NEMETSCHEK Scia

Stade des Alpes - Grenoble
Etudes et Techniques Internationales (ETI)

Theoretical Background

National Annexes to EN 1991

Scia Engineer

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Version Information

Welcome to the Theoretical Background for National Annexes to EN 1991-1-3 and EN 1991-1-4.

This document provides background information regarding the application of NDP items according to different countries.

Version info

Document Title	Theoretical Background – National Annexes to EN 1991
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Introduction

In this Theoretical background in depth information is given regarding the application of National Annexes to EN 1991-1-3 and EN 1991-1-4 for different countries.

More specifically this concerns the following codes:

Eurocode 1: Actions on structures - Part 1-3: General actions - Snow loads
EN 1991-1-3/2003-12 (AC: 2009-03)

Eurocode 1: Actions on structures - Part 1-4: General actions – Wind actions
EN 1991-1-4/2005-04 (AC: 2010-01)

The first chapter gives an overview of all NDP articles given in EN 1991-1-3 and EN 1991-1-4 and specifies which of those articles are supported by Scia Engineer.

The subsequent chapters provide details on the specific implementation of the supported articles for different countries.

National Choice in EN 1991-1-3

This chapter specifies the articles of EN 1991-1-3 in which a national choice is allowed. In addition for each article information is given if the article is supported within Scia Engineer.

EN 1991-3

Article	Commentary
1.1(2)	NA may give guidance for the treatment of snow loads for altitudes above 1 500 m. *No default implementation/Not supported for Scia Engineer*
1.1(4)	NA may give modifications to shape coefficients (in the Annex B) *No default implementation/Not supported for Scia Engineer*
2(3), 2(4)	The National Annex may give the conditions of use of the exceptional snow load *No default implementation/Not supported for Scia Engineer*
3.3(1), 3.3(3)	The National Annex may define which design situation to apply for a particular local effect described in Section 6 *No default implementation/Not supported for Scia Enginer*
4.1(1)	Characteristic snow load on the ground s_k *NA data (formulae) supported in Scia Engineer*
4.2(1)	Representative values of snow load (ψ_0, ψ_1, ψ_2) *NA data supported in Scia Engineer*
4.3(1)	Exceptional snow load on the ground s_{Ad} *NA data supported in Scia Engineer*
5.2(1), 5.2(4), 5.2(5), 5.2(6)	The load arrangement. It can be modified by National annexes. *No default implementation/Not supported for Scia Enginer*
5.2(7)	The exposure coefficient C_e *NA data supported in Scia Engineer*
5.2(8)	The thermal coefficient C_t *NA data supported in Scia Engineer*
5.3.3(4), 5.3.4(3), 5.3.5(1), 5.3.5(3), 5.3.6(1), 5.3.6(3)	The roof shape coefficient. *No default implementation/Not supported for Scia Enginer*
A(1) (through table A1)	Design situations and load arrangements for different locations *No default implementation/Not supported for Scia Enginer*

National Annexes

This chapter provides details on the specific implementation of the supported articles for different countries. Only those items for which a country differs from the default EN are elaborated. For more information reference is made to the EN code and the respective National Annex documents.

EN 1991-1-3

Austria

According to Austrian National Annex ÖNORM B EN 1991-1-3/NA: 2006-04

Article	Commentary
4.1(1)	*Characteristic snow load calculated using formula* $$s_k = (0{,}642 \cdot Z + 0{,}009) \cdot \left[1 + \left(\frac{A}{728}\right)^2\right]$$ Where the: Z means snow zone; A means altitude above the sea level
4.2(1)	*Using the default EN*
4.3(1)	*Using the default EN*
5.2(7)	*Using the default EN*
5.2(8)	*Using the default EN*

Belgium

According to Belgian National Annex NBN EN 1991-1-3/NA:2007-10

Article	Commentary
4.1(1)	*Characteristic snow load calculated using formula* $s_k = 0{,}50\ \mathrm{kN/m^2}$ voor $A \leq 100$ m; $s_k = 0{,}50 + 0{,}007(A - 100)/6$ voor $100\ \mathrm{m} < A \leq 700$ m. Where the: A means altitude above the sea level
4.2(1)	*Using the default EN*
4.3(1)	*For the Belgium should be used value C_esl = 1*
5.2(7)	*Using the default EN*
5.2(8)	*Using the default EN*

Czech Republic

According to Czech National Annex ČSN EN 1991-1-3/NA:2005-08 + ČSN EN 1991-1-3:2005/Z1:2006

Article	Commentary
4.1(1)	*Characteristic snow load is taken according to the snow zone* S_k(I)=0,70 kN/m^2 S_k (II)=1,00 kN/m^2 S_k (III)=1,5 kN/m^2 S_k (IV)=2,0 kN/m^2 S_k (V)=2,5 kN/m^2 S_k (VI)=3,0 kN/m^2 S_k (VII)=4,0 kN/m^2 S_k (VIII) = user defined value
4.2(1)	*Using the default EN*
4.3(1)	*Exceptional snow load is not considered in the Czech Republic.*
5.2(7)	*Using the default EN*
5.2(8)	*Using the default EN*

Finland

According to Finnish National Annex SFS EN 1991-1-3/NA

Article	Commentary
4.1(1)	*User inputs the value of snow load manually according to the map from code*
4.2(1)	*(see table below)*
4.3(1)	*Exceptional snow load is not considered in the Finland.*
5.2(7)	*Exposure coefficient specified by the user according to the Annex.*
5.2(8)	*Thermal coefficient specified by the user according to the Annex.*

4.2(1):

