SLOVENSKI STANDARD
SIST EN 50341-2-16:2018

01-februar-2018

Nadzemni električni vodi za izmenične napetosti nad 1 kV - 2-16. del: Nacionalna normativna določila (NNA) za Norveško (na podlagi EN 50341-1:2012)

Overhead electrical lines exceeding AC 1 kV - Part 2-16: National Normative Aspects (NNA) for NORWAY (based on EN 50341-1:2012)

Lignes électriques aériennes dépassant 1 kV en courant alternatif - Partie 2-16 : Aspects Normatifs Nationaux pour la NORVEGE (Basé sur l'EN 50341-1:2012)

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EUROPEAN STANDARD

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English Version

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

This European Standard 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 CEN-CENELEC Management Centre has the same status as the official versions.

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

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Contents

European foreword

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

Norsk Elektroteknisk Komité
Mustads vei 1, NO-0283 Oslo
Phone no. +47 67 83 31 00
E-mail: Nek@nek.no

2 The Norwegian NC has prepared this Part 2-16 of EN 50341-1:2012, listing the Norwegian national normative aspects, under its sole responsibility, and duly passed it through the CENELEC and CLC/TC 11 procedures.

NOTE The Norwegian NC also takes sole responsibility for the technically correct coordination of this EN 50341-2-16 with EN 50341-1:2012. It has performed the necessary checks in the frame of quality assurance/control. It is noted however that this quality assurance/control has been made in the framework of the general responsibility of a standards committee under the national laws/regulations.

3 This EN 50341-2-16 is normative in Norway and informative for other countries.

4 This EN 50341-2-16 has to be read in conjunction with EN 50341-1:2012, hereinafter referred to as Part 1. All clause numbers used in this Part 2-16 correspond to those of Part 1.

Specific subclauses, which are prefixed "NO", are to be read as amendments to the relevant text in Part 1. Any necessary clarification regarding the application of Part 2-16 in conjunction with Part 1 shall be referred to the Norwegian NC who will, in cooperation with CLC/TC 11 clarify the requirements.

When no reference is made in Part 2-16 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 2-16 shall be taken into account in Norway.

However any "boxed values", whether in Part 1 or Part 2-16, shall not be amended in the direction of greater risk in a Project Specification.

6 The national Norwegian standards/regulations related to overhead electrical lines exceeding 1 kV (AC) are identified in 2.1/NO1.

NOTE All national standards referred to in this Part 2-16 will be replaced by the relevant European Standards as soon as they become available and are declared by the Norwegian NC to be applicable and thus reported to the secretary of CLC/TC 11.

Clause National regulation

1 Scope
(snc)

This Part 2-16 is applicable for new permanent overhead lines only and generally not for existing lines in Norway. If some planning/design or execution work on existing lines in Norway has to be performed, the degree of application of this Standard shall be agreed upon by the parties concerned and the authorities.

2 Normative references, definitions and symbols

2.1 NO.1 Normative references
(A-dev)

These references shall be added to the list:
Act No. 4 of 24 May 1929 of Supervision of Electrical Installations and Electrical Equipment Regulations for Electrical Installations – system for generating, transmission and distribution.

The Norwegian Regulations FEF 2006. Guidelines to the Norwegian Regulations FEF 2006.

If newer acts and regulations are issued, the ones mentioned above shall be replaced with the valid version.

3 NO.1 Basis of design
(snc)

Unless mentioned below, the clauses 3.1 - 3.7.4 may be considered as informative.

3.2 Requirements of overhead lines

3.2.1 NO.1 Basic requirements
(snc)

Generally minimum 50 year return periods shall be applied as basic loads.

4 Actions on lines

4.1 NO.1 Introduction
(snc)

May be considered as informative.

(snc) **NO.2 Types of load**

Permanent loads include self-weight of supports, insulator sets, other fixed equipment and of the conductors from the adjacent spans. Aircraft warning spheres and similar elements are also to be considered as permanent loads.

Climatic loads include wind, ice and combined wind and ice loads on conductors, insulator sets, lattice towers and poles.

Clause National regulation

Security loads include wire breakage.

Safety loads take the safety to the linesmen into consideration and also prevent collapse of the support by including load cases that may occur during construction and maintenance.

Other loads may include forces that occur due to short-circuit currents, avalanches, creeping snow, earthquakes etc.

4.2 (snc) **NO.1 Permanent loads**

Mentioned in clause 4.1 NO.2.

4.3 (snc) **NO.1 Wind Loads**

The text in Main Body may be considered as informative.

4.3.1 (snc) **NO.1 Field of application and basic wind velocity**

EN 1991-1-4 should normally be applied, alternatively wind velocities and their return periods may be asessed by an experienced meteorologist, and include effects of gust, height above ground, topography and the direction of the power line relative to that of the wind.

4.3.2 (snc) **NO.1 Mean wind velocity**

EN 1991-1-4 should normally be applied. The wind velocity of 10 m above ground may be considered constant up to 20 m above ground.

In fjords or valleys the given wind velocities in EN 1991-1-4 apply for a line direction parallel to the main direction of the fjord or valley. If the line direction is perpendicular to the fjord/valley direction, or if the line along a fjord/valley passes the mouth of a branch fjord/valley, the calculated wind velocity shall be multiplied by 1,2.

