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DS/EN 1993-1-1:2022 DK NA:202x

National Annex to: Eurocode 3 — Design of steel structures—
Part 1-1: General rules and rules for buildings

Nationalt Anneks til: Eurocode 3 — Stålkonstruktioner—
Del 1-1: Generelle regler samt regler for bygningskonstruktioner

Foreword

Published [måned og år].

This National Annex (NA) to EN 1993-1-1:2022 forms part of the Danish national annexes to the second generation of Eurocodes.

This NA supersedes DS/EN 1993-1-1 DK NA:2019 upon its implementation in the Building Regulations (Bygningsreglementet 2018 – BR18) as an appendix.

During the transition period stated in the Building Regulations, both the first generation and the second generation of the Eurocodes and NAs may be applied.

This NA cannot be used in conjunction with the first generation of Eurocodes.

This NA lays down the conditions for the Danish implementation of EN 1993-1-1:2022 for construction works in conformity with the Danish Building Regulations; Bygningsreglementet 2018 (BR 18). Other parties may bring this NA into force by reference.

The Eurocodes establish the principle that certain parameters are left open for national determination. These parameters are referred to as *Nationally Determined Parameters* (NDP) and specify the nationally applicable values, classes or methods. Furthermore, the NA may provide *Non-Contradictory, Complementary Information* (NCCI), i.e. additional guidance and alternative methods or values that support the application of the Eurocode without altering or contradicting its provisions.

Further, this National Annex includes NOTES. Notes have the status of guidance and provide additional information intended to assist in the understanding or use of the text of the national annex.

In conformity with the Danish Building Regulations, the verbal forms used in this Eurocode and the NA are to be understood as follows:

- "shall" expresses a requirement to be followed
- "should" expresses a recommendation. Alternative approaches could be used if technically justified
- "may" expresses permission within the limits of the Danish Building Regulations
- "can" expresses a possibility or capability
- "is/are" expresses a statement of certainty or a fact

This NA includes:

- Foreword;
- An overview of clauses with possible Nationally Determined Parameters (NDPs) and Non-Contradictory Complementary Information (NCCI);
- National choices for national Determined Parameters (NDP), and Non-Contradictory Complementary Information (NCCI)

Valid versions of the NAs as well as previous versions and addenda can be found at www.bygningsreglementet.dk.

Overview of possible Nationally Determined Parameters (NDPs) and Non-Contradictory Complementary Information (NCCI)

The list below identifies the clauses where Nationally Determined Parameters (NDPs) are possible, and whether a national choice is made, and if an informative annex is applicable or not applicable. Furthermore, clauses providing complementary information (NCCI) are identified in the list below.

Clause	**Subject**	**Nationally Determined Parameter**	**Non-Contradictory Complementary Information**
4.4.3(2)	Design values of geometrical properties	Unchanged	
5.1(1)	Materials	Unchanged	
5.2.1(1)	Material properties	National Choice	
5.2.2(1)	Ductility requirements	Unchanged	
7.2.1(4)	Consideration of second order effects	Unchanged	
7.2.2(9)	Methods of analysis for ultimate limit state design checks	Unchanged	
7.3.2	Sway Imperfections for global analysis of frames		Complementary information
7.3.3.1(1)	Flexural buckling	Unchanged	
7.3.3.2(1)	Lateral torsional buckling	Unchanged	
7.4.1(3)	Methods of analysis considering material non-linearities	Unchanged	
8.1(1)	Partial factors	National Choice	
8.2.8(3)	Combined bending and shear	Unchanged	
8.3.2.3(1)	Reduction factors χ_{LT} for lateral torsional buckling	Unchanged	
8.3.3(2)	Uniform members in bending and axial compression	National Choice	
8.3.4(1)	General method for lateral and lateral torsional buckling of structural components	Unchanged	
9.2(2)B	Deformations and dynamic effects for buildings		Complementary information
10(3)	Fatigue	National Choice	
A.2(2)	Selection process	Unchanged	

Clause	**Subject**	**Nationally Determined Parameter**	**Non-Contradictory Complementary Information**
A.4(3)	Selection process	National Choice	
A.4(5)	Selection process	Unchanged	
Annex E	Basis for the calibration of partial factors	Normative	

NOTE
Unchanged: Recommendations in the Eurocode to be followed.
National choice: A National Determined Parameter is chosen and defined.
Complementary information: (Non-contradictory) complementary information on how to use the Eurocode.
Normative: The Annex shall be used.
Informative: The Annex may be used.
Not applicable: The Annex cannot be used.
No further information: The Eurocode allows further information. No further information is given.

National Determined Parameter (NDP) and Non-contradictory complementary Information (NCCI)

5.2.1(1) Material properties

(NDP)

Approach a) shall be used.

The Table 5.1 and 5.2 shall not be used. Therefore, the nominal values of the steel strength and the ultimate strength shall be taken from EN 10025 (all parts), EN 10210 (all parts) and EN 10219 (all parts).

NOTE The partial safety factors are based on the extra safety on the material strength, which is shown in Table E.1 of Annex E. The partial safety factors also include the extra safety, which is included in formulas for analysis used in EN 1993 all parts.

