

***NATIONAL ANNEX
TO
CYS EN 1993-3-2:2006***

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

***Part 3-2: Towers,
masts and chimneys
– Chimneys***

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TO
CYS EN 1993-3-2:2006
Eurocode 3: Design of steel structures
Part 3-2: Towers, masts and chimneys – Chimneys

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INTRODUCTION

This National Annex has been prepared by the CYS TC 18 National Standardisation Technical Committee of the Cyprus Organisation for Standardisation. (CYS)

NA 1 SCOPE

This National Annex is to be used together with CYS EN 1993-3-2:2006.

This National Annex gives:

(a) Nationally determined parameters for the following clauses of CYS EN 1993-3-2:2006 where National choice is allowed (see Section NA 2)

- 2.3.3.1(1)
- 2.3.3.5(1)
- 2.6(1)
- 4.2(1)
- 5.1(1)
- 5.2.1(3)
- 6.1(1)P
- 6.2.1(6)
- 6.4.1(1)
- 6.4.2(1)
- 6.4.3(2)
- 7.2(1)
- 7.2(2)
- 9.1(3)
- 9.1(4)
- 9.5(1)
- A.1(1)
- A.2(1) (2 places)
- C.2(1)

(b) Decisions on the use of the Informative Annexes B, C, D and E (see Section NA 3)

(c) References to non-contradictory complementary information to assist the user to apply CYS EN 1993-3-2:2006. In this National Annex such information is provided for the following clauses in CYS EN 1993-3-2:2006 (see Section NA 4)

- None

NA 2 NATIONALLY DETERMINED PARAMETERS

NA 2.1 Clause 2.3.3.1(1) Imposed loads

The characteristic imposed loads on platforms and railings are specified as

- Imposed loads on platforms: **2,0 kN/m²** ... (2.1a (CYS EN 1993-3-2))
- Horizontal loads on railings: **0,5 kN/m** ... (2.1b (CYS EN 1993-3-2))

NA 2.2 Clause 2.3.3.5(1) Ice loads

No further information is provided on ice loading.

NA 2.3 Clause 2.6(1) Durability

The design service life of the structure is specified as 30 years.

NA 2.4 Clause 4.2(1) External corrosion allowance

Table 4.1 (CYS EN 1993-3-2) provides values for the external corrosion allowance c_{ext} for normal environment.

Table 4.1 (CYS) External corrosion allowance (c_{ext})

Exposure	Exposure time	
	First 10 years	Each additional 10 years period
painted carbon steel (with no planned programme for repainting)	0	1 mm
painted carbon steel (with a planned programme for repainting)	0	0 mm
painted carbon steel protected by insulation and waterproof cladding	0	1 mm
unprotected carbon steel	1,5 mm	1 mm
unprotected weathering steel (see (3))	0,5 mm	0,3 mm
unprotected stainless steel	0	0
unprotected inner surface of the structural shell and unprotected outer surface of the liner in a double skin or multi-flue chimney (for carbon or weathering steel)	0,2mm	0,1mm

NA 2.5 Clause 5.1(1) Modelling of the chimney for determining action effects

No further information is provided on damping effects.

NA 2.6 Clause 5.2.1(3) Analysis of the structural shell

The criteria for neglecting shell effects are specified as

$$\ell / r_m \geq 0,14r_m / t + 10 \quad \dots (5.1 (CYS EN 1993-3-2))$$

where ℓ is the total height

r_m is the medium radius of the shell (i.e. in the middle of the plate)

t is the corroded plate thickness

NA 2.7 Clause 6.1.(1)P General

The partial factors for chimneys γ_M are specified as

$$\gamma_{M0} = 1,00$$

$$\gamma_{M1} = 1,10$$

$$\gamma_{M2} = 1,25$$

NA 2.8 Clause 6.2.1(6) Strength verification

The limits for the opening are specified as follows:

Stress distribution may generally be deemed to be satisfied if the stiffeners project above and below the opening at least 0,8 times the spacing of the stiffeners or 0,8 times the height of the opening, whichever is the greatest and the maximum angle of the opening should be 120°.

NA 2.9 Clause 6.4.1(1) General

The partial factors for joints and connections in chimneys are specified in Table 2.1 (CYS EN 1993-3-2) of the National Annex of CYS EN 1993-1-8, which is repeated below.

