NATIONAL ANNEX TO CYS EN 1999-1-1:2007 (Including A1:2009 and A2:2013)

Eurocode 9: Design of aluminium structures

Part 1-1: General structural rules

CYPRUS ORGANISATION FOR STANDARDISATION

NATIONAL ANNEX

TO

CYS EN 1999-1-1:2007

(Including A1:2009, A2:2013)

Eurocode 9: Design of aluminium structures

Part 1-1: General structural rules

This National Annex has been approved by the Board of Directors of the Cyprus Organisation for Standardisation (CYS) on 23.08.2019.

INTRODUCTION

This National Annex has been prepared by the 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 1999-1-1:2007 including A1:2009, A2:2013. Any reference in the rest of this text to CYS EN 1991-1-1:2007 means the above document.

This National Annex gives:

(a) Nationally determined parameters for the following clauses of CYS EN 1999-1-1:2007 where National choice is allowed (see Section NA 2)

- 1.1.2(1)
- 2.1.2(3)
- 2.3.1(1)
- 3.2.1(1)
- 3.2.2(1)
- 3.2.2(2)
- 3.2.3.1(1)
- 3.3.2.1(3)
- 3.3.2.2(1)
- 5.2.1(3)
- 5.3.2(3)
- 5.3.4(3)
- 6.1.3(1)
- 6.2.1(5)
- 7.1(4)
- 7.2.1(1)
- 7.2.2(1)
- 7.2.3(1)
- 8.1.1(2)
- 8.9(3)
- A.2
- C.3.4.1(2)
- C.3.4.1(3)
- C.3.4.1(4)
- K.1(1)
- K.3(1)

(b) Decisions on the use of the Informative Annexes A, C, D, E, F, G, H, I, J, K, L and M (see Section NA 3)

(c) References to non-contradictory complementary information to assist the user to apply CYS EN 1999-1-1:2007. In this National Annex such information is provided for the following clauses in CYS EN 1999-1-1:2007 (see Section NA 4).

NA 2 NATIONALLY DETERMINED PARAMETERS

NA 2.1 Clause 1.1.2 (1) Scope of EN 1999-1-1

The minimum material thicknesses are defined as follows (if not otherwise explicitly stated in this standard):

- components with material thickness not less than 0,6 mm;
- welded components with material thickness not less than 1,5 mm;
- connections with:
    - o steel bolts and pins with diameter not less than 5 mm;
    - o aluminium bolts and pins with diameter not less than 8 mm;
    - o rivets and thread forming screws with diameter not less than 4,2 mm

NA 2.2 Clause 2.1.2 (3) Reliability management

No further guidance is given.

NA 2.3 Clause 2.3.1 (1) Actions and environmental influences

No further actions are defined.

NA 2.4 Clause 3.2.1 (1) Range of materials

No other aluminium alloys and temper listed.

NA 2.5 Clause 3.2.2 (1) Material properties for wrought aluminium alloys

For the application of products for electrically welded tubes buckling class B shall be used. No further rules are given.

NA 2.6 Clause 3.2.2 (2) Material properties for wrought aluminium alloys

For temperatures between 80°C and 100°C the following procedure shall be used:

All characteristic aluminium resistance values (f_o, f_u, $f_{o,haz}$ and $f_{u,haz}$) may be reduced according to

$$X_{kT} = [1 - k_{100}(T - 80) / 20] X_k$$

where:

X_k is the characteristic value of a strength property of a material

X_{kT} is the characteristic strength value for the material at temperature T between 80°C and 100 °C

T is the highest temperature the structure is operating

k_{100} = 0,1 for strain hardening alloys (3xxx-alloys, 5xxx-alloys and EN AW 8011A)

k_{100} = 0,2 for precipitation hardening material (6xxx-alloys and EN AW-7020)

At 100^{O}C generally Buckling Class B is applicable for all aluminium alloys. For temperatures between 80°C and 100°C interpolation between Class A and Class B should be done.

No further rules for the reduction of the characteristic values are given.

NA 2.7 Clause 3.2.3.1 (1) General

No rules concerning the quality requirements for castings are given.

NA 2.8 Clause 3.3.2.1 (3) General

No further provisions for the use of aluminium bolts are given.

NA 2.9 Clause 3.3.2.2 (1) Preloaded bolts

No rules for bolts, not according to existing ENs and ISO Standards, to be used for preloading application are given.

NA 2.10 Clause 5.2.1 (3) Effects of deformed geometry of the structure

First order analysis may be used for the structure, if the increase of the relevant internal forces or moments or any other change of structural behaviour caused by deformations can be neglected. This condition may be assumed to be fulfilled, if the following criterion is satisfied:

$$\alpha_{cr} = \frac{F_{cr}}{F_{Ed}} \geq 10$$

where:

α_{cr} is the factor by which the design loading would have to be increased to cause elastic instability in a global mode

F_{Ed} is the design loading on the structure

F_{cr} is the elastic critical buckling load for global instability mode based on initial elastic stiffness.

No other different criterion for the limit of α_{cr} for neglecting the influence of second order effects, is given.

NA 2.11 Clause 5.3.2 (3) Imperfections for global analysis of frames

Table 2.1(CYS) defines the design values of initial bow imperfection e_0/L of the Table 2.1 of CYS EN 1999-1-1:2007.