Snow load	ψ_0	ψ_1	ψ_2
s_k < 2,75 kN/m^2	0,7	0,4	0,2
s_k ≥2,75 kN/m^2	0,7	0,5	0,2

France

According to French National Annex NF EN 1991-1-3/NA:2007-05

<table>
<tr><th>Article</th><th>Commentary</th></tr>
<tr><td>4.1(1)</td><td>

Characteristic snow load is taken according to the snow zone

<table>
<tr><td>Régions :</td><td>A1</td><td>A2</td><td>B1</td><td>B2</td><td>C1</td><td>C2</td><td>D</td><td>E</td></tr>
<tr><td>Valeur caractéristique (S_k) de la charge de neige sur le sol à une altitude inférieure à 200 m :</td><td>0,45</td><td>0,45</td><td>0,55</td><td>0,55</td><td>0,65</td><td>0,65</td><td>0,90</td><td>1,40</td></tr>
</table>

with respect to the altitude modification

<table>
<tr><th>Altitude A</th><th>Δs_1</th><th>Δs_2</th></tr>
<tr><td>de 200 à 500 m</td><td>A/1000 – 0,20</td><td>1,5 A/1000 – 0,30</td></tr>
<tr><td>de 500 à 1000 m</td><td>1,5 A/1000 – 0,45</td><td>3,5 A/1000 – 1,30</td></tr>
<tr><td>de 1000 à 2000 m</td><td>3,5 A/1000 – 2,45</td><td>7 A/1000 – 4,80</td></tr>
</table>

</td></tr>
<tr><td>4.2(1)</td><td>Using the default EN</td></tr>
<tr><td>4.3(1)</td><td>

Exceptional snow load is taken according to the snow zone.

<table>
<tr><td>Régions :</td><td>A1</td><td>A2</td><td>B1</td><td>B2</td><td>C1</td><td>C2</td><td>D</td><td>E</td></tr>
<tr><td>Valeur de calcul (S_{Ad}) de la charge exceptionnelle de neige sur le sol :</td><td>—</td><td>1,00</td><td>1,00</td><td>1,35</td><td>—</td><td>1,35</td><td>1,80</td><td>—</td></tr>
</table>

</td></tr>
<tr><td>5.2(7)</td><td>Exposure coefficient specified by the user according to the Annex.
When the quasi-permanent protection conditions of the roof due to neighbouring buildings avoid the snow from being moved by the wind then the value 1,25 is recommended.</td></tr>
<tr><td>5.2(8)</td><td>Using the default EN</td></tr>
</table>

Germany

According to German National Annex ÖNORM E DIN EN 1991-1-3/NA: 2007

<table>
<tr><th>Article</th><th>Commentary</th></tr>
<tr><td>4.1(1)</td><td>

Characteristic snow load calculated using formulae

Zone 1: $$s_k = 0{,}19 + 0{,}91 \cdot \left(\frac{A+140}{760}\right)^2$$

Zone 2: $$s_k = 0{,}25 + 1{,}91 \cdot \left(\frac{A+140}{760}\right)^2$$

Zone 3: $$s_k = 0{,}31 + 2{,}91 \cdot \left(\frac{A+140}{760}\right)^2$$

Where the:

A means altitude above the sea level

</td></tr>
<tr><td>4.2(1)</td><td>Using the default EN</td></tr>
<tr><td>4.3(1)</td><td>Using the default EN</td></tr>
<tr><td>5.2(7)</td><td>Using the default EN</td></tr>
<tr><td>5.2(8)</td><td>Using the default EN</td></tr>
</table>

Netherlands

According to Dutch National Annex NEN EN 1991-1-3/NA: 2007-11

Article	Commentary
4.1(1)	*The characteristic values of the snow load on the ground for every site in the Netherlands shall be taken as s_k = 0,7 kN/m²*
4.2(1)	$\psi_0 = 0$ $\psi_1 = 0,2$ $\psi_2 = 0$
4.3(1)	*Exceptional snow load is not considered in the Netherlands.*
5.2(7)	*The exposure coefficient for every site in the Netherlands is C_e = 1,0.*
5.2(8)	*The thermal coefficient for every building in the Netherlands is C_t = 1,0 unless specified differently in an other Dutch standard.*

United Kingdom

According to British National Annex BS EN 1991-1-3/NA 2003

Article	Commentary
4.1(1)	*The characteristic values of the snow load on the ground is calculated using following formula:* $s_k = [0,15 + (0,1Z + 0,05)] + \left(\frac{A-100}{525}\right)$ (NA.1) *Please note that there is **(A-100)** as the original (A+100) gives wrong results. This modification will be part of next BS-EN corigenda.*
4.2(1)	*Using the default EN*
4.3(1)	*Using the default EN*
5.2(7)	*The recommended value of exposure coefficient C_e in the UK is 1,0 for all topographies.*
5.2(8)	*The recommended value of thermal coefficient C_t in the UK is 1,0 for all roofing materials*

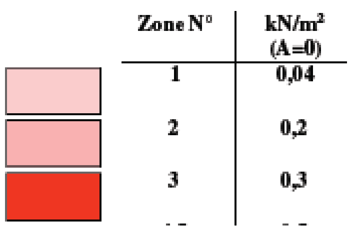
Slovakia

According to Slovak National Annex STN EN 1991-1-3/NA: 2004-12

Article	Commentary
4.1(1)	*Characteristic snow load is taken according to the snow zone* S_k(I)=0,75 kN/m^2 S_k (II)=1,05 kN/m^2 S_k (III)=1,5 kN/m^2 S_k (IV)=2,25 kN/m^2 S_k (V) = user defined value
4.2(1)	*Using the default EN*
4.3(1)	*Using the default EN*
5.2(7)	*The recommended value of exposure coefficient C_e in the Slovakia is 1,0 for all topographies.*
5.2(8)	*The recommended value of thermal coefficient C_t in the Slovakia is 1,0.*

