876** | **4755** | **4630** |
| | 140 | 5997 | 5910 | 5821 | 5730 | 5637 | 5541 | 5442 | 5341 | 5236 | 5127 | 5015 | 4899 |
| | 150 | 6181 | 6100 | 6016 | 5930 | 5842 | 5752 | 5660 | 5564 | 5466 | 5365 | 5261 | 5154 |
| | | | | | | | WINTER | | | | | SUMMER | |

Weather Assumptions:

| | | | |
|---|---|---|---|
| Emissivity = | 0.5 | Suntime = | 14 |
| Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |

Conductor : 4-1/2" Alum, Sched 40, 6063 Alloy

| | | | |
|---|---|---|---|
| $T_{low}$ = | 20 °C | Outside Diameter = | 5 inches |
| $R_{low}$ = | 4.2E-06 ohms/ft | $T_{high}$ = | 70 °C |
| | | $R_{high}$ = | 4.9E-06 ohms/ft |

## Bus Conductor: **5" Alum, Sched 40, 6063 Alloy**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 4647 | 4468 | 4279 | 4080 | 3869 | 3643 | 3400 | 3135 | 2842 | 2510 | 2122 | 1639 |
| | 70 | 4973 | 4811 | 4642 | 4465 | 4279 | 4083 | 3874 | 3651 | 3410 | 3148 | 2858 | 2531 |
| | 80 | 5271 | 5124 | 4971 | 4811 | 4644 | 4469 | 4285 | 4091 | 3884 | 3663 | 3425 | 3166 |
| **Normal** | **90** | **5548** | **5413** | **5272** | **5127** | **4975** | **4817** | **4652** | **4479** | **4297** | **4104** | **3899** | **3680** |
| | 100 | 5808 | 5683 | 5553 | 5419 | 5280 | 5136 | 4986 | 4829 | 4666 | 4494 | 4313 | 4122 |
| | 110 | 6054 | 5937 | 5817 | 5692 | 5564 | 5431 | 5294 | 5151 | 5002 | 4847 | 4684 | 4514 |
| **Emergency (<24 hrs)** | **115** | **6173** | **6060** | **5943** | **5823** | **5700** | **5572** | **5440** | **5303** | **5160** | **5012** | **4857** | **4696** |
| | 120 | 6288 | 6179 | 6067 | 5951 | 5832 | 5709 | 5581 | 5450 | 5313 | 5171 | 5024 | 4869 |
| **Emergency (< 1 hr )** | **130** | **6513** | **6410** | **6305** | **6197** | **6085** | **5971** | **5852** | **5730** | **5604** | **5473** | **5338** | **5197** |
| | 140 | 6730 | 6633 | 6534 | 6432 | 6328 | 6221 | 6110 | 5996 | 5879 | 5758 | 5632 | 5502 |
| | 150 | 6940 | 6848 | 6755 | 6659 | 6561 | 6460 | 6357 | 6250 | 6141 | 6027 | 5911 | 5790 |
| | | | | | | | WINTER | | | | | SUMMER | |

Weather Assumptions:

| | | | |
|---|---|---|---|
| Emissivity = | 0.5 | Suntime = | 14 |
| Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |

Conductor : 5" Alum, Sched 40, 6063 Alloy

| | | | |
|---|---|---|---|
| | | Outside Diameter = | 5.563 inches |
| $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| $R_{low}$ = | 3.6E-06 ohms/ft | $R_{high}$ = | 4.2E-06 ohms/ft |

## Bus Conductor: **6" Alum, Sched 40, 6063 Alloy**

| Rating | Rated Operating Temperature | Assumed Wind Speed = 2 fps<br>Ambient Temperature (°C)<br>-15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 5599 | 5382 | 5154 | 4912 | 4655 | 4380 | 4083 | 3759 | 3399 | 2991 | 2511 | 1904 |
| | 70 | 6000 | 5804 | 5600 | 5385 | 5159 | 4921 | 4667 | 4395 | 4101 | 3781 | 3425 | 3023 |
| | 80 | 6367 | 6188 | 6003 | 5810 | 5608 | 5396 | 5172 | 4936 | 4684 | 4415 | 4125 | 3807 |
| **Normal** | **90** | **6707** | **6544** | **6374** | **6198** | **6014** | **5823** | **5623** | **5413** | **5192** | **4957** | **4708** | **4441** |
| | 100 | 7027 | 6876 | 6719 | 6557 | 6389 | 6215 | 6033 | 5843 | 5645 | 5437 | 5217 | 4984 |
| | 110 | 7330 | 7189 | 7043 | 6893 | 6738 | 6578 | 6412 | 6239 | 6058 | 5870 | 5673 | 5466 |
| **Emergency (<24 hrs)** | **115** | **7476** | **7339** | **7199** | **7055** | **6905** | **6751** | **6591** | **6425** | **6253** | **6073** | **5886** | **5689** |
| | 120 | 7618 | 7487 | 7351 | 7211 | 7068 | 6919 | 6765 | 6606 | 6441 | 6269 | 6090 | 5903 |
| **Emergency (< 1 hr )** | **130** | **7895** | **7772** | **7645** | **7514** | **7380** | **7242** | **7099** | **6952** | **6799** | **6641** | **6477** | **6306** |
| | 140 | 8163 | 8046 | 7927 | 7805 | 7679 | 7550 | 7416 | 7279 | 7137 | 6991 | 6839 | 6682 |
| | 150 | 8422 | 8312 | 8200 | 8085 | 7966 | 7845 | 7720 | 7592 | 7459 | 7323 | 7182 | 7036 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 6" Alum, Sched 40, 6063 Alloy | | Outside Diameter = | 6.625 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 2.8E-06 ohms/ft | $R_{high}$ = | 3.3E-06 ohms/ft |

## Bus Conductor: **1" Alum, Sched 80, 6063 Alloy**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 1149 | 1107 | 1064 | 1018 | 969 | 918 | 863 | 804 | 740 | 669 | 589 | 496 |
| | 70 | 1220 | 1182 | 1142 | 1101 | 1058 | 1013 | 965 | 914 | 860 | 802 | 738 | 668 |
| | 80 | 1285 | 1250 | 1214 | 1176 | 1137 | 1096 | 1054 | 1009 | 961 | 911 | 858 | 800 |
| **Normal** | **90** | **1345** | **1313** | **1279** | **1245** | **1209** | **1172** | **1133** | **1093** | **1050** | **1006** | **959** | **909** |
| | 100 | 1401 | 1371 | 1340 | 1308 | 1275 | 1241 | 1205 | 1168 | 1130 | 1090 | 1048 | 1004 |
| | 110 | 1454 | 1426 | 1397 | 1367 | 1336 | 1304 | 1272 | 1238 | 1203 | 1166 | 1128 | 1088 |
| **Emergency (<24 hrs)** | **115** | **1479** | **1452** | **1424** | **1395** | **1365** | **1335** | **1303** | **1270** | **1237** | **1202** | **1165** | **1127** |
| | 120 | 1504 | 1477 | 1450 | 1422 | 1393 | 1364 | 1333 | 1302 | 1269 | 1236 | 1201 | 1165 |
| **Emergency (< 1 hr )** | **130** | **1552** | **1526** | **1501** | **1474** | **1448** | **1420** | **1391** | **1362** | **1332** | **1301** | **1268** | **1235** |
| | 140 | 1597 | 1573 | 1549 | 1524 | 1499 | 1473 | 1446 | 1419 | 1390 | 1361 | 1331 | 1300 |
| | 150 | 1641 | 1618 | 1595 | 1572 | 1548 | 1523 | 1498 | 1472 | 1446 | 1418 | 1390 | 1361 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 1" Alum, Sched 80, 6063 Alloy | | Outside Diameter = | 1.315 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 2.4E-05 ohms/ft | $R_{high}$ = | 2.8E-05 ohms/ft |

## Bus Conductor: **1-1/2" Alum, Sched 80, 6063 Alloy**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 1645 | 1584 | 1520 | 1453 | 1383 | 1308 | 1228 | 1141 | 1047 | 942 | 822 | 681 |
| | 70 | 1749 | 1694 | 1637 | 1577 | 1515 | 1449 | 1379 | 1305 | 1226 | 1140 | 1047 | 943 |
| | 80 | 1846 | 1795 | 1743 | 1689 | 1632 | 1573 | 1511 | 1446 | 1377 | 1304 | 1225 | 1140 |
| **Normal** | **90** | **1936** | **1889** | **1841** | **1791** | **1739** | **1686** | **1630** | **1571** | **1510** | **1445** | **1376** | **1304** |
| | 100 | 2019 | 1976 | 1931 | 1885 | 1838 | 1788 | 1737 | 1684 | 1628 | 1570 | 1509 | 1445 |
| | 110 | 2098 | 2058 | 2016 | 1973 | 1929 | 1883 | 1836 | 1787 | 1736 | 1684 | 1628 | 1571 |
| **Emergency (<24 hrs)** | **115** | **2136** | **2097** | **2057** | **2015** | **1973** | **1929** | **1883** | **1836** | **1787** | **1737** | **1684** | **1629** |
| | 120 | 2173 | 2135 | 2096 | 2056 | 2015 | 1972 | 1929 | 1883 | 1836 | 1788 | 1737 | 1685 |
| **Emergency (< 1 hr )** | **130** | **2245** | **2209** | **2172** | **2135** | **2096** | **2056** | **2015** | **1973** | **1930** | **1885** | **1838** | **1790** |
| | 140 | 2314 | 2280 | 2245 | 2210 | 2173 | 2136 | 2097 | 2058 | 2017 | 1975 | 1932 | 1888 |
| | 150 | 2380 | 2348 | 2315 | 2282 | 2247 | 2212 | 2176 | 2139 | 2101 | 2061 | 2021 | 1979 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 1-1/2" Alum, Sched 80, 6063 Alloy | | Outside Diameter = | 1.9 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 1.4E-05 ohms/ft | $R_{high}$ = | 1.7E-05 ohms/ft |

## Bus Conductor: **2" Alum, Sched 80, 6063 Alloy**

| Rating | Rated Operating Temperature | Assumed Wind Speed = 2 fps<br>Ambient Temperature (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **-15** | **-10** | **-5** | **0** | **5** | **10** | **15** | **20** | **25** | **30** | **35** | **40** |
| | 60 | 2072 | 1994 | 1913 | 1827 | 1737 | 1640 | 1538 | 1426 | 1305 | 1170 | 1015 | 830 |
| | 70 | 2204 | 2133 | 2060 | 1983 | 1903 | 1819 | 1729 | 1634 | 1533 | 1423 | 1303 | 1169 |
| | 80 | 2325 | 2260 | 2193 | 2124 | 2051 | 1975 | 1896 | 1813 | 1724 | 1631 | 1530 | 1422 |
| **Normal** | **90** | **2437** | **2377** | **2315** | **2251** | **2185** | **2116** | **2045** | **1970** | **1892** | **1809** | **1722** | **1629** |
| | 100 | 2541 | 2485 | 2428 | 2369 | 2308 | 2245 | 2180 | 2112 | 2041 | 1967 | 1889 | 1808 |
| | 110 | 2639 | 2587 | 2534 | 2479 | 2422 | 2364 | 2304 | 2241 | 2177 | 2110 | 2041 | 1968 |
| **Emergency (<24 hrs)** | **115** | **2686** | **2636** | **2584** | **2531** | **2477** | **2421** | **2363** | **2303** | **2241** | **2178** | **2112** | **2042** |
| | 120 | 2732 | 2684 | 2634 | 2582 | 2529 | 2475 | 2419 | 2362 | 2304 | 2243 | 2179 | 2113 |
| **Emergency (< 1 hr )** | **130** | **2821** | **2775** | **2728** | **2680** | **2631** | **2581** | **2529** | **2477** | **2422** | **2366** | **2308** | **2247** |
| | 140 | 2906 | 2863 | 2819 | 2774 | 2729 | 2682 | 2634 | 2585 | 2534 | 2482 | 2428 | 2372 |
| | 150 | 2988 | 2948 | 2907 | 2866 | 2823 | 2779 | 2734 | 2688 | 2640 | 2591 | 2541 | 2489 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 2" Alum, Sched 80, 6063 Alloy | | Outside Diameter = | 2.375 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 1E-05 ohms/ft | $R_{high}$ = | 1.2E-05 ohms/ft |

## Bus Conductor: **2-1/2" Alum, Sched 80, 6063 Alloy**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 2719 | 2616 | 2509 | 2395 | 2276 | 2149 | 2012 | 1864 | 1702 | 1522 | 1314 | 1064 |
| | 70 | 2896 | 2802 | 2706 | 2604 | 2498 | 2387 | 2269 | 2143 | 2008 | 1862 | 1702 | 1524 |
| | 80 | 3057 | 2972 | 2884 | 2792 | 2696 | 2596 | 2491 | 2381 | 2264 | 2140 | 2007 | 1862 |
| **Normal** | **90** | **3207** | **3128** | **3047** | **2963** | **2875** | **2785** | **2690** | **2591** | **2488** | **2379** | **2263** | **2140** |
| | 100 | 3346 | 3273 | 3198 | 3120 | 3040 | 2957 | 2871 | 2781 | 2688 | 2590 | 2487 | 2379 |
| | 110 | 3478 | 3409 | 3339 | 3267 | 3193 | 3116 | 3037 | 2955 | 2869 | 2780 | 2688 | 2591 |
| **Emergency (<24 hrs)** | **115** | **3541** | **3475** | **3407** | **3337** | **3266** | **3192** | **3115** | **3036** | **2955** | **2870** | **2781** | **2689** |
| | 120 | 3602 | 3538 | 3473 | 3405 | 3336 | 3265 | 3191 | 3115 | 3037 | 2955 | 2871 | 2783 |
| **Emergency (< 1 hr )** | **130** | **3722** | **3661** | **3600** | **3537** | **3472** | **3405** | **3337** | **3266** | **3193** | **3118** | **3040** | **2959** |
| | 140 | 3836 | 3779 | 3721 | 3662 | 3601 | 3538 | 3474 | 3408 | 3340 | 3270 | 3198 | 3123 |
| | 150 | 3946 | 3893 | 3838 | 3782 | 3724 | 3665 | 3605 | 3543 | 3480 | 3414 | 3347 | 3278 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 2-1/2" Alum, Sched 80, 6063 Alloy | | Outside Diameter = | 2.875 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 6.8E-06 ohms/ft | $R_{high}$ = | 8.1E-06 ohms/ft |

## Bus Conductor: **3" Alum, Sched 80, 6063 Alloy**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 3345 | 3218 | 3085 | 2944 | 2796 | 2638 | 2468 | 2284 | 2081 | 1854 | 1593 | 1275 |
| | 70 | 3566 | 3451 | 3331 | 3206 | 3075 | 2936 | 2790 | 2633 | 2465 | 2283 | 2084 | 1860 |
| | 80 | 3768 | 3663 | 3554 | 3440 | 3322 | 3199 | 3069 | 2932 | 2787 | 2632 | 2466 | 2286 |
| **Normal** | **90** | **3955** | **3858** | **3758** | **3654** | **3547** | **3435** | **3318** | **3195** | **3067** | **2932** | **2788** | **2635** |
| | 100 | 4130 | 4040 | 3947 | 3852 | 3753 | 3650 | 3544 | 3433 | 3317 | 3196 | 3069 | 2935 |
| | 110 | 4295 | 4211 | 4124 | 4036 | 3944 | 3849 | 3752 | 3650 | 3545 | 3435 | 3320 | 3200 |
| **Emergency (<24 hrs)** | **115** | **4374** | **4293** | **4209** | **4124** | **4035** | **3944** | **3850** | **3753** | **3652** | **3547** | **3437** | **3323** |
| | 120 | 4451 | 4373 | 4292 | 4209 | 4124 | 4036 | 3945 | 3852 | 3755 | 3654 | 3550 | 3441 |
| **Emergency (< 1 hr )** | **130** | **4601** | **4527** | **4451** | **4373** | **4294** | **4212** | **4127** | **4040** | **3951** | **3858** | **3762** | **3662** |
| | 140 | 4745 | 4675 | 4604 | 4531 | 4456 | 4379 | 4300 | 4219 | 4135 | 4049 | 3960 | 3868 |
| | 150 | 4883 | 4818 | 4750 | 4681 | 4611 | 4539 | 4465 | 4388 | 4310 | 4230 | 4147 | 4061 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 3" Alum, Sched 80, 6063 Alloy | | Outside Diameter = | 3.5 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 5.1E-06 ohms/ft | $R_{high}$ = | 6E-06 ohms/ft |

Bus Conductor: **3-1/2" Alum, Sched 80, 6063 Alloy**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 3851 | 3704 | 3550 | 3388 | 3215 | 3032 | 2835 | 2621 | 2385 | 2120 | 1813 | 1438 |
| | 70 | 4108 | 3975 | 3837 | 3692 | 3540 | 3380 | 3210 | 3029 | 2834 | 2623 | 2390 | 2128 |
| | 80 | 4343 | 4222 | 4096 | 3965 | 3829 | 3686 | 3536 | 3377 | 3209 | 3030 | 2837 | 2628 |
| **Normal** | **90** | **4561** | **4449** | **4334** | **4214** | **4090** | **3960** | **3825** | **3684** | **3535** | **3379** | **3212** | **3035** |
| | 100 | 4764 | 4661 | 4554 | 4444 | 4330 | 4211 | 4088 | 3960 | 3827 | 3687 | 3540 | 3384 |
| | 110 | 4956 | 4860 | 4760 | 4658 | 4553 | 4444 | 4331 | 4214 | 4092 | 3965 | 3833 | 3694 |
| **Emergency (<24 hrs)** | **115** | **5048** | **4955** | **4859** | **4760** | **4659** | **4554** | **4445** | **4333** | **4217** | **4095** | **3969** | **3837** |
| | 120 | 5139 | 5048 | 4955 | 4860 | 4762 | 4661 | 4556 | 4448 | 4337 | 4221 | 4100 | 3974 |
| **Emergency (< 1 hr )** | **130** | **5313** | **5228** | **5141** | **5052** | **4960** | **4866** | **4768** | **4668** | **4565** | **4458** | **4347** | **4232** |
| | 140 | 5481 | 5401 | 5319 | 5235 | 5149 | 5060 | 4970 | 4876 | 4780 | 4680 | 4578 | 4471 |
| | 150 | 5643 | 5567 | 5490 | 5411 | 5330 | 5247 | 5161 | 5074 | 4984 | 4891 | 4796 | 4697 |
| | | | | | | | WINTER | | | | | SUMMER | |

Weather Assumptions:

| | | | |
|---|---|---|---|
| Emissivity = | 0.5 | Suntime = | 14 |
| Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |

Conductor : 3-1/2" Alum, Sched 80, 6063 Alloy

| | | | |
|---|---|---|---|
| Outside Diameter = | 4 inches | | |
| $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| $R_{low}$ = | 4.2E-06 ohms/ft | $R_{high}$ = | 5E-06 ohms/ft |

Bus Conductor: **4" Alum, Sched 80, 6063 Alloy**

| Rating | Rated Operating Temperature | Assumed Wind Speed = 2 fps<br>Ambient Temperature (°C)<br>-15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 4419 | 4250 | 4073 | 3885 | 3687 | 3475 | 3246 | 2998 | 2725 | 2417 | 2060 | 1619 |
| | 70 | 4728 | 4575 | 4415 | 4248 | 4072 | 3887 | 3691 | 3481 | 3255 | 3010 | 2739 | 2435 |
| | 80 | 5012 | 4871 | 4726 | 4575 | 4417 | 4251 | 4078 | 3894 | 3699 | 3492 | 3268 | 3025 |
| **Normal** | **90** | **5275** | **5146** | **5012** | **4874** | **4730** | **4580** | **4424** | **4260** | **4088** | **3906** | **3713** | **3506** |
| | 100 | 5523 | 5403 | 5279 | 5152 | 5019 | 4882 | 4740 | 4591 | 4436 | 4274 | 4102 | 3922 |
| | 110 | 5757 | 5645 | 5530 | 5412 | 5289 | 5163 | 5032 | 4896 | 4754 | 4607 | 4453 | 4291 |
| **Emergency (<24 hrs)** | **115** | **5870** | **5762** | **5651** | **5536** | **5418** | **5296** | **5170** | **5040** | **4905** | **4764** | **4617** | **4463** |
| | 120 | 5981 | 5876 | 5768 | 5658 | 5544 | 5426 | 5305 | 5179 | 5049 | 4914 | 4774 | 4627 |
| **Emergency (< 1 hr )** | **130** | **6195** | **6097** | **5996** | **5892** | **5785** | **5676** | **5563** | **5446** | **5326** | **5201** | **5072** | **4938** |
| | 140 | 6402 | 6309 | 6214 | 6116 | 6016 | 5914 | 5808 | 5699 | 5587 | 5471 | 5351 | 5227 |
| | 150 | 6603 | 6515 | 6425 | 6333 | 6239 | 6142 | 6043 | 5940 | 5835 | 5727 | 5616 | 5501 |
| | | | | | | | WINTER | | | | | SUMMER | |

Weather Assumptions:

| | | | |
|---|---|---|---|
| Emissivity = | 0.5 | Suntime = | 14 |
| Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |

Conductor : 4" Alum, Sched 80, 6063 Alloy

| | | | |
|---|---|---|---|
| Outside Diameter = | 4.5 inches | | |
| $T_{low}$ = | 20 °C | $T_{high}$ = | 80 °C |
| $R_{low}$ = | 3.5E-06 ohms/ft | $R_{high}$ = | 4.2E-06 ohms/ft |

## Bus Conductor: **4-1/2" Alum, Sched 80, 6063 Alloy**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 4895 | 4707 | 4510 | 4301 | 4080 | 3844 | 3589 | 3312 | 3006 | 2661 | 2259 | 1761 |
| | 70 | 5227 | 5058 | 4881 | 4695 | 4501 | 4295 | 4077 | 3843 | 3592 | 3319 | 3017 | 2677 |
| | 80 | 5530 | 5376 | 5215 | 5048 | 4873 | 4690 | 4498 | 4295 | 4079 | 3848 | 3600 | 3330 |
| **Normal** | **90** | **5811** | **5669** | **5522** | **5369** | **5211** | **5045** | **4873** | **4692** | **4502** | **4300** | **4087** | **3859** |
| | 100 | 6073 | 5942 | 5806 | 5666 | 5520 | 5369 | 5213 | 5049 | 4878 | 4699 | 4511 | 4311 |
| | 110 | 6321 | 6198 | 6072 | 5942 | 5808 | 5669 | 5525 | 5376 | 5221 | 5059 | 4890 | 4712 |
| **Emergency (<24 hrs)** | **115** | **6440** | **6321** | **6199** | **6074** | **5945** | **5811** | **5673** | **5530** | **5382** | **5227** | **5066** | **4897** |
| | 120 | 6556 | 6441 | 6324 | 6203 | 6078 | 5949 | 5817 | 5679 | 5537 | 5389 | 5235 | 5074 |
| **Emergency (< 1 hr )** | **130** | **6781** | **6673** | **6563** | **6450** | **6334** | **6214** | **6091** | **5963** | **5832** | **5695** | **5554** | **5407** |
| | 140 | 6997 | 6896 | 6792 | 6686 | 6577 | 6465 | 6350 | 6232 | 6109 | 5983 | 5852 | 5717 |
| | 150 | 7207 | 7111 | 7014 | 6914 | 6811 | 6706 | 6598 | 6487 | 6373 | 6255 | 6134 | 6008 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 4-1/2" Alum, Sched 80, 6063 Alloy | | Outside Diameter = | 5 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 3E-06 ohms/ft | $R_{high}$ = | 3.6E-06 ohms/ft |

## Bus Conductor: **5" Alum, Sched 80, 6063 Alloy**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 5492 | 5281 | 5058 | 4823 | 4573 | 4307 | 4019 | 3705 | 3359 | 2967 | 2508 | 1937 |
| | 70 | 5867 | 5676 | 5477 | 5269 | 5049 | 4817 | 4571 | 4308 | 4024 | 3715 | 3373 | 2987 |
| | 80 | 6209 | 6035 | 5855 | 5667 | 5470 | 5265 | 5048 | 4819 | 4575 | 4315 | 4035 | 3729 |
| **Normal** | **90** | **6525** | **6366** | **6201** | **6029** | **5851** | **5665** | **5471** | **5268** | **5053** | **4827** | **4586** | **4328** |
| | 100 | 6821 | 6674 | 6521 | 6364 | 6201 | 6031 | 5855 | 5671 | 5479 | 5278 | 5065 | 4841 |
| | 110 | 7100 | 6963 | 6821 | 6676 | 6525 | 6369 | 6208 | 6040 | 5866 | 5684 | 5493 | 5293 |
| **Emergency (<24 hrs)** | **115** | **7234** | **7101** | **6965** | **6825** | **6680** | **6530** | **6375** | **6215** | **6048** | **5874** | **5693** | **5503** |
| | 120 | 7365 | 7237 | 7105 | 6969 | 6830 | 6686 | 6537 | 6383 | 6223 | 6056 | 5883 | 5703 |
| **Emergency (< 1 hr )** | **130** | **7619** | **7498** | **7375** | **7248** | **7118** | **6984** | **6846** | **6703** | **6555** | **6402** | **6244** | **6079** |
| | 140 | 7863 | 7750 | 7634 | 7515 | 7393 | 7268 | 7139 | 7006 | 6869 | 6727 | 6580 | 6429 |
| | 150 | 8099 | 7992 | 7883 | 7771 | 7657 | 7539 | 7418 | 7294 | 7166 | 7034 | 6898 | 6757 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 5" Alum, Sched 80, 6063 Alloy | | Outside Diameter = | 5.563 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 2.5E-06 ohms/ft | $R_{high}$ = | 3E-06 ohms/ft |

## Bus Conductor: **6" Alum, Sched 80, 6063 Alloy**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 6762 | 6500 | 6224 | 5932 | 5622 | 5290 | 4931 | 4539 | 4105 | 3612 | 3032 | 2300 |
| | 70 | 7222 | 6986 | 6740 | 6482 | 6210 | 5923 | 5617 | 5290 | 4936 | 4551 | 4123 | 3639 |
| | 80 | 7640 | 7426 | 7203 | 6971 | 6729 | 6474 | 6206 | 5923 | 5621 | 5298 | 4949 | 4569 |
| **Normal** | **90** | **8025** | **7829** | **7626** | **7416** | **7196** | **6967** | **6728** | **6476** | **6212** | **5931** | **5633** | **5314** |
| | 100 | 8385 | 8204 | 8017 | 7824 | 7624 | 7416 | 7199 | 6973 | 6736 | 6487 | 6225 | 5948 |
| | 110 | 8724 | 8556 | 8383 | 8205 | 8020 | 7829 | 7631 | 7425 | 7211 | 6987 | 6752 | 6506 |
| **Emergency (<24 hrs)** | **115** | **8887** | **8725** | **8558** | **8386** | **8209** | **8025** | **7835** | **7638** | **7433** | **7220** | **6997** | **6763** |
| | 120 | 9046 | 8889 | 8728 | 8563 | 8392 | 8215 | 8033 | 7844 | 7648 | 7444 | 7231 | 7009 |
| **Emergency (< 1 hr )** | **130** | **9353** | **9207** | **9057** | **8902** | **8743** | **8579** | **8410** | **8235** | **8055** | **7867** | **7673** | **7470** |
| | 140 | 9649 | 9512 | 9371 | 9226 | 9077 | 8925 | 8767 | 8605 | 8437 | 8264 | 8085 | 7899 |
| | 150 | 9936 | 9806 | 9674 | 9538 | 9398 | 9255 | 9108 | 8956 | 8800 | 8639 | 8473 | 8301 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.5 | Suntime = | 14 |
| | Absorptivity = | 0.5 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 6" Alum, Sched 80, 6063 Alloy | | Outside Diameter = | 6.625 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 1.8E-06 ohms/ft | $R_{high}$ = | 2.2E-06 ohms/ft |

## Bus Conductor: **3/4" Copper, Schedule 40, 98% ICAS**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 1081 | 1041 | 998 | 954 | 906 | 855 | 801 | 742 | 677 | 604 | 519 | 417 |
| | 70 | 1154 | 1117 | 1079 | 1039 | 997 | 953 | 906 | 856 | 802 | 743 | 679 | 607 |
| | 80 | 1220 | 1187 | 1152 | 1116 | 1078 | 1038 | 997 | 953 | 906 | 857 | 803 | 745 |
| **Normal** | **90** | **1281** | **1250** | **1219** | **1186** | **1151** | **1115** | **1078** | **1039** | **998** | **954** | **908** | **859** |
| | 100 | 1339 | 1310 | 1281 | 1250 | 1219 | 1186 | 1152 | 1116 | 1079 | 1040 | 1000 | 956 |
| | 110 | 1393 | 1366 | 1339 | 1311 | 1281 | 1251 | 1220 | 1187 | 1154 | 1119 | 1082 | 1043 |
| **Emergency (<24 hrs)** | **115** | **1419** | **1393** | **1367** | **1339** | **1311** | **1282** | **1252** | **1221** | **1189** | **1155** | **1120** | **1083** |
| | 120 | 1444 | 1419 | 1394 | 1367 | 1340 | 1312 | 1283 | 1253 | 1222 | 1190 | 1157 | 1122 |
| **Emergency (< 1 hr )** | **130** | **1493** | **1470** | **1446** | **1421** | **1396** | **1370** | **1343** | **1315** | **1286** | **1257** | **1226** | **1194** |
| | 140 | 1541 | 1519 | 1496 | 1473 | 1449 | 1425 | 1400 | 1374 | 1347 | 1319 | 1291 | 1261 |
| | 150 | 1586 | 1566 | 1544 | 1523 | 1500 | 1477 | 1453 | 1429 | 1404 | 1378 | 1352 | 1324 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.85 | Suntime = | 14 |
| | Absorptivity = | 0.85 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 3/4" Copper, Schedule 40, 98% ICAS | | Outside Diameter = | 1.05 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 2.5E-05 ohms/ft | $R_{high}$ = | 3E-05 ohms/ft |

Bus Conductor: **1" Copper, Schedule 40, 98% ICAS**

| Rating | Rated Operating Temperature | Assumed Wind Speed = 2 fps<br>Ambient Temperature (°C)<br>-15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 1367 | 1316 | 1261 | 1204 | 1143 | 1078 | 1008 | 931 | 847 | 752 | 641 | 505 |
| | 70 | 1462 | 1415 | 1366 | 1315 | 1262 | 1205 | 1145 | 1080 | 1011 | 935 | 852 | 758 |
| | 80 | 1548 | 1505 | 1461 | 1415 | 1367 | 1317 | 1263 | 1207 | 1147 | 1084 | 1015 | 940 |
| **Normal** | **90** | **1628** | **1589** | **1548** | **1506** | **1463** | **1417** | **1369** | **1319** | **1266** | **1211** | **1151** | **1088** |
| | 100 | 1703 | 1667 | 1629 | 1591 | 1551 | 1509 | 1466 | 1420 | 1373 | 1323 | 1271 | 1216 |
| | 110 | 1774 | 1740 | 1705 | 1670 | 1632 | 1594 | 1554 | 1513 | 1470 | 1425 | 1378 | 1329 |
| **Emergency (<24 hrs)** | **115** | **1808** | **1775** | **1742** | **1707** | **1672** | **1635** | **1596** | **1557** | **1516** | **1473** | **1428** | **1381** |
| | 120 | 1841 | 1810 | 1777 | 1744 | 1710 | 1674 | 1637 | 1599 | 1560 | 1519 | 1476 | 1431 |
| **Emergency (< 1 hr )** | **130** | **1906** | **1876** | **1846** | **1815** | **1783** | **1749** | **1715** | **1680** | **1643** | **1606** | **1566** | **1525** |
| | 140 | 1968 | 1940 | 1912 | 1882 | 1852 | 1821 | 1789 | 1756 | 1722 | 1687 | 1651 | 1613 |
| | 150 | 2028 | 2002 | 1975 | 1947 | 1919 | 1890 | 1860 | 1829 | 1798 | 1765 | 1731 | 1696 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.85 | Suntime = | 14 |
| | Absorptivity = | 0.85 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 1" Copper, Schedule 40, 98% ICAS | | Outside Diameter = | 1.315 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 1.8E-05 ohms/ft | $R_{high}$ = | 2.1E-05 ohms/ft |

