CYS National Annex to CYS EN 1993-1-1:2005

Eurocode 3:

Design of steel structures

Part 1-1: General rules and rules for buildings

Prepared by
Eurocodes Committee, Scientific and Technical Chamber of Cyprus under a Ministry of Interior's Programme

NATIONAL ANNEX

TO

CYS EN 1993-1-1:2005

Eurocode 3: Design of steel structures

Part1-1: General rules and rules for buildings

This National Annex has been approved by the Board of Governors of the Cyprus Organisation for Standardisation on 11/06/2010.

INTRODUCTION

This National Annex has been prepared by the Eurocodes Committee of the Technical Chamber of Cyprus which was commissioned by the Ministry of Interior of the Republic of Cyprus.

NA 1 SCOPE

This National Annex is to be used in conjunction with CYS EN 1993-1-1:2005.

This National Annex gives:

(a) Nationally Determined Parameters described in the following clauses of CYS EN 1993-1-1:2005 (see Section NA 2):

- 2.3.1 (1)
- 3.1 (2)
- 3.2.1 (1)
- 3.2.2 (1)
- 3.2.3 (1)
- 3.2.3 (3)B
- 3.2.4 (1)B
- 5.2.1 (3)
- 5.2.2 (8)
- 5.3.2 (3)
- 5.3.2 (11)
- 5.3.4 (3)
- 6.1(1)
- 6.1 (1)B
- 6.3.2.2 (2)
- 6.3.2.3 (1)
- 6.3.2.3 (2)
- 6.3.2.4 (1)B
- 6.3.2.4 (2)B
- 6.3.3 (5)
- 6.3.4 (1)
- 7.2.1 (1)B
- 7.2.2 (1)B
- 7.2.3 (1)B
- BB.1.3 (3)B

(b) Decisions on the use of CYS EN 1993-1-1:2005 informative annexes (see Section NA 3)

(c) References to non-contradictory complementary information to assist the user to apply CYS EN 1993-1-1:2005 (see Section NA 4)

NA 2 NATIONALLY DETERMINED PARAMETERS

NA 2.1 Clause 2.3.1 (1) Actions and environmental influences

Refer to the parts of CYS EN 1991 and their National Annexes.

NA 2.2 Clause 3.1 (2) General

No information for other steel material and products is provided in this National Annex.

NA 2.3 Clause 3.2.1 (1) Material properties

The nominal values of the yield strength f_y and the ultimate strength f_u for structural steel should be obtained by adopting the values $f_y = R_{eh}$ and $f_u = R_m$ direct from the product standard.

NA 2.4 Clause 3.2.2 (1) Ductility requirements

The following recommended requirements should be used:

- $f_u / f_y \geq 1{,}10$;
- elongation at failure not less than 15%;
- $\varepsilon_u \geq 15\varepsilon_y$, where ε_y is the yield strain ($\varepsilon_y = f_y / E$).

NA 2.5 Clause 3.2.3 (1) Fracture toughness

Refer to CYS EN1991-1-5 and its National Annex.

NA 2.6 Clause 3.2.3 (3)B Fracture toughness

The toughness properties for members in compression should be taken from Table 2.1 (CYS) of the CYS EN 1993-1-10 for $\sigma_{Ed} = 0{,}25\ f_y(t)$, which is repeated here.

