SLOVENSKI STANDARD
SIST EN 50341-2-20:2019

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Nadomešča:
SIST EN 50341-2-20:2016

Nadzemni električni vodi za izmenične napetosti nad 1 kV - 2-20. del: Nacionalna normativna določila (NNA) za Estonijo (na podlagi EN 50341-1:2012)

Overhead electrical lines exceeding AC 1 kV - Part 2-20: National Normative Aspects (NNA) for ESTONIA (based on EN 50341-1:2012)

Ta slovenski standard je istoveten z: EN 50341-2-20:2018

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29.240.20	Daljnovodi	Power transmission and distribution lines

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EUROPEAN STANDARD

NORME EUROPÉENNE

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Overhead electrical lines exceeding AC 1 kV - Part 2-20: National Normative Aspects (NNA) for ESTONIA (based on EN 50341-1:2012)

This European Standard was approved by CENELEC on 2018-11-26.

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

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Ref. No. EN 50341-2-20:2018 E

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European foreword

1 The Estonian National Committee (NC) is identified by the following address

Estonian Centre for Standardisation
Estonian National High Voltage Committee (HVC)
Akadeemia tee 21/6, 12618 Tallinn, Estonia
Phone: +372 605 5050
Fax: +372 605 5070
E-mail: info@evs.ee

2 The Estonian NC has prepared this Part 2-20 (EN 50341) listing the Estonian National Normative aspects, under its sole responsibility, and duly passed it through the CENELEC and CLC/TC 11 procedures.

NOTE The Estonian NC also takes sole responsibility for the technically correct co-ordination of this NNA with EN 50341-1. It has performed the necessary checks in the frame of quality assurance/control. However, it is noted that this quality control has been made in the framework of the general responsibility of a standards committee under the national laws/regulations.

3 This revision supersedes EVS-EN 50341-2-20:2015.

The most significant technical changes with respect to the previous edition are:

— requirements for low voltage lines are included;

— telecommunication lines located on common structures with power lines are taken into account;

— the last amendments of Estonian legal documents are taken into account.

4 This Part 2-20 is normative in Estonia and informative for other countries.

5 This Part 2-20 has to be read in conjunction with EN 50341-1, referred to hereafter as Part 1. All clause numbers used in this Part 2-20 correspond to those in Part 1. Specific subclauses, which are prefixed “**EE**”, are to be read as amendments to the relevant text in Part 1. Any necessary clarification regarding the application of Part 2-20 in conjunction with Part 1 shall be referred to the Estonian NC that will, in cooperation with CLC/TC 11, clarify the requirements.

When no reference is made in Part 2-20 to a specific subclause, Part 1 applies.

6 In the case of “box values” defined in Part 1, amended values (if any), which are defined in Part 2-20, shall be taken into account in Estonia.

However any boxed value, whether in Part 1 or in Part 2-20, shall not be amended in the direction of greater risk in the Project Specification.

Terms with prepositions “from” and “up to”, denoting boundaries of values, always include the boundary values itself, as it is common in other Estonian normative documents.

7 The national Estonian standards/regulations related to overhead electrical lines are listed in Clause 2.

NOTE All national standards referred to in this Part 2-20 will be replaced by the relevant European Standards as soon as they become available and are declared by the Estonian Centre for Standardisation to be applicable and thus reported to the secretary of CLC/TC 11.

0 INTRODUCTION

0.7 Language

(snc) **EE.1 Language**
This Part 2-20 is published in English and in Estonian.

1 SCOPE

1.1 General

(snc) **EE.1 Application to new lines**
In Estonia the standard EN 50341-1 (Part 1) can only be applied using this NNA (EN 50341-2-20) containing National Normative Aspects for Estonia.

This Part 2-20 applies to all new overhead electric lines with nominal system voltages exceeding AC 1 kV and also for low voltage (below 1 kV AC) overhead lines performed by aerial cables. The requirements of the structural design are applicable also for DC overhead lines, where the electrical requirements are given in the Project Specification.