## Bus Conductor: **1-1/4" Copper, Schedule 40, 98% ICAS**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 1772 | 1704 | 1633 | 1558 | 1477 | 1392 | 1299 | 1198 | 1085 | 958 | 808 | 621 |
| | 70 | 1898 | 1837 | 1773 | 1707 | 1636 | 1562 | 1482 | 1397 | 1306 | 1205 | 1094 | 969 |
| | 80 | 2013 | 1958 | 1900 | 1840 | 1777 | 1711 | 1641 | 1567 | 1489 | 1405 | 1314 | 1214 |
| **Normal** | **90** | **2121** | **2070** | **2017** | **1962** | **1905** | **1846** | **1783** | **1718** | **1648** | **1575** | **1497** | **1413** |
| | 100 | 2221 | 2174 | 2126 | 2075 | 2023 | 1969 | 1912 | 1853 | 1791 | 1726 | 1657 | 1584 |
| | 110 | 2317 | 2273 | 2228 | 2181 | 2133 | 2083 | 2031 | 1977 | 1921 | 1862 | 1800 | 1736 |
| **Emergency (<24 hrs)** | **115** | **2363** | **2320** | **2277** | **2232** | **2186** | **2138** | **2088** | **2036** | **1982** | **1926** | **1867** | **1806** |
| | 120 | 2408 | 2367 | 2325 | 2281 | 2237 | 2190 | 2142 | 2093 | 2041 | 1987 | 1931 | 1873 |
| **Emergency (< 1 hr )** | **130** | **2495** | **2456** | **2417** | **2377** | **2335** | **2292** | **2247** | **2201** | **2154** | **2104** | **2053** | **1999** |
| | 140 | 2579 | 2543 | 2506 | 2468 | 2429 | 2388 | 2347 | 2304 | 2260 | 2214 | 2167 | 2117 |
| | 150 | 2660 | 2626 | 2591 | 2556 | 2519 | 2481 | 2442 | 2402 | 2361 | 2318 | 2274 | 2229 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.85 | Suntime = | 14 |
| | Absorptivity = | 0.85 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 1-1/4" Copper, Schedule 40, 98% ICAS | | Outside Diameter = | 1.66 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 1.2E-05 ohms/ft | $R_{high}$ = | 1.4E-05 ohms/ft |

## Bus Conductor: **1-1/2" Copper, Schedule 40, 98% ICAS**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 2009 | 1931 | 1849 | 1763 | 1671 | 1573 | 1466 | 1350 | 1221 | 1073 | 900 | 679 |
| | 70 | 2153 | 2083 | 2011 | 1935 | 1854 | 1769 | 1679 | 1581 | 1476 | 1361 | 1233 | 1088 |
| | 80 | 2286 | 2223 | 2158 | 2089 | 2018 | 1942 | 1862 | 1778 | 1688 | 1592 | 1487 | 1373 |
| **Normal** | **90** | **2411** | **2353** | **2293** | **2230** | **2165** | **2098** | **2026** | **1951** | **1872** | **1789** | **1699** | **1604** |
| | 100 | 2527 | 2474 | 2418 | 2361 | 2302 | 2240 | 2175 | 2108 | 2037 | 1963 | 1884 | 1801 |
| | 110 | 2637 | 2588 | 2537 | 2484 | 2429 | 2372 | 2313 | 2252 | 2187 | 2120 | 2050 | 1976 |
| **Emergency (<24 hrs)** | **115** | **2691** | **2643** | **2593** | **2542** | **2490** | **2435** | **2378** | **2319** | **2258** | **2194** | **2127** | **2057** |
| | 120 | 2743 | 2696 | 2649 | 2600 | 2549 | 2496 | 2442 | 2385 | 2326 | 2265 | 2201 | 2135 |
| **Emergency (< 1 hr )** | **130** | **2844** | **2800** | **2756** | **2710** | **2662** | **2614** | **2563** | **2511** | **2457** | **2400** | **2342** | **2281** |
| | 140 | 2941 | 2901 | 2859 | 2816 | 2771 | 2726 | 2679 | 2630 | 2580 | 2527 | 2473 | 2417 |
| | 150 | 3036 | 2998 | 2958 | 2918 | 2876 | 2833 | 2789 | 2744 | 2697 | 2648 | 2598 | 2546 |
| | | | | | | | WINTER | | | | | SUMMER | |

Weather Assumptions:

| | | | |
|---|---|---|---|
| Emissivity = | 0.85 | Suntime = | 14 |
| Absorptivity = | 0.85 | Degrees North Latitude= | 40 |
| Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |

Conductor : 1-1/2" Copper, Schedule 40, 98% ICAS

| | | | |
|---|---|---|---|
| $T_{low}$ = | 20 °C | Outside Diameter = | 1.9 inches |
| $R_{low}$ = | 1E-05 ohms/ft | $T_{high}$ = | 70 °C |
| | | $R_{high}$ = | 1.2E-05 ohms/ft |

## Bus Conductor: **2" Copper, Schedule 40, 98% ICAS**

| Rating | Rated Operating Temperature | Assumed Wind Speed = 2 fps<br>Ambient Temperature (°C)<br>-15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 2486 | 2389 | 2286 | 2177 | 2061 | 1936 | 1801 | 1653 | 1488 | 1300 | 1076 | 785 |
| | 70 | 2669 | 2581 | 2490 | 2393 | 2292 | 2184 | 2069 | 1946 | 1813 | 1667 | 1504 | 1319 |
| | 80 | 2836 | 2756 | 2674 | 2587 | 2497 | 2401 | 2301 | 2194 | 2081 | 1959 | 1827 | 1683 |
| **Normal** | **90** | **2991** | **2918** | **2843** | **2764** | **2682** | **2597** | **2507** | **2413** | **2313** | **2207** | **2095** | **1974** |
| | 100 | 3137 | 3070 | 3000 | 2928 | 2853 | 2775 | 2694 | 2609 | 2520 | 2427 | 2328 | 2224 |
| | 110 | 3275 | 3212 | 3148 | 3081 | 3012 | 2941 | 2867 | 2789 | 2709 | 2625 | 2538 | 2446 |
| **Emergency (<24 hrs)** | **115** | **3342** | **3281** | **3219** | **3155** | **3088** | **3020** | **2949** | **2875** | **2798** | **2719** | **2636** | **2549** |
| | 120 | 3407 | 3348 | 3288 | 3226 | 3162 | 3096 | 3028 | 2958 | 2885 | 2809 | 2730 | 2647 |
| **Emergency (< 1 hr )** | **130** | **3533** | **3478** | **3422** | **3365** | **3305** | **3244** | **3182** | **3118** | **3051** | **2981** | **2908** | **2833** |
| | 140 | 3655 | 3604 | 3551 | 3498 | 3443 | 3387 | 3329 | 3269 | 3207 | 3143 | 3076 | 3006 |
| | 150 | 3774 | 3726 | 3678 | 3628 | 3577 | 3524 | 3470 | 3414 | 3356 | 3296 | 3235 | 3170 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.85 | Suntime = | 14 |
| | Absorptivity = | 0.85 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 2" Copper, Schedule 40, 98% ICAS | | Outside Diameter = | 2.375 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 7.6E-06 ohms/ft | $R_{high}$ = | 9.1E-06 ohms/ft |

## Bus Conductor: **2-1/2" Copper, Schedule 40, 98% ICAS**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 3190 | 3064 | 2930 | 2789 | 2639 | 2477 | 2301 | 2107 | 1891 | 1643 | 1345 | 950 |
| | 70 | 3430 | 3317 | 3199 | 3074 | 2943 | 2803 | 2654 | 2494 | 2320 | 2129 | 1916 | 1672 |
| | 80 | 3650 | 3548 | 3441 | 3329 | 3212 | 3089 | 2959 | 2821 | 2673 | 2515 | 2343 | 2154 |
| **Normal** | **90** | **3855** | **3761** | **3663** | **3562** | **3456** | **3346** | **3230** | **3108** | **2979** | **2842** | **2695** | **2538** |
| | 100 | 4047 | 3960 | 3870 | 3778 | 3681 | 3581 | 3476 | 3366 | 3251 | 3130 | 3002 | 2866 |
| | 110 | 4229 | 4148 | 4065 | 3980 | 3891 | 3799 | 3703 | 3603 | 3499 | 3390 | 3276 | 3155 |
| **Emergency (<24 hrs)** | **115** | **4317** | **4239** | **4159** | **4077** | **3991** | **3903** | **3811** | **3716** | **3616** | **3512** | **3404** | **3290** |
| | 120 | 4402 | 4328 | 4251 | 4171 | 4089 | 4004 | 3916 | 3824 | 3729 | 3630 | 3526 | 3418 |
| **Emergency (< 1 hr )** | **130** | **4570** | **4500** | **4428** | **4353** | **4277** | **4198** | **4116** | **4032** | **3944** | **3853** | **3759** | **3660** |
| | 140 | 4731 | 4665 | 4598 | 4528 | 4457 | 4383 | 4307 | 4229 | 4148 | 4064 | 3976 | 3886 |
| | 150 | 4888 | 4826 | 4763 | 4698 | 4631 | 4562 | 4491 | 4417 | 4342 | 4264 | 4183 | 4099 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.85 | Suntime = | 14 |
| | Absorptivity = | 0.85 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 2-1/2" Copper, Schedule 40, 98% ICAS | | Outside Diameter = | 2.875 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 5.3E-06 ohms/ft | $R_{high}$ = | 6.3E-06 ohms/ft |

## Bus Conductor: **3" Copper, Schedule 40, 98% ICAS**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 4065 | 3903 | 3732 | 3550 | 3356 | 3146 | 2918 | 2667 | 2385 | 2059 | 1663 | 1127 |
| | 70 | 4380 | 4235 | 4083 | 3923 | 3753 | 3574 | 3381 | 3174 | 2949 | 2701 | 2423 | 2103 |
| | 80 | 4668 | 4537 | 4400 | 4256 | 4106 | 3948 | 3780 | 3602 | 3412 | 3207 | 2984 | 2739 |
| **Normal** | **90** | **4936** | **4816** | **4691** | **4561** | **4426** | **4284** | **4135** | **3977** | **3811** | **3635** | **3446** | **3243** |
| | 100 | 5188 | 5077 | 4963 | 4844 | 4720 | 4591 | 4457 | 4316 | 4168 | 4012 | 3847 | 3671 |
| | 110 | 5426 | 5324 | 5218 | 5109 | 4995 | 4877 | 4754 | 4626 | 4493 | 4353 | 4205 | 4050 |
| **Emergency (<24 hrs)** | **115** | **5542** | **5443** | **5341** | **5236** | **5126** | **5013** | **4896** | **4773** | **4646** | **4512** | **4373** | **4226** |
| | 120 | 5655 | 5559 | 5461 | 5359 | 5254 | 5146 | 5033 | 4916 | 4794 | 4666 | 4533 | 4394 |
| **Emergency (< 1 hr )** | **130** | **5874** | **5785** | **5693** | **5599** | **5501** | **5400** | **5296** | **5188** | **5075** | **4959** | **4837** | **4710** |
| | 140 | 6087 | 6003 | 5917 | 5829 | 5738 | 5644 | 5546 | 5446 | 5342 | 5234 | 5123 | 5006 |
| | 150 | 6294 | 6215 | 6134 | 6051 | 5966 | 5878 | 5787 | 5693 | 5597 | 5497 | 5393 | 5286 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.85 | Suntime = | 14 |
| | Absorptivity = | 0.85 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 3" Copper, Schedule 40, 98% ICAS | | Outside Diameter = | 3.5 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 3.7E-06 ohms/ft | $R_{high}$ = | 4.4E-06 ohms/ft |

## Bus Conductor: **3-1/2" Copper, Schedule 40, 98% ICAS**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 4855 | 4660 | 4454 | 4235 | 4001 | 3748 | 3473 | 3168 | 2826 | 2428 | 1942 | 1270 |
| | 70 | 5237 | 5063 | 4881 | 4689 | 4485 | 4269 | 4037 | 3787 | 3515 | 3215 | 2878 | 2488 |
| | 80 | 5588 | 5431 | 5266 | 5095 | 4914 | 4724 | 4522 | 4308 | 4078 | 3831 | 3562 | 3265 |
| **Normal** | **90** | **5914** | **5770** | **5621** | **5465** | **5303** | **5132** | **4953** | **4764** | **4564** | **4352** | **4124** | **3879** |
| | 100 | 6221 | 6088 | 5951 | 5809 | 5661 | 5506 | 5345 | 5176 | 4998 | 4810 | 4612 | 4400 |
| | 110 | 6512 | 6389 | 6262 | 6131 | 5995 | 5854 | 5707 | 5553 | 5393 | 5225 | 5048 | 4861 |
| **Emergency (<24 hrs)** | **115** | **6652** | **6534** | **6412** | **6286** | **6155** | **6020** | **5879** | **5732** | **5579** | **5419** | **5251** | **5075** |
| | 120 | 6790 | 6676 | 6558 | 6437 | 6311 | 6181 | 6046 | 5905 | 5759 | 5606 | 5446 | 5279 |
| **Emergency (< 1 hr )** | **130** | **7058** | **6951** | **6842** | **6728** | **6612** | **6491** | **6366** | **6236** | **6102** | **5962** | **5816** | **5664** |
| | 140 | 7317 | 7217 | 7115 | 7009 | 6900 | 6788 | 6671 | 6551 | 6427 | 6298 | 6163 | 6024 |
| | 150 | 7570 | 7476 | 7379 | 7280 | 7178 | 7073 | 6964 | 6853 | 6737 | 6617 | 6493 | 6364 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.85 | Suntime = | 14 |
| | Absorptivity = | 0.85 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 3-1/2" Copper, Schedule 40, 98% ICAS | | Outside Diameter = | 4 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 2.8E-06 ohms/ft | $R_{high}$ = | 3.4E-06 ohms/ft |

## Bus Conductor: **4" Copper, Schedule 40, 98% ICAS**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 5376 | 5159 | 4930 | 4686 | 4424 | 4142 | 3833 | 3492 | 3107 | 2658 | 2106 | 1325 |
| | 70 | 5807 | 5613 | 5410 | 5196 | 4969 | 4728 | 4469 | 4190 | 3886 | 3549 | 3170 | 2731 |
| | 80 | 6201 | 6027 | 5844 | 5653 | 5452 | 5240 | 5015 | 4776 | 4520 | 4244 | 3942 | 3610 |
| **Normal** | **90** | **6569** | **6409** | **6243** | **6070** | **5889** | **5700** | **5501** | **5290** | **5067** | **4830** | **4576** | **4302** |
| | 100 | 6914 | 6767 | 6615 | 6457 | 6293 | 6121 | 5941 | 5753 | 5555 | 5346 | 5125 | 4889 |
| | 110 | 7242 | 7106 | 6966 | 6820 | 6669 | 6512 | 6349 | 6178 | 6000 | 5812 | 5615 | 5407 |
| **Emergency (<24 hrs)** | **115** | **7401** | **7270** | **7134** | **6995** | **6850** | **6699** | **6543** | **6380** | **6209** | **6031** | **5844** | **5647** |
| | 120 | 7556 | 7430 | 7299 | 7165 | 7025 | 6881 | 6730 | 6574 | 6412 | 6242 | 6064 | 5877 |
| **Emergency (< 1 hr )** | **130** | **7858** | **7740** | **7619** | **7493** | **7364** | **7230** | **7091** | **6947** | **6798** | **6642** | **6480** | **6311** |
| | 140 | 8151 | 8040 | 7927 | 7810 | 7689 | 7564 | 7435 | 7302 | 7164 | 7020 | 6871 | 6716 |
| | 150 | 8436 | 8332 | 8225 | 8116 | 8003 | 7886 | 7766 | 7642 | 7513 | 7380 | 7242 | 7099 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.85 | Suntime = | 14 |
| | Absorptivity = | 0.85 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 4" Copper, Schedule 40, 98% ICAS | | Outside Diameter = | 4.5 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 2.5E-06 ohms/ft | $R_{high}$ = | 3E-06 ohms/ft |

## Bus Conductor: **1" Copper, Schedule 80, 98% ICAS**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 1601 | 1541 | 1477 | 1410 | 1339 | 1263 | 1180 | 1091 | 992 | 881 | 751 | 592 |
| | 70 | 1712 | 1657 | 1600 | 1541 | 1478 | 1411 | 1341 | 1265 | 1184 | 1095 | 998 | 888 |
| | 80 | 1813 | 1763 | 1711 | 1657 | 1601 | 1542 | 1480 | 1414 | 1344 | 1269 | 1189 | 1101 |
| **Normal** | **90** | **1907** | **1861** | **1813** | **1764** | **1713** | **1660** | **1604** | **1545** | **1483** | **1418** | **1349** | **1274** |
| | 100 | 1994 | 1952 | 1908 | 1863 | 1816 | 1767 | 1717 | 1664 | 1608 | 1550 | 1489 | 1424 |
| | 110 | 2077 | 2038 | 1997 | 1955 | 1912 | 1867 | 1821 | 1772 | 1722 | 1669 | 1614 | 1556 |
| **Emergency (<24 hrs)** | **115** | **2117** | **2079** | **2040** | **2000** | **1958** | **1915** | **1870** | **1823** | **1775** | **1725** | **1672** | **1617** |
| | 120 | 2156 | 2120 | 2082 | 2043 | 2002 | 1961 | 1918 | 1873 | 1827 | 1779 | 1728 | 1676 |
| **Emergency (< 1 hr )** | **130** | **2232** | **2197** | **2162** | **2125** | **2088** | **2049** | **2009** | **1968** | **1925** | **1880** | **1834** | **1786** |
| | 140 | 2305 | 2272 | 2239 | 2205 | 2169 | 2133 | 2096 | 2057 | 2017 | 1976 | 1934 | 1889 |
| | 150 | 2376 | 2345 | 2313 | 2281 | 2248 | 2214 | 2179 | 2142 | 2105 | 2067 | 2027 | 1986 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.85 | Suntime = | 14 |
| | Absorptivity = | 0.85 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 1" Copper, Schedule 80, 98% ICAS | | Outside Diameter = | 1.315 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 1.3E-05 ohms/ft | $R_{high}$ = | 1.5E-05 ohms/ft |

## Bus Conductor: **1-1/2" Copper, Schedule 80, 98% ICAS**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 2302 | 2212 | 2118 | 2019 | 1914 | 1802 | 1680 | 1547 | 1398 | 1230 | 1031 | 778 |
| | 70 | 2466 | 2387 | 2304 | 2217 | 2125 | 2027 | 1923 | 1812 | 1691 | 1559 | 1413 | 1246 |
| | 80 | 2619 | 2547 | 2472 | 2394 | 2311 | 2225 | 2134 | 2037 | 1934 | 1823 | 1704 | 1573 |
| **Normal** | **90** | **2762** | **2695** | **2627** | **2555** | **2481** | **2403** | **2321** | **2236** | **2145** | **2049** | **1947** | **1837** |
| | 100 | 2895 | 2834 | 2771 | 2705 | 2637 | 2566 | 2492 | 2415 | 2334 | 2249 | 2159 | 2063 |
| | 110 | 3022 | 2965 | 2906 | 2845 | 2783 | 2718 | 2650 | 2579 | 2506 | 2429 | 2348 | 2264 |
| **Emergency (<24 hrs)** | **115** | **3083** | **3028** | **2971** | **2913** | **2852** | **2790** | **2725** | **2657** | **2587** | **2514** | **2437** | **2357** |
| | 120 | 3142 | 3089 | 3035 | 2978 | 2920 | 2860 | 2797 | 2733 | 2665 | 2595 | 2522 | 2445 |
| **Emergency (< 1 hr )** | **130** | **3258** | **3208** | **3157** | **3105** | **3050** | **2994** | **2936** | **2876** | **2814** | **2750** | **2683** | **2613** |
| | 140 | 3370 | 3323 | 3275 | 3226 | 3175 | 3123 | 3069 | 3013 | 2955 | 2896 | 2834 | 2769 |
| | 150 | 3478 | 3434 | 3389 | 3343 | 3295 | 3246 | 3195 | 3143 | 3089 | 3034 | 2976 | 2917 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.85 | Suntime = | 14 |
| | Absorptivity = | 0.85 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 1-1/2" Copper, Schedule 80, 98% ICAS | | Outside Diameter = | 1.9 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 7.7E-06 ohms/ft | $R_{high}$ = | 9.2E-06 ohms/ft |

## Bus Conductor: **2" Copper, Schedule 80, 98% ICAS**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 2911 | 2797 | 2676 | 2549 | 2413 | 2267 | 2109 | 1936 | 1743 | 1522 | 1259 | 919 |
| | 70 | 3125 | 3022 | 2915 | 2802 | 2683 | 2557 | 2423 | 2279 | 2123 | 1952 | 1761 | 1544 |
| | 80 | 3321 | 3228 | 3131 | 3029 | 2923 | 2812 | 2694 | 2569 | 2436 | 2294 | 2139 | 1970 |
| **Normal** | **90** | **3503** | **3417** | **3329** | **3236** | **3141** | **3040** | **2935** | **2825** | **2708** | **2585** | **2453** | **2311** |
| | 100 | 3673 | 3594 | 3513 | 3428 | 3341 | 3249 | 3154 | 3055 | 2951 | 2841 | 2726 | 2604 |
| | 110 | 3835 | 3761 | 3686 | 3608 | 3527 | 3443 | 3357 | 3266 | 3172 | 3074 | 2971 | 2864 |
| **Emergency (<24 hrs)** | **115** | **3913** | **3842** | **3769** | **3694** | **3616** | **3536** | **3453** | **3366** | **3277** | **3184** | **3086** | **2984** |
| | 120 | 3989 | 3921 | 3850 | 3778 | 3703 | 3626 | 3546 | 3463 | 3378 | 3289 | 3197 | 3099 |
| **Emergency (< 1 hr )** | **130** | **4137** | **4073** | **4007** | **3940** | **3870** | **3799** | **3726** | **3650** | **3572** | **3490** | **3406** | **3317** |
| | 140 | 4280 | 4220 | 4158 | 4096 | 4032 | 3966 | 3898 | 3828 | 3755 | 3680 | 3602 | 3520 |
| | 150 | 4419 | 4363 | 4306 | 4248 | 4188 | 4127 | 4063 | 3998 | 3930 | 3860 | 3787 | 3712 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.85 | Suntime = | 14 |
| | Absorptivity = | 0.85 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 2" Copper, Schedule 80, 98% ICAS | | Outside Diameter = | 2.375 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 5.6E-06 ohms/ft | $R_{high}$ = | 6.6E-06 ohms/ft |

## Bus Conductor: **2-1/2"Copper, Schedule 80, 98% ICAS**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 3830 | 3679 | 3519 | 3349 | 3168 | 2974 | 2763 | 2531 | 2271 | 1973 | 1615 | 1141 |
| | 70 | 4119 | 3983 | 3841 | 3691 | 3533 | 3366 | 3187 | 2995 | 2786 | 2557 | 2301 | 2008 |
| | 80 | 4383 | 4260 | 4132 | 3998 | 3857 | 3709 | 3553 | 3387 | 3210 | 3020 | 2813 | 2587 |
| **Normal** | **90** | **4629** | **4516** | **4399** | **4277** | **4150** | **4017** | **3878** | **3731** | **3577** | **3412** | **3237** | **3048** |
| | 100 | 4859 | 4755 | 4648 | 4536 | 4420 | 4300 | 4174 | 4042 | 3904 | 3758 | 3604 | 3441 |
| | 110 | 5078 | 4981 | 4882 | 4779 | 4672 | 4562 | 4447 | 4327 | 4202 | 4071 | 3934 | 3789 |
| **Emergency (<24 hrs)** | **115** | **5183** | **5090** | **4994** | **4895** | **4793** | **4686** | **4576** | **4462** | **4342** | **4218** | **4087** | **3950** |
| | 120 | 5286 | 5197 | 5104 | 5008 | 4910 | 4808 | 4702 | 4592 | 4478 | 4359 | 4234 | 4104 |
| **Emergency (< 1 hr )** | **130** | **5487** | **5403** | **5317** | **5227** | **5136** | **5041** | **4943** | **4841** | **4736** | **4627** | **4513** | **4395** |
| | 140 | 5681 | 5602 | 5521 | 5438 | 5352 | 5264 | 5172 | 5078 | 4981 | 4880 | 4775 | 4666 |
| | 150 | 5870 | 5795 | 5719 | 5641 | 5560 | 5478 | 5392 | 5304 | 5214 | 5120 | 5023 | 4922 |
| | | | | | | | WINTER | | | | | SUMMER | |

Weather Assumptions:

| | | | |
|---|---|---|---|
| Emissivity = | 0.85 | Suntime = | 14 |
| Absorptivity = | 0.85 | Degrees North Latitude= | 40 |
| Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |

Conductor : 2-1/2"Copper, Schedule 80, 98% ICAS

| | | | |
|---|---|---|---|
| $T_{low}$ = | 20 °C | Outside Diameter = | 2.875 inches |
| $R_{low}$ = | 3.6E-06 ohms/ft | $T_{high}$ = | 70 °C |
| | | $R_{high}$ = | 4.3E-06 ohms/ft |

## Bus Conductor: **3" Copper, Schedule 80, 98% ICAS**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 4727 | 4539 | 4340 | 4128 | 3902 | 3658 | 3393 | 3101 | 2773 | 2394 | 1934 | 1310 |
| | 70 | 5093 | 4924 | 4748 | 4561 | 4365 | 4156 | 3932 | 3691 | 3429 | 3141 | 2818 | 2446 |
| | 80 | 5428 | 5275 | 5116 | 4950 | 4775 | 4590 | 4396 | 4189 | 3967 | 3729 | 3470 | 3185 |
| **Normal** | **90** | **5740** | **5600** | **5455** | **5304** | **5146** | **4981** | **4808** | **4625** | **4432** | **4227** | **4007** | **3771** |
| | 100 | 6032 | 5904 | 5771 | 5632 | 5489 | 5339 | 5182 | 5019 | 4846 | 4665 | 4473 | 4269 |
| | 110 | 6310 | 6191 | 6068 | 5940 | 5808 | 5671 | 5529 | 5380 | 5224 | 5061 | 4890 | 4710 |
| **Emergency (<24 hrs)** | **115** | **6444** | **6329** | **6211** | **6088** | **5961** | **5830** | **5693** | **5551** | **5402** | **5247** | **5085** | **4914** |
| | 120 | 6576 | 6465 | 6350 | 6232 | 6110 | 5983 | 5852 | 5716 | 5574 | 5426 | 5271 | 5109 |
| **Emergency (< 1 hr )** | **130** | **6831** | **6727** | **6620** | **6510** | **6397** | **6280** | **6158** | **6032** | **5902** | **5766** | **5625** | **5477** |
| | 140 | 7078 | 6981 | 6881 | 6778 | 6672 | 6563 | 6450 | 6333 | 6212 | 6087 | 5957 | 5821 |
| | 150 | 7319 | 7227 | 7133 | 7036 | 6937 | 6835 | 6729 | 6621 | 6508 | 6392 | 6271 | 6146 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.85 | Suntime = | 14 |
| | Absorptivity = | 0.85 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 3" Copper, Schedule 80, 98% ICAS | | Outside Diameter = | 3.5 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 2.7E-06 ohms/ft | $R_{high}$ = | 3.2E-06 ohms/ft |

## Bus Conductor: **3-1/2" Copper, Schedule 80, 98% ICAS**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 5449 | 5231 | 5000 | 4754 | 4491 | 4207 | 3898 | 3556 | 3172 | 2726 | 2180 | 1425 |
| | 70 | 5878 | 5683 | 5478 | 5263 | 5034 | 4791 | 4531 | 4251 | 3945 | 3608 | 3230 | 2792 |
| | 80 | 6272 | 6095 | 5911 | 5718 | 5515 | 5302 | 5076 | 4835 | 4577 | 4300 | 3998 | 3665 |
| **Normal** | **90** | **6638** | **6477** | **6309** | **6134** | **5952** | **5760** | **5559** | **5347** | **5123** | **4884** | **4629** | **4354** |
| | 100 | 6982 | 6834 | 6680 | 6520 | 6354 | 6180 | 5999 | 5809 | 5610 | 5399 | 5176 | 4939 |
| | 110 | 7309 | 7171 | 7029 | 6882 | 6729 | 6571 | 6406 | 6233 | 6053 | 5864 | 5666 | 5456 |
| **Emergency (<24 hrs)** | **115** | **7466** | **7334** | **7197** | **7055** | **6909** | **6757** | **6599** | **6434** | **6262** | **6082** | **5894** | **5696** |
| | 120 | 7621 | 7493 | 7361 | 7225 | 7084 | 6937 | 6786 | 6628 | 6464 | 6292 | 6113 | 5925 |
| **Emergency (< 1 hr )** | **130** | **7922** | **7802** | **7679** | **7552** | **7421** | **7286** | **7145** | **7000** | **6849** | **6692** | **6528** | **6357** |
| | 140 | 8213 | 8101 | 7986 | 7867 | 7745 | 7618 | 7488 | 7353 | 7213 | 7068 | 6918 | 6761 |
| | 150 | 8496 | 8391 | 8283 | 8171 | 8057 | 7939 | 7817 | 7691 | 7561 | 7427 | 7287 | 7143 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.85 | Suntime = | 14 |
| | Absorptivity = | 0.85 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 3-1/2" Copper, Schedule 80, 98% ICAS | | Outside Diameter = | 4 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 2.2E-06 ohms/ft | $R_{high}$ = | 2.7E-06 ohms/ft |

## Bus Conductor: **4" Copper, Schedule 80, 98% ICAS**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | 6210 | 5960 | 5695 | 5413 | 5111 | 4784 | 4428 | 4034 | 3589 | 3071 | 2432 | 1530 |
| | 70 | 6708 | 6484 | 6250 | 6002 | 5740 | 5462 | 5163 | 4840 | 4488 | 4100 | 3662 | 3154 |
| | 80 | 7164 | 6962 | 6751 | 6530 | 6298 | 6053 | 5794 | 5517 | 5221 | 4902 | 4554 | 4170 |
| **Normal** | **90** | **7588** | **7404** | **7212** | **7012** | **6803** | **6584** | **6354** | **6111** | **5854** | **5579** | **5286** | **4969** |
| | 100 | 7987 | 7817 | 7642 | 7459 | 7269 | 7071 | 6863 | 6646 | 6417 | 6176 | 5920 | 5647 |
| | 110 | 8366 | 8209 | 8047 | 7879 | 7704 | 7523 | 7334 | 7137 | 6931 | 6714 | 6487 | 6246 |
| **Emergency (<24 hrs)** | **115** | **8549** | **8398** | **8241** | **8080** | **7912** | **7739** | **7558** | **7369** | **7173** | **6967** | **6751** | **6524** |
| | 120 | 8728 | 8582 | 8432 | 8276 | 8115 | 7948 | 7775 | 7594 | 7406 | 7210 | 7005 | 6789 |
| **Emergency (< 1 hr )** | **130** | **9077** | **8941** | **8801** | **8656** | **8506** | **8352** | **8192** | **8025** | **7853** | **7673** | **7486** | **7290** |
| | 140 | 9416 | 9288 | 9157 | 9021 | 8882 | 8738 | 8589 | 8435 | 8275 | 8110 | 7937 | 7758 |
| | 150 | 9745 | 9625 | 9502 | 9375 | 9244 | 9110 | 8971 | 8827 | 8679 | 8525 | 8366 | 8200 |
| | | | | | | | WINTER | | | | | SUMMER | |

