SLOVENSKI STANDARD
SIST EN 50341-3:2002

01-junij-2002

Nadzemni elektriļ ni vodi za izmeniļ ne napetosti nad 45 kV - 3. del: Zbirka nacionalnih normativnih doloļ il (NNA)

Overhead electrical lines exceeding AC 45 kV -- Part 3: Set of National Normative Aspects

Freileitungen über AC 45 kV -- Teil 3: Nationale Normative Festlegungen

Lignes électriques aériennes dépassant AC 45 kV -- Partie 2: Aspects Normatifs Nationaux

Ta slovenski standard je istoveten z: EN 50341-3:2001

ICS:

29.240.20	Daljnovodi	Power transmission and distribution lines

SIST EN 50341-3:2002 **en,fr,de**

EUROPEAN STANDARD **EN 50341-3**

NORME EUROPÉENNE

EUROPÄISCHE NORM October 2001

ICS 29.240.20

English version

Overhead electrical lines exceeding AC 45 kV
Part 3: Set of National Normative Aspects

Lignes électriques aériennes dépassant AC 45 kV
Partie 3: Aspects Normatifs Nationaux

Freileitungen über AC 45 kV
Teil 3: Nationale Normative Festlegungen

This European Standard was approved by CENELEC on 2001-01-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard 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 European Standard exists in one official version (English). 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, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Ref. No. EN 50341-3:2001 E

Foreword

The different parts of this European Standard EN 50341-3 were prepared by the respective CENELEC National Committees in cooperation with the Technical Committee CENELEC TC 11, Overhead electrical lines exceeding 1 kV AC (1,5 kV DC).

The text of the drafts were submitted to the Unique Acceptance Procedure and were approved by CENELEC as EN 50341-3 on 2001-01-01.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2002-05-01
- latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2004-01-01

Text of EN 50341-3

Please see the subparts specific to each National Committee.

NOTE This Part 3 of EN 50341 is published by CENELEC in English only.

National Normative Aspects (NNA)

for

AUSTRIA

based on EN 50341-1:2001

Contents

Foreword

1. The Austrian National Committee (NC) is identified by the following address:

   Austrian Electrotechnical National Committee
   Österreichischer Verband für Elektrotechnik (ÖVE)
   Eschenbachgasse 9, A-1010 Vienna, Austria
   Phone no. +43.1.587.63.73
   Fax no. +43.1.586.74.08
   name/number of relevant subcommittee: Fach(normen)ausschuss L

2. The Austrian NC has prepared this Part 3-1 of EN 50341 listing the Austrian national normative aspects, under its sole responsibility, and duly passed it through the CENELEC and CLC/TC11 procedures.

   NOTE The final draft prEN 50341-3-1:2000 was published as Entwurf ÖVE/ÖNORM EN 50341-3-1:2000-08 on Austrian national level. At the end of deadline, 2000-09-15, the supposed changes have been discussed during the 82nd meeting of „Fach(normen)ausschuss L". The agreed changes are incorporated in this document.

3. This EN 50341-3-1 is normative in Austria and informative for other countries;

4. This EN 50341-3-1 has to be read in conjunction with EN 50341-1, hereinafter referred to as Part 1. All clause numbers used in this Part 3-1 correspond to those of Part 1. Specific subclauses, which are prefixed „AT", are to be read as amendments to the relevant text in Part 1. Any necessary clarification regarding the application of Part 3-1 in conjunction with Part 1 shall be referred to the Austrian NC who will, in cooperation with CLC/TC11 clarify the requirements.

   When no reference is made in Part 3-1 to a specific subclause, then Part 1 applies.

5. In the case of „boxed values" defined in Part 1, amended values (if any) which are defined in Part 3-1 shall be taken into account in Austria.

   However any boxed value, whether in Part 1 or Part 3-1, shall not be amended in the direction of greater risk in a Project Specification.

6. The Austrian NC declares in accordance with subclause 3.1 of Part 1 that this Part 3-1 follows the „Empirical Approach" (subclause 4.3), and that consequently subclause 4.2 „General Approach" is not applicable for Austria.

7. The national Austrian standards/regulations related to overhead electrical lines exceeding 1 kV (A.C.) are identified/listed in 2.3.

   NOTE All national standards referred to in this Part 3-1 will be replaced by the relevant European Standards as soon as they become available and are declared by the Austrian NC to be applicable and thus reported to the secretary of CLC/TC 11.

Clause National regulation

1 General scope – Field of application

(A-dev) **AT.1** Notes 1, 2 and 3 are normative in Austria:

NOTE 1 The extent of the application of this standard is defined in Austrian „Elektrizitätsverordnung – ETV".

