EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1991-1-4:2005/AC

July 2009
Juillet 2009
Juli 2009

English version
Version Française
Deutsche Fassung

Eurocode 1: Actions on structures - Part 1-4: General actions - Wind actions

Eurocode 1 : Actions sur les structures - Partie 1-4 : Actions générales - Actions du vent

Eurocode 1: Einwirkungen auf Tragwerke - Teil 1-4: Allgemeine Einwirkungen - Windlasten

This corrigendum becomes effective on 29 July 2009 for incorporation in the three official language versions of the EN.

Ce corrigendum prendra effet le 29 juillet 2009 pour incorporation dans les trois versions linguistiques officielles de la EN.

Die Berichtigung tritt am 29.Juli 2009 zur Einarbeitung in die drei offiziellen Sprachfassungen der EN in Kraft.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No.:EN 1991-1-4:2005/AC:2009 D/E/F

1) Modifications to "National annex for EN 1991-1-4"

Page 7, delete the following:

"**1.1 (11) Note 1**".

Page 8, replace:

"**8.4.2 (1) Notes 1 and 2**"

with:

"**8.4.2 (1)**".

2) Modifications to 1.1

Page 9, replace paragraph "(2)" *with the following one:*

"(2) This Part is applicable to:

- Buildings and civil engineering works with heights up to 200 m, see also (11).

- Bridges having no span greater than 200 m, provided that they satisfy the criteria for dynamic response, see (12) and 8.2.".

Pages 9 and 10, replace paragraph "(11)":

"(11) This part does not give guidance on the following aspects:

− wind actions on lattice towers with non-parallel chords

− wind actions on guyed masts and guyed chimneys

− torsional vibrations, e.g. tall buildings with a central core

− bridge deck vibrations from transverse wind turbulence

− cable supported bridges

− vibrations where more than the fundamental mode needs to be considered

    NOTE 1 The National Annex may provide guidance on these aspects as non contradictory complementary information.

    NOTE 2 For wind actions on guyed masts, guyed chimneys and lattice towers with non-parallel chords, see EN 1993-3-1, Annex A.

    NOTE 3 For wind actions on lighting columns, see EN 40."

with:

"(11) Guyed masts and lattice towers are treated in EN 1993-3-1 and lighting columns in EN 40.

(12) This part does not give guidance on the following aspects:

- torsional vibrations, e.g. tall buildings with a central core

- bridge deck vibrations from transverse wind turbulence

- wind actions on cable supported bridges

- vibrations where more than the fundamental mode needs to be considered.".

3) Modifications to 1.7

Pages 11 and 12, paragraph "(2)", "Latin upper case letters", *between the lines dedicated to* "K" *and* "K_{iv}", *add the following line:*

"K_a aerodynamic damping parameter".

Page 12, paragraph "(2)", "Latin lower case letters", *between the lines dedicated to* "c_p" *and* "c_{prob}", *add the following lines:*

"c_{pe} external pressure coefficient

c_{pi} internal pressure coefficient

$c_{p,net}$ net pressure coefficient".

Page 13, paragraph "(2)", "Latin lower case letters", *between the lines dedicated to* "k" *and* "k_p", *add the following lines:*

"k_l turbulence factor".

Page 14, paragraph "(2)", "Greek lower case letters", *definition of* "δ_a", *replace* "aerodynamic logarithmic decrement of damping" *with* "logarithmic decrement of aerodynamic damping".

Page 14, paragraph "(2)", "Greek lower case letters", *definition of* "δ_s", *replace* "structural logarithmic decrement of damping" *with* "logarithmic decrement of structural damping".

4) Modification to "Section 2"

Page 16, paragraph "(2)", *replace the* "NOTE":

"NOTE   See also EN 1991-1-3, EN 1991-2 and ISO FDIS12494"

with the following:

"NOTE   See also EN 1991-1-3, EN 1991-2 and ISO 12494".

5) Modification to 6.3.2

Page 30, paragraph "(1)", *3rd line, replace* "5.2" *with* "5.3".

