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Nadzemni električni vodi za izmenične napetosti nad 45 kV - 2-20. del: Nacionalna normativna določila (NNA) za Estonijo (na podlagi EN 50341-1:2012)

Overhead electrical lines exceeding AC 45 kV - Part 2-20: National Normative Aspects (NNA) for ESTONIA (based on EN 50341-1:2012)

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Overhead electrical lines exceeding AC 45 kV - Part 2-20: National Normative Aspects (NNA) for ESTONIA (based on EN 50341-1:2012)

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European Committee for Electrotechnical Standardization
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Europäisches Komitee für Elektrotechnische Normung

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FOREWORD

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

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2 The Estonian NC has prepared this Part 2-20 of EN 50341, listing the Estonian national normative aspects under its sole responsibility, and has 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 Part 2-20 is normative in Estonia and informative for other countries.

4 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 articles 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.

5 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 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.

6 The national Estonian standards/regulations related to overhead electrical lines exceeding AC 1 kV are identified/listed in Clause 2 of this Part 2-20.

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

(NCPT) **EE.1 Application to new lines**
This Part 2-20 applies to all new overhead electric lines with nominal system voltages exceeding AC 1 kV and with rated frequencies below 100 Hz. This standard also applies to D.C. overhead lines in structural aspects.

(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, for which specific requirements should be defined in the Project Specification.

1.2 Field of application

(A-dev) **EE.1 Application to mounting of telecommunication equipment**
The Standard EVS-EN 50341:2012 is applicable to fixing of structural elements for telecommunication (antennas, satellite dishes, All Dielectric Self Supporting (ADSS) equipment, 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 line owner and stated in the Project Specification.

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

(NCPT) **EE.2 Application to existing overhead lines**
The Standard EVS-EN 50341:2012 shall not be applied to maintenance, reconductoring, tee-offs, extensions or diversions to existing overhead lines in Estonia, unless specifically required in the Project Specification.

In cases of major revisions of existing lines the degree of application of the Standard EVS-EN 50341:2012 should be agreed upon by the parties concerned and specified in the Project Specification.

(NCPT) **EE.3 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 National Standard and to what extent should 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 line route and construction or mounting of high voltage overhead line 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. (RT – Riigi Teataja, RTL – Riigi Teataja Lisa (*supplement*). *Riigi Teataja* is the official publication of the Republic of Estonia).

NAME	PUBLICATION CITATION
Asjaõigusseadus Law of Property Act	(RT I 1993, 39, 590)
Asjaõigusseaduse rakendamise seadus Law of Property Act Implementation Act	(RT I 1993, 72, 1021)
Elektriohutusseadus Electrical Safety Act	(RT I 2007, 12, 64)
Elektrituruseadus Electricity Market Act	(RT I 2003, 25, 153)
Elektroonilise side seadus Electronic Communications Act	(RT I 2004, 87, 593)
Ehitusseadus[1] Building Act[1]	(RT I 2002, 47, 297)
Jäätmeseadus Waste Act	(RT I 2004, 9, 52)
Keskkonnajärelvalve seadus Environmental Supervision Act	(RT I 2001, 56, 337)
Keskkonnamõju hindamise ja keskkonnajuhtimissüsteemi seadus Environmental Impact Assessment and Environmental Management System Act	(RT I 2005, 15, 87)
Lennundusseadus Aviation Act	(RT I 1999, 26, 376)
Looduskaitseseadus Nature Conservation Act	(RT I 2004, 38, 258)
Maakatastriseadus Land Cadastre Act	(RT I 1994, 74, 1324)
Meresõiduohutuse seadus Maritime Safety Act	(RT I 2002, 1, 1)
Muinsuskaitseseadus Heritage Conservation Act	(RT I 2002, 27, 153)
Planeerimisseadus Planning Act	(RT I 2002, 99, 579)
Raudteeseadus Railways Act	(RT I 2003, 79, 530)
Teeseadus Roads Act	(RT I 1999, 26, 377)
Tööstusheitmete seadus Industrial Emissions Act	(RT I, 16.05.2013, 1)
Veeseadus Water Act	(RT I 1994, 40, 655)
Võlaõigusseadus Law of Obligations Act	(RT I 2001, 81, 487)
Majandus- ja kommunikatsiooniministri määrus „Elektripaigaldise kaitsevööndi ulatus ja kaitsevööndis tegutsemise kord“ Regulation of the Minister of Economic Affairs and Communications “Extent of protection zone for an electrical installation and practical arrangements in a protection zone”	(RTL 2007, 27, 482)

Sotsiaalministri määrus „Müra normtasemed elu- ja puhkealadel, elamutes ning ühiskasutusega hoonetes ja müratasemе 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)

The following Estonian standards should be taken into account:

EVS-EN 1991-1-4:2005+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 1991-1-4:2005/A1:2010+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 50522:2010. *Üle 1 kV nimivahelduvpingega tugevvoolupaigaldiste maandamine.* Earthing of power installations exceeding 1 kV a.c.

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

EVS 843:2003. *Linnatänavad*. Town streets

EVS 884:2005. *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 14229:2010. *Ehituspuit. Õhuliinide puitpostid*. Structural timber – Wood poles for overhead lines.

EVS-EN 61773:2002. Overhead lines – Testing of foundations for structures

EVS-EN 1997-1:2005+NA:2006. *Eurokoodeks 7: Geotehniline projekteerimine. Osa 1: Üldeeskirjad*. Eurocode 7: Geotechnical design – Part 1: General rules

EVS-EN 1997-1:2005/A1:2013. *Eurokoodeks 7: Geotehniline projekteerimine. Osa 1: Üldeeskirjad*. Eurocode 7: Geotechnical design – Part 1: General rules

EVS-EN 60071-1. Insulation co-ordination – Part 1: Definitions, principles and rules

EVS-EN 60071-2. Insulation co-ordination – Part 2: Application guide

EVS-EN 61284:2002. Overhead lines – Requirements and tests for fittings

Other valid relevant normative regulatory documents should also be taken in 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	Lines exceeding AC 1 kV
1	Normal lines
2	Important lines
3	Very important lines
NOTE If line reliability is not specified in the Project Specification, the requirements of Level 1 apply.	

