

# ***NATIONAL ANNEX***

***TO***

***CYS EN 1993-1-6:2007  
(+A1: 2017+AC:2009)***

***Eurocode 3: Design of  
steel structures***

***Part 1-6: Strength  
and Stability of Shell  
Structures***



**NATIONAL ANNEX**  
**TO**  
**CYS EN 1993-1-6:2007 (+A1:2017+AC:2009)**  
**Eurocode 3: Design of steel structures**  
**Part 1-6: Strength and Stability of Shell Structures**

This National Annex has been approved by the Board of Directors of the Cyprus Organisation for Standardisation (CYS) on 14.06.2019.

**Note: Correction - changes to NA 2. 13 Clause 8.5.2(2) Design resistance (buckling strength) on 01.06.2020.**

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## INTRODUCTION

This National Annex has been prepared by CYS TC18 National Standardisation Technical Committee of the Cyprus Organization for Standardisation. (CYS).

### NA 1 SCOPE

This National Annex is to be used together with CYS EN 1993-1-6:2007 (Including A1:2017, Corrigendum AC:2009). Any reference in the rest of this text to CYS EN 1993-1-6:2007 means the above document.

This National Annex gives:

- (a) Nationally determined parameters for the following clauses of CYS EN 1993-1-6:2007 where National choice is allowed (see Section NA 2):
- 3.1(4)
  - 4.1.4(3)
  - 5.2.4(1)
  - 6.2.1(6)
  - 6.3(5)
  - 7.3.1(1)
  - 7.3.2(1)
  - 8.4.2(3)
  - 8.4.3(2)
  - 8.4.3(4)
  - 8.4.4(4)
  - 8.4.5(1)
  - 8.5.2(2)
  - 8.5.2(4)
  - 8.6.3(5)
  - 8.8.2(9)
  - 8.8.2(18)
  - 8.8.2(20) (2 times)
  - 9.2.1(2)P
- (b) References to non-contradictory complementary information to assist the user to apply CYS EN 1993-1-6: 2007(see Section NA 3).

## NA 2 NATIONALLY DETERMINED PARAMETERS

### NA 2.1 Clause 3.1(4) Material properties

No information is given on material properties at temperatures exceeding 150°C.

### NA 2.2 Clause 4.1.4(3) LS4: Fatigue

The recommended value of  $N_f = 10\,000$  shall be used.

### NA 2.3 Clause 5.2.4(1) Stress resultants and stresses

The recommended value of the radius to thickness ratio  $(r/t)_{\min} = 25$  shall be used.

**NA 2.4 Clause 6.2.1(6) Design values of stresses**

The recommended value of  $j = 3$  shall be used.

**NA 2.5 Clause 6.3(5) Design by global numerical MNA or GMNA analysis**

The recommended value of  $n_{mps} = (66 - f_{yd}/15)$ , where  $f_{yd}$  is in MPa, shall be used.

**NA 2.6 Clause 7.3.1(1) Design values of total accumulated plastic strain**

No recommendation is given for a more refined materially nonlinear global analysis.

**NA 2.7 Clause 7.3.2(1) Total accumulated plastic strain limitation**

The recommended value of  $n_{p,eq} = 25$  for use in equation (7.5) of CYS EN 1993-1-6: 2007 shall be used.

**NA 2.8 Clause 8.4.2(3) Out-of-roundness tolerance**

Values for the out-of-roundness tolerance parameter  $U_{r,max}$  as recommended in Table 8.1 of CYS EN 1993-1-6: 2007 are given in Table 8.1 (CYS).

**Table 8.1 (CYS): Values for out-of-roundness tolerance parameter  $U_{r,max}$**

	Diameter range	$d[m] \leq 0,50m$	$0,50m < d[m] < 1,25m$	$1,25m \leq d[m]$
Fabrication tolerance quality class	Description	Recommended value of $U_{r,max}$		
Class A	Excellent	0,014	$0,007 + 0,0093(1,25-d)$	0,007
Class B	High	0,020	$0,010 + 0,0133(1,25-d)$	0,010
Class C	Normal	0,030	$0,015 + 0,0200(1,25-d)$	0,015

**NA 2.9 Clause 8.4.3(2) Non-intended eccentricity tolerance**

Values for the maximum permitted non-intended eccentricity  $e_{a,max}$  as recommended in Table 8.2 of CYS EN 1993-1-6: 2007 are given in Table 8.2 (CYS).