Table 2.1 : Partial safety factors for joints

Resistance of members and cross-sections	γ_{M0} , γ_{M1} and γ_{M2} see CYS EN 1993-1-1
Resistance of bolts	$\gamma_{M2} = 1,25$
Resistance of rivets	
Resistance of pins	
Resistance of welds	
Resistance of plates in bearing	
Slip resistance - for hybrid connections or connections under fatigue loading - for other design situations	$\gamma_{M3} = 1,25$ $\gamma_{M3,ser} = 1,1$
Bearing resistance of an injection bolt	$\gamma_{M4} = 1,0$
Resistance of joints in hollow section lattice girder	$\gamma_{M5} = 1,0$
Resistance of pins at serviceability limit state	$\gamma_{M6,ser} = 1,0$
Preload of high strength bolts	$\gamma_{M7} = 1,1$
Resistance of concrete	γ_c see CYS EN 1992-1-1

NA 2.10 Clause 6.4.2(1) Flange bolted connections

No further information is provided on the design of flange bolted connections.

NA 2.11 Clause 6.4.3(2) Connection of chimney to the foundation or supporting structure

No further information is provided on the design of the connections to the foundations.

NA 2.12 Clause 7.2(1) Deflections

The limiting value of the deflection in the along-wind direction at the top of a self-supporting chimney is specified as

$$\delta_{max} = h/50 \quad \dots (7.1 (CYS EN 1993-3-2))$$

where h is the overall height of the chimney.

NA 2.13 Clause 7.2(2) Deflections

Table 7.1 (CYS EN 1993-3-2) provides limiting values of vibration amplitudes, for the reliability classes, defined in Annex A of this part.

Table 7.1: Maximum amplitudes of cross-wind vibration

Reliability class	Limits to cross-wind vibration amplitude	
3	0,05	times the outer diameter
2	0,10	times the outer diameter

1	0,15	times the outer diameter

NA 2.14 Clause 9.1(3) General

No further information is provided on the modeling for stress analysis.

NA 2.15 Clause 9.1(4) General

No further information is provided.

NA 2.16 Clause 9.5(1) Partial factors for fatigue

The value of γ_{Ff} is 1,00.

The values for γ_{Mf} are specified in Table 3.1 (CYS EN 1993-3-2) of the National Annex of CYS EN 1993-1-9, which is repeated below.

Table 3.1: Recommended values for partial factors for fatigue strength

Assessment method	Consequence of failure	
	Low consequence	High consequence
Damage tolerant	1,00	1,15
Safe life	1,15	1,35

NA 2.17 Clause A.1(1) Reliability differentiation for steel chimneys

Table A.1 (CYS EN 1993-3-2) provides relevant reliability classes related to the consequences of structural failure.

Table A.1: Reliability differentiation for chimneys

Reliability Class	
3	Chimneys erected in strategic locations, such as nuclear power plants or in densely populated urban locations. Major chimneys in manned industrial sites where the economic and social consequences of their failure would be very high.
2	All normal chimneys at industrial sites or other locations that cannot be defined as Class 1 or Class 3.
1	Chimneys built in open countryside whose failure would not cause injury. Chimneys less than 16m high in unmanned sites.

NA 2.18 Clause A.2(1) Partial factors for actions

Table A.2 (CYS EN 1993-3-2) provides numerical values of γ_G and γ_Q for the reliability classes, defined in this Annex.

Table A.2: Partial factors for permanent and variable actions

Type of Effect	Reliability Class	Permanent Actions	Variable Actions (Qs)
unfavourable	3	1,2	1,6
	2	1,1	1,4
	1	1,0	1,2
favourable	All Classes	1,0	0,0
Accidental situations		1,0	1,0

No information is provided on the use of dynamic response analysis for wind actions.

NA 2.19 Clause C.2(1) Enhancement of fatigue strength for special quality requirements

Enhancement of fatigue strength can be considered for the following details, if quality level B is applied:

- transverse splices in shell with butt welds carried out from both sides
- longitudinal splices in shell with continuous seam weld
- continuous longitudinal attachment with or without shear flow
- cruciform joints with partial penetration welds

NA 3 DECISION ON USE OF THE INFORMATIVE ANNEXES

NA 3.1 Annex B

Annex B may be used

NA 3.2 Annex C

Annex C may be used

NA 3.3 Annex D

Annex D may be used

NA 3.4 Annex E

Annex E may be used

NA 4 REFERENCES TO NON-CONTRADICTORY COMPLEMENTARY INFORMATION

None

**NA to
CYS EN
1993-3-2:2006**

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