7.3.2 Sway Imperfections for global analysis of frames

(NCCI)

For frames to be designed according to Method M2 in 7.2.2(6) and not being sensitive to sway buckling in a sway mode according to 7.3.1(5) the sway imperfections in section 7.3.2 apply.

8.1(1) Partial factors

(NDP)

For persistent and transient design situations the following material partial factors in Table 8.1.a NA are used. Basis for partial factors see Table 8.1.b NA.

Table 8.1.a NA — Partial factors

		For steel with $f_u/f_y \geq 1{,}1$	For steel with $f_u/f_y < 1{,}1$	In accidental or seismic situations
Resistance of cross-section (whatever the class is)	γ_{M0}	1,00	1,10	1,00
Resistance of members to instability assessed by member check	γ_{M1}	1,00	1,10	1,00
Resistance of cross-sections in tension to fracture	γ_{M2}	1,25	1,25	1,00
NOTE	The partial safety factors are based on the extra safety on the material strength, which is shown in Table E.1 of Annex E. The partial safety factors also include the extra safety, which is included in formulas for analysis used in EN 1993 all parts. See b_2 and b_3 in Table 8.1.b NA.			

Table 8.1.b NA — Basis for partial factors

	γ_1 **Failure mode**	γ_2 **Calculation model**		b_2 **Bias**	γ_3 **Strength parameter**		b_3 **Bias**
		$V_{2,XR}$[a]	$V_{2,XRT}$[b]	[c]	$V_{3,R}$[d]	$V_{3,RT}$[e]	[f]
γ_{M0}	warning with/without residual resistance	0%	0%	1,0	3,5%	0%	1,04
γ_{M1}	warning without residual resistance	4%	0%	1,1	3,5%	0%	1,04
γ_{M2}	No warning	5%	0%	1,1	3,5%	0%	1,04

NOTE The sub partial factors (γ_1, γ_2 and γ_3) are based on the assumptions shown in Table 8.1.a NA and γ_M is determined following DK NA EN1990 Annex FF

a Coefficient of variation of uncertainty of calculation model in laboratory conditions.

b Coefficient of variation of uncertainty associated with the transfer from laboratory conditions to conditions in a real structure for calculation model.

c Bias is the conservatism included in the Eurocode calculation model.

d Coefficient of variation of strength parameter in laboratory conditions.

e Coefficient of variation of uncertainty associated with the transfer from laboratory conditions to conditions in a real structure for the strength parameter.

f Bias is the extra conservatism included in the representative (nominel) value of the strength parameter compared to the value of the characteristic 5% fractile.

g Warning with residual resistance is fulfilled when an additional resistance of the order 10% is obtained compared to the Eurocode calculation model ($f_u/f_y \geq 1{,}10$).
Warning without residual resistances shall be used for $f_u/f_y < 1{,}10$.

8.3.3(2) Uniform members in bending and axial compression

(NDP)

The alternative method in DS/CEN/TS 1993-1-101:2022 is allowed.

9.2(2)B Deformations and dynamic effects for buildings

(NCCI)

Requirements for deflections may be agreed with the owner of the building.

For vertical or horizontal deflections, the following recommendations is normally sufficient for buildings, though some flooring, cladding, insulation, glass areas etc. will often require more strict deformation limits:

Table 9.2.a NA — Sufficient vertical or horizontal deformation

Area				**Deformation limit**
Beams in floors, roofs and facades exposed to one characteristic load without dynamic factor:				
Floor				L/400
Roof and facade				L/200
Secondary thin plated structures:				
Uninsulated roof or façade				L/90
Roof with insulation and asphalt roofing:				
	for	L	< 4,5 m	L/150
	for 4,5 m ≤	L	< 6,0 m	30 mm
	for 6,0 m ≤	L		L/200
NOTE	L is the span width for simply supported beams or continuous beams and twice the length of a cantilever beam.			

For horizontal deflections of a frame or a column the following recommendations is normally sufficient for buildings, though some cladding, insulation, glass areas etc. will often require more strict deformation limits:

Table 9.2.b NA — Sufficient horizontal deflection of a frame or column

Area	**Deformation limit**
Frame without crane	H/150
Column in one story building	H/300
Columns in building with more than one story:	
Column per story	H/300
The top of the building	H_e/500
NOTE 1 H is the height of the single column.	
NOTE 2 H_e is the height of the building.	

10(3) Fatigue

(NDP)

The value of γ_{Mf} shall be taken as the largest value in Table 5.1 NA in DS/EN 1993-1-9 DK NA:202x.

A.4(3) Selection process

(NDP)

Table A.1 NA — Selection of execution class based on the type of loading (EXC)

Consequence class (CC)	Type of loading	
	Static Quasi-static[d]	Fatigue[a]
CC4	EXC3[b]	EXC3[c]
CC3	EXC3	EXC3[c]
CC2a and CC2b	EXC2	EXC3
CC1	EXC1	EXC2

a See DS/EN 1993-1-9.

b EXC4 shall be considered for critical elements and/or joints.

c EXC4 shall be used for specific critical details of the structure where fatigue is the dominant design situation. The special requirement according to DS/EN 1090-2 should also be provided.

d This also covers the seismic action in Denmark.