(ncpt) **EE.2 "New overhead line"**
A "new overhead line" means a completely new line between two points, A and B. A new branch line of the existing power line should be considered as a new power line including the junction support. Specific requirements for junction support should be defined with the Project Specification.

1.2 Field of application

(ncpt) **EE.1 Application to covered conductors and aerial cables**
The standard includes requirements for the design and construction of overhead lines with nominal system voltages up to 45 kV AC equipped with covered conductors and aerial cables. Additionally, the requirements of the equipment standards and manufacturers' instructions shall be followed.

(A-dev) **EE.2 Application to mounting of telecommunication equipment**
The Standard EVS-EN 50341:2013 is applicable to fixing of structural elements for telecommunication (antennas, All Dielectric Self Supporting (ADSS) equipment, junction boxes, etc.), if mounted on power line supports (towers), especially regarding wind forces and ice loads on such fixed elements. The design and installation should be done under the due control of the line owner and/or the competent authority. Mounting of telecommunication equipment on power line supports must be coordinated with the line owner and stated in the Project Specification.

This standard applies to telecommunication lines only in the case of their common installation with power lines. This standard does not apply to separately installed telecommunication overhead lines.

If telecommunication equipment (antennas, dishes, etc.) will be installed in the transmission line supports, and their size, location or mounting may have major effects on the loads or design of the structures, the requirements of EVS-EN 1993-3-1/NA:2009 shall also to be taken into account. If such structures include conductive parts, the requirements on clearances in subclause 5.8 should be applied.

(ncpt) **EE.3 Application to installation of other equipment**

Only equipment belonging to the line (electric or telecommunication line) can be installed on the overhead lines. However, with the permission of the owner of the line, equipment serving communal services or environmental protection like road signs, warning signs or warning balls, etc., may also be installed. The installation height of equipment meant to be installed and maintained by an instructed person shall be such that the work can be done without climbing the support and the distances of safe electrical work can be followed. The additional loads due to this equipment on the line supports shall be taken into account if necessary.

(ncpt) **EE.4 Application to existing overhead lines**

The Standard EVS-EN 50341:2013 shall not be applied to maintenance, branch lines, extensions or diversions of existing overhead lines in Estonia, unless specifically required in the Project Specification.

Overhead lines that meet the mechanical and electrical requirements in force at the time of their construction can be continually operated if this does not cause obvious danger. Such lines may be repaired and upgraded according to previously valid requirements. Thereat repair means replacing a damaged element with a similar new one; renovation means a more extensive improvement of the line with the aim of extending its life, while preserving the basic construction of the line.

Any modification of existing lines shall be subject to this standard, but previous norms and standards can also be used. It shall be made sure that the changes do not have a significant impact on the line's load. Modification means, for example, the relocation of some of the supports or the development of the line provided for in the initial design - for example, adding a circuit or reconductoring on existing supports.

In cases of major revisions of existing lines the degree of application of the Standard EVS-EN 50341:2013 should be in any case agreed upon by the parties concerned and specified in the Project Specification.

(ncpt) **EE.5 Application to installations under construction or design**

Installations in the design and construction stage may be completed by using the standard valid at the beginning of planning unless otherwise agreed with the line owner and/or any other competent authority.

It must also be determined in the Project Specification which previous Standard and to what extent shall be applied to the project in question.

2 NORMATIVE REFERENCES, DEFINITIONS AND SYMBOLS

2.1 Normative references

(A-dev) **EE.1 Application of references in Part 1**

References in EN 50341-1 apply without change.