6) Modification to 7.2.8

Page 50, paragraph "(1)"*,* "Figure 7.11"*, replace the three lines between the figure itself and its title:*

"for 0 < h/d < 0,5, $c_{pe,10}$ is obtained by linear interpolation

for 0,2 ≤ f/d ≤ 0,3 and h/d ≥ 0,5, two values of $c_{pe,10}$ have to be considered

the diagram is not applicable for flat roofs"

with:

"For Zone A:

- for 0 < h/d < 0,5, the coefficient $c_{pe,10}$ is obtained by linear interpolation

- for 0,2 ≤ f/d ≤ 0,3 and h/d ≥ 0,5, two values of $c_{pe,10}$ have to be considered

- the diagram is not applicable for flat roofs".

7) Modification to 7.3

Page 56, paragraph "(8)"*,* "Table 7.6"*, 5th row* "[**Roof angle α** =]10°"*, 4th column* **"Zone A"**, *3rd line in the cell (corresponding to* "Minimum φ = 1"*), replace* "- 2,1" *with* "- 1,6".

8) Modifications to 7.8

Page 68, paragraph "(1)"*,* "Table 7.11"*, replace the table with the following one:*

"

Number of sides	Sections	Finish of surface and of corners	Reynolds number $Re^{(a)}$	$c_{f,0}$
5	Pentagon	all	All	1,80
6	Hexagon	all	All	1,60
8	Octagon	surface smooth [b] $r/b < 0,075$	$Re \leq 2,4 \cdot 10^5$	1,45
			$Re \geq 3 \cdot 10^5$	1,30
		surface smooth [b] $r/b \geq 0,075$	$Re \leq 2 \cdot 10^5$	1,30
			$Re \geq 7 \cdot 10^5$	1,10
10	Decagon	all	All	1,30
12	Dodecagon	surface smooth [c] corners rounded	$2 \cdot 10^5 < Re < 1,2 \cdot 10^6$	0,90
		all others	$Re < 4 \cdot 10^5$	1,30
			$Re > 4 \cdot 10^5$	1,10
16-18	Hexdecagon to Octadecagon	surface smooth [c] corners rounded	$Re < 2 \cdot 10^5$	treat as a circular cylinder, see (7.9)
			$2 \cdot 10^5 \leq Re < 1,2 \cdot 10^6$	0,70

[a] Reynolds number with $v = v_m$ and v_m given in 4.3, Re, is defined in 7.9

[b] r = corner radius, b = diameter of circumscribed circumference, see Figure 7.26

[c] From wind tunnel tests on sectional models with galvanised steel surface and a section with b = 0,3 m and corner radius of $0,06 \cdot b$

".

Page 68, paragraph "(2)"*, replace the paragraph with the following text:*

"(2) For buildings where $h/d > 5$, c_f may be determined from Expression (7.13).

   NOTE   See also Table 7.11 and Figure 7.26.".

9) Modifications to 7.11

Page 76, paragraph "(1)"*,* "NOTE 1"*, replace* "Figure 7.33 to 7.35 are based" *with* "Figure 7.35 is based"*.*

Page 76, paragraph "(1)"*,replace* "NOTE 2"*:*

   "NOTE 2   The National Annex may give a reduction factor for scaffolding without air tightness devices and affected by solid building obstruction. A recommended value is given in prEN 12811."

with:

   "NOTE 2   The National Annex may give a reduction factor for scaffolding without air tightness devices and affected by solid building obstruction. A recommended value is given in EN 12811.".*

10) Modification to 7.12

Page 79, paragraph "(2)"*,* "Table 7.15"*, last row, replace:*

"ρ is the air density (see 7.1)"

with:

"ρ is the air density (see 4.5 (1) NOTE 2)".

11) Modification to 8.1

Page 84, paragraph "(3)"*, replace the* "NOTE"*:*

"NOTE The notation used for bridges differs from that defined in 1.7. The following notations are used for bridges:

L length in y-direction

b width in x-direction

d depth in z-direction

In Figure 8.2 the values to be given to L ,b and d in various cases are, where relevant, more precisely defined in further clauses. When Sections 5 to 7 are referred to, the notations for b and d need to be readjusted."

with:

"NOTE The notation used for bridges differs from that in 1.7. The following notations (see Figure 8.2) are used for bridges:

L length in y-direction

b width in x-direction

d depth in z-direction

The values to be given to L, b and d in various cases are, where relevant, more precisely defined in various clauses. When Sections 5 to 7 are referred to, the notations for b and d need to be readjusted.".

