SLOVENSKI STANDARD
SIST EN 50341-2-12:2019

01-april-2019

Nadzemni električni vodi za izmenične napetosti nad 1 kV - 2-12. del: Nacionalna normativna določila (NNA) za Islandijo (na podlagi EN 50341-1:2012)

Overhead electrical lines exceeding AC 1 kV - Part 2-12: National Normative Aspects (NNA) for ICELAND (based on EN 50341-1:2012)

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

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European Foreword

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

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Staðlaráð Íslands
Þórunnartúni 2
105 Reykjavík
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2 The Icelandic NC has prepared this Part 2-12 of EN 50341-1:2012 listing the Icelandic National Normative Aspects (NNA), under its sole responsibility, and duly passed it through the CENELEC and CLC/TC 11 procedures.

Note 1: The Icelandic NC also takes sole responsibility for the technically correct co-ordination of this EN 50341-2-12 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 EN 50341-2-12 is normative in Iceland and informative for other countries.

4 This Part 2-12 has to be read in conjunction with EN 50341-1, hereinafter referred to as Part 1. All clause numbers used in this Part 2-12 correspond to those of Part 1. Specific subclauses, which are prefixed “IS”, are to be read as amendments to the relevant text in Part 1. Any necessary clarification regarding the application of Part 2-12 in conjunction with Part 1 shall be referred to the Icelandic NC who will, in co-operation with CLC/TC 11 clarify the requirements.

When no reference is made in Part 2-12 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 2-12 shall be taken into account in Iceland.

However, any boxed value, whether in Part 1 or Part 2-12, shall not be amended in the direction of greater risk in a Project Specification.

6 The national Icelandic standards/regulations related to overhead electrical lines exceeding 1 kV (AC) are listed in subclause 2.1/IS.1.

NOTE All national standards referred to in this Part 2-12 will be replaced by the relevant European Standards as soon as they become available and are declared by the Icelandic NC to be applicable and thus reported to the secretary of CLC/TC 11.

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1 Scope

1.1 General

1.1 **IS.1 Application to new lines**

(snc) This Part 2-12 is only applicable to new overhead transmission lines exceeding 1 kV (AC). If deviations and/or extensions to existing transmission lines are planned, the Icelandic NC shall be informed and will decide case by case whether ÍST EN 50341 is applicable or not.

2 Normative references, definitions and symbols

2.1 Normative references

2.1 **IS.1 National normative laws and government regulations:**

(A-dev)

- Lög nr. 146/1996 um öryggi raforkuvirkja, neysluveitna og raffanga. *Act no. 146/1996 on the Safety of Electrical Installations, Consumer Apparatus and Electrical Materials.*
- Reglugerð um raforkuvirki nr. 678/2009, með áorðnum breytingum. *The Electrical Regulation no. 678/2009, with later changes.*
- Reglugerð um hávaða nr. 724/2008, með áorðnum breytingum. *The Regulation on noise no. 724/2008, with later changes.*

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3 Basis of design

3.2 Requirements of overhead lines

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3.2.2 Reliability requirements

3.2.2 **IS.1 Reliability requirements**

(snc) Three reliability levels are used for new transmission lines as shown in the following table:

Table 3.2.2/IS.1 Reliability levels

Reliability level	Voltage	Transmission lines
1	≤ 45 kV	Normal lines
	> 45 kV and ≤ 132 kV	Less important lines
2	≤ 45 kV	Very important lines
	> 45 kV and ≤ 132 kV	Normal lines
	> 132 kV and ≤ 400 kV	Less important lines
3	< 220 kV	Very important lines
	≥ 220 kV	Normal lines
Level 3 shall be used in built up or urban areas for lines ≥ 132 kV		

Level of importance shall be defined in Project Specification.

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3.2.5 Strength coordination

3.2.5 **IS.1 Strength coordination**

(snc) The partial factors γ_M for the resistance of all structural elements of tension and terminal supports shall be multiplied by the factor 1,1 for voltage ≥ 132 kV. This requirement does not need to be applied in the load case “Construction and maintenance” and “Security loads”.

