SLOVENSKI STANDARD

SIST EN 50341-1:2002/A1:2009

01-november-2009

Nadzemni elektriļ ni vodi za izmeniļ ne napetosti nad 45 kV - 1. del: Sploġne zahteve - Skupna doloļ ila

Overhead electrical lines exceeding AC 45 kV -- Part 1: General requirements - Common specifications

Freileitungen über AC 45 kV -- Teil 1: Allgemeine Anforderungen - Gemeinsame Festlegungen

Lignes électriques aériennes dépassant AC 45 kV -- Partie 1: Règles générales - Spécifications communes

Ta slovenski standard je istoveten z: EN 50341-1:2001/A1:2009

ICS:

29.240.20	Daljnovodi	Power transmission and distribution lines

SIST EN 50341-1:2002/A1:2009 en,fr,de

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 50341-1/A1

April 2009

ICS 29.240.20

English version

Overhead electrical lines exceeding AC 45 kV - Part 1: General requirements - Common specifications

Lignes électriques aériennes dépassant AC 45 kV - Partie 1: Règles générales - Spécifications communes

Freileitungen über AC 45 kV - Teil 1: Allgemeine Anforderungen - Gemeinsame Festlegungen

This amendment A1 modifies the European Standard EN 50341-1:2001; it was approved by CENELEC on 2009-04-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This amendment exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: avenue Marnix 17, B - 1000 Brussels

Ref. No. EN 50341-1:2001/A1:2009 E

Foreword

This amendment was prepared by the Technical Committee CENELEC TC 11, Overhead electrical lines exceeding 1 kV a.c. (1,5 kV d.c.).

The text of the draft was submitted to the formal vote and was approved by CENELEC as amendment A1 to EN 50341-1:2001 on 2009-04-01.

The following dates were fixed:

– latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2010-04-01
– latest date by which the national standards conflicting with the amendment have to be withdrawn	(dow)	2012-04-01

Introduction

Replace by:

Introduction

Detailed structure of the standard

The standard comprises two parts, numbered Part 1 and Part 3.

Part 1: General requirements - Common specifications

This part, also referred to as the Main Body, includes clauses common to all countries. These clauses have been prepared by Working Groups and approved by CLC/TC 11.

The Main Body is available in English, French and German.

Part 3: National Normative Aspects

The index lists the existing National Normative Aspects (NNAs) related to the different countries.

The National Normative Aspects (NNAs) reflect national practices. They generally include A-deviations, special national conditions and national complements.

A-deviations:

A-deviations are required by existing national laws or regulations, which cannot be altered at the time of preparation of the standard.

Reference is made to CENELEC Internal Regulations Part 2, definition 2.17.

Special national conditions (snc):

Special national conditions are national characteristics or practices that cannot be changed even over a long period, e.g. those due to climatic conditions, earth resistivity, etc.

Reference is made to CENELEC Internal Regulations, Part 2, definition 2.15.

National complements (NCPTs):

National complements reflect national practices, which are neither A-deviations, nor special national conditions. It has been agreed within CLC/TC 11 that NCPTs should be gradually adapted to the Main Body, aiming at the usual EN structure including only a Main Body, A-deviations and special national conditions.

Language:

The NNAs are published in English and in the national language(s) of the respective country.

All clauses

In the Main Body text there are many instances where the word “should” has been inadvertently used in place of “shall”. Until such time as a full revision to this European Standard is completed **replace** “should” **by** “shall” in all cases.

Replace the obsolete references to draft EN(V)s with those indicated in Table 1.

