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# National Grid

Technical  
Guidance Note

TGN(E) 26  
Issue 3  
April 2001

**Current Ratings for  
Overhead Lines**

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## CURRENT RATINGS FOR OVERHEAD LINES

### FOREWORD

Issue 3 of this Technical Guidance Note (TGN) has the following differences compared to Issue 2:

- (a) 300 mm<sup>2</sup> Upas AAAC and 620 mm<sup>2</sup> Matthew GZTACSR are now included in the list of conductors.
- (b) Ratings for the following conductor bundles are included:
  - (i) 1 x 300 mm<sup>2</sup> Upas AAAC and 1 x 500 mm<sup>2</sup> Rubus AAAC at 132 kV (75°C only)
  - (ii) 2 x 300 mm<sup>2</sup> Upas AAAC at 275 kV (50, 55 and 65°C)
  - (iii) 3 x 700 mm<sup>2</sup> Araucaria AAAC at 275 kV and 400 kV (50°C and 75°C)
  - (iv) 2 x 620 mm<sup>2</sup> Matthew GZTACSR at 275 kV and 400 kV (170°C)
- (c) The ratings for the special conductors used on the Thames, Severn and Usk river crossings are provided.
- (d) For compatibility with IEC standards and NGTS 3.4.2, alloy resistivities are now quoted in nΩ.m rather than μΩ.cm. (1 μΩ.cm = 10 nΩ.m).
- (e) NGTS 3.4.2 now specifies 30.5 nΩ.m as the maximum resistivity allowed for all new AAAC and is not restricted to specified contracts only (Appendix H). This alloy is designated 'extra high conductivity' (EHC). The previous alloys with resistivities of 31.2 nΩ.m and 32.5 nΩ.m are designated 'high conductivity' (HC) and 'standard conductivity' (SC), respectively.
- (f) The pre-fault and post-fault derating of new conductor is reviewed and recommendations given according to conductor rated temperature, grease type and surface emissivity.
- (g) The possibility of using surface-treated, new conductor to minimise the initial derating is noted.
- (h) Changes have been made to some short-term overload ratings as a result of correctly applying the effects of natural convection and ac resistance in these calculations. For small conductors at the lower rated temperatures, there are some minor increases in ratings. However, for the remainder, there are decreases of up to a few percent, especially for the large conductors at high pre-load values.
- (i) All references to thermal uprating have been removed from this issue; this is now dealt with in TGN(E) 136: 'Factors to be considered for thermal uprating of National Grid overhead lines'.
- (j) The interpolations between the Spring/Autumn and Winter ratings, and between the Summer and Spring/Autumn ratings are to be based on the maximum forecast temperature for the 24-hour period under consideration and not the average value. This is to minimise the risk of increased exceedence arising from the occurrence of low wind speeds.

## 1 SCOPE

This TGN presents the seasonal pre-fault and post-fault continuous thermal ratings, together with the short-term overload ratings, applicable to National Grid's standard conductor sizes and resistivities, as specified in National Grid Technical Specification NGTS 3.4.2: 'Conductors for Overhead Lines'. It also now covers the first high temperature conductor to be introduced on to the system – 'Matthew' GZTACSR gap type conductor – as specified in NGTS 3.4.13: 'GZTACSR Conductor and Fittings for Overhead Lines'. In addition, the ratings are provided for the special conductors used on the Thames, Severn and Usk river crossings. Thus, this issue of the TGN covers all of the conductors currently in use on National Grid's system.

The ratings are tabulated in amperes and in MVA, based on National Grid's standard 132 kV, 275 kV and 400 kV overhead line circuits operating at a nominal frequency of 50 Hz and nominal system voltage, as specified in NGTS 1. For ACSR, the standard rated temperatures are 50°C, 65°C and 75°C; for AAAC, 50°C, 65°C, 75°C and 90°C; for ACAR, 75°C; for GZTACSR, 170°C. In order to minimise the amount of data presented, only those combinations of rated temperature, voltage, conductor size, type and bundle which are currently in use – or are likely to be used – are included. To cater for the special case of L66/2 construction (2x300 mm<sup>2</sup> Upas AAAC), a 55°C rating is provided. Further details are given in Section 6.

Appendices A and B contain rating data per conductor and per circuit, respectively, in concise form. Appendix C contains the continuous ratings for use on old ACSR lines where line restrictions have been assigned. Appendices D to I contain detailed overload current and MVA capabilities for each circuit type; Appendix J provides this data for the river-crossing sections of the respective circuits; Appendix K provides similar data for ACSR lines with restricted ratings.

Note: This document applies to the overhead line portion of a circuit only and must not be assumed to apply to associated equipment or to be a requirement to be met, in general, by associated equipment.

## 2 REFERENCES

This TGN makes reference to, or should be read in conjunction with, the following documents:

CERL Report RD/L/N 129/79: A Statistical Approach to the Thermal Rating of Zebra Conductor based on Real Weather Observations, by C F Price.

NGRDC Report  
NGRDC/0037/R90: Natural Convection Effects on Overhead Line Statistical Ratings, by F D Pullen.

NGTS 1: Overview – National Grid System.

NGTS 3.4.2: Conductors for Overhead Lines.

NGTS 3.4.13: GZTACSR Conductor and Fittings for Overhead Lines.

TGN(T) 33: Installation of Aluminium Current Carrying Overhead Line Conductor Fittings.

TGN(T) 39: Emergency Current Ratings for Damaged Overhead Line Conductors.

TGN(E) 136: Factors to be considered for Thermal Up-rating of National Grid Overhead Lines.

TR(E) 327: Assessment of 620 mm<sup>2</sup> 'Matthew' GZTACSR Gap Type Conductor for Use on L2 Towers, by M J Tunstall.

ET/OHL/323/NOTE99: Additional Tests on 620 mm<sup>2</sup> Matthew GZTACSR, by M J Tunstall.

TR(T) 273: Analysis of Overhead Line Thermal Ratings using Meteorological Data, by S P Hoffmann.

ET/OHL/351/2000: Predictive Ratings for the Fleet-Lovedean Overhead Line Route, by S P Hoffmann.

### 3 DEFINITIONS

Unless otherwise stated, the term 'circuit' applies to the overhead line portion of a circuit only and is defined by the voltage and the type of conductor system.

The size of an ACSR is expressed in terms of the nominal area of the aluminium portion of its cross-section ( $\text{mm}^2$ ).

For AAAC and ACAR, the size is expressed in terms of the nominal cross-sectional area of the equivalent aluminium conductor. In principle, these sizes should reflect the resistivity of the alloy involved. Thus, for example, there should be three nominal sizes of Rubus corresponding to the 32.5, 31.2 and 30.5  $\text{n}\Omega\cdot\text{m}$  resistivity alloy, respectively. However, this has not been adopted and Rubus is referred to as 500  $\text{mm}^2$  AAAC, independent of its resistivity. The terms 'standard conductivity' (SC), 'high conductivity' (HC) and 'extra high conductivity' (EHC) are used to distinguish the 32.5  $\text{n}\Omega\cdot\text{m}$ , 31.2 and 30.5  $\text{n}\Omega\cdot\text{m}$  resistivity alloys, respectively.

For GZTACSR, the resistivity of the ZTAI, aluminium/zirconium high temperature alloy (28.7  $\text{n}\Omega\cdot\text{m}$ ) is sufficiently close to that of electrical grade aluminium (28.3  $\text{n}\Omega\cdot\text{m}$ ) for the nominal area of the alloy to be used to denote its size.

### 4 CONDUCTOR DETAILS

#### 4.1 Standard Conductor Types and Sizes

Ratings are provided for circuits employing the following conductors.

##### 4.1.1 ACSR (Aluminium Conductor Steel Reinforced)

- (a) 175  $\text{mm}^2$  (30/7/2.79 mm) – Lynx
- (b) 400  $\text{mm}^2$  (54/7/3.18 mm) – Zebra

##### 4.1.2 ACAR (Aluminium Conductor Alloy Reinforced)

- (a) 500  $\text{mm}^2$  (24/37/3.37 mm) – Collybia

##### 4.1.3 AAAC (All Aluminium Alloy Conductor)

- (a) 300  $\text{mm}^2$  (37/3.53 mm) – Upas
- (b) 425  $\text{mm}^2$  (37/4.14 mm) – Totara
- (c) 500  $\text{mm}^2$  (61/3.50 mm) – Rubus
- (d) 570  $\text{mm}^2$  (61/3.71 mm) – Sorbus
- (e) 700  $\text{mm}^2$  (61/4.14 mm) – Araucaria
- (f) 850  $\text{mm}^2$  (61/4.56 mm) – Redwood

##### 4.2 GZTACSR (Gap Type ZI Alloy Conductor Steel Reinforced)

- (a) 620  $\text{mm}^2$  (40 trapezoidal wires/7/3.2 mm) – Matthew

#### 4.3 River-crossing Conductors

There are three special river-crossing conductors in use on the National Grid system, as follows:

- (a) Thames crossing ACSR (unnamed)  
Aluminium layers: 36 trapezoidal wires/74/3.38 mm  
Steel layers: 90/3.12 mm/1/3.35 mm

- (b) Severn crossing ACSR (unnamed)  
Aluminium layers: 40 trapezoidal wires/37/2.79 mm  
Steel layers: 90/2.87 mm/1/3.07 mm
- (c) Usk crossing AACSR – Rachel  
Aluminium alloy layers: 30/3.91 mm/30/ 3.20 mm/30/2.62 mm  
Steel layers: 60/2.62 mm/1/3.00 mm

#### 4.4 Alloy Resistivity

Prior to 1986, the alloy used in AAAC and ACAR conductors had a resistivity of 32.5 nΩ.m (SC alloy). During 1985, AAAC with a resistivity of 31.2 nΩ.m (HC alloy) began to be purchased and, from 1986 until approximately 1997, all the AAAC purchased has had this lower resistivity. Appendices F and G apply to SC AAAC and the HC AAAC, respectively. The retrospective rerating of AAAC circuits to allow for the true alloy resistivity has been undertaken. Should any cases remain where the conductor's provenance cannot be reliably established, it is anticipated that in situ resistance measurements could be made using a micro-ohm meter to resolve the matter.

Since 1997, all the AAAC supplied has had a resistivity of 30.5 nΩ.m, while retaining the same mechanical performance as the existing conductor. Since June 2000, NGTS 3.4.2 Issue 4 has specified a maximum resistivity of 30.5 nΩ.m as a requirement for all AAAC. The ratings for conductors made from this EHC alloy are provided in Appendix H.

## 5 BASES FOR LINE RATING LIMITS

National Grid line ratings are calculated on a probabilistic basis derived from the research work carried out at CERL and described in Report No. RD/LN 129/79. The approach accepts that, because of the random variations in wind speed, direction, ambient temperature and solar radiation, the actual temperature of the line may exceed the temperature for which it was profiled. The proportion of time for which the line exceeds its profile temperature is termed the 'exceedence'. When the statistical rating method was being introduced in 1982, exceedences up to 14% were considered. The choice of exceedence is based on considerations of the statistical occurrence of rated post-fault continuous or short-term loadings, reinforced by the tendency for the weather conditions to provide greater cooling during times of high load and high risk of fault. The final choice was 10%, subject to review in the light of experience and further study of weather statistics. No operational problems have arisen from using the statistical approach and a further analysis of recorded weather data concluded that there is no significant increase in risk of flashover or risk of conductor annealing in raising the exceedence level to 12% for standard line constructions. This value was adopted in Issue 1 of TGN(T) 26.

The effects of natural convection on conductor cooling were not fully taken into account in the CERL study. This cooling effect increases with conductor diameter and with temperature difference between the conductor and the air. The analysis published in NGRDC/0037/R90 shows that it provides significant increases in ratings for the larger conductors at 75°C and above, and it has therefore been included in the calculation method from Issue 1 of this TGN. However, it has subsequently been found that the effects of natural convection and ac resistance were not being fully included in the calculation of the short-term ratings presented in Issues 1 and 2. This has been corrected in the ratings presented in this Issue. For small conductors at the lower rated temperatures, there are some minor increases in ratings. However, for the remainder, there are decreases of up to a few percent, especially for the large conductors at high pre-load values.

### 5.1 Post-fault Exceedence

The 12% exceedence applies to the post-fault rating of the line: thus, if the full post-fault rating is used on a continuous basis, the line temperature will exceed its profiled temperature for approximately 12% of the time. The risk of sparkover, however, is dependent on the risk of actually employing the full post-fault rating, together with the risk of the co-incident occurrence of maximum overvoltage in a span with minimum clearance. The actual risk of sparkover has been assessed in the past at  $10^{-9}$  to  $10^{-10}$ . However, it should be noted that any significant increase in the use of continuous post-fault ratings resulting from changes in the way the system is operated will increase this risk.

## 5.2 Pre-fault Ratio

With a post-fault exceedence of 10%, the pre-fault rating had been set at 85% of the post-fault value. This percentage was chosen on the basis that it provided a pre-fault rating with a statistically insignificant risk of exceeding the line rated temperature. Increasing the post-fault exceedence to 12% while maintaining a pre-fault ratio of 85% necessarily increases the pre-fault exceedence. An examination of the effect of this, based on a statistical analysis of conductor temperatures calculated from weather data recorded over several years, has shown that the pre-fault exceedence is very sensitive to such increases. In order to restrict the risk of exceeding line temperature to a suitably low level, the pre-fault ratio was reduced to 84%. This ensures that the risk of exceeding the line rated temperature is of order 1 in 1,000 but the risk of exceeding it by more than 5°C – when sag increases start to become significant – is less than 1 in 10,000.

## 5.3 Matthew GZTACSR High Temperature Conductor

For all rated temperatures up to 90°C, the probabilistic method described by Price in RD/L/N 129/79, as modified by Pullen in NGRDC/0037/R90 to allow for natural convective cooling, has been used. However, at the 170°C rated temperature of GZTACSR, the Price/Pullen method was found to be inaccurate. In particular, the ratings calculated using this method led to much greater exceedences than expected. This has not been investigated in detail but it is expected that, at this much higher rated temperature, the ratio of the various terms in the heat balance equation will have changed significantly, making the empirical equation for the correlation term,  $C_T$ , in the Price/Pullen formulation no longer valid.

The appropriate post-fault seasonal ratings having an exceedence of 12% at a rated temperature of 170°C were therefore determined from calculated distributions of conductor temperature, as described in TR(E) 327.

## 5.4 River-crossing Conductors

The three special construction, river-crossing conductors listed in Section 4.3 have not previously been rated on a common basis. This reflects the varying dates of their installation, spanning the periods over which the ratings calculation methods used by the CEBG underwent significant development from a deterministic to a probabilistic approach.

Because of their height and exposure, the characteristic wind speed used to calculate the ratings for river-crossing conductors is  $1 \text{ ms}^{-1}$  (CERL Report RD/L/N 129/79), rather than the  $0.5 \text{ ms}^{-1}$  used for standard conductors. In view of the low risk of clearance infringement on such spans, an exceedence of 14% was used for rating the Thames crossing and this basis has been adopted herein for rating the other crossing conductors. The ac losses for all three conductors have been based on the empirical equation for those of the Thames conductor (CERL Report RD/L/N 129/79).

## 6 RATED TEMPERATURES

For ACSR, the standard rated temperatures are 50°C, 65°C and 75°C; for AAAC, 50°C, 65°C, 75°C and 90°C; for ACAR, 75°C; for GZTACSR, 170°C. In order to reduce the volume of data presented in this TGN, the AAAC ratings for rated temperatures of 50°C and 65°C have been restricted to 300 mm<sup>2</sup> Upas and 700 mm<sup>2</sup> Araucaria. These conductors are used as a replacement for twin 175 mm<sup>2</sup> on L3 and L66 towers but clearance for 75°C operation is not normally available because of the lower stringing tensions required. In the case of Upas, a 55°C rating has been added to cover L66/2 construction (2x300 mm<sup>2</sup> AAAC). For 425 mm<sup>2</sup> Totara, only the 50°C rating is provided: Totara is the minimum diameter AAAC that could be used in a twin bundle at 400 kV, from audible noise considerations and has been used for generator connections.

For Matthew GZTACSR, the standard rated temperature which will be compatible with the available clearances on most L2/L8 routes is 170°C: ratings for only this temperature are provided at present.

The ratings for the river-crossing conductors are provided for their existing rated temperature only.