**Table 8.2 (CYS): Values for maximum permitted non-intended eccentricities**

Fabrication tolerance quality class	Description	Recommended values for maximum permitted non-intended eccentricity $e_{a,max}$
Class A	Excellent	2 mm
Class B	High	3 mm
Class C	Normal	4 mm

**NA 2.10 Clause 8.4.3(4) Non-intended eccentricity tolerance**

Values for the non-intended eccentricity tolerance parameter  $U_{e,max}$  as recommended in Table 8.3 of CYS EN 1993-1-6: 2007 are given in Table 8.3.

**Table 8.3 (CYS): Values for non-intended eccentricity tolerances**

Fabrication tolerance quality class	Description	Recommended value of $U_{e,max}$
Class A	Excellent	0,14
Class B	High	0,20
Class C	Normal	0,30

**NA 2.11 Clause 8.4.4(4) Dimple tolerances**

Values for the dimple tolerance parameter  $U_{0,max}$  as recommended in Table 8.4 of CYS EN 1993-1-6: 2007 are given in Table 8.4 (CYS).

**Table 8.4 (CYS): Values for dimple tolerance parameter  $U_{0,max}$**

Fabrication tolerance quality class	Description	Recommended value of $U_{0,max}$
Class A	Excellent	0,006
Class B	High	0,010
Class C	Normal	0,016

**NA 2.12 Clause 8.4.5(1) Interface flatness tolerance**

The recommended value of  $\beta_0 = 0,1\% = 0,001$  radians shall be used.

**NA 2.13 Clause 8.5.2(2) Design resistance (buckling strength)**

Where no application standard exists for the form of construction involved, or the application standard does not define the relevant values of  $\gamma_{M1}$ , the value of  $\gamma_{M1}$  shall not be taken as smaller than the recommended value of  $\gamma_{M1} = 1,1$ .

**When applying Formulae D.14c and D.14d to calculate the meridional buckling capacity according to Formulae (8.11), (8.31), (8.36) and (8.42), it is recommended that for the relative slenderness range between  $\bar{\lambda}_{x0}$  and  $\bar{\lambda}_{xy}$  the value of  $\gamma_{M1}$  should not be taken as smaller than  $\gamma_{M1} = 1,2$ .**

**NA 2.14 Clause 8.5.2(4) Design resistance (buckling strength)**

The values of the following parameters shall be taken from Annex D of CYS EN 1993-1-6: 2007:

- $\alpha$  is the elastic buckling reduction factor
- $\beta$  is the plastic range factor
- $\eta$  is the interaction exponent
- $\bar{\lambda}_0$  is the squash limit relative slenderness
- $\chi^h$  is the hardening limit

**NA 2.15 Clause 8.6.3(5) Design value of resistance**

The values of the following parameters shall be taken from Annex E of CYS EN 1993-1-6:2007:

- $\alpha$  is the elastic buckling reduction factor
- $\beta$  is the plastic range factor
- $\eta$  is the interaction exponent
- $\bar{\lambda}_0$  is the squash limit relative slenderness
- $\chi^h$  is the hardening limit

**NA 2.16 Clause 8.8.2(9) Design value of resistance**

The recommended value of  $\beta = 0,1$  radians shall be used.

**NA 2.17 Clause 8.8.2(18) Design value of resistance**

No additional requirements are defined for the assessment of appropriate patterns of imperfections.

**NA 2.18 Clause 8.8.2(20) (2 times) Design value of resistance**

The recommended value of  $n_i = 25$  shall be used.

Values for the dimple tolerance parameter  $U_{n1}$  and  $U_{n2}$  as recommended in Table 8.5 of CYS EN 1993-1-6: 2007 are given in Table 8.5 (CYS).

**Table 8.5 (CYS): Values for dimple imperfection amplitude parameters  $U_{n1}$  and  $U_{n2}$**

Fabrication tolerance quality class	Description	Recommended value of $U_{n1}$	Recommended value of $U_{n2}$
Class A	Excellent	0,010	0,010
Class B	High	0,016	0,016
Class C	Normal	0,025	0,025

**NA 2.19 Clause 9.2.1(2)P General**

Where no application standard exists for the form of construction involved, or the application standard does not define the relevant values of the partial factor for resistance to fatigue  $\gamma_{Mf}$ , the value of  $\gamma_{Mf}$  should be taken from CYS EN 1993-1-9: 2005/AC: 2009 but not smaller than  $\gamma_{Mf} = 1,1$ .

**NA 3 REFERENCES TO NON-CONTRADICTORY COMPLEMENTARY INFORMATION**

None



**NA to  
CYS EN  
1993-1-6:2007  
(Including  
A1: 2017  
+AC:2009)**

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