Table 1 – Main Body Specification – Update of references

Clause number	Old reference to EN(V)	New reference to EN	New title	Comment
Foreword	prEN 1993-7-1	-	-	No longer exists.
2.3	ENV 1991-1	1991-1-1	Part 1-1: General actions - Densities, self weight, imposed loads - for buildings	
2.3	ENV 1991-2-4	1991-1-4	Part 1-4: General actions - wind actions	
2.3	ENV 1992-1-3	No longer exists.		Integrated in ENV 1992-1-1.
2.3	ENV 1992-3	No longer exists.		Integrated in ENV 1992-1-1.
4.2.2.1.5	ENV 1991-2-4, Clause 8	1991-1-4, Subclause 4.3.2		Table 4.2.1.
4.2.2.4.3	ENV 1991-2-4, Clause B.2	1991-1-4		Formula for G_x is replaced by C_sC_d.
4.2.2.4.3	ENV 1991-2-4, Clause 10	1991-1-1		
4.2.2.4.4	ENV 1991-2-4, Clause 10	1991-1-1		
7.2.1	ENV 1993-1-1, Clause 3, Annexes B and D			Annex B does not deal with material and Annex D does not exist.
7.2.2	ENV 1993-1-3	1993-1-3		
7.2.4	ENV 1993-1-1, Annex C	This annex no longer exists.		

1 Scope

Replace NOTE 2 **by** the following:

NOTE 2 Design and construction of overhead lines with insulated conductors, where internal and external clearances can be smaller than specified in the standard, are not included. Other requirements of the standard may be applicable, and where necessary NNAs shall be consulted.

Add the following NOTE 4:

NOTE 4 The specific definition as to the meaning and extent of a "new overhead line" is to be identified by each NC within their own NNA. At the least, it shall mean a totally new line between two points, A and B.

2 Definitions, symbols and references

Add the following definitions:

2.1.107
composite insulator
insulator made of at least two insulating parts, namely a core and a housing, equipped with end fittings

NOTE Composite insulators, for example, can consist either of individual sheds mounted on the core, with or without an intermediate sheath, or alternatively, of a housing directly moulded or cast in one or several pieces onto the core.

2.1.108
anti-cascading tower
tension or suspension tower specially designed with higher strength to avoid cascade failures and installed at a nominated frequency of towers to limit damage and permit quick restoration of failed towers and conductor(s)

3 Basis of design

3.2.2 Reliability of overhead lines

Add the following paragraphs at the end of the existing clause as an informative note:

NOTE It is important to note that increasing the Reliability Level is not the only way to improve continuity of service of an overhead line. The reference reliability level is generally regarded as providing an acceptable reliability level in respect of continuity of service and safety, but in fact a designer shall consider the following two aspects:

Safety of the public: the reference return period of 50 years gives a high level of reliability. The probability of failure is acceptable in respect of public safety, because the combined probability resulting in human injury is very low. Moreover, as components are designed as complete systems rather than individually in isolation, and because they are usually designed prior to specific knowledge of the real line parameters (e.g. span length), the use factor has a positive influence on actual line reliability.

Continuity of service: it is possible to increase the availability by increasing the return period (upgrading) but it is not the only solution. It is also possible to increase the service life by creating redundancy, constructing other overhead lines, or having more lines radiating from substations thereby improving design by strength coordination, limiting damage, installing anti-cascading towers, and by setting an emergency restoration plan to repair damage very quickly.

Overall costs are not only determined by the probability of failure, but mostly by the possible consequence of failure, including the uncontrollable propagation of failure, and this may extend well beyond the initial failure. Such consequences can be reduced significantly by the following cost-effective measures such as: strength coordination, design of supports to resist torsional and longitudinal security loadings, load control devices, de-icing methods, anti-cascading towers, and construction of other overhead lines, etc. (i.e. proactive solutions); emergency restoration structures, training of linemen, etc. (i.e. reactive solutions).

3.5 Material properties

Delete the note at the end of this subclause.

4 Actions on lines

4.2.4.4 Equivalent diameter D of ice covered conductor

Replace the symbol definition in the formula:

I is the factored ice load (N/m) according to the wind combination as specified in 4.2.4.1. It includes all relevant combination and partial load factors for the reliability level concerned.
In the equations of 3.7.4, it is calculated as follows:

$I = \gamma_{Q1}\, Q_{1K} = \gamma_I\, I_K$ formula 3.7.4 (1) for dominating ice load
$I = \Psi_{Q2}\, Q_{2K} = \Psi_I\, I_K$ formula 3.7.4 (1) for dominating wind load

where

I_K is the reference (characteristic) ice load.