NOTE 2 The construction of lines with covered conductors (KUF) and reduced internal or external clearance is not permitted in Austria. For KUF-lines the prescriptions for clearances as from 5.4.2.1 apply.

NOTE 3 In addition to the text from Part 1 the following applies:
These regulations also cover telecommunication lines which are carried on supports of OH high voltage lines. These regulations are not valid for constructions of conductors or cables with integrated optical fibres independent from their function which do not have simultaneously the function of a conductor or an earth wire. For such constructions the normal additional load as from 4.3.3 and the exceptional additional loads with minimum 12 N/m are to be considered.

For such constructions with metallic materials internal clearances as defined in 5.4.2.1 apply.

2 Definitions, symbols and references

2.1 Definitions

(A-dev) **AT.1**
endurance tensile stress
of a conductor is the greatest constant tensile stress the conductor can withstand for a year without breaking

(A-dev) **AT.2**
a **conductor crosses an object** when, as a result of being deflected by wind blowing in the direction of that facility, the outline of the conductor intersects the outline of the object

(A-dev) **AT.3**
In addition to the definition in Part 1:
Conductors
are understood to mean bare, insulated, or sheathed wires and cables suspended between the supports of an overhead high-tension power transmission line – regardless of whether they are energized or not. Included here are lines having multiple functions (composite cables for conductors and earthwires). **OPCON** and **OPGW** are to be considered as conductors.

(A-dev) **AT.4**
the **protective zone** of an object is determined from the plan area which results when the ground plan of that object is enlarged equally on all sides by the extent indicated as the relevant lateral clearance for the object in question and for that group of overhead HV-lines, the Protective Zone is specified for.

(A-dev) **AT.5**
conductor in protective zone
a conductor of an overhead HV-line is within the protective zone of an object when, as a result of being deflected by wind blowing in the direction of the object, the outline of that conductor intersects the protective zone of that object

Clause National regulation

(A-dev) **AT.6**
clearance
the shortest permissible distance between a conductor of an overhead HV-line and an object. The clearance can occupy any position in space. The object in question may also be a conductor of another line. (Expression in German: „Schutzabstand")

(A-dev) **AT.7**
normal additional load
that additional load which acts vertically and evenly distributed along the length of a conductor, and which is to be considered for normal loading assumptions as given in 4.3.3.

(A-dev) **AT.8**
exceptional additional load
that additional load which acts vertically and evenly distributed along the length of a conductor, and which on the basis of experience, can be expected only exceptionally and is to be considered for exceptional loading assumptions as given in 4.3.3.

(A-dev) **AT.9**
normal loading conditions
no ice conditions between temperatures of -20 and +40°C and under –5°C plus regular additional loads as defined in table 4.3.10.3/AT.2.

(A-dev) **AT.10**
exceptional loading conditions

conditions under -5°C plus regular additional loads as defined in table 4.3.10.3/AT.2.

(A-dev) **AT.11**
line groups
are defined as follows in Table 2.1/AT.11

Table 2.1/AT.11 - Line groups

Line Group	Nominal Insulation (series)	Maximum Operating Voltage, Effective Value in kV	Proof Alternating Voltage A (Alternating Voltage Holding Voltage) Effective Value in kV	Normal Surge Level (Surge Holding Voltage) Peak Value in kV
I	till 45kV	see ÖVE-L11 [3] till 45kV	see ÖVE-L11 [3] till 45kV	see ÖVE-L11 [3] till 45kV
II	60 N	72,5	140	325
	110 NE[1]	123	185	450
	110 N	123	230	450[2]
III	150 NE[1]	170	275	650
	150 N	170	325	750
	220 NE[1]	245	395	900
	220 N	245	460	1050
IV	380 NE[1]	420	630	1425

[1] The letter „E" indicates that it is a system with an effectively earthed neutral point.
[2] Applies only to overhead lines. In the case of other plant a value of 550 kV applies.
[3] New editions of ÖVE-L11 are published as series ÖVE/ÖNORM E 8111.