The possibility of uprating an existing overhead line to a higher rated temperature depends not only on the ability to maintain the necessary clearances, but on a number of other aspects, such as the thermal characteristics of the conductor grease, the type of tension joints, etc. These are all dealt with in TGN(E) 136.

## 7 CONTINUOUS RATINGS

### 7.1 Post-fault Rating

The post-fault rating corresponds to the maximum continuous thermal rating that can be used in a post-fault situation until pre-fault requirements can be restored. This period should not exceed 24 hours and will normally be well within 24 hours. During the period of use of the post-fault rating there is an approximately 12% risk of exceeding the conductor's rated temperature for which the line has been profiled.

### 7.2 Pre-fault Rating

The pre-fault rating is set at 84% of the corresponding post-fault rating; this ensures a very low risk of exceeding the conductor's rated temperature. Since circuits generally operate at a fraction of their pre-fault rating, the risk of exceeding the conductor's rated temperature under normal operational conditions is essentially zero.

### 7.3 Planned Pre-fault Use of up to Continuous Post-fault Rating

Special cases may arise where it is operationally justifiable to plan for a circuit to carry, without time limitation, a continuous pre-fault load in excess of the specified 84% value. As the continuous loading increases from the 84% value towards the 100% value, the risk of conductor sags being greater than those used in preparation of the line profile will cease to be negligible. Such loadings should therefore be the subject of prior agreement with the appropriate manager and may require a check on the actual ground clearances and their margins in hand over minimum ground clearance.

## 8 TEMPORARY DERATING OF NEW CONDUCTOR

Thermal radiation from the surface is an important mechanism in the cooling of conductors. The coefficient of emissivity of a new conductor is approximately 0.3, compared to 0.9 for an aged conductor where the surface has become blackened. Thus a new, shiny conductor will run hotter than an aged conductor for the same electrical load. This has three potential consequences:

- (a) There is a risk of the grease coming to the conductor surface, leading to audible noise which may result in public complaint;
- (b) There is a risk that grease will drip from the conductor causing public complaint;
- (c) The exceedence of the line will be increased.

Items (a) and (b) above depend on the thermal performance of the grease; item (c) is ameliorated by the initial overtension that is applied to new conductor to allow for creep.

It is possible to increase the coefficient of emissivity of the conductor surface during manufacture by a number of methods. A value of at least 0.6 is known to be achievable by applying a surface treatment and this is required as a minimum value for high temperature GZTACSR in NGTS 3.4.13 (see 8.3 below). The option of specifying an initial minimum value for the coefficient of emissivity of 0.6 for standard conductors is now included in NGTS 3.4.2 Issue 4.

Based on the above considerations, the following sections detail the recommended reductions in the initial ratings according to conductor type, grease type and initial surface condition. These reductions should be maintained for an **energisation** period of six months, since the presence of the surface voltage gradient is important to the attraction of airborne particles which lead to surface blackening.

In all other circumstances, the ratings in this TGN apply immediately to any line with no assigned restriction but not necessarily to the associated equipment.

## 8.1 Shiny Conductor

### 8.1.1 Burmah Castrol Rustilo 431 Grease

This is the standard grease used in all of National Grid's conductors since 1987. For conductors manufactured with this grease, the recommended initial reductions in ratings are as follows:

- (a) 90°C rated temperature: pre-fault: 10%; post-fault: 10%
- (b) 75°C rated temperature: pre-fault: 5%; post-fault: 10%

For rated temperatures of 65°C or below, no reductions are necessary.

### 8.1.2 High Temperature Grease (eg Burmah Castrol Rustilo 450 Grease)

For conductor manufactured with a grease that meets the 150°C requirements of NGTS 3.4.2 Issue 4 June 2000, the following initial reductions are recommended:

- (a) 90°C rated temperature: pre-fault: 0%; post-fault: 5%

For rated temperatures of 75°C or below, no reductions are necessary.

## 8.2 Surface-treated Conductor

### 8.2.1 Burmah Castrol Rustilo 431 Grease

This is the standard grease used in all of National Grid's conductors since 1987. For conductors with a surface emissivity of at least 0.6 and manufactured with this grease, the recommended initial reductions in ratings are as follows:

- (a) 90°C rated temperature: pre-fault: 0%; post-fault: 5%

For rated temperatures of 75°C or below, no reductions are necessary.

### 8.2.2 High Temperature Grease (eg Burmah Castrol Rustilo 450 Grease)

For conductors with a surface emissivity of at least 0.6 and manufactured with a grease that meets the 150°C requirements of NGTS 3.4.2 Issue 4 June 2000, no initial reductions are required for rated temperatures not exceeding 90°C.

## 8.3 High Temperature GZTACSR

GZTACSR supplied to NGTS 3.4.13 must have a minimum value for the coefficient of surface emissivity of 0.6. This is required in order to avoid a large, initial derating resulting from the increased importance of radiative cooling at the higher rated temperatures. However, the following initial derating is still required:

- (a) 170°C rated temperature: pre-fault: 7%; post-fault: 7%

## 9 RESTRICTED CONTINUOUS RATINGS

Restricted continuous ratings may need to be applied to some lines originally constructed for 50°C operation: these ratings are specified in Tables C1 and C2. Only Zebra and Lynx ACSR conductors are involved. Typically, a line to which such a restriction applies will have compression joints not made to the requirements of TGN(T) 33 and/or bolted jumper connections which have not been reconditioned. The application and removal of a restriction will depend either on achieving the necessary resistance values for all joints, or from the results of infra-red surveys carried out under acceptable loading and weather conditions.

Since restricted ratings are not based upon conductor sag considerations, the basis for calculating them has not been changed from TPS 1/96 Issue 9. The use of these restricted ratings will finally disappear as the associated lines are refurbished.

The maximum allowable, restricted continuous ratings for Zebra conductor are less than the corresponding unrestricted 50°C pre-fault ratings. Both pre-fault and post-fault restricted continuous ratings are therefore set to this maximum value. In the case of Lynx conductor, however, the maximum allowable restricted value exceeds the unrestricted pre-fault value. The restricted post-fault value is therefore set equal to this maximum allowable value and the pre-fault value remains the same as for the unrestricted case.

Emergency ratings for damaged conductors of all construction types are given in TGN(T) 39.

## 10 OVERLOAD RATINGS

### 10.1 Standard Ratings

Single conductor overload ratings are no longer provided in separate tables in order to reduce the size of the document. Should they be needed, they can be readily deduced from the circuit overload capabilities provided in Appendices D to I by dividing the circuit value by the appropriate number of subconductors. Overloads for 3, 5, 10 and 20 minute periods with different pre-loads are provided, as before. The pre-load percentages are based upon the post-fault continuous ratings, up to a maximum value of 84%. It is not appropriate to consider extrapolation of overload ratings for pre-fault loads greater than 84% of the listed post-fault continuous thermal ratings. For such pre-fault loadings, the maximum post-fault load is the 100% continuous rating.

Within each Appendix, the ratings sheets are presented in the following hierarchical order: voltage, conductor nominal area, number of subconductors, rated temperature.

Overload ratings are calculated, taking into account the thermal capacity of the conductor. The time period associated with a particular rating is an absolute maximum. If a circuit carries such an overload for a longer period the conductor temperature and sag will rapidly exceed the safe limits. Thus, it is necessary to select an overload time appropriate to the operational action that can be taken following a fault.

Three minutes is considered to be the minimum safe period for which overload ratings of overhead lines are generally calculated. Therefore, the 3 minute rating should be used where a 2 minute overload is required.

Where special equipment is available to guarantee circuit tripping in a specified period, consideration may be given to providing an overload rating for a period shorter than 3 minutes: Network Engineering should be consulted in such cases.

### 10.2 Restricted Overload Ratings

The standard overload ratings may normally be applied to lines with restricted continuous ratings. The pre-load currents shall be as given in Appendix D for standard 50°C ratings of ACSR conductors, that is, the current for a short term overload rating shall be considered as a percentage of the 50°C unrestricted rating. For example, a 400 kV twin circuit with a restricted summer continuous rating of 900 MVA carries 330 MVA and, since this is 30 percent of the unrestricted rating, the 20 minute overload rating would be 1250 MVA. This has been justified through research on the performance of compression joints. For convenience the overload ratings for restricted circuits are given in Appendix K, together with the restricted continuous ratings. Since the basis for the calculation of restricted ratings has not been changed, the maximum pre-load remains at 75% of the unrestricted post-fault continuous rating for Zebra and 85% for Lynx, as before.

### 10.3 Repeat Overloads

No restrictions are stated in the TGN regarding repeated overloads for the following reasons:

- (a) The coincidence of a very low wind speed with full overload current being applied for the full overload period is unlikely.
- (b) The period of any critical low wind speed condition at conductor height is short, and is unlikely to persist for a period longer than the combined overloads.
- (c) The initial fall in temperature of the conductor after the removal of a heavy overload is rapid.

## 11 RATING SEASONS

The rating seasons are as follows:

- (a) WINTER – December, January, February.
- (b) SPRING/AUTUMN – March, April / September, October, November.
- (c) SUMMER – May, June, July, August.

Any rating change date shall be the nearest commencement of the working week at the beginning of each season.

## 12 ASSIGNMENT OF CIRCUIT RATINGS

The ratings detailed in this TGN are specific to the overhead line portion of a circuit and are based upon the thermal limitations imposed by the overhead line design. These limitations are principally those of maintaining minimum ground clearance and the temperature at which the grease migrates to the surface of the conductor. The continuous and overload ratings of a complete circuit may, however, be limited to less than the line thermal ratings by system design considerations associated with line length and reactive power, the ratings of associated plant or protection settings, and are therefore outside the scope of this TGN.

The statistical approach embodied in the determination of the ratings specified in this TGN caters for unstable weather conditions that are typical for each particular seasonal period, and which can lead to sudden drops in wind speed. The specified ratings can therefore be applied within the seasonal period without reference to the prevailing weather data.

Under certain weather conditions, it could be possible to extend the Winter ratings into the designated Spring / Autumn periods, and to extend the Spring/Autumn periods into the designated Summer periods subject to the following requirements:

- (a) The Winter ratings should not be exceeded.
- (b) The continuous Summer ratings may be linearly interpolated between the Spring/Autumn (9°C) and Summer (20°C) ratings using the maximum forecast air temperature from 9°C to 20°C.
- (c) Similarly, the continuous Spring/Autumn ratings may be linearly interpolated between the Winter (2°C) and Spring/Autumn ratings (9°C) using the maximum forecast air temperature from 2°C to 9°C.
- (d) De-rating of lines during periods of ambient temperatures higher than the assigned seasonal temperature range is not required.
- (e) The overload ratings may also be interpolated, based upon the pre-fault load as a percentage of the interpolated continuous post-fault rating.

These extended ratings should only be used where there is a particular operational need, where the weather pattern or the local climate is such that low wind speeds can be reasonably precluded, and where the operation of the system can cater for unexpected weather changes with sufficient speed. In order to minimise the risk of increased exceedence arising from the occurrence of low wind speeds, the **maximum** forecast temperature for the 24-hour period should be used.

Where the possibility of enhancing a line's rating on a day-to-day basis for a long-term period is required, application of the Meteorological Office Ratings Enhancement (MORE) scheme to the line should be considered. This requires an assessment of the line to be undertaken and requests should be made to Operational Services, System Operations.

### 13 ROUNDING OF NUMBERS

All ratings, both in ampere or MVA terms, have been rounded as follows:

- (a) Less than 250: to the nearest unit.
- (b) Less than 1000: to the nearest 5.
- (c) Greater than 1000: to the nearest 10.

Rounding of all values has been applied after their final evaluation, so that rounded values of current have not been used to produce rounded values of MVA.

It should be noted that the rounding of numbers produces minor discrepancies between the single conductor continuous current ratings in Appendix A and the circuit ratings for twin or quad bundles.

## APPENDIX A: SHORT-FORM TABLES OF SINGLE CONDUCTOR CONTINUOUS CURRENT RATINGS

Table A1: Continuous Thermal Current Ratings of Single Conductors at 50<sup>0</sup>C (& Upas @ 55<sup>0</sup>C)

| RATED TEMPERATURE<br>50 <sup>0</sup> C (& 55 <sup>0</sup> C UPAS) |                                              | Pre-fault Rating (Amps) |                   |        | Post-fault Rating (Amps) |                   |        |
|-------------------------------------------------------------------|----------------------------------------------|-------------------------|-------------------|--------|--------------------------|-------------------|--------|
|                                                                   |                                              | Winter                  | Spring/<br>Autumn | Summer | Winter                   | Spring/<br>Autumn | Summer |
| ACSR                                                              | 175 mm <sup>2</sup> Lynx                     | 485                     | 450               | 390    | 580                      | 540               | 465    |
|                                                                   | 400 mm <sup>2</sup> Zebra                    | 845                     | 775               | 670    | 1000                     | 925               | 800    |
| ACAR                                                              | 500 mm <sup>2</sup> Collybia                 | 940                     | 870               | 750    | 1120                     | 1035              | 890    |
| 32.5 nΩ.m AAAC                                                    | 700 mm <sup>2</sup> Araucaria                | 1200                    | 1110              | 950    | 1430                     | 1320              | 1130   |
| 31.2 nΩ.m AAAC                                                    | 425 mm <sup>2</sup> Totara                   | 880                     | 810               | 700    | 1040                     | 960               | 835    |
|                                                                   | 700 mm <sup>2</sup> Araucaria                | 1230                    | 1130              | 965    | 1460                     | 1350              | 1150   |
| 30.5 nΩ.m AAAC                                                    | 300 mm <sup>2</sup> Upas                     | 715                     | 665               | 575    | 855                      | 790               | 685    |
|                                                                   | 300 mm <sup>2</sup> Upas @ 55 <sup>0</sup> C | 755                     | 700               | 620    | 895                      | 835               | 735    |
|                                                                   | 425 mm <sup>2</sup> Totara                   | 890                     | 820               | 710    | 1060                     | 975               | 840    |
|                                                                   | 700 mm <sup>2</sup> Araucaria                | 1240                    | 1140              | 975    | 1480                     | 1360              | 1160   |

Table A2: Continuous Thermal Current Ratings of Single Conductors at 65<sup>0</sup>C

| RATED TEMPERATURE<br>65 <sup>0</sup> C |                               | Pre-fault Rating (Amps) |                   |        | Post-fault Rating (Amps) |                   |        |
|----------------------------------------|-------------------------------|-------------------------|-------------------|--------|--------------------------|-------------------|--------|
|                                        |                               | Winter                  | Spring/<br>Autumn | Summer | Winter                   | Spring/<br>Autumn | Summer |
| ACSR                                   | 175 mm <sup>2</sup> Lynx      | 555                     | 520               | 470    | 660                      | 620               | 560    |
|                                        | 400 mm <sup>2</sup> Zebra     | 965                     | 910               | 815    | 1150                     | 1080              | 970    |
| ACAR                                   | 500 mm <sup>2</sup> Collybia  | 1080                    | 1020              | 915    | 1290                     | 1220              | 1090   |
| 32.5 nΩ.m AAAC                         | 700 mm <sup>2</sup> Araucaria | 1390                    | 1310              | 1170   | 1650                     | 1560              | 1400   |
| 31.2 nΩ.m AAAC                         | 425 mm <sup>2</sup> Totara    | 1010                    | 950               | 850    | 1200                     | 1130              | 1020   |
|                                        | 700 mm <sup>2</sup> Araucaria | 1410                    | 1330              | 1190   | 1680                     | 1590              | 1420   |
| 30.5 nΩ.m AAAC                         | 300 mm <sup>2</sup> Upas      | 820                     | 775               | 695    | 980                      | 925               | 830    |
|                                        | 425 mm <sup>2</sup> Totara    | 1020                    | 965               | 865    | 1220                     | 1150              | 1030   |
|                                        | 700 mm <sup>2</sup> Araucaria | 1430                    | 1350              | 1210   | 1700                     | 1600              | 1440   |