Weather Assumptions:

| | | | |
|---|---|---|---|
| Emissivity = | 0.85 | Suntime = | 14 |
| Absorptivity = | 0.85 | Degrees North Latitude= | 40 |
| Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |

Conductor : 4" Copper, Schedule 80, 98% ICAS

| | | | |
|---|---|---|---|
| $T_{low}$ = | 20 °C | Outside Diameter = | 4.5 inches |
| $R_{low}$ = | 1.9E-06 ohms/ft | $T_{high}$ = | 70 °C |
| | | $R_{high}$ = | 2.2E-06 ohms/ft |

## Bus Conductor: **1/0 ACSR 6/1**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 336 | 327 | 317 | 307 | 297 | 286 | 274 | 263 | 250 | 237 | 222 | 207 |
| | 90 | 349 | 340 | 332 | 322 | 313 | 303 | 293 | 282 | 271 | 260 | 247 | 234 |
| | 100 | 361 | 353 | 345 | 336 | 328 | 319 | 310 | 300 | 290 | 279 | 268 | 257 |
| **Normal** | **105** | **367** | **359** | **351** | **343** | **335** | **326** | **317** | **308** | **298** | **288** | **278** | **267** |
| | 110 | 372 | 365 | 357 | 349 | 341 | 333 | 324 | 316 | 306 | 297 | 287 | 277 |
| | 120 | 382 | 376 | 368 | 361 | 354 | 346 | 338 | 330 | 322 | 313 | 304 | 294 |
| **Emergency (<24 hrs)** | **130** | **392** | **386** | **379** | **372** | **365** | **358** | **351** | **343** | **335** | **327** | **319** | **310** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **401** | **395** | **389** | **383** | **376** | **369** | **362** | **355** | **348** | **341** | **333** | **325** |
| | 150 | 410 | 404 | 398 | 392 | 386 | 380 | 373 | 367 | 360 | 353 | 346 | 338 |
| | 160 | 418 | 413 | 407 | 402 | 396 | 390 | 384 | 378 | 371 | 365 | 358 | 351 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 1/0 ACSR 6/1 | | Outside Diameter = | 0.398 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 0.00017 ohms/ft | $R_{high}$ = | 0.00022 ohms/ft |

## Bus Conductor: **2/0 ACSR 6/1**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature ($^{o}$C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 383 | 373 | 362 | 350 | 338 | 326 | 313 | 299 | 285 | 270 | 253 | 236 |
| | 90 | 396 | 387 | 377 | 366 | 356 | 344 | 333 | 321 | 308 | 295 | 281 | 266 |
| | 100 | 409 | 400 | 390 | 381 | 371 | 361 | 350 | 339 | 328 | 316 | 304 | 291 |
| **Normal** | **105** | **414** | **406** | **397** | **388** | **378** | **368** | **358** | **348** | **337** | **326** | **314** | **302** |
| | 110 | 420 | 411 | 403 | 394 | 385 | 376 | 366 | 356 | 346 | 335 | 324 | 312 |
| | 120 | 430 | 422 | 414 | 406 | 398 | 389 | 380 | 371 | 362 | 352 | 342 | 331 |
| **Emergency (<24 hrs)** | **130** | **440** | **432** | **425** | **417** | **409** | **401** | **393** | **385** | **376** | **367** | **358** | **348** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **449** | **442** | **435** | **428** | **420** | **413** | **405** | **397** | **389** | **381** | **372** | **363** |
| | 150 | 457 | 451 | 444 | 438 | 431 | 424 | 417 | 409 | 402 | 394 | 386 | 378 |
| | 160 | 466 | 459 | 453 | 447 | 440 | 434 | 427 | 420 | 413 | 406 | 398 | 391 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 2/0 ACSR 6/1 | | Outside Diameter = | 0.447 inches |
| | $T_{low}$ = | 25 $^{o}$C | $T_{high}$ = | 75 $^{o}$C |
| | $R_{low}$ = | 0.00013 ohms/ft | $R_{high}$ = | 0.00018 ohms/ft |

## Bus Conductor: **3/0 ACSR 6/1**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 437 | 425 | 412 | 399 | 385 | 371 | 356 | 341 | 324 | 307 | 288 | 268 |
| | 90 | 451 | 440 | 429 | 417 | 405 | 392 | 379 | 365 | 350 | 335 | 319 | 302 |
| | 100 | 465 | 454 | 444 | 433 | 422 | 410 | 398 | 386 | 373 | 359 | 345 | 330 |
| **Normal** | **105** | **471** | **461** | **451** | **440** | **430** | **419** | **407** | **395** | **383** | **370** | **357** | **343** |
| | 110 | 477 | 467 | 458 | 448 | 437 | 427 | 416 | 404 | 393 | 380 | 368 | 354 |
| | 120 | 488 | 479 | 470 | 461 | 451 | 442 | 431 | 421 | 410 | 399 | 388 | 376 |
| **Emergency (<24 hrs)** | **130** | **498** | **490** | **482** | **473** | **464** | **455** | **446** | **436** | **426** | **416** | **406** | **395** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **508** | **501** | **493** | **485** | **476** | **468** | **459** | **450** | **441** | **432** | **422** | **412** |
| | 150 | 518 | 511 | 503 | 496 | 488 | 480 | 472 | 463 | 455 | 446 | 437 | 428 |
| | 160 | 527 | 520 | 513 | 506 | 498 | 491 | 483 | 476 | 468 | 459 | 451 | 442 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 3/0 ACSR 6/1 | | Outside Diameter = | 0.502 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 0.0001 ohms/ft | $R_{high}$ = | 0.00014 ohms/ft |

## Bus Conductor: **4/0 ACSR 6/1**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 496 | 482 | 468 | 453 | 437 | 421 | 404 | 386 | 368 | 348 | 326 | 303 |
| | 90 | 511 | 499 | 486 | 472 | 458 | 444 | 429 | 413 | 397 | 379 | 361 | 341 |
| | 100 | 526 | 514 | 502 | 490 | 477 | 464 | 450 | 436 | 422 | 406 | 390 | 373 |
| **Normal** | **105** | **532** | **521** | **510** | **498** | **486** | **473** | **460** | **447** | **433** | **418** | **403** | **387** |
| | 110 | 538 | 528 | 517 | 505 | 494 | 482 | 469 | 457 | 443 | 430 | 415 | 400 |
| | 120 | 550 | 540 | 530 | 520 | 509 | 498 | 487 | 475 | 463 | 450 | 437 | 424 |
| **Emergency (<24 hrs)** | **130** | **562** | **552** | **543** | **533** | **523** | **513** | **502** | **492** | **480** | **469** | **457** | **445** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **572** | **563** | **555** | **546** | **536** | **527** | **517** | **507** | **497** | **486** | **475** | **464** |
| | 150 | 582 | 574 | 566 | 557 | 548 | 540 | 530 | 521 | 512 | 502 | 492 | 481 |
| | 160 | 592 | 584 | 576 | 568 | 560 | 552 | 543 | 534 | 526 | 516 | 507 | 497 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 4/0 ACSR 6/1 | | Outside Diameter = | 0.563 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 8.1E-05 ohms/ft | $R_{high}$ = | 0.00012 ohms/ft |

## Bus Conductor: **159 kcm ACSR 12/7**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 433 | 421 | 408 | 395 | 381 | 367 | 352 | 336 | 320 | 302 | 283 | 262 |
| | 90 | 443 | 432 | 421 | 409 | 397 | 384 | 371 | 357 | 343 | 328 | 311 | 294 |
| | 100 | 452 | 442 | 432 | 421 | 410 | 399 | 387 | 375 | 362 | 349 | 335 | 320 |
| **Normal** | **105** | **456** | **447** | **437** | **427** | **416** | **405** | **394** | **383** | **371** | **358** | **345** | **331** |
| | 110 | 460 | 451 | 442 | 432 | 422 | 412 | 401 | 390 | 379 | 367 | 354 | 341 |
| | 120 | 468 | 459 | 451 | 442 | 433 | 423 | 414 | 404 | 393 | 383 | 372 | 360 |
| **Emergency (<24 hrs)** | **130** | **475** | **467** | **459** | **451** | **442** | **434** | **425** | **416** | **406** | **397** | **387** | **376** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **482** | **474** | **467** | **459** | **452** | **444** | **435** | **427** | **418** | **409** | **400** | **391** |
| | 150 | 488 | 481 | 474 | 467 | 460 | 453 | 445 | 437 | 429 | 421 | 413 | 404 |
| | 160 | 494 | 488 | 482 | 475 | 468 | 461 | 454 | 447 | 440 | 432 | 424 | 416 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 159 kcm ACSR 12/7 | | Outside Diameter = | 0.756 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 0.0001 ohms/ft | $R_{high}$ = | 0.00018 ohms/ft |

## Bus Conductor: **203.2 kcm ACSR 16/19**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 459 | 446 | 433 | 419 | 405 | 389 | 374 | 357 | 339 | 321 | 300 | 279 |
| | 90 | 467 | 455 | 443 | 431 | 418 | 405 | 391 | 377 | 361 | 345 | 328 | 310 |
| | 100 | 474 | 463 | 453 | 442 | 430 | 418 | 406 | 393 | 380 | 366 | 351 | 336 |
| **Normal** | **105** | **477** | **467** | **457** | **446** | **435** | **424** | **413** | **400** | **388** | **375** | **361** | **347** |
| | 110 | 480 | 471 | 461 | 451 | 440 | 430 | 419 | 407 | 395 | 383 | 370 | 357 |
| | 120 | 486 | 478 | 469 | 459 | 450 | 440 | 430 | 420 | 409 | 398 | 386 | 374 |
| **Emergency (<24 hrs)** | **130** | **492** | **484** | **476** | **467** | **459** | **450** | **440** | **431** | **421** | **411** | **401** | **390** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **498** | **490** | **482** | **475** | **467** | **458** | **450** | **441** | **432** | **423** | **413** | **404** |
| | 150 | 503 | 496 | 489 | 482 | 474 | 466 | 459 | 451 | 442 | 434 | 425 | 416 |
| | 160 | 508 | 502 | 495 | 488 | 481 | 474 | 467 | 459 | 452 | 444 | 436 | 428 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 203.2 kcm ACSR 16/19 | | Outside Diameter = | 0.714 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 7.8E-05 ohms/ft | $R_{high}$ = | 0.00016 ohms/ft |

## Bus Conductor: **266.8 kcm ACSR 26/7**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 640 | 622 | 603 | 584 | 564 | 543 | 521 | 498 | 474 | 448 | 420 | 390 |
| | 90 | 670 | 653 | 636 | 618 | 600 | 581 | 561 | 541 | 519 | 496 | 472 | 446 |
| | 100 | 697 | 682 | 666 | 650 | 633 | 616 | 597 | 579 | 559 | 539 | 517 | 494 |
| **Normal** | **105** | **711** | **696** | **680** | **665** | **648** | **632** | **614** | **596** | **578** | **558** | **538** | **516** |
| | 110 | 723 | 709 | 694 | 679 | 663 | 647 | 631 | 613 | 595 | 577 | 557 | 537 |
| | 120 | 748 | 734 | 720 | 706 | 692 | 677 | 661 | 645 | 629 | 612 | 594 | 576 |
| **Emergency (<24 hrs)** | **130** | **771** | **758** | **745** | **732** | **718** | **704** | **690** | **675** | **660** | **644** | **628** | **611** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **793** | **781** | **769** | **756** | **743** | **730** | **717** | **703** | **689** | **674** | **659** | **643** |
| | 150 | 814 | 803 | 791 | 779 | 767 | 755 | 742 | 729 | 716 | 702 | 688 | 673 |
| | 160 | 835 | 824 | 813 | 802 | 790 | 778 | 766 | 754 | 742 | 729 | 715 | 702 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 266.8 kcm ACSR 26/7 | | Outside Diameter = | 0.642 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 6.5E-05 ohms/ft | $R_{high}$ = | 7.8E-05 ohms/ft |

## Bus Conductor: **266.8 kcm ACSR 30/7**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 647 | 629 | 610 | 591 | 570 | 549 | 527 | 504 | 479 | 452 | 424 | 394 |
| | 90 | 677 | 661 | 643 | 626 | 607 | 588 | 568 | 547 | 525 | 502 | 477 | 451 |
| | 100 | 705 | 690 | 674 | 657 | 640 | 623 | 604 | 585 | 566 | 545 | 523 | 500 |
| **Normal** | **105** | **719** | **704** | **688** | **672** | **656** | **639** | **622** | **603** | **584** | **565** | **544** | **522** |
| | 110 | 732 | 717 | 702 | 687 | 671 | 655 | 638 | 621 | 602 | 584 | 564 | 543 |
| | 120 | 757 | 743 | 729 | 715 | 700 | 685 | 669 | 653 | 636 | 619 | 601 | 582 |
| **Emergency (<24 hrs)** | **130** | **780** | **767** | **754** | **741** | **727** | **713** | **698** | **683** | **668** | **652** | **635** | **618** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **803** | **790** | **778** | **765** | **752** | **739** | **725** | **711** | **697** | **682** | **667** | **651** |
| | 150 | 824 | 813 | 801 | 789 | 777 | 764 | 751 | 738 | 725 | 711 | 696 | 682 |
| | 160 | 845 | 834 | 823 | 812 | 800 | 788 | 776 | 764 | 751 | 738 | 724 | 711 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 266.8 kcm ACSR 30/7 | | Outside Diameter = | 0.66 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 6.5E-05 ohms/ft | $R_{high}$ = | 7.7E-05 ohms/ft |

## Bus Conductor: **336.4 kcm ACSR 18/1**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 727 | 707 | 686 | 664 | 641 | 617 | 592 | 566 | 538 | 508 | 476 | 442 |
| | 90 | 761 | 742 | 723 | 703 | 682 | 660 | 638 | 614 | 590 | 564 | 536 | 507 |
| | 100 | 793 | 775 | 758 | 739 | 720 | 700 | 679 | 658 | 636 | 612 | 588 | 562 |
| **Normal** | **105** | **808** | **791** | **774** | **756** | **737** | **718** | **699** | **678** | **657** | **635** | **611** | **587** |
| | 110 | 823 | 806 | 790 | 772 | 755 | 736 | 717 | 698 | 677 | 656 | 634 | 611 |
| | 120 | 851 | 835 | 820 | 804 | 787 | 770 | 752 | 734 | 715 | 696 | 676 | 655 |
| **Emergency (<24 hrs)** | **130** | **877** | **863** | **848** | **833** | **817** | **801** | **785** | **768** | **751** | **733** | **714** | **695** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **903** | **889** | **875** | **861** | **846** | **831** | **816** | **800** | **784** | **767** | **750** | **732** |
| | 150 | 927 | 914 | 901 | 887 | 874 | 860 | 845 | 830 | 815 | 799 | 783 | 767 |
| | 160 | 950 | 938 | 926 | 913 | 900 | 887 | 873 | 859 | 845 | 830 | 815 | 799 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 336.4 kcm ACSR 18/1 | | Outside Diameter = | 0.684 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 5.2E-05 ohms/ft | $R_{high}$ = | 6.2E-05 ohms/ft |

## Bus Conductor: **336.4 kcm ACSR 26/7**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 741 | 721 | 699 | 677 | 653 | 629 | 603 | 576 | 548 | 518 | 485 | 450 |
| | 90 | 776 | 757 | 737 | 717 | 696 | 673 | 650 | 626 | 601 | 574 | 546 | 516 |
| | 100 | 809 | 791 | 773 | 754 | 734 | 714 | 693 | 671 | 648 | 624 | 599 | 573 |
| **Normal** | **105** | **824** | **807** | **789** | **771** | **752** | **733** | **713** | **692** | **670** | **647** | **624** | **599** |
| | 110 | 839 | 823 | 806 | 788 | 770 | 751 | 732 | 712 | 691 | 669 | 647 | 623 |
| | 120 | 868 | 852 | 836 | 820 | 803 | 786 | 768 | 749 | 730 | 710 | 690 | 668 |
| **Emergency (<24 hrs)** | **130** | **895** | **881** | **866** | **850** | **834** | **818** | **801** | **784** | **766** | **748** | **729** | **709** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **921** | **908** | **893** | **879** | **864** | **849** | **833** | **817** | **800** | **783** | **766** | **748** |
| | 150 | 946 | 933 | 920 | 906 | 892 | 878 | 863 | 848 | 832 | 817 | 800 | 783 |
| | 160 | 971 | 958 | 945 | 932 | 919 | 906 | 892 | 877 | 863 | 848 | 832 | 817 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 336.4 kcm ACSR 26/7 | | Outside Diameter = | 0.72 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 5.2E-05 ohms/ft | $R_{high}$ = | 6.2E-05 ohms/ft |

## Bus Conductor: **336.4 kcm ACSR 30/7**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 750 | 729 | 707 | 684 | 661 | 636 | 610 | 583 | 554 | 523 | 490 | 455 |
| | 90 | 786 | 766 | 746 | 725 | 704 | 681 | 658 | 634 | 608 | 581 | 552 | 522 |
| | 100 | 819 | 801 | 782 | 763 | 743 | 722 | 701 | 679 | 656 | 632 | 606 | 580 |
| **Normal** | **105** | **834** | **817** | **799** | **781** | **761** | **742** | **721** | **700** | **678** | **655** | **631** | **606** |
| | 110 | 850 | 833 | 815 | 798 | 779 | 760 | 741 | 720 | 699 | 677 | 655 | 631 |
| | 120 | 879 | 863 | 847 | 830 | 813 | 795 | 777 | 759 | 739 | 719 | 698 | 676 |
| **Emergency (<24 hrs)** | **130** | **906** | **892** | **876** | **861** | **845** | **828** | **811** | **794** | **776** | **757** | **738** | **718** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **933** | **919** | **905** | **890** | **875** | **859** | **844** | **827** | **811** | **793** | **775** | **757** |
| | 150 | 958 | 945 | 931 | 918 | 903 | 889 | 874 | 859 | 843 | 827 | 810 | 793 |
| | 160 | 983 | 970 | 957 | 944 | 931 | 917 | 903 | 889 | 874 | 859 | 843 | 827 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 336.4 kcm ACSR 30/7 | | Outside Diameter = | 0.741 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 5.1E-05 ohms/ft | $R_{high}$ = | 6.1E-05 ohms/ft |

## Bus Conductor: **397.5 kcm ACSR 26/7**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 824 | 801 | 777 | 752 | 726 | 699 | 671 | 640 | 609 | 575 | 538 | 499 |
| | 90 | 864 | 843 | 820 | 798 | 774 | 749 | 724 | 697 | 668 | 639 | 607 | 574 |
| | 100 | 900 | 881 | 860 | 839 | 817 | 795 | 771 | 747 | 721 | 695 | 667 | 637 |
| **Normal** | **105** | **918** | **899** | **879** | **859** | **838** | **816** | **794** | **770** | **746** | **721** | **694** | **666** |
| | 110 | 935 | 916 | 897 | 878 | 857 | 837 | 815 | 793 | 770 | 745 | 720 | 694 |
| | 120 | 967 | 950 | 932 | 914 | 895 | 876 | 856 | 835 | 814 | 791 | 768 | 745 |
| **Emergency (<24 hrs)** | **130** | **998** | **982** | **965** | **948** | **930** | **912** | **893** | **874** | **854** | **834** | **813** | **791** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **1027** | **1012** | **996** | **980** | **963** | **946** | **929** | **911** | **893** | **874** | **854** | **834** |
| | 150 | 1055 | 1041 | 1026 | 1011 | 995 | 979 | 963 | 946 | 929 | 911 | 893 | 874 |
| | 160 | 1083 | 1069 | 1055 | 1040 | 1026 | 1010 | 995 | 979 | 963 | 946 | 929 | 911 |
| | | | | | | | WINTER | | | | | SUMMER | |

Weather Assumptions:

| | | | |
|---|---|---|---|
| Emissivity = | 0.7 | Suntime = | 14 |
| Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |

Conductor : 397.5 kcm ACSR 26/7

| | | | |
|---|---|---|---|
| $T_{low}$ = | 25 °C | Outside Diameter = | 0.783 inches |
| $R_{low}$ = | 4.4E-05 ohms/ft | $T_{high}$ = | 75 °C |
| | | $R_{high}$ = | 5.2E-05 ohms/ft |

## Bus Conductor: **397.5 kcm ACSR 30/7**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 834 | 811 | 787 | 761 | 735 | 707 | 678 | 648 | 616 | 581 | 544 | 504 |
| | 90 | 874 | 853 | 830 | 807 | 783 | 758 | 732 | 705 | 676 | 646 | 614 | 580 |
| | 100 | 912 | 891 | 871 | 849 | 827 | 804 | 781 | 756 | 730 | 703 | 675 | 645 |
| **Normal** | **105** | **929** | **910** | **890** | **869** | **848** | **826** | **803** | **780** | **755** | **730** | **703** | **675** |
| | 110 | 946 | 928 | 908 | 889 | 868 | 847 | 825 | 803 | 779 | 755 | 729 | 702 |
| | 120 | 979 | 962 | 944 | 925 | 906 | 887 | 866 | 845 | 824 | 801 | 778 | 754 |
| **Emergency (<24 hrs)** | **130** | **1011** | **994** | **977** | **960** | **942** | **924** | **905** | **885** | **865** | **845** | **823** | **801** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **1040** | **1025** | **1009** | **993** | **976** | **959** | **941** | **923** | **904** | **885** | **865** | **845** |
| | 150 | 1069 | 1054 | 1039 | 1024 | 1008 | 992 | 975 | 958 | 941 | 923 | 904 | 885 |
| | 160 | 1097 | 1083 | 1069 | 1054 | 1039 | 1024 | 1008 | 992 | 976 | 959 | 941 | 924 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 397.5 kcm ACSR 30/7 | | Outside Diameter = | 0.806 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 4.3E-05 ohms/ft | $R_{high}$ = | 5.2E-05 ohms/ft |

## Bus Conductor: **477 kcm ACSR 26/7**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 926 | 900 | 873 | 845 | 816 | 785 | 753 | 719 | 683 | 644 | 603 | 559 |
| | 90 | 971 | 947 | 922 | 896 | 870 | 842 | 813 | 783 | 751 | 717 | 682 | 644 |
| | 100 | 1013 | 990 | 967 | 944 | 919 | 894 | 867 | 840 | 811 | 781 | 749 | 716 |
| **Normal** | **105** | **1032** | **1011** | **989** | **966** | **942** | **918** | **893** | **866** | **839** | **810** | **781** | **749** |
| | 110 | 1052 | 1031 | 1009 | 987 | 965 | 941 | 917 | 892 | 866 | 838 | 810 | 780 |
| | 120 | 1088 | 1069 | 1049 | 1028 | 1007 | 985 | 963 | 940 | 916 | 891 | 865 | 838 |
| **Emergency (<24 hrs)** | **130** | **1123** | **1105** | **1086** | **1067** | **1047** | **1027** | **1006** | **984** | **962** | **939** | **915** | **891** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **1157** | **1140** | **1122** | **1104** | **1085** | **1066** | **1047** | **1026** | **1006** | **984** | **962** | **939** |
| | 150 | 1189 | 1173 | 1156 | 1139 | 1121 | 1103 | 1085 | 1066 | 1047 | 1027 | 1006 | 985 |
| | 160 | 1220 | 1205 | 1189 | 1173 | 1156 | 1139 | 1122 | 1104 | 1086 | 1067 | 1048 | 1028 |
| | | | | | | | WINTER | | | | | SUMMER | |

Weather Assumptions:

| | | | |
|---|---|---|---|
| Emissivity = | 0.7 | Suntime = | 14 |
| Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |

Conductor : 477 kcm ACSR 26/7

| | | | |
|---|---|---|---|
| Outside Diameter = | 0.858 inches | | |
| $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| $R_{low}$ = | 3.7E-05 ohms/ft | $R_{high}$ = | 4.4E-05 ohms/ft |

## Bus Conductor: **556. 5 kcm ACSR 24/7**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 1015 | 986 | 957 | 926 | 894 | 860 | 825 | 787 | 748 | 705 | 660 | 611 |
| | 90 | 1064 | 1038 | 1011 | 983 | 953 | 923 | 891 | 858 | 823 | 786 | 747 | 705 |
| | 100 | 1110 | 1086 | 1061 | 1035 | 1008 | 980 | 951 | 921 | 889 | 856 | 822 | 785 |
| **Normal** | **105** | **1132** | **1109** | **1084** | **1059** | **1034** | **1007** | **979** | **950** | **920** | **889** | **856** | **821** |
| | 110 | 1154 | 1131 | 1107 | 1083 | 1058 | 1033 | 1006 | 978 | 950 | 920 | 888 | 856 |
| | 120 | 1194 | 1173 | 1151 | 1129 | 1105 | 1081 | 1057 | 1031 | 1005 | 978 | 949 | 919 |
| **Emergency (<24 hrs)** | **130** | **1233** | **1213** | **1192** | **1171** | **1150** | **1127** | **1104** | **1081** | **1056** | **1031** | **1005** | **978** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **1270** | **1251** | **1232** | **1212** | **1192** | **1171** | **1149** | **1127** | **1104** | **1081** | **1057** | **1032** |
| | 150 | 1306 | 1288 | 1270 | 1251 | 1232 | 1212 | 1192 | 1171 | 1150 | 1128 | 1105 | 1082 |
| | 160 | 1340 | 1323 | 1306 | 1288 | 1270 | 1251 | 1232 | 1213 | 1193 | 1172 | 1151 | 1129 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 556. 5 kcm ACSR 24/7 | | Outside Diameter = | 0.914 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 3.1E-05 ohms/ft | $R_{high}$ = | 3.8E-05 ohms/ft |

## Bus Conductor: **556.5 kcm ACSR 26/7**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 1022 | 993 | 963 | 932 | 899 | 865 | 830 | 792 | 752 | 710 | 664 | 615 |
| | 90 | 1071 | 1045 | 1017 | 989 | 960 | 929 | 897 | 863 | 828 | 791 | 751 | 709 |
| | 100 | 1118 | 1093 | 1068 | 1042 | 1015 | 986 | 957 | 927 | 895 | 862 | 827 | 790 |
| **Normal** | **105** | **1140** | **1116** | **1092** | **1067** | **1040** | **1013** | **986** | **957** | **926** | **895** | **862** | **827** |
| | 110 | 1161 | 1138 | 1115 | 1091 | 1065 | 1040 | 1013 | 985 | 956 | 926 | 894 | 862 |
| | 120 | 1203 | 1181 | 1159 | 1136 | 1113 | 1089 | 1064 | 1038 | 1012 | 984 | 956 | 926 |
| **Emergency (<24 hrs)** | **130** | **1242** | **1221** | **1201** | **1179** | **1158** | **1135** | **1112** | **1088** | **1064** | **1038** | **1012** | **984** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **1279** | **1260** | **1241** | **1221** | **1200** | **1179** | **1157** | **1135** | **1112** | **1088** | **1064** | **1039** |
| | 150 | 1315 | 1297 | 1279 | 1260 | 1240 | 1221 | 1200 | 1179 | 1158 | 1136 | 1113 | 1090 |
| | 160 | 1350 | 1333 | 1315 | 1297 | 1279 | 1260 | 1241 | 1222 | 1202 | 1181 | 1160 | 1138 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 556.5 kcm ACSR 26/7 | | Outside Diameter = | 0.927 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 3.1E-05 ohms/ft | $R_{high}$ = | 3.7E-05 ohms/ft |

## Bus Conductor: **556.5 kcm ACSR 30/7**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 1033 | 1004 | 974 | 943 | 910 | 875 | 839 | 801 | 761 | 718 | 671 | 621 |
| | 90 | 1084 | 1057 | 1029 | 1001 | 971 | 940 | 907 | 873 | 838 | 800 | 760 | 717 |
| | 100 | 1131 | 1106 | 1081 | 1054 | 1027 | 998 | 969 | 938 | 906 | 872 | 837 | 799 |
| **Normal** | **105** | **1154** | **1130** | **1105** | **1079** | **1053** | **1026** | **997** | **968** | **937** | **905** | **872** | **837** |
| | 110 | 1175 | 1152 | 1128 | 1104 | 1078 | 1052 | 1025 | 997 | 967 | 937 | 905 | 872 |
| | 120 | 1217 | 1195 | 1173 | 1150 | 1126 | 1102 | 1077 | 1051 | 1024 | 996 | 967 | 937 |
| **Emergency (<24 hrs)** | **130** | **1257** | **1236** | **1215** | **1194** | **1172** | **1149** | **1126** | **1102** | **1077** | **1051** | **1024** | **997** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **1295** | **1276** | **1256** | **1236** | **1215** | **1194** | **1172** | **1149** | **1126** | **1102** | **1077** | **1052** |
| | 150 | 1331 | 1313 | 1294 | 1275 | 1256 | 1236 | 1215 | 1194 | 1172 | 1150 | 1127 | 1103 |
| | 160 | 1367 | 1349 | 1332 | 1314 | 1295 | 1276 | 1257 | 1237 | 1217 | 1196 | 1174 | 1152 |
| | | | | | | | WINTER | | | | | SUMMER | |

Weather Assumptions:

| | | | |
|---|---|---|---|
| Emissivity = | 0.7 | Suntime = | 14 |
| Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |

Conductor : 556.5 kcm ACSR 30/7

| | | | |
|---|---|---|---|
| $T_{low}$ = | 25 °C | Outside Diameter = | 0.953 inches |
| $R_{low}$ = | 3.1E-05 ohms/ft | $T_{high}$ = | 75 °C |
| | | $R_{high}$ = | 3.7E-05 ohms/ft |

## Bus Conductor: **605 kcm ACSR 24/7**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 1070 | 1040 | 1009 | 976 | 942 | 907 | 869 | 830 | 788 | 743 | 695 | 643 |
| | 90 | 1123 | 1095 | 1066 | 1036 | 1006 | 973 | 940 | 904 | 867 | 828 | 787 | 743 |
| | 100 | 1172 | 1146 | 1119 | 1092 | 1063 | 1034 | 1003 | 971 | 938 | 903 | 867 | 828 |
| **Normal** | **105** | **1195** | **1170** | **1144** | **1118** | **1091** | **1062** | **1033** | **1003** | **971** | **938** | **903** | **867** |
| | 110 | 1218 | 1194 | 1169 | 1143 | 1117 | 1090 | 1062 | 1032 | 1002 | 971 | 938 | 903 |
| | 120 | 1261 | 1238 | 1215 | 1191 | 1167 | 1142 | 1116 | 1089 | 1061 | 1032 | 1002 | 971 |
| **Emergency (<24 hrs)** | **130** | **1302** | **1281** | **1259** | **1237** | **1214** | **1190** | **1166** | **1141** | **1115** | **1089** | **1061** | **1032** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **1342** | **1322** | **1301** | **1280** | **1259** | **1237** | **1214** | **1191** | **1167** | **1142** | **1116** | **1090** |
| | 150 | 1379 | 1361 | 1341 | 1321 | 1301 | 1280 | 1259 | 1237 | 1215 | 1192 | 1168 | 1143 |
| | 160 | 1416 | 1398 | 1380 | 1361 | 1342 | 1322 | 1302 | 1282 | 1261 | 1239 | 1217 | 1194 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 605 kcm ACSR 24/7 | | Outside Diameter = | 0.953 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 2.9E-05 ohms/ft | $R_{high}$ = | 3.5E-05 ohms/ft |