12) Modifications to 8.3.1

Page 85, paragraph "(1)"*, end of* "NOTE 2"*, add* ", where some typical cases for determining $A_{ref,x}$ (as defined in 8.3.1(4)) and d_{tot} are shown."*.*

Page 86, paragraph "(1)"*,* "Figure 8.3"*, replace the notes within the figure:*

"a) construction phase or open parapets (more than 50% open)

b) With parapets or noise barrier or traffic"

with:

6

"a) Construction phase, open parapets (more than 50% open) and open safety barriers

b) Solid parapets, noise barrier, solid safety barriers or traffic"

thus:

"

bridge type

a) Construction phase, open parapets (more than 50% open) and open safety barriers

b) Solid parapets, noise barrier, solid safety barriers or traffic

$$A_{ref,x} = d_{tot} L$$

trusses separately

".
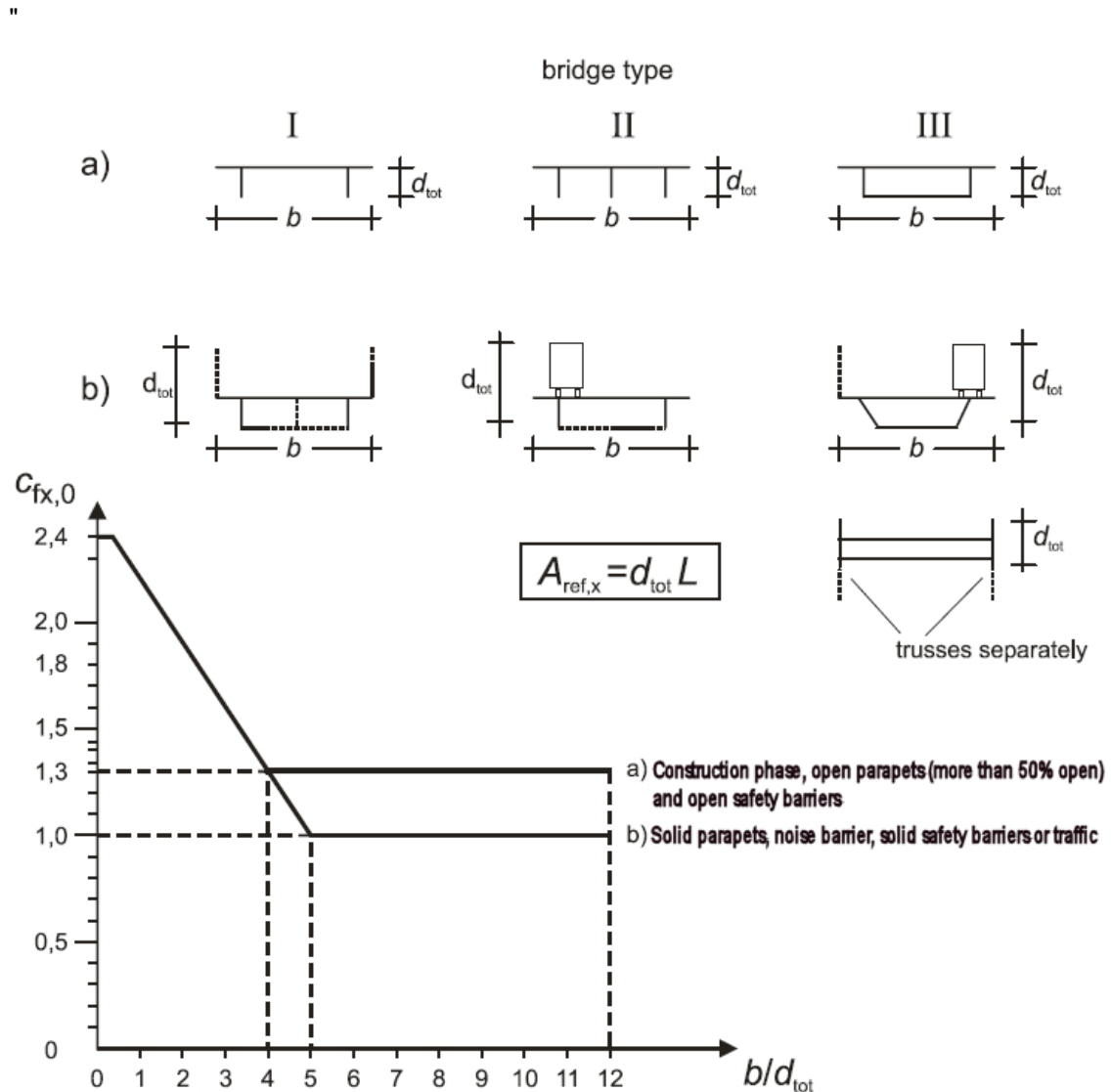
Page 86, paragraph "(1)", "NOTE 4", *replace* "Where two generally similar decks are at the same level and separated transversally by a gap not exceeding significantly 1 m" *with* "Where two generally similar decks are at the same level and separated transversely by a gap not significantly exceeding 1 m".