Ireland

According to Irish National Annex IS EN 1991-1-3/NA: 2007-03

Article	Commentary
4.1(1)	*The characteristic values of the snow load on the ground is calculated using following formula:* $$s_k = 0{,}140Z - 0{,}1 + \frac{A}{501}$$ ***minimum Sk = 0,25 kN/m^2*** ***minimum A = 100 m*** Where the: Z – zone number from the map A – altitude above the sea level 
4.2(1)	*Using the default EN*
4.3(1)	*Exceptional snow load is not considered in the Ireland.*
5.2(7)	*Using the default EN*
5.2(8)	*Using the default EN*

Poland

According to Slovak National Annex PN EN 1991-1-3/NA: 2005/ AP1:2010

<table>
<tr><th>Article</th><th>Commentary</th></tr>
<tr><td>4.1(1)</td><td>The characteristic values of the snow load on the ground is calculated using following table:

Tablica NB.1 – Wartości charakterystyczne obciążenia śniegiem gruntu w Polsce
<table>
<tr><th>Strefa</th><th>s_k, kN/m^2</th></tr>
<tr><td>1</td><td>0,007A – 1,4; $s_k \geq 0,70$</td></tr>
<tr><td>2</td><td>0,9</td></tr>
<tr><td>3</td><td>0,006A – 0,6; $s_k \geq 1,2$</td></tr>
<tr><td>4</td><td>1,6</td></tr>
<tr><td>5</td><td>0,93exp(0,00134A); $s_k \geq 2,0$</td></tr>
<tr><td colspan="2">UWAGA: A = Wysokość nad poziomem morza (m)</td></tr>
</table>
Where the:
A – altitude above the sea level</td></tr>
<tr><td>4.2(1)</td><td>Using the default EN</td></tr>
<tr><td>4.3(1)</td><td>Exceptional snow load is not considered in the Poland.</td></tr>
<tr><td>5.2(7)</td><td>Using the default EN</td></tr>
<tr><td>5.2(8)</td><td>Thermal coefficient specified by the user according to the Annex.</td></tr>
</table>

Slovenia

According to Slovenian National Annex SIST EN 1991-1-3/NA:2004/A101:2008 (sl)

Article	Commentary
4.1(1)	*The characteristic values of the snow load on the ground is calculated using following formulae: (with respect to the snow zone)* A1 $s_k = 0{,}651\left[1+\left(\frac{A}{728}\right)^2\right]$ A2 $s_k = 1{,}293\left[1+\left(\frac{A}{728}\right)^2\right]$ A3 $s_k = 1{,}935\left[1+\left(\frac{A}{728}\right)^2\right]$ A4 $s_k = 2{,}577\left[1+\left(\frac{A}{728}\right)^2\right]$ M1 $s_k = 0{,}289\left[1+\left(\frac{A}{452}\right)^2\right]$ Where the: A – altitude above the sea level
4.2(1)	*Using the default EN*
4.3(1)	*In the Republic of Slovenia, this section applies only in places higher than 1500 m above sea level. Here the recommended value of C_esl = 2,0 is considered.*
5.2(7)	*Using the default EN*
5.2(8)	*Using the default EN*

Greece

According to Greek National Annex ELOT EN 1991-1-3/NA:2009

<table>
<tr><th>Article</th><th>Commentary</th></tr>
<tr><td>4.1(1)</td><td>The characteristic values of the snow load on the ground is calculated using following formulae: (with respect to the snow zone)
$$s_{k,A} = s_{k,0}\left[1+\left(\frac{A}{917}\right)^2\right]$$
<table>
<tr><th>Zone</th><th>$s_{k,0}$ (kN/m²)</th></tr>
<tr><td>A</td><td>0.4</td></tr>
<tr><td>B</td><td>0.8</td></tr>
<tr><td>C</td><td>1.7</td></tr>
</table>
Where the:
A – altitude above the sea level</td></tr>
<tr><td>4.2(1)</td><td>Using the default EN</td></tr>
<tr><td>4.3(1)</td><td>Using the default EN</td></tr>
<tr><td>5.2(7)</td><td>Using the default EN</td></tr>
<tr><td>5.2(8)</td><td>Using the default EN</td></tr>
</table>

Romania

According to Romanian National Annex SR EN 1991-1-3/NA:2006-09

<table>
<tr><th>Article</th><th>Commentary</th></tr>
<tr><td>4.1(1)</td><td>The characteristic values of the snow load on the ground is calculated using table
Zona 1: s_k=1,5 kN/m²
Zona 2: s_k=2,0 kN/m²
Zona 3: s_k=2,5 kN/m²
For buildings situated from 1000m to 1500m altitude , the characteristic values of the snow load from the ground are calculated with the following relations:
$s_k = 1,5 + 0,00602(A - 1000)$ pentru Zona 1: s_k=1,5 kN/m²
$s_k = 2,0 + 0,00560(A - 1000)$ pentru Zona 2: s_k=2,0 kN/m²
Where the:
A – altitude above the sea level</td></tr>
<tr><td>4.2(1)</td><td>
<table>
<tr><th>Acțiunea zăpezii</th><th>ψ_0</th><th>ψ_1</th><th>ψ_2</th></tr>
<tr><td>Toate amplasamentele</td><td>0,7</td><td>0,5</td><td>0,4</td></tr>
</table></td></tr>
<tr><td>4.3(1)</td><td>Using the default EN</td></tr>
<tr><td>5.2(7)</td><td>Using the default EN</td></tr>
<tr><td>5.2(8)</td><td>Using the default EN</td></tr>
</table>

National Choice in EN 1991-1-4

This chapter specifies the articles of EN 1991-1-4 in which a national choice is allowed. In addition for each article information is given if the article is supported within Scia Engineer.

