Social- og Boligstyrelsen
Danish Authority of Social Services and Housing

DS/EN 1993-1-6 DK NA:2021

National Annex to
**Eurocode 3: Design of steel structures –
Part 1-6: Strength and stability of shell structures**

Foreword

This National Annex (NA) is a revision of DS/EN 1993-1-6 DK NA:2019 and replaces the latter as from 2021-01-01.

Text has been added under "(Non-contradictory) complementary information".

This NA lays down the conditions for the implementation in Denmark of EN 1993-1-6 for construction works in conformity with the Danish Building Regulations.

This NA applies to construction works covered by section 16(1) of the Danish Building Regulations as well as to construction works covered by sections 24 to 27 of the Danish Building Regulations.

This NA includes:

- an overview of possible national choices and clauses containing complementary information;
- national choices;
- (non-contradictory) complementary information which may assist the user of the Eurocode.

For structures covered by sections 24 to 27 of the Danish Building Regulations BR18, or not covered by the Danish Building Regulations, levels of checking may still be used for the calculation of structures in ultimate limit states. For structures covered by section 16(1) of the Danish Building Regulations, levels of checking cannot be applied.

Overview of possible national choices and clauses containing complementary information

The list below identifies the clauses where national choices are possible and the applicable/not applicable informative annexes. Furthermore, clauses giving complementary information are identified. Complementary information is given at the end of this document.

Clause	Subject	National choice[1)]	Complementary information[2)]
3.1(4)	Materials and geometry, Material properties	No further information	
4.1.4 (3)	Ultimate limit states in steel shells, Ultimate limit states to be accounted for	Unchanged	
5.2.4 (1)	Stress resultants and stresses in shells, Modelling of the shell for analysis	Unchanged	
6.3 (5)	Plastic limit state (LS1), Design by global numerical MNA or GMNA analysis	Unchanged	
7.3.1 (1)	Cyclic plasticity limit state (LS2), Design by global numerical MNA or GMNA analysis	Unchanged	
7.3.2 (1)	Cyclic plasticity limit state (LS2), Design by global numerical MNA or GMNA analysis	Unchanged	
8.4.2 (3)	Buckling limit state (LS3), Buckling-relevant geometrical tolerances	Unchanged	
8.4.3 (2)	Buckling limit state (LS3), Buckling-relevant geometrical tolerances	Unchanged	
8.4.3 (4)	Buckling limit state (LS3), Buckling-relevant geometrical tolerances	Unchanged	
8.4.4 (4)	Buckling limit state (LS3), Buckling-relevant geometrical tolerances	Unchanged	
8.4.5 (1)	Buckling limit state (LS3), Buckling-relevant geometrical tolerances	Unchanged	
8.5.2 (2)	Buckling limit state (LS3), Stress design	National choice	
8.5.2 (4)	Buckling limit state (LS3), Stress design	Unchanged	
8.7.2 (7)	Buckling limit state (LS3), Design by global numerical analysis using GMNIA analysis	Unchanged	
8.7.2 (16)	Buckling limit state (LS3), Design by global numerical analysis using GMNIA analysis	Unchanged	
8.7.2 (18) 2 occurrences	Buckling limit state (LS3), Design by global numerical analysis using GMNIA analysis	Unchanged	
9.2.1(2)P	Fatigue limit state (LS4), Stress design	National choice	
8.5.2(2)	(Non-contradictory) complementary information in relation to D.14c and D.14d		Addition

Clause	Subject	National choice[1)]	Complementary information[2)]

1)
National choice: A national choice has been made.
No further information: The Eurocode allows further information. No further information is given.

2)
Complementary information: (Non-contradictory) complementary information on how to use the Eurocode

National choices

8.5.2(2) Buckling limit state (LS3), Stress design

The below expressions for γ_{Mi} are used, including the factor (γ_0) for the partial factors for strength parameters and resistances, cf. National Annex to EN 1990, Table A1.2(B+C):

$$\gamma_{M1} = 1{,}2 \cdot \gamma_0 \cdot \gamma_3$$
$$\gamma_{M2} = 1{,}35 \cdot \gamma_0 \cdot \gamma_3$$

Where there is a risk that no warning of failure is given, the partial factor should be multiplied by a factor 1,1.

The factor γ_0 takes into account the combination of actions, cf. National Annex to EN 1990, Table A1.2(B+C).

Limit state	**STR/GEO**				**STR**
Combination of actions	1	2	3	4	5
γ_0	1,0	1,0	K_{FI}	K_{FI}	$1{,}2 \cdot K_{FI}$

The factor γ_3 takes account of the level of checking of the product. The reduced level of checking is not used.
Extended level of checking: $\gamma_3 = 0{,}95$
Normal level of checking: $\gamma_3 = 1{,}00$

For structures covered by section 16(1) of the Danish Building Regulations, the extended level of checking cannot be applied, and γ_3.is taken as 1,00.

The partial factors are determined in accordance with the National Annex to EN 1990, Annex F, where $\gamma_M = \gamma_1 \gamma_2 \gamma_3 \gamma_4$.

γ_1 takes into account the type of failure;
γ_2 takes into account the uncertainty related to the design model;
γ_3 takes into account the extent of checking;
γ_4 takes into account the variation of the strength parameter or resistance.

When determining γ_1, the following types of failure have been assumed:

γ_{M1}: Warning of failure without residual resistance
γ_{M2}: No warning of failure

For accidental and seismic design situations the following values are used:

$$\gamma_{M1} = 1{,}0$$
$$\gamma_{M2} = 1{,}0$$

9.2.1(2)P Fatigue limit state (LS4), Stress design

The partial factor for resistance to fatigue is determined in accordance with the National Annex to EN 1993-1-9.

(Non-contradictory complementary information

8.5.2(2)
When using expressions D.14c and D.14d for calculating stability resistance in the meridional direction, to which expressions (8.11), (8.31), (8.36) and (8.42) are used in the calculation, $\gamma M1$ should not be taken as less than 1.32 for relative slenderness between x0 and xp.