Table A3: Continuous Thermal Current Ratings of Single Conductors at 75 °C

| RATED TEMPERATURE<br>75 °C |                               | Pre-fault Rating (Amps) |                   |        | Post-fault Rating (Amps) |                   |        |
|----------------------------|-------------------------------|-------------------------|-------------------|--------|--------------------------|-------------------|--------|
|                            |                               | Winter                  | Spring/<br>Autumn | Summer | Winter                   | Spring/<br>Autumn | Summer |
| ACSR                       | 175 mm <sup>2</sup> Lynx      | 595                     | 565               | 520    | 705                      | 675               | 615    |
|                            | 400 mm <sup>2</sup> Zebra     | 1040                    | 985               | 905    | 1230                     | 1180              | 1080   |
| ACAR                       | 500 mm <sup>2</sup> Collybia  | 1170                    | 1110              | 1020   | 1390                     | 1320              | 1210   |
| 32.5 nΩ.m AAAC             | 500 mm <sup>2</sup> Rubus     | 1190                    | 1140              | 1040   | 1420                     | 1350              | 1240   |
|                            | 700 mm <sup>2</sup> Araucaria | 1500                    | 1420              | 1300   | 1780                     | 1700              | 1550   |
| 31.2 nΩ.m AAAC             | 425 mm <sup>2</sup> Totara    | 1090                    | 1040              | 950    | 1300                     | 1230              | 1130   |
|                            | 500 mm <sup>2</sup> Rubus     | 1220                    | 1160              | 1060   | 1450                     | 1380              | 1260   |
|                            | 570 mm <sup>2</sup> Sorbus    | 1320                    | 1250              | 1150   | 1570                     | 1490              | 1360   |
|                            | 700 mm <sup>2</sup> Araucaria | 1530                    | 1450              | 1330   | 1820                     | 1730              | 1580   |
|                            | 850 mm <sup>2</sup> Redwood   | 1730                    | 1650              | 1510   | 2060                     | 1960              | 1790   |
| 30.5 nΩ.m AAAC             | 300 mm <sup>2</sup> Upas      | 885                     | 845               | 770    | 1060                     | 1000              | 915    |
|                            | 425 mm <sup>2</sup> Totara    | 1100                    | 1050              | 960    | 1310                     | 1250              | 1140   |
|                            | 500 mm <sup>2</sup> Rubus     | 1230                    | 1170              | 1070   | 1470                     | 1400              | 1270   |
|                            | 570 mm <sup>2</sup> Sorbus    | 1330                    | 1270              | 1160   | 1590                     | 1510              | 1380   |
|                            | 700 mm <sup>2</sup> Araucaria | 1540                    | 1470              | 1340   | 1840                     | 1750              | 1600   |
|                            | 850 mm <sup>2</sup> Redwood   | 1750                    | 1670              | 1520   | 2090                     | 1980              | 1810   |

Table A4: Continuous Thermal Current Ratings of Single Conductors at 85 °C

| RATED TEMPERATURE<br>85 °C |                               | Pre-fault Rating (Amps) |                   |        | Post-fault Rating (Amps) |                   |        |
|----------------------------|-------------------------------|-------------------------|-------------------|--------|--------------------------|-------------------|--------|
|                            |                               | Winter                  | Spring/<br>Autumn | Summer | Winter                   | Spring/<br>Autumn | Summer |
| 32.5 nΩ.m AAAC             | 500 mm <sup>2</sup> Rubus     | 1280                    | 1220              | 1130   | 1520                     | 1460              | 1350   |
|                            | 700 mm <sup>2</sup> Araucaria | 1600                    | 1530              | 1420   | 1910                     | 1830              | 1690   |
| 31.2 nΩ.m AAAC             | 425 mm <sup>2</sup> Totara    | 1160                    | 1120              | 1030   | 1390                     | 1330              | 1230   |
|                            | 500 mm <sup>2</sup> Rubus     | 1300                    | 1250              | 1160   | 1550                     | 1480              | 1380   |
|                            | 570 mm <sup>2</sup> Sorbus    | 1410                    | 1350              | 1250   | 1680                     | 1610              | 1490   |
|                            | 700 mm <sup>2</sup> Araucaria | 1630                    | 1560              | 1450   | 1940                     | 1860              | 1720   |
|                            | 850 mm <sup>2</sup> Redwood   | 1860                    | 1780              | 1650   | 2210                     | 2120              | 1960   |
| 30.5 nΩ.m AAAC             | 425 mm <sup>2</sup> Totara    | 1180                    | 1130              | 1040   | 1400                     | 1340              | 1240   |
|                            | 500 mm <sup>2</sup> Rubus     | 1320                    | 1260              | 1170   | 1570                     | 1500              | 1390   |
|                            | 570 mm <sup>2</sup> Sorbus    | 1430                    | 1370              | 1260   | 1700                     | 1630              | 1510   |
|                            | 700 mm <sup>2</sup> Araucaria | 1650                    | 1580              | 1460   | 1960                     | 1880              | 1740   |
|                            | 850 mm <sup>2</sup> Redwood   | 1880                    | 1800              | 1660   | 2230                     | 2140              | 1980   |

Table A5: Continuous Thermal Current Ratings of Single Conductors at 90<sup>0</sup>C (except GZTZCSR)

| RATED TEMPERATURE<br>90 <sup>0</sup> C (except GZTACSR) |                               | Pre-fault Rating (Amps) |                   |        | Post-fault Rating (Amps) |                   |        |
|---------------------------------------------------------|-------------------------------|-------------------------|-------------------|--------|--------------------------|-------------------|--------|
|                                                         |                               | Winter                  | Spring/<br>Autumn | Summer | Winter                   | Spring/<br>Autumn | Summer |
| 32.5 nΩ.m AAAC                                          | 500 mm <sup>2</sup> Rubus     | 1320                    | 1270              | 1180   | 1570                     | 1510              | 1400   |
|                                                         | 700 mm <sup>2</sup> Araucaria | 1650                    | 1590              | 1480   | 1970                     | 1890              | 1760   |
| 31.2 nΩ.m AAAC                                          | 425 mm <sup>2</sup> Totara    | 1200                    | 1150              | 1070   | 1430                     | 1370              | 1280   |
|                                                         | 500 mm <sup>2</sup> Rubus     | 1340                    | 1290              | 1200   | 1600                     | 1530              | 1430   |
|                                                         | 570 mm <sup>2</sup> Sorbus    | 1450                    | 1400              | 1300   | 1730                     | 1660              | 1550   |
|                                                         | 700 mm <sup>2</sup> Araucaria | 1680                    | 1620              | 1510   | 2000                     | 1930              | 1790   |
|                                                         | 850 mm <sup>2</sup> Redwood   | 1910                    | 1840              | 1710   | 2280                     | 2190              | 2040   |
| 30.5 nΩ.m AAAC                                          | 425 mm <sup>2</sup> Totara    | 1210                    | 1170              | 1090   | 1440                     | 1390              | 1290   |
|                                                         | 500 mm <sup>2</sup> Rubus     | 1360                    | 1300              | 1210   | 1620                     | 1550              | 1440   |
|                                                         | 570 mm <sup>2</sup> Sorbus    | 1470                    | 1410              | 1310   | 1750                     | 1680              | 1560   |
|                                                         | 700 mm <sup>2</sup> Araucaria | 1700                    | 1630              | 1520   | 2030                     | 1950              | 1810   |
|                                                         | 850 mm <sup>2</sup> Redwood   | 1930                    | 1860              | 1730   | 2300                     | 2210              | 2060   |
| GZTACSR (170 <sup>0</sup> C)                            | 620 mm <sup>2</sup> Matthew   | 1880                    | 1850              | 1790   | 2240                     | 2200              | 2140   |

## APPENDIX B: SHORT-FORM TABLES OF CIRCUIT CONTINUOUS MVA RATINGS

Table B1: Continuous Thermal MVA Ratings of Overhead Line Circuits at 50 °C (& Upas @ 55 °C)

| RATED TEMPERATURE 50°C |                |                       | Pre-fault Rating (MVA) |                   |        | Post-fault Rating (MVA) |                   |        |
|------------------------|----------------|-----------------------|------------------------|-------------------|--------|-------------------------|-------------------|--------|
| Voltage                | Conductor Type | Size, mm <sup>2</sup> | Winter                 | Spring/<br>Autumn | Summer | Winter                  | Spring/<br>Autumn | Summer |
| 132 kV                 | ACSR           | 1x175                 | 111                    | 103               | 89     | 132                     | 123               | 106    |
|                        |                | 2x175                 | 222                    | 207               | 178    | 265                     | 246               | 212    |
|                        |                | 1x400                 | 193                    | 177               | 154    | 229                     | 211               | 183    |
|                        |                | 2x400                 | 385                    | 355               | 305    | 460                     | 425               | 365    |
| 275 kV                 | ACSR           | 2x175                 | 465                    | 430               | 370    | 550                     | 515               | 445    |
|                        |                | 2x400                 | 805                    | 740               | 640    | 955                     | 880               | 760    |
|                        |                | 4x400                 | 1610                   | 1480              | 1280   | 1910                    | 1770              | 1520   |
|                        | 32.5 nΩ.m AAAC | 1x700                 | 575                    | 530               | 450    | 680                     | 630               | 540    |
|                        | 31.2 nΩ.m AAAC | 2x425                 | 840                    | 770               | 665    | 995                     | 920               | 795    |
|                        |                | 1x700                 | 585                    | 540               | 460    | 695                     | 640               | 550    |
|                        | 30.5 nΩ.m AAAC | 2x300                 | 685                    | 635               | 545    | 815                     | 755               | 650    |
|                        |                | 2x300 @ 55 °C         | 720                    | 670               | 590    | 855                     | 795               | 700    |
|                        |                | 2x425                 | 845                    | 780               | 675    | 1010                    | 930               | 800    |
|                        |                | 1x700                 | 590                    | 545               | 465    | 705                     | 650               | 555    |
|                        |                | 3x700                 | 1730                   | 1630              | 1400   | 2110                    | 1950              | 1660   |

Table B1 (Continued): Continuous Thermal MVA Ratings of Overhead Line Circuits at 50 °C

| RATED TEMPERATURE 50°C |                |                       | Pre-fault Rating (MVA) |                   |        | Post-fault Rating (MVA) |                   |        |
|------------------------|----------------|-----------------------|------------------------|-------------------|--------|-------------------------|-------------------|--------|
| Voltage                | Conductor Type | Size, mm <sup>2</sup> | Winter                 | Spring/<br>Autumn | Summer | Winter                  | Spring/<br>Autumn | Summer |
| 400 kV                 | ACSR           | 2x400                 | 1170                   | 1080              | 930    | 1390                    | 1280              | 1110   |
|                        |                | 4x400                 | 2330                   | 2160              | 1860   | 2780                    | 2570              | 2220   |
|                        | 31.2 nΩ.m AAAC | 2x425                 | 1220                   | 1120              | 970    | 1450                    | 1340              | 1150   |
|                        | 30.5 nΩ.m AAAC | 2x425                 | 1230                   | 1130              | 980    | 1470                    | 1350              | 1170   |
|                        |                | 3x700                 | 2580                   | 2380              | 2030   | 3070                    | 2830              | 2420   |

Table B2: Continuous Thermal MVA Ratings of Overhead Line Circuits at 65 °C

| RATED TEMPERATURE 65°C |                |                       | Pre-fault Rating (MVA) |                   |        | Post-fault Rating (MVA) |                   |        |
|------------------------|----------------|-----------------------|------------------------|-------------------|--------|-------------------------|-------------------|--------|
| Voltage                | Conductor Type | Size, mm <sup>2</sup> | Winter                 | Spring/<br>Autumn | Summer | Winter                  | Spring/<br>Autumn | Summer |
| 132 kV                 | ACSR           | 1x175                 | 126                    | 119               | 108    | 150                     | 142               | 128    |
|                        |                | 2x175                 | 255                    | 238               | 216    | 300                     | 285               | 255    |
|                        |                | 1x400                 | 220                    | 208               | 186    | 260                     | 248               | 221    |
|                        |                | 2x400                 | 440                    | 415               | 375    | 525                     | 495               | 445    |
| 275 kV                 | ACSR           | 2x175                 | 525                    | 495               | 450    | 625                     | 590               | 535    |
|                        |                | 2x400                 | 920                    | 865               | 775    | 1090                    | 1030              | 920    |
|                        |                | 4x400                 | 1840                   | 1730              | 1560   | 2190                    | 2060              | 1850   |
|                        | 32.5 nΩ.m AAAC | 1x700                 | 660                    | 625               | 560    | 785                     | 740               | 665    |
|                        | 31.2 nΩ.m AAAC | 2x425                 | 965                    | 910               | 810    | 1150                    | 1080              | 965    |
|                        |                | 1x700                 | 675                    | 635               | 570    | 800                     | 755               | 675    |
|                        | 30.5 nΩ.m AAAC | 2x300                 | 785                    | 740               | 665    | 935                     | 880               | 790    |
|                        |                | 2x425                 | 975                    | 920               | 825    | 1160                    | 1090              | 980    |
|                        |                | 1x700                 | 680                    | 640               | 575    | 810                     | 765               | 685    |

Table B2 (Continued): Continuous Thermal MVA Ratings of Overhead Line Circuits at 65 °C

| RATED TEMPERATURE 65°C |                |                       | Pre-fault Rating (MVA) |                   |        | Post-fault Rating (MVA) |                   |        |
|------------------------|----------------|-----------------------|------------------------|-------------------|--------|-------------------------|-------------------|--------|
| Voltage                | Conductor Type | Size, mm <sup>2</sup> | Winter                 | Spring/<br>Autumn | Summer | Winter                  | Spring/<br>Autumn | Summer |
| 400 kV                 | ACSR           | 2x400                 | 1340                   | 1260              | 1130   | 1590                    | 1500              | 1340   |
|                        |                | 4x400                 | 2670                   | 2520              | 2260   | 3180                    | 3000              | 2690   |
|                        | 31.2 nΩ.m AAAC | 2x425                 | 1400                   | 1320              | 1180   | 1670                    | 1570              | 1400   |
|                        | 30.5 nΩ.m AAAC | 2x425                 | 1420                   | 1340              | 1200   | 1690                    | 1590              | 1420   |

Table B3: Continuous Thermal MVA Ratings of Overhead Line Circuits at 75 °C

| RATED TEMPERATURE 75°C |                |                       | Pre-fault Rating (MVA) |                   |        | Post-fault Rating (MVA) |                   |        |
|------------------------|----------------|-----------------------|------------------------|-------------------|--------|-------------------------|-------------------|--------|
| Voltage                | Conductor Type | Size, mm <sup>2</sup> | Winter                 | Spring/<br>Autumn | Summer | Winter                  | Spring/<br>Autumn | Summer |
| 132 kV                 | ACSR           | 1x175                 | 136                    | 129               | 118    | 162                     | 154               | 141    |
|                        |                | 2x175                 | 270                    | 260               | 237    | 325                     | 310               | 280    |
|                        |                | 1x400                 | 237                    | 226               | 206    | 280                     | 270               | 246    |
|                        |                | 2x400                 | 475                    | 450               | 415    | 565                     | 535               | 490    |
|                        | 30.5 nΩ.m AAAC | 1x300                 | 203                    | 193               | 176    | 241                     | 230               | 210    |
|                        |                | 1x500                 | 280                    | 270               | 245    | 335                     | 320               | 290    |
| 275 kV                 | ACSR           | 2x175                 | 565                    | 540               | 495    | 675                     | 640               | 590    |
|                        |                | 2x400                 | 990                    | 940               | 860    | 1180                    | 1120              | 1020   |
|                        |                | 4x400                 | 1980                   | 1880              | 1720   | 2350                    | 2240              | 2050   |
|                        | ACAR           | 2x500                 | 1110                   | 1060              | 965    | 1320                    | 1260              | 1150   |