EN 1991-1-4

Article	Commentary
1.1(11) Note 1	Scope of the code with respect to the structure type *No default implementation/Not supported for Scia Engineer*
1.5(2)	Design assisted by testing and measurements *No default implementation/Not supported for Scia Engineer*
4.1(1)	Calculation of the wind velocity and the wind pressure *NA data supported in Scia Engineer*
4.2(1)P Note 1	Influence of the altitude on the basic wind velocity *NA data supported in Scia Engineer*
4.2(1)P Notes 2 and 3	Directional and season factor c_{dir}, c_{season} *Coefficient inputted by the user*
4.2(1)P Note 5	Values of K and n factors *NA data supported in Scia Engineer*
4.3.1(1) Notes 1 and 2	Variation of the wind velocity with the height *For cr(z) see 4.3.2(1)* *Orography factor $c_o(z)$ inputted by the user as a constant value*
4.3.2(1)	Terrain roughness factor $c_r(z)$ *NA data supported in Scia Engineer*
4.3.2(2)	Terrain roughness factor with respect to the wind direction *No default implementation/Not supported for Scia Engineer*
4.3.3(1)	Orography *See 4.3.1(1) Note 2*
4.3.4(1)	Influence of neighbouring structures *No default implementation/Not supported for Scia Engineer*
4.3.5(1)	Closely spaced buildings *No default implementation/Not supported for Scia Engineer*
4.4(1) Note 2	Wind turbulence factor $I_v(z)$ *NA data supported in Scia Engineer*

4.5(1) Note 1	Peak velocity pressure *NA data supported in Scia Engineer*
4.5(1) Note 2	Air density *NA data supported in Scia Engineer*
5.3(5)	Correlation between windward and leeward sides *No default implementation/Not supported for Scia Engineer*
6.1(1) 6.3.1(1) Note 3	Size and dynamic coefficients *No default implementation/Not supported for Scia Engineer*
6.3.2(1)	Serviceability assessments *No default implementation/Not supported for Scia Engineer*
7.1.2(2) 7.1.3(1) 7.2.1(1) Note 2 7.2.2(1) 7.2.2(2) Note 1 7.2.8(1) 7.2.9(2) 7.2.10(3) Notes 1 and 2 7.4.1(1) 7.4.3(2) 7.6(1) Note 1 7.7(1) Note 1 7.8(1) 7.10(1) Note 1 7.11(1) Note 1 7.13(1) 7.13(2)	Pressure coefficients c_{pe} *No default implementation/Not supported for Scia Engineer*
8.1(1) Notes 1 and 2 8.1(4) 8.1(5) 8. 2(1) Note 1 8.3(1) 8.3.1(2) 8.3.2(1) 8.3.3(1) Note 1 8.3.4(1) 8.4.2(1) Notes 1 and 2	Wind actions on bridges *No default implementation/Not supported for Scia Engineer*
A.2(1)	Transitions between roughness categories *No default implementation/Not supported for Scia Engineer*

E.1.3.3(1) E.1.5.1(1) Notes 1 and 2 E.1.5.1(3) E.1.5.2.6(1) Note 1 E.1.5.3(2) Note 1 E.1.5.3(4) E.1.5.3(6)	Vortex shedding *No default implementation/Not supported for Scia Engineer*
E.3	Interference galloping *No default implementation/Not supported for Scia Engineer*

National Annexes

This chapter provides details on the specific implementation of the supported articles for different countries. Only those items for which a country differs from the default EN are elaborated. For more information reference is made to the EN code and the respective National Annex documents.

EN 1991-1-4

Austria

According to Austrian National Annex ÖNORM B EN 1991-1-4/NA: 2006-12

Article	Commentary
4.1(1)	*The value of $v_{b.0}$ is specified by the user according to the Table A.1 from the Annex.*
4.2(1)P Note 1	*Influence of the altitude is included in the Table A.1.*
4.2(1)P Notes 2 and 3	*Using the default EN*
4.2(1)P Note 5	*Using the default EN*
4.3.1(1) Notes 1 and 2	*For $c_r(z)$ see 4.3.2(1)* *Orography factor $c_o(z)$ inputted by the user as a constant value*
4.3.2(1)	*The factor $c_r(z)$ is not needed for evaluation of $q_p(z)$ according to the Austrian Annex*
4.4(1) Note 2	*The turbulence factor $I_v(z)$ is not needed for evaluation of $q_p(z)$ according to the Austrian Annex*
4.5(1) Note 1	*Peak velocity pressure is enumerated according to following formulae* Gelände: $\frac{q_p}{q_b} = \frac{q_p}{q_{b,0}}$ II: $2{,}1 \cdot \left(\frac{z}{10}\right)^{0{,}24}$ III: $1{,}75 \cdot \left(\frac{z}{10}\right)^{0{,}29}$ IV: $1{,}2 \cdot \left(\frac{z}{10}\right)^{0{,}38}$
4.5(1) Note 2	*Using the default EN*