4 Actions on lines

4.3 Wind loads

4.3.1 Field of application and basic wind velocity

4.3.1 **IS.1 Field of application and basic wind velocity**

(snc) The basic wind velocity ($V_{b,0}$), terrain category and the directional factor (C_{dir}) shall be given in the Project Specification for each line section. The values can either be according to the Icelandic National Annex of EN 1991-1-4 or be evaluated by experts using reliable extreme wind statistic and considering local conditions.

4.3.2 Mean wind velocity

4.3.2 **IS.1 Mean wind velocity**

(snc) A new terrain category with roughness length z_0 = 0,03 and terrain factor k_r = 0,182 is applicable in addition to terrain categories listed in table 4.1.

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4.3.3 Mean wind pressure

4.3.3 **IS.1 Mean wind pressure**

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(snc) The air density can be taken as ρ = 1,25 kg/m³. The use of other values that take into account air temperature and atmospheric pressures is optional.

4.4 Wind forces on overhead line components

4.4.1 Wind forces on conductors

4.4.1.1 General

4.4.1.1 **IS.1 General**

(ncpt) The reference height above ground, h, shall be taken as Method 1 unless the Project Specification specifies otherwise.

4.4.1.3 Drag factor

4.4.1.3 **IS.1 Drag factor**

(ncpt) The drag factor for bare stranded conductors shall be derived with Method 1, i.e. C_c = 1,0 unless the Project Specification specifies otherwise.

For the calculation of the conductor tension the span factor shall be based on the ruling span length unless otherwise specified in the Project Specification.

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4.4.3 Wind forces on lattice towers

4.4.3.1 General

4.4.3.1 **IS.1 General**

(ncpt) Method 1 and Method 2 can both be used.

4.4.3.2 Method 1

4.4.3.2 **IS.1 Wind load for lattice cross-arms**

(ncpt) Wind forces on rectangular lattice cross-arms with a ratio of length / height ≥ 12 can be estimated as follows:

$$Q_{Wtc} = q_p(h) \cdot G_{tc} \cdot C_{tc} \cdot A_{tc} \cdot \left(\sin^2\phi + \frac{1}{3}\cos^2\phi\right)$$

Where

$q_p(h)$ is the peak wind pressure;

G_{tc} is the structural factor for lattice cross-arms, the recommended value is 1,0;

C_{tc} is the drag factor for the lattice cross-arm in a wind perpendicular to the longitudinal axis of the cross-arm. For angle sections C_{tc} = 2,8;

A_{tc} is the effective wind area of the elements of the lattice cross-arm in the front panel face;

ϕ is the angle between wind direction and the longitudinal axis of the lattice cross-arm.

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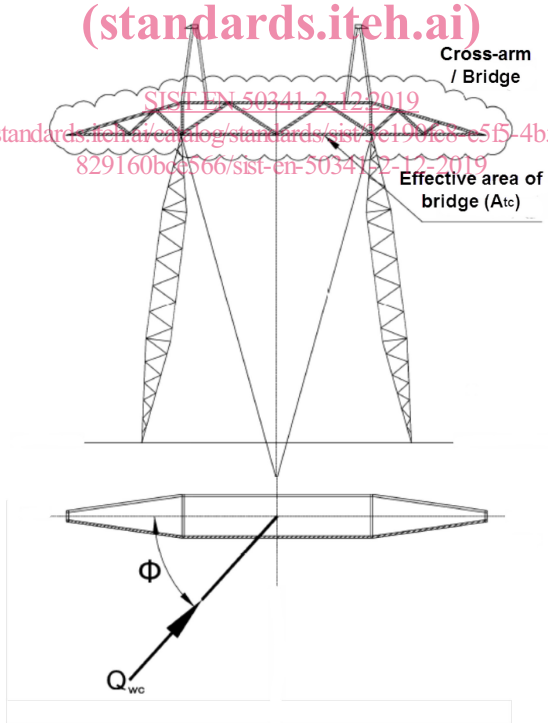

Figure 4.4.3.2/IS.1 Wind load for lattice cross-arm

4.4.3.3 Method 2

4.4.3.3 **IS.1 Drag factor for tower members**

(ncpt) The drag factor C_m can be taken lower than 1,6 provided that it gives not less loading than in Method 1. The drag factor C_m shall nevertheless be ≥ 1,2.