**Table B3 (Continued): Continuous Thermal MVA Ratings of Overhead Line Circuits at 75 °C**

| RATED TEMPERATURE 75°C |                |                       | Pre-fault Rating (MVA) |                   |        | Post-fault Rating (MVA) |                   |        |
|------------------------|----------------|-----------------------|------------------------|-------------------|--------|-------------------------|-------------------|--------|
| Voltage                | Conductor Type | Size, mm <sup>2</sup> | Winter                 | Spring/<br>Autumn | Summer | Winter                  | Spring/<br>Autumn | Summer |
| 275 kV                 | 32.5 nΩ.m AAAC | 2x500                 | 1140                   | 1080              | 990    | 1350                    | 1290              | 1180   |
|                        |                | 1x700                 | 715                    | 680               | 620    | 850                     | 810               | 740    |
|                        |                | 2x700                 | 1430                   | 1360              | 1240   | 1700                    | 1620              | 1480   |
|                        | 31.2 nΩ.m AAAC | 2x425                 | 1040                   | 990               | 900    | 1240                    | 1180              | 1070   |
|                        |                | 2x500                 | 1160                   | 1100              | 1010   | 1380                    | 1310              | 1200   |
|                        |                | 2x570                 | 1260                   | 1200              | 1090   | 1500                    | 1420              | 1300   |
|                        |                | 1x700                 | 725                    | 690               | 630    | 865                     | 825               | 750    |
|                        |                | 2x700                 | 1450                   | 1380              | 1260   | 1730                    | 1650              | 1500   |
|                        |                | 2x850                 | 1650                   | 1570              | 1440   | 1970                    | 1870              | 1710   |
|                        | 30.5 nΩ.m AAAC | 2x425                 | 1050                   | 1000              | 915    | 1250                    | 1190              | 1090   |
|                        |                | 2x500                 | 1170                   | 1120              | 1020   | 1400                    | 1330              | 1210   |
|                        |                | 2x570                 | 1270                   | 1210              | 1100   | 1510                    | 1440              | 1310   |
|                        |                | 1x700                 | 735                    | 700               | 640    | 875                     | 830               | 760    |
|                        |                | 2x700                 | 1470                   | 1400              | 1280   | 1750                    | 1660              | 1520   |
|                        |                | 3x700                 | 2200                   | 2100              | 1920   | 2620                    | 2500              | 2280   |
|                        |                | 2x850                 | 1670                   | 1590              | 1450   | 1990                    | 1890              | 1730   |

Table B3 (Continued): Continuous Thermal MVA Ratings of Overhead Line Circuits at 75 °C

| RATED TEMPERATURE 75°C |                |                       | Pre-fault Rating (MVA) |                   |        | Post-fault Rating (MVA) |                   |        |
|------------------------|----------------|-----------------------|------------------------|-------------------|--------|-------------------------|-------------------|--------|
| Voltage                | Conductor Type | Size, mm <sup>2</sup> | Winter                 | Spring/<br>Autumn | Summer | Winter                  | Spring/<br>Autumn | Summer |
| 400 kV                 | ACSR           | 2x400                 | 1440                   | 1370              | 1250   | 1710                    | 1630              | 1490   |
|                        |                | 4x400                 | 2870                   | 2730              | 2500   | 3420                    | 3260              | 2980   |
|                        | ACAR           | 2x500                 | 1620                   | 1540              | 1410   | 1930                    | 1830              | 1670   |
|                        | 32.5 nΩ.m AAAC | 2x500                 | 1660                   | 1570              | 1440   | 1970                    | 1870              | 1710   |
|                        |                | 2x700                 | 2080                   | 1970              | 1800   | 2470                    | 2350              | 2150   |
|                        | 31.2 nΩ.m AAAC | 2x425                 | 1510                   | 1440              | 1310   | 1800                    | 1710              | 1560   |
|                        |                | 2x500                 | 1690                   | 1610              | 1470   | 2010                    | 1910              | 1750   |
|                        |                | 2x570                 | 1830                   | 1740              | 1590   | 2180                    | 2070              | 1890   |
|                        |                | 2x700                 | 2120                   | 2010              | 1840   | 2520                    | 2400              | 2190   |
|                        |                | 2x850                 | 2400                   | 2290              | 2090   | 2860                    | 2720              | 2480   |
|                        | 30.5 nΩ.m AAAC | 2x425                 | 1530                   | 1450              | 1330   | 1820                    | 1730              | 1580   |
|                        |                | 2x500                 | 1710                   | 1620              | 1480   | 2030                    | 1930              | 1770   |
|                        |                | 2x570                 | 1830                   | 1740              | 1590   | 2180                    | 2070              | 1890   |
|                        |                | 2x700                 | 2140                   | 2030              | 1860   | 2550                    | 2420              | 2210   |
|                        |                | 3x700                 | 3210                   | 3050              | 2790   | 3820                    | 3630              | 3320   |
|                        |                | 2x850                 | 2430                   | 2310              | 2110   | 2890                    | 2750              | 2510   |

**Table B4: Continuous Thermal MVA Ratings of Overhead Line Circuits at 85 °C**

| RATED TEMPERATURE 85°C |                |                       | Pre-fault Rating (MVA) |                   |        | Post-fault Rating (MVA) |                   |        |
|------------------------|----------------|-----------------------|------------------------|-------------------|--------|-------------------------|-------------------|--------|
| Voltage                | Conductor Type | Size, mm <sup>2</sup> | Winter                 | Spring/<br>Autumn | Summer | Winter                  | Spring/<br>Autumn | Summer |
| 275 kV                 | 32.5 nΩ.m AAAC | 2x500                 | 1220                   | 1160              | 1080   | 1450                    | 1390              | 1280   |
|                        |                | 1x700                 | 765                    | 730               | 675    | 910                     | 870               | 805    |
|                        |                | 2x700                 | 1530                   | 1460              | 1340   | 1820                    | 1740              | 1610   |
|                        | 31.2 nΩ.m AAAC | 2x425                 | 1110                   | 1060              | 985    | 1320                    | 1260              | 1170   |
|                        |                | 2x500                 | 1240                   | 1190              | 1100   | 1480                    | 1410              | 1310   |
|                        |                | 2x570                 | 1340                   | 1290              | 1190   | 1600                    | 1530              | 1420   |
|                        |                | 1x700                 | 780                    | 745               | 690    | 925                     | 885               | 820    |
|                        |                | 2x700                 | 1560                   | 1490              | 1380   | 1850                    | 1770              | 1640   |
|                        |                | 2x850                 | 1770                   | 1690              | 1570   | 2100                    | 2020              | 1870   |
|                        | 30.5 nΩ.m AAAC | 2x425                 | 1120                   | 1070              | 995    | 1330                    | 1280              | 1180   |
|                        |                | 2x500                 | 1250                   | 1200              | 1110   | 1490                    | 1430              | 1320   |
|                        |                | 2x570                 | 1360                   | 1300              | 1200   | 1620                    | 1550              | 1430   |
|                        |                | 1x700                 | 785                    | 755               | 695    | 935                     | 895               | 830    |
|                        |                | 2x700                 | 1470                   | 1400              | 1280   | 1750                    | 1660              | 1520   |
|                        |                | 2x850                 | 1790                   | 1710              | 1580   | 2130                    | 2040              | 1890   |

Table B4 (Continued): Continuous Thermal MVA Ratings of Overhead Line Circuits at 85 °C

| RATED TEMPERATURE 85°C |                |                       | Pre-fault Rating (MVA) |                   |        | Post-fault Rating (MVA) |                   |        |
|------------------------|----------------|-----------------------|------------------------|-------------------|--------|-------------------------|-------------------|--------|
| Voltage                | Conductor Type | Size, mm <sup>2</sup> | Winter                 | Spring/<br>Autumn | Summer | Winter                  | Spring/<br>Autumn | Summer |
| 400 kV                 | 32.5 nΩ.m AAAC | 2x500                 | 1770                   | 1690              | 1570   | 2110                    | 2020              | 1870   |
|                        |                | 2x700                 | 2220                   | 2130              | 1970   | 2640                    | 2530              | 2340   |
|                        | 31.2 nΩ.m AAAC | 2x425                 | 1610                   | 1550              | 1430   | 1920                    | 1840              | 1700   |
|                        |                | 2x500                 | 1800                   | 1730              | 1600   | 2150                    | 2060              | 1900   |
|                        |                | 2x570                 | 1950                   | 1870              | 1730   | 2330                    | 2230              | 2060   |
|                        |                | 2x700                 | 2260                   | 2170              | 2010   | 2690                    | 2580              | 2390   |
|                        |                | 2x850                 | 2570                   | 2460              | 2280   | 3060                    | 2930              | 2710   |
|                        | 30.5 nΩ.m AAAC | 2x425                 | 1630                   | 1560              | 1450   | 1940                    | 1860              | 1720   |
|                        |                | 2x500                 | 1820                   | 1750              | 1620   | 2170                    | 2080              | 1930   |
|                        |                | 2x570                 | 1950                   | 1870              | 1730   | 2330                    | 2230              | 2060   |
|                        |                | 2x700                 | 2290                   | 2190              | 2030   | 2720                    | 2610              | 2410   |
|                        |                | 2x850                 | 2600                   | 2490              | 2300   | 3090                    | 2960              | 2740   |

Table B5: Continuous Thermal MVA Ratings of Overhead Line Circuits at 90 °C

| RATED TEMPERATURE 90°C |                 |                       | Pre-fault Rating (MVA) |                   |        | Post-fault Rating (MVA) |                   |        |
|------------------------|-----------------|-----------------------|------------------------|-------------------|--------|-------------------------|-------------------|--------|
| Voltage                | Conductor Type  | Size, mm <sup>2</sup> | Winter                 | Spring/<br>Autumn | Summer | Winter                  | Spring/<br>Autumn | Summer |
| 275 kV                 | 32.5 nΩ.m AAAC  | 2x500                 | 1250                   | 1200              | 1120   | 1490                    | 1430              | 1330   |
|                        |                 | 1x700                 | 785                    | 755               | 705    | 935                     | 900               | 840    |
|                        |                 | 2x700                 | 1570                   | 1510              | 1410   | 1870                    | 1800              | 1680   |
|                        | 31.2 nΩ.m AAAC  | 2x425                 | 1140                   | 1100              | 1020   | 1360                    | 1310              | 1220   |
|                        |                 | 2x500                 | 1280                   | 1230              | 1140   | 1520                    | 1460              | 1360   |
|                        |                 | 2x570                 | 1380                   | 1330              | 1240   | 1650                    | 1580              | 1470   |
|                        |                 | 1x700                 | 800                    | 770               | 715    | 955                     | 915               | 855    |
|                        |                 | 2x700                 | 1600                   | 1540              | 1430   | 1910                    | 1830              | 1710   |
|                        |                 | 2x850                 | 1820                   | 1750              | 1630   | 2170                    | 2080              | 1940   |
|                        | 30.5 nΩ.m AAAC  | 2x425                 | 1160                   | 1110              | 1030   | 1380                    | 1320              | 1230   |
|                        |                 | 2x500                 | 1290                   | 1240              | 1160   | 1540                    | 1480              | 1380   |
|                        |                 | 2x570                 | 1400                   | 1340              | 1250   | 1670                    | 1600              | 1490   |
|                        |                 | 1x700                 | 810                    | 780               | 725    | 965                     | 925               | 865    |
|                        |                 | 2x700                 | 1620                   | 1560              | 1450   | 1930                    | 1850              | 1730   |
|                        |                 | 2x850                 | 1840                   | 1770              | 1650   | 2190                    | 2110              | 1960   |
|                        | GZTACSR (170°C) | 2x620                 | 1790                   | 1760              | 1710   | 2130                    | 2100              | 2030   |

Table B5 (Continued): Continuous Thermal MVA Ratings of Overhead Line Circuits at 90 °C (except GZTACSR)

| RATED TEMPERATURE 90°C (except GZTACSR) |                 |                       | Pre-fault Rating (MVA) |                   |        | Post-fault Rating (MVA) |                   |        |
|-----------------------------------------|-----------------|-----------------------|------------------------|-------------------|--------|-------------------------|-------------------|--------|
| Voltage                                 | Conductor Type  | Size, mm <sup>2</sup> | Winter                 | Spring/<br>Autumn | Summer | Winter                  | Spring/<br>Autumn | Summer |
| 400 kV                                  | 32.5 nΩ.m AAAC  | 2x500                 | 1820                   | 1750              | 1630   | 2170                    | 2080              | 1940   |
|                                         |                 | 2x700                 | 2290                   | 2200              | 2050   | 2720                    | 2620              | 2440   |
|                                         | 31.2 nΩ.m AAAC  | 2x425                 | 1660                   | 1600              | 1490   | 1980                    | 1900              | 1770   |
|                                         |                 | 2x500                 | 1860                   | 1790              | 1660   | 2210                    | 2130              | 1980   |
|                                         |                 | 2x570                 | 2010                   | 1930              | 1800   | 2400                    | 2300              | 2140   |
|                                         |                 | 2x700                 | 2330                   | 2240              | 2090   | 2780                    | 2670              | 2480   |
|                                         |                 | 2x850                 | 2650                   | 2550              | 2370   | 3160                    | 3030              | 2820   |
|                                         | 30.5 nΩ.m AAAC  | 2x425                 | 1680                   | 1610              | 1500   | 2000                    | 1920              | 1790   |
|                                         |                 | 2x500                 | 1880                   | 1810              | 1680   | 2240                    | 2150              | 2000   |
|                                         |                 | 2x570                 | 2040                   | 1960              | 1820   | 2420                    | 2330              | 2170   |
|                                         |                 | 2x700                 | 2360                   | 2260              | 2110   | 2810                    | 2700              | 2510   |
|                                         |                 | 2x850                 | 2680                   | 2570              | 2400   | 3190                    | 3060              | 2850   |
|                                         | GZTACSR (170°C) | 2x620                 | 2610                   | 2560              | 2490   | 3100                    | 3050              | 2960   |

## APPENDIX C: RESTRICTED CONTINUOUS CURRENT AND CIRCUIT MVA RATINGS FOR ACSR CONDUCTORS

Table C1: Restricted Continuous Current Ratings of Single ACSR Conductors

| ACSR CONDUCTOR            | Pre-fault Rating (Amps) |                   |        | Post-fault Rating (Amps) |                   |        |
|---------------------------|-------------------------|-------------------|--------|--------------------------|-------------------|--------|
|                           | Winter                  | Spring/<br>Autumn | Summer | Winter                   | Spring/<br>Autumn | Summer |
| 175 mm <sup>2</sup> Lynx  | 486                     | 452               | 390    | 550                      | 510               | 440    |
| 400 mm <sup>2</sup> Zebra | 800                     | 700               | 650    | 800                      | 700               | 650    |

Table C2: Restricted Continuous Circuit MVA Ratings (ACSR Conductors)

| Voltage<br>kV | ACSR Size<br>mm <sup>2</sup> | Pre-fault Rating (MVA) |                   |        | Post-fault Rating (MVA) |                   |        |
|---------------|------------------------------|------------------------|-------------------|--------|-------------------------|-------------------|--------|
|               |                              | Winter                 | Spring/<br>Autumn | Summer | Winter                  | Spring/<br>Autumn | Summer |
| 132           | 1x175                        | 111                    | 103               | 89     | 126                     | 117               | 101    |
|               | 1x400                        | 183                    | 160               | 149    | 183                     | 160               | 149    |
|               | 2x175                        | 222                    | 206               | 178    | 250                     | 233               | 201    |
| 275           | 2x175                        | 465                    | 430               | 370    | 525                     | 485               | 420    |
|               | 2x400                        | 760                    | 665               | 620    | 760                     | 665               | 620    |
| 400           | 2x400                        | 1110                   | 970               | 900    | 1110                    | 970               | 900    |
|               | 4x400                        | 2220                   | 1940              | 1800   | 2220                    | 1940              | 1800   |

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## APPENDIX D: CIRCUIT OVERLOAD RATINGS FOR ACSR CONDUCTORS

Table D1: Circuit Thermal Overload Ratings for 132 kV, 1x175mm<sup>2</sup> Lynx ACSR

| Rated Temperature: 50 °C    |                                 |                   |     |                            |     |                   |     |
|-----------------------------|---------------------------------|-------------------|-----|----------------------------|-----|-------------------|-----|
| ALL RATINGS ARE PER CIRCUIT |                                 | Winter<br>AmpsMVA |     | Spring / Autumn<br>AmpsMVA |     | Summer<br>AmpsMVA |     |
| Pre-Fault Continuous        |                                 | 485               | 111 | 450                        | 103 | 390               | 89  |
| Post-Fault Continuous       |                                 | 580               | 132 | 540                        | 123 | 465               | 106 |
| Overloads                   |                                 |                   |     |                            |     |                   |     |
| Pre-Load %<br>(Footnote 2)  | Overload<br>Duration<br>Minutes |                   |     |                            |     |                   |     |
| 84<br>(Footnote 3)          | 20                              | 590               | 135 | 545                        | 125 | 470               | 108 |
|                             | 10                              | 630               | 144 | 580                        | 133 | 495               | 113 |
|                             | 5                               | 710               | 163 | 655                        | 149 | 555               | 126 |
|                             | 3                               | 810               | 185 | 740                        | 170 | 625               | 143 |
| 75                          | 20                              | 595               | 136 | 555                        | 126 | 475               | 109 |
|                             | 10                              | 650               | 149 | 600                        | 137 | 510               | 116 |
|                             | 5                               | 760               | 173 | 695                        | 159 | 585               | 134 |
|                             | 3                               | 885               | 203 | 810                        | 185 | 685               | 156 |
| 60                          | 20                              | 605               | 138 | 560                        | 128 | 480               | 110 |
|                             | 10                              | 675               | 155 | 620                        | 142 | 530               | 121 |
|                             | 5                               | 820               | 187 | 750                        | 172 | 635               | 145 |
|                             | 3                               | 985               | 226 | 900                        | 206 | 755               | 173 |
| 30                          | 20                              | 615               | 141 | 570                        | 130 | 490               | 112 |
|                             | 10                              | 710               | 163 | 655                        | 150 | 555               | 127 |
|                             | 5                               | 895               | 205 | 820                        | 187 | 690               | 158 |
|                             | 3                               | 1110              | 255 | 1010                       | 230 | 845               | 193 |
| 0                           | 20                              | 620               | 142 | 575                        | 131 | 490               | 112 |
|                             | 10                              | 725               | 165 | 665                        | 152 | 565               | 129 |
|                             | 5                               | 920               | 210 | 840                        | 192 | 710               | 162 |
|                             | 3                               | 1140              | 260 | 1040                       | 238 | 875               | 200 |
| Pre-loads                   | 84%                             | 485               | 111 | 455                        | 103 | 390               | 89  |
|                             | 75%                             | 435               | 99  | 405                        | 92  | 350               | 80  |
|                             | 60%                             | 350               | 79  | 325                        | 74  | 280               | 64  |
|                             | 30%                             | 174               | 40  | 162                        | 37  | 140               | 32  |

1. Current per conductor is obtained by dividing the tabulated phase current by the number of subconductors.
2. Pre-load is defined as the percentage of continuous post-fault rating.
3. With a pre-fault loading greater than 84% the overload rating is equal to the 100% post-fault rating.