(A-dev) **EE.2 Wind load on temporary lines**

In accordance with the Estonian National Annex of EVS-EN 1991-1-4:2005+NA:2007, the recommended value of the seasonal coefficient c_{season} = 1,0.

(NCPT) **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 need not be considered.

3.2.3 Security requirements

(NCPT) **EE.1 Distance between tension supports**

In lines with nominal voltage exceeding AC 1 kV up to and including 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 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.

3.2.6 Additional considerations

(A-dev) **EE.1 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.2 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.

3.2.7 Design working life

(NCPT) **EE.1**

In general, design working life of lines with nominal voltage exceeding AC 1 kV up to and including 20 kV is 30 years; for lines with nominal voltage exceeding AC 20 kV it is 50 years. A different design working life may be specified in the Project Specification.

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.

3.6 Design values

3.6.3 Design value of a material property

(NCPT) **EE.1 Partial factors for actions**
Partial factors for a material property higher than those stated in Eurocodes 2, 3, 5, 7, and 8 may be specified in the Project Specification.

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 speed**
The following value shall be used for basic wind velocity ($V_{b,0}$) according to the Estonian National Annex of EVS-EN 1991-1-4:2005+NA:2007:

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

Other values of basic wind speed based on long-term statistics and local conditions can be specified in the Project Specification.

4.3.2 Mean wind velocity

(A-dev) **EE.1 Wind directional factor**
According to the Estonian National Annex of EVS-EN 1991-1-4:2005+NA:2007, the recommended value of the directional factor c_{dir} = 1,0.

(A-dev) **EE.2 Orography factor**
According to the Estonian National Annex of EVS-EN 1991-1-4:2005+NA:2007, the recommended value of the orography factor c_o = 1,0.

4.3.3 Mean wind pressure

(A-dev) **EE.1 Air density**
According to EVS-EN 1991-1-4:2005+NA:2007, the conservative value for air density ρ = 1,25 kg/m^3 is used in Estonia.

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 voltage up to AC 20 kV, reference height above ground *h* shall be taken as 10 m regardless of the actual height, provided that the structure height is a maximum of 20 m.

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

(NCPT) **EE.2 Mechanical tension in a section**
For calculating the mechanical tension in a section, the section length should be used as the span length.

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

4.4.1.3 Drag factor

(snc) **EE.1 Drag factor for conductors**
The drag factor for the conductor, C_C, shall be determined by method 1, i.e. C_C = 1,0.

4.4.2 Wind forces on insulator sets

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

Wind forces due to wind pressure on the insulator sets themselves may be neglected for the design of supports.

4.4.3 Wind forces on lattice towers

4.4.3.1 General

(snc) **EE.1 Method for determining of wind forces**
Wind forces on the tower itself can be determined by method 1, by which tower is divided into sections, or by method 2, by which each individual member of the tower is considered separately.

(snc) **EE.2 The reference height of lattice tower sections or members**
The reference height of lattice tower sections or members can be determined by any method given in Clause 4.4.3.1 of Part 1: either the same value is used for every section or member of a lattice tower, which is equal to 60 % of the total height of the tower, or the reference height for every section or member is determined separately as the height of the geometric centre of the corresponding section or member above ground.

4.4.4 Wind forces on poles

(snc) **EE.1 Method for determining the reference height**
The reference height to evaluate wind forces on poles can be determined either by method 1 or method 2.

4.5 Ice loads

4.5.2 Ice forces on conductors

(snc) **EE.1 Extreme ice load per unit length**

Extreme ice load per unit length I (N/m) shall be calculated by the following formula:

$$I = 9{,}82 \times 10^{-3}\ \rho_I\ \pi\ b\ (d + b)$$

where

b is the icing thickness, mm;

d is the diameter of conductor or earthwire, mm;

ρ_I is the ice density, g/cm^3.

Simplified:

$$I = 0{,}0277\ b\ (b + d)$$

Value of the icing thickness should be taken equal to 10 mm and the ice type should be glaze ice with density 0,90 g/cm^3, unless specified otherwise in the Project Specification.

4.6 Combined wind and ice loads

4.6.1 Combined probabilities

(snc) **EE.1 Load combinations and combination factors**

Values of load combinations and combination factors are given in Table 4.13/EE.1.

Load cases 2b*, 2c*, 2d*, 2e* and 3b need not be investigated for lines with nominal voltage exceeding AC 1 kV up to and including 20 kV.

4.6.2 Drag factors and ice densities

(snc) **EE.1 Drag factor and ice density**

Drag factor for glaze ice covered conductor C_{Ic} is 1,0.

4.7 Temperature effects

(snc) **EE.1 Ambient temperatures**

The following ambient temperatures should be used:

- Minimum temperature with no other climatic action: –40 °C,
  on Western Estonian islands: –30 °C;
- Normal ambient temperature (every day temperature): +5 °C;
- Maximum temperature: +35 °C;
- The temperatures applied to different load cases are given in Table 4.13/EE.

4.8 Security loads

4.8.1 General

(NCPT) **EE.1 Lines with nominal voltage of AC 20 kV and below**

Security loads need not be taken into account for lines with nominal voltages up to and including AC 20 kV unless specified otherwise in the Project Specification.