Belgium

According to Belgian National Annex NBN EN 1991-1-4/NA: 2010-05

Article	Commentary
4.1(1)	*The value of $v_{b.0}$ is specified by the user by selection from values 23, 24, 25, 26 m/s*
4.2(1)P Note 1	*Influence of the altitude is not considered in the Belgian Annex*
4.2(1)P Notes 2 and 3	*c_{dir}, c_{season} factors specified by the user according to the Annex.*
4.2(1)P Note 5	*Using the default EN*
4.3.1(1) Notes 1 and 2	*For cr(z) see 4.3.2(1)* *Orography factor co(z) inputted by the user as a constant value*
4.3.2(1)	*k_r – formula from the default EN* *z_{min}, z_0 – from the default EN*
4.4(1) Note 2	*$I_v(z)$ – formula from the default EN* *k_i, – according to the Annex formula* $k_I = c_0(z)\,(1 - 2.10^{-4}(\log_{10}(z_0) + 3)^6)$
4.5(1) Note 1	*Using the default EN* formulae
4.5(1) Note 2	*Using the default EN*

Czech Republic

According to Czech National Annex
ČSN EN 1991-1-4/NA:2005-04 + ČSN EN 1991-1-4:2007-9/O1:2008-09

Article	Commentary
4.1(1)	*The value of $v_{b.0}$ is taken according to the wind zone* $v_{b.0}$(I)=22,5 m/s $v_{b.0}$ (II) =25 m/s $v_{b.0}$ (III) =27,5 m/s $v_{b.0}$ (IV) =30 m/s $v_{b.0}$ (V) =36 m/s (can be modified by the user)
4.2(1)P Note 1	*Influence of the altitude is not considered in the Annex*
4.2(1)P Notes 2 and 3	*Directional and season factors c_{dir}, c_{season} are to be taken 1,0*
4.2(1)P Note 5	*Using the default EN*
4.3.1(1) Notes 1 and 2	*For $c_r(z)$ see 4.3.2(1)* *Orography factor $c_o(z)$ inputted by the user as a constant value*
4.3.2(1)	*Using the default EN*
4.4(1) Note 2	*Using the default EN*
4.5(1) Note 1	*Using the default EN*
4.5(1) Note 2	*Using the default EN*

Finland

According to Finnish National Annex SFS EN 1991-1-4/NA

Article	Commentary
4.1(1)	*Mainland in the entire country* $v_{b,0} = 21$ m/s *Sea areas: open sea, scattered islands out in the open sea* $v_{b,0} = 22$ m/s *In Lappland: at the top of mountains* $v_{b,0} = 26$ m/s *In Lappland: at the bottom of mountains* $v_{b,0} = 21$ m/s.
4.2(1)P Note 1	*Influence of the altitude is not considered in the Annex*
4.2(1)P Notes 2 and 3	*Using the default EN*
4.2(1)P Note 5	*Using the default EN*
4.3.1(1) Notes 1 and 2	*For cr(z) see 4.3.2(1)* *The possibility of a thermal surface inversion should be considered while designing high-rise structures (h > 100 m). The function* $c_o(z)$ *is then replaced by the function* $c_{INV}(z) \cdot c_o(z)$. *The value of those functions are inputted by the user as a constant value*
4.3.2(1)	*Formula from the default EN is used For the terrain category 0, however, the terrain factor is taken as* $k_r = 0{,}18$ *instead of the value arising from Eq. (4.5)*
4.4(1) Note 2	*Using the default EN*
4.5(1) Note 1	*Using the default EN*
4.5(1) Note 2	*User can decide between the default EN value and annex formula* $\rho = 353/T * e^{-0{,}00012\,H}$ *Where: T is the absolute temperature [K]* *H is altitude above the sea level at the site*

France

According to French National Annex NF EN 1991-1-4/NA:2008-03

Article	Commentary
4.1(1)	*Mainland zone 1* $v_{b,0} = 22$ m/s *Mainland zone 2* $v_{b,0} = 24$ m/s *Mainland zone 3* $v_{b,0} = 26$ m/s *Mainland zone 4* $v_{b,0} = 28$ m/s *Guadeloupe* $v_{b,0} = 36$ m/s *Guyana* $v_{b,0} = 17$ m/s *Martinique* $v_{b,0} = 32$ m/s *Reunion* $v_{b,0} = 34$ m/s
4.2(1)P Note 1	*Influence of the altitude is not considered in the Annex*
4.2(1)P Notes 2 and 3	c_{dir}, c_{season} *factors specified by the user according to the Annex*
4.2(1)P Note 5	*K=0,15 for p>0,02 (1/p < 50)* *K=0,2 for p>=0,02 (1/p >=50)* *where the 1/p is the life period of the building* *n = 0,5*
4.3.1(1) Notes 1 and 2	*For cr(z) see 4.3.2(1)* *Orography factor $c_o(z)$ inputted by the user as a constant value*
4.3.2(1)	see table below
4.4(1) Note 2	*Using the default EN*
4.5(1) Note 1	*Using the default EN*
4.5(1) Note 2	$\rho = 1{,}225$ kg/m^3

4.3.2(1):

Category of the terrain	z_0	z_{min}
0	0,005	1
II	0,05	2
III a	0,20	5
III b	0,5	9
IV	1,0	15