## Bus Conductor: **795 kcm ACSR 26/7**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 1281 | 1245 | 1207 | 1168 | 1127 | 1084 | 1039 | 992 | 941 | 887 | 829 | 766 |
| | 90 | 1346 | 1312 | 1278 | 1242 | 1205 | 1166 | 1125 | 1083 | 1038 | 991 | 941 | 888 |
| | 100 | 1406 | 1375 | 1343 | 1310 | 1276 | 1240 | 1203 | 1165 | 1125 | 1083 | 1039 | 992 |
| **Normal** | **105** | **1434** | **1404** | **1374** | **1342** | **1309** | **1275** | **1240** | **1203** | **1165** | **1125** | **1083** | **1039** |
| | 110 | 1462 | 1433 | 1403 | 1373 | 1341 | 1309 | 1275 | 1240 | 1203 | 1165 | 1125 | 1084 |
| | 120 | 1515 | 1488 | 1460 | 1432 | 1402 | 1372 | 1341 | 1309 | 1275 | 1240 | 1204 | 1166 |
| **Emergency (<24 hrs)** | **130** | **1566** | **1540** | **1514** | **1488** | **1460** | **1432** | **1403** | **1373** | **1342** | **1310** | **1277** | **1242** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **1614** | **1591** | **1566** | **1541** | **1515** | **1489** | **1461** | **1433** | **1405** | **1375** | **1344** | **1312** |
| | 150 | 1661 | 1639 | 1615 | 1592 | 1568 | 1543 | 1517 | 1491 | 1464 | 1436 | 1407 | 1378 |
| | 160 | 1707 | 1685 | 1663 | 1641 | 1618 | 1594 | 1570 | 1546 | 1520 | 1494 | 1467 | 1440 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 795 kcm ACSR 26/7 | | Outside Diameter = | 1.108 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 2.2E-05 ohms/ft | $R_{high}$ = | 2.6E-05 ohms/ft |

## Bus Conductor: **795 kcm ACSR 30/7**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 1297 | 1260 | 1222 | 1182 | 1141 | 1097 | 1051 | 1003 | 952 | 897 | 838 | 774 |
| | 90 | 1362 | 1328 | 1293 | 1257 | 1219 | 1180 | 1139 | 1096 | 1051 | 1003 | 952 | 898 |
| | 100 | 1423 | 1391 | 1359 | 1326 | 1291 | 1255 | 1218 | 1179 | 1138 | 1096 | 1051 | 1004 |
| **Normal** | **105** | **1452** | **1421** | **1390** | **1358** | **1325** | **1290** | **1255** | **1218** | **1179** | **1139** | **1096** | **1052** |
| | 110 | 1480 | 1450 | 1420 | 1389 | 1358 | 1324 | 1290 | 1255 | 1218 | 1179 | 1139 | 1097 |
| | 120 | 1534 | 1506 | 1478 | 1449 | 1420 | 1389 | 1357 | 1325 | 1291 | 1255 | 1219 | 1181 |
| **Emergency (<24 hrs)** | **130** | **1585** | **1559** | **1533** | **1506** | **1478** | **1450** | **1420** | **1390** | **1358** | **1326** | **1292** | **1257** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **1634** | **1610** | **1585** | **1560** | **1534** | **1507** | **1480** | **1451** | **1422** | **1392** | **1361** | **1328** |
| | 150 | 1682 | 1659 | 1635 | 1611 | 1587 | 1562 | 1536 | 1509 | 1482 | 1454 | 1425 | 1395 |
| | 160 | 1728 | 1706 | 1684 | 1661 | 1638 | 1614 | 1590 | 1565 | 1539 | 1513 | 1486 | 1458 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 795 kcm ACSR 30/7 | | Outside Diameter = | 1.14 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 2.2E-05 ohms/ft | $R_{high}$ = | 2.6E-05 ohms/ft |

## Bus Conductor: **795 kcm ACSR 30/19**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 1296 | 1260 | 1221 | 1182 | 1140 | 1097 | 1051 | 1003 | 952 | 897 | 838 | 774 |
| | 90 | 1361 | 1328 | 1293 | 1256 | 1219 | 1180 | 1139 | 1096 | 1050 | 1003 | 952 | 898 |
| | 100 | 1422 | 1391 | 1359 | 1325 | 1291 | 1255 | 1217 | 1179 | 1138 | 1095 | 1051 | 1003 |
| **Normal** | **105** | **1451** | **1421** | **1390** | **1358** | **1324** | **1290** | **1254** | **1217** | **1179** | **1138** | **1096** | **1051** |
| | 110 | 1479 | 1450 | 1420 | 1389 | 1357 | 1324 | 1290 | 1254 | 1217 | 1179 | 1139 | 1096 |
| | 120 | 1533 | 1506 | 1478 | 1449 | 1419 | 1389 | 1357 | 1324 | 1290 | 1255 | 1218 | 1180 |
| **Emergency (<24 hrs)** | **130** | **1585** | **1559** | **1533** | **1506** | **1478** | **1449** | **1420** | **1389** | **1358** | **1326** | **1292** | **1257** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **1634** | **1610** | **1585** | **1559** | **1533** | **1507** | **1479** | **1451** | **1422** | **1391** | **1360** | **1328** |
| | 150 | 1681 | 1658 | 1635 | 1611 | 1586 | 1561 | 1535 | 1509 | 1482 | 1453 | 1424 | 1395 |
| | 160 | 1727 | 1705 | 1683 | 1661 | 1637 | 1614 | 1589 | 1564 | 1539 | 1512 | 1485 | 1457 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 795 kcm ACSR 30/19 | | Outside Diameter = | 1.14 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 2.2E-05 ohms/ft | $R_{high}$ = | 2.6E-05 ohms/ft |

## Bus Conductor: **954 kcm ACSR 45/7**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 1404 | 1364 | 1323 | 1280 | 1235 | 1188 | 1138 | 1086 | 1030 | 971 | 907 | 837 |
| | 90 | 1474 | 1437 | 1400 | 1360 | 1320 | 1277 | 1233 | 1186 | 1137 | 1085 | 1030 | 972 |
| | 100 | 1540 | 1506 | 1471 | 1435 | 1397 | 1358 | 1318 | 1276 | 1232 | 1186 | 1137 | 1086 |
| **Normal** | **105** | **1571** | **1538** | **1504** | **1470** | **1434** | **1396** | **1358** | **1318** | **1276** | **1232** | **1186** | **1138** |
| | 110 | 1601 | 1569 | 1537 | 1503 | 1469 | 1433 | 1396 | 1358 | 1318 | 1276 | 1232 | 1187 |
| | 120 | 1659 | 1630 | 1599 | 1568 | 1536 | 1503 | 1469 | 1433 | 1396 | 1358 | 1319 | 1277 |
| **Emergency (<24 hrs)** | **130** | **1715** | **1687** | **1658** | **1629** | **1599** | **1568** | **1536** | **1504** | **1470** | **1434** | **1398** | **1360** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **1768** | **1742** | **1715** | **1687** | **1659** | **1630** | **1600** | **1570** | **1538** | **1506** | **1472** | **1437** |
| | 150 | 1819 | 1794 | 1769 | 1743 | 1716 | 1689 | 1661 | 1633 | 1603 | 1573 | 1541 | 1509 |
| | 160 | 1868 | 1845 | 1821 | 1796 | 1771 | 1746 | 1719 | 1692 | 1665 | 1636 | 1607 | 1577 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 954 kcm ACSR 45/7 | | Outside Diameter = | 1.165 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 1.9E-05 ohms/ft | $R_{high}$ = | 2.3E-05 ohms/ft |

## Bus Conductor: **954 kcm ACSR 48/7**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 1402 | 1362 | 1321 | 1278 | 1233 | 1186 | 1137 | 1084 | 1029 | 970 | 906 | 836 |
| | 90 | 1472 | 1435 | 1397 | 1358 | 1317 | 1275 | 1231 | 1184 | 1135 | 1083 | 1028 | 970 |
| | 100 | 1536 | 1502 | 1468 | 1432 | 1394 | 1355 | 1315 | 1273 | 1229 | 1183 | 1135 | 1084 |
| **Normal** | **105** | **1567** | **1534** | **1501** | **1466** | **1430** | **1393** | **1355** | **1314** | **1273** | **1229** | **1183** | **1135** |
| | 110 | 1597 | 1565 | 1533 | 1500 | 1465 | 1429 | 1392 | 1354 | 1314 | 1273 | 1229 | 1184 |
| | 120 | 1654 | 1625 | 1594 | 1563 | 1531 | 1498 | 1464 | 1429 | 1392 | 1354 | 1315 | 1273 |
| **Emergency (<24 hrs)** | **130** | **1709** | **1681** | **1653** | **1624** | **1594** | **1563** | **1531** | **1498** | **1465** | **1430** | **1393** | **1356** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **1761** | **1735** | **1708** | **1681** | **1653** | **1624** | **1594** | **1564** | **1532** | **1500** | **1466** | **1431** |
| | 150 | 1811 | 1786 | 1761 | 1735 | 1709 | 1682 | 1654 | 1626 | 1596 | 1566 | 1535 | 1503 |
| | 160 | 1859 | 1836 | 1812 | 1788 | 1763 | 1738 | 1711 | 1685 | 1657 | 1629 | 1600 | 1569 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 954 kcm ACSR 48/7 | | Outside Diameter = | 1.175 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 1.9E-05 ohms/ft | $R_{high}$ = | 2.3E-05 ohms/ft |

## Bus Conductor: **1033.5 kcm ACSR 45/7**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 1476 | 1434 | 1390 | 1345 | 1298 | 1248 | 1196 | 1141 | 1082 | 1020 | 952 | 879 |
| | 90 | 1550 | 1512 | 1472 | 1431 | 1388 | 1343 | 1296 | 1247 | 1195 | 1141 | 1083 | 1021 |
| | 100 | 1620 | 1584 | 1547 | 1509 | 1470 | 1429 | 1386 | 1342 | 1296 | 1247 | 1196 | 1142 |
| **Normal** | **105** | **1653** | **1618** | **1583** | **1546** | **1509** | **1469** | **1429** | **1386** | **1342** | **1296** | **1248** | **1197** |
| | 110 | 1685 | 1652 | 1618 | 1582 | 1546 | 1508 | 1469 | 1429 | 1387 | 1343 | 1297 | 1249 |
| | 120 | 1747 | 1716 | 1684 | 1651 | 1617 | 1582 | 1546 | 1509 | 1470 | 1430 | 1388 | 1345 |
| **Emergency (<24 hrs)** | **130** | **1805** | **1776** | **1746** | **1716** | **1684** | **1651** | **1618** | **1583** | **1548** | **1511** | **1472** | **1432** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **1862** | **1834** | **1806** | **1777** | **1748** | **1717** | **1686** | **1654** | **1620** | **1586** | **1551** | **1514** |
| | 150 | 1916 | 1890 | 1863 | 1836 | 1808 | 1780 | 1750 | 1720 | 1689 | 1657 | 1624 | 1590 |
| | 160 | 1968 | 1944 | 1919 | 1893 | 1867 | 1840 | 1812 | 1784 | 1754 | 1724 | 1694 | 1662 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 1033.5 kcm ACSR 45/7 | | Outside Diameter = | 1.212 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 1.7E-05 ohms/ft | $R_{high}$ = | 2.1E-05 ohms/ft |

## Bus Conductor: **1033.5 kcm ACSR 54/7**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 1479 | 1437 | 1393 | 1348 | 1301 | 1251 | 1198 | 1143 | 1084 | 1021 | 954 | 880 |
| | 90 | 1552 | 1513 | 1473 | 1432 | 1389 | 1344 | 1297 | 1248 | 1196 | 1141 | 1083 | 1021 |
| | 100 | 1619 | 1583 | 1546 | 1508 | 1469 | 1428 | 1386 | 1341 | 1295 | 1246 | 1195 | 1141 |
| **Normal** | **105** | **1651** | **1616** | **1581** | **1545** | **1507** | **1468** | **1427** | **1385** | **1341** | **1294** | **1246** | **1195** |
| | 110 | 1682 | 1649 | 1615 | 1579 | 1543 | 1505 | 1467 | 1426 | 1384 | 1340 | 1294 | 1246 |
| | 120 | 1741 | 1710 | 1679 | 1646 | 1612 | 1577 | 1541 | 1504 | 1466 | 1426 | 1384 | 1340 |
| **Emergency (<24 hrs)** | **130** | **1798** | **1769** | **1739** | **1708** | **1677** | **1645** | **1611** | **1577** | **1541** | **1504** | **1466** | **1426** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **1852** | **1825** | **1797** | **1768** | **1738** | **1708** | **1677** | **1645** | **1612** | **1578** | **1542** | **1506** |
| | 150 | 1904 | 1878 | 1852 | 1825 | 1797 | 1769 | 1739 | 1709 | 1679 | 1647 | 1614 | 1580 |
| | 160 | 1954 | 1930 | 1905 | 1879 | 1853 | 1826 | 1799 | 1771 | 1742 | 1712 | 1682 | 1650 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 1033.5 kcm ACSR 54/7 | | Outside Diameter = | 1.245 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 1.7E-05 ohms/ft | $R_{high}$ = | 2.1E-05 ohms/ft |

## Bus Conductor: **1272 kcm ACSR 45/7**

| Rating | Rated Operating Temperature | Assumed Wind Speed = 2 fps<br>Ambient Temperature (°C)<br>-15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 1680 | 1632 | 1582 | 1530 | 1476 | 1420 | 1360 | 1297 | 1230 | 1158 | 1080 | 996 |
| | 90 | 1767 | 1723 | 1677 | 1630 | 1581 | 1530 | 1476 | 1420 | 1361 | 1298 | 1232 | 1161 |
| | 100 | 1848 | 1807 | 1765 | 1721 | 1676 | 1630 | 1581 | 1530 | 1477 | 1422 | 1363 | 1301 |
| **Normal** | **105** | **1886** | **1847** | **1807** | **1765** | **1722** | **1677** | **1630** | **1582** | **1531** | **1479** | **1423** | **1365** |
| | 110 | 1924 | 1886 | 1847 | 1807 | 1765 | 1722 | 1677 | 1631 | 1583 | 1533 | 1480 | 1425 |
| | 120 | 1996 | 1960 | 1924 | 1887 | 1848 | 1808 | 1767 | 1724 | 1680 | 1634 | 1586 | 1537 |
| **Emergency (<24 hrs)** | **130** | **2065** | **2032** | **1997** | **1962** | **1926** | **1889** | **1851** | **1811** | **1770** | **1728** | **1684** | **1639** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **2131** | **2100** | **2067** | **2034** | **2001** | **1966** | **1930** | **1893** | **1855** | **1816** | **1775** | **1733** |
| | 150 | 2195 | 2165 | 2135 | 2104 | 2072 | 2039 | 2006 | 1971 | 1936 | 1899 | 1861 | 1822 |
| | 160 | 2256 | 2228 | 2200 | 2170 | 2140 | 2109 | 2078 | 2045 | 2012 | 1978 | 1942 | 1906 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 1272 kcm ACSR 45/7 | | Outside Diameter = | 1.345 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 1.4E-05 ohms/ft | $R_{high}$ = | 1.7E-05 ohms/ft |

## Bus Conductor: **1590 kcm ACSR 45/7**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 1925 | 1870 | 1813 | 1754 | 1691 | 1626 | 1557 | 1484 | 1407 | 1324 | 1234 | 1136 |
| | 90 | 2027 | 1977 | 1925 | 1870 | 1814 | 1755 | 1693 | 1629 | 1560 | 1488 | 1411 | 1329 |
| | 100 | 2123 | 2076 | 2028 | 1978 | 1926 | 1872 | 1816 | 1758 | 1697 | 1633 | 1565 | 1493 |
| **Normal** | **105** | **2168** | **2123** | **2077** | **2029** | **1979** | **1928** | **1874** | **1818** | **1760** | **1699** | **1635** | **1568** |
| | 110 | 2213 | 2169 | 2124 | 2078 | 2030 | 1981 | 1930 | 1876 | 1821 | 1763 | 1702 | 1638 |
| | 120 | 2298 | 2257 | 2215 | 2172 | 2128 | 2082 | 2035 | 1986 | 1935 | 1882 | 1827 | 1769 |
| **Emergency (<24 hrs)** | **130** | **2379** | **2341** | **2302** | **2262** | **2220** | **2178** | **2133** | **2088** | **2041** | **1992** | **1942** | **1889** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **2458** | **2422** | **2385** | **2347** | **2308** | **2268** | **2227** | **2185** | **2141** | **2096** | **2049** | **2000** |
| | 150 | 2533 | 2499 | 2464 | 2429 | 2392 | 2355 | 2316 | 2276 | 2235 | 2193 | 2150 | 2105 |
| | 160 | 2607 | 2574 | 2541 | 2508 | 2473 | 2438 | 2401 | 2364 | 2326 | 2286 | 2246 | 2204 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 1590 kcm ACSR 45/7 | | Outside Diameter = | 1.504 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 1.2E-05 ohms/ft | $R_{high}$ = | 1.4E-05 ohms/ft |

## Bus Conductor: **1590 kcm ACSR 54/19**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 1930 | 1875 | 1818 | 1758 | 1696 | 1630 | 1561 | 1488 | 1410 | 1327 | 1236 | 1138 |
| | 90 | 2030 | 1979 | 1927 | 1872 | 1816 | 1757 | 1695 | 1630 | 1562 | 1489 | 1412 | 1330 |
| | 100 | 2122 | 2075 | 2027 | 1977 | 1925 | 1872 | 1816 | 1757 | 1696 | 1632 | 1564 | 1492 |
| **Normal** | **105** | **2166** | **2121** | **2075** | **2027** | **1977** | **1925** | **1872** | **1816** | **1758** | **1697** | **1633** | **1566** |
| | 110 | 2209 | 2165 | 2120 | 2074 | 2027 | 1977 | 1926 | 1873 | 1817 | 1759 | 1699 | 1635 |
| | 120 | 2291 | 2250 | 2208 | 2166 | 2121 | 2076 | 2028 | 1979 | 1929 | 1876 | 1821 | 1763 |
| **Emergency (<24 hrs)** | **130** | **2369** | **2331** | **2292** | **2252** | **2210** | **2168** | **2124** | **2079** | **2032** | **1983** | **1933** | **1881** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **2444** | **2408** | **2371** | **2334** | **2295** | **2255** | **2215** | **2172** | **2129** | **2084** | **2037** | **1989** |
| | 150 | 2516 | 2482 | 2448 | 2412 | 2376 | 2339 | 2301 | 2261 | 2221 | 2179 | 2136 | 2091 |
| | 160 | 2586 | 2554 | 2521 | 2488 | 2454 | 2419 | 2383 | 2346 | 2308 | 2269 | 2228 | 2187 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 1590 kcm ACSR 54/19 | | Outside Diameter = | 1.545 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 1.2E-05 ohms/ft | $R_{high}$ = | 1.4E-05 ohms/ft |

## Bus Conductor: **2167 kcm ACSR 72/7**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 2293 | 2227 | 2159 | 2087 | 2013 | 1935 | 1852 | 1764 | 1671 | 1571 | 1463 | 1344 |
| | 90 | 2420 | 2360 | 2297 | 2232 | 2165 | 2094 | 2020 | 1942 | 1860 | 1773 | 1681 | 1582 |
| | 100 | 2540 | 2484 | 2426 | 2367 | 2305 | 2240 | 2173 | 2103 | 2029 | 1952 | 1871 | 1784 |
| **Normal** | **105** | **2597** | **2543** | **2488** | **2430** | **2371** | **2309** | **2245** | **2178** | **2108** | **2034** | **1957** | **1876** |
| | 110 | 2653 | 2601 | 2547 | 2492 | 2435 | 2375 | 2314 | 2250 | 2183 | 2113 | 2040 | 1963 |
| | 120 | 2761 | 2712 | 2662 | 2610 | 2557 | 2502 | 2445 | 2386 | 2325 | 2261 | 2195 | 2126 |
| **Emergency (<24 hrs)** | **130** | **2864** | **2818** | **2771** | **2723** | **2673** | **2622** | **2569** | **2514** | **2458** | **2399** | **2338** | **2275** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **2963** | **2920** | **2876** | **2831** | **2784** | **2736** | **2687** | **2636** | **2583** | **2528** | **2472** | **2414** |
| | 150 | 3060 | 3019 | 2977 | 2934 | 2890 | 2845 | 2799 | 2751 | 2702 | 2651 | 2599 | 2544 |
| | 160 | 3153 | 3115 | 3075 | 3035 | 2993 | 2950 | 2907 | 2862 | 2816 | 2768 | 2719 | 2669 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 2167 kcm ACSR 72/7 | | Outside Diameter = | 1.735 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 9.2E-06 ohms/ft | $R_{high}$ = | 1.1E-05 ohms/ft |

## Bus Conductor: **2493 kcm ACAR 54/37**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 2415 | 2345 | 2273 | 2198 | 2119 | 2037 | 1949 | 1857 | 1758 | 1653 | 1538 | 1412 |
| | 90 | 2554 | 2490 | 2424 | 2355 | 2284 | 2209 | 2131 | 2049 | 1962 | 1870 | 1772 | 1667 |
| | 100 | 2685 | 2626 | 2565 | 2501 | 2436 | 2367 | 2296 | 2222 | 2144 | 2063 | 1976 | 1885 |
| **Normal** | **105** | **2748** | **2690** | **2632** | **2571** | **2508** | **2442** | **2374** | **2303** | **2229** | **2152** | **2070** | **1984** |
| | 110 | 2809 | 2754 | 2697 | 2638 | 2578 | 2515 | 2449 | 2382 | 2311 | 2237 | 2160 | 2078 |
| | 120 | 2927 | 2876 | 2823 | 2768 | 2711 | 2653 | 2593 | 2530 | 2465 | 2398 | 2327 | 2254 |
| **Emergency (<24 hrs)** | **130** | **3041** | **2993** | **2943** | **2891** | **2839** | **2784** | **2728** | **2670** | **2610** | **2548** | **2483** | **2416** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **3151** | **3105** | **3058** | **3010** | **2960** | **2909** | **2857** | **2803** | **2747** | **2689** | **2629** | **2567** |
| | 150 | 3257 | 3214 | 3170 | 3124 | 3078 | 3030 | 2980 | 2930 | 2877 | 2823 | 2767 | 2710 |
| | 160 | 3361 | 3320 | 3278 | 3235 | 3191 | 3146 | 3099 | 3051 | 3002 | 2952 | 2900 | 2846 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 2493 kcm ACAR 54/37 | | Outside Diameter = | 1.821 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 100 °C |
| | $R_{low}$ = | 8.5E-06 ohms/ft | $R_{high}$ = | 1E-05 ohms/ft |

## Bus Conductor: **3/0 AAC 7 str**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 460 | 448 | 434 | 421 | 406 | 391 | 376 | 359 | 342 | 324 | 304 | 283 |
| | 90 | 481 | 469 | 457 | 444 | 431 | 418 | 404 | 389 | 373 | 357 | 340 | 322 |
| | 100 | 500 | 489 | 478 | 466 | 454 | 442 | 429 | 415 | 401 | 387 | 372 | 356 |
| **Normal** | **105** | **509** | **499** | **488** | **476** | **465** | **453** | **440** | **428** | **414** | **400** | **386** | **371** |
| | 110 | 518 | 508 | 497 | 486 | 475 | 464 | 452 | 439 | 427 | 413 | 399 | 385 |
| | 120 | 535 | 525 | 515 | 505 | 495 | 484 | 473 | 461 | 450 | 437 | 425 | 412 |
| **Emergency (<24 hrs)** | **130** | **551** | **541** | **532** | **523** | **513** | **503** | **492** | **482** | **471** | **460** | **448** | **436** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **566** | **557** | **548** | **539** | **530** | **521** | **511** | **501** | **491** | **480** | **469** | **458** |
| | 150 | 580 | 572 | 564 | 555 | 546 | 537 | 528 | 519 | 509 | 500 | 489 | 479 |
| | 160 | 594 | 586 | 578 | 570 | 562 | 554 | 545 | 536 | 527 | 518 | 508 | 499 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 3/0 AAC 7 str | | Outside Diameter = | 0.464 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 0.0001 ohms/ft | $R_{high}$ = | 0.00013 ohms/ft |

## Bus Conductor: **250 kcm AAC 19 str**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 595 | 579 | 561 | 544 | 525 | 506 | 485 | 464 | 441 | 417 | 391 | 364 |
| | 90 | 623 | 607 | 591 | 575 | 558 | 540 | 522 | 503 | 483 | 462 | 439 | 416 |
| | 100 | 648 | 634 | 619 | 604 | 588 | 572 | 555 | 538 | 520 | 501 | 481 | 460 |
| **Normal** | **105** | **660** | **646** | **632** | **618** | **602** | **587** | **571** | **554** | **537** | **519** | **500** | **480** |
| | 110 | 672 | 658 | 645 | 631 | 616 | 601 | 586 | 570 | 553 | 536 | 518 | 499 |
| | 120 | 694 | 682 | 669 | 656 | 642 | 628 | 614 | 599 | 584 | 568 | 551 | 534 |
| **Emergency (<24 hrs)** | **130** | **715** | **704** | **692** | **679** | **666** | **653** | **640** | **626** | **612** | **597** | **582** | **567** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **736** | **724** | **713** | **701** | **689** | **677** | **665** | **652** | **639** | **625** | **611** | **596** |
| | 150 | 755 | 744 | 734 | 723 | 711 | 700 | 688 | 676 | 663 | 651 | 638 | 624 |
| | 160 | 774 | 764 | 753 | 743 | 732 | 721 | 710 | 699 | 687 | 675 | 663 | 650 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 250 kcm AAC 19 str | | Outside Diameter = | 0.574 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 7.1E-05 ohms/ft | $R_{high}$ = | 8.5E-05 ohms/ft |

## Bus Conductor: **300 kcm AAC 19 str**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 668 | 650 | 630 | 610 | 589 | 567 | 545 | 520 | 495 | 468 | 439 | 407 |
| | 90 | 700 | 682 | 664 | 646 | 627 | 607 | 586 | 565 | 542 | 518 | 493 | 466 |
| | 100 | 728 | 712 | 696 | 679 | 661 | 643 | 624 | 604 | 584 | 563 | 540 | 517 |
| **Normal** | **105** | **742** | **727** | **711** | **694** | **677** | **660** | **642** | **623** | **603** | **583** | **562** | **539** |
| | 110 | 755 | 740 | 725 | 709 | 693 | 676 | 659 | 641 | 622 | 602 | 582 | 561 |
| | 120 | 781 | 767 | 752 | 738 | 722 | 707 | 691 | 674 | 657 | 639 | 620 | 601 |
| **Emergency (<24 hrs)** | **130** | **805** | **792** | **778** | **764** | **750** | **735** | **720** | **705** | **689** | **672** | **655** | **638** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **828** | **815** | **803** | **790** | **776** | **762** | **748** | **734** | **719** | **704** | **688** | **671** |
| | 150 | 850 | 838 | 826 | 814 | 801 | 788 | 775 | 761 | 747 | 733 | 718 | 703 |
| | 160 | 871 | 860 | 849 | 837 | 825 | 813 | 800 | 787 | 774 | 761 | 747 | 733 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 300 kcm AAC 19 str | | Outside Diameter = | 0.629 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 5.9E-05 ohms/ft | $R_{high}$ = | 7.1E-05 ohms/ft |

## Bus Conductor: **336.4 kcm AAC 19 str**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 719 | 699 | 678 | 656 | 634 | 610 | 585 | 559 | 532 | 503 | 471 | 437 |
| | 90 | 753 | 734 | 715 | 695 | 674 | 653 | 631 | 607 | 583 | 557 | 530 | 501 |
| | 100 | 784 | 767 | 749 | 730 | 711 | 692 | 671 | 650 | 628 | 605 | 581 | 556 |
| **Normal** | **105** | **799** | **782** | **765** | **747** | **729** | **710** | **691** | **670** | **649** | **627** | **604** | **580** |
| | 110 | 813 | 797 | 780 | 763 | 746 | 728 | 709 | 689 | 669 | 648 | 627 | 604 |
| | 120 | 841 | 825 | 810 | 794 | 778 | 761 | 743 | 726 | 707 | 688 | 668 | 647 |
| **Emergency (<24 hrs)** | **130** | **867** | **853** | **838** | **823** | **808** | **792** | **776** | **759** | **742** | **724** | **706** | **687** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **892** | **878** | **865** | **850** | **836** | **821** | **806** | **791** | **774** | **758** | **741** | **723** |
| | 150 | 916 | 903 | 890 | 877 | 863 | 849 | 835 | 820 | 805 | 790 | 774 | 757 |
| | 160 | 939 | 927 | 914 | 902 | 889 | 876 | 862 | 848 | 834 | 820 | 805 | 790 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 336.4 kcm AAC 19 str | | Outside Diameter = | 0.666 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 5.3E-05 ohms/ft | $R_{high}$ = | 6.3E-05 ohms/ft |

Bus Conductor: **350 kcm AAC 19 str**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 737 | 716 | 695 | 673 | 650 | 625 | 600 | 573 | 545 | 515 | 483 | 448 |
| | 90 | 772 | 753 | 733 | 713 | 691 | 669 | 647 | 623 | 598 | 571 | 543 | 514 |
| | 100 | 804 | 786 | 768 | 749 | 730 | 709 | 689 | 667 | 644 | 621 | 596 | 570 |
| **Normal** | **105** | **819** | **802** | **784** | **766** | **747** | **728** | **708** | **687** | **666** | **643** | **620** | **595** |
| | 110 | 834 | 817 | 800 | 783 | 765 | 746 | 727 | 707 | 686 | 665 | 643 | 619 |
| | 120 | 862 | 847 | 831 | 814 | 798 | 780 | 763 | 744 | 725 | 705 | 685 | 664 |
| **Emergency (<24 hrs)** | **130** | **889** | **874** | **859** | **844** | **828** | **812** | **796** | **779** | **761** | **743** | **724** | **704** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **915** | **901** | **887** | **872** | **858** | **842** | **827** | **811** | **794** | **778** | **760** | **742** |
| | 150 | 939 | 926 | 913 | 899 | 885 | 871 | 856 | 841 | 826 | 810 | 794 | 777 |
| | 160 | 963 | 951 | 938 | 925 | 912 | 898 | 885 | 871 | 856 | 841 | 826 | 810 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 350 kcm AAC 19 str | | Outside Diameter = | 0.679 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 5.1E-05 ohms/ft | $R_{high}$ = | 6.1E-05 ohms/ft |