Page 87, top of page, paragraph preceding paragraph "(4)", *replace the following paragraph:*

"(2) Where a bridge deck is sloped transversely, $c_{fx,0}$ should be increased by 3% per degree of inclination, but not more than 25 %."

with the following one:

"(3) Where a bridge deck is sloped transversely, $c_{fx,0}$ should be increased by 3% per degree of inclination, but not more than 25 %.".

Page 87, paragraph "(4)"*, replace:*

"Reference areas $A_{ref,x}$ for load combinations without traffic load should be defined as :"

with:

"Reference areas $A_{ref,x}$ for load combinations without traffic load should be based on the relevant value of d_{tot} as defined in Figure 8.5 and Table 8.1:".

Page 87, paragraph "(4)"*, entry* "(a)"*, delete* "(see Figure 8.5 and Table 8.1)".

Page 88, paragraph "(4)"*, replace the title:*

"**Table 8.1 — Depth to be used for $A_{ref,x}$**"

with:

"**Table 8.1 — Depth d_{tot} to be used for $A_{ref,x}$**".

Page 88, paragraph "(7)"*, replace:*

"Wind pressure effects of passing vehicles are outside the scope of this Part. Wind effects induced by passing trains see EN 1991-2."

with:

"Wind pressure effects from passing vehicles are outside the scope of this Part. For wind effects induced by passing trains see EN 1991-2.".

13) Modification to 8.4.2

Page 91, end of paragraph "(1)"*, add the following* "NOTE 2"*:*

"NOTE 2   The National Annex may give procedures for the treatment of asymmetric loading. The recommended procedure is to completely remove the design wind load from those parts of the structure where its action will produce a beneficial effect (see 7.1.2 (1)).".

14) Modification to A.3

Page 99, paragraph "(5)"*, list entry* "**b)**"*, replace* "when: $\dfrac{z}{L_d} > 3,5$" *with* "when: $\dfrac{X}{L_e} > 3,5$".

15) Modification to A.5

Page 101, at the end of paragraph "(1)"*, add the sentence* "These rules are direction dependent, the values of h_{ave} and x should be established for each 30° sector as described in 4.3.2.".

16) Modification to C.4

Page 109, replace paragraph "(1)":

"(1) The maximum along-wind displacement is the static displacement determined from the equivalent static wind force defined in 5.2."

with:

"(1) The maximum along-wind displacement is the static displacement determined from the equivalent static wind force defined in 5.3.".

17) Modification to Annex D

Pages 111 and 112, "Figure D.1" *and* "Figure D.2"*, within both figures, under* "based on"*, replace* "$\delta_s = 0$" *with* "$\delta_a = 0$".

18) Modification to E.1.3.1

Page 115, paragraph "(1)"*, 2nd line, replace* "equals a natural frequency of the structure or a structural element" *with* "equals the natural frequency (mode *i*) of the structure or the structural".

19) Modifications to E.1.5.2.2

Page 121, definitions in "Table E.3"*, last row, replace the following definition:*

"$v_{crit,i}$ is the critical wind velocity (see Expression (E.1))"

with:

"$v_{crit,i}$ is the critical wind velocity (see E.1.3.1)".

Page 121, definitions in "Table E.3"*, last row, last line, replace the following definition:*

"$v_{m,Lj}$ is the mean wind velocity (see 4.2) in the centre of the effective correlation length as defined in Figure E.3"

with:

"$v_{m,Lj}$ is the mean wind velocity (see 4.3.1) in the centre of the effective correlation length as defined in Figure E.3".

