NATIONAL ANNEX TO CYS EN 1992-4:2018

Eurocode 2: Design of concrete structures

Part 4: Design of fastenings for use in concrete

CYPRUS ORGANISATION FOR STANDARDISATION

NATIONAL ANNEX

TO

CYS EN 1992-4:2018

Eurocode 2: Design of concrete structures Part 4: Design of fastenings for use in concrete

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

INTRODUCTION

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

NA 1 SCOPE

This National Annex is to be used together with CYS EN 1992-4:2018.

This National Annex gives:

(a) Nationally determined parameters for the following clauses of CYS EN 1992-4:2018 where National choice is allowed (see Section NA 2)

- 4.4.1 (2)
- 4.4.2.2 (2)
- 4.4.2.3
- 4.4.2.4
- 4.7 (2)
- 9.3 (1)
- C.2 (2)
- C.4.4 (1)
- C.4.4 (3)
- D.2 (2)

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

(c)References to non-contradictory complementary information to assist the user to apply CYS EN 1992-4:2018. In this National Annex such information is provided for the following clauses in CYS EN 1992-4:2018 (see Section NA 4)

NA 2 NATIONALLY DETERMINED PARAMETERS

NA 2.1 Clause 4.4.1 (2) Partial factors for actions

The values of partial factors for ultimate limit state are $\gamma_{\text{ind}} = 1,2$ for concrete failure and $\gamma_{\text{ind}} = 1,0$ for other modes of failure, and in case of fatigue loading $\gamma_{\text{F,fat}} = 1,0$.

NA 2.2 Clause 4.4.2.2 (2) Ultimate limit state (static, quasi static and seismic loading)

The value of a partial factor under static, quasi static, seismic and accidental loading is given in Table 4.1 (CYS), when the partial factor is not product dependent.

Table 4.1 (CYS): Values of partial factors

Failure modes	Partial factor		
	Permanent and transient design situations		Accidental design situation
Steel failure – fasteners			
Tension	γ_{Ms}	= 1,2 · $f_{uk}/f_{yk} \geq 1,4$	= 1,05 · $f_{uk}/f_{yk} \geq 1,25$
Shear with and without lever arm	γ_{Ms}	= 1,0 · $f_{uk}/f_{yk} \geq 1,25$ when $f_{uk} \leq 800$ N/mm^2 and $f_{yk}/f_{uk} \leq 0,8$	= 1,0 · $f_{uk}/f_{yk} \geq 1,25$ when $f_{uk} \leq 800$ N/mm^2 and $f_{yk}/f_{uk} \leq 0,8$
	γ_{Ms}	= 1,5 when $f_{uk} > 800$ N/mm^2 or $f_{yk}/f_{uk} > 0,8$	= 1,3 when $f_{uk} > 800$ N/mm^2 or $f_{yk}/f_{uk} > 0,8$
Steel failure – anchor channels			
Tension in anchors and channel bolts	γ_{Ms}	= 1,2 · $f_{uk}/f_{yk} \geq 1,4$	= 1,05 · $f_{uk}/f_{yk} \geq 1,25$
Shear with and without lever arm in channel bolts	γ_{Ms}	= 1,0 · $f_{uk}/f_{yk} \geq 1,25$ when $f_{uk} \leq 800$ N/mm^2 and $f_{yk}/f_{uk} \leq 0,8$	= 1,0 · $f_{uk}/f_{yk} \geq 1,25$ when $f_{uk} \leq 800$ N/mm^2 and $f_{yk}/f_{uk} \leq 0,8$
	γ_{Ms}	= 1,5 when $f_{uk} > 800$ N/mm^2 or $f_{yk}/f_{uk} > 0,8$	= 1,3 when $f_{uk} > 800$ N/mm^2 or $f_{yk}/f_{uk} > 0,8$
Connection between anchor and channel in tension and shear	$\gamma_{Ms,ca}$	= 1,8	= 1,6
Local failure of anchor channel by bending of lips in tension and shear	$\gamma_{Ms,l}$	= 1,8	= 1,6
Bending of channel	$\gamma_{Ms,flex}$	= 1,15	= 1,0
Steel failure – supplementary reinforcement			
Tension	$\gamma_{Ms,re}$	= 1,15 [a]	= 1,0
Concrete related failure			
Concrete cone failure, concrete edge failure, concrete blow-out failure, concrete pry-out	γ_{Mc}	= $\gamma_c \cdot \gamma_{inst}$	= $\gamma_c \cdot \gamma_{inst}$
	γ_c	= 1,5[a] for seismic repair and strengthening of existing structures see the CYS EN 1998 series	= 1,2[a] for seismic repair and strengthening of existing structures see the CYS EN 1998 series

failure	γ_{inst}	= 1,0 for headed fasteners and anchor channels satisfying the requirements of 4.6 (in tension and shear) ≥ 1,0 for post-installed fasteners in tension, see relevant European Technical Product Specification = 1,0 for post-installed fasteners in shear
Concrete splitting failure	γ_{Msp}	$= \gamma_{Mc}$
Pull-out and combined pull-out and concrete failure	γ_{Mp}	$= \gamma_{Mc}$
[a] The values are in accordance with CYS EN 1992-1-1.		