## Bus Conductor: **500 kcm AAC 19 str**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 924 | 898 | 871 | 843 | 814 | 783 | 751 | 717 | 682 | 644 | 603 | 558 |
| | 90 | 968 | 944 | 920 | 894 | 867 | 840 | 811 | 781 | 749 | 716 | 680 | 642 |
| | 100 | 1010 | 987 | 964 | 941 | 916 | 891 | 865 | 837 | 809 | 779 | 748 | 714 |
| **Normal** | **105** | **1029** | **1008** | **986** | **963** | **939** | **915** | **890** | **864** | **836** | **808** | **778** | **747** |
| | 110 | 1048 | 1027 | 1006 | 984 | 962 | 938 | 914 | 889 | 863 | 836 | 808 | 778 |
| | 120 | 1085 | 1065 | 1045 | 1025 | 1004 | 982 | 960 | 936 | 913 | 888 | 862 | 835 |
| **Emergency (<24 hrs)** | **130** | **1119** | **1101** | **1082** | **1063** | **1043** | **1023** | **1002** | **981** | **959** | **936** | **912** | **887** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **1153** | **1135** | **1118** | **1100** | **1081** | **1062** | **1042** | **1022** | **1002** | **980** | **958** | **936** |
| | 150 | 1184 | 1168 | 1151 | 1134 | 1117 | 1099 | 1081 | 1062 | 1042 | 1022 | 1002 | 981 |
| | 160 | 1215 | 1200 | 1184 | 1168 | 1151 | 1134 | 1117 | 1099 | 1081 | 1062 | 1043 | 1023 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 500 kcm AAC 19 str | | Outside Diameter = | 0.811 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 3.6E-05 ohms/ft | $R_{high}$ = | 4.3E-05 ohms/ft |

## Bus Conductor: **556.5 kcm AAC 37 str**

| Rating | Rated Operating Temperature | Assumed Wind Speed = 2 fps<br>Ambient Temperature (°C)<br>-15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 989 | 961 | 933 | 903 | 871 | 838 | 804 | 768 | 729 | 688 | 644 | 597 |
| | 90 | 1037 | 1012 | 985 | 958 | 929 | 899 | 868 | 836 | 802 | 766 | 728 | 688 |
| | 100 | 1082 | 1058 | 1033 | 1008 | 982 | 955 | 926 | 897 | 866 | 834 | 801 | 765 |
| **Normal** | **105** | **1103** | **1080** | **1056** | **1032** | **1007** | **981** | **954** | **926** | **896** | **866** | **834** | **800** |
| | 110 | 1124 | 1101 | 1078 | 1055 | 1031 | 1006 | 980 | 953 | 925 | 896 | 865 | 834 |
| | 120 | 1163 | 1142 | 1121 | 1099 | 1076 | 1053 | 1029 | 1004 | 978 | 952 | 924 | 895 |
| **Emergency (<24 hrs)** | **130** | **1200** | **1181** | **1161** | **1140** | **1119** | **1097** | **1075** | **1052** | **1028** | **1003** | **978** | **952** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **1236** | **1218** | **1199** | **1180** | **1160** | **1139** | **1118** | **1097** | **1075** | **1052** | **1028** | **1004** |
| | 150 | 1271 | 1253 | 1235 | 1217 | 1198 | 1179 | 1160 | 1139 | 1119 | 1097 | 1075 | 1053 |
| | 160 | 1304 | 1287 | 1271 | 1253 | 1235 | 1217 | 1199 | 1180 | 1160 | 1140 | 1120 | 1098 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 556.5 kcm AAC 37 str | | Outside Diameter = | 0.858 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 3.2E-05 ohms/ft | $R_{high}$ = | 3.8E-05 ohms/ft |

## Bus Conductor: **795 kcm AAC 37 str**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 1238 | 1203 | 1167 | 1129 | 1090 | 1049 | 1005 | 959 | 911 | 859 | 803 | 742 |
| | 90 | 1300 | 1268 | 1235 | 1200 | 1164 | 1127 | 1088 | 1047 | 1004 | 959 | 910 | 859 |
| | 100 | 1358 | 1328 | 1297 | 1265 | 1232 | 1198 | 1162 | 1125 | 1087 | 1046 | 1004 | 959 |
| **Normal** | **105** | **1385** | **1356** | **1326** | **1296** | **1264** | **1231** | **1197** | **1162** | **1125** | **1087** | **1046** | **1004** |
| | 110 | 1412 | 1384 | 1355 | 1325 | 1295 | 1263 | 1231 | 1197 | 1162 | 1125 | 1087 | 1047 |
| | 120 | 1463 | 1437 | 1410 | 1382 | 1354 | 1325 | 1294 | 1263 | 1231 | 1197 | 1162 | 1126 |
| **Emergency (<24 hrs)** | **130** | **1511** | **1487** | **1462** | **1436** | **1409** | **1382** | **1354** | **1325** | **1295** | **1264** | **1232** | **1198** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **1558** | **1535** | **1511** | **1487** | **1462** | **1436** | **1410** | **1383** | **1355** | **1326** | **1296** | **1266** |
| | 150 | 1603 | 1581 | 1558 | 1535 | 1512 | 1488 | 1463 | 1438 | 1412 | 1385 | 1357 | 1329 |
| | 160 | 1646 | 1625 | 1604 | 1582 | 1560 | 1537 | 1514 | 1490 | 1466 | 1441 | 1415 | 1388 |
| | | | | | | | WINTER | | | | | SUMMER | |

Weather Assumptions:

| | | | |
|---|---|---|---|
| Emissivity = | 0.7 | Suntime = | 14 |
| Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |

Conductor : 795 kcm AAC 37 str

| | | | |
|---|---|---|---|
| | | Outside Diameter = | 1.026 inches |
| $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| $R_{low}$ = | 2.3E-05 ohms/ft | $R_{high}$ = | 2.7E-05 ohms/ft |

## Bus Conductor: **795 kcm AAC 61 str**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 1239 | 1204 | 1168 | 1130 | 1090 | 1049 | 1006 | 960 | 911 | 859 | 803 | 743 |
| | 90 | 1301 | 1269 | 1235 | 1201 | 1165 | 1127 | 1088 | 1047 | 1004 | 959 | 911 | 859 |
| | 100 | 1358 | 1329 | 1298 | 1266 | 1233 | 1199 | 1163 | 1126 | 1087 | 1047 | 1004 | 959 |
| **Normal** | **105** | **1386** | **1357** | **1327** | **1297** | **1265** | **1232** | **1198** | **1163** | **1126** | **1087** | **1047** | **1005** |
| | 110 | 1412 | 1385 | 1356 | 1326 | 1296 | 1264 | 1232 | 1198 | 1162 | 1126 | 1087 | 1047 |
| | 120 | 1463 | 1437 | 1411 | 1383 | 1355 | 1325 | 1295 | 1264 | 1231 | 1198 | 1163 | 1127 |
| **Emergency (<24 hrs)** | **130** | **1512** | **1488** | **1462** | **1437** | **1410** | **1383** | **1355** | **1326** | **1296** | **1265** | **1233** | **1199** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **1559** | **1536** | **1512** | **1488** | **1463** | **1437** | **1411** | **1384** | **1356** | **1327** | **1297** | **1266** |
| | 150 | 1604 | 1582 | 1559 | 1536 | 1513 | 1489 | 1464 | 1439 | 1413 | 1386 | 1358 | 1329 |
| | 160 | 1647 | 1626 | 1605 | 1583 | 1561 | 1538 | 1515 | 1491 | 1467 | 1441 | 1416 | 1389 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 795 kcm AAC 61 str | | Outside Diameter = | 1.028 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 2.3E-05 ohms/ft | $R_{high}$ = | 2.7E-05 ohms/ft |

## Bus Conductor: **1000 kcm AAC 37 str**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 1429 | 1388 | 1346 | 1303 | 1257 | 1209 | 1159 | 1105 | 1049 | 988 | 923 | 853 |
| | 90 | 1502 | 1464 | 1426 | 1386 | 1344 | 1301 | 1256 | 1208 | 1158 | 1106 | 1050 | 990 |
| | 100 | 1569 | 1535 | 1499 | 1462 | 1424 | 1385 | 1343 | 1301 | 1256 | 1209 | 1159 | 1107 |
| **Normal** | **105** | **1602** | **1568** | **1534** | **1499** | **1462** | **1424** | **1385** | **1344** | **1301** | **1256** | **1209** | **1160** |
| | 110 | 1633 | 1601 | 1568 | 1534 | 1498 | 1462 | 1424 | 1385 | 1344 | 1302 | 1257 | 1210 |
| | 120 | 1694 | 1663 | 1632 | 1601 | 1568 | 1534 | 1499 | 1463 | 1425 | 1386 | 1346 | 1304 |
| **Emergency (<24 hrs)** | **130** | **1751** | **1723** | **1694** | **1664** | **1633** | **1602** | **1569** | **1535** | **1501** | **1465** | **1428** | **1389** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **1806** | **1780** | **1752** | **1724** | **1695** | **1666** | **1635** | **1604** | **1572** | **1538** | **1504** | **1468** |
| | 150 | 1859 | 1834 | 1808 | 1782 | 1755 | 1727 | 1698 | 1669 | 1639 | 1608 | 1576 | 1543 |
| | 160 | 1911 | 1887 | 1862 | 1837 | 1812 | 1786 | 1759 | 1731 | 1703 | 1674 | 1644 | 1613 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 1000 kcm AAC 37 str | | Outside Diameter = | 1.15 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 1.8E-05 ohms/ft | $R_{high}$ = | 2.2E-05 ohms/ft |

## Bus Conductor: **1033.5 kcm AAC 61 str**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 1459 | 1418 | 1375 | 1330 | 1283 | 1234 | 1183 | 1128 | 1071 | 1009 | 942 | 870 |
| | 90 | 1534 | 1496 | 1456 | 1415 | 1373 | 1329 | 1282 | 1234 | 1183 | 1129 | 1072 | 1011 |
| | 100 | 1603 | 1568 | 1531 | 1494 | 1455 | 1414 | 1372 | 1328 | 1283 | 1235 | 1184 | 1131 |
| **Normal** | **105** | **1636** | **1602** | **1567** | **1531** | **1493** | **1455** | **1414** | **1373** | **1329** | **1283** | **1235** | **1185** |
| | 110 | 1668 | 1636 | 1602 | 1567 | 1531 | 1493 | 1455 | 1415 | 1373 | 1330 | 1284 | 1237 |
| | 120 | 1730 | 1700 | 1668 | 1635 | 1602 | 1567 | 1532 | 1495 | 1456 | 1417 | 1375 | 1332 |
| **Emergency (<24 hrs)** | **130** | **1789** | **1760** | **1731** | **1700** | **1669** | **1637** | **1603** | **1569** | **1534** | **1497** | **1459** | **1420** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **1846** | **1819** | **1791** | **1762** | **1733** | **1702** | **1671** | **1639** | **1606** | **1572** | **1537** | **1501** |
| | 150 | 1901 | 1875 | 1848 | 1821 | 1794 | 1765 | 1736 | 1706 | 1675 | 1643 | 1611 | 1577 |
| | 160 | 1953 | 1929 | 1904 | 1878 | 1852 | 1825 | 1798 | 1770 | 1741 | 1711 | 1680 | 1649 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 1033.5 kcm AAC 61 str | | Outside Diameter = | 1.172 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 1.8E-05 ohms/ft | $R_{high}$ = | 2.1E-05 ohms/ft |

## Bus Conductor: **1510.5 kcm AAC 61 str**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 1838 | 1785 | 1731 | 1674 | 1615 | 1553 | 1487 | 1418 | 1344 | 1265 | 1180 | 1087 |
| | 90 | 1936 | 1887 | 1838 | 1786 | 1732 | 1676 | 1617 | 1555 | 1490 | 1422 | 1349 | 1271 |
| | 100 | 2027 | 1982 | 1936 | 1889 | 1839 | 1788 | 1735 | 1679 | 1621 | 1560 | 1495 | 1427 |
| **Normal** | **105** | **2071** | **2028** | **1983** | **1938** | **1890** | **1841** | **1790** | **1737** | **1681** | **1623** | **1562** | **1498** |
| | 110 | 2113 | 2072 | 2029 | 1985 | 1939 | 1892 | 1843 | 1792 | 1739 | 1684 | 1626 | 1565 |
| | 120 | 2195 | 2156 | 2116 | 2075 | 2033 | 1989 | 1944 | 1897 | 1848 | 1798 | 1745 | 1690 |
| **Emergency (<24 hrs)** | **130** | **2274** | **2237** | **2199** | **2161** | **2121** | **2080** | **2038** | **1995** | **1950** | **1903** | **1855** | **1805** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **2349** | **2314** | **2279** | **2243** | **2205** | **2167** | **2128** | **2087** | **2045** | **2002** | **1957** | **1911** |
| | 150 | 2421 | 2389 | 2355 | 2321 | 2286 | 2250 | 2213 | 2175 | 2136 | 2096 | 2054 | 2011 |
| | 160 | 2492 | 2461 | 2429 | 2397 | 2364 | 2330 | 2295 | 2259 | 2223 | 2185 | 2146 | 2106 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 1510.5 kcm AAC 61 str | | Outside Diameter = | 1.417 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 1.3E-05 ohms/ft | $R_{high}$ = | 1.5E-05 ohms/ft |

## Bus Conductor: **1590 kcm AAC 61 str**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 1895 | 1841 | 1785 | 1726 | 1665 | 1601 | 1533 | 1461 | 1385 | 1304 | 1216 | 1120 |
| | 90 | 1996 | 1947 | 1895 | 1842 | 1786 | 1728 | 1668 | 1604 | 1537 | 1466 | 1391 | 1310 |
| | 100 | 2092 | 2045 | 1998 | 1949 | 1898 | 1845 | 1790 | 1732 | 1672 | 1609 | 1542 | 1472 |
| **Normal** | **105** | **2137** | **2093** | **2047** | **1999** | **1950** | **1900** | **1847** | **1792** | **1735** | **1675** | **1612** | **1546** |
| | 110 | 2181 | 2138 | 2094 | 2049 | 2001 | 1953 | 1902 | 1850 | 1795 | 1738 | 1678 | 1615 |
| | 120 | 2267 | 2226 | 2185 | 2143 | 2099 | 2054 | 2007 | 1958 | 1908 | 1856 | 1802 | 1745 |
| **Emergency (<24 hrs)** | **130** | **2348** | **2310** | **2272** | **2232** | **2191** | **2149** | **2105** | **2060** | **2014** | **1966** | **1916** | **1864** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **2427** | **2391** | **2354** | **2317** | **2279** | **2239** | **2198** | **2157** | **2113** | **2069** | **2023** | **1975** |
| | 150 | 2502 | 2469 | 2434 | 2399 | 2363 | 2326 | 2287 | 2248 | 2208 | 2166 | 2123 | 2079 |
| | 160 | 2576 | 2544 | 2511 | 2478 | 2444 | 2409 | 2373 | 2336 | 2298 | 2259 | 2219 | 2177 |
| | | | | | | | WINTER | | | | | SUMMER | |

Weather Assumptions:

| | | | |
|---|---|---|---|
| Emissivity = | 0.7 | Suntime = | 14 |
| Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |

Conductor : 1590 kcm AAC 61 str

| | | | |
|---|---|---|---|
| | | Outside Diameter = | 1.454 inches |
| $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| $R_{low}$ = | 1.2E-05 ohms/ft | $R_{high}$ = | 1.4E-05 ohms/ft |

## Bus Conductor: **2000 kcm AAC 127 str**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 2210 | 2146 | 2081 | 2012 | 1941 | 1865 | 1786 | 1702 | 1612 | 1516 | 1413 | 1299 |
| | 90 | 2340 | 2282 | 2222 | 2159 | 2094 | 2025 | 1954 | 1879 | 1800 | 1716 | 1627 | 1532 |
| | 100 | 2464 | 2410 | 2354 | 2296 | 2236 | 2173 | 2108 | 2040 | 1969 | 1894 | 1816 | 1732 |
| **Normal** | **105** | **2524** | **2471** | **2417** | **2361** | **2303** | **2243** | **2181** | **2116** | **2048** | **1977** | **1903** | **1824** |
| | 110 | 2582 | 2531 | 2479 | 2425 | 2369 | 2311 | 2252 | 2189 | 2124 | 2057 | 1986 | 1911 |
| | 120 | 2695 | 2647 | 2598 | 2548 | 2496 | 2442 | 2386 | 2329 | 2269 | 2207 | 2142 | 2075 |
| **Emergency (<24 hrs)** | **130** | **2804** | **2759** | **2713** | **2665** | **2616** | **2566** | **2514** | **2461** | **2405** | **2348** | **2288** | **2226** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **2909** | **2866** | **2823** | **2778** | **2732** | **2685** | **2637** | **2586** | **2535** | **2481** | **2426** | **2369** |
| | 150 | 3011 | 2971 | 2930 | 2888 | 2844 | 2800 | 2754 | 2707 | 2658 | 2608 | 2557 | 2503 |
| | 160 | 3111 | 3073 | 3034 | 2994 | 2953 | 2911 | 2867 | 2823 | 2777 | 2730 | 2682 | 2632 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 2000 kcm AAC 127 str | | Outside Diameter = | 1.63 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 0.00001 ohms/ft | $R_{high}$ = | 1.1E-05 ohms/ft |

## Bus Conductor: **3500 kcm AAC 127 str**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80 | 2914 | 2828 | 2740 | 2647 | 2550 | 2448 | 2341 | 2227 | 2107 | 1978 | 1838 | 1684 |
| | 90 | 3086 | 3007 | 2926 | 2841 | 2753 | 2661 | 2566 | 2466 | 2361 | 2249 | 2130 | 2001 |
| | 100 | 3248 | 3175 | 3100 | 3022 | 2942 | 2860 | 2774 | 2683 | 2589 | 2489 | 2384 | 2273 |
| **Normal** | **105** | **3326** | **3256** | **3183** | **3110** | **3033** | **2954** | **2871** | **2785** | **2695** | **2601** | **2502** | **2397** |
| | 110 | 3403 | 3334 | 3266 | 3195 | 3121 | 3045 | 2966 | 2884 | 2798 | 2708 | 2614 | 2514 |
| | 120 | 3552 | 3489 | 3425 | 3359 | 3290 | 3220 | 3147 | 3071 | 2992 | 2910 | 2824 | 2734 |
| **Emergency (<24 hrs)** | **130** | **3697** | **3638** | **3578** | **3516** | **3452** | **3386** | **3318** | **3247** | **3174** | **3099** | **3020** | **2938** |
| | | | | | | | | | | | | | |
| **Emergency (< 1 hr )** | **140** | **3837** | **3782** | **3725** | **3667** | **3607** | **3545** | **3481** | **3415** | **3347** | **3277** | **3204** | **3129** |
| | 150 | 3974 | 3921 | 3868 | 3813 | 3756 | 3698 | 3638 | 3576 | 3513 | 3447 | 3379 | 3309 |
| | 160 | 4107 | 4057 | 4007 | 3954 | 3901 | 3846 | 3790 | 3732 | 3672 | 3610 | 3547 | 3481 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 3500 kcm AAC 127 str | | Outside Diameter = | 2.158 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 6.7E-06 ohms/ft | $R_{high}$ = | 7.6E-06 ohms/ft |

## Bus Conductor: **1/0 Copper 7 str**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50 | 363 | 347 | 330 | 312 | 293 | 273 | 251 | 226 | 199 | 167 | 126 | 62 |
| | 60 | 389 | 374 | 359 | 344 | 327 | 310 | 291 | 271 | 249 | 225 | 198 | 166 |
| | 70 | 412 | 399 | 385 | 371 | 356 | 341 | 325 | 307 | 289 | 269 | 247 | 224 |
| **Normal** | **75** | **422** | **410** | **397** | **384** | **370** | **355** | **340** | **323** | **306** | **288** | **268** | **247** |
| | 80 | 433 | 421 | 408 | 396 | 382 | 368 | 354 | 338 | 322 | 305 | 287 | 267 |
| | 90 | 452 | 441 | 430 | 418 | 405 | 393 | 380 | 366 | 351 | 336 | 320 | 304 |
| **Emergency (<24 hrs)** | **95** | **461** | **451** | **439** | **428** | **416** | **404** | **392** | **378** | **365** | **351** | **335** | **320** |
| | 100 | 470 | 460 | 449 | 438 | 427 | 415 | 403 | 390 | 377 | 364 | 350 | 335 |
| **Emergency (< 1 hr )** | **110** | **487** | **477** | **467** | **457** | **446** | **436** | **424** | **413** | **401** | **389** | **376** | **362** |
| | 120 | 503 | 493 | 484 | 475 | 465 | 455 | 444 | 433 | 422 | 411 | 399 | 387 |
| | 130 | 517 | 509 | 500 | 491 | 482 | 472 | 463 | 453 | 442 | 432 | 421 | 410 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 1/0 Copper 7 str | | Outside Diameter = | 0.3684 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 0.00011 ohms/ft | $R_{high}$ = | 0.00013 ohms/ft |

## Bus Conductor: **2/0 Copper 7 str**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50 | 419 | 401 | 381 | 361 | 339 | 315 | 289 | 260 | 228 | 190 | 142 | 62 |
| | 60 | 450 | 433 | 416 | 397 | 378 | 358 | 336 | 313 | 287 | 259 | 227 | 189 |
| | 70 | 477 | 462 | 446 | 429 | 412 | 394 | 375 | 355 | 334 | 311 | 285 | 258 |
| **Normal** | **75** | **489** | **475** | **460** | **444** | **428** | **411** | **393** | **374** | **354** | **333** | **310** | **285** |
| | 80 | 501 | 487 | 473 | 458 | 443 | 426 | 410 | 392 | 373 | 353 | 332 | 309 |
| | 90 | 524 | 511 | 498 | 484 | 470 | 455 | 440 | 424 | 407 | 390 | 371 | 351 |
| **Emergency (<24 hrs)** | **95** | **535** | **522** | **510** | **496** | **483** | **469** | **454** | **439** | **423** | **406** | **389** | **370** |
| | 100 | 545 | 533 | 521 | 508 | 495 | 481 | 467 | 453 | 438 | 422 | 405 | 388 |
| **Emergency (< 1 hr )** | **110** | **565** | **554** | **542** | **530** | **518** | **505** | **492** | **479** | **465** | **451** | **436** | **420** |
| | 120 | 583 | 573 | 562 | 551 | 539 | 528 | 516 | 503 | 490 | 477 | 463 | 449 |
| | 130 | 601 | 591 | 581 | 570 | 560 | 549 | 537 | 526 | 514 | 501 | 489 | 476 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 2/0 Copper 7 str | | Outside Diameter = | 0.4137 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 8.4E-05 ohms/ft | $R_{high}$ = | 1E-04 ohms/ft |

## Bus Conductor: **4/0 Copper 7 str**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50 | 560 | 535 | 508 | 480 | 450 | 418 | 383 | 343 | 299 | 246 | 177 | 44 |
| | 60 | 601 | 579 | 555 | 531 | 505 | 477 | 447 | 416 | 381 | 342 | 298 | 246 |
| | 70 | 639 | 618 | 597 | 575 | 552 | 527 | 502 | 474 | 445 | 414 | 379 | 341 |
| **Normal** | **75** | **656** | **636** | **616** | **595** | **573** | **550** | **526** | **500** | **473** | **444** | **413** | **379** |
| | 80 | 673 | 654 | 634 | 614 | 593 | 571 | 549 | 524 | 499 | 472 | 443 | 412 |
| | 90 | 704 | 686 | 669 | 650 | 631 | 611 | 590 | 569 | 546 | 522 | 497 | 470 |
| **Emergency (<24 hrs)** | **95** | **719** | **702** | **685** | **667** | **648** | **629** | **610** | **589** | **567** | **545** | **521** | **496** |
| | 100 | 733 | 717 | 700 | 683 | 665 | 647 | 628 | 608 | 588 | 566 | 544 | 520 |
| **Emergency (< 1 hr )** | **110** | **760** | **745** | **729** | **713** | **697** | **680** | **663** | **644** | **626** | **606** | **586** | **565** |
| | 120 | 785 | 771 | 757 | 742 | 727 | 711 | 695 | 678 | 660 | 643 | 624 | 605 |
| | 130 | 810 | 796 | 783 | 769 | 754 | 740 | 724 | 709 | 693 | 676 | 659 | 641 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 4/0 Copper 7 str | | Outside Diameter = | 0.5217 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 5.3E-05 ohms/ft | $R_{high}$ = | 6.3E-05 ohms/ft |

## Bus Conductor: **4/0 Copper 19 str**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50 | 561 | 536 | 510 | 482 | 452 | 419 | 384 | 344 | 299 | 246 | 177 | 41 |
| | 60 | 603 | 581 | 557 | 532 | 506 | 478 | 449 | 417 | 382 | 343 | 299 | 246 |
| | 70 | 641 | 620 | 599 | 577 | 553 | 529 | 503 | 476 | 446 | 415 | 380 | 342 |
| **Normal** | **75** | **658** | **638** | **618** | **597** | **575** | **552** | **527** | **502** | **474** | **445** | **414** | **379** |
| | 80 | 675 | 656 | 636 | 616 | 595 | 573 | 550 | 526 | 501 | 473 | 444 | 413 |
| | 90 | 706 | 689 | 671 | 652 | 633 | 613 | 592 | 570 | 548 | 524 | 499 | 472 |
| **Emergency (<24 hrs)** | **95** | **721** | **704** | **687** | **669** | **650** | **631** | **611** | **591** | **569** | **547** | **523** | **498** |
| | 100 | 735 | 719 | 702 | 685 | 667 | 649 | 630 | 610 | 590 | 568 | 546 | 522 |
| **Emergency (< 1 hr )** | **110** | **762** | **747** | **732** | **716** | **699** | **682** | **665** | **646** | **628** | **608** | **588** | **567** |
| | 120 | 788 | 774 | 759 | 744 | 729 | 713 | 697 | 680 | 663 | 645 | 626 | 607 |
| | 130 | 812 | 799 | 785 | 771 | 757 | 742 | 727 | 711 | 695 | 678 | 661 | 643 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 4/0 Copper 19 str | | Outside Diameter = | 0.5275 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 5.3E-05 ohms/ft | $R_{high}$ = | 6.3E-05 ohms/ft |

Bus Conductor: **250 kcm Copper 19 str**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50 | 623 | 595 | 565 | 534 | 500 | 464 | 424 | 380 | 330 | 269 | 190 | #NUM! |
| | 60 | 670 | 644 | 618 | 591 | 561 | 530 | 497 | 461 | 422 | 379 | 329 | 270 |
| | 70 | 711 | 689 | 665 | 640 | 614 | 587 | 558 | 528 | 495 | 459 | 421 | 378 |
| **Normal** | **75** | **731** | **709** | **687** | **663** | **638** | **613** | **585** | **557** | **526** | **494** | **459** | **420** |
| | 80 | 750 | 729 | 707 | 685 | 661 | 637 | 611 | 584 | 556 | 525 | 493 | 458 |
| | 90 | 785 | 765 | 745 | 725 | 703 | 681 | 658 | 634 | 609 | 582 | 554 | 524 |
| **Emergency (<24 hrs)** | **95** | **801** | **783** | **764** | **744** | **723** | **702** | **680** | **657** | **633** | **607** | **581** | **553** |
| | 100 | 817 | 799 | 781 | 762 | 742 | 722 | 701 | 679 | 656 | 632 | 607 | 580 |
| **Emergency (< 1 hr )** | **110** | **848** | **831** | **814** | **796** | **778** | **759** | **739** | **719** | **698** | **676** | **654** | **630** |
| | 120 | 877 | 861 | 845 | 828 | 811 | 794 | 775 | 757 | 737 | 717 | 697 | 675 |
| | 130 | 904 | 889 | 874 | 858 | 842 | 826 | 809 | 792 | 774 | 755 | 736 | 716 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 250 kcm Copper 19 str | | Outside Diameter = | 0.5735 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 4.5E-05 ohms/ft | $R_{high}$ = | 5.3E-05 ohms/ft |

## Bus Conductor: **350 kcm Copper 19 str**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50 | 767 | 732 | 695 | 656 | 614 | 569 | 519 | 463 | 399 | 323 | 219 | #NUM! |
| | 60 | 826 | 795 | 762 | 728 | 691 | 653 | 611 | 566 | 517 | 462 | 399 | 324 |
| | 70 | 879 | 851 | 821 | 790 | 758 | 724 | 688 | 650 | 609 | 565 | 516 | 462 |
| **Normal** | **75** | **904** | **877** | **848** | **819** | **789** | **756** | **723** | **687** | **649** | **608** | **564** | **516** |
| | 80 | 927 | 901 | 874 | 846 | 817 | 787 | 755 | 721 | 686 | 648 | 607 | 564 |
| | 90 | 972 | 948 | 923 | 897 | 871 | 843 | 814 | 784 | 753 | 719 | 684 | 647 |
| **Emergency (<24 hrs)** | **95** | **993** | **970** | **946** | **921** | **896** | **869** | **842** | **813** | **783** | **752** | **719** | **684** |
| | 100 | 1013 | 991 | 968 | 944 | 919 | 894 | 868 | 840 | 812 | 782 | 751 | 718 |
| **Emergency (< 1 hr )** | **110** | **1052** | **1031** | **1009** | **987** | **965** | **941** | **917** | **892** | **866** | **839** | **811** | **781** |
| | 120 | 1088 | 1069 | 1049 | 1028 | 1007 | 985 | 963 | 939 | 915 | 890 | 865 | 838 |
| | 130 | 1123 | 1105 | 1086 | 1066 | 1047 | 1026 | 1005 | 984 | 961 | 938 | 914 | 890 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 350 kcm Copper 19 str | | Outside Diameter = | 0.6785 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 3.2E-05 ohms/ft | $R_{high}$ = | 3.8E-05 ohms/ft |

## Bus Conductor: **350 kcm Copper 37 str**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50 | 768 | 733 | 696 | 657 | 615 | 569 | 519 | 464 | 400 | 323 | 219 | #NUM! |
| | 60 | 827 | 796 | 763 | 728 | 692 | 653 | 612 | 567 | 518 | 463 | 400 | 324 |
| | 70 | 880 | 852 | 822 | 791 | 759 | 725 | 689 | 651 | 610 | 565 | 517 | 462 |
| **Normal** | **75** | **905** | **877** | **849** | **820** | **789** | **757** | **723** | **688** | **650** | **609** | **565** | **516** |
| | 80 | 928 | 902 | 875 | 847 | 818 | 788 | 756 | 722 | 686 | 649 | 608 | 564 |
| | 90 | 973 | 949 | 924 | 898 | 872 | 844 | 815 | 785 | 753 | 720 | 685 | 647 |
| **Emergency (<24 hrs)** | **95** | **994** | **971** | **947** | **922** | **897** | **870** | **843** | **814** | **784** | **752** | **719** | **684** |
| | 100 | 1014 | 992 | 969 | 945 | 920 | 895 | 869 | 841 | 813 | 783 | 752 | 719 |
| **Emergency (< 1 hr )** | **110** | **1053** | **1032** | **1011** | **988** | **966** | **942** | **918** | **893** | **867** | **840** | **811** | **782** |
| | 120 | 1090 | 1070 | 1050 | 1029 | 1008 | 986 | 964 | 940 | 916 | 891 | 866 | 839 |
| | 130 | 1124 | 1106 | 1087 | 1068 | 1048 | 1027 | 1006 | 985 | 962 | 939 | 916 | 891 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 350 kcm Copper 37 str | | Outside Diameter = | 0.6811 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 3.2E-05 ohms/ft | $R_{high}$ = | 3.8E-05 ohms/ft |