The calculated values may generally be deviated from if separate evaluations are made by meteorologist. In areas where strong winds are known to occur or may be expected, it is recommended that a meteorologist should be consulted.

4.3.3 (snc) **NO.1 Mean wind pressure**

EN 1991-1-4 should normally be applied.

Clause National regulation

4.3.4 NO.1 Turbulence intensity and peak wind pressure
(snc)

EN 1991-1-4 should normally be applied. In such case the wind velocity shall include the effects of gust.

For wind on the conductors an average direction factor of 0,9 may be applied to reduce the wind velocity when EN 1991-1-4 is applied. This reduction factor does not apply for wind pressure on the towers or any of their components.

4.3.5 NO.1 Wind forces on any overhead line component
(snc)

The value of the wind force, Q_W due to wind blowing horizontally at reference height above ground, h, perpendicular to any line component, is given by:

$$Q_W = 0{,}5\rho(V_T)^2 \, C \, A$$

ρ = The air density. Normally considered constant as 1,292 kg/m^3.

V_T = The wind velocity with return period T.

C = The drag factor (or force coefficient) depending on the shape of the line component being considered.

A = The area of the line component being considered, projected on a plane perpendicular to the wind direction.

To arrive at the actual design values according to the reliability class, the values of wind velocity or wind pressure have to be factored with their respective conversion factor given in Table 4.3.5/NO.1.

Table 4.3.5/NO.1

Return period T	Conversion factor V_T/V_{50}	Conversion factor q_T/q_{50}
3	0,763	0,58
50	1,000	1,00
150	1,087	1,18
500	1,182	1,40

4.4 Wind forces on overhead line components

4.4.1 NO.1 Wind forces on conductors
(snc)

Wind pressure on conductors gives forces transversal to the direction of the line as well as higher tension in the conductors. In addition to the components from the

Clause National regulation

conductor tension the wind load from each of the adjacent spans on the support may be calculated as:

$$F_C = \zeta^2\, 0{,}5\, C_C\, d\ \rho\, [(V_{T1})^2\, G_{L1}\, 0{,}5L_1 + (V_{T2})^2\, G_{L2}\, 0{,}5L_2)]$$

where

ζ : 0,9 (average conductor direction factor when EN 1991-1-4 is used).

ζ : 1,0 when wind velocities are given by a meteorologist.

C_C : drag coefficient for the conductor. For ordinary stranded conductors and regular wind speeds, C_C = 1,0. For smooth conductors C_C = 1,1.

d : diameter of conductor.

ρ : the air density, 1,292 kg/m^3.

V_{T1}, V_{T2} : the wind velocity with return period T acting normal to the conductor for L_1 and L_2 respectively and simultaneosly.

G_{L1}, G_{L2} : span factor (see below) for L_1 and L_2 respectively. .

L_1, L_2 : length of span L_1 and L_2 on their respective side of the support.

The total wind pressure on bundled conductors is set equal to the sum of that on the individual conductor without taking into accout possible sheltering effects on leeward conductors.

The span factor can be calculated as follows:

$G_L = 1$ for span lengths up to 100 m

$G_L = 1 - (L - 100)/1\,000$ for span lengths between 100 and 450 m

$G_L = 0{,}65$ for span lengths exceeding 450 m

Other span factors can be used after consulting a meteorologist, or as documented otherwise.

4.4.1.1 NO.1 General
(snc)

May be considered as informative.

4.4.1.2 NO.1 Structural factor
(snc)

Not to be used.

4.4.1.3 NO.1 Drag factor
(snc)

May be considered as informative.

4.4.2 NO.1 Wind forces on insulator sets
(snc)

These shall be specified in Project Specification.

Clause National regulation

4.4.3 NO.1 Wind forces on lattice towers
(snc)

These shall be specified in Project Specification. Clauses 4.4.3.1-3 may be considered as informative.

4.4.4 NO.1 Wind forces on poles
(snc)

These shall be considered.

For round timber a drag factor not less than 0,8 may be applied. For gluelam poles a drag factor of 2,0 is recommended.

4.5 Ice loads

4.5.1 NO.1 General
(snc)

Wet snow and hard rime ice are the two types of ice considered for design.

NO.2 Characteristic ice load

Table 4.5.1/NO.1 gives general 50 year values for the different regions in Norway, and is ment to be the basis for design where no other information is available. The given values will be currently adjusted as new information is available. The given values may be deviated from if separate evaluations are made by meteorologist.

For regions not covered in the table, meteorlogist should be consulted.

To arrive at the actual design values according to the reliability class, the values of Table 4.5.1/NO.1 has to be multiplied by the conversion factor given in Table 4.5.1/NO.2.

Table 4.5.1/NO.2

Return period T	Conversion factor I_T/I_{50} 1)
3	0,35
50	1,00
150	1,25
500	1,50

1) I_T and I_{50} are ice loads with return periods of T and 50 years periods respectively.

4.5.2 NO.1 Ice forces on conductors
(snc)

The weight span method does not apply. Loads from the conductors shall be based