Table D2: Circuit Thermal Overload Ratings for 132 kV, 1x175mm<sup>2</sup> Lynx ACSR

|                             |                                 |                   |     | Rated Temperature: 65 °C   |     |                   |     |
|-----------------------------|---------------------------------|-------------------|-----|----------------------------|-----|-------------------|-----|
| ALL RATINGS ARE PER CIRCUIT |                                 | Winter<br>AmpsMVA |     | Spring / Autumn<br>AmpsMVA |     | Summer<br>AmpsMVA |     |
| Pre-Fault Continuous        |                                 | 555               | 126 | 520                        | 119 | 470               | 108 |
| Post-Fault Continuous       |                                 | 660               | 150 | 620                        | 142 | 560               | 128 |
| Overloads                   |                                 |                   |     |                            |     |                   |     |
| Pre-Load %<br>(Footnote 2)  | Overload<br>Duration<br>Minutes |                   |     |                            |     |                   |     |
| 84<br>(Footnote 3)          | 20                              | 675               | 154 | 635                        | 145 | 570               | 130 |
|                             | 10                              | 720               | 165 | 675                        | 155 | 605               | 138 |
|                             | 5                               | 815               | 186 | 765                        | 175 | 680               | 155 |
|                             | 3                               | 930               | 213 | 870                        | 199 | 770               | 176 |
| 75                          | 20                              | 680               | 156 | 640                        | 147 | 575               | 132 |
|                             | 10                              | 745               | 170 | 700                        | 160 | 620               | 142 |
|                             | 5                               | 870               | 199 | 815                        | 186 | 720               | 165 |
|                             | 3                               | 1020              | 233 | 950                        | 218 | 840               | 192 |
| 60                          | 20                              | 690               | 158 | 650                        | 149 | 585               | 133 |
|                             | 10                              | 775               | 177 | 725                        | 166 | 645               | 148 |
|                             | 5                               | 940               | 215 | 880                        | 201 | 775               | 178 |
|                             | 3                               | 1140              | 260 | 1060                       | 242 | 930               | 213 |
| 30                          | 20                              | 705               | 161 | 660                        | 151 | 595               | 136 |
|                             | 10                              | 815               | 186 | 765                        | 175 | 680               | 155 |
|                             | 5                               | 1030              | 236 | 960                        | 220 | 845               | 194 |
|                             | 3                               | 1280              | 290 | 1190                       | 270 | 1040              | 238 |
| 0                           | 20                              | 705               | 162 | 665                        | 152 | 595               | 136 |
|                             | 10                              | 830               | 189 | 775                        | 177 | 690               | 158 |
|                             | 5                               | 1060              | 242 | 985                        | 225 | 870               | 199 |
|                             | 3                               | 1320              | 300 | 1230                       | 280 | 1080              | 246 |
| Pre-loads                   | 84%                             | 555               | 126 | 520                        | 119 | 470               | 108 |
|                             | 75%                             | 495               | 112 | 465                        | 106 | 420               | 96  |
|                             | 60%                             | 395               | 90  | 370                        | 85  | 335               | 77  |
|                             | 30%                             | 198               | 45  | 186                        | 43  | 168               | 38  |

1. Current per conductor is obtained by dividing the tabulated phase current by the number of subconductors.
2. Pre-load is defined as the percentage of continuous post-fault rating.
3. With a pre-fault loading greater than 84% the overload rating is equal to the 100% post-fault rating.

Table D3: Circuit Thermal Overload Ratings for 132 kV, 1x175mm<sup>2</sup> Lynx ACSR

|                             |                                 |                   |     | Rated Temperature: 75 °C   |     |                   |     |
|-----------------------------|---------------------------------|-------------------|-----|----------------------------|-----|-------------------|-----|
| ALL RATINGS ARE PER CIRCUIT |                                 | Winter<br>AmpsMVA |     | Spring / Autumn<br>AmpsMVA |     | Summer<br>AmpsMVA |     |
| Pre-Fault Continuous        |                                 | 595               | 136 | 565                        | 129 | 520               | 118 |
| Post-Fault Continuous       |                                 | 705               | 162 | 675                        | 154 | 615               | 141 |
| Overloads                   |                                 |                   |     |                            |     |                   |     |
| Pre-Load %<br>(Footnote 2)  | Overload<br>Duration<br>Minutes |                   |     |                            |     |                   |     |
| 84<br>(Footnote 3)          | 20                              | 725               | 166 | 690                        | 158 | 630               | 144 |
|                             | 10                              | 775               | 177 | 735                        | 168 | 670               | 153 |
|                             | 5                               | 880               | 201 | 830                        | 190 | 750               | 172 |
|                             | 3                               | 1000              | 230 | 945                        | 216 | 850               | 195 |
| 75                          | 20                              | 735               | 168 | 695                        | 159 | 635               | 145 |
|                             | 10                              | 800               | 183 | 760                        | 173 | 690               | 157 |
|                             | 5                               | 940               | 214 | 885                        | 202 | 800               | 182 |
|                             | 3                               | 1100              | 250 | 1040                       | 237 | 930               | 213 |
| 60                          | 20                              | 745               | 170 | 705                        | 161 | 640               | 147 |
|                             | 10                              | 835               | 191 | 790                        | 181 | 715               | 163 |
|                             | 5                               | 1020              | 232 | 955                        | 219 | 860               | 197 |
|                             | 3                               | 1230              | 280 | 1150                       | 265 | 1030              | 236 |
| 30                          | 20                              | 755               | 173 | 715                        | 164 | 655               | 149 |
|                             | 10                              | 880               | 201 | 830                        | 190 | 750               | 171 |
|                             | 5                               | 1110              | 255 | 1050                       | 239 | 940               | 215 |
|                             | 3                               | 1380              | 315 | 1290                       | 295 | 1160              | 265 |
| 0                           | 20                              | 760               | 174 | 720                        | 165 | 655               | 150 |
|                             | 10                              | 895               | 204 | 840                        | 193 | 760               | 174 |
|                             | 5                               | 1140              | 260 | 1070                       | 245 | 965               | 220 |
|                             | 3                               | 1430              | 325 | 1340                       | 305 | 1200              | 275 |
| Pre-loads                   | 84%                             | 590               | 136 | 565                        | 129 | 515               | 118 |
|                             | 75%                             | 530               | 122 | 505                        | 116 | 460               | 106 |
|                             | 60%                             | 425               | 97  | 405                        | 92  | 370               | 85  |
|                             | 30%                             | 212               | 49  | 202                        | 46  | 184               | 42  |

1. Current per conductor is obtained by dividing the tabulated phase current by the number of subconductors.
2. Pre-load is defined as the percentage of continuous post-fault rating.
3. With a pre-fault loading greater than 84% the overload rating is equal to the 100% post-fault rating.

Table D4: Circuit Thermal Overload Ratings for 132 kV, 2x175mm<sup>2</sup> Lynx ACSR

|                             |                                 |                         |     | Rated Temperature: 50 °C         |     |                         |     |
|-----------------------------|---------------------------------|-------------------------|-----|----------------------------------|-----|-------------------------|-----|
| ALL RATINGS ARE PER CIRCUIT |                                 | Winter<br>Amps      MVA |     | Spring / Autumn<br>Amps      MVA |     | Summer<br>Amps      MVA |     |
| Pre-Fault Continuous        |                                 | 970                     | 222 | 905                              | 207 | 780                     | 178 |
| Post-Fault Continuous       |                                 | 1160                    | 265 | 1080                             | 246 | 930                     | 212 |
| Overloads                   |                                 |                         |     |                                  |     |                         |     |
| Pre-Load %<br>(Footnote 2)  | Overload<br>Duration<br>Minutes |                         |     |                                  |     |                         |     |
| 84<br>(Footnote 3)          | 20                              | 1180                    | 270 | 1090                             | 250 | 940                     | 215 |
|                             | 10                              | 1260                    | 290 | 1160                             | 265 | 985                     | 226 |
|                             | 5                               | 1420                    | 325 | 1310                             | 300 | 1110                    | 255 |
|                             | 3                               | 1620                    | 370 | 1480                             | 340 | 1250                    | 285 |
| 75                          | 20                              | 1190                    | 275 | 1110                             | 255 | 950                     | 217 |
|                             | 10                              | 1300                    | 295 | 1200                             | 275 | 1020                    | 232 |
|                             | 5                               | 1520                    | 345 | 1390                             | 320 | 1170                    | 270 |
|                             | 3                               | 1770                    | 405 | 1620                             | 370 | 1370                    | 310 |
| 60                          | 20                              | 1210                    | 275 | 1120                             | 255 | 960                     | 220 |
|                             | 10                              | 1350                    | 310 | 1240                             | 285 | 1060                    | 242 |
|                             | 5                               | 1640                    | 375 | 1500                             | 345 | 1270                    | 290 |
|                             | 3                               | 1970                    | 450 | 1800                             | 410 | 1510                    | 345 |
| 30                          | 20                              | 1230                    | 280 | 1140                             | 260 | 975                     | 223 |
|                             | 10                              | 1420                    | 325 | 1310                             | 300 | 1110                    | 255 |
|                             | 5                               | 1790                    | 410 | 1640                             | 375 | 1380                    | 315 |
|                             | 3                               | 2210                    | 505 | 2010                             | 460 | 1690                    | 385 |
| 0                           | 20                              | 1240                    | 285 | 1150                             | 260 | 980                     | 224 |
|                             | 10                              | 1450                    | 330 | 1330                             | 305 | 1130                    | 260 |
|                             | 5                               | 1840                    | 420 | 1680                             | 385 | 1420                    | 325 |
|                             | 3                               | 2280                    | 520 | 2080                             | 475 | 1750                    | 400 |
| Pre-loads                   | 84%                             | 975                     | 223 | 905                              | 207 | 780                     | 178 |
|                             | 75%                             | 870                     | 199 | 810                              | 184 | 700                     | 159 |
|                             | 60%                             | 695                     | 159 | 650                              | 148 | 560                     | 127 |
|                             | 30%                             | 350                     | 80  | 325                              | 74  | 280                     | 64  |

1. Current per conductor is obtained by dividing the tabulated phase current by the number of subconductors.
2. Pre-load is defined as the percentage of continuous post-fault rating.
3. With a pre-fault loading greater than 84% the overload rating is equal to the 100% post-fault rating.

Table D5: Circuit Thermal Overload Ratings for 132 kV, 2x175mm<sup>2</sup> Lynx ACSR

|                             |                                 |                   |     | Rated Temperature: 65 °C   |     |                   |     |
|-----------------------------|---------------------------------|-------------------|-----|----------------------------|-----|-------------------|-----|
| ALL RATINGS ARE PER CIRCUIT |                                 | Winter<br>AmpsMVA |     | Spring / Autumn<br>AmpsMVA |     | Summer<br>AmpsMVA |     |
| Pre-Fault Continuous        |                                 | 1110              | 255 | 1040                       | 238 | 945               | 216 |
| Post-Fault Continuous       |                                 | 1320              | 300 | 1240                       | 285 | 1120              | 255 |
| Overloads                   |                                 |                   |     |                            |     |                   |     |
| Pre-Load %<br>(Footnote 2)  | Overload<br>Duration<br>Minutes |                   |     |                            |     |                   |     |
| 84<br>(Footnote 3)          | 20                              | 1350              | 310 | 1270                       | 290 | 1140              | 260 |
|                             | 10                              | 1440              | 330 | 1350                       | 310 | 1210              | 275 |
|                             | 5                               | 1630              | 375 | 1530                       | 350 | 1360              | 310 |
|                             | 3                               | 1860              | 425 | 1740                       | 400 | 1540              | 350 |
| 75                          | 20                              | 1360              | 310 | 1280                       | 295 | 1150              | 265 |
|                             | 10                              | 1490              | 340 | 1400                       | 320 | 1240              | 285 |
|                             | 5                               | 1740              | 400 | 1630                       | 370 | 1440              | 330 |
|                             | 3                               | 2040              | 465 | 1900                       | 435 | 1680              | 385 |
| 60                          | 20                              | 1380              | 315 | 1300                       | 295 | 1170              | 265 |
|                             | 10                              | 1550              | 355 | 1450                       | 330 | 1290              | 295 |
|                             | 5                               | 1880              | 430 | 1760                       | 400 | 1550              | 355 |
|                             | 3                               | 2270              | 520 | 2120                       | 485 | 1860              | 425 |
| 30                          | 20                              | 1410              | 320 | 1320                       | 300 | 1190              | 270 |
|                             | 10                              | 1630              | 375 | 1530                       | 350 | 1360              | 310 |
|                             | 5                               | 2060              | 470 | 1920                       | 440 | 1690              | 385 |
|                             | 3                               | 2550              | 585 | 2370                       | 540 | 2080              | 475 |
| 0                           | 20                              | 1410              | 325 | 1330                       | 305 | 1190              | 275 |
|                             | 10                              | 1660              | 380 | 1550                       | 355 | 1380              | 315 |
|                             | 5                               | 2120              | 485 | 1970                       | 450 | 1740              | 400 |
|                             | 3                               | 2640              | 605 | 2450                       | 560 | 2150              | 490 |
| Pre-loads                   | 84%                             | 1110              | 250 | 1040                       | 239 | 940               | 214 |
|                             | 75%                             | 990               | 225 | 930                        | 214 | 840               | 191 |
|                             | 60%                             | 790               | 180 | 745                        | 171 | 670               | 153 |
|                             | 30%                             | 395               | 90  | 370                        | 86  | 335               | 76  |

1. Current per conductor is obtained by dividing the tabulated phase current by the number of subconductors.
2. Pre-load is defined as the percentage of continuous post-fault rating.
3. With a pre-fault loading greater than 84% the overload rating is equal to the 100% post-fault rating.