Clause National regulation

(ncpt) **AT.12**
minimum mechanical failing load
of a conductor is defined as 0,95 times its rated breaking load

(ncpt) **AT.13**
cross section of a **conductor** (in German: Sollquerschnitt)
the metallic cross section, calculated from the data sheets

cross section of an **aerial cable**
the mechanical load carrying section of the cable only

(ncpt) **AT.14**
span
the sector of a line between two consecutive supports of that line

(ncpt) **AT.15**
span length
the horizontal distance between two consecutive supports of that line

(ncpt) **AT.16**
section
the sector of a HV-line having one or more spans between two consecutive tension towers

(ncpt) **AT.17**
conductor pull
the product of the rated cross-section of the conductor and the tensile stress acting in this cross-section in the tangential direction of the sag curve

(ncpt) **AT.18**
upward or **downward pull**
the product of horizontal conductor pull and the tangent of the angle of inclination of the straight line connecting the two suspension points against the horizontal

(ncpt) **AT.19**
sag
of a conductor is the vertically measured distance between a point of the conductor axis and the straight line connecting the conductor's two points of suspension

(ncpt) **AT.20**
initial state
that one of the two states, -5°C plus normal additional load, or –20°C without additional load, at which the higher tensile stress occurs in the peak of the sag curve

(ncpt) **AT.21**
initial tensile stress is the horizontal component of the tensile stress in the conductor when in the initial state

(ncpt) **AT.22**
maximum tensile stress
the tensile stress occurring in the upper point of suspension of a conductor when in the initial state

Clause National regulation

(ncpt) **AT.23**
tensile strength

(ncpt) defined by $sz = \frac{0{,}95 \times \text{theoretical break load of conductor}}{\text{nominal cross-section}}$

(ncpt) **AT.24**
fittings
constructional elements which are installed either individually or in combination on or between conductors, insulators as well as between conductors resp. insulators and supports

Until IEC TC11 has finalized its document on tests of overhead lines fittings the failure criteria of fittings are defined by the following definitions of **limit loads for fittings**:

(A-dev) **AT.25**
breaking load
that load at which breaking occurs and thus the coupling is interrupted

(A-dev) **AT.26**
ultimate load
that load at which – despite progressive deformation – no further load can be taken up

(A-dev) **AT.27**
stretching load
that load at which permanent deformation will occur if further loads are applied

(ncpt) **AT.28**
safety
the quotient of limit load divided by the load arising from normal and exceptional loadings

(ncpt) **AT.29**
nominal cross section (in German: Nennquerschnitt)
the cross section used to define the conductor

2.3 References

(ncpt) **AT.1** ÖNORM B 3304, Natural rock aggregates for concrete

(ncpt) **AT.2** ÖNORM B 3307, Ready-mixed concrete

(ncpt) **AT.3** ÖNORM B 4100, Teil2, Timber structures, design and construction

(A-dev) **AT.4** ÖNORM B 4200 Teil 4, Reinforced concrete structures, basic rules for design

(A-dev) **AT.5** ÖNORM B 4200 Teil 7, Reinforced concrete structures, concrete reinforcement

(A-dev) **AT.6** ÖNORM B 4200 Teil 8 und 9, Reinforced concrete structures, design and detailing

(A-dev) **AT.7** ÖNORM B 4200 Teil 10, Concrete- production, applicability and verification of quality

Clause National regulation

(A-dev) **AT.8** ÖNORM B 4430, Teil 1, Earthwork and foundation engineering; permisssible soil pressures; areal foundations

(A-dev) **AT.9** ÖNORM B 4430 Teil 2, Earthwork and foundation engineering; permisssible soil pressures; pile foundations

(A-dev) **AT.10** ÖNORM B 4605, Steel structures; towers, analysis, erection and workmanship

(ncpt) **AT.11** ÖNORM E4000, Electrical overhead lines; aluminium and E-AlMgSi wires for stranded conductors

(ncpt) **AT.12** ÖNORM E4030, Electrical overhead lines, Technical supply Conditions for strands and conductors type AAC, AAAC or steel also A/ACSR and aluminium/alluvium-clad steel conductors and AACSR conductors

(ncpt) **AT.13** ÖNORM E4006 Galvanized steel strands for stranded conductors

(ncpt) **AT.14** ÖNORM E 4200, Electrical overhead lines, Wooden poles, acceptance criteria

(ncpt) **AT.15** ÖNORM E 4201, Electrical overhead lines, Wooden poles, calculation and construction

(ncpt) **AT.16** ÖNORM E 4202, Electrical overhead lines, Wooden poles, bearing capacity of basic types

(A-dev) **AT.17** ÖNORM S 1119, Low frequency lactic and magnetic fields, Permissible limits of exposure for the protection of persons in the frequency range 0 Hz to 30 kHz

(ncpt) **AT.18** DIN 48200, part 1 Strands made of copper for stranded conductors

(A-dev) **AT.19** ÖVE EN 50110-1, Operation of electrical installations

(A-dev) **AT.20** ÖVE-L11, Construction of overhead power lines of more than 1kV

3 Basis of design

(ncpt) **AT.1** : If elements are used which are not standardised, is shall be proven, that they guarantee the requested safety. Proof by calculation is allowed.