(A-dev) **EE.2 References to Estonian national laws, regulations and standards**

Choice of lines' route and construction or mounting of high voltage overhead lines is regulated by the following Estonian laws and government regulations. These laws and regulations are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

In addition to Part 1 the following Estonian standards and acts should be taken into account:

EVS 814:2003. *Normaalbetooni külmakindlus. Määratlused, spetsifikatsioonid ja katsemeetodid*. Frost resistance of normal-weight concrete. Definitions, specifications and test method

EVS 843:2016. *Linnatänavad*. Urban streets

EVS 884:2017. *Maagaasitorustik. Projekteerimise põhinõuded üle 16 baarise töörõhuga torustikele*. Natural gas pipeline systems – Pipelines for maximum operating pressure over 16 bar – General requirements for design

EVS-EN 1991-1-4/A1:2010/NA:2010. *Eurokoodeks 1: Ehituskonstruktsioonide koormused. Osa 1-4: Tuulekoormus. Eesti standardi rahvuslik lisa.* Eurocode 1: Actions on structures – Part 1-4: General actions – Wind actions. Estonian National Annex

EVS-EN 1991-1-4/NA:2007. *Eurokoodeks 1: Ehituskonstruktsioonide koormused. Osa 1-4: Üldkoormused. Tuulekoormus. Eesti standardi rahvuslik lisa.* Eurocode 1: Actions on structures – Part 1-4: General actions – Wind actions. Estonian National Annex

EVS-EN 1993-3-1/NA:2009. *Eurokoodeks 3: Teraskonstruktsioonide projekteerimine. Osa 3-1: Tornid, mastid ja korstnad. Tornid ja mastid. Eesti standardi rahvuslik lisa*. Eurocode 3 - Design of steel structures - Part 3-1: Towers, masts and chimneys - Towers and masts. Estonian National Annex

Asjaõigusseadus ja muudatused. Law of Property Act (RT I 1993, 39, 590) and amendments

NOTE RT – *Riigi Teataja* (The State Gazette), an official online publication of the Republic of Estonia, RTL – *Riigi Teataja Lisa* (Supplement of the State Gazette). The translations published in *Riigi Teataja* are unofficial texts – they do not have legal force and you cannot rely on them in judicial or any other official proceedings. In Estonia, legislation has legal force only in Estonian.

Asjaõigusseaduse rakendamise seadus ja muudatused. Law of Property Act Implementation Act (RT I 1993, 72, 1021) and amendments

Ehitusseadustik ja muudatused. Building Code (RT I 05.03.2015, 1) and amendments

Ehitusseadustiku ja planeerimisseaduse rakendamise seadus ja muudatused. An Act to Implement the Building Code and the Planning Act (RT I, 23.03.2015, 3) and amendments

Elektrituruseadus ja muudatused. Electricity Market Act (RT I 2003, 25, 153) and amendments

Elektroonilise side seadus ja muudatused. Electronic Communications Act (RT I 2004, 87, 593) and amendments

Jäätmeseadus ja muudatused. Waste Act (RT I 2004, 9, 52) and amendments

Keskkonnajärelevalve seadus ja muudatused. Environmental Supervision Act (RT I 2001, 56, 337) and amendments

Keskkonnamõju hindamise ja keskkonnajuhtimissüsteemi seadus ja muudatused. Environmental Impact Assessment and Environmental Management System Act (RT I 2005, 15, 87) and amendments

Lennundusseadus ja muudatused. Aviation Act (RT I 1999, 26, 376) and amendments

Looduskaitseseadus ja muudatused. Nature Conservation Act (RT I 2004, 38, 258) and amendments

Maakatastriseadus ja muudatused. Land Cadastre Act (RT I 1994, 74, 1324) and amendments

Meresõiduohutuse seadus ja muudatused. Maritime Safety Act (RT I 2002, 1, 1) and amendments

Muinsuskaitseseadus ja muudatused. Heritage Conservation Act (RT I 2002, 27, 153) and amendments

Planeerimisseadus ja muudatused. Planning Act (RT I 26.02.2015, 3) and amendments

Raudteeseadus ja muudatused. Railways Act (RT I 2003, 79, 530) and amendments

Seadme ohutuse seadus ja muudatused. Equipment Safety Act (RT I 23.03.2015, 4) and amendments

Majandus- ja taristuministri määrus „Ehitise kaitsevööndi ulatus, kaitsevööndis tegutsemise kord ja kaitsevööndi tähistusele esitatavad nõuded“. Regulation of the Minister of Economic Affairs and Infrastructure “Extent of a structure protection zone, procedures for operating in the protection zone and requirements for the protection zone designation” (RT I, 28.06.2015, 4)