Germany

According to German National Annex E DIN EN 1991-1-4/NA:2008-09

<table>
<tr><th>Article</th><th>Commentary</th></tr>
<tr><td>4.1(1)</td><td>The value of $v_{b.0}$ is specified by the user according to the table from the Annex.
WZ1 $v_{b.0}$ = 22,5 m/s
WZ2 $v_{b.0}$ = 25 m/s
WZ3 $v_{b.0}$ = 27,5 m/s
WZ4 $v_{b.0}$ = 30 m/s</td></tr>
<tr><td>4.2(1)P Note 1</td><td>For the H_s > 800 the wind speed is increased by (0,2 + (H_s/1 000))
where the H_s means the altitude above the sea level</td></tr>
<tr><td>4.2(1)P Notes 2 and 3</td><td>Using the default EN</td></tr>
<tr><td>4.2(1)P Note 5</td><td>K = 0,1
n = 1</td></tr>
<tr><td>4.3.1(1) Notes 1 and 2</td><td>For cr(z) see 4.3.2(1)
Orography factor $c_o(z)$ inputted by the user as a constant value</td></tr>
<tr><td>4.3.2(1)</td><td>The factor $c_r(z)$ is not needed for evaluation of $q_p(z)$ according to the German Annex</td></tr>
<tr><td>4.4(1) Note 2</td><td>The turbulence factor $I_v(z)$ is not needed for evaluation of $q_p(z)$ according to the German Annex</td></tr>
<tr><td>4.5(1) Note 1</td><td>
<table>
<tr><th>Geländekategorie</th><th>I</th><th>II</th><th>III</th><th>IV</th></tr>
<tr><td>Mindesthöhe z_{min}</td><td>2,00 m</td><td>4,00 m</td><td>8,00 m</td><td>16,00 m</td></tr>
<tr><td>Mittlere Windgeschwindigkeit v_m für $z > z_{min}$</td><td>$1,18 \times v_b (z/10)^{0,12}$</td><td>$1,00 \times v_b (z/10)^{0,16}$</td><td>$0,77 \times v_b (z/10)^{0,22}$</td><td>$0,56 \times v_b (z/10)^{0,30}$</td></tr>
<tr><td>v_m / v_b für $z < z_{min}$</td><td>0,97</td><td>0,86</td><td>0,73</td><td>0,64</td></tr>
<tr><td>Turbulenzintensität I_v für $z > z_{min}$</td><td>$0,14 \times (z/10)^{-0,12}$</td><td>$0,19 \times (z/10)^{-0,16}$</td><td>$0,28 \times (z/10)^{-0,22}$</td><td>$0,43 \times (z/10)^{-0,30}$</td></tr>
<tr><td>I_v für $z < z_{min}$</td><td>0,17</td><td>0,22</td><td>0,29</td><td>0,37</td></tr>
<tr><td>Böengeschwindigkeitsdruck q_p für $z > z_{min}$</td><td>$2,6 \times q_b (z/10)^{0,19}$</td><td>$2,1 \times q_b (z/10)^{0,24}$</td><td>$1,6 \times q_b (z/10)^{0,31}$</td><td>$1,1 \times q_b (z/10)^{0,40}$</td></tr>
<tr><td>q_p / q_b für $z < z_{min}$</td><td>1,9</td><td>1,7</td><td>1,5</td><td>1,3</td></tr>
</table>
</td></tr>
<tr><td>4.5(1) Note 2</td><td>Using the default EN</td></tr>
</table>

Netherlands

According to Dutch National Annex NEN EN 1991-1-4/NA: 2006-12 Ontw.

<table>
<tr><th>Article</th><th>Commentary</th></tr>
<tr><td>4.1(1)</td><td>The value of $v_{b.0}$ is taken according to the wind zone

$v_{b.0}$(I)=29 m/s
$v_{b.0}$ (II) =27 m/s
$v_{b.0}$ (III) =24,5 m/s</td></tr>
<tr><td>4.2(1)P Note 1</td><td>Influence of the altitude is not considered in the Annex</td></tr>
<tr><td>4.2(1)P Notes 2 and 3</td><td>Using the default EN</td></tr>
<tr><td>4.2(1)P Note 5</td><td><table><tr><th>Wind zone</th><th>K</th><th>n</th></tr><tr><td>I</td><td>0,2</td><td>0,5</td></tr><tr><td>II</td><td>0,234</td><td>0,5</td></tr><tr><td>III</td><td>0,281</td><td>0,5</td></tr></table></td></tr>
<tr><td>4.3.1(1) Notes 1 and 2</td><td>For $c_r(z)$ see 4.3.2(1)
Orography factor $c_o(z)$ inputted by the user as a constant value</td></tr>
<tr><td>4.3.2(1)</td><td>Tabel 4.1 — Terreincategorieën voor toepassing in Nederland
<table><tr><th colspan="2">Terreincategorie</th><th>z_0
m</th><th>z_{min}
m</th></tr><tr><td>0</td><td>Zee of kustgebied aan zee</td><td>0,005</td><td>1</td></tr><tr><td>II</td><td>Onbebouwd gebied</td><td>0,2</td><td>4</td></tr><tr><td>III</td><td>Bebouwd gebied</td><td>0,5</td><td>7</td></tr></table></td></tr>
<tr><td>4.4(1) Note 2</td><td>Using the default EN</td></tr>
<tr><td>4.5(1) Note 1</td><td>Using the default EN</td></tr>
<tr><td>4.5(1) Note 2</td><td>Using the default EN</td></tr>
</table>

United Kingdom

According to British National Annex BS EN 1991-1-4/NA:2005-12

Article	Commentary
4.1(1)	*The value of $v_{b.0}$ is calculated from the $v_{b.map}$ and the altitude factor* $$v_{b,0} = v_{b,map} c_{alt}$$ *$v_{b.map}$ is inserted by the user*
4.2(1)P Note 1	$$c_{alt} = 1 + 0{,}001 \cdot A$$ *Where the A is the altitude above the sea level*
4.2(1)P Notes 2 and 3	*c_{dir}, c_{season} factors specified by the user according to the Annex*
4.2(1)P Note 5	*Using the default EN*
4.3.1(1) Notes 1 and 2	*For $c_r(z)$ see 4.3.2(1)* *Orography factor $c_o(z)$ inputted by the user as a constant value*
4.3.2(1)	*The factor $c_r(z)$ is not needed for evaluation of $q_p(z)$ according to the British Annex*
4.4(1) Note 2	*The turbulence factor $I_v(z)$ is not needed for evaluation of $q_p(z)$ according to the Austrian Annex*
4.5(1) Note 1	*The BS NA uses diagrams for getting the $v_p(z)$ coefficient. It is not possible to do any automatic calculation of the coefficient, therefore we enable to input the constant value of the* ***$c_e(z)$*** *coefficient. It is supposed that the users will use different setting of the wind (Library in the Project setting dialogue - tab Loads)*
4.5(1) Note 2	*$\rho = 1{,}226\ kg/m^3$*