Table D6: Circuit Thermal Overload Ratings for 132 kV, 2x175mm<sup>2</sup> Lynx ACSR

|                             |                                 |                   |     | Rated Temperature: 75 °C   |     |                   |     |
|-----------------------------|---------------------------------|-------------------|-----|----------------------------|-----|-------------------|-----|
| ALL RATINGS ARE PER CIRCUIT |                                 | Winter<br>AmpsMVA |     | Spring / Autumn<br>AmpsMVA |     | Summer<br>AmpsMVA |     |
| Pre-Fault Continuous        |                                 | 1190              | 270 | 1130                       | 260 | 1040              | 237 |
| Post-Fault Continuous       |                                 | 1410              | 325 | 1350                       | 310 | 1230              | 280 |
| Overloads                   |                                 |                   |     |                            |     |                   |     |
| Pre-Load %<br>(Footnote 2)  | Overload<br>Duration<br>Minutes |                   |     |                            |     |                   |     |
| 84<br>(Footnote 3)          | 20                              | 1450              | 330 | 1380                       | 315 | 1260              | 290 |
|                             | 10                              | 1550              | 355 | 1470                       | 335 | 1340              | 305 |
|                             | 5                               | 1760              | 400 | 1660                       | 380 | 1500              | 345 |
|                             | 3                               | 2010              | 460 | 1890                       | 435 | 1700              | 390 |
| 75                          | 20                              | 1470              | 335 | 1390                       | 320 | 1270              | 290 |
|                             | 10                              | 1600              | 365 | 1520                       | 345 | 1380              | 315 |
|                             | 5                               | 1880              | 430 | 1770                       | 405 | 1600              | 365 |
|                             | 3                               | 2200              | 505 | 2070                       | 475 | 1860              | 425 |
| 60                          | 20                              | 1490              | 340 | 1410                       | 320 | 1280              | 295 |
|                             | 10                              | 1670              | 380 | 1580                       | 360 | 1430              | 325 |
|                             | 5                               | 2030              | 465 | 1910                       | 440 | 1720              | 395 |
|                             | 3                               | 2460              | 560 | 2310                       | 525 | 2070              | 470 |
| 30                          | 20                              | 1510              | 345 | 1430                       | 330 | 1310              | 300 |
|                             | 10                              | 1760              | 400 | 1660                       | 380 | 1500              | 345 |
|                             | 5                               | 2220              | 510 | 2090                       | 480 | 1880              | 430 |
|                             | 3                               | 2760              | 630 | 2590                       | 590 | 2310              | 530 |
| 0                           | 20                              | 1520              | 350 | 1440                       | 330 | 1310              | 300 |
|                             | 10                              | 1790              | 410 | 1680                       | 385 | 1520              | 350 |
|                             | 5                               | 2280              | 520 | 2150                       | 490 | 1930              | 440 |
|                             | 3                               | 2850              | 655 | 2680                       | 610 | 2390              | 545 |
| Pre-loads                   | 84%                             | 1180              | 275 | 1130                       | 260 | 1030              | 235 |
|                             | 75%                             | 1060              | 244 | 1010                       | 232 | 920               | 210 |
|                             | 60%                             | 845               | 195 | 810                        | 186 | 740               | 168 |
|                             | 30%                             | 425               | 98  | 405                        | 93  | 370               | 84  |

1. Current per conductor is obtained by dividing the tabulated phase current by the number of subconductors.
2. Pre-load is defined as the percentage of continuous post-fault rating.
3. With a pre-fault loading greater than 84% the overload rating is equal to the 100% post-fault rating.

Table D7: Circuit Thermal Overload Ratings for 132 kV, 1x400mm<sup>2</sup> Zebra ACSR

|                             |                                 |                         |     | Rated Temperature: 50 °C         |     |                         |     |
|-----------------------------|---------------------------------|-------------------------|-----|----------------------------------|-----|-------------------------|-----|
| ALL RATINGS ARE PER CIRCUIT |                                 | Winter<br>Amps      MVA |     | Spring / Autumn<br>Amps      MVA |     | Summer<br>Amps      MVA |     |
| Pre-Fault Continuous        |                                 | 840                     | 193 | 780                              | 178 | 670                     | 154 |
| Post-Fault Continuous       |                                 | 1000                    | 229 | 925                              | 212 | 800                     | 183 |
| Overloads                   |                                 |                         |     |                                  |     |                         |     |
| Pre-Load %<br>(Footnote 2)  | Overload<br>Duration<br>Minutes |                         |     |                                  |     |                         |     |
| 84<br>(Footnote 3)          | 20                              | 1060                    | 243 | 980                              | 224 | 835                     | 191 |
|                             | 10                              | 1170                    | 270 | 1080                             | 247 | 915                     | 210 |
|                             | 5                               | 1380                    | 315 | 1260                             | 290 | 1070                    | 244 |
|                             | 3                               | 1620                    | 370 | 1480                             | 340 | 1250                    | 285 |
| 75                          | 20                              | 1090                    | 249 | 1000                             | 229 | 855                     | 195 |
|                             | 10                              | 1240                    | 285 | 1130                             | 260 | 960                     | 220 |
|                             | 5                               | 1500                    | 345 | 1380                             | 315 | 1160                    | 265 |
|                             | 3                               | 1800                    | 415 | 1650                             | 375 | 1390                    | 315 |
| 60                          | 20                              | 1120                    | 255 | 1030                             | 236 | 875                     | 200 |
|                             | 10                              | 1320                    | 300 | 1210                             | 275 | 1020                    | 234 |
|                             | 5                               | 1660                    | 380 | 1520                             | 350 | 1280                    | 295 |
|                             | 3                               | 2050                    | 470 | 1870                             | 425 | 1560                    | 360 |
| 30                          | 20                              | 1160                    | 265 | 1070                             | 244 | 910                     | 208 |
|                             | 10                              | 1420                    | 325 | 1300                             | 295 | 1100                    | 250 |
|                             | 5                               | 1860                    | 425 | 1700                             | 390 | 1430                    | 325 |
|                             | 3                               | 2330                    | 535 | 2120                             | 485 | 1780                    | 405 |
| 0                           | 20                              | 1180                    | 270 | 1080                             | 247 | 920                     | 210 |
|                             | 10                              | 1450                    | 330 | 1330                             | 305 | 1130                    | 255 |
|                             | 5                               | 1920                    | 440 | 1750                             | 400 | 1470                    | 335 |
|                             | 3                               | 2420                    | 555 | 2210                             | 505 | 1850                    | 420 |
| Pre-loads                   | 84%                             | 840                     | 192 | 775                              | 178 | 670                     | 154 |
|                             | 75%                             | 750                     | 172 | 695                              | 159 | 600                     | 137 |
|                             | 60%                             | 600                     | 137 | 555                              | 127 | 480                     | 110 |
|                             | 30%                             | 300                     | 69  | 280                              | 64  | 240                     | 55  |

1. Current per conductor is obtained by dividing the tabulated phase current by the number of subconductors.
2. Pre-load is defined as the percentage of continuous post-fault rating.
3. With a pre-fault loading greater than 84% the overload rating is equal to the 100% post-fault rating.

Table D8: Circuit Thermal Overload Ratings for 132 kV, 1x400mm<sup>2</sup> Zebra ACSR

|                             |                                 |                         |     | Rated Temperature: 65 °C         |     |                         |     |
|-----------------------------|---------------------------------|-------------------------|-----|----------------------------------|-----|-------------------------|-----|
| ALL RATINGS ARE PER CIRCUIT |                                 | Winter<br>Amps      MVA |     | Spring / Autumn<br>Amps      MVA |     | Summer<br>Amps      MVA |     |
| Pre-Fault Continuous        |                                 | 965                     | 220 | 910                              | 208 | 815                     | 187 |
| Post-Fault Continuous       |                                 | 1150                    | 260 | 1080                             | 248 | 970                     | 222 |
| Overloads                   |                                 |                         |     |                                  |     |                         |     |
| Pre-Load %<br>(Footnote 2)  | Overload<br>Duration<br>Minutes |                         |     |                                  |     |                         |     |
| 84<br>(Footnote 3)          | 20                              | 1220                    | 280 | 1150                             | 260 | 1020                    | 234 |
|                             | 10                              | 1350                    | 310 | 1260                             | 290 | 1120                    | 255 |
|                             | 5                               | 1580                    | 360 | 1480                             | 340 | 1310                    | 300 |
|                             | 3                               | 1860                    | 425 | 1730                             | 395 | 1530                    | 350 |
| 75                          | 20                              | 1250                    | 285 | 1170                             | 270 | 1050                    | 239 |
|                             | 10                              | 1420                    | 325 | 1330                             | 305 | 1180                    | 270 |
|                             | 5                               | 1730                    | 395 | 1610                             | 370 | 1420                    | 325 |
|                             | 3                               | 2080                    | 475 | 1930                             | 440 | 1700                    | 390 |
| 60                          | 20                              | 1280                    | 295 | 1200                             | 275 | 1070                    | 245 |
|                             | 10                              | 1510                    | 345 | 1410                             | 325 | 1250                    | 285 |
|                             | 5                               | 1910                    | 435 | 1780                             | 405 | 1570                    | 360 |
|                             | 3                               | 2360                    | 540 | 2190                             | 500 | 1930                    | 440 |
| 30                          | 20                              | 1330                    | 305 | 1250                             | 285 | 1110                    | 255 |
|                             | 10                              | 1630                    | 375 | 1520                             | 350 | 1350                    | 310 |
|                             | 5                               | 2140                    | 490 | 1990                             | 455 | 1750                    | 400 |
|                             | 3                               | 2690                    | 615 | 2500                             | 570 | 2190                    | 500 |
| 0                           | 20                              | 1350                    | 310 | 1260                             | 290 | 1120                    | 255 |
|                             | 10                              | 1670                    | 380 | 1560                             | 355 | 1380                    | 315 |
|                             | 5                               | 2210                    | 505 | 2060                             | 470 | 1810                    | 415 |
|                             | 3                               | 2800                    | 640 | 2600                             | 595 | 2280                    | 520 |
| Pre-loads                   | 84%                             | 965                     | 218 | 905                              | 208 | 815                     | 186 |
|                             | 75%                             | 860                     | 195 | 810                              | 186 | 730                     | 166 |
|                             | 60%                             | 690                     | 156 | 650                              | 149 | 580                     | 133 |
|                             | 30%                             | 345                     | 78  | 325                              | 74  | 290                     | 67  |

1. Current per conductor is obtained by dividing the tabulated phase current by the number of subconductors.
2. Pre-load is defined as the percentage of continuous post-fault rating.
3. With a pre-fault loading greater than 84% the overload rating is equal to the 100% post-fault rating.

Table D9: Circuit Thermal Overload Ratings for 132 kV, 1x400mm<sup>2</sup> Zebra ACSR

|                             |                                 |                   |     | Rated Temperature: 75 °C   |     |                   |     |
|-----------------------------|---------------------------------|-------------------|-----|----------------------------|-----|-------------------|-----|
| ALL RATINGS ARE PER CIRCUIT |                                 | Winter<br>AmpsMVA |     | Spring / Autumn<br>AmpsMVA |     | Summer<br>AmpsMVA |     |
| Pre-Fault Continuous        |                                 | 1040              | 237 | 985                        | 226 | 905               | 206 |
| Post-Fault Continuous       |                                 | 1230              | 280 | 1170                       | 270 | 1070              | 246 |
| Overloads                   |                                 |                   |     |                            |     |                   |     |
| Pre-Load %<br>(Footnote 2)  | Overload<br>Duration<br>Minutes |                   |     |                            |     |                   |     |
| 84<br>(Footnote 3)          | 20                              | 1310              | 300 | 1240                       | 285 | 1130              | 260 |
|                             | 10                              | 1450              | 330 | 1370                       | 315 | 1240              | 285 |
|                             | 5                               | 1710              | 390 | 1610                       | 370 | 1450              | 330 |
|                             | 3                               | 2000              | 460 | 1890                       | 430 | 1690              | 385 |
| 75                          | 20                              | 1340              | 305 | 1270                       | 290 | 1160              | 265 |
|                             | 10                              | 1530              | 350 | 1440                       | 330 | 1310              | 300 |
|                             | 5                               | 1860              | 425 | 1750                       | 400 | 1580              | 360 |
|                             | 3                               | 2240              | 515 | 2110                       | 480 | 1890              | 430 |
| 60                          | 20                              | 1380              | 315 | 1310                       | 300 | 1190              | 270 |
|                             | 10                              | 1630              | 370 | 1540                       | 350 | 1390              | 315 |
|                             | 5                               | 2060              | 470 | 1940                       | 445 | 1740              | 400 |
|                             | 3                               | 2550              | 585 | 2390                       | 545 | 2140              | 490 |
| 30                          | 20                              | 1430              | 330 | 1360                       | 310 | 1230              | 280 |
|                             | 10                              | 1760              | 400 | 1660                       | 380 | 1490              | 340 |
|                             | 5                               | 2310              | 530 | 2170                       | 495 | 1940              | 445 |
|                             | 3                               | 2910              | 665 | 2730                       | 625 | 2440              | 555 |
| 0                           | 20                              | 1450              | 330 | 1370                       | 315 | 1240              | 285 |
|                             | 10                              | 1800              | 410 | 1690                       | 385 | 1520              | 350 |
|                             | 5                               | 2380              | 545 | 2240                       | 510 | 2010              | 460 |
|                             | 3                               | 3030              | 695 | 2840                       | 650 | 2530              | 580 |
| Pre-loads                   | 84%                             | 1030              | 235 | 985                        | 227 | 900               | 207 |
|                             | 75%                             | 920               | 210 | 880                        | 202 | 800               | 184 |
|                             | 60%                             | 740               | 168 | 700                        | 162 | 640               | 148 |
|                             | 30%                             | 370               | 84  | 350                        | 81  | 320               | 74  |

1. Current per conductor is obtained by dividing the tabulated phase current by the number of subconductors.
2. Pre-load is defined as the percentage of continuous post-fault rating.
3. With a pre-fault loading greater than 84% the overload rating is equal to the 100% post-fault rating.

Table D10: Circuit Thermal Overload Ratings for 275 kV, 2x175mm<sup>2</sup> Lynx ACSR

|                             |                                 |                   |      | Rated Temperature: 50 °C   |     |                   |     |
|-----------------------------|---------------------------------|-------------------|------|----------------------------|-----|-------------------|-----|
| ALL RATINGS ARE PER CIRCUIT |                                 | Winter<br>AmpsMVA |      | Spring / Autumn<br>AmpsMVA |     | Summer<br>AmpsMVA |     |
| Pre-Fault Continuous        |                                 | 970               | 465  | 905                        | 430 | 780               | 370 |
| Post-Fault Continuous       |                                 | 1160              | 550  | 1080                       | 515 | 930               | 445 |
| Overloads                   |                                 |                   |      |                            |     |                   |     |
| Pre-Load %<br>(Footnote 2)  | Overload<br>Duration<br>Minutes |                   |      |                            |     |                   |     |
| 84<br>(Footnote 3)          | 20                              | 1180              | 565  | 1090                       | 520 | 940               | 450 |
|                             | 10                              | 1260              | 600  | 1160                       | 550 | 985               | 470 |
|                             | 5                               | 1420              | 680  | 1310                       | 620 | 1110              | 525 |
|                             | 3                               | 1620              | 770  | 1480                       | 705 | 1250              | 595 |
| 75                          | 20                              | 1190              | 570  | 1110                       | 525 | 950               | 455 |
|                             | 10                              | 1300              | 620  | 1200                       | 570 | 1020              | 485 |
|                             | 5                               | 1520              | 720  | 1390                       | 660 | 1170              | 560 |
|                             | 3                               | 1770              | 845  | 1620                       | 775 | 1370              | 650 |
| 60                          | 20                              | 1210              | 575  | 1120                       | 535 | 960               | 460 |
|                             | 10                              | 1350              | 645  | 1240                       | 590 | 1060              | 505 |
|                             | 5                               | 1640              | 780  | 1500                       | 715 | 1270              | 605 |
|                             | 3                               | 1970              | 940  | 1800                       | 855 | 1510              | 720 |
| 30                          | 20                              | 1230              | 585  | 1140                       | 545 | 975               | 465 |
|                             | 10                              | 1420              | 680  | 1310                       | 625 | 1110              | 530 |
|                             | 5                               | 1790              | 855  | 1640                       | 780 | 1380              | 660 |
|                             | 3                               | 2210              | 1050 | 2010                       | 960 | 1690              | 805 |
| 0                           | 20                              | 1240              | 590  | 1150                       | 545 | 980               | 470 |
|                             | 10                              | 1450              | 690  | 1330                       | 635 | 1130              | 540 |
|                             | 5                               | 1840              | 875  | 1680                       | 800 | 1420              | 675 |
|                             | 3                               | 2280              | 1090 | 2080                       | 990 | 1750              | 830 |
| Pre-loads                   | 84%                             | 975               | 460  | 905                        | 435 | 780               | 375 |
|                             | 75%                             | 870               | 410  | 810                        | 385 | 700               | 335 |
|                             | 60%                             | 695               | 330  | 650                        | 310 | 560               | 265 |
|                             | 30%                             | 350               | 165  | 325                        | 154 | 280               | 134 |

1. Current per conductor is obtained by dividing the tabulated phase current by the number of subconductors.
2. Pre-load is defined as the percentage of continuous post-fault rating.
3. With a pre-fault loading greater than 84% the overload rating is equal to the 100% post-fault rating.