4.2.5 Temperature effects

Replace this subclause **by** the following:

4.2.5 Temperature effects

Temperature effects in five different design situations may generally apply as described below. They will depend on other climatic actions that may be present:

a) a minimum temperature to be considered with no other climatic action, if this is relevant;
b) a normal ambient reference temperature assumed for the extreme wind speed condition;
c) a reduced wind speed combined with a minimum temperature condition to be considered, if relevant;
d) a temperature to be assumed with icing. For both of the main types of icing (precipitation icing and incloud icing) a temperature of 0 °C may be used, unless otherwise specified. A lower temperature shall be taken into account in regions where the temperature often drops significantly after a snowfall;
e) a temperature to be used for the combination of wind and ice.

It is expected that lower minimum temperatures will be applicable for the longer return periods *T* indicated in Table 3.1.

The relevant temperatures and associated design situations are given in the NNAs.

4.2.10.2 Standard load cases

Replace this subclause **by** the following:

4.2.10.2 Standard load cases

For control of adequate reliability and functions under service conditions of the overhead line, standard load cases (indicated in Table 4.2.7) and options given below may be defined in the NNAs.

Table 4.2.7 – Standard load cases (normative)

Load case	Load as per subclause	Conditions	Remark
1a 1b	4.2.2	Extreme wind load Wind load at a minimum temperature	See (a) If relevant, see 4.2.5
2a 2b 2c 2d	4.2.3	Uniform ice loads on all spans Uniform ice loads, transversal bending Unbalanced ice loads, longitudinal bending Unbalanced ice loads, torsional bending	 If relevant, see (b) See (c) If relevant, see (d)
3	4.2.4	Combined wind and ice loads	See (e)
4	4.2.6	Construction and maintenance loads	
5a 5b	4.2.7 (a) 4.2.7 (b)	Security loads, torsional loads Security loads, longitudinal loads	Reduced partial factors for material properties may apply as given in Clauses 7 and 8.

In all load cases, the vertical component of the permanent actions as given in 4.2.1 shall be included. Where permanent actions reduce the effects of other actions such as uplift on a foundation, the minimum value of the permanent action shall be applied, for example minimum allowed ratio of weight-to-wind span.

If applicable and stated in the Project Specification, load cases involving short circuit loads or other special loads in accordance with 4.2.8 and 4.2.9, respectively, shall be investigated.

Items (a) to (e) apply as given in Table 4.2.7:

(a) A wind direction normal to the line shall be considered and at all other angles which may be critical for the design.

Wind load on all spans in one direction from the support resulting in longitudinal loads may be considered in the design of the relevant supports, where this condition is not adequately addressed by other defined load cases (optional).

(b) In load case 2b, a reduced ice load equal to the characteristic ice load multiplied by a reduction factor α on all the conductors on all the cross-arms on one side only of the support shall be investigated. This load case is illustrated in Figure 4.2.4. Where this load condition can be ignored α is defined as 1 (optional).

(c) In load case 2c, the characteristic ice load on all the conductors in one direction only from all the cross-arms of the support shall be multiplied by a reduction factor α_1 and in the other direction by a reduction factor α_2. This load case is illustrated in Figure 4.2.5 (optional).

(d) In load case 2d, the characteristic ice load on all the conductors on all the cross-arms on one side only of the support and in one direction of the line only shall be multiplied by a reduction factor α_3. For all remaining conductors, the characteristic ice load shall be multiplied by a reduction factor α_4, thus providing the maximum torsion.

This load case is illustrated in Figure 4.2.6. The number of unbalanced conductors may otherwise be specified in the NNAs. Where this load condition can be ignored or is otherwise taken care of in the NNA by other defined load cases, α_3 and α_4 are defined as 1 (optional).

(e) Where site conditions require, combined unbalanced wind and ice loads may be considered in the design of the relevant supports, providing this condition is not adequately addressed by other defined load cases. The ice load and/or the wind load shall be applied on all the conductors in one direction only from all the cross-arms of the support resulting in longitudinal loads (optional).