20) Modification to E.1.5.2.4

Page 124, paragraph "(2)"*,* "Table E.5"*, last row, replace* "NOTE 1"*:*

"NOTE 1   The mode shape, $\Phi_{i,y}(s)$, is taken from F.3. The parameters *n* and *m* are defined in Expression (E.7) and in Figure E.3"

with:

"NOTE 1   The mode shape, $\Phi_{i,y}(s)$, is taken from F.3. The parameters *n* and *m* are defined in Expression (E.8) and in Figure E.3".

21) Modification to E.1.5.2.7

Page 126, replace the last sentence of paragraph "(2)" before the final "NOTE":

"For coupled cylinders with *a/d* > 3,0 specialist advice is recommended."

with:

''For coupled cylinders with *a/b* > 3,0 specialist advice is recommended.".

22) Modifications to E.1.5.3

Page 127, paragraph "(2)", list of definitions, replace the following definition:

"*St*   is the Strouhal number given in E.1.6.2"

with:

"*St*   is the Strouhal number given in Table E.1".

Page 127, paragraph "(2)", list of definitions, add the following definition between the definitions of "a_L" and "St":

"*Sc*   is the Scruton number given in E.1.3.3".

Page 128, paragraph "(5)", "Table E.6", "NOTE", delete ", respectively" *at the end of the sentence.*

Page 128, paragraph "(6)", replace equation "(E.17)":

$$" k_p = \sqrt{2} \cdot \left(1 + \cfrac{1,2}{\tan\left(0,75 \cdot \cfrac{Sc}{(4 \cdot \pi \cdot K_a)} \right)} \right) \tag{E.17}"$$

with the following expression:

$$" k_p = \sqrt{2} \cdot \left\{ 1 + 1,2 \cdot \arctan\left(0,75 \cdot \cfrac{Sc}{(4 \cdot \pi \cdot K_a)^4} \right) \right\} \tag{E.17}".$$

23) Modification to E.4.2

Page 134, paragraph "(1)", list, delete the second bullet point:

"— The torsional axis is parallel to the plane of the plate and normal to the wind direction, and the centre of torsion is at least *d*/4 downwind of the windward edge of the plate, where *b* is the inwind depth of the plate measured normal to the torsional axis. This includes the common cases of torsional centre at geometrical centre, i.e. centrally supported signboard or canopy, and torsional centre at downwind edge, i.e. cantilevered canopy."

with:

10

"— The torsional axis is parallel to the plane of the plate and normal to the wind direction, and the centre of torsion is at least $d/4$ downwind of the windward edge of the plate, where d is the inwind depth of the plate measured normal to the torsional axis. This includes the common cases of torsional centre at geometrical centre, i.e. centrally supported signboard or canopy, and torsional centre at downwind edge, i.e. cantilevered canopy.".

24) Modification to E.4.3

Page 135, end of paragraph "(3)"*, below the final figure, add the figure number and title that follow:*

"Figure E.6 — Rate of change of aerodynamic moment coefficient, $dc_M/d\theta$, with respect to geometric centre "GC" for rectangular section"*.*

25) Modifications to F.2

Page 138, paragraph "(5)"*, list entry* "b)"*, replace* "$L > L_1$" *with* "$L \geq L_1$"*.*

Page 138, paragraph "(5)"*, list entry* "c)"*, replace* "$L > L_1 > L_2$" *with* "$L \geq L_1 \geq L_2$"*.*

Page 139, paragraph "(7)"*, Expression* "(F.10)"*, in the denominator of the expression, replace* "K_2" *with* "K^2"*.*

26) Modification to F.5

Page 145, paragraph "(5)"*,* "Table F.2"*, replace* "NOTE 1" *with* "NOTE"*; then delete* "NOTE 2" *as follows:*

"NOTE 2   For cable supported bridges the values given in Table F.2 need to be factored by 0,75".

27) Modifications to Bibliography

Page 146, replace the second reference:

"ISO 3898   General principles on reliability for structures"

with:

"ISO 3898   Bases for design of structures — Notations — General symbols".

End of the "Bibliography"*, add the two following references:*

"EN 12811-1   Temporary works equipment – Part 1: Scaffolds – Performance requirements and general design"

and:

"ISO 12494   Atmospheric icing of structures".