Table D11: Circuit Thermal Overload Ratings for 275 kV, 2x175mm<sup>2</sup> Lynx ACSR

|                             |                                 |                   |      | Rated Temperature: 65 °C   |      |                   |      |
|-----------------------------|---------------------------------|-------------------|------|----------------------------|------|-------------------|------|
| ALL RATINGS ARE PER CIRCUIT |                                 | Winter<br>AmpsMVA |      | Spring / Autumn<br>AmpsMVA |      | Summer<br>AmpsMVA |      |
| Pre-Fault Continuous        |                                 | 1110              | 525  | 1040                       | 495  | 945               | 450  |
| Post-Fault Continuous       |                                 | 1320              | 625  | 1240                       | 590  | 1120              | 535  |
| Overloads                   |                                 |                   |      |                            |      |                   |      |
| Pre-Load %<br>(Footnote 2)  | Overload<br>Duration<br>Minutes |                   |      |                            |      |                   |      |
| 84<br>(Footnote 3)          | 20                              | 1350              | 645  | 1270                       | 605  | 1140              | 545  |
|                             | 10                              | 1440              | 685  | 1350                       | 645  | 1210              | 575  |
|                             | 5                               | 1630              | 775  | 1530                       | 730  | 1360              | 645  |
|                             | 3                               | 1860              | 885  | 1740                       | 830  | 1540              | 735  |
| 75                          | 20                              | 1360              | 650  | 1280                       | 610  | 1150              | 550  |
|                             | 10                              | 1490              | 710  | 1400                       | 665  | 1240              | 590  |
|                             | 5                               | 1740              | 830  | 1630                       | 775  | 1440              | 685  |
|                             | 3                               | 2040              | 975  | 1900                       | 905  | 1680              | 800  |
| 60                          | 20                              | 1380              | 660  | 1300                       | 620  | 1170              | 555  |
|                             | 10                              | 1550              | 740  | 1450                       | 695  | 1290              | 615  |
|                             | 5                               | 1880              | 900  | 1760                       | 840  | 1550              | 740  |
|                             | 3                               | 2270              | 1080 | 2120                       | 1010 | 1860              | 885  |
| 30                          | 20                              | 1410              | 670  | 1320                       | 630  | 1190              | 565  |
|                             | 10                              | 1630              | 775  | 1530                       | 725  | 1360              | 645  |
|                             | 5                               | 2060              | 980  | 1920                       | 915  | 1690              | 805  |
|                             | 3                               | 2550              | 1220 | 2370                       | 1130 | 2080              | 990  |
| 0                           | 20                              | 1410              | 675  | 1330                       | 635  | 1190              | 570  |
|                             | 10                              | 1660              | 790  | 1550                       | 740  | 1380              | 655  |
|                             | 5                               | 2120              | 1010 | 1970                       | 940  | 1740              | 830  |
|                             | 3                               | 2640              | 1260 | 2450                       | 1170 | 2150              | 1030 |
| Pre-loads                   | 84%                             | 1110              | 525  | 1040                       | 495  | 940               | 450  |
|                             | 75%                             | 990               | 470  | 930                        | 440  | 840               | 400  |
|                             | 60%                             | 790               | 375  | 745                        | 355  | 670               | 320  |
|                             | 30%                             | 395               | 188  | 370                        | 177  | 335               | 160  |

1. Current per conductor is obtained by dividing the tabulated phase current by the number of subconductors.
2. Pre-load is defined as the percentage of continuous post-fault rating.
3. With a pre-fault loading greater than 84% the overload rating is equal to the 100% post-fault rating.

Table D12: Circuit Thermal Overload Ratings for 275 kV, 2x175mm<sup>2</sup> Lynx ACSR

|                             |                                 |                   |      | Rated Temperature: 75 °C   |      |                   |      |
|-----------------------------|---------------------------------|-------------------|------|----------------------------|------|-------------------|------|
| ALL RATINGS ARE PER CIRCUIT |                                 | Winter<br>AmpsMVA |      | Spring / Autumn<br>AmpsMVA |      | Summer<br>AmpsMVA |      |
| Pre-Fault Continuous        |                                 | 1190              | 565  | 1130                       | 540  | 1040              | 495  |
| Post-Fault Continuous       |                                 | 1410              | 675  | 1350                       | 640  | 1230              | 590  |
| Overloads                   |                                 |                   |      |                            |      |                   |      |
| Pre-Load %<br>(Footnote 2)  | Overload<br>Duration<br>Minutes |                   |      |                            |      |                   |      |
| 84<br>(Footnote 3)          | 20                              | 1450              | 690  | 1380                       | 655  | 1260              | 600  |
|                             | 10                              | 1550              | 740  | 1470                       | 700  | 1340              | 635  |
|                             | 5                               | 1760              | 835  | 1660                       | 790  | 1500              | 715  |
|                             | 3                               | 2010              | 955  | 1890                       | 900  | 1700              | 810  |
| 75                          | 20                              | 1470              | 700  | 1390                       | 665  | 1270              | 605  |
|                             | 10                              | 1600              | 765  | 1520                       | 720  | 1380              | 655  |
|                             | 5                               | 1880              | 895  | 1770                       | 845  | 1600              | 760  |
|                             | 3                               | 2200              | 1050 | 2070                       | 985  | 1860              | 885  |
| 60                          | 20                              | 1490              | 710  | 1410                       | 670  | 1280              | 610  |
|                             | 10                              | 1670              | 795  | 1580                       | 750  | 1430              | 680  |
|                             | 5                               | 2030              | 970  | 1910                       | 910  | 1720              | 820  |
|                             | 3                               | 2460              | 1170 | 2310                       | 1100 | 2070              | 985  |
| 30                          | 20                              | 1510              | 720  | 1430                       | 685  | 1310              | 620  |
|                             | 10                              | 1760              | 835  | 1660                       | 790  | 1500              | 715  |
|                             | 5                               | 2220              | 1060 | 2090                       | 995  | 1880              | 895  |
|                             | 3                               | 2760              | 1310 | 2590                       | 1230 | 2310              | 1100 |
| 0                           | 20                              | 1520              | 725  | 1440                       | 685  | 1310              | 625  |
|                             | 10                              | 1790              | 850  | 1680                       | 800  | 1520              | 725  |
|                             | 5                               | 2280              | 1090 | 2150                       | 1020 | 1930              | 920  |
|                             | 3                               | 2850              | 1360 | 2680                       | 1270 | 2390              | 1140 |
| Pre-loads                   | 84%                             | 1180              | 565  | 1130                       | 540  | 1030              | 495  |
|                             | 75%                             | 1060              | 505  | 1010                       | 480  | 920               | 440  |
|                             | 60%                             | 845               | 405  | 810                        | 385  | 740               | 355  |
|                             | 30%                             | 425               | 202  | 405                        | 192  | 370               | 177  |

1. Current per conductor is obtained by dividing the tabulated phase current by the number of subconductors.
2. Pre-load is defined as the percentage of continuous post-fault rating.
3. With a pre-fault loading greater than 84% the overload rating is equal to the 100% post-fault rating.

Table D13: Circuit Thermal Overload Ratings for 275 kV, 2x400mm<sup>2</sup> Zebra ACSR

|                             |                                 |                   |      | Rated Temperature: 50 °C   |      |                   |      |
|-----------------------------|---------------------------------|-------------------|------|----------------------------|------|-------------------|------|
| ALL RATINGS ARE PER CIRCUIT |                                 | Winter<br>AmpsMVA |      | Spring / Autumn<br>AmpsMVA |      | Summer<br>AmpsMVA |      |
| Pre-Fault Continuous        |                                 | 1680              | 805  | 1560                       | 740  | 1340              | 640  |
| Post-Fault Continuous       |                                 | 2010              | 955  | 1850                       | 885  | 1600              | 760  |
| Overloads                   |                                 |                   |      |                            |      |                   |      |
| Pre-Load %<br>(Footnote 2)  | Overload<br>Duration<br>Minutes |                   |      |                            |      |                   |      |
| 84<br>(Footnote 3)          | 20                              | 2130              | 1010 | 1960                       | 935  | 1670              | 795  |
|                             | 10                              | 2350              | 1120 | 2160                       | 1030 | 1830              | 875  |
|                             | 5                               | 2760              | 1310 | 2530                       | 1200 | 2140              | 1020 |
|                             | 3                               | 3230              | 1540 | 2950                       | 1410 | 2490              | 1190 |
| 75                          | 20                              | 2180              | 1040 | 2000                       | 955  | 1710              | 810  |
|                             | 10                              | 2470              | 1180 | 2270                       | 1080 | 1920              | 915  |
|                             | 5                               | 3000              | 1430 | 2750                       | 1310 | 2320              | 1110 |
|                             | 3                               | 3610              | 1720 | 3300                       | 1570 | 2770              | 1320 |
| 60                          | 20                              | 2240              | 1070 | 2060                       | 980  | 1750              | 835  |
|                             | 10                              | 2640              | 1260 | 2420                       | 1150 | 2040              | 975  |
|                             | 5                               | 3330              | 1580 | 3040                       | 1450 | 2560              | 1220 |
|                             | 3                               | 4090              | 1950 | 3730                       | 1780 | 3130              | 1490 |
| 30                          | 20                              | 2320              | 1110 | 2140                       | 1020 | 1820              | 865  |
|                             | 10                              | 2840              | 1350 | 2600                       | 1240 | 2200              | 1050 |
|                             | 5                               | 3710              | 1770 | 3390                       | 1620 | 2850              | 1360 |
|                             | 3                               | 4670              | 2220 | 4250                       | 2020 | 3560              | 1690 |
| 0                           | 20                              | 2350              | 1120 | 2160                       | 1030 | 1840              | 875  |
|                             | 10                              | 2910              | 1380 | 2660                       | 1270 | 2250              | 1070 |
|                             | 5                               | 3840              | 1830 | 3500                       | 1670 | 2940              | 1400 |
|                             | 3                               | 4840              | 2310 | 4410                       | 2100 | 3690              | 1760 |
| Pre-loads                   | 84%                             | 1690              | 800  | 1550                       | 745  | 1340              | 640  |
|                             | 75%                             | 1510              | 715  | 1390                       | 665  | 1200              | 570  |
|                             | 60%                             | 1210              | 575  | 1110                       | 530  | 960               | 455  |
|                             | 30%                             | 605               | 285  | 555                        | 265  | 480               | 228  |

1. Current per conductor is obtained by dividing the tabulated phase current by the number of subconductors.
2. Pre-load is defined as the percentage of continuous post-fault rating.
3. With a pre-fault loading greater than 84% the overload rating is equal to the 100% post-fault rating.

Table D14: Circuit Thermal Overload Ratings for 275 kV, 2x400mm<sup>2</sup> Zebra ACSR

|                             |                                 |                   |      | Rated Temperature: 65 °C   |      |                   |      |
|-----------------------------|---------------------------------|-------------------|------|----------------------------|------|-------------------|------|
| ALL RATINGS ARE PER CIRCUIT |                                 | Winter<br>AmpsMVA |      | Spring / Autumn<br>AmpsMVA |      | Summer<br>AmpsMVA |      |
| Pre-Fault Continuous        |                                 | 1930              | 920  | 1820                       | 865  | 1630              | 780  |
| Post-Fault Continuous       |                                 | 2300              | 1090 | 2170                       | 1030 | 1940              | 925  |
| Overloads                   |                                 |                   |      |                            |      |                   |      |
| Pre-Load %<br>(Footnote 2)  | Overload<br>Duration<br>Minutes |                   |      |                            |      |                   |      |
| 84<br>(Footnote 3)          | 20                              | 2440              | 1160 | 2290                       | 1090 | 2050              | 975  |
|                             | 10                              | 2690              | 1280 | 2530                       | 1200 | 2250              | 1070 |
|                             | 5                               | 3160              | 1510 | 2960                       | 1410 | 2620              | 1250 |
|                             | 3                               | 3720              | 1770 | 3460                       | 1650 | 3060              | 1460 |
| 75                          | 20                              | 2490              | 1190 | 2340                       | 1120 | 2090              | 995  |
|                             | 10                              | 2830              | 1350 | 2660                       | 1260 | 2360              | 1120 |
|                             | 5                               | 3450              | 1640 | 3220                       | 1530 | 2850              | 1360 |
|                             | 3                               | 4150              | 1980 | 3870                       | 1840 | 3410              | 1620 |
| 60                          | 20                              | 2570              | 1220 | 2410                       | 1150 | 2150              | 1020 |
|                             | 10                              | 3020              | 1440 | 2830                       | 1350 | 2510              | 1190 |
|                             | 5                               | 3820              | 1820 | 3560                       | 1700 | 3140              | 1500 |
|                             | 3                               | 4710              | 2250 | 4380                       | 2090 | 3850              | 1830 |
| 30                          | 20                              | 2660              | 1270 | 2500                       | 1190 | 2220              | 1060 |
|                             | 10                              | 3260              | 1550 | 3050                       | 1450 | 2690              | 1280 |
|                             | 5                               | 4270              | 2040 | 3980                       | 1900 | 3500              | 1670 |
|                             | 3                               | 5390              | 2570 | 5000                       | 2380 | 4390              | 2090 |
| 0                           | 20                              | 2690              | 1280 | 2530                       | 1200 | 2250              | 1070 |
|                             | 10                              | 3340              | 1590 | 3120                       | 1480 | 2750              | 1310 |
|                             | 5                               | 4420              | 2100 | 4110                       | 1960 | 3620              | 1720 |
|                             | 3                               | 5600              | 2670 | 5200                       | 2480 | 4550              | 2170 |
| Pre-loads                   | 84%                             | 1930              | 915  | 1820                       | 865  | 1630              | 775  |
|                             | 75%                             | 1720              | 820  | 1630                       | 770  | 1460              | 695  |
|                             | 60%                             | 1380              | 655  | 1300                       | 620  | 1160              | 555  |
|                             | 30%                             | 690               | 325  | 650                        | 310  | 580               | 280  |

1. Current per conductor is obtained by dividing the tabulated phase current by the number of subconductors.
2. Pre-load is defined as the percentage of continuous post-fault rating.
3. With a pre-fault loading greater than 84% the overload rating is equal to the 100% post-fault rating.