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4.5 Ice loads

4.5.2 Ice forces on conductors

4.5.2 **IS.1 Characteristic ice load**

(ncpt) The reference unit ice load (I_R) shall be specified in the Project Specification. It shall be based on a 30 mm single conductor at a height of 10 m above ground. Wet snow icing shall always be specified and in-cloud icing shall be specified where relevant.

The characteristic ice load (I_k) is determined by:

$$I_k = I_R \cdot k_d \cdot k_b \cdot k_h$$

Where

- I_R is the reference ice load (N/m) for a 30 mm single conductor 10 m above ground;
- k_d is the influence of conductor diameter on the ice load;
- k_b is the influence of the number of sub-conductors in a bundle on the ice load;
- k_h is the influence of conductor height above ground on the ice load.

The influence of conductor diameter and conductor height above ground on the characteristic ice load shall be taken as in the following table.

Table 4.5.1/IS.1 Influence of the conductor diameter and height above ground on the ice load, k_h and k_d

Parameter	Wet snow icing	In-cloud icing
k_h	1,0	1,0 + (h - 10) · 0,01 but $k_h \geq 1,0$
k_d	1,0 + 5 · (D – 0,03) but $k_d \geq 0,9$ and $k_d \leq 1,1$	

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- h is the height of conductor above ground in [m];
- D is the conductor diameter in [m].

The ice load can be reduced by the factor k_b when the number of sub-conductors in a bundle is greater than one provided that the sub-conductors are connected with spacers with regular intervals (<75m).

Table 4.5.2/IS.1 Ice loading reduction for bundle conductors, k_b

Reference ice load (I_R) [N/m]	Number of conductors in a bundle		
	1 (simplex)	2 (duplex)	3 (triplex)
0 – 50	1,0	1,0	1,0
50 – 250	1,0	1,075 – 0,0015 · I_R	1,125 – 0,0025 · I_R
> 250	1,0	0,7	0,5

Extreme ice load (I_T) is determined by:

$$I_T = \gamma_I \cdot \psi_I \cdot I_k$$

Values for combined partial (γ) and combination (ψ) factors are given in table 4.13/IS.1 for $\psi_I \cdot \gamma_I$.

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4.5.2 **IS.2 Ice on structures and insulators**

(snc) No ice is considered on structures or insulators in case of wet-snow icing.

In case of in-cloud icing, ice shall be applied to tower members, guys and insulators by assuming the ice load as 0,8 · I_R. The ice shape can be assumed to have a constant thickness around the profile cross section.

4.6 Combined wind and ice loads

4.6.1 Combined probabilities

4.6.1 **IS.1 Combined probabilities**

(snc) The wind velocity in a combined wind and ice load (V_{Comb}) shall be determined based on extreme wind velocity on site with a reference return period of 50 years (V_{50}) by:

$$V_{Comb} = V_{50} \cdot \sqrt{\gamma_W \cdot \psi_W}$$

The ice load (I_{Comb}) in the combination of wind and ice load shall be determined based on the characteristic ice load (I_k) by:

$$I_{Comb} = \gamma_I \cdot \psi_I \cdot I_k$$

Values for combined partial (γ) and combination (ψ) factors are given in table 4.13/IS.1 for $\psi_W \cdot \gamma_W$ and $\psi_I \cdot \gamma_I$.

4.6.2 Drag factors and ice densities

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4.6.2 **IS.1 Drag factors and ice densities**

(snc) The drag factor and ice density for icing shall be taken in accordance with the following table.

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Table 4.6/IS.1 Drag factors and ice density for icing

Ice type	Wet snow	In-cloud icing
Drag factor, C_{ic}	1,0	1,1
Density, ρ_i [kg/m³]	700	500

4.7 Temperature effects

4.7 **IS.1 Temperature effects**

(snc) The following temperature values shall be used unless otherwise specified in the Project Specification:

extreme wind condition, 0°C;

wet snow icing condition, 0°C;

in-cloud icing condition, -5 °C.

4.8 Security loads

4.8.1 General

4.8.1 **IS.1 General**

(snc) A security load should generally not be considered for supports at less than 132 kV or for wood poles supports at 132 kV.