Table 2.1 (CYS): Maximum permissible values of element thickness t in mm

Steel grade	Sub-grade	Charpy energy CVN		Reference temperature T_{Ed} [°C]																				
				10	0	-10	-20	-30	-40	-50	10	0	-10	-20	-30	-40	-50	10	0	-10	-20	-30	-40	-50
		at T [°C]	J_{min}	$\sigma_{Ed} = 0{,}75\ f_y(t)$							$\sigma_{Ed} = 0{,}50\ f_y(t)$							$\sigma_{Ed} = 0{,}25\ f_y(t)$						
S235	JR	20	27	60	50	40	35	30	25	20	90	75	65	55	45	40	35	135	115	100	85	75	65	60
	J0	0	27	90	75	60	50	40	35	30	125	105	90	75	65	55	45	175	155	135	115	100	85	75
	J2	-20	27	125	105	90	75	60	50	40	170	145	125	105	90	75	65	200	200	175	155	135	115	100
S275	JR	20	27	55	45	35	30	25	20	15	80	70	55	50	40	35	30	125	110	95	80	70	60	55
	J0	0	27	75	65	55	45	35	30	25	115	95	80	70	55	50	40	165	145	125	110	95	80	70
	J2	-20	27	110	95	75	65	55	45	35	155	130	115	95	80	70	55	200	190	165	145	125	110	95
	M,N	-20	40	135	110	95	75	65	55	45	180	155	130	115	95	80	70	200	200	190	165	145	125	110
	ML,NL	-50	27	185	160	135	110	95	75	65	200	200	180	155	130	115	95	230	200	200	200	190	165	145
S355	JR	20	27	40	35	25	20	15	15	10	65	55	45	40	30	25	25	110	95	80	70	60	55	45
	J0	0	27	60	50	40	35	25	20	15	95	80	65	55	45	40	30	150	130	110	95	80	70	60
	J2	-20	27	90	75	60	50	40	35	25	135	110	95	80	65	55	45	200	175	150	130	110	95	80
	K2,M,N	-20	40	110	90	75	60	50	40	35	155	135	110	95	80	65	55	200	200	175	150	130	110	95
	ML,NL	-50	27	155	130	110	90	75	60	50	200	180	155	135	110	95	80	210	200	200	200	175	150	130
S420	M,N	-20	40	95	80	65	55	45	35	30	140	120	100	85	70	60	50	200	185	160	140	120	100	85
	ML,NL	-50	27	135	115	95	80	65	55	45	190	165	140	120	100	85	70	200	200	200	185	160	140	120
S460	Q	-20	30	70	60	50	40	30	25	20	110	95	75	65	55	45	35	175	155	130	115	95	80	70
	M,N	-20	40	90	70	60	50	40	30	25	130	110	95	75	65	55	45	200	175	155	130	115	95	80
	QL	-40	30	105	90	70	60	50	40	30	155	130	110	95	75	65	55	200	200	175	155	130	115	95
	ML,NL	-50	27	125	105	90	70	60	50	40	180	155	130	110	95	75	65	200	200	200	175	155	130	115
	QL1	-60	30	150	125	105	90	70	60	50	200	180	155	130	110	95	75	215	200	200	200	175	155	130
S690	Q	0	40	40	30	25	20	15	10	10	65	55	45	35	30	20	20	120	100	85	75	60	50	45
	Q	-20	30	50	40	30	25	20	15	10	80	65	55	45	35	30	20	140	120	100	85	75	60	50
	QL	-20	40	60	50	40	30	25	20	15	95	80	65	55	45	35	30	165	140	120	100	85	75	60
	QL	-40	30	75	60	50	40	30	25	20	115	95	80	65	55	45	35	190	165	140	120	100	85	75
	QL1	-40	40	90	75	60	50	40	30	25	135	115	95	80	65	55	45	200	190	165	140	120	100	85
	QL1	-60	30	110	90	75	60	50	40	30	160	135	115	95	80	65	55	200	200	190	165	140	120	100

NOTE 1 Linear interpolation can be used in applying Table 2.1 (CYS). Most applications require σ_{Ed} values between $\sigma_{Ed} = 0,75\ f_y(t)$ and $\sigma_{Ed} = 0,50\ f_y(t)$. $\sigma_{Ed} = 0,25\ f_y(t)$ is given for interpolation purposes. Extrapolations beyond the extreme values are not valid.

NOTE 2 For ordering products made of S 690 steels the T_J – values should be specified.

NA 2.7 Clause 3.2.4 (1)B Through-thickness properties

The allocation of target values Z_{Ed} according to 3.2(2) of CYS EN 1993-1-10 to the quality class in EN 10164 are given in Table 3.2 (CYS).

Table 3.2 (CYS): Choice of quality class according to EN 10164

Target value of Z_{Ed} according to CYS EN 1993-1-10	Required value of Z_{Rd} according to EN 10164
$Z_{Ed} \leq 10$	—
$10 < Z_{Ed} \leq 20$	Z 15
$20 < Z_{Ed} \leq 30$	Z 25
$Z_{Ed} > 30$	Z 35

NA 2.8 Clause 5.2.1 (3) Effects of deformed geometry of the structure

The lower limit for α_{cr} should be the general limit set in the clause.