## Bus Conductor: **500 kcm Copper 19 str**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50 | 955 | 911 | 865 | 815 | 762 | 704 | 641 | 570 | 488 | 388 | 249 | #NUM! |
| | 60 | 1031 | 991 | 950 | 907 | 861 | 812 | 759 | 702 | 640 | 570 | 489 | 391 |
| | 70 | 1098 | 1063 | 1026 | 987 | 946 | 903 | 858 | 810 | 758 | 701 | 640 | 570 |
| **Normal** | **75** | **1130** | **1096** | **1061** | **1024** | **985** | **945** | **902** | **857** | **809** | **757** | **701** | **640** |
| | 80 | 1160 | 1128 | 1094 | 1059 | 1022 | 984 | 943 | 901 | 856 | 808 | 757 | 701 |
| | 90 | 1217 | 1187 | 1156 | 1124 | 1090 | 1056 | 1019 | 981 | 942 | 900 | 855 | 808 |
| **Emergency (<24 hrs)** | **95** | **1244** | **1215** | **1185** | **1154** | **1122** | **1089** | **1055** | **1018** | **981** | **941** | **899** | **855** |
| | 100 | 1270 | 1243 | 1214 | 1184 | 1153 | 1121 | 1088 | 1054 | 1018 | 980 | 941 | 899 |
| **Emergency (< 1 hr )** | **110** | **1320** | **1294** | **1267** | **1240** | **1211** | **1182** | **1151** | **1120** | **1087** | **1053** | **1017** | **980** |
| | 120 | 1368 | 1343 | 1318 | 1292 | 1266 | 1238 | 1210 | 1181 | 1151 | 1119 | 1087 | 1053 |
| | 130 | 1413 | 1390 | 1366 | 1342 | 1317 | 1291 | 1265 | 1238 | 1210 | 1181 | 1151 | 1120 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 500 kcm Copper 19 str | | Outside Diameter = | 0.811 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 2.3E-05 ohms/ft | $R_{high}$ = | 2.7E-05 ohms/ft |

## Bus Conductor: **500 kcm Copper 37 str**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50 | 956 | 912 | 865 | 816 | 762 | 705 | 641 | 570 | 488 | 388 | 249 | #NUM! |
| | 60 | 1031 | 992 | 951 | 907 | 861 | 812 | 760 | 703 | 640 | 570 | 489 | 391 |
| | 70 | 1099 | 1064 | 1026 | 988 | 947 | 904 | 859 | 810 | 758 | 702 | 640 | 571 |
| **Normal** | **75** | **1131** | **1097** | **1061** | **1024** | **986** | **945** | **903** | **858** | **809** | **758** | **702** | **640** |
| | 80 | 1161 | 1129 | 1095 | 1059 | 1023 | 984 | 944 | 902 | 857 | 809 | 757 | 702 |
| | 90 | 1218 | 1188 | 1157 | 1125 | 1091 | 1057 | 1020 | 982 | 942 | 900 | 856 | 808 |
| **Emergency (<24 hrs)** | **95** | **1245** | **1216** | **1186** | **1155** | **1123** | **1090** | **1055** | **1019** | **982** | **942** | **900** | **856** |
| | 100 | 1272 | 1244 | 1215 | 1185 | 1154 | 1122 | 1089 | 1055 | 1019 | 981 | 942 | 900 |
| **Emergency (< 1 hr )** | **110** | **1322** | **1295** | **1269** | **1241** | **1212** | **1183** | **1152** | **1121** | **1088** | **1054** | **1018** | **981** |
| | 120 | 1369 | 1344 | 1319 | 1293 | 1267 | 1239 | 1211 | 1182 | 1152 | 1120 | 1088 | 1054 |
| | 130 | 1414 | 1391 | 1367 | 1343 | 1318 | 1292 | 1266 | 1239 | 1211 | 1182 | 1152 | 1121 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 500 kcm Copper 37 str | | Outside Diameter = | 0.8134 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 2.3E-05 ohms/ft | $R_{high}$ = | 2.7E-05 ohms/ft |

## Bus Conductor: **750 kcm Copper 37 str**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50 | 1219 | 1162 | 1102 | 1037 | 968 | 892 | 809 | 716 | 606 | 471 | 274 | #NUM! |
| | 60 | 1319 | 1268 | 1215 | 1159 | 1099 | 1035 | 967 | 892 | 810 | 718 | 610 | 478 |
| | 70 | 1409 | 1363 | 1315 | 1265 | 1212 | 1157 | 1097 | 1034 | 967 | 893 | 812 | 721 |
| **Normal** | **75** | **1451** | **1407** | **1362** | **1314** | **1264** | **1211** | **1156** | **1097** | **1035** | **967** | **894** | **813** |
| | 80 | 1492 | 1449 | 1406 | 1360 | 1313 | 1263 | 1211 | 1156 | 1097 | 1035 | 968 | 895 |
| | 90 | 1568 | 1529 | 1489 | 1447 | 1404 | 1359 | 1312 | 1263 | 1211 | 1156 | 1098 | 1036 |
| **Emergency (<24 hrs)** | **95** | **1604** | **1566** | **1528** | **1488** | **1446** | **1403** | **1359** | **1312** | **1263** | **1211** | **1157** | **1099** |
| | 100 | 1639 | 1603 | 1566 | 1527 | 1487 | 1446 | 1403 | 1359 | 1312 | 1263 | 1212 | 1158 |
| **Emergency (< 1 hr )** | **110** | **1706** | **1672** | **1637** | **1602** | **1565** | **1527** | **1487** | **1446** | **1404** | **1360** | **1313** | **1265** |
| | 120 | 1769 | 1738 | 1705 | 1672 | 1638 | 1602 | 1566 | 1528 | 1489 | 1448 | 1406 | 1362 |
| | 130 | 1830 | 1800 | 1770 | 1738 | 1706 | 1673 | 1639 | 1604 | 1568 | 1530 | 1491 | 1451 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 750 kcm Copper 37 str | | Outside Diameter = | 0.9968 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 1.6E-05 ohms/ft | $R_{high}$ = | 1.8E-05 ohms/ft |

## Bus Conductor: **750 kcm Copper 61 str**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50 | 1219 | 1162 | 1102 | 1037 | 968 | 893 | 809 | 716 | 607 | 471 | 274 | #NUM! |
| | 60 | 1320 | 1269 | 1215 | 1159 | 1099 | 1036 | 967 | 892 | 810 | 718 | 610 | 478 |
| | 70 | 1410 | 1364 | 1316 | 1265 | 1213 | 1157 | 1098 | 1035 | 967 | 893 | 812 | 721 |
| **Normal** | **75** | **1452** | **1408** | **1362** | **1314** | **1264** | **1212** | **1156** | **1098** | **1035** | **967** | **894** | **813** |
| | 80 | 1492 | 1450 | 1406 | 1361 | 1313 | 1264 | 1211 | 1156 | 1098 | 1035 | 968 | 895 |
| | 90 | 1568 | 1529 | 1489 | 1448 | 1404 | 1359 | 1312 | 1263 | 1211 | 1157 | 1099 | 1037 |
| **Emergency (<24 hrs)** | **95** | **1604** | **1567** | **1528** | **1488** | **1447** | **1404** | **1359** | **1312** | **1263** | **1212** | **1157** | **1099** |
| | 100 | 1639 | 1603 | 1566 | 1528 | 1488 | 1447 | 1404 | 1359 | 1312 | 1264 | 1212 | 1158 |
| **Emergency (< 1 hr )** | **110** | **1706** | **1673** | **1638** | **1602** | **1565** | **1527** | **1488** | **1447** | **1405** | **1360** | **1314** | **1265** |
| | 120 | 1770 | 1738 | 1706 | 1672 | 1638 | 1603 | 1566 | 1528 | 1489 | 1449 | 1406 | 1363 |
| | 130 | 1831 | 1801 | 1770 | 1739 | 1707 | 1674 | 1640 | 1605 | 1568 | 1531 | 1492 | 1452 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 750 kcm Copper 61 str | | Outside Diameter = | 0.9981 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 1.6E-05 ohms/ft | $R_{high}$ = | 1.8E-05 ohms/ft |

## Bus Conductor: **1000 kcm Copper 37 str**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50 | 1440 | 1372 | 1299 | 1222 | 1139 | 1048 | 948 | 835 | 702 | 535 | 278 | #NUM! |
| | 60 | 1562 | 1501 | 1437 | 1370 | 1298 | 1222 | 1140 | 1050 | 951 | 839 | 708 | 545 |
| | 70 | 1671 | 1617 | 1559 | 1499 | 1436 | 1370 | 1299 | 1223 | 1142 | 1053 | 955 | 845 |
| **Normal** | **75** | **1723** | **1670** | **1616** | **1559** | **1499** | **1436** | **1370** | **1300** | **1224** | **1143** | **1055** | **958** |
| | 80 | 1772 | 1722 | 1670 | 1615 | 1559 | 1499 | 1437 | 1371 | 1301 | 1226 | 1145 | 1057 |
| | 90 | 1865 | 1819 | 1771 | 1721 | 1670 | 1616 | 1560 | 1501 | 1439 | 1373 | 1304 | 1230 |
| **Emergency (<24 hrs)** | **95** | **1910** | **1865** | **1819** | **1771** | **1722** | **1670** | **1617** | **1561** | **1502** | **1440** | **1375** | **1306** |
| | 100 | 1952 | 1909 | 1865 | 1819 | 1772 | 1723 | 1671 | 1618 | 1562 | 1504 | 1442 | 1377 |
| **Emergency (< 1 hr )** | **110** | **2035** | **1995** | **1953** | **1911** | **1867** | **1821** | **1774** | **1725** | **1675** | **1622** | **1566** | **1508** |
| | 120 | 2113 | 2075 | 2037 | 1997 | 1956 | 1914 | 1870 | 1825 | 1778 | 1730 | 1679 | 1626 |
| | 130 | 2187 | 2152 | 2116 | 2078 | 2040 | 2001 | 1960 | 1918 | 1875 | 1830 | 1783 | 1735 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 1000 kcm Copper 37 str | | Outside Diameter = | 1.1508 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 1.2E-05 ohms/ft | $R_{high}$ = | 1.4E-05 ohms/ft |

## Bus Conductor: **1000 kcm Copper 61 str**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50 | 1440 | 1372 | 1300 | 1222 | 1139 | 1049 | 948 | 835 | 702 | 535 | 278 | #NUM! |
| | 60 | 1562 | 1501 | 1438 | 1370 | 1299 | 1222 | 1140 | 1050 | 951 | 839 | 708 | 545 |
| | 70 | 1672 | 1617 | 1560 | 1500 | 1437 | 1370 | 1299 | 1224 | 1142 | 1053 | 956 | 845 |
| **Normal** | **75** | **1723** | **1671** | **1616** | **1559** | **1500** | **1437** | **1370** | **1300** | **1225** | **1144** | **1055** | **958** |
| | 80 | 1773 | 1722 | 1670 | 1616 | 1559 | 1500 | 1437 | 1371 | 1301 | 1226 | 1146 | 1058 |
| | 90 | 1866 | 1820 | 1772 | 1722 | 1670 | 1616 | 1560 | 1501 | 1439 | 1374 | 1304 | 1230 |
| **Emergency (<24 hrs)** | **95** | **1910** | **1866** | **1819** | **1772** | **1722** | **1671** | **1617** | **1561** | **1503** | **1441** | **1376** | **1306** |
| | 100 | 1953 | 1910 | 1866 | 1820 | 1772 | 1723 | 1672 | 1619 | 1563 | 1504 | 1443 | 1378 |
| **Emergency (< 1 hr )** | **110** | **2035** | **1995** | **1954** | **1911** | **1867** | **1822** | **1775** | **1726** | **1675** | **1622** | **1567** | **1509** |
| | 120 | 2113 | 2076 | 2037 | 1997 | 1956 | 1914 | 1871 | 1825 | 1779 | 1730 | 1680 | 1627 |
| | 130 | 2188 | 2153 | 2116 | 2079 | 2041 | 2001 | 1961 | 1919 | 1875 | 1831 | 1784 | 1736 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 1000 kcm Copper 61 str | | Outside Diameter = | 1.152 inches |
| | $T_{low}$ = | 25 °C | $T_{high}$ = | 75 °C |
| | $R_{low}$ = | 1.2E-05 ohms/ft | $R_{high}$ = | 1.4E-05 ohms/ft |

Bus Conductor: **1500 kcm Copper 61 str HD**

| Rating | Rated Operating Temperature | Assumed Wind Speed = 2 fps<br>Ambient Temperature (°C)<br>-15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50 | 1973 | 1878 | 1777 | 1669 | 1552 | 1425 | 1283 | 1121 | 930 | 684 | 257 | #NUM! |
| | 60 | 2159 | 2074 | 1985 | 1890 | 1790 | 1682 | 1566 | 1439 | 1298 | 1138 | 949 | 708 |
| | 70 | 2329 | 2252 | 2171 | 2087 | 1998 | 1904 | 1804 | 1697 | 1581 | 1455 | 1315 | 1156 |
| **Normal** | **75** | **2409** | **2336** | **2259** | **2178** | **2094** | **2005** | **1911** | **1811** | **1705** | **1589** | **1463** | **1323** |
| | 80 | 2487 | 2416 | 2343 | 2266 | 2186 | 2102 | 2013 | 1919 | 1819 | 1713 | 1597 | 1472 |
| | 90 | 2636 | 2570 | 2502 | 2432 | 2358 | 2282 | 2202 | 2118 | 2030 | 1936 | 1837 | 1730 |
| **Emergency (<24 hrs)** | **95** | **2707** | **2644** | **2578** | **2510** | **2440** | **2367** | **2291** | **2211** | **2127** | **2039** | **1945** | **1846** |
| | 100 | 2776 | 2715 | 2652 | 2587 | 2519 | 2449 | 2376 | 2300 | 2220 | 2136 | 2048 | 1955 |
| **Emergency (< 1 hr )** | **110** | **2911** | **2854** | **2795** | **2734** | **2671** | **2606** | **2538** | **2468** | **2395** | **2319** | **2239** | **2156** |
| | 120 | 3040 | 2986 | 2931 | 2874 | 2815 | 2754 | 2691 | 2626 | 2559 | 2489 | 2416 | 2340 |
| | 130 | 3165 | 3114 | 3061 | 3008 | 2952 | 2896 | 2837 | 2776 | 2714 | 2649 | 2582 | 2512 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 1500 kcm Copper 61 str HD | | Outside Diameter = | 1.411 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 7.3E-06 ohms/ft | $R_{high}$ = | 8E-06 ohms/ft |

Bus Conductor: **2000 kcm Copper 127 str HD**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50 | 2299 | 2187 | 2068 | 1940 | 1801 | 1649 | 1480 | 1286 | 1054 | 750 | 80 | #NUM! |
| | 60 | 2500 | 2401 | 2296 | 2185 | 2068 | 1941 | 1804 | 1655 | 1488 | 1297 | 1071 | 776 |
| | 70 | 2680 | 2590 | 2497 | 2399 | 2296 | 2186 | 2070 | 1945 | 1810 | 1662 | 1498 | 1310 |
| **Normal** | **75** | **2763** | **2678** | **2590** | **2497** | **2399** | **2297** | **2188** | **2072** | **1948** | **1814** | **1667** | **1503** |
| | 80 | 2844 | 2762 | 2678 | 2590 | 2497 | 2400 | 2298 | 2190 | 2075 | 1952 | 1818 | 1672 |
| | 90 | 2995 | 2920 | 2843 | 2763 | 2679 | 2592 | 2500 | 2404 | 2303 | 2196 | 2082 | 1960 |
| **Emergency (<24 hrs)** | **95** | **3067** | **2995** | **2921** | **2844** | **2764** | **2681** | **2594** | **2503** | **2407** | **2307** | **2200** | **2087** |
| | 100 | 3136 | 3067 | 2996 | 2922 | 2846 | 2766 | 2683 | 2597 | 2506 | 2411 | 2311 | 2205 |
| **Emergency (< 1 hr )** | **110** | **3269** | **3205** | **3139** | **3071** | **3000** | **2927** | **2851** | **2772** | **2690** | **2604** | **2514** | **2420** |
| | 120 | 3395 | 3335 | 3274 | 3210 | 3145 | 3077 | 3007 | 2934 | 2859 | 2781 | 2699 | 2614 |
| | 130 | 3516 | 3460 | 3402 | 3342 | 3281 | 3218 | 3153 | 3086 | 3017 | 2944 | 2870 | 2792 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 2000 kcm Copper 127 str HD | | Outside Diameter = | 1.632 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 5.5E-06 ohms/ft | $R_{high}$ = | 6.6E-06 ohms/ft |

# Appendix A

**Substation Bus Rating Calculation Spreadsheet**
**Program File (EXCEL Spreadsheet)**

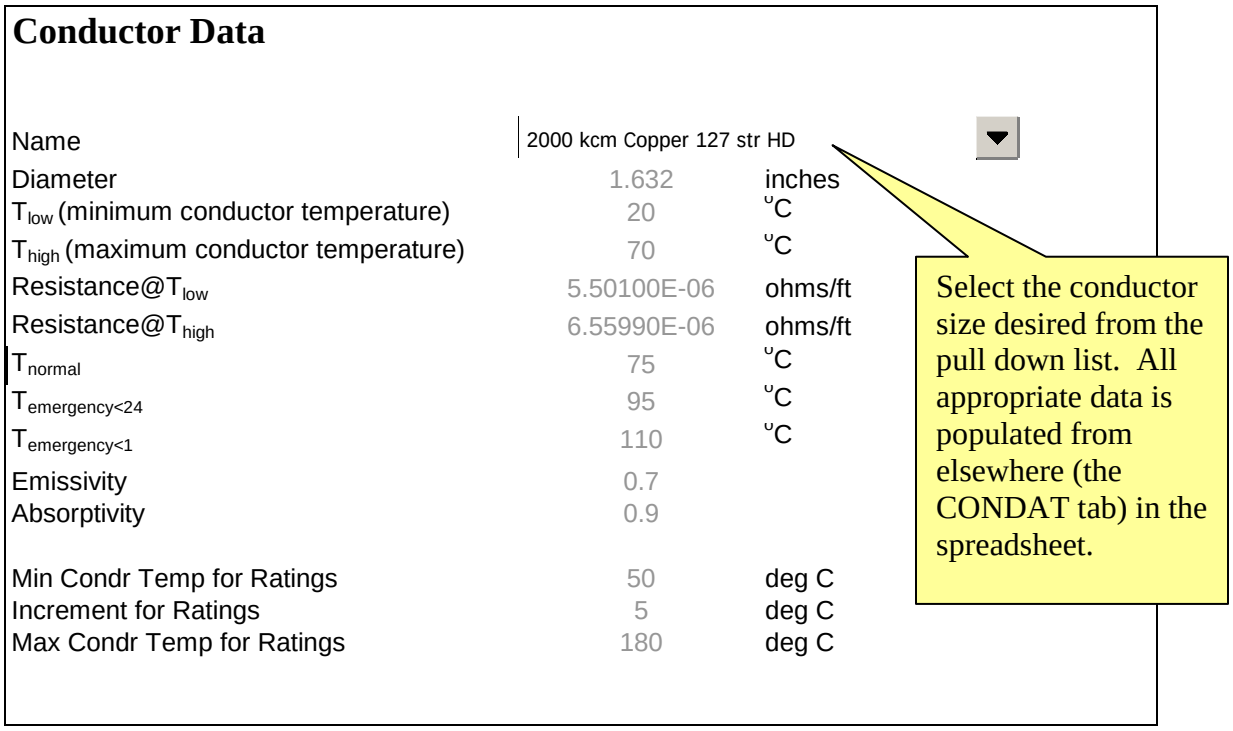
File name: PJM Bus Rating 100604.xls

# Appendix B

**Explanation of**
**Substation Bus Rating Calculation**
**Spreadsheet**

The work group developed an Excel spreadsheet program (PJM Bus Rating 100604.xls) to perform the calculations detailed in the document as well as creating the tables of ratings that are found in the document. The spreadsheet program is included as part of this document. This appendix described the various sections or tabs of the spreadsheet software.

**The Conductor data tab:**



## The Weather data tab:

Select weather parameters from pull down boxes, and adjust the RED entries as appropriate. PJM recommendations are shown on the right.

**Weather Data**

**Drop Down Boxes and Red Entries a… hangeable**

| | | | | |
|---|---|---|---|---|
| Suntime | | 14:00 Hours | | *1… hours recomended by the PJM Bus Ampacity Taskforce* |
| Degrees North Latitude | | 40 | o | *40° recom by the PJM Bus Ampacity T. F.* |
| Atmosphere | | Clear | | *"Clear atmosphere recommended by the PJM Bus Ampacity Taskforce* |
| Emissivity (□1 | | 0.7 | | *(selected when chosing conductor)* |
| Absorptivity (□1 | | 0.9 | | *(selected when chosing conductor)* |
| Ambient Temperature Range | | -15°C to 40°C | | |
| Elevation Above Sea Level | | 1000 | ft | *1000 ft recomended by the PJM Bus Ampacity Taskforce* |
| User defined Wind speed for comparison | V1 | 0 | (ft/sec) | *User definable comparison wind speed* |
| Wind speed for Published Ratings | V2 | 2 | (ft/sec) | |
| Azimuth of Conductor (N-S = 0, E-W = 90) | | 90 | o | *90° recomended by the PJM Bus Ampacity Taskforce* |
| $Z_1$ (Angle between wind and conductor) | | 90 | o | *90° recomended by the PJM Bus Ampacity Taskforce* |
| $K_{angle}$ (Wind direction factor) | | 1 | | |
| Hc (Altitude of the sun) at 14:00 Hours | | 59.73 | o | |
| Qs (Total heat flux) at 14:00 Hours | | 96.09 | (W/ft²) | |
| $Z_c$ (Azimuth of the sun) | | 245.20 | o | |
| □(Effective angle of incidence of the sun's rays) | | 117.23 | o | |
| Total Heat Flux - Industrial Atmosphere | | 73.96 | (W/ft²) | |
| Total Heat Flux - Clear Atmosphere | | 96.09 | (W/ft²) | |

Value used in calculations and derived from the above data

To convert from Knots or mph to fps, enter below

| | | | |
|---|---|---|---|
| 2.00 | Knots = | 3.38 | (ft/sec) |
| 5.00 | miles/hr = | 7.33 | (ft/sec) |

## The Publication Table Tab:

This table has no changeable items. All values are calculated. This table was used to publish the tables in this document.

Bus Conductor: **2000 kcm Copper 127 str HD**

**Assumed Wind Speed = 2 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50 | 2299 | 2187 | 2068 | 1940 | 1801 | 1649 | 1480 | 1286 | 1054 | 750 | 80 | #NUM! |
| | 60 | 2500 | 2401 | 2296 | 2185 | 2068 | 1941 | 1804 | 1655 | 1488 | 1297 | 1071 | 776 |
| | 70 | 2680 | 2590 | 2497 | 2399 | 2296 | 2186 | 2070 | 1945 | 1810 | 1662 | 1498 | 1310 |
| **Normal** | **75** | **2763** | **2678** | **2590** | **2497** | **2399** | **2297** | **2188** | **2072** | **1948** | **1814** | **1667** | **1503** |
| | 80 | 2844 | 2762 | 2678 | 2590 | 2497 | 2400 | 2298 | 2190 | 2075 | 1952 | 1818 | 1672 |
| | 90 | 2995 | 2920 | 2843 | 2763 | 2679 | 2592 | 2500 | 2404 | 2303 | 2196 | 2082 | 1960 |
| **Emergency (<24 hrs)** | **95** | **3067** | **2995** | **2921** | **2844** | **2764** | **2681** | **2594** | **2503** | **2407** | **2307** | **2200** | **2087** |
| | 100 | 3136 | 3067 | 2996 | 2922 | 2846 | 2766 | 2683 | 2597 | 2506 | 2411 | 2311 | 2205 |
| **Emergency (< 1 hr )** | **110** | **3269** | **3205** | **3139** | **3071** | **3000** | **2927** | **2851** | **2772** | **2690** | **2604** | **2514** | **2420** |
| | 120 | 3395 | 3335 | 3274 | 3210 | 3145 | 3077 | 3007 | 2934 | 2859 | 2781 | 2699 | 2614 |
| | 130 | 3516 | 3460 | 3402 | 3342 | 3281 | 3218 | 3153 | 3086 | 3017 | 2944 | 2870 | 2792 |
| | | | | | | | WINTER | | | | | SUMMER | |

| | | | | |
|---|---|---|---|---|
| Weather Assumptions: | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |
| Conductor : | 2000 kcm Copper 127 str HD | | Outside Diameter = | 1.632 inches |
| | $T_{low}$ = | 20 °C | $T_{high}$ = | 70 °C |
| | $R_{low}$ = | 5.5E-06 ohms/ft | $R_{high}$ = | 6.6E-06 ohms/ft |

## The Comparison Table Tab:

This table shows a comparison in rating based on a 2 fps wind speed recommended by PJM, and another wind speed that is chosen form the Weather Data tab. Here the alternative wind speed is 0 fps or no wind.

Bus Conductor: **2000 kcm Copper 127 str HD**

**Assumed Wind Speed = 0 fps**

| Rating | Rated Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50 | 1814 | 1694 | 1566 | 1428 | 1277 | 1108 | 910 | 659 | 214 | #NUM! | #NUM! | #NUM! |
| | 60 | 2032 | 1927 | 1816 | 1699 | 1574 | 1440 | 1293 | 1128 | 937 | 699 | 323 | #NUM! |
| | 70 | 2227 | 2132 | 2033 | 1930 | 1822 | 1707 | 1585 | 1454 | 1311 | 1151 | 966 | 739 |
| **Normal** | **75** | **2318** | **2227** | **2133** | **2035** | **1933** | **1826** | **1713** | **1592** | **1462** | **1320** | **1162** | **981** |
| | 80 | 2404 | 2317 | 2228 | 2135 | 2038 | 1937 | 1831 | 1719 | 1599 | 1471 | 1331 | 1175 |
| | 90 | 2567 | 2487 | 2405 | 2320 | 2232 | 2141 | 2046 | 1947 | 1843 | 1733 | 1616 | 1490 |
| **Emergency (<24 hrs)** | **95** | **2644** | **2567** | **2488** | **2407** | **2323** | **2236** | **2145** | **2052** | **1953** | **1850** | **1741** | **1625** |
| | 100 | 2719 | 2645 | 2568 | 2490 | 2409 | 2326 | 2240 | 2151 | 2058 | 1960 | 1858 | 1750 |
| **Emergency (< 1 hr )** | **110** | **2862** | **2792** | **2721** | **2648** | **2574** | **2497** | **2418** | **2336** | **2251** | **2164** | **2072** | **1976** |
| | 120 | 2997 | 2932 | 2865 | 2797 | 2728 | 2656 | 2583 | 2507 | 2429 | 2349 | 2266 | 2179 |
| | 130 | 3126 | 3065 | 3002 | 2938 | 2873 | 2806 | 2737 | 2667 | 2595 | 2521 | 2444 | 2365 |
| | | | | | | | WINTER | | | | | SUMMER | |

**Assumed Wind Speed = 2 fps**

| Rating | Operating Temperature | Ambient Temperature (°C) -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50 | 2299 | 2187 | 2068 | 1940 | 1801 | 1649 | 1480 | 1286 | 1054 | 750 | 80 | #NUM! |
| | 60 | 2500 | 2401 | 2296 | 2185 | 2068 | 1941 | 1804 | 1655 | 1488 | 1297 | 1071 | 776 |
| | 70 | 2680 | 2590 | 2497 | 2399 | 2296 | 2186 | 2070 | 1945 | 1810 | 1662 | 1498 | 1310 |
| **Normal** | **75** | **2763** | **2678** | **2590** | **2497** | **2399** | **2297** | **2188** | **2072** | **1948** | **1814** | **1667** | **1503** |
| | 80 | 2844 | 2762 | 2678 | 2590 | 2497 | 2400 | 2298 | 2190 | 2075 | 1952 | 1818 | 1672 |
| | 90 | 2995 | 2920 | 2843 | 2763 | 2679 | 2592 | 2500 | 2404 | 2303 | 2196 | 2082 | 1960 |
| **Emergency (<24 hrs)** | **95** | **3067** | **2995** | **2921** | **2844** | **2764** | **2681** | **2594** | **2503** | **2407** | **2307** | **2200** | **2087** |
| | 100 | 3136 | 3067 | 2996 | 2922 | 2846 | 2766 | 2683 | 2597 | 2506 | 2411 | 2311 | 2205 |
| **Emergency (< 1 hr )** | **110** | **3269** | **3205** | **3139** | **3071** | **3000** | **2927** | **2851** | **2772** | **2690** | **2604** | **2514** | **2420** |
| | 120 | 3395 | 3335 | 3274 | 3210 | 3145 | 3077 | 3007 | 2934 | 2859 | 2781 | 2699 | 2614 |
| | 130 | 3516 | 3460 | 3402 | 3342 | 3281 | 3218 | 3153 | 3086 | 3017 | 2944 | 2870 | 2792 |
| | | | | | | | WINTER | | | | | SUMMER | |

| Weather Assumptions: | | | | |
|---|---|---|---|---|
| | Emissivity = | 0.7 | Suntime = | 14 |
| | Absorptivity = | 0.9 | Degrees North Latitude= | 40 |
| | Atmosphere = | Clear | Elevation Above Sea Level= | 1000 |
| | Azimuth of Conductor (N-S = 0, E-W = 90) = | 90 | $Z_1$ (Angle between wind and conductor) | 90 |

## The Ratings with Sun Tab:

This table is one of the results tables and shows conductor ratings for the range of operating temperatures, ambient temperatures for each of the two different wind speeds. This table is for daytime since it is based upon solar exposure.