The values of partial factors, in Table 4.1 (CYS), take into account that the characteristic resistance for steel failure is based on f_{uk}, except f_{yk} should be used for bending of the channel of anchor channels and steel failure of supplementary reinforcement.

NA 2.3 Clause 4.4.2.3 Ultimate limit state (fatigue loading)

The values of the partial factors for material for fastenings under fatigue loading are $\gamma_{\text{Ms,fat}} = 1,35$ (steel failure) and $\gamma_{\text{Mc,fat}} = \gamma_{\text{Msp,fat}} = \gamma_{\text{Mp,fat}} = 1,5 \cdot \gamma_{\text{inst}}$ (concrete related failure modes).

NA 2.4 Clause 4.4.2.4 Serviceability limit state

The value of the partial factor for serviceability limit state is $\gamma_{\text{M}} = 1,0$.

NA 2.5 Clause 4.7 (2) Determination of concrete condition

The value of the admissible tensile stress σ_{adm} for the definition of uncracked concrete is $\sigma_{\text{adm}} = 0$ N/mm^2 and is based on the characteristic combination of loading at the serviceability limit state.

NA 2.6 Clause 9.3 (1) Derivation of forces acting on fasteners

The determination of seismic action effects may be found in NA to CYS EN1998-1:2004

NA 3 DECISION ON USE OF THE ANNEXES

NA 3.1 Annex A

Annex A may be used

NA 3.2 Annex B

Annex B may be used

NA 3.3 Annex C

Annex C may be used

NA 3.4 Annex C.2 (2) Performance categories

The assignment of the seismic performance categories C1 and C2 to the seismicity level and building importance classes are shown in Table C.1 (CYS).

Table C.1 (CYS): Seismic Performance categories for fasteners

Seismicity level[a]		**Importance Class acc. to CYS EN 1998-1:2004, 4.2.5**			
Class	$a_{\text{g}} \cdot S^{\text{c}}$	**I**	**II**	**III**	**IV**
Very Low[b]	$a_{\text{g}} \cdot S \le 0,05\ g$	No seismic performance category required			
Low[b]	$0,05\ g < a_{\text{g}} \cdot S \le 0,1\ g$	C1	C1[d] or C2[e]		C2
> low	$a_g \cdot S > 0,1\ g$	C1	C2		

[a] The values defining the seismicity levels are in the NA to CYS EN 1992-4:2018. The recommended values are given here.

b	Definition according to CYS EN 1998-1:2004, 3.2.1.
c	a_g = design ground acceleration on type A ground (see CYS EN 1998-1:2004, 3.2.1), S = soil factor (see CYS EN 1998-1:2004, 3.2.2).
d	C1 for fixing non-structural elements to structures (Type 'B' connections).
e	C2 for fixing structural elements to structures (Type 'A' connections).

NA 3.5 Annex C.4.4 (1) Additions and alterations to EN 1998-1:2004, 4.3.5.2

The determination of the seismic action effects of non-structural elements can be determined applying Formula (4.24) of CYS EN 1998-1:2004 in combination with Formula (C.3) of CYS EN 1992-4:2018.

NA 3.6 Annex C.4.4 (3) Additions and alterations to EN 1998-1:2004, 4.3.5.2

The determination of the vertical seismic action effects of non-structural elements can be determined applying Formula C.5 of CYS EN 1992-4:2018.

NA 3.7 Annex D

Annex D may be used

NA 3.8 Annex D.2 (2) Partial factors

The value of the partial factor for materials $\gamma_{M,fi}$ may be found in the CYS EN 1992-4:2018.

NA 3.9 Annex E

Annex E may be used

NA 3.10 Annex F

Annex F may be used

NA 3.11 Annex G

Annex G may be used

NA 4 REFERENCES TO NON-CONTRADICTORY COMPLEMENTARY INFORMATION

None

blank

NA to
CYS EN
1992-4:2018

CYPRUS ORGANISATION FOR STANDARDISATION
Limassol Avenue and Kosta Anaxagora 30,
2nd & 3rd Floor, 2014 Strovolos, Cyprus
P.O.BOX.16197, 2086 Nicosia, Cyprus
Tel: +357 22 411411 Fax: +357 22 411511
E-Mail: cystandards@cys.org.cy
Website: www.cys.org.cy