NA 2.9 Clause 5.2.2 (8) Structural stability of frames

No further information is provided in this National Annex.

NA 2.10 Clause 5.3.2 (3) Imperfections for global analysis of frames

The values of initial local bow imperfection, e_0 / L, are specified in Table 5.1 (CYS).

Table 5.1 (CYS): Design values of initial bow imperfection e_0 / L

Buckling curve acc. to Table 6.1	elastic analysis	plastic analysis
	e_0 / L	e_0 / L
a_0	1 / 350	1 / 300
a	1 / 300	1 / 250
b	1 / 250	1 / 200
c	1 / 200	1 / 150
d	1 / 150	1 / 100

NA 2.11 Clause 5.3.2 (11) Imperfections for global analysis of frames

No further information is provided in this National Annex.

NA 2.12 Clause 5.3.4 (3) Member imperfections

The recommended value of k=0,5 should be used.

NA 2.13 Clause 6.1 (1) General

For structures not covered by CYS EN 1993 Part 2 to Part 6, the values for the partial factors γ_{Mi} should be taken from CYS EN 1993-2.

NA 2.14 Clause 6.1 (1)B General

The following recommended values for the partial factors γ_{Mi} for buildings should be used:

$\gamma_{M0} = 1,00$

$\gamma_{M1} = 1,00$

$\gamma_{M2} = 1,25$

NA 2.15 Clause 6.3.2.2 (2) Lateral torsional buckling curves – General case

The values of imperfection factor α_{LT} are defined in Table 6.3 (CYS).

Table 6.3 (CYS): Imperfection factors for lateral torsional buckling curves

Buckling curve	a	b	c	d
Imperfection factor α_{LT}	0,21	0,34	0,49	0,76

The specification of the symbols for the buckling curves are given in Table 6.4 (CYS).

Table 6.4 (CYS): Lateral torsional buckling curves for cross-sections using equation (6.56)

Cross-section	Limits	Buckling curve
Rolled I-sections	$h/b \leq 2$ $h/b > 2$	**a** **b**
Welded I-sections	$h/b \leq 2$ $h/b > 2$	**c** **d**
Other cross-sections	-	**d**

NA 2.16 Clause 6.3.2.3 (1) Lateral torsional buckling curves for rolled sections or equivalent welded sections

The following recommended limitations should be used:

$\bar{\lambda}_{LT,0} = 0,4$ (maximum value)

$\beta = 0,75$ (minimum value)

The specification of the symbols for the lateral torsional buckling curves are given in Table 6.5 (CYS).

Table 6.5 (CYS): Selection of lateral torsional buckling curve for cross sections using equation (6.57)

Cross-section	Limits	Buckling curve
Rolled I-sections	$h/b \leq 2$ $h/b > 2$	**b** **c**
Welded I-sections	$h/b \leq 2$ $h/b > 2$	**c** **d**

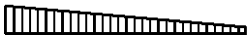
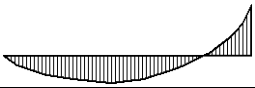
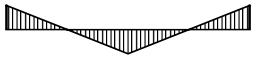
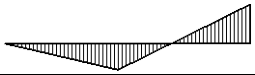
NA 2.17 Clause 6.3.2.3 (2) Lateral torsional buckling curves for rolled sections or equivalent welded sections

The following recommended minimum values should be used:

$f = 1 - 0{,}5(1 - k_c)[1 - 2{,}0(\bar{\lambda}_{LT} - 0{,}8)^2]$ but $f \leq 1{,}0$

Table 6.6 (CYS) defines the values for the correction factor, k_c, of Table 6.6 of CYS EN 1993-1-1.

Table 6.6 (CYS): Correction factors kc

Moment distribution	k_c
 $\psi = 1$	1,0
 $-1 \leq \psi \leq 1$	$\frac{1}{1{,}33 - 0{,}33\psi}$
	0,94
	0,90
	0,91
	0,86
	0,77
	0,82

NA 2.18 Clause 6. 3.2.4 (1)B Simplified as sessment m ethods f or b eams with restraints in buildings

The recommended limit value $\bar{\lambda}_{c0} = \bar{\lambda}_{LT,0} + 0{,}1$ should be used, see 6.3.2.3 of CYS EN 1993-1-1.