4 Actions on lines

4.1 Introduction

(A-dev) **AT.1** : In Austria chapter 4.3 Actions, Empirical Approach, is to be followed.

Clause National regulation

4.3 Actions, empirical approach

(ncpt) **AT.1** : The supports are to be designed to withstand the following external forces (loads):

(1) selfweight of support
(2) permanent loads
(3) additional loads
(4) assembly loads
(5) wind loads
(6) conductor pulls

4.3.2 Wind loads

(ncpt) **AT.1** : Wind loads on line supports are to be calculated for general under normal loading conditions, components exposed to wind are free of ice.

(ncpt) **AT.2** : In unusual cases, under particularly unfavourable climatic conditions, it may be necessary, in addition to the exceptional loading conditions as from relevant clauses of this regulations to allow for additional loading conditions, i.e. wind pressure on ice-covered components.

(ncpt) **AT.3** :

Table 4.3.2/AT.3 Wind pressure acting upon the directly affected components
Values relate to a wind velocity of 120 km/h and a thrust of 700 N/m²

Component		aerodyn. drag coefficient C_x	$C_x \cdot q_{120}$ N/m2	Reduction factor
full flat surfaces		1,6	1112	1
flat lattice walls	made of angle profiles	1,4	973	1
	made of rods	1,1	765	1
Timber poles, steel poles, concrete poles of circular or near-circular shape		0,7	487	1
steel poles and concrete poles of hexagonal or octagonal shape		1,0	695	1
Double poles of Timber, steel resp. concrete	in the pole-plane	0,7	487	1
	rectangular to pole-plane where $e < d_m$ [1)]	0,8	556	1
wires and conductors of Circular or elliptical shape	d < 15,8 mm	1,15	600	0,75
	d > 15,8 mm	1,0	521	0,75
Aircraft warning and radar sphere d < 1,0 m		0,4	278	1

[1)] e ..... inner distance pole to pole
d_m ....means diameter of pole

(ncpt) **AT.4** : Wind loads acting upon supports resulting from conductors are to be calculated as from the formula $Q_{wc}=q_c \cdot G_c \cdot C_c \cdot d \cdot L \cdot \cos \varphi$

(ncpt) **AT.5** : Plane surfaces and lattice construction in direction of wind may be neglected when calculating the wind load.

(ncpt) **AT.6** : In case of „quartering wind" the total wind force acting on equilateral-triangular or quadratic steel lattice towers is to be taken as twice the wind force blowing vertically against one individual tower wall. Following that, back walls are considered as already taken into account in that calculation.

Clause National regulation

(ncpt) **AT.7** : For components in the lee of wind, the wind load may be assumed as per Table 4.3.2/AT.7.

Table 4.3.2/AT.7 - Wind Load acting on components in the lee of the wind

Component		Wind load as per 4.3.2	
Back structure of lattice towers and lattice-type crossarms		80% of wind forces acting on the front lattice surface	
A-poles (wind in direction of A-plane on the rear pole)		50% of wind forces on the front pole.	
Bundle conductors horizontally arranged, for individual conductors in lee		80% of wind forces acting on the front conductor.	
Components located in lee of the wind,	$x < B$	no wind load	
Depending on the distance x of these components and upon the breadth B	$x = B$ to $x = 20\ B$	50 %	of wind load on the front component
of the front component	$x > 20\ B$	100 %	

(snc) **AT.8**: Span factor $G_c = 1,0$

(snc) **AT.9** : Factor V_h (m/s) given in the formula in 4.3.2 and AT.4 is to be calculated:
- at elevations above 15 m to 40 m above ground: at least 33,33 m/s (120 km/h).
- at elevations up to 15 metres and over 40 metres: Values for $C_x \cdot q_{120}$ according to Table 4.3.2/AT.3 may be reduced by 30% for elevations up to 15 metres above ground. For elevations of more than 40 metres above ground these values are to be increased by 30% for each 50 metres additional height started upon - on those parts of the line located at that greater heights.

4.3.3 Ice loads

(A-dev) **AT.1** : Ice loads on conductors (including earth wires and OPGWs): Ice loads occur as „normal additional loads“ in „normal conditions“ and as „exceptional additional loads“ in „exceptional conditions“.

(A-dev) **AT.2** : Normal and exceptional additional loads on conductors are to be selected with a view to the prevailing climatic conditions; the minimum assumptions are:

Normal additional load: (4 + 0,2 x d) in N/m (d = conductor diameter in mm)

Exceptional additional load for Group	II	III	IV	
	35	40	50	<N/m>