Majandus- ja taristuministri määrus „Tee projekteerimise normid”. Regulation of the Minister of Economic Affairs and Infrastructure “Road design regulations” (RT I, 07.08.2015, 14)

Sotsiaalministri määrus „Müra normtasemed elu- ja puhkealadel, elamutes ning ühiskasutusega hoonetes ja mürataseme mõõtmise meetodid“. Regulation of the Minister of Social Affairs “Audible noise limits in residential and recreational areas, residential and social buildings and noise level control methods” (RTL 2002, 38, 511)

Other valid relevant normative regulatory documents should also be taken into account.

Internal normative documents of a utility may be referred to in the Project Specification.

3 BASIS OF DESIGN

3.2 Requirements of overhead lines

3.2.2 Reliability requirements

(ncpt) **EE.1 Selection of reliability levels**

Three reliability levels are used, as shown in the following table:

Table EE.3.1 — Reliability levels

Reliability level	Nominal system voltage	Line type
1	U_n < 110 kV	Normal lines
	U_n = 110 kV	Unimportant lines
2	U_n = 110 kV	Normal lines
3	U_n ≥ 110 kV	Important lines, including all 330 kV lines
NOTE The type of line is considered normal unless otherwise specified in the Project Specification.		

(A-dev) **EE.2 Wind load on temporary lines**
In accordance with the Estonian National Annex of EVS-EN 1991-1-4 the recommended value of the seasonal coefficient c_{season} is 1,0.

(snc) **EE.3 Ice load on temporary lines**
When designing temporary lines intended for use between April and October, where ice accretion does not occur, the ice load doesn't need to be considered.

3.2.3 Security requirements

(snc) **EE.1 Distance between tension supports**
In lines with nominal system voltage exceeding AC 1 kV up to 20 kV, the distance between tension supports must not be greater than 2 km unless specified otherwise in the Project Specification. For lines with nominal system voltage exceeding AC 20 kV the distance between tension supports shall be specified in the Project Specification.

3.2.5 Strength coordination

(ncpt) **EE.1 Specific requirements**
The strength coordination is based on the principles of IEC 60826, which are presented in Annex A of Part 1 of this Standard. Specific requirements for strength coordination may be specified in the Project Specification if necessary.

3.2.6 Additional considerations

(ncpt) **EE.1 Location of overhead lines**
The overhead line route shall be chosen as easily accessible as possible for operation as well as for reparations.

The construction of overhead lines in a densely built-up area shall be avoided.

(A-dev) **EE.2 Environmental aspects**
Consideration of an overhead line as an element in the environment shall take into account the environmental and legal situations in that particular region of Estonia.

(ncpt) **EE.3 Safety and protection of wildlife and livestock**
Specific requirements on safety of human beings and protection of wildlife and livestock (e.g. birds, cattle, etc.) may be specified in the Project Specification, if necessary.

(ncpt) **EE.4 Protection of birds**
Crossarms, insulators and other components of overhead line poles shall be designed so that the birds cannot stay above insulators and cannot find possibilities for nesting in a dangerous proximity to the live conductors.

3.3 Limit states

3.3.3 Serviceability limit states

(ncpt) **EE.1 Criteria of serviceability**
Criteria of serviceability limit states are defined in clauses relating to particular line components. Additional requirements may be presented in the Project Specification.

3.4 Actions

3.4.2 Classification of actions by their variation in time

(ncpt) **EE.1 Variable actions**
Wind loads and ice loads as well as applicable temperatures are assessed by applying the reliability concept.

4 ACTIONS ON LINES

4.1 Introduction

(snc) **EE.1 Climatic data**

For assessment of the climatic data to determine numerical values for actions, the first approach is applied, i.e. Estonian and European standards are used. Specific references shall be given in the corresponding subsections.