**Steady State Thermal Rating with SUN (Ampacity), Amperes**

**2000 kcm Copper 127 str HD** — Clear — □1 0.7 — □1 0.9

Rating Condition: V1
**Wind Speed (ft/sec): 0**

| Condr Max Temp Deg C | -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | 1814 | 1694 | 1566 | 1428 | 1277 | 1108 | 910 | 659 | 214 | #NUM! | #NUM! | #NUM! |
| 55 | 1927 | 1815 | 1696 | 1570 | 1434 | 1285 | 1118 | 923 | 679 | 274 | #NUM! | #NUM! |
| 60 | 2032 | 1927 | 1816 | 1699 | 1574 | 1440 | 1293 | 1128 | 937 | 699 | 323 | #NUM! |
| 65 | 2132 | 2032 | 1928 | 1819 | 1703 | 1579 | 1446 | 1301 | 1139 | 952 | 719 | 366 |
| 70 | 2227 | 2132 | 2033 | 1930 | 1822 | 1707 | 1585 | 1454 | 1311 | 1151 | 966 | 739 |
| 75 | 2318 | 2227 | 2133 | 2035 | 1933 | 1826 | 1713 | 1592 | 1462 | 1320 | 1162 | 981 |
| 80 | 2404 | 2317 | 2228 | 2135 | 2038 | 1937 | 1831 | 1719 | 1599 | 1471 | 1331 | 1175 |
| 85 | 2487 | 2404 | 2318 | 2229 | 2137 | 2042 | 1942 | 1837 | 1726 | 1607 | 1480 | 1341 |
| 90 | 2567 | 2487 | 2405 | 2320 | 2232 | 2141 | 2046 | 1947 | 1843 | 1733 | 1616 | 1490 |
| 95 | 2644 | 2567 | 2488 | 2407 | 2323 | 2236 | 2145 | 2052 | 1953 | 1850 | 1741 | 1625 |
| 100 | 2719 | 2645 | 2568 | 2490 | 2409 | 2326 | 2240 | 2151 | 2058 | 1960 | 1858 | 1750 |
| 105 | 2791 | 2720 | 2646 | 2571 | 2493 | 2413 | 2331 | 2245 | 2157 | 2064 | 1968 | 1866 |
| 110 | 2862 | 2792 | 2721 | 2648 | 2574 | 2497 | 2418 | 2336 | 2251 | 2164 | 2072 | 1976 |
| 115 | 2930 | 2863 | 2794 | 2724 | 2652 | 2578 | 2502 | 2423 | 2342 | 2258 | 2171 | 2080 |
| 120 | 2997 | 2932 | 2865 | 2797 | 2728 | 2656 | 2583 | 2507 | 2429 | 2349 | 2266 | 2179 |
| 125 | 3063 | 2999 | 2935 | 2869 | 2801 | 2732 | 2661 | 2589 | 2514 | 2436 | 2357 | 2274 |
| 130 | 3126 | 3065 | 3002 | 2938 | 2873 | 2806 | 2737 | 2667 | 2595 | 2521 | 2444 | 2365 |
| 135 | 3189 | 3129 | 3068 | 3006 | 2943 | 2878 | 2812 | 2744 | 2674 | 2602 | 2529 | 2453 |
| 140 | 3250 | 3192 | 3133 | 3072 | 3011 | 2948 | 2884 | 2818 | 2751 | 2682 | 2611 | 2537 |
| 145 | 3311 | 3254 | 3196 | 3137 | 3078 | 3017 | 2954 | 2891 | 2826 | 2759 | 2690 | 2619 |
| 150 | 3370 | 3315 | 3258 | 3201 | 3143 | 3084 | 3023 | 2962 | 2898 | 2834 | 2767 | 2699 |
| 155 | 3428 | 3374 | 3319 | 3264 | 3207 | 3150 | 3091 | 3031 | 2970 | 2907 | 2843 | 2777 |
| 160 | 3486 | 3433 | 3380 | 3325 | 3270 | 3214 | 3157 | 3099 | 3039 | 2978 | 2916 | 2852 |
| 165 | 3542 | 3491 | 3439 | 3386 | 3332 | 3278 | 3222 | 3165 | 3107 | 3048 | 2988 | 2926 |
| 170 | 3598 | 3548 | 3497 | 3445 | 3393 | 3340 | 3286 | 3231 | 3174 | 3117 | 3058 | 2998 |
| 175 | 3653 | 3604 | 3555 | 3504 | 3453 | 3401 | 3348 | 3295 | 3240 | 3184 | 3127 | 3069 |
| 180 | 3708 | 3660 | 3611 | 3562 | 3512 | 3462 | 3410 | 3358 | 3305 | 3250 | 3195 | 3138 |

Rating Condition: V2
**Wind Speed (ft/sec): 2**

| Condr Max Temp Deg C | -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | 2299 | 2187 | 2068 | 1940 | 1801 | 1649 | 1480 | 1286 | 1054 | 750 | 80 | #NUM! |
| 55 | 2403 | 2297 | 2186 | 2067 | 1940 | 1802 | 1652 | 1484 | 1291 | 1062 | 763 | 169 |
| 60 | 2500 | 2401 | 2296 | 2185 | 2068 | 1941 | 1804 | 1655 | 1488 | 1297 | 1071 | 776 |
| 65 | 2592 | 2498 | 2400 | 2296 | 2186 | 2069 | 1943 | 1807 | 1658 | 1493 | 1304 | 1079 |
| 70 | 2680 | 2590 | 2497 | 2399 | 2296 | 2186 | 2070 | 1945 | 1810 | 1662 | 1498 | 1310 |
| 75 | 2763 | 2678 | 2590 | 2497 | 2399 | 2297 | 2188 | 2072 | 1948 | 1814 | 1667 | 1503 |
| 80 | 2844 | 2762 | 2678 | 2590 | 2497 | 2400 | 2298 | 2190 | 2075 | 1952 | 1818 | 1672 |
| 85 | 2921 | 2843 | 2762 | 2678 | 2590 | 2499 | 2402 | 2301 | 2193 | 2078 | 1955 | 1823 |
| 90 | 2995 | 2920 | 2843 | 2763 | 2679 | 2592 | 2500 | 2404 | 2303 | 2196 | 2082 | 1960 |
| 95 | 3067 | 2995 | 2921 | 2844 | 2764 | 2681 | 2594 | 2503 | 2407 | 2307 | 2200 | 2087 |
| 100 | 3136 | 3067 | 2996 | 2922 | 2846 | 2766 | 2683 | 2597 | 2506 | 2411 | 2311 | 2205 |
| 105 | 3204 | 3137 | 3069 | 2998 | 2924 | 2848 | 2769 | 2686 | 2600 | 2510 | 2415 | 2315 |
| 110 | 3269 | 3205 | 3139 | 3071 | 3000 | 2927 | 2851 | 2772 | 2690 | 2604 | 2514 | 2420 |
| 115 | 3333 | 3271 | 3207 | 3141 | 3073 | 3003 | 2930 | 2855 | 2776 | 2694 | 2609 | 2519 |
| 120 | 3395 | 3335 | 3274 | 3210 | 3145 | 3077 | 3007 | 2934 | 2859 | 2781 | 2699 | 2614 |
| 125 | 3456 | 3398 | 3339 | 3277 | 3214 | 3149 | 3081 | 3011 | 2939 | 2864 | 2786 | 2705 |
| 130 | 3516 | 3460 | 3402 | 3342 | 3281 | 3218 | 3153 | 3086 | 3017 | 2944 | 2870 | 2792 |
| 135 | 3574 | 3520 | 3464 | 3406 | 3347 | 3286 | 3223 | 3159 | 3092 | 3022 | 2950 | 2876 |
| 140 | 3632 | 3579 | 3524 | 3469 | 3411 | 3352 | 3292 | 3229 | 3164 | 3098 | 3029 | 2957 |
| 145 | 3688 | 3637 | 3584 | 3530 | 3474 | 3417 | 3358 | 3298 | 3235 | 3171 | 3105 | 3036 |
| 150 | 3743 | 3693 | 3642 | 3590 | 3536 | 3480 | 3424 | 3365 | 3305 | 3243 | 3178 | 3112 |
| 155 | 3798 | 3749 | 3700 | 3649 | 3596 | 3543 | 3487 | 3431 | 3372 | 3312 | 3250 | 3186 |
| 160 | 3852 | 3804 | 3756 | 3706 | 3656 | 3603 | 3550 | 3495 | 3438 | 3380 | 3320 | 3258 |
| 165 | 3905 | 3859 | 3812 | 3763 | 3714 | 3663 | 3611 | 3558 | 3503 | 3447 | 3389 | 3329 |
| 170 | 3957 | 3912 | 3867 | 3820 | 3772 | 3722 | 3672 | 3620 | 3567 | 3512 | 3456 | 3398 |
| 175 | 4009 | 3965 | 3921 | 3875 | 3828 | 3780 | 3731 | 3681 | 3629 | 3576 | 3522 | 3465 |
| 180 | 4061 | 4018 | 3974 | 3930 | 3884 | 3837 | 3790 | 3741 | 3691 | 3639 | 3586 | 3532 |

## The Ratings without Sun Tab:

This table is another of the results tables and shows conductor ratings for the range of operating temperatures, ambient temperatures for each of the two different wind speeds. This table is for night time since it is absent solar exposure.

**Steady State Thermal Rating without SUN (Ampacity), Amperes**

**2000 kcm Copper 127 str HD** ☐ 0.7 ☐ 0.9

Rating Condition: V1
Wind Speed (ft/sec): 0

| Condr Max Temp Deg C | -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | 2235 | 2139 | 2039 | 1935 | 1826 | 1712 | 1591 | 1462 | 1323 | 1170 | 999 | 800 |
| 55 | 2321 | 2229 | 2134 | 2035 | 1931 | 1824 | 1710 | 1590 | 1462 | 1323 | 1171 | 1000 |
| 60 | 2404 | 2315 | 2224 | 2129 | 2031 | 1929 | 1822 | 1709 | 1589 | 1462 | 1324 | 1172 |
| 65 | 2483 | 2398 | 2310 | 2220 | 2126 | 2028 | 1927 | 1820 | 1708 | 1589 | 1462 | 1325 |
| 70 | 2560 | 2478 | 2394 | 2306 | 2217 | 2123 | 2027 | 1926 | 1820 | 1708 | 1590 | 1463 |
| 75 | 2634 | 2555 | 2474 | 2390 | 2304 | 2214 | 2122 | 2026 | 1925 | 1820 | 1709 | 1591 |
| 80 | 2706 | 2630 | 2551 | 2470 | 2387 | 2301 | 2213 | 2121 | 2025 | 1926 | 1821 | 1710 |
| 85 | 2776 | 2702 | 2626 | 2548 | 2468 | 2385 | 2300 | 2212 | 2121 | 2026 | 1926 | 1822 |
| 90 | 2844 | 2772 | 2698 | 2623 | 2546 | 2466 | 2384 | 2300 | 2212 | 2122 | 2027 | 1928 |
| 95 | 2910 | 2840 | 2769 | 2696 | 2621 | 2544 | 2465 | 2384 | 2300 | 2213 | 2123 | 2029 |
| 100 | 2974 | 2906 | 2837 | 2767 | 2694 | 2620 | 2544 | 2466 | 2385 | 2301 | 2215 | 2125 |
| 105 | 3037 | 2971 | 2904 | 2836 | 2765 | 2694 | 2620 | 2544 | 2467 | 2386 | 2303 | 2217 |
| 110 | 3099 | 3035 | 2969 | 2903 | 2835 | 2765 | 2694 | 2621 | 2546 | 2468 | 2388 | 2306 |
| 115 | 3159 | 3097 | 3033 | 2968 | 2902 | 2835 | 2766 | 2695 | 2623 | 2548 | 2471 | 2391 |
| 120 | 3218 | 3157 | 3096 | 3033 | 2969 | 2903 | 2836 | 2767 | 2697 | 2625 | 2551 | 2474 |
| 125 | 3276 | 3217 | 3157 | 3096 | 3033 | 2970 | 2904 | 2838 | 2770 | 2700 | 2628 | 2554 |
| 130 | 3333 | 3275 | 3217 | 3157 | 3096 | 3035 | 2971 | 2907 | 2841 | 2773 | 2704 | 2632 |
| 135 | 3389 | 3333 | 3276 | 3218 | 3159 | 3098 | 3037 | 2974 | 2910 | 2844 | 2777 | 2708 |
| 140 | 3445 | 3390 | 3334 | 3277 | 3220 | 3161 | 3101 | 3040 | 2978 | 2914 | 2849 | 2782 |
| 145 | 3499 | 3445 | 3391 | 3336 | 3280 | 3222 | 3164 | 3105 | 3044 | 2982 | 2919 | 2854 |
| 150 | 3553 | 3500 | 3447 | 3393 | 3339 | 3283 | 3226 | 3168 | 3109 | 3049 | 2988 | 2925 |
| 155 | 3606 | 3555 | 3503 | 3450 | 3397 | 3342 | 3287 | 3231 | 3173 | 3115 | 3055 | 2994 |
| 160 | 3658 | 3608 | 3558 | 3506 | 3454 | 3401 | 3347 | 3292 | 3236 | 3179 | 3121 | 3061 |
| 165 | 3710 | 3661 | 3612 | 3561 | 3510 | 3459 | 3406 | 3352 | 3298 | 3242 | 3186 | 3128 |
| 170 | 3762 | 3714 | 3665 | 3616 | 3566 | 3516 | 3464 | 3412 | 3359 | 3305 | 3249 | 3193 |
| 175 | 3813 | 3766 | 3718 | 3670 | 3621 | 3572 | 3522 | 3471 | 3419 | 3366 | 3312 | 3257 |
| 180 | 3863 | 3817 | 3771 | 3724 | 3676 | 3628 | 3579 | 3529 | 3478 | 3427 | 3374 | 3320 |

Rating Condition: V2
Wind Speed (ft/sec): 2

| Condr Max Temp Deg C | -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | 2644 | 2547 | 2445 | 2338 | 2224 | 2103 | 1973 | 1832 | 1678 | 1505 | 1308 | 1071 |
| 55 | 2729 | 2637 | 2540 | 2439 | 2332 | 2219 | 2098 | 1969 | 1828 | 1674 | 1502 | 1305 |
| 60 | 2810 | 2722 | 2631 | 2534 | 2434 | 2327 | 2214 | 2094 | 1965 | 1825 | 1671 | 1500 |
| 65 | 2888 | 2804 | 2716 | 2625 | 2529 | 2429 | 2323 | 2210 | 2091 | 1962 | 1822 | 1669 |
| 70 | 2962 | 2882 | 2798 | 2711 | 2620 | 2525 | 2425 | 2319 | 2207 | 2088 | 1959 | 1820 |
| 75 | 3034 | 2957 | 2877 | 2793 | 2707 | 2616 | 2521 | 2421 | 2316 | 2204 | 2085 | 1957 |
| 80 | 3103 | 3029 | 2952 | 2872 | 2789 | 2703 | 2613 | 2518 | 2419 | 2314 | 2202 | 2083 |
| 85 | 3170 | 3099 | 3025 | 2948 | 2869 | 2786 | 2700 | 2610 | 2516 | 2417 | 2312 | 2201 |
| 90 | 3235 | 3166 | 3095 | 3022 | 2945 | 2866 | 2784 | 2698 | 2608 | 2514 | 2415 | 2311 |
| 95 | 3299 | 3232 | 3163 | 3092 | 3019 | 2943 | 2864 | 2782 | 2697 | 2607 | 2513 | 2414 |
| 100 | 3360 | 3296 | 3229 | 3161 | 3090 | 3017 | 2942 | 2863 | 2781 | 2696 | 2606 | 2513 |
| 105 | 3420 | 3358 | 3294 | 3228 | 3160 | 3089 | 3016 | 2941 | 2862 | 2781 | 2695 | 2606 |
| 110 | 3479 | 3418 | 3356 | 3292 | 3227 | 3159 | 3089 | 3016 | 2941 | 2862 | 2781 | 2696 |
| 115 | 3536 | 3477 | 3417 | 3356 | 3292 | 3227 | 3159 | 3089 | 3016 | 2941 | 2863 | 2782 |
| 120 | 3592 | 3535 | 3477 | 3417 | 3356 | 3292 | 3227 | 3160 | 3090 | 3018 | 2943 | 2865 |
| 125 | 3647 | 3592 | 3535 | 3478 | 3418 | 3357 | 3294 | 3228 | 3161 | 3091 | 3019 | 2944 |
| 130 | 3701 | 3648 | 3593 | 3537 | 3479 | 3419 | 3358 | 3295 | 3230 | 3163 | 3094 | 3022 |
| 135 | 3754 | 3702 | 3649 | 3594 | 3538 | 3481 | 3422 | 3361 | 3298 | 3233 | 3166 | 3097 |
| 140 | 3807 | 3756 | 3704 | 3651 | 3597 | 3541 | 3484 | 3425 | 3364 | 3301 | 3236 | 3169 |
| 145 | 3858 | 3809 | 3759 | 3707 | 3654 | 3600 | 3544 | 3487 | 3428 | 3367 | 3305 | 3240 |
| 150 | 3909 | 3861 | 3812 | 3762 | 3711 | 3658 | 3604 | 3548 | 3491 | 3432 | 3372 | 3309 |
| 155 | 3959 | 3913 | 3865 | 3816 | 3766 | 3715 | 3662 | 3608 | 3553 | 3496 | 3437 | 3377 |
| 160 | 4009 | 3964 | 3917 | 3869 | 3821 | 3771 | 3720 | 3667 | 3614 | 3558 | 3501 | 3443 |
| 165 | 4058 | 4014 | 3968 | 3922 | 3875 | 3826 | 3777 | 3726 | 3673 | 3620 | 3564 | 3507 |
| 170 | 4107 | 4064 | 4019 | 3974 | 3928 | 3881 | 3832 | 3783 | 3732 | 3680 | 3626 | 3571 |
| 175 | 4155 | 4113 | 4070 | 4026 | 3981 | 3935 | 3887 | 3839 | 3790 | 3739 | 3687 | 3633 |
| 180 | 4203 | 4162 | 4120 | 4077 | 4033 | 3988 | 3942 | 3895 | 3847 | 3797 | 3747 | 3694 |

## The CONDAT Tab:

This table is the source data for all of the wire and bus sizes available in the spreadsheet. 40 rows are available at the bottom for user additions.

**Conductor Data Table**

Note: FOR COPPER TUBES: R70c = 1.1925*R20c

| Name | Outside Diam. inches | Rlow u ohm/ft | Tlow deg C | Rhigh u ohm/ft | Thigh deg C | Rated Operating Temperatures $T_{normal}$ deg C | $T_{emergency<24}$ deg C | $T_{emergency<1}$ deg C | Emissivity | Absorptivity |
|---|---|---|---|---|---|---|---|---|---|---|
| 1" Alum, Sched 40, 6061 Alloy | 1.315 | 41.210 | 20 | 46.680 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 1-1/2" Alum, Sched 40, 6061 Alloy | 1.900 | 25.450 | 20 | 28.820 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 2" Alum, Sched 40, 6061 Alloy | 2.375 | 18.940 | 20 | 21.450 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 2-1/2" Alum, Sched 40, 6061 Alloy | 2.875 | 11.950 | 20 | 13.530 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 3" Alum, Sched 40, 6061 Alloy | 3.500 | 9.138 | 20 | 10.350 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 3-1/2" Alum, Sched 40, 6061 Alloy | 4.000 | 7.957 | 20 | 8.613 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 4" Alum, Sched 40, 6061 Alloy | 4.500 | 6.415 | 20 | 7.280 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 5" Alum, Sched 40, 6061 Alloy | 5.563 | 4.735 | 20 | 5.373 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 6" Alum, Sched 40, 6061 Alloy | 6.625 | 3.648 | 20 | 4.140 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 1" Alum, Sched 80, 6061 Alloy | 1.315 | 31.860 | 20 | 36.080 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 1-1/2" Alum, Sched 80, 6061 Alloy | 1.900 | 19.060 | 20 | 21.590 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 2" Alum, Sched 80, 6061 Alloy | 2.375 | 13.780 | 20 | 15.610 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 2-1/2" Alum, Sched 80, 6061 Alloy | 2.875 | 9.033 | 20 | 10.270 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 3" Alum, Sched 80, 6061 Alloy | 3.500 | 6.751 | 20 | 7.683 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 3-1/2" Alum, Sched 80, 6061 Alloy | 4.000 | 5.536 | 20 | 6.313 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 4" Alum, Sched 80, 6061 Alloy | 4.500 | 4.620 | 20 | 5.284 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 5" Alum, Sched 80, 6061 Alloy | 5.563 | 3.361 | 20 | 3.833 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 6" Alum, Sched 80, 6061 Alloy | 6.625 | 2.425 | 20 | 2.790 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 1" Alum, Sched 40, 6063 Alloy | 1.315 | 31.120 | 20 | 36.570 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 1-1/2" Alum, Sched 40, 6063 Alloy | 1.900 | 19.220 | 20 | 22.590 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 2" Alum, Sched 40, 6063 Alloy | 2.375 | 14.300 | 20 | 16.820 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 2-1/2" Alum, Sched 40, 6063 Alloy | 2.875 | 9.020 | 20 | 10.610 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 3" Alum, Sched 40, 6063 Alloy | 3.500 | 6.896 | 20 | 8.122 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 3-1/2" Alum, Sched 40, 6063 Alloy | 4.000 | 5.735 | 20 | 6.759 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 4" Alum, Sched 40, 6063 Alloy | 4.500 | 4.842 | 20 | 5.713 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 4-1/2" Alum, Sched 40, 6063 Alloy | 5.000 | 4.167 | 20 | 4.920 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 5" Alum, Sched 40, 6063 Alloy | 5.563 | 3.574 | 20 | 4.221 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 6" Alum, Sched 40, 6063 Alloy | 6.625 | 2.754 | 20 | 3.257 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 1" Alum, Sched 80, 6063 Alloy | 1.315 | 24.06 | 20 | 28.270 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 1-1/2" Alum, Sched 80, 6063 Alloy | 1.900 | 14.39 | 20 | 16.910 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 2" Alum, Sched 80, 6063 Alloy | 2.375 | 10.41 | 20 | 12.300 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 2-1/2" Alum, Sched 80, 6063 Alloy | 2.875 | 6.819 | 20 | 8.068 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 3" Alum, Sched 80, 6063 Alloy | 3.500 | 5.096 | 20 | 6.048 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 3-1/2" Alum, Sched 80, 6063 Alloy | 4.000 | 4.179 | 20 | 4.974 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 4" Alum, Sched 80, 6063 Alloy | 4.500 | 3.488 | 20 | 4.172 | 80 | 90 | 115 | 130 | 0.5 | 0.5 |
| 4-1/2" Alum, Sched 80, 6063 Alloy | 5.000 | 2.967 | 20 | 3.559 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 5" Alum, Sched 80, 6063 Alloy | 5.563 | 2.515 | 20 | 3.032 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 6" Alum, Sched 80, 6063 Alloy | 6.625 | 1.829 | 20 | 2.248 | 70 | 90 | 115 | 130 | 0.5 | 0.5 |
| 3/4" Copper, Schedule 40, 98% ICAS | 1.050 | 24.79 | 20 | 29.562 | 70 | 90 | 115 | 130 | 0.85 | 0.85 |
| 1" Copper, Schedule 40, 98% ICAS | 1.315 | 17.600 | 20 | 20.988 | 70 | 90 | 115 | 130 | 0.85 | 0.85 |
| 1-1/4" Copper, Schedule 40, 98% ICAS | 1.660 | 11.970 | 20 | 14.274 | 70 | 90 | 115 | 130 | 0.85 | 0.85 |
| 1-1/2" Copper, Schedule 40, 98% ICAS | 1.900 | 10.080 | 20 | 12.020 | 70 | 90 | 115 | 130 | 0.85 | 0.85 |
| 2" Copper, Schedule 40, 98% ICAS | 2.375 | 7.620 | 20 | 9.087 | 70 | 90 | 115 | 130 | 0.85 | 0.85 |
| 2-1/2" Copper, Schedule 40, 98% ICAS | 2.875 | 5.250 | 20 | 6.261 | 70 | 90 | 115 | 130 | 0.85 | 0.85 |
| 3" Copper, Schedule 40, 98% ICAS | 3.500 | 3.682 | 20 | 4.391 | 70 | 90 | 115 | 130 | 0.85 | 0.85 |
| 3-1/2" Copper, Schedule 40, 98% ICAS | 4.000 | 2.822 | 20 | 3.365 | 70 | 90 | 115 | 130 | 0.85 | 0.85 |
| 4" Copper, Schedule 40, 98% ICAS | 4.500 | 2.490 | 20 | 2.969 | 70 | 90 | 115 | 130 | 0.85 | 0.85 |
| 1" Copper, Schedule 80, 98% ICAS | 1.315 | 12.830 | 20 | 15.300 | 70 | 90 | 115 | 130 | 0.85 | 0.85 |
| 1-1/2" Copper, Schedule 80, 98% ICAS | 1.900 | 7.680 | 20 | 9.158 | 70 | 90 | 115 | 130 | 0.85 | 0.85 |
| 2" Copper, Schedule 80, 98% ICAS | 2.375 | 5.558 | 20 | 6.628 | 70 | 90 | 115 | 130 | 0.85 | 0.85 |
| 2-1/2"Copper, Schedule 80, 98% ICAS | 2.875 | 3.641 | 20 | 4.342 | 70 | 90 | 115 | 130 | 0.85 | 0.85 |
| 3" Copper, Schedule 80, 98% ICAS | 3.500 | 2.723 | 20 | 3.247 | 70 | 90 | 115 | 130 | 0.85 | 0.85 |
| 3-1/2" Copper, Schedule 80, 98% ICAS | 4.000 | 2.240 | 20 | 2.671 | 70 | 90 | 115 | 130 | 0.85 | 0.85 |
| 4" Copper, Schedule 80, 98% ICAS | 4.500 | 1.866 | 20 | 2.225 | 70 | 90 | 115 | 130 | 0.85 | 0.85 |
| 1/0 ACSR 6/1 | 0.398 | 169.508 | 25 | 216.856 | 75 | 105 | 130 | 140 | 0.7 | 0.9 |
| 2/0 ACSR 6/1 | 0.447 | 128.977 | 25 | 176.515 | 75 | 105 | 130 | 140 | 0.7 | 0.9 |
| 3/0 ACSR 6/1 | 0.502 | 102.462 | 25 | 144.318 | 75 | 105 | 130 | 140 | 0.7 | 0.9 |
| 4/0 ACSR 6/1 | 0.563 | 81.250 | 25 | 118.939 | 75 | 105 | 130 | 140 | 0.7 | 0.9 |
| 159 kcm ACSR 12/7 | 0.756 | 103.409 | 25 | 181.439 | 75 | 105 | 130 | 140 | 0.7 | 0.9 |
| 203.2 kcm ACSR 16/19 | 0.714 | 77.841 | 25 | 155.303 | 75 | 105 | 130 | 140 | 0.7 | 0.9 |
| 266.8 kcm ACSR 26/7 | 0.642 | 65.095 | 25 | 77.898 | 75 | 105 | 130 | 140 | 0.7 | 0.9 |
| 266.8 kcm ACSR 30/7 | 0.660 | 64.640 | 25 | 77.330 | 75 | 105 | 130 | 140 | 0.7 | 0.9 |
| 336.4 kcm ACSR 18/1 | 0.684 | 52.197 | 25 | 62.462 | 75 | 105 | 130 | 140 | 0.7 | 0.9 |
| 336.4 kcm ACSR 26/7 | 0.720 | 51.667 | 25 | 61.818 | 75 | 105 | 130 | 140 | 0.7 | 0.9 |
| 336.4 kcm ACSR 30/7 | 0.741 | 51.288 | 25 | 61.364 | 75 | 105 | 130 | 140 | 0.7 | 0.9 |

## The DeltaT Tab:

This tab is used for intermediate steps in the calculation. No user inputs are required. The table shows the difference in temperature between the conductor temperature and ambient temperature.

***DELTA t* (degrees C) = ($T_c$ - $T_a$)**

**2000 kcm Copper 127 str HD**

| Rating Condition | Wind Speed (ft/sec) | Condr Max Temp Deg C | -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| V1 | 0 | 50 | 65.0 | 60.0 | 55.0 | 50.0 | 45.0 | 40.0 | 35.0 | 30.0 | 25.0 | 20.0 | 15.0 | 10.0 |
| V2 | 2 | 50 | 65.0 | 60.0 | 55.0 | 50.0 | 45.0 | 40.0 | 35.0 | 30.0 | 25.0 | 20.0 | 15.0 | 10.0 |
| V1 | 0 | 55 | 70.0 | 65.0 | 60.0 | 55.0 | 50.0 | 45.0 | 40.0 | 35.0 | 30.0 | 25.0 | 20.0 | 15.0 |
| V2 | 2 | 55 | 70.0 | 65.0 | 60.0 | 55.0 | 50.0 | 45.0 | 40.0 | 35.0 | 30.0 | 25.0 | 20.0 | 15.0 |
| V1 | 0 | 60 | 75.0 | 70.0 | 65.0 | 60.0 | 55.0 | 50.0 | 45.0 | 40.0 | 35.0 | 30.0 | 25.0 | 20.0 |
| V2 | 2 | 60 | 75.0 | 70.0 | 65.0 | 60.0 | 55.0 | 50.0 | 45.0 | 40.0 | 35.0 | 30.0 | 25.0 | 20.0 |
| V1 | 0 | 65 | 80.0 | 75.0 | 70.0 | 65.0 | 60.0 | 55.0 | 50.0 | 45.0 | 40.0 | 35.0 | 30.0 | 25.0 |
| V2 | 2 | 65 | 80.0 | 75.0 | 70.0 | 65.0 | 60.0 | 55.0 | 50.0 | 45.0 | 40.0 | 35.0 | 30.0 | 25.0 |
| V1 | 0 | 70 | 85.0 | 80.0 | 75.0 | 70.0 | 65.0 | 60.0 | 55.0 | 50.0 | 45.0 | 40.0 | 35.0 | 30.0 |
| V2 | 2 | 70 | 85.0 | 80.0 | 75.0 | 70.0 | 65.0 | 60.0 | 55.0 | 50.0 | 45.0 | 40.0 | 35.0 | 30.0 |
| V1 | 0 | 75 | 90.0 | 85.0 | 80.0 | 75.0 | 70.0 | 65.0 | 60.0 | 55.0 | 50.0 | 45.0 | 40.0 | 35.0 |
| V2 | 2 | 75 | 90.0 | 85.0 | 80.0 | 75.0 | 70.0 | 65.0 | 60.0 | 55.0 | 50.0 | 45.0 | 40.0 | 35.0 |
| V1 | 0 | 80 | 95.0 | 90.0 | 85.0 | 80.0 | 75.0 | 70.0 | 65.0 | 60.0 | 55.0 | 50.0 | 45.0 | 40.0 |
| V2 | 2 | 80 | 95.0 | 90.0 | 85.0 | 80.0 | 75.0 | 70.0 | 65.0 | 60.0 | 55.0 | 50.0 | 45.0 | 40.0 |
| V1 | 0 | 85 | 100.0 | 95.0 | 90.0 | 85.0 | 80.0 | 75.0 | 70.0 | 65.0 | 60.0 | 55.0 | 50.0 | 45.0 |
| V2 | 2 | 85 | 100.0 | 95.0 | 90.0 | 85.0 | 80.0 | 75.0 | 70.0 | 65.0 | 60.0 | 55.0 | 50.0 | 45.0 |
| V1 | 0 | 90 | 105.0 | 100.0 | 95.0 | 90.0 | 85.0 | 80.0 | 75.0 | 70.0 | 65.0 | 60.0 | 55.0 | 50.0 |
| V2 | 2 | 90 | 105.0 | 100.0 | 95.0 | 90.0 | 85.0 | 80.0 | 75.0 | 70.0 | 65.0 | 60.0 | 55.0 | 50.0 |
| V1 | 0 | 95 | 110.0 | 105.0 | 100.0 | 95.0 | 90.0 | 85.0 | 80.0 | 75.0 | 70.0 | 65.0 | 60.0 | 55.0 |
| V2 | 2 | 95 | 110.0 | 105.0 | 100.0 | 95.0 | 90.0 | 85.0 | 80.0 | 75.0 | 70.0 | 65.0 | 60.0 | 55.0 |
| V1 | 0 | 100 | 115.0 | 110.0 | 105.0 | 100.0 | 95.0 | 90.0 | 85.0 | 80.0 | 75.0 | 70.0 | 65.0 | 60.0 |
| V2 | 2 | 100 | 115.0 | 110.0 | 105.0 | 100.0 | 95.0 | 90.0 | 85.0 | 80.0 | 75.0 | 70.0 | 65.0 | 60.0 |
| V1 | 0 | 105 | 120.0 | 115.0 | 110.0 | 105.0 | 100.0 | 95.0 | 90.0 | 85.0 | 80.0 | 75.0 | 70.0 | 65.0 |
| V2 | 2 | 105 | 120.0 | 115.0 | 110.0 | 105.0 | 100.0 | 95.0 | 90.0 | 85.0 | 80.0 | 75.0 | 70.0 | 65.0 |
| V1 | 0 | 110 | 125.0 | 120.0 | 115.0 | 110.0 | 105.0 | 100.0 | 95.0 | 90.0 | 85.0 | 80.0 | 75.0 | 70.0 |
| V2 | 2 | 110 | 125.0 | 120.0 | 115.0 | 110.0 | 105.0 | 100.0 | 95.0 | 90.0 | 85.0 | 80.0 | 75.0 | 70.0 |
| V1 | 0 | 115 | 130.0 | 125.0 | 120.0 | 115.0 | 110.0 | 105.0 | 100.0 | 95.0 | 90.0 | 85.0 | 80.0 | 75.0 |
| V2 | 2 | 115 | 130.0 | 125.0 | 120.0 | 115.0 | 110.0 | 105.0 | 100.0 | 95.0 | 90.0 | 85.0 | 80.0 | 75.0 |
| V1 | 0 | 120 | 135.0 | 130.0 | 125.0 | 120.0 | 115.0 | 110.0 | 105.0 | 100.0 | 95.0 | 90.0 | 85.0 | 80.0 |
| V2 | 2 | 120 | 135.0 | 130.0 | 125.0 | 120.0 | 115.0 | 110.0 | 105.0 | 100.0 | 95.0 | 90.0 | 85.0 | 80.0 |
| V1 | 0 | 125 | 140.0 | 135.0 | 130.0 | 125.0 | 120.0 | 115.0 | 110.0 | 105.0 | 100.0 | 95.0 | 90.0 | 85.0 |
| V2 | 2 | 125 | 140.0 | 135.0 | 130.0 | 125.0 | 120.0 | 115.0 | 110.0 | 105.0 | 100.0 | 95.0 | 90.0 | 85.0 |
| V1 | 0 | 130 | 145.0 | 140.0 | 135.0 | 130.0 | 125.0 | 120.0 | 115.0 | 110.0 | 105.0 | 100.0 | 95.0 | 90.0 |
| V2 | 2 | 130 | 145.0 | 140.0 | 135.0 | 130.0 | 125.0 | 120.0 | 115.0 | 110.0 | 105.0 | 100.0 | 95.0 | 90.0 |
| V1 | 0 | 135 | 150.0 | 145.0 | 140.0 | 135.0 | 130.0 | 125.0 | 120.0 | 115.0 | 110.0 | 105.0 | 100.0 | 95.0 |
| V2 | 2 | 135 | 150.0 | 145.0 | 140.0 | 135.0 | 130.0 | 125.0 | 120.0 | 115.0 | 110.0 | 105.0 | 100.0 | 95.0 |
| V1 | 0 | 140 | 155.0 | 150.0 | 145.0 | 140.0 | 135.0 | 130.0 | 125.0 | 120.0 | 115.0 | 110.0 | 105.0 | 100.0 |
| V2 | 2 | 140 | 155.0 | 150.0 | 145.0 | 140.0 | 135.0 | 130.0 | 125.0 | 120.0 | 115.0 | 110.0 | 105.0 | 100.0 |
| V1 | 0 | 145 | 160.0 | 155.0 | 150.0 | 145.0 | 140.0 | 135.0 | 130.0 | 125.0 | 120.0 | 115.0 | 110.0 | 105.0 |
| V2 | 2 | 145 | 160.0 | 155.0 | 150.0 | 145.0 | 140.0 | 135.0 | 130.0 | 125.0 | 120.0 | 115.0 | 110.0 | 105.0 |
| V1 | 0 | 150 | 165.0 | 160.0 | 155.0 | 150.0 | 145.0 | 140.0 | 135.0 | 130.0 | 125.0 | 120.0 | 115.0 | 110.0 |
| V2 | 2 | 150 | 165.0 | 160.0 | 155.0 | 150.0 | 145.0 | 140.0 | 135.0 | 130.0 | 125.0 | 120.0 | 115.0 | 110.0 |
| V1 | 0 | 155 | 170.0 | 165.0 | 160.0 | 155.0 | 150.0 | 145.0 | 140.0 | 135.0 | 130.0 | 125.0 | 120.0 | 115.0 |
| V2 | 2 | 155 | 170.0 | 165.0 | 160.0 | 155.0 | 150.0 | 145.0 | 140.0 | 135.0 | 130.0 | 125.0 | 120.0 | 115.0 |

## The TFilm tab:

This tab is used for intermediate steps in the calculation. No user inputs are required. The table shows the temperature of the air film between the conductor and ambient environment.