Table 2.1(CYS) - Design values of initial bow imperfection e_0 / L

Buckling class acc. to Table 3.2 of CYS EN 1999-1-1:2007.	elastic analysis	plastic analysis
	e_0/L	e_0/L
A	1/300	1/250
B	1/200	1/150

NA 2.12 Clause 5.3.4 (3) Member imperfections

The value of k is defined to be k = 0,5.

NA 2.13 Clause 6.1.3 (1) Partial safety factors

The partial factors γ_{Mi} are defined to be:

γ_{M1} = 1,10

γ_{M2} = 1,25

For other recommended numerical values see CYS EN 1999 Part 1-2 to Part 1-5. No further information for structures not covered by CYS EN 1999 Part 1-2 to Part 1-5 are given.

NA 2.14 Clause 6.2.1 (5) Resistance of cross-sections

For the criterion (6.15) of CYS EN 1999-1-1:2007, the constant C is defined to be, C = 1,2.

NA 2.15 Clause 7.1 (4) General

No further guidance is given.

NA 2.16 Clause 7.2.1 (1) Vertical deflections

The National Annex does not specify the limits.

NA 2.17 Clause 7.2.2 (1) Horizontal deflections

The National Annex does not specify the limits.

NA 2.18 Clause 7.2.3 (1) Dynamic effects

The National Annex does not specify the limits for vibration of floors.

NA 2.19 Clause 8.1.1 (2) Introduction

Table 8.1 (CYS) provides the partial safety factors γ_M for joints, that shall be applied to the characteristic resistance for the various types of joints.

Table 8.1 - Recommended partial factors γ_M for joints

Resistance of members and cross-sections	γ_{M1} and γ_{M2} see 6.1.3
Resistance of bolt connections	γ_{M2} = 1,25
Resistance of rivet connections	
Resistance of plates in bearing	
Resistance of pin connections	γ_{Mp} = 1,25
Resistance of welded connections	γ_{Mw} = 1,25
Slip resistance, see 8.5.9.3 - for serviceability limit states - for ultimate limit states	 $\gamma_{Ms,ser}$ = 1,1 $\gamma_{Ms,ult}$ = 1,25
Resistance of adhesive bonded connections	γ_{Ma} ≥ 3,0
Resistance of pins at serviceability limit state	$\gamma_{Mp,ser}$ = 1,0

NA 2.20 Clause 8.9 (3) Other joining methods

The National Annex does not give any further provisions for other joining methods.

NA 2.21 Clause A.2 Design provisions for reliability differentiation – Design supervision levels

No further rules are given.

NA 2.22 Clause C.3.4.1(2) General design provisions

The partial factors $\gamma_{Mo,c}$ and $\gamma_{Mu,c}$ for criterion (C.1) of Annex C of CYS EN 1999-1-1:2007 are defined for buildings, to be:

$\gamma Mo,c = 1,1$ and

$\gamma Mu,c = 2,0$

NA 2.23 Clause C.3.4.1(3) General design provisions

The partial factors $\gamma_{M2,cu}$ and $\gamma_{M2,co}$ for criteria (C.2) and (C.3) of Annex C of CYS EN 1999-1-1:2007 are defined for buildings, to be:

$\gamma_{M2,cu} = \gamma_{Mu,c} = 2,0$ and
$\gamma_{M2,co} = \gamma_{Mo,c} = 1,1$

NA 2.24 Clause C.3.4.1(4) General design provisions

The partial factors $\gamma_{Mp,co}$ and $\gamma_{Mp,cu}$ for criteria (C.4) and (C.5) of Annex C of CYS EN 1999-1-1:2007 are defined for buildings, to be:

$\gamma_{Mp,co} = \gamma_{Mp} = 1,25$ and
$\gamma_{Mp,cu} = \gamma_{Mu,c} = 2,0$

NA 2.25 Clause K.1(1) General

Shear lag in flanges may be neglected at ultimate limit states when $b_0 < L_e / 25$ for support regions, cantilevers and region with concentrated load and when $b_0 < L_e / 15$ for sagging bending regions.

NA 2.26 Clause K.3(1) Shear lag at ultimate limit states

At ultimate limit states shear lag effects shall be determined using the following method:

a) elastic shear lag effects as defined for serviceability and fatigue limit states.

No further rules for elastic-plastic shear lag effects allowing for limited plastic strains are given.

NA 3 DECISION ON USE OF THE INFORMATIVE ANNEXES A, C, D, E, F, G, H, I, J, K, L AND M

NA 3.1 Annex A

Annex A 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 3.5 Annex F

Annex F may be used

NA 3.6 Annex G

Annex G may be used

NA 3.7 Annex H

Annex H may be used

NA 3.8 Annex I

Annex I may be used

NA 3.9 Annex J

Annex J may be used

NA 3.10 Annex K

Annex K may be used

NA 3.11 Annex L

Annex L may be used

NA 3.12 Annex M

Annex M may be used

NA 4 REFERENCES TO NON-CONTRADICTORY COMPLEMENTARY INFORMATION

None

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NA to CYS EN 1999-1-1:2007 *(Including A1:2009 and A2:2013)*

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