NA 2.19 Clause 6. 3.2.4 (2)B Simplified as sessment m ethods f or b eams with restraints in buildings

The recommended value of $k_{f\ell}$ =1,10 should be used.

NA 2.20 Clause 6.3.3 (5) Uniform members in bending and axial compression

Method 2 is preferred but Method 1 may be used at the discretion of the designer.

NA 2.21 Clause 6.3.4 (1) General m ethod f or l ateral and l ateral t orsional buckling of structural components

The method may be used at the discretion of the designer.

NA 2.22 Clause 7.2.1 (1)B Vertical deflections

With reference to Figure A1.1 (CYS) of CYS EN 1990, which is repeated here, the recommended limits for vertical deflections are given in Table NA1.

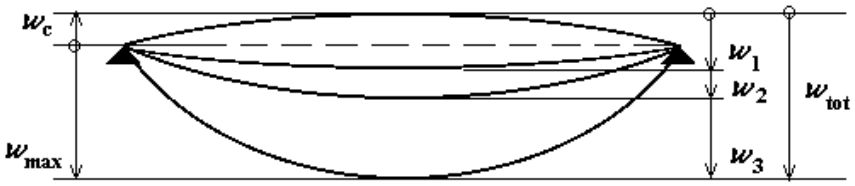


Figure A1.1 (CYS) - Definitions of vertical deflections

Key :

w_c Precamber in the unloaded structural member

w_1 Initial part of the deflection under permanent loads of the relevant combination of actions according to expressions (6.14a) to (6.16b)

w_2 Long-term part of the deflection under permanent loads

w_3 Additional part of the deflection due to the variable actions of the relevant combination of actions according to expressions (6.14a) to (6.16b)

w_{tot} Total deflection as sum of w_1 , w_2 , w_3

w_{max} Remaining total deflection taking into account the precamber

Table NA1: Recommended limits for vertical deflections

Design situation	Total deflection limits
Cantilevers	Length/180
Beams carrying plaster or other brittle finish	Span/360
Other beams (except purlins and sheeting rails)	Span/250
Purlins and sheeting rails	To suit cladding

NA 2.23 Clause 7.2.2 (1)B Horizontal deflections

With reference to Figure A1.2 of CYS EN 1990, which is repeated here, the recommended limits for horizontal deflections are given in Table NA2.

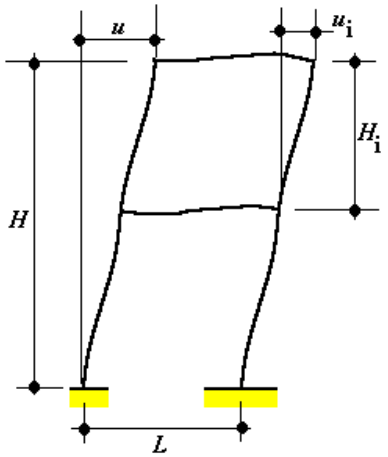


Figure A1.2 (CYS) - Definition of horizontal displacements

Key :
u Overall horizontal displacement over the building height H
u_i Horizontal displacement over a storey height H_i

Table NA2: Recommended limits for horizontal deflections

Design situation	Deflection limits
Tops of columns in single storey buildings, except portal frames	Height/300
Columns in portal frame buildings, not supporting crane runways	To suit cladding
In each storey of a building with more than one storey	Storey height/300
On the multistorey building as a whole	Building height/500

NA 2.24 Clause 7.2.3 (1)B Dynamic effects

The recommended limits for vibration of floors are given in Table NA3.

Table NA3: Recommended limits for vibration of floors

Design situation	Lowest natural frequency
Floors over which people walk regularly	5 Hz
Floor which is jumped or danced on in a rhythmical manner	9 Hz

NA 2.25 Clause BB.1.3 (3)B Hollow sections as members

No further information is provided in this National Annex.

NA 3 DECISION ON THE USE OF INFORMATIVE 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 AB

Annex AB may be used.

NA 3.4 Annex BB

Annex BB may be used.

NA 4 REFERENCES TO NON-CONTRADICTORY COMPLEMENTARY INFORMATION

None

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CYPRUS ORGANISATION FOR STANDARDISATION
Limassol Avenue and Kosta Anaxagora 30,
2nd & 3rd Floor, 2014 Nicosia, 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