4.3 Wind loads

4.3.1 Field of application and basic wind velocity

(A-dev) **EE.1 Basic wind velocity**

For all territory of Estonia the following value shall be used for basic wind velocity ($V_{b,0}$) according to the Estonian National Annex EVS-EN 1991-1-4/A1:2010/NA:2010:

$$V_{b,0} = 21 \text{ m/s}$$

For overhead lines with nominal system voltages up to 20 kV, according to long-term experience, the value 18.5 m/s for the basic wind velocity $V_{b,0}$ shall be used.

4.3.2 Mean wind velocity

(A-dev) **EE.1 Wind directional factor**

According to the Estonian National Annex EVS-EN 1991-1-4/A1:2010/NA:2010, the value of the directional factor c_{dir} is 1,0.

(A-dev) **EE.2 Orography factor**

According to the Estonian National Annex EVS-EN 1991-1-4/A1:2010/NA:2010, the value of the orography factor c_o is 1,0.

4.3.3 Mean wind pressure

(A-dev) **EE.1 Air density**

According to the Estonian National Annex EVS-EN 1991-1-4/A1:2010/NA:2010, the conservative value for air density ρ = 1,25 kg/m^3 regardless of temperature is used in Estonia.

4.3.5 Wind forces on any overhead line component

(ncpt) **EE.1 Nominal wind load**

Determination of minimum air clearances in Clause 5 is based on the nominal wind load which is found, multiplying the extreme wind load (with 50-year return period) Q_{W50} by C_T^2 = 0m58, which is the ratio of square of the 10 minutes mean wind velocity with 3-year return period V_3 to square of the 10 minutes mean wind velocity with 50-year return period V_{50}:

$$Q_{W3} = C^2_T \times Q_{W50} = 0{,}58 Q_{W50}$$

For determination of ice and wind forces affecting the mast elements, the wind load $Q_{W3\,I}$ is calculated as the nominal wind load (with 3-year return period) Q_{W3} multiplied by the reduction factor B_I = 0.7 (see Table 4.13 / EE.1 and Part 1, subclause 4.6.6.1):

$$Q_{W3\,I} = B_I \times Q_{W3} = B_I \times C^2_T \times Q_{W50} = \Psi_W \times Q_{W50} = 0{,}4 Q_{W50}$$

where

Ψ_W is the combination factor for wind loads.

4.4 Wind forces on overhead line components

4.4.1 Wind forces on conductors

4.4.1.1 General

(snc) **EE.1 Conductors reference height above ground**

For lines with nominal system AC voltage up to 20 kV, reference height above ground *h* for the calculation of wind forces on conductors should be determined according to method 6 in Table 4.3 of Part 1.

For lines with nominal system AC voltage exceeding 20 kV, reference height above ground *h* for the calculation of wind forces on conductors should be determined desirably according to method 2 in Table 4.3 of Part 1.

The mean reference height of spans in the section weighted by their lengths shall be taken as the reference height above ground of the conductors in the section.

4.4.1.2 Structural factor

(ncpt) **EE.1 Span factor**

For determination of the span factor in sag and tension analysis the section length shall be taken as the span length. For analysis of loads on supports and on conductors fixed on pin or post insulators, the average length of the spans adjacent to the support must be taken as the span length.

4.4.1.3 Drag factor

(snc) **EE.1 Drag factor for conductors**

The drag factor C_C for conductors and earth wires shall be determined by method 1 in subclause 4.4.1.3 of Part 1, i.e. C_C is 1,0 for any conductor, subconductor and earth wire.

(snc) **EE.2 Drag factor for aerial cables**

The value of the drag factor C_C for aerial bundle cables is 1,2.

4.4.2 Wind forces on insulator sets

(ncpt) **EE.1 Wind forces on insulator sets**

When designing supports wind forces on insulator sets due to wind pressure can be neglected. If taking them into account the wind forces acting on the insulator sets are determined in accordance with subclause 4.4.2 of Part 1. The horizontal projection area A_{ins} of the insulating set to the vertical plane parallel with the insulator string axis is calculated as

$$A_{ins} = L\ D\ \sin\alpha,$$

where

L is the effective length of the insulator string;

D is the external diameter of the insulator;

α is the angle between insulator string and wind direction. The conservative value α = 90° may be used.