Slovakia

According to Slovak National Annex STN EN 1991-1-4/NA: 2008-07

Article	Commentary
4.1(1)	*The value of $v_{b.0}$ is taken according to the wind zone* $v_{b.0}$(I)=24 m/s $v_{b.0}$ (II) =26 m/s $v_{b.0}$ (III) =30 m/s (for altitudes from 700 to 1300 m a.s.l.) $v_{b.0}$ (M) =33 m/s (for for mountain areas above 1300 m a.s.l.)
4.2(1)P Note 1	*Influence of the altitude is not considered in the Annex*
4.2(1)P Notes 2 and 3	*Using the default EN*
4.2(1)P Note 5	*Using the default EN*
4.3.1(1) Notes 1 and 2	*For $c_r(z)$ see 4.3.2(1)* *Orography factor $c_o(z)$ inputted by the user as a constant value*
4.3.2(1)	*Using the default EN*
4.4(1) Note 2	*Using the default EN*
4.5(1) Note 1	*Using the default EN*
4.5(1) Note 2	*Using the default EN*

Ireland

According to Irosh National Annex IS EN 1991-1-4/NA: 2010-03

Article	Commentary
4.1(1)	*The value of $v_{b.0}$ is calculated from the $v_{b.map}$ and the altitude factor* $v_{b,0} = v_{b,map} c_{alt}$ *$v_{b.map}$ is inserted by the user*
4.2(1)P Note 1	$c_{alt} = 1 + 0{,}001 \cdot A$ *Where the:* *A is the altitude above the sea level*
4.2(1)P Notes 2 and 3	*c_{dir}, c_{season} factors specified by the user according to the Annex*
4.2(1)P Note 5	*Using the default EN*
4.3.1(1) Notes 1 and 2	*For $c_r(z)$ see 4.3.2(1)* *Orography factor $c_o(z)$ inputted by the user as a constant value*
4.3.2(1)	*The factor $c_r(z)$ is not needed for evaluation of $q_p(z)$ according to the Irish Annex*
4.4(1) Note 2	*The turbulence factor $I_v(z)$ is not needed for evaluation of $q_p(z)$ according to the Irish Annex*
4.5(1) Note 1	*The IS NA uses diagrams for getting the $v_p(z)$ coefficient. It is not possible to do any automatic calculation of the coefficient, therefore we enable to input the constant value of the **c_e(z)** coefficient. It is supposed that the users will use different setting of the wind (Library in the Project setting dialogue - tab Loads)*
4.5(1) Note 2	*ρ = 1,226 kg/m^3*

Poland

According to Polish National Annex PN EN 1991-1-4/NA: 2008

<table>
<tr><th>Article</th><th>Commentary</th></tr>
<tr><td>4.1(1)</td><td>The value of $v_{b.0}$ is calculated according to the following formulea (with respect to the wind zone)
<table>
<tr><th>Strefa</th><th>$v_{b,0}$ (m/s)</th><th>$v_{b,0}$ (m/s)</th></tr>
<tr><td></td><td>$A \le$ 300 m</td><td>A > 300 m</td></tr>
<tr><td>1</td><td>22</td><td>$22 \cdot [1 + 0{,}0006\,(A - 300)]$</td></tr>
<tr><td>2</td><td>26</td><td>26</td></tr>
<tr><td>3</td><td>22</td><td>$22 \cdot [1 + 0{,}0006\,(A - 300)]$</td></tr>
</table>
Where the:
A is the altitude above the sea level</td></tr>
<tr><td>4.2(1)P Note 1</td><td>see the table above</td></tr>
<tr><td>4.2(1)P Notes 2 and 3</td><td>c_{dir}, c_{season} factors specified by the user according to the Annex</td></tr>
<tr><td>4.2(1)P Note 5</td><td>Using the default EN</td></tr>
<tr><td>4.3.1(1) Notes 1 and 2</td><td>For cr(z) see 4.3.2(1)
Orography factor $c_o(z)$ inputted by the user as a constant value</td></tr>
<tr><td>4.3.2(1)</td><td>The factor $c_r(z)$ is not necessary for evaluation of the peak wind velocity pressure.</td></tr>
<tr><td>4.4(1) Note 2</td><td>The turbulence factor $I_v(z)$ is not needed for evaluation of $q_p(z)$ according to the Polish Annex</td></tr>
<tr><td>4.5(1) Note 1</td><td>Peak velocity pressure is enumerated according to following formulae:
$$v_b := v_{b.0} \cdot c_{dir} \cdot c_{season} \cdot c_{prob} \cdot c_o$$
$$q_b := \frac{1}{2} \cdot \rho \cdot v_b^{\,2}$$
$$q_p(z) = q_b * C_e(z)$$
<table>
<tr><th>Kategoria terenu</th><th>$c_r(z)$</th><th>$c_e(z)$</th><th>z_{min}, m</th><th>z_{max}, m</th></tr>
<tr><td>0</td><td>$1{,}3 \cdot \left(\frac{z}{10}\right)^{0{,}11}$</td><td>$3{,}0 \cdot \left(\frac{z}{10}\right)^{0{,}17}$</td><td>1</td><td>200</td></tr>
<tr><td>I</td><td>$1{,}2 \cdot \left(\frac{z}{10}\right)^{0{,}13}$</td><td>$2{,}8 \cdot \left(\frac{z}{10}\right)^{0{,}19}$</td><td>1</td><td>200</td></tr>
<tr><td>II</td><td>$1{,}0 \cdot \left(\frac{z}{10}\right)^{0{,}17}$</td><td>$2{,}3 \cdot \left(\frac{z}{10}\right)^{0{,}24}$</td><td>2</td><td>300</td></tr>
<tr><td>III</td><td>$0{,}8 \cdot \left(\frac{z}{10}\right)^{0{,}19}$</td><td>$1{,}9 \cdot \left(\frac{z}{10}\right)^{0{,}26}$</td><td>5</td><td>400</td></tr>
<tr><td>IV</td><td>$0{,}6 \cdot \left(\frac{z}{10}\right)^{0{,}24}$</td><td>$1{,}5 \cdot \left(\frac{z}{10}\right)^{0{,}29}$</td><td>10</td><td>500</td></tr>
</table></td></tr>
<tr><td>4.5(1) Note 2</td><td>Using the default EN</td></tr>
</table>