$T_{film}$ (degrees C) = $(T_c + T_a)/2$

**2000 kcm Copper 127 str HD**

| Rating Con | Wind Speed (ft/sec) | Condr Max Temp Deg C | -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| V1 | 0 | 50 | 17.5 | 20.0 | 22.5 | 25.0 | 27.5 | 30.0 | 32.5 | 35.0 | 37.5 | 40.0 | 42.5 | 45.0 |
| V2 | 2 | 50 | 17.5 | 20.0 | 22.5 | 25.0 | 27.5 | 30.0 | 32.5 | 35.0 | 37.5 | 40.0 | 42.5 | 45.0 |
| V1 | 0 | 55 | 20.0 | 22.5 | 25.0 | 27.5 | 30.0 | 32.5 | 35.0 | 37.5 | 40.0 | 42.5 | 45.0 | 47.5 |
| V2 | 2 | 55 | 20.0 | 22.5 | 25.0 | 27.5 | 30.0 | 32.5 | 35.0 | 37.5 | 40.0 | 42.5 | 45.0 | 47.5 |
| V1 | 0 | 60 | 22.5 | 25.0 | 27.5 | 30.0 | 32.5 | 35.0 | 37.5 | 40.0 | 42.5 | 45.0 | 47.5 | 50.0 |
| V2 | 2 | 60 | 22.5 | 25.0 | 27.5 | 30.0 | 32.5 | 35.0 | 37.5 | 40.0 | 42.5 | 45.0 | 47.5 | 50.0 |
| V1 | 0 | 65 | 25.0 | 27.5 | 30.0 | 32.5 | 35.0 | 37.5 | 40.0 | 42.5 | 45.0 | 47.5 | 50.0 | 52.5 |
| V2 | 2 | 65 | 25.0 | 27.5 | 30.0 | 32.5 | 35.0 | 37.5 | 40.0 | 42.5 | 45.0 | 47.5 | 50.0 | 52.5 |
| V1 | 0 | 70 | 27.5 | 30.0 | 32.5 | 35.0 | 37.5 | 40.0 | 42.5 | 45.0 | 47.5 | 50.0 | 52.5 | 55.0 |
| V2 | 2 | 70 | 27.5 | 30.0 | 32.5 | 35.0 | 37.5 | 40.0 | 42.5 | 45.0 | 47.5 | 50.0 | 52.5 | 55.0 |
| V1 | 0 | 75 | 30.0 | 32.5 | 35.0 | 37.5 | 40.0 | 42.5 | 45.0 | 47.5 | 50.0 | 52.5 | 55.0 | 57.5 |
| V2 | 2 | 75 | 30.0 | 32.5 | 35.0 | 37.5 | 40.0 | 42.5 | 45.0 | 47.5 | 50.0 | 52.5 | 55.0 | 57.5 |
| V1 | 0 | 80 | 32.5 | 35.0 | 37.5 | 40.0 | 42.5 | 45.0 | 47.5 | 50.0 | 52.5 | 55.0 | 57.5 | 60.0 |
| V2 | 2 | 80 | 32.5 | 35.0 | 37.5 | 40.0 | 42.5 | 45.0 | 47.5 | 50.0 | 52.5 | 55.0 | 57.5 | 60.0 |

## The Air Density tab:

This tab is used for intermediate steps in the calculation. No user inputs are required. The table shows the air density around the conductor based on temperature.

**Air Density ($\rho_f$), (lb/ft$^3$)**

**2000 kcm Copper 127 str HD**

| Rating Con | Wind Speed (ft/sec) | Condr Max Temp Deg C | -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| V1 | 0 | 50 | 0.073134 | 0.072509 | 0.071894 | 0.07129 | 0.070696 | 0.070112 | 0.069537 | 0.068972 | 0.068415 | 0.067868 | 0.067329 | 0.066799 |
| V2 | 2 | 50 | 0.073134 | 0.072509 | 0.071894 | 0.07129 | 0.070696 | 0.070112 | 0.069537 | 0.068972 | 0.068415 | 0.067868 | 0.067329 | 0.066799 |
| V1 | 0 | 55 | 0.072509 | 0.071894 | 0.07129 | 0.070696 | 0.070112 | 0.069537 | 0.068972 | 0.068415 | 0.067868 | 0.067329 | 0.066799 | 0.066277 |
| V2 | 2 | 55 | 0.072509 | 0.071894 | 0.07129 | 0.070696 | 0.070112 | 0.069537 | 0.068972 | 0.068415 | 0.067868 | 0.067329 | 0.066799 | 0.066277 |
| V1 | 0 | 60 | 0.071894 | 0.07129 | 0.070696 | 0.070112 | 0.069537 | 0.068972 | 0.068415 | 0.067868 | 0.067329 | 0.066799 | 0.066277 | 0.065763 |
| V2 | 2 | 60 | 0.071894 | 0.07129 | 0.070696 | 0.070112 | 0.069537 | 0.068972 | 0.068415 | 0.067868 | 0.067329 | 0.066799 | 0.066277 | 0.065763 |
| V1 | 0 | 65 | 0.07129 | 0.070696 | 0.070112 | 0.069537 | 0.068972 | 0.068415 | 0.067868 | 0.067329 | 0.066799 | 0.066277 | 0.065763 | 0.065258 |
| V2 | 2 | 65 | 0.07129 | 0.070696 | 0.070112 | 0.069537 | 0.068972 | 0.068415 | 0.067868 | 0.067329 | 0.066799 | 0.066277 | 0.065763 | 0.065258 |
| V1 | 0 | 70 | 0.070696 | 0.070112 | 0.069537 | 0.068972 | 0.068415 | 0.067868 | 0.067329 | 0.066799 | 0.066277 | 0.065763 | 0.065258 | 0.064759 |
| V2 | 2 | 70 | 0.070696 | 0.070112 | 0.069537 | 0.068972 | 0.068415 | 0.067868 | 0.067329 | 0.066799 | 0.066277 | 0.065763 | 0.065258 | 0.064759 |
| V1 | 0 | 75 | 0.070112 | 0.069537 | 0.068972 | 0.068415 | 0.067868 | 0.067329 | 0.066799 | 0.066277 | 0.065763 | 0.065258 | 0.064759 | 0.064269 |
| V2 | 2 | 75 | 0.070112 | 0.069537 | 0.068972 | 0.068415 | 0.067868 | 0.067329 | 0.066799 | 0.066277 | 0.065763 | 0.065258 | 0.064759 | 0.064269 |
| V1 | 0 | 80 | 0.069537 | 0.068972 | 0.068415 | 0.067868 | 0.067329 | 0.066799 | 0.066277 | 0.065763 | 0.065258 | 0.064759 | 0.064269 | 0.063785 |
| V2 | 2 | 80 | 0.069537 | 0.068972 | 0.068415 | 0.067868 | 0.067329 | 0.066799 | 0.066277 | 0.065763 | 0.065258 | 0.064759 | 0.064269 | 0.063785 |

## The Air Viscosity tab:

This tab is used for intermediate steps in the calculation. No user inputs are required. The table shows the viscosity of the air around the conductor.

**Absolute Viscosity of Air ($\mu_f$), (lb/ft*h)**

**2000 kcm Copper 127 str HD**

| Rating Con | Wind Speed (ft/sec) | Condr Max Temp Deg C | -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| V1 | 0 | 50 | 0.043572 | 0.043863 | 0.044152 | 0.04444 | 0.044727 | 0.045012 | 0.045297 | 0.04558 | 0.045862 | 0.046143 | 0.046423 | 0.046701 |
| V2 | 2 | 50 | 0.043572 | 0.043863 | 0.044152 | 0.04444 | 0.044727 | 0.045012 | 0.045297 | 0.04558 | 0.045862 | 0.046143 | 0.046423 | 0.046701 |
| V1 | 0 | 55 | 0.043863 | 0.044152 | 0.04444 | 0.044727 | 0.045012 | 0.045297 | 0.04558 | 0.045862 | 0.046143 | 0.046423 | 0.046701 | 0.046979 |
| V2 | 2 | 55 | 0.043863 | 0.044152 | 0.04444 | 0.044727 | 0.045012 | 0.045297 | 0.04558 | 0.045862 | 0.046143 | 0.046423 | 0.046701 | 0.046979 |
| V1 | 0 | 60 | 0.044152 | 0.04444 | 0.044727 | 0.045012 | 0.045297 | 0.04558 | 0.045862 | 0.046143 | 0.046423 | 0.046701 | 0.046979 | 0.047255 |
| V2 | 2 | 60 | 0.044152 | 0.04444 | 0.044727 | 0.045012 | 0.045297 | 0.04558 | 0.045862 | 0.046143 | 0.046423 | 0.046701 | 0.046979 | 0.047255 |
| V1 | 0 | 65 | 0.04444 | 0.044727 | 0.045012 | 0.045297 | 0.04558 | 0.045862 | 0.046143 | 0.046423 | 0.046701 | 0.046979 | 0.047255 | 0.047531 |
| V2 | 2 | 65 | 0.04444 | 0.044727 | 0.045012 | 0.045297 | 0.04558 | 0.045862 | 0.046143 | 0.046423 | 0.046701 | 0.046979 | 0.047255 | 0.047531 |
| V1 | 0 | 70 | 0.044727 | 0.045012 | 0.045297 | 0.04558 | 0.045862 | 0.046143 | 0.046423 | 0.046701 | 0.046979 | 0.047255 | 0.047531 | 0.047805 |
| V2 | 2 | 70 | 0.044727 | 0.045012 | 0.045297 | 0.04558 | 0.045862 | 0.046143 | 0.046423 | 0.046701 | 0.046979 | 0.047255 | 0.047531 | 0.047805 |
| V1 | 0 | 75 | 0.045012 | 0.045297 | 0.04558 | 0.045862 | 0.046143 | 0.046423 | 0.046701 | 0.046979 | 0.047255 | 0.047531 | 0.047805 | 0.048078 |
| V2 | 2 | 75 | 0.045012 | 0.045297 | 0.04558 | 0.045862 | 0.046143 | 0.046423 | 0.046701 | 0.046979 | 0.047255 | 0.047531 | 0.047805 | 0.048078 |
| V1 | 0 | 80 | 0.045297 | 0.04558 | 0.045862 | 0.046143 | 0.046423 | 0.046701 | 0.046979 | 0.047255 | 0.047531 | 0.047805 | 0.048078 | 0.04835 |
| V2 | 2 | 80 | 0.045297 | 0.04558 | 0.045862 | 0.046143 | 0.046423 | 0.046701 | 0.046979 | 0.047255 | 0.047531 | 0.047805 | 0.048078 | 0.04835 |

## The $q_c$ tab:

This tab is used for intermediate steps in the calculation. No user inputs are required. The table shows the convection heat loss from a 1 foot length of conductor.

**Convected Heat Loss ($q_c$), Watts Per Foot of Conductor ( max of qc0, kqc1, or kqc2)**

**2000 kcm Copper 127 str HD**

| Rating Condition | Wind Speed (ft/sec) | Condr Max Temp Deg C | -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| V1 | 0 | 50 | 20.40 | 18.37 | 16.41 | 14.51 | 12.66 | 10.88 | 9.17 | 7.53 | 5.97 | 4.50 | 3.13 | 1.88 |
| V2 | 2 | 50 | 32.65 | 30.12 | 27.60 | 25.08 | 22.56 | 20.04 | 17.53 | 15.02 | 12.51 | 10.01 | 7.50 | 5.00 |
| V1 | 0 | 55 | 22.28 | 20.22 | 18.22 | 16.27 | 14.39 | 12.56 | 10.80 | 9.10 | 7.47 | 5.93 | 4.47 | 3.11 |
| V2 | 2 | 55 | 35.14 | 32.61 | 30.09 | 27.57 | 25.05 | 22.54 | 20.03 | 17.52 | 15.01 | 12.50 | 10.00 | 7.50 |
| V1 | 0 | 60 | 24.18 | 22.09 | 20.05 | 18.07 | 16.14 | 14.27 | 12.46 | 10.71 | 9.03 | 7.42 | 5.88 | 4.43 |
| V2 | 2 | 60 | 37.63 | 35.11 | 32.58 | 30.06 | 27.55 | 25.03 | 22.52 | 20.01 | 17.50 | 15.00 | 12.49 | 9.99 |
| V1 | 0 | 65 | 26.10 | 23.98 | 21.91 | 19.89 | 17.92 | 16.01 | 14.15 | 12.36 | 10.62 | 8.96 | 7.36 | 5.84 |
| V2 | 2 | 65 | 40.12 | 37.60 | 35.08 | 32.56 | 30.04 | 27.53 | 25.01 | 22.50 | 20.00 | 17.49 | 14.99 | 12.49 |
| V1 | 0 | 70 | 28.04 | 25.89 | 23.78 | 21.73 | 19.73 | 17.78 | 15.88 | 14.04 | 12.26 | 10.54 | 8.89 | 7.30 |
| V2 | 2 | 70 | 42.61 | 40.09 | 37.56 | 35.05 | 32.53 | 30.02 | 27.51 | 25.00 | 22.49 | 19.98 | 17.48 | 14.98 |
| V1 | 0 | 75 | 29.99 | 27.81 | 25.68 | 23.59 | 21.55 | 19.57 | 17.64 | 15.76 | 13.93 | 12.17 | 10.46 | 8.82 |
| V2 | 2 | 75 | 45.10 | 42.57 | 40.05 | 37.53 | 35.02 | 32.51 | 30.00 | 27.49 | 24.98 | 22.48 | 19.97 | 17.47 |
| V1 | 0 | 80 | 31.96 | 29.75 | 27.59 | 25.47 | 23.40 | 21.38 | 19.42 | 17.50 | 15.63 | 13.83 | 12.07 | 10.38 |
| V2 | 2 | 80 | 47.58 | 45.06 | 42.54 | 40.02 | 37.51 | 35.00 | 32.49 | 29.98 | 27.47 | 24.97 | 22.46 | 19.96 |

## The $\mu_r$ tab:

This tab is used for intermediate steps in the calculation. No user inputs are required. The table shows the thermal conductivity of the air around the conductor.

**Thermal Conductivity of Air ($k_f$) at Temperature , $T_{film}$ W/ft (degrees C)**

**2000 kcm Copper 127 str HD**

| Rating Con | Wind Speed (ft/sec) | Condr Max Temp Deg C | -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| V1 | 0 | 50 | 0.007786 | 0.007843 | 0.0079 | 0.007957 | 0.008014 | 0.00807 | 0.008127 | 0.008184 | 0.008241 | 0.008297 | 0.008354 | 0.008411 |
| V2 | 2 | 50 | 0.007786 | 0.007843 | 0.0079 | 0.007957 | 0.008014 | 0.00807 | 0.008127 | 0.008184 | 0.008241 | 0.008297 | 0.008354 | 0.008411 |
| V1 | 0 | 55 | 0.007843 | 0.0079 | 0.007957 | 0.008014 | 0.00807 | 0.008127 | 0.008184 | 0.008241 | 0.008297 | 0.008354 | 0.008411 | 0.008467 |
| V2 | 2 | 55 | 0.007843 | 0.0079 | 0.007957 | 0.008014 | 0.00807 | 0.008127 | 0.008184 | 0.008241 | 0.008297 | 0.008354 | 0.008411 | 0.008467 |
| V1 | 0 | 60 | 0.0079 | 0.007957 | 0.008014 | 0.00807 | 0.008127 | 0.008184 | 0.008241 | 0.008297 | 0.008354 | 0.008411 | 0.008467 | 0.008524 |
| V2 | 2 | 60 | 0.0079 | 0.007957 | 0.008014 | 0.00807 | 0.008127 | 0.008184 | 0.008241 | 0.008297 | 0.008354 | 0.008411 | 0.008467 | 0.008524 |
| V1 | 0 | 65 | 0.007957 | 0.008014 | 0.00807 | 0.008127 | 0.008184 | 0.008241 | 0.008297 | 0.008354 | 0.008411 | 0.008467 | 0.008524 | 0.008581 |
| V2 | 2 | 65 | 0.007957 | 0.008014 | 0.00807 | 0.008127 | 0.008184 | 0.008241 | 0.008297 | 0.008354 | 0.008411 | 0.008467 | 0.008524 | 0.008581 |
| V1 | 0 | 70 | 0.008014 | 0.00807 | 0.008127 | 0.008184 | 0.008241 | 0.008297 | 0.008354 | 0.008411 | 0.008467 | 0.008524 | 0.008581 | 0.008637 |
| V2 | 2 | 70 | 0.008014 | 0.00807 | 0.008127 | 0.008184 | 0.008241 | 0.008297 | 0.008354 | 0.008411 | 0.008467 | 0.008524 | 0.008581 | 0.008637 |
| V1 | 0 | 75 | 0.00807 | 0.008127 | 0.008184 | 0.008241 | 0.008297 | 0.008354 | 0.008411 | 0.008467 | 0.008524 | 0.008581 | 0.008637 | 0.008694 |
| V2 | 2 | 75 | 0.00807 | 0.008127 | 0.008184 | 0.008241 | 0.008297 | 0.008354 | 0.008411 | 0.008467 | 0.008524 | 0.008581 | 0.008637 | 0.008694 |
| V1 | 0 | 80 | 0.008127 | 0.008184 | 0.008241 | 0.008297 | 0.008354 | 0.008411 | 0.008467 | 0.008524 | 0.008581 | 0.008637 | 0.008694 | 0.00875 |
| V2 | 2 | 80 | 0.008127 | 0.008184 | 0.008241 | 0.008297 | 0.008354 | 0.008411 | 0.008467 | 0.008524 | 0.008581 | 0.008637 | 0.008694 | 0.00875 |

## The $q_s$ tab:

This tab is used for intermediate steps in the calculation. No user inputs are required. The table shows the heat gain to the conductor due to solar heat input. This is only used for day time ratings.

**Solar Heat Gain ($q_s$), Watts Per Foot of Conductor**

**2000 kcm Copper 127 str HD** **Clear** □[ 0.7 □[ 0.9

| Rating Condition | Wind Speed (ft/sec) | Condr Max Temp Deg C | -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| V1 | 0 | 50 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 |
| V2 | 2 | 50 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 |
| V1 | 0 | 55 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 |
| V2 | 2 | 55 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 |
| V1 | 0 | 60 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 |
| V2 | 2 | 60 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 |
| V1 | 0 | 65 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 |
| V2 | 2 | 65 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 |
| V1 | 0 | 70 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 |
| V2 | 2 | 70 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 |
| V1 | 0 | 75 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 |
| V2 | 2 | 75 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 |
| V1 | 0 | 80 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 |
| V2 | 2 | 80 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 | 10.458 |

## The $q_r$ tab:

This tab is used for intermediate steps in the calculation. No user inputs are required. The table shows the heat loss due to radiation from the hot conductor.

**Radiated Heat Loss ($q_r$), Watts Per Foot of Conductor**

**2000 kcm Copper 127 str HD** □[ 0.7 □[ 0.9

| Rating Condition | Wind Speed (ft/sec) | Condr Max Temp Deg C | -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| V1 | 0 | 50 | 10.2563 | 9.6944 | 9.0995 | 8.4703 | 7.8057 | 7.1041 | 6.3644 | 5.5852 | 4.7650 | 3.9025 | 2.9962 | 2.0447 |
| V2 | 2 | 50 | 10.2563 | 9.6944 | 9.0995 | 8.4703 | 7.8057 | 7.1041 | 6.3644 | 5.5852 | 4.7650 | 3.9025 | 2.9962 | 2.0447 |
| V1 | 0 | 55 | 11.3525 | 10.7905 | 10.1957 | 9.5665 | 8.9018 | 8.2003 | 7.4606 | 6.6814 | 5.8612 | 4.9987 | 4.0924 | 3.1409 |
| V2 | 2 | 55 | 11.3525 | 10.7905 | 10.1957 | 9.5665 | 8.9018 | 8.2003 | 7.4606 | 6.6814 | 5.8612 | 4.9987 | 4.0924 | 3.1409 |
| V1 | 0 | 60 | 12.4999 | 11.9380 | 11.3431 | 10.7140 | 10.0493 | 9.3478 | 8.6081 | 7.8289 | 7.0087 | 6.1462 | 5.2399 | 4.2883 |
| V2 | 2 | 60 | 12.4999 | 11.9380 | 11.3431 | 10.7140 | 10.0493 | 9.3478 | 8.6081 | 7.8289 | 7.0087 | 6.1462 | 5.2399 | 4.2883 |
| V1 | 0 | 65 | 13.7003 | 13.1384 | 12.5435 | 11.9143 | 11.2497 | 10.5482 | 9.8085 | 9.0292 | 8.2090 | 7.3465 | 6.4402 | 5.4887 |
| V2 | 2 | 65 | 13.7003 | 13.1384 | 12.5435 | 11.9143 | 11.2497 | 10.5482 | 9.8085 | 9.0292 | 8.2090 | 7.3465 | 6.4402 | 5.4887 |
| V1 | 0 | 70 | 14.9551 | 14.3932 | 13.7983 | 13.1692 | 12.5045 | 11.8030 | 11.0633 | 10.2840 | 9.4638 | 8.6013 | 7.6950 | 6.7435 |
| V2 | 2 | 70 | 14.9551 | 14.3932 | 13.7983 | 13.1692 | 12.5045 | 11.8030 | 11.0633 | 10.2840 | 9.4638 | 8.6013 | 7.6950 | 6.7435 |
| V1 | 0 | 75 | 16.2660 | 15.7041 | 15.1092 | 14.4801 | 13.8154 | 13.1139 | 12.3742 | 11.5949 | 10.7747 | 9.9122 | 9.0059 | 8.0544 |
| V2 | 2 | 75 | 16.2660 | 15.7041 | 15.1092 | 14.4801 | 13.8154 | 13.1139 | 12.3742 | 11.5949 | 10.7747 | 9.9122 | 9.0059 | 8.0544 |
| V1 | 0 | 80 | 17.6347 | 17.0727 | 16.4779 | 15.8487 | 15.1840 | 14.4825 | 13.7428 | 12.9636 | 12.1434 | 11.2809 | 10.3746 | 9.4231 |
| V2 | 2 | 80 | 17.6347 | 17.0727 | 16.4779 | 15.8487 | 15.1840 | 14.4825 | 13.7428 | 12.9636 | 12.1434 | 11.2809 | 10.3746 | 9.4231 |

## The Resistance tab:

This tab is used for intermediate steps in the calculation. No user inputs are required. The table shows the resistance of the conductor based upon the conductor temperature.

**Conductor Electrical Resistance (R), (Ohms/ft.)**

**2000 kcm Copper 127 str HD**

| Rating Condition | Wind Speed (ft/sec) | Condr Max Temp Deg C | -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| V1 | 0 | 50 | 6.1E-06 | 6.1E-06 | 6.1E-06 | 6.1E-06 | 6.1E-06 | 6.1E-06 | 6.1E-06 | 6.1E-06 | 6.1E-06 | 6.1E-06 | 6.1E-06 | 6.1E-06 |
| V2 | 2 | 50 | 6.1E-06 | 6.1E-06 | 6.1E-06 | 6.1E-06 | 6.1E-06 | 6.1E-06 | 6.1E-06 | 6.1E-06 | 6.1E-06 | 6.1E-06 | 6.1E-06 | 6.1E-06 |
| V1 | 0 | 55 | 6.2E-06 | 6.2E-06 | 6.2E-06 | 6.2E-06 | 6.2E-06 | 6.2E-06 | 6.2E-06 | 6.2E-06 | 6.2E-06 | 6.2E-06 | 6.2E-06 | 6.2E-06 |
| V2 | 2 | 55 | 6.2E-06 | 6.2E-06 | 6.2E-06 | 6.2E-06 | 6.2E-06 | 6.2E-06 | 6.2E-06 | 6.2E-06 | 6.2E-06 | 6.2E-06 | 6.2E-06 | 6.2E-06 |
| V1 | 0 | 60 | 6.3E-06 | 6.3E-06 | 6.3E-06 | 6.3E-06 | 6.3E-06 | 6.3E-06 | 6.3E-06 | 6.3E-06 | 6.3E-06 | 6.3E-06 | 6.3E-06 | 6.3E-06 |
| V2 | 2 | 60 | 6.3E-06 | 6.3E-06 | 6.3E-06 | 6.3E-06 | 6.3E-06 | 6.3E-06 | 6.3E-06 | 6.3E-06 | 6.3E-06 | 6.3E-06 | 6.3E-06 | 6.3E-06 |
| V1 | 0 | 65 | 6.5E-06 | 6.5E-06 | 6.5E-06 | 6.5E-06 | 6.5E-06 | 6.5E-06 | 6.5E-06 | 6.5E-06 | 6.5E-06 | 6.5E-06 | 6.5E-06 | 6.5E-06 |
| V2 | 2 | 65 | 6.5E-06 | 6.5E-06 | 6.5E-06 | 6.5E-06 | 6.5E-06 | 6.5E-06 | 6.5E-06 | 6.5E-06 | 6.5E-06 | 6.5E-06 | 6.5E-06 | 6.5E-06 |
| V1 | 0 | 70 | 6.6E-06 | 6.6E-06 | 6.6E-06 | 6.6E-06 | 6.6E-06 | 6.6E-06 | 6.6E-06 | 6.6E-06 | 6.6E-06 | 6.6E-06 | 6.6E-06 | 6.6E-06 |
| V2 | 2 | 70 | 6.6E-06 | 6.6E-06 | 6.6E-06 | 6.6E-06 | 6.6E-06 | 6.6E-06 | 6.6E-06 | 6.6E-06 | 6.6E-06 | 6.6E-06 | 6.6E-06 | 6.6E-06 |
| V1 | 0 | 75 | 6.7E-06 | 6.7E-06 | 6.7E-06 | 6.7E-06 | 6.7E-06 | 6.7E-06 | 6.7E-06 | 6.7E-06 | 6.7E-06 | 6.7E-06 | 6.7E-06 | 6.7E-06 |
| V2 | 2 | 75 | 6.7E-06 | 6.7E-06 | 6.7E-06 | 6.7E-06 | 6.7E-06 | 6.7E-06 | 6.7E-06 | 6.7E-06 | 6.7E-06 | 6.7E-06 | 6.7E-06 | 6.7E-06 |
| V1 | 0 | 80 | 6.8E-06 | 6.8E-06 | 6.8E-06 | 6.8E-06 | 6.8E-06 | 6.8E-06 | 6.8E-06 | 6.8E-06 | 6.8E-06 | 6.8E-06 | 6.8E-06 | 6.8E-06 |
| V2 | 2 | 80 | 6.8E-06 | 6.8E-06 | 6.8E-06 | 6.8E-06 | 6.8E-06 | 6.8E-06 | 6.8E-06 | 6.8E-06 | 6.8E-06 | 6.8E-06 | 6.8E-06 | 6.8E-06 |

# Appendix C

## References

This PJM Substation Conductor Rating document was prepared using various industry standards as guides and references. These referenced documents are:


1. *IEEE Standard for Calculating the Current-Temperature Relationship of Bare Overhead Conductors*, IEEE Std 738-1993
2. *IEEE Guide for Design of Substation Rigid-Bus Structures*, IEEE Std 605-1998
3. *A Uniform Method for the determination of load capability of line terminal equipment*, ECAR 74-EEP-42, revised June 1974.
4. *ECAR Transmission Conductors Loss of Strength Due to Elevated Temperature, ECAR 74-TFP-37*, May 1974.
5. *Determining the Loadability of Line Terminal Equipment*, ECAR 88-EEP-42, July 1988
6. *Transmission Conductor Thermal Ratings*, ECAR 89-TFP-28, October 1989
7. *Bare Overhead Transmission Conductor Ratings*, PJM Interconnection, November 2000.