Table D15: Circuit Thermal Overload Ratings for 275 kV, 2x400mm<sup>2</sup> Zebra ACSR

|                             |                                 |                   |      | Rated Temperature: 75 °C   |      |                   |      |
|-----------------------------|---------------------------------|-------------------|------|----------------------------|------|-------------------|------|
| ALL RATINGS ARE PER CIRCUIT |                                 | Winter<br>AmpsMVA |      | Spring / Autumn<br>AmpsMVA |      | Summer<br>AmpsMVA |      |
| Pre-Fault Continuous        |                                 | 2070              | 990  | 1970                       | 940  | 1810              | 860  |
| Post-Fault Continuous       |                                 | 2470              | 1180 | 2350                       | 1120 | 2150              | 1020 |
| Overloads                   |                                 |                   |      |                            |      |                   |      |
| Pre-Load %<br>(Footnote 2)  | Overload<br>Duration<br>Minutes |                   |      |                            |      |                   |      |
| 84<br>(Footnote 3)          | 20                              | 2620              | 1250 | 2490                       | 1190 | 2270              | 1080 |
|                             | 10                              | 2900              | 1380 | 2740                       | 1310 | 2490              | 1180 |
|                             | 5                               | 3410              | 1620 | 3220                       | 1530 | 2900              | 1380 |
|                             | 3                               | 4010              | 1910 | 3770                       | 1800 | 3390              | 1610 |
| 75                          | 20                              | 2680              | 1280 | 2540                       | 1210 | 2310              | 1100 |
|                             | 10                              | 3050              | 1450 | 2880                       | 1370 | 2610              | 1240 |
|                             | 5                               | 3720              | 1770 | 3500                       | 1670 | 3150              | 1500 |
|                             | 3                               | 4490              | 2140 | 4210                       | 2010 | 3780              | 1800 |
| 60                          | 20                              | 2760              | 1320 | 2620                       | 1250 | 2380              | 1130 |
|                             | 10                              | 3260              | 1550 | 3070                       | 1460 | 2780              | 1320 |
|                             | 5                               | 4130              | 1970 | 3880                       | 1850 | 3480              | 1660 |
|                             | 3                               | 5100              | 2430 | 4780                       | 2280 | 4270              | 2040 |
| 30                          | 20                              | 2870              | 1370 | 2710                       | 1290 | 2460              | 1170 |
|                             | 10                              | 3510              | 1670 | 3310                       | 1580 | 2980              | 1420 |
|                             | 5                               | 4620              | 2200 | 4330                       | 2060 | 3880              | 1850 |
|                             | 3                               | 5830              | 2780 | 5460                       | 2600 | 4870              | 2320 |
| 0                           | 20                              | 2900              | 1380 | 2740                       | 1310 | 2480              | 1180 |
|                             | 10                              | 3600              | 1710 | 3390                       | 1610 | 3050              | 1450 |
|                             | 5                               | 4770              | 2270 | 4480                       | 2130 | 4010              | 1910 |
|                             | 3                               | 6060              | 2890 | 5670                       | 2700 | 5060              | 2410 |
| Pre-loads                   | 84%                             | 2070              | 990  | 1970                       | 940  | 1810              | 855  |
|                             | 75%                             | 1850              | 885  | 1760                       | 840  | 1610              | 765  |
|                             | 60%                             | 1480              | 710  | 1410                       | 670  | 1290              | 610  |
|                             | 30%                             | 740               | 355  | 705                        | 335  | 645               | 305  |

1. Current per conductor is obtained by dividing the tabulated phase current by the number of subconductors.
2. Pre-load is defined as the percentage of continuous post-fault rating.
3. With a pre-fault loading greater than 84% the overload rating is equal to the 100% post-fault rating.

Table D16: Circuit Thermal Overload Ratings for 275 kV, 4x400mm<sup>2</sup> Zebra ACSR

| Rated Temperature: 50 °C    |                              |        |      |                 |      |        |      |
|-----------------------------|------------------------------|--------|------|-----------------|------|--------|------|
| ALL RATINGS ARE PER CIRCUIT |                              | Winter |      | Spring / Autumn |      | Summer |      |
|                             |                              | Amps   | MVA  | Amps            | MVA  | Amps   | MVA  |
| Pre-Fault Continuous        |                              | 3370   | 1610 | 3110            | 1480 | 2690   | 1280 |
| Post-Fault Continuous       |                              | 4010   | 1910 | 3710            | 1770 | 3200   | 1520 |
| Overloads                   |                              |        |      |                 |      |        |      |
| Pre-Load %<br>(Footnote 2)  | Overload Duration<br>Minutes |        |      |                 |      |        |      |
| 84<br>(Footnote 3)          | 20                           | 4260   | 2030 | 3920            | 1870 | 3340   | 1590 |
|                             | 10                           | 4700   | 2240 | 4320            | 2060 | 3670   | 1750 |
|                             | 5                            | 5510   | 2630 | 5050            | 2410 | 4270   | 2040 |
|                             | 3                            | 6460   | 3080 | 5910            | 2810 | 4980   | 2370 |
| 75                          | 20                           | 4350   | 2070 | 4010            | 1910 | 3410   | 1620 |
|                             | 10                           | 4940   | 2350 | 4540            | 2160 | 3850   | 1830 |
|                             | 5                            | 6010   | 2860 | 5500            | 2620 | 4640   | 2210 |
|                             | 3                            | 7220   | 3440 | 6590            | 3140 | 5540   | 2640 |
| 60                          | 20                           | 4480   | 2130 | 4120            | 1960 | 3510   | 1670 |
|                             | 10                           | 5270   | 2510 | 4830            | 2300 | 4090   | 1950 |
|                             | 5                            | 6650   | 3170 | 6080            | 2900 | 5120   | 2440 |
|                             | 3                            | 8180   | 3900 | 7460            | 3550 | 6260   | 2980 |
| 30                          | 20                           | 4650   | 2210 | 4270            | 2030 | 3640   | 1730 |
|                             | 10                           | 5680   | 2710 | 5200            | 2480 | 4400   | 2090 |
|                             | 5                            | 7430   | 3540 | 6780            | 3230 | 5700   | 2720 |
|                             | 3                            | 9330   | 4440 | 8500            | 4050 | 7120   | 3390 |
| 0                           | 20                           | 4700   | 2240 | 4320            | 2060 | 3680   | 1750 |
|                             | 10                           | 5810   | 2770 | 5320            | 2530 | 4500   | 2140 |
|                             | 5                            | 7670   | 3650 | 7000            | 3340 | 5890   | 2810 |
|                             | 3                            | 9690   | 4610 | 8820            | 4200 | 7390   | 3520 |
| Pre-loads                   |                              |        |      |                 |      |        |      |
|                             | 84%                          | 3370   | 1600 | 3120            | 1490 | 2690   | 1280 |
|                             | 75%                          | 3010   | 1430 | 2780            | 1330 | 2400   | 1140 |
|                             | 60%                          | 2410   | 1150 | 2230            | 1060 | 1920   | 910  |
|                             | 30%                          | 1200   | 575  | 1110            | 530  | 960    | 455  |

1. Current per conductor is obtained by dividing the tabulated phase current by the number of subconductors.
2. Pre-load is defined as the percentage of continuous post-fault rating.
3. With a pre-fault loading greater than 84% the overload rating is equal to the 100% post-fault rating.

Table D17: Circuit Thermal Overload Ratings for 275 kV, 4x400mm<sup>2</sup> Zebra ACSR

| Rated Temperature: 65 °C    |                              |        |      |                 |      |        |      |
|-----------------------------|------------------------------|--------|------|-----------------|------|--------|------|
| ALL RATINGS ARE PER CIRCUIT |                              | Winter |      | Spring / Autumn |      | Summer |      |
|                             |                              | Amps   | MVA  | Amps            | MVA  | Amps   | MVA  |
| Pre-Fault Continuous        |                              | 3860   | 1840 | 3640            | 1730 | 3270   | 1560 |
| Post-Fault Continuous       |                              | 4590   | 2190 | 4330            | 2060 | 3890   | 1850 |
| Overloads                   |                              |        |      |                 |      |        |      |
| Pre-Load %<br>(Footnote 2)  | Overload Duration<br>Minutes |        |      |                 |      |        |      |
| 84<br>(Footnote 3)          | 20                           | 4880   | 2320 | 4590            | 2190 | 4100   | 1950 |
|                             | 10                           | 5380   | 2560 | 5050            | 2410 | 4500   | 2140 |
|                             | 5                            | 6330   | 3010 | 5920            | 2820 | 5240   | 2500 |
|                             | 3                            | 7430   | 3540 | 6930            | 3300 | 6120   | 2910 |
| 75                          | 20                           | 4980   | 2370 | 4680            | 2230 | 4180   | 1990 |
|                             | 10                           | 5670   | 2700 | 5310            | 2530 | 4720   | 2250 |
|                             | 5                            | 6900   | 3290 | 6440            | 3070 | 5700   | 2710 |
|                             | 3                            | 8310   | 3960 | 7740            | 3690 | 6810   | 3250 |
| 60                          | 20                           | 5130   | 2450 | 4820            | 2300 | 4290   | 2050 |
|                             | 10                           | 6050   | 2880 | 5660            | 2690 | 5020   | 2390 |
|                             | 5                            | 7650   | 3640 | 7130            | 3400 | 6290   | 3000 |
|                             | 3                            | 9430   | 4490 | 8770            | 4180 | 7700   | 3670 |
| 30                          | 20                           | 5330   | 2540 | 4990            | 2380 | 4440   | 2120 |
|                             | 10                           | 6520   | 3110 | 6090            | 2900 | 5390   | 2570 |
|                             | 5                            | 8550   | 4070 | 7960            | 3790 | 7010   | 3340 |
|                             | 3                            | 10770  | 5130 | 10010           | 4770 | 8770   | 4180 |
| 0                           | 20                           | 5390   | 2570 | 5050            | 2410 | 4490   | 2140 |
|                             | 10                           | 6670   | 3180 | 6230            | 2970 | 5510   | 2620 |
|                             | 5                            | 8830   | 4210 | 8220            | 3920 | 7230   | 3450 |
|                             | 3                            | 11190  | 5330 | 10390           | 4950 | 9110   | 4340 |
| Pre-loads                   |                              |        |      |                 |      |        |      |
|                             | 84%                          | 3860   | 1840 | 3640            | 1730 | 3270   | 1550 |
|                             | 75%                          | 3440   | 1640 | 3250            | 1540 | 2920   | 1390 |
|                             | 60%                          | 2750   | 1310 | 2600            | 1240 | 2330   | 1110 |
|                             | 30%                          | 1380   | 655  | 1300            | 620  | 1170   | 555  |

1. Current per conductor is obtained by dividing the tabulated phase current by the number of subconductors.
2. Pre-load is defined as the percentage of continuous post-fault rating.
3. With a pre-fault loading greater than 84% the overload rating is equal to the 100% post-fault rating.

Table D18: Circuit Thermal Overload Ratings for 275 kV, 4x400mm<sup>2</sup> Zebra ACSR

| Rated Temperature: 75 °C    |                              |        |      |                 |      |        |      |
|-----------------------------|------------------------------|--------|------|-----------------|------|--------|------|
| ALL RATINGS ARE PER CIRCUIT |                              | Winter |      | Spring / Autumn |      | Summer |      |
|                             |                              | Amps   | MVA  | Amps            | MVA  | Amps   | MVA  |
| Pre-Fault Continuous        |                              | 4150   | 1980 | 3950            | 1880 | 3610   | 1720 |
| Post-Fault Continuous       |                              | 4940   | 2350 | 4700            | 2240 | 4300   | 2050 |
| Overloads                   |                              |        |      |                 |      |        |      |
| Pre-Load %<br>(Footnote 2)  | Overload Duration<br>Minutes |        |      |                 |      |        |      |
| 84<br>(Footnote 3)          | 20                           | 5250   | 2500 | 4980            | 2370 | 4530   | 2160 |
|                             | 10                           | 5800   | 2760 | 5490            | 2610 | 4980   | 2370 |
|                             | 5                            | 6820   | 3250 | 6430            | 3060 | 5810   | 2770 |
|                             | 3                            | 8020   | 3820 | 7540            | 3590 | 6780   | 3230 |
| 75                          | 20                           | 5360   | 2560 | 5090            | 2420 | 4630   | 2200 |
|                             | 10                           | 6100   | 2910 | 5770            | 2750 | 5220   | 2490 |
|                             | 5                            | 7440   | 3550 | 7010            | 3340 | 6310   | 3010 |
|                             | 3                            | 8970   | 4270 | 8430            | 4010 | 7550   | 3600 |
| 60                          | 20                           | 5530   | 2630 | 5230            | 2490 | 4750   | 2260 |
|                             | 10                           | 6520   | 3100 | 6150            | 2930 | 5550   | 2640 |
|                             | 5                            | 8250   | 3930 | 7760            | 3700 | 6970   | 3320 |
|                             | 3                            | 10190  | 4850 | 9560            | 4550 | 8550   | 4070 |
| 30                          | 20                           | 5730   | 2730 | 5420            | 2580 | 4910   | 2340 |
|                             | 10                           | 7030   | 3350 | 6620            | 3150 | 5970   | 2840 |
|                             | 5                            | 9230   | 4400 | 8670            | 4130 | 7770   | 3700 |
|                             | 3                            | 11660  | 5550 | 10920           | 5200 | 9750   | 4640 |
| 0                           | 20                           | 5800   | 2760 | 5490            | 2610 | 4970   | 2370 |
|                             | 10                           | 7190   | 3430 | 6770            | 3230 | 6100   | 2910 |
|                             | 5                            | 9540   | 4540 | 8960            | 4270 | 8020   | 3820 |
|                             | 3                            | 12120  | 5770 | 11350           | 5400 | 10120  | 4820 |
| Pre-loads                   |                              |        |      |                 |      |        |      |
|                             | 84%                          | 4150   | 1970 | 3950            | 1880 | 3610   | 1720 |
|                             | 75%                          | 3700   | 1760 | 3520            | 1680 | 3220   | 1540 |
|                             | 60%                          | 2960   | 1410 | 2820            | 1340 | 2580   | 1230 |
|                             | 30%                          | 1480   | 705  | 1410            | 670  | 1290   | 615  |

1. Current per conductor is obtained by dividing the tabulated phase current by the number of subconductors.
2. Pre-load is defined as the percentage of continuous post-fault rating.
3. With a pre-fault loading greater than 84% the overload rating is equal to the 100% post-fault rating.

Table D19: Circuit Thermal Overload Ratings for 400 kV, 2x400mm<sup>2</sup> Zebra ACSR

|                             |                                 |                   |      | Rated Temperature: 50 °C   |      |                   |      |
|-----------------------------|---------------------------------|-------------------|------|----------------------------|------|-------------------|------|
| ALL RATINGS ARE PER CIRCUIT |                                 | Winter<br>AmpsMVA |      | Spring / Autumn<br>AmpsMVA |      | Summer<br>AmpsMVA |      |
| Pre-Fault Continuous        |                                 | 1680              | 1170 | 1560                       | 1080 | 1340              | 930  |
| Post-Fault Continuous       |                                 | 2010              | 1390 | 1850                       | 1280 | 1600              | 1110 |
| Overloads                   |                                 |                   |      |                            |      |                   |      |
| Pre-Load %<br>(Footnote 2)  | Overload<br>Duration<br>Minutes |                   |      |                            |      |                   |      |
| 84<br>(Footnote 3)          | 20                              | 2130              | 1480 | 1960                       | 1360 | 1670              | 1160 |
|                             | 10                              | 2350              | 1630 | 2160                       | 1500 | 1830              | 1270 |
|                             | 5                               | 2760              | 1910 | 2530                       | 1750 | 2140              | 1480 |
|                             | 3                               | 3230              | 2240 | 2950                       | 2050 | 2490              | 1730 |
| 75                          | 20                              | 2180              | 1510 | 2000                       | 1390 | 1710              | 1180 |
|                             | 10                              | 2470              | 1710 | 2270                       | 1570 | 1920              | 1330 |
|                             | 5                               | 3000              | 2080 | 2750                       | 1910 | 2320              | 1610 |
|                             | 3                               | 3610              | 2500 | 3300                       | 2280 | 2770              | 1920 |
| 60                          | 20                              | 2240              | 1550 | 2060                       | 1430 | 1750              | 1220 |
|                             | 10                              | 2640              | 1830 | 2420                       | 1670 | 2040              | 1420 |
|                             | 5                               | 3330              | 2300 | 3040                       | 2110 | 2560              | 1770 |
|                             | 3                               | 4090              | 2830 | 3730                       | 2580 | 3130              | 2170 |
| 30                          | 20                              | 2320              | 1610 | 2140                       | 1480 | 1820              | 1260 |
|                             | 10                              | 2840              | 1970 | 2600                       | 1800 | 2200              | 1520 |
|                             | 5                               | 3710              | 2570 | 3390                       | 2350 | 2850              | 1970 |
|                             | 3                               | 4670              | 3230 | 4250                       | 2940 | 3560              | 2470 |
| 0                           | 20                              | 2350              | 1630 | 2160                       | 1500 | 1840              | 1270 |
|                             | 10                              | 2910              | 2010 | 2660                       | 1840 | 2250              | 1560 |
|                             | 5                               | 3840              | 2660 | 3500                       | 2430 | 2940              | 2040 |
|                             | 3                               | 4840              | 3360 | 4410                       | 3060 | 3690              | 2560 |
| Pre-loads                   | 84%                             | 1690              | 1170 | 1550                       | 1080 | 1340              | 930  |
|                             | 75%                             | 1510              | 1040 | 1390                       | 960  | 1200              | 830  |
|                             | 60%                             | 1210              | 835  | 1110                       | 770  | 960               | 665  |
|                             | 30%                             | 605               | 415  | 555                        | 385  | 480               | 335  |

1. Current per conductor is obtained by dividing the tabulated phase current by the number of subconductors.
2. Pre-load is defined as the percentage of continuous post-fault rating.
3. With a pre-fault loading greater than 84% the overload rating is equal to the 100% post-fault rating.