Slovenia

According to Slovenian National Annex SIST EN 1991-1-4/NA:2005/A101:2007

<table>
<tr><th>Article</th><th>Commentary</th></tr>
<tr><td>4.1(1)</td><td>The value of $v_{b.0}$ is taken according to the wind zone and altitude above the sea level
<table>
<tr><th>Zone</th><th>altitude</th><th>$v_{b.0}$</th></tr>
<tr><td rowspan="4">1</td><td>< 800 m</td><td>20 m/s</td></tr>
<tr><td>800m – 1600 m</td><td>25 m/s</td></tr>
<tr><td>1600 m – 2000 m</td><td>30 m/s</td></tr>
<tr><td>> 2000 m</td><td>40 m/s</td></tr>
<tr><td rowspan="3">2</td><td>< 1600 m</td><td>25 m/s</td></tr>
<tr><td>1600 m – 2000 m</td><td>30 m/s</td></tr>
<tr><td>> 2000 m</td><td>40 m/s</td></tr>
<tr><td>3</td><td>all</td><td>30 m/s</td></tr>
</table></td></tr>
<tr><td>4.2(1)P Note 1</td><td>see the table above</td></tr>
<tr><td>4.2(1)P Notes 2 and 3</td><td>The recommended value of both coefficients is 1,0.</td></tr>
<tr><td>4.2(1)P Note 5</td><td>Using the default EN</td></tr>
<tr><td>4.3.1(1) Notes 1 and 2</td><td>For $c_r(z)$ see 4.3.2(1)
Orography factor $c_o(z)$ inputted by the user as a constant value</td></tr>
<tr><td>4.3.2(1)</td><td>Using the default EN</td></tr>
<tr><td>4.4(1) Note 2</td><td>Using the default EN</td></tr>
<tr><td>4.5(1) Note 1</td><td>Using the default EN</td></tr>
<tr><td>4.5(1) Note 2</td><td>Using the default EN</td></tr>
</table>

Greece

According to Greek National Annex ELOT EN 1991-1-4/NA:2009

<table>
<tr><th>Article</th><th>Commentary</th></tr>
<tr><td>4.1(1)</td><td>The value of $v_{b.0}$ is taken according to the wind zone
<table>
<tr><th>Zone</th><th>$v_{b.0}$</th></tr>
<tr><td>the islands and coast up to 10km from shore</td><td>27 m/s</td></tr>
<tr><td>rest of the country</td><td>33 m/s</td></tr>
</table></td></tr>
<tr><td>4.2(1)P Note 1</td><td>Influence of the altitude is not considered in the Annex</td></tr>
<tr><td>4.2(1)P Notes 2 and 3</td><td>The recommended value of both coefficients is 1,0.</td></tr>
<tr><td>4.2(1)P Note 5</td><td>Using the default EN</td></tr>
<tr><td>4.3.1(1) Notes 1 and 2</td><td>For $c_r(z)$ see 4.3.2(1)
Orography factor $c_o(z)$ inputted by the user as a constant value</td></tr>
<tr><td>4.3.2(1)</td><td>Using the default EN</td></tr>
<tr><td>4.4(1) Note 2</td><td>Using the default EN</td></tr>
<tr><td>4.5(1) Note 1</td><td>Using the default EN</td></tr>
<tr><td>4.5(1) Note 2</td><td>Using the default EN</td></tr>
</table>

Romania

According to Romanian National Annex SR EN 1991-1-4/NA:2007-06

Article	Commentary
4.1(1)	*The value of $v_{b.0}$ is inputted by the user according to the wind map or table with main cities and relevant wind speeds*
4.2(1)P Note 1	*Influence of the altitude is not considered in the Annex*
4.2(1)P Notes 2 and 3	*The recommended value of both coefficients is 1,0.*
4.2(1)P Note 5	*Using the default EN*
4.3.1(1) Notes 1 and 2	*For $c_r(z)$ see 4.3.2(1)* *Orography factor $c_o(z)$ inputted by the user as a constant value*
4.3.2(1)	*Using the default EN*
4.4(1) Note 2	*Using the default EN*
4.5(1) Note 1	*Using the default EN*
4.5(1) Note 2	*Using the default EN*