Addendum bridges:2015 section 8 Wind actions on bridges

DS/EN 1991-1-4 DK NA:2010

National Annex to

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

Preface

The implementation of Eurocodes has involved the preparation of

- National Annexes to the bridge-specific Eurocodes
- Addenda to National Annexes for bridge-specific sections in Eurocodes for loads.

Together with the basic Eurocodes, including the related national annexes, these constitute the codes of practices to be applied in the design of bridges in Denmark.

Scope

This National Annex sets out the conditions for implementing section 8 Wind actions on bridges in EN 1991-1-4.

Contents

This National Annex contains the national choices that apply in Denmark.

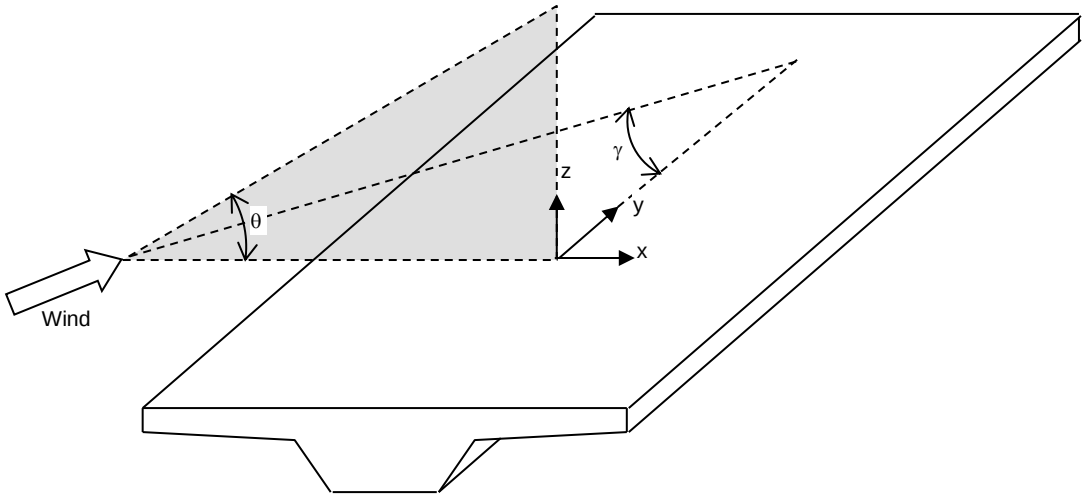
The national choices may be in the form of current national values, a choice between several methods or addition of supplementary guidance.

In connection with the national choices, the national annexes may refer to Banedanmark's Railway Standards (e.g. BN1-59) or Danish Road Directorate's Road Standards.

Reference may also be made to the infrastructure manager (IF). IF is the authority which has ownership and/or holds maintenance responsibility for a road bridge or for a railway bridge. Examples of IFs include the Danish Road Directorate, local authorities, Banedanmark and regional railway providers.

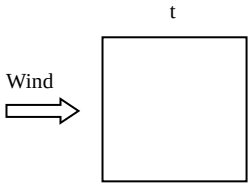
In addition, the National Annex includes an overview of all the items where it has been possible to make a national choice.

Items for which a national choice has been made

Page	Item	Subject	National choice
82	8.1 (1), NOTE 1	Wind action on other types of bridges (arch bridges, suspension bridges, cable-stayed bridges, etc.).	Reference is made to the specialist literature on other types of bridges. The following criteria are aerodynamic sensitivity parameters $P_b = P_z\left(\frac{16 \cdot b}{L}\right)$ can be used for assessing whether wind tunnel tests or special aerodynamic calculations are needed to assess the wind stability of the bridge where: L is the length of longest span (m) b is the width of bridge decks (m) P_z is defined in 8.2 (1), NOTE 1 a) Excitation from the wind can be disregarded if $P_b < 0.04$ b) For $0.04 < P_b < 1.0$, the wind stability should be assessed subject to the guidelines set out in EN 1991-1-4 (c) For $P_b > 1$, the bridge is deemed to be exposed to wind-induced effects and should be tested by wind-tunnel tests
82	8.1 (1), NOTE 2	Angle of the wind direction in the horizontal and vertical plane.	See figures below.
			
84	8.1 (4)	Max basic wind speed with traffic on road bridge.	Only the characteristic wind action $v_{b,0} = 24$ m/s or $v_{b,0} = 27$ m/s in the marginal zone in Jutland is applied, in other words, $v^*_{b,0} = v_{b,0}$ 8.1 (4): " …the basic wind speed $v^*_{b,0}$ with a value $v_{b,0}$" is changed to " …the basic wind speed $v_{b,0}$ with a value $v^*_{b,0}$"
84	8.1 (5)	Max basic wind speed with traffic on railway bridge.	Only the characteristic wind action $v_{b,0} = 24$ m/s or $v_{b,0} = 27$ m/s in the marginal zone in Jutland is applied, in other words, $v^{**}_{b,0} = v_{b,0}$ 8.1 (5): " …the basic wind speed $v^{**}_{b,0}$ with a value $v_{b,0}$" is changed to " …the basic wind speed $v_{b,0}$ with a value $v^{**}_{b,0}$"

Page	Item	Subject	National choice
85	8.2 (1), NOTE 1	Criteria for when the procedure for assessing dynamic response is required and methods for the assessment.	Road and railway bridges with spans less than 100 m do not normally require inclusion of dynamic factors for response in the wind direction. Dynamic factors for vertical response may also be disregarded (ignored) if: a) the lowest natural frequencies in bending or torsion are higher than 1 Hz or b) $P_z = \left(\frac{V(z)}{n_b \cdot b}\right)^2 \left(\frac{\rho \cdot b^2}{m}\right) \leq 1$ where: ρ = air density = 1.226 kg/m^3 b = tyre width (m) m = mass per unit length (kg/m) V(z) = mean wind speed at bridge girder height (m/s) n_b = lowest natural frequency in vertical bending (Hz)
89	8.3.2	Table 8.2	Clarification: Table 8.2: C is termed the wind action factor but in the table, C is termed the force factor. To be changed to wind action factor.
91	8.4.2 (1), NOTE 1	Simplified rules for bridge piers.	Upper limit values for shape factors C_{fp} for bridge piers can be taken from Table DK NA 2.

Table DK NA 2. Shape factors C_{fp} for bridge piers

Cross sectional shape	t/b	C_{fp} for pier height/width conditions						
		1	2	4	6	10	20	40
 b is side length perpendicular to the wind	< 0.25	1.31	1.37	1.43	1.49	1.61	1.76	1.92
	0.33	1.36	1.43	1.49	1.56	1.68	1.84	2.00
	0.50	1.44	1.51	1.58	1.65	1.78	1.95	2.12
	0.67	1.50	1.57	1.65	1.72	1.85	2.03	2.21
	1.0	1.35	1.42	1.48	1.54	1.66	1.83	1.99
	1.5	1.17	1.23	1.28	1.34	1.44	1.58	1.72
	2.0	1.04	1.09	1.14	1.19	1.28	1.41	1.53
	3.0	0.86	0.90	0.94	0.98	1.06	1.16	1.26
	> 4	0.73	0.77	0.80	0.83	0.90	0.99	1.07
Rectangle along diagonal		1.0	1.1	1.1	1.2	1.2	1.3	1.4
Octagonal cross section		0.82	0.86	0.90	0.94	1.01	1.11	1.20
Dodecagonal cross section		0.69	0.73	0.76	0.79	0.85	0.94	1.02
Circular cross section		0.76	0.79	0.83	0.86	0.93	1.02	1.11

Note 1. After completion of the superstructure, the height/width ratio = 40 is applied
Note 2. For piers with triangular noses C_{fp} is defined for the circumscribed rectangle

Overview of possible national choices

The following overview shows the places where a national choice is possible and which informative annexes that apply/do not apply. Moreover, it is specified where a national choice has been made.

In addition, this National Annex provides references to supplementary (non-conflicting) information which may assist to the user of the Eurocode.

Page	Items	Subject	Comment
82	8.1 (1), NOTE 1	Wind action on other types of bridges (arch bridges, suspension bridges, cable-stayed bridges, etc.).	National choice specified.
82	8.1 (1), NOTE 2	Angle of the wind direction in the horizontal and vertical plane.	National choice specified.
84	8.1 (4)	Max basic wind speed with traffic on road bridge.	National choice specified.
84	8.1 (5)	Max basic wind speed with traffic on railway bridge.	National choice specified.
85	8.2 (1), NOTE 1	Criteria for when the procedure for assessing dynamic response is required and methods for the assessment.	National choice specified.
85	8.3 (1), NOTE	Shape factors on parapets and portals.	No national choice.
86	8.3.1 (2)	The shape factor for wind power $c_{fx,0}$ in the event of a sloping bridge/surface on the wind side (windward side).	No national choice.
88	8.3.2 (1)	Wind action factor C.	No national choice.
89	8.3.2	Table 8.2	Clarification - no national choice.
89	8.3.3 (1)	The shape factor for wind power $c_{f,z}$ (the shape factor for 'lift').	No national choice.
90	8.3.4 (1)	Wind action in the longitudinal direction.	No national choice.
91	8.4.2 (1), NOTE 1	Simplified rules for bridge piers.	National choice specified.

Note: No national choice implies